

**ROAD TESTS: COMPACT CAMPING WAGONS**

# POPULAR MECHANICS

FEBRUARY, 1961  
35 CENTS



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for Your Kids**

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**THE HAZARDS OF OWNING A HOME**

**Scientists on the Brink of Hell**

**MAKE YOUR OWN PRINTED CIRCUITS**



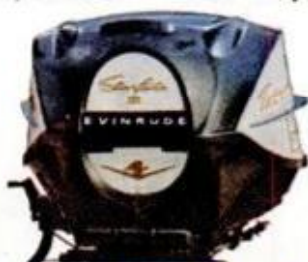
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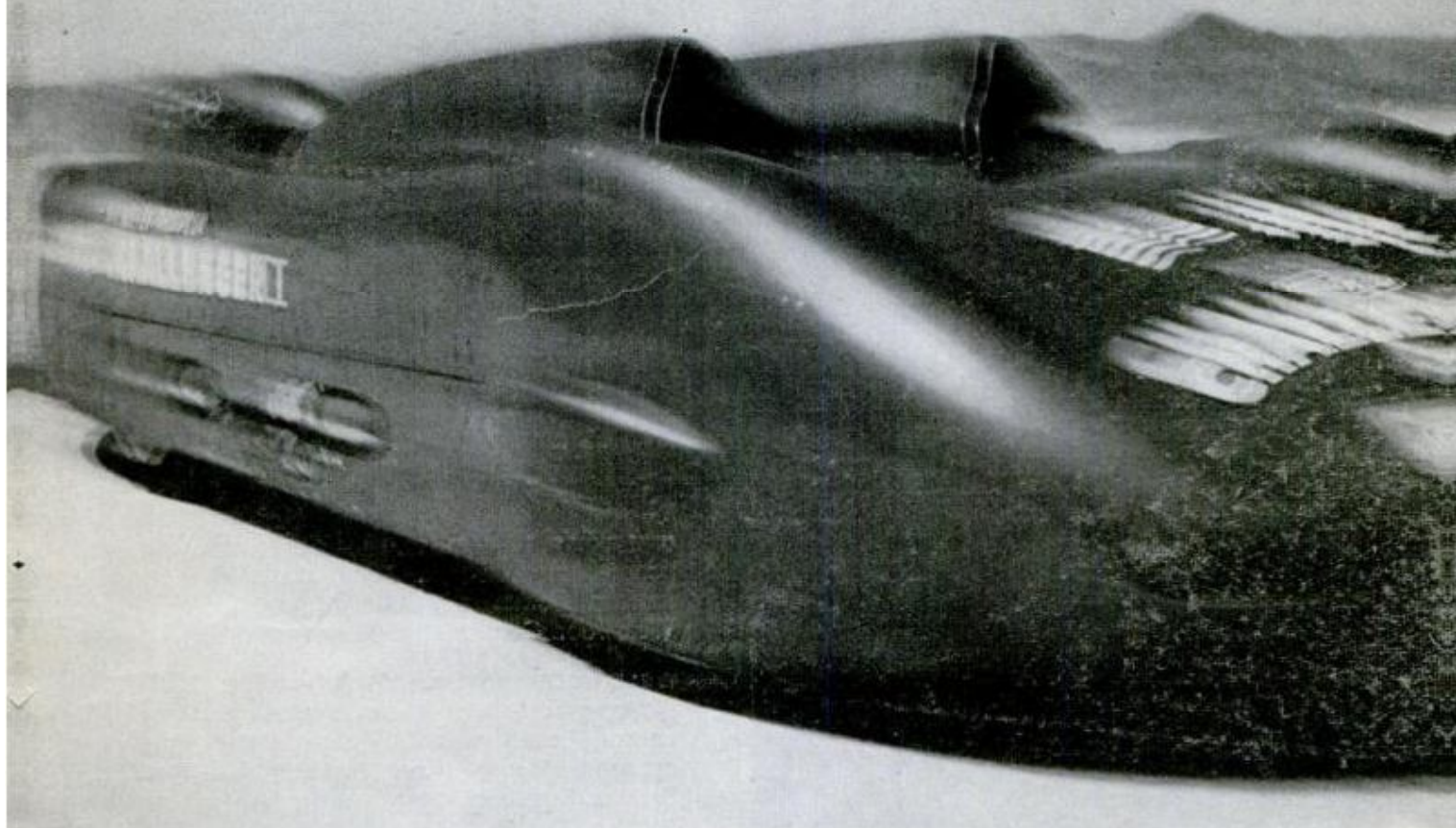
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Volume 115

FEBRUARY 1961

Number 2

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## Next Month...

SPECIAL! BOATS! There's a big bonus for boaters — a 38-page section — in the March issue. Included is the first installment of complete plans for building the Go-Cat, a roomy catamaran . . . Also, the owners themselves report on the Buick Special and Dodge Lancer . . . And our own surprising results in testing a new gas supplement that promises more mileage and cleaner engines

# RUGGED RELIABILITY TEST: NEW TEMPEST DRIVEN ROUGH AND HARD BY TEAM OF TEENAGERS!



Six of the teenagers photographed at a rest stop in Denver, Colorado. Left to right: Roger Anthony, John Sheffler, Jay Hall, Larry Weber, Jim Bader and Bob Quaid.

## THE HOT TOPIC IS THE NEW TEMPEST BY PONTIAC!



When you turn a couple of new cars over to a team of teenagers, you know the cars will get a real test of performance and durability. That's exactly what Pontiac did last July 1 with a Tempest Sedan and a Tempest Safari! The only instructions: "Keep them moving 24 hours a day. Treat them rough! Pile on the miles! Drive safely. Stick to the traffic laws."

The Tempest had already passed all the usual car tests (2,600,000 miles of testing by pro drivers and engineers). But this was the big one. A new and different kind of test. Pass this and the Tempest had it made.

It was a responsible assignment. The kids knew it and they bought it—100%! Sure they got tough with the cars. But that's what Pontiac expected—and wanted! That's the way you find out how much a car can take . . . how much it can deliver.

### PONTIAC RELIABILITY PROGRAM PAYS OFF!

The test ended on October 15, 1960. The durability run proved conclusively that the new Tempest (with the 4-cylinder engine up front . . . transmission in the rear . . . flexible, triple-alloy steel drive shaft . . . 4-wheel independent suspension . . . integral body and frame) gives the others something to shoot for on performance, economy and reliability.

### THROUGH 48 STATES, CANADA, TOO!

Supervised by three Pontiac engineers, these teenagers really man-handled the Tempest through 48 states and 7 Canadian provinces. They rammed the cars over back roads! Held it at the legal limit on expressways! Breezed it up and down Pikes Peak with no sweat! Scooted across scorching deserts.

### EQUAL TO SEVEN YEARS OF DRIVING

Day and night the miles piled up. 100,947 on the Sedan; 101,002 on the Wagon. Roughly the same as 7 or 8 years' driving. The cars got no special care. The protective maintenance procedures recommended in the Owner's Manual were followed—and it paid off! Plugs, points and fuel filters were changed every 12 to 15 thousand miles. Brakes were adjusted a couple of times but *never needed relining!* Tires were changed twice.

(Here are the other repairs. Sedan: 19,194 miles—starter solenoid changed. 20,701 miles—windshield cracked by stone. 40,094—left rear back-up light replaced. 62,765 miles—fuel pump replaced. 96,492—generator brushes replaced. 98,549—radiator leak repaired. Wagon: 4,576—light switch replaced. 16,192—stone chip in windshield. 40,591—heater switch connector loose. 51,368 miles—flying rock pierced gas tank. 96,527—generator brushes replaced. 97,210—rear wheel bearing replaced.)

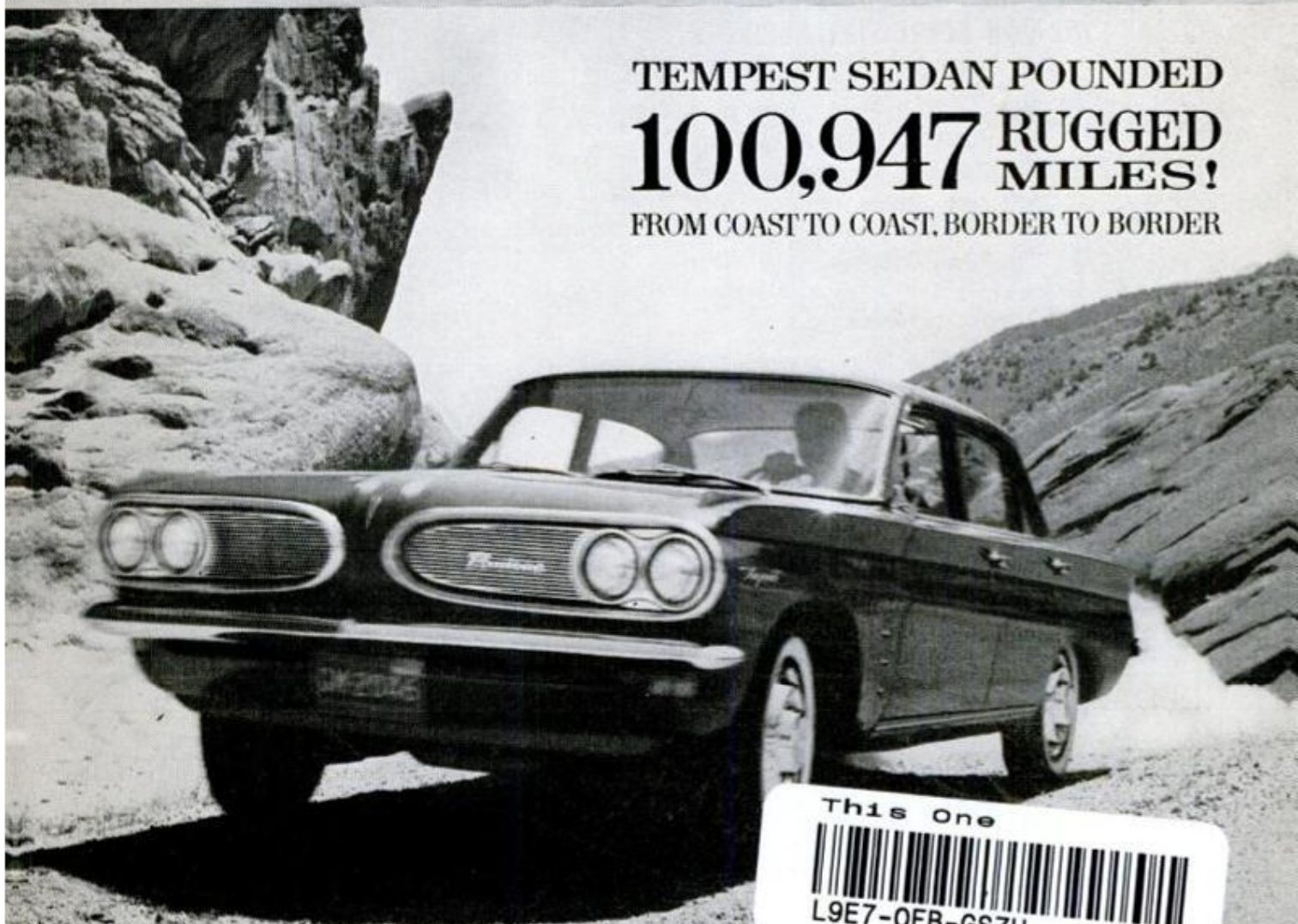
That's it! And that's low-cost, trouble-free driving. Check the Tempest out yourself! See your Pontiac dealer. Get the keys. Drive it.

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TEMPEST SAFARI RACKED UP  
**101,002 TOUGH MILES!**  
IN 107 DAY ROUND-THE-CLOCK MARATHON



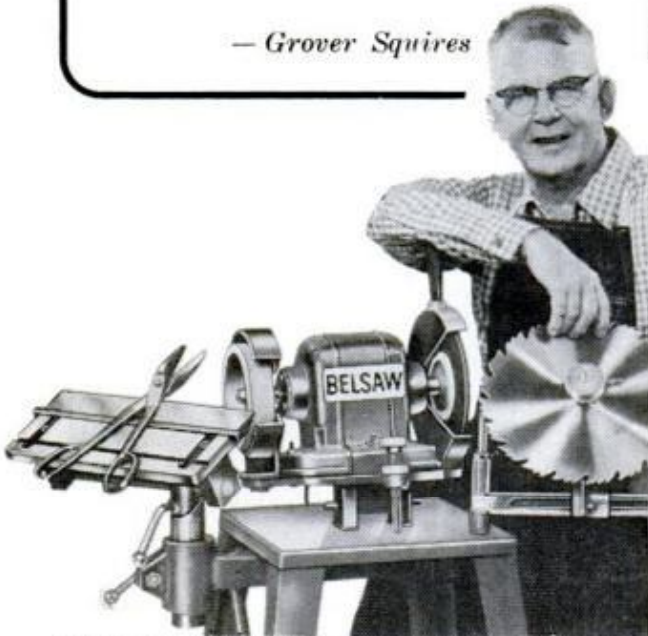
TEMPEST SEDAN POUNDED  
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This One  
  
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# "I SAW MYSELF 10 YEARS FROM NOW!"



IT WAS PAYDAY. THERE WAS FRED, LOOKING A LITTLE RUN-DOWN. ON THE SAME JOB 10 YEARS. NICE GUY. MARRIED. TWO CHILDREN.

FRED AND I WALKED AWAY FROM THE PAY WINDOW TOGETHER. HE SEEMED DEPRESSED, UNHAPPY.

EACH WEEK I FEEL I'M LETTING THE KIDS DOWN. CAN'T SEEM TO AFFORD THINGS THEY NEED. I'M JUST NOT GETTING AHEAD.



FRED'S WORDS HIT ME ALL OF A SUDDEN. I COULD SEE MYSELF SAYING THE SAME THING — **10 YEARS FROM NOW!**



THAT NIGHT, STILL THINKING ABOUT FRED, I SAW AN I.C.S. AD ABOUT HOW I.C.S. TRAINING OPENS JOB OPPORTUNITIES. HOW PEOPLE LIKE ME CAN WIN PROMOTIONS, MORE PAY.



I MAILED THE I.C.S. COUPON THAT NIGHT. MY BOSS SOON LEARNED I WAS AN I.C.S. STUDENT. HE MOVED ME OFF THE LINE. AND TWO RAISES LATER...



FRED'S STILL ON THE SAME OLD JOB. STILL HOPING FOR THE "BREAK" HE'LL NEVER GET WITHOUT TRAINING. ONE DAY THE BOSS CALLED ME IN...



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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.

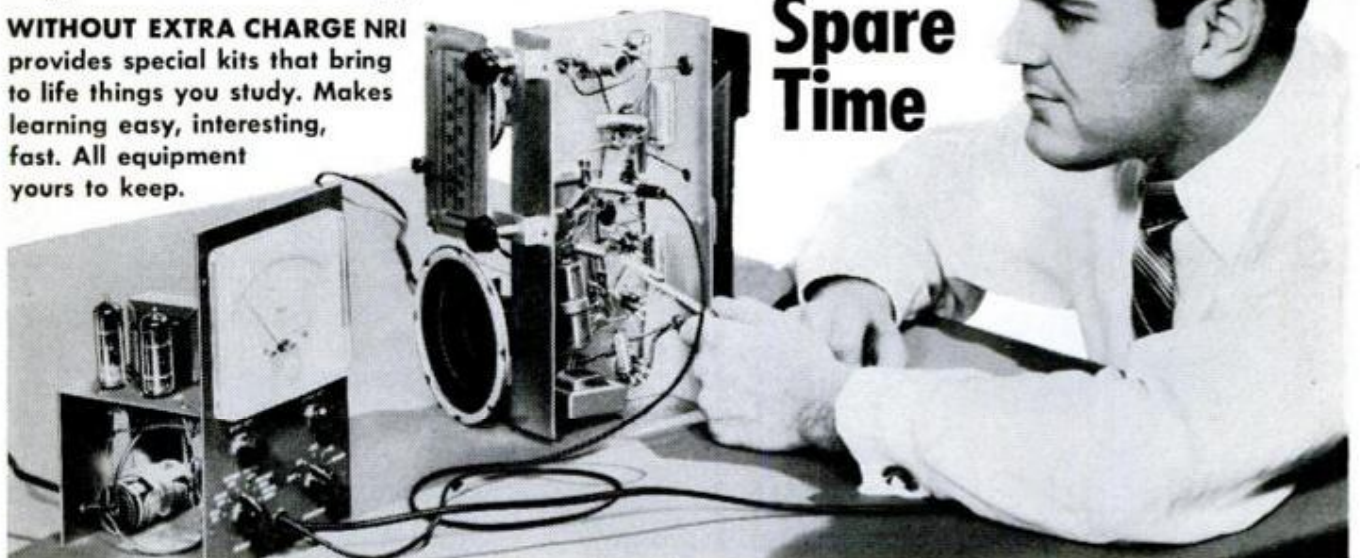
## Chemists Rid Water of Detergent

When detergents used to wash clothes are drained into a system that supplies drinking water downstream, they create a tough problem in water purification. Dr. I. M. Abrams, a chemist with the Chemical Process Co., Redwood City, Calif., however, reports that alkyl benzene sulfonates—the resistant part of detergents—can be almost completely removed by passing water through Duolite, a plasticlike material. The process is an ion exchange in which an ingredient of the material is exchanged for sulfonates.

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**J. M. SMITH**  
President

If you check the classified advertisements in your local newspaper, you will undoubtedly see more job opportunities available for men with Electronics training than for any other field. Hardly without exception, these are better than average jobs, with bright futures . . . jobs for which YOU could qualify through NRI training. Thousands of men like yourself—most of them without a high school diploma—have moved up to good pay and enjoy greater prestige in jobs with TV and Radio broadcasting stations, in industrial plants making Electronic equipment or in businesses of their own where they sell, install and service Radio and TV sets.

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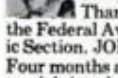
Join the many NRI graduates now taking advantage of career opportunities in this amazing Electronic Age. For 45 years, NRI has featured the best Radio-TV Electronics training for beginners— for men without previous experience. Throughout the U.S. and Canada, successful NRI graduates are proof that it's practical to train at home, in your spare time, at your own pace. Keep your present job while training. NRI supplies this training at low cost because it is

### NRI Trained These Men



I was working in a textile factory trying to make ends meet. Now I own one of the most modern service shops in this section. **ARGIE C. TAYLOR**, Glasgow, Ky.

After graduating I was a shipboard radio operator. Now I am chief engineer at Station WARA. NRI was a wonderful foundation. **RAYMOND D. ARNOLD**, Attleboro, Mass.



Thanks to NRI I am in a top position with the Federal Aviation Agency in the Navajids Electronic Section. **JOE DUCKWORTH**, Fort Worth, Texas.

Four months after starting your course I left my job in a hardware store to work at Raytheon Manufacturing. Now I am an engineering assistant in Microwave Power Tube Research and Development Laboratory. **LEONARD BLOOM**, Newton Centre, Mass.

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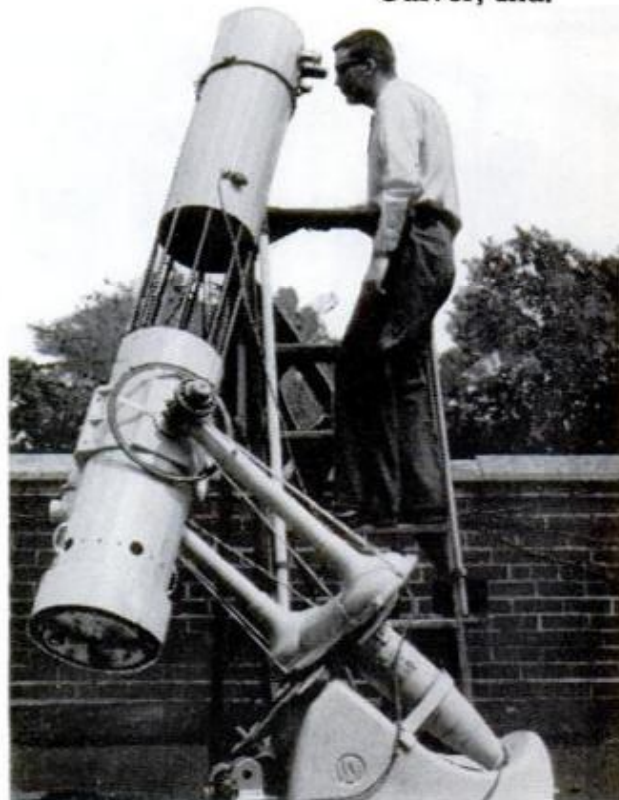
## Over the Editor's Desk



### To the Editor:

Enclosed find photograph of a telescope which may encourage some amateurs in making their own instruments, since the adaptation of junk parts to functional use may be clearly seen. The telescope is in use at Culver Military Academy. I spent several years gradually collecting parts as they appeared in the local junk yard and suggested possibilities of use.

Warner Williams  
Culver, Ind.



Mr. Williams lists some of the junk parts as follows: Main tube, ordinary galvanized sheet metal bent to a cylinder in facets on a tinner's brake . . . sections united with small iron pipe; fork supporting tube made of old Ford rear axle housings mounted on a quarter-inch sheet-iron plate from an old sailing boat centerboard; polar axis (just below fork) a discarded 6-inch artillery shell, loaded in the nose for counterweight with rifle-range salvaged lead; mirror cell in lower end of tube, an old brake drum; adjusting controls for mirror are radio tuning knobs; finder made of a paper mailing tube; clock drive, gears from motorcycle magneto and airplane supercharger; steel belt drive is a steel measuring tape; polar axis support bearing from an old truck.

(Continued on page 14)

# How to 'take charge' of a highly-paid job

in

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### Many CTI graduates go in business



It is relatively easy to start a repair business in the Air Conditioning and Refrigeration field. Armed with up-to-date knowledge, seasoned with skill acquired through practice on kits, and equipped with tools and gauges, many graduates start out on their own. Some expand into retail stores. Others have contracts to service taverns, restaurants, food stores and commercial buildings. The more resourceful become contractors. Conditions for success are excellent.

### Many students earn cash as they train

The average CTI student is eager to put his skill to profitable work, on a part-time basis. Though most students prefer to tie up with local dealers and repair establishments, a surprising number are independents. The extra cash helps meet training cost. Often there's enough to bank, or invest in more equipment.



### Letters prove efficiency of training



"I have a business of my own servicing domestic and commercial refrigerators."—*Paul Humphrey, Colo.* "I made \$1,000 while training, and am now a refrigeration man for a dairy."—*Giles Minton, N. C.* "I opened a little shop and am swamped with work."—*Charles Corley, Kan.* "Doing service work on a part-time basis the past 10 months, I earned \$2,400. Have a nice business."—*Renos Johnson, Ind.* "My firm advanced me to field superintendent."—*Milburn Dougan, Ark.* You can do as well as these graduates!



An exclusive feature of CTI training is that you get parts to build a 1/4 h.p. commercial-type condensing unit (above). You also receive mechanic's tools and gauges (right). After unit is assembled, you can build an air conditioner, freezer, refrigerator or milk cooler. Only CTI sends *working kits.*



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## Author vs. Tidal Wave

Ed Engledow's eyewitness reporting of volcanic and tidal-wave destruction on the Island of Hawaii—where he is the *Honolulu Star-Bulletin's* one-man news bureau—during the past year, made lively reading in newspapers throughout the U.S. As you will see in "Scientists on the Brink of Hell," (page 136) he manages to leap into a story when the news is hottest. The research for this article was halted, though, by this very tendency to be where news is breaking. In May, when the tidal wave spawned by Chilean earthquakes rolled into Hilo, Ed's home base, he was there: "Like an idiot, I was right on the bay front when the big one hit. Never again. It chased me up a street about a block to where my car was parked, headed, naturally, facing the ocean, and I came close to leaving it parked there. I could see the wave was slowing down and took a chance on saving it. It is probably the only time a Hillman Husky was driven 25 miles an hour in reverse." As a result of his coverage of the Hilo disaster, in which 59 people were killed, Engledow was asked to testify at a legislative session investigating the failure of the island's warning system to give protection. The men of the Volcano Observatory, the subject of his *PM* article, also helped in the development of a new Pacific-wide wave-warning system.

☆☆☆

## Adventure in the North

Writer-photographer Harry Rowed, who ranges Canada to research articles, was hard put to keep up with the fast-moving geologists he portrays in the article, "Oil Hunt in the Arctic," page 125. He had to use plane, boat and helicopter on this *PM* trip which took him to the Arctic Coast, at Tuktoyaktuk.

"Transportation, as almost always in the North was always questionable, but I was extremely fortunate in being at the right place at the right time to catch rides. Also, one of the oil company pilots did me the favor of landing on very rough water and getting me into Inuvik in time to make airline connections coming out. Otherwise, I might have been in the North an additional week."

Another assignment was waiting when he returned home, to Jasper, Alberta. It took him to British Columbia where a forest fire was raging. Ironically, billows of smoke, which added to the drama of Engledow's article, virtually obliterated the scenes Rowed had hoped to photograph in the Canadian mountains.

(Continued on page 18)



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## Sidelights from the PENTAGON

By William R. Kreh

ARMY BRASS is being mustered out of service. No, the Army is not getting rid of its officers, just brass cartridge casings. It has introduced a case that burns up completely when fired from a gun. Designed primarily for tanks, it is also being tested for artillery, rifles and sidearms. The Army isn't saying what the new stuff is made of, but did admit it is up to 10 times lighter than conventional brass cases, depending on caliber. The tank corps will benefit most. Brass cases now have to be tossed out of a tank by asbestos-gloved loaders.

San Diego, take a letter! The Navy's Bureau of Ships has unveiled new machines that can transmit the contents of a 480-page book from the Pentagon to the West Coast in four minutes. The machines can send 43,000 words a minute to any point reached by coaxial cable or microwave networks.

Why are there exactly 16 launching tubes on the new Polaris-firing nuclear submarines? A Navy officer who should know says the figure was arrived at by simple mathematics. Scientists wanted as many missiles aboard as possible, since doubling the number of launching tubes wouldn't double the cost of the vessel. Navy men felt there was a saturation point; too many would not give the crew sufficient living space. Ship designers were noncommittal; they said the subs could be built to any size. The deadlock was solved by a committee of seven which planned the layout of the Polaris subs. Each member of the committee wrote on a slip of paper the number of launching tubes he would like to have in the subs. The numbers were then added up and divided by seven. The result was 16. How scientific can you get?

Motorists who drive across the Chesapeake Bay Bridge may catch a glimpse of a midget submarine in action. The Navy is

testing a 50-foot underwater craft to learn more about the properties and actions of sea water. It will be watched by a team of scientists in a 10-ton aluminum cradle suspended under the giant bridge. They will study the structure and origin of waves, light penetration and underwater visibility. The bridge is being used "to take advantage of a stable platform, unaffected by motion such as would be encountered from a ship or aircraft, to gain undistorted measurements over a long period of time."

Maybe now you'll be able to weigh the meat in the sandwiches at the corner delicatessen. The Air Force has developed instruments capable of weighing masses only a few 100-billionths of an inch thick.

Next time there's a man overboard from the Navy destroyer USS *Waller*, the crew will throw a 12-foot pole at him, javelin style, as well as a life-preserver ring. It's a special recovery marker consisting of a long bamboo pole which is weighted at the bottom and buoyed about four feet from the end. The pole sticks up out of the water, and at the top are a light and a fluorescent flag. Theoretically, this gives both the man in the water and the lookout on ship a common marker to concentrate on.

Submariners of the future may breathe by candlelight. The Office of Naval Research has developed candles of sodium chlorate which give off oxygen when burned.

Army sentry dogs, good soldiers that they are, are doing double duty. They guard missile sites and also contribute to the study of arthritis development in children. The dogs sometimes develop a condition known as hip dysplasia which has characteristics similar to those found in arthritic children. Periodic X rays are taken of the dogs during their tour of duty to record the stress on their joints. The X rays are sent to the Armed Forces Institute of Pathology in Washington, D.C., along with reports on the dog's work and condition. These studies are being used by the National Institute of Health to seek a cure for arthritic diseases in children.

Army foot soldiers, once a frugal group, are now throwing away much of their equipment. At a recent display of quartermasters, they showed some new disposable paper uniforms, disposable plates and utensils, disposable aluminum ovens and disposable dehydrated food containers. One private murmured wistfully, "No disposable sergeants?" ★★★

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# Profits That Lie Hidden in America's Mountain of Broken Electrical Appliances

By J. M. Smith President, National Radio Institute



**And I mean profits for you — no matter who you are, where you live, or what you are doing now. Do you realize that there are over 400 million electrical appliances in the homes of America today? So it's no wonder that men who know how to service them properly are making \$3 to \$5 an hour — in spare time or full time! I'd like to send you a Free Book telling how you can quickly and easily get into this profitable field.**

**T**HE COMING OF THE AUTO created a multi-million dollar service industry, the auto repair business. Now the same thing is happening in the electrical appliance field. But with this important difference: anybody with a few simple tools can get started in appliance repair work. No big investment or expensive equipment is needed.

The appliance repair business is booming — because the sale of appliances is booming. One thing naturally follows the other. In addition to the 400,000,000 appliances *already* sold, this year alone will see sales of 76 million *new* appliances. For example, 4,750,000 new coffee makers, almost 2,000,000 new room air conditioners, 1,425,000 new clothes dryers. A nice steady income awaits the man who can service appliances like these. And I want to tell you why that man can be *you* — even if you don't know a volt from an ampere now.

### A Few Examples of What I Mean

Now here's a report from Earl Reid, of Thompson, Ohio: "In one month I took in approximately \$648 of which \$510 was clear. I work only part time." And, to take a big jump out to California, here's one from



J. G. Stinson, of Long Beach: "I have opened up a small repair shop. At present I am operating the shop on a spare time basis — but the way business is growing it will be a very short time before I will devote my full time to it."

Don't worry about how little you may now know about repair work. What John D. Pettis, of Bradley, Illinois wrote to me is this: "I had practically no knowledge of any kind of repair work. Now I am busy almost all my spare time and my day off — and have more and more repair work coming in all along. I have my shop in my basement."

### We Tell You Everything You Need to Know

If you'd like to get started in this fascinating, profitable, rapidly growing field — let us give you the home training you need. Here's an excellent opportunity to build up "a business of your own" without big investment — open up an appliance repair shop, become independent. Or you may prefer to keep your present job, turn your spare time into extra money.

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### To the Editor:

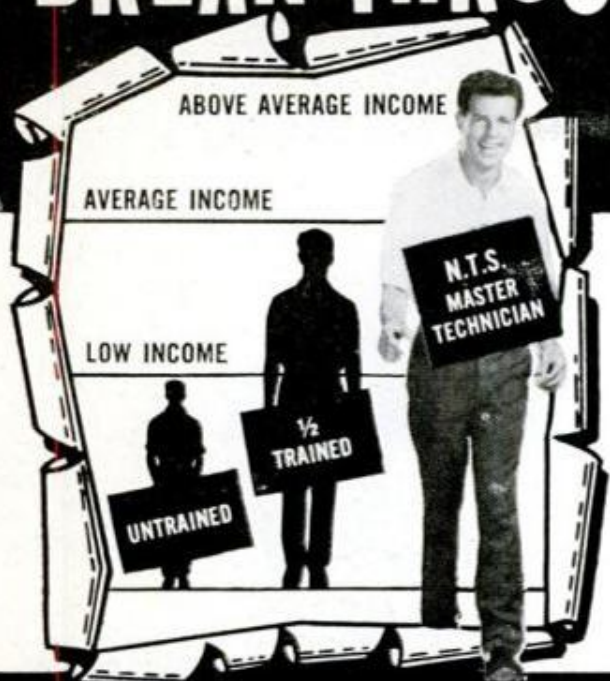
After recently arriving home from Japan I purchased a 1955 Chevy eight from a Chevy dealer. The car ran fine until I had it tuned up. A few days after I got it back the valves started to click. When I took it back the dealer claimed it needed new lifters. At that point I was a little leary about spending all that money in a car without getting another person's advice. That afternoon I picked up a copy of *Popular Mechanics* and discovered your article on trouble-shooting. I took the magazine and the car back to the dealer and after he followed your advice the car was like new.

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CWO 4, USN

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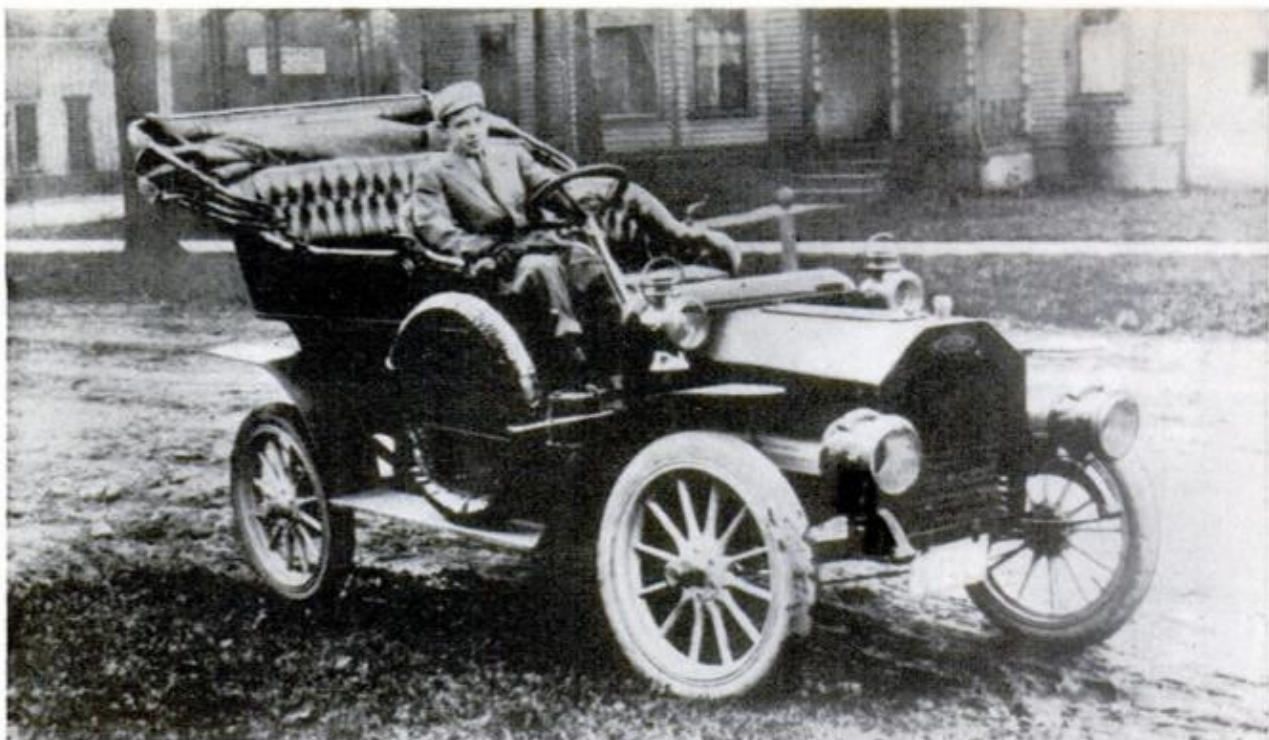
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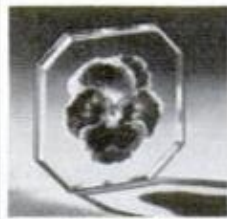
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Or you can take on an opponent with the repeater peashooter (it has a pea magazine attached) invented by John Tylle of Columbus, Nebr.

Spider webs used as cross hairs for gun sights and optical devices are made even better by a blackening process developed by James Kent, Jr., Pasadena, Calif., and Thomas Rodgers, Burbank. Normally translucent, the webs often produce a fuzzy-edged outline. In a two-stage process, they're now placed in the atmosphere of a vaporized reducing agent, then in a chamber containing vaporized metal oxide to make them black.

Dale Gilmore of Springdale, Ark., has patented a popcorn-ball maker. It conveys popped corn past a shaker of sweet powder, melts the powder and then shapes the ball.

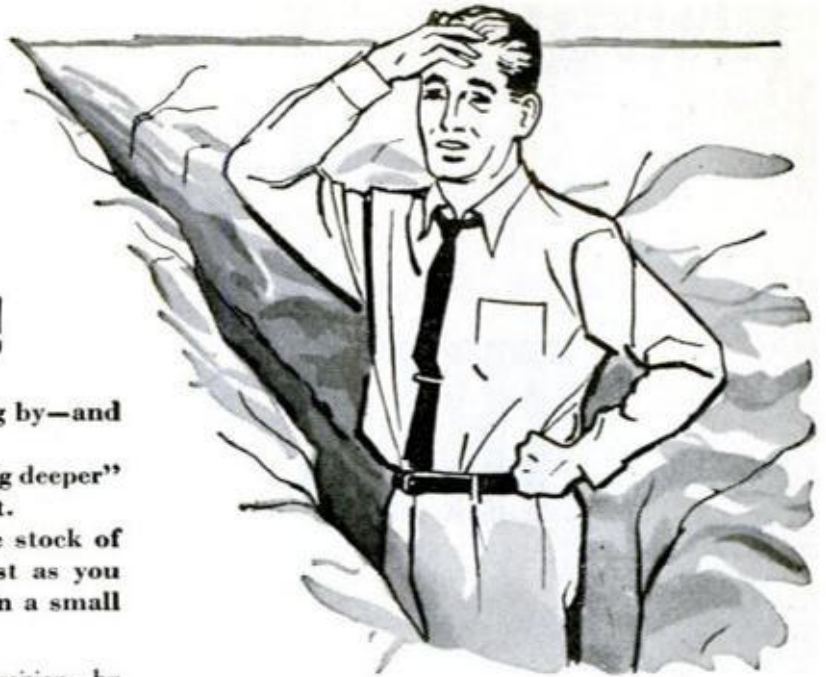
Over in Stuttgart, Germany, Josef Muller has a car that can be tilted as it rounds a corner. On a right turn, he taps a lever that bends two joints in the axles. The car body tips to the right and the wheels ride on their right outer edges.

A doll that does the hoola hoop won a patent for Leroy Bryant of Louisville, Ky.

Soft wedges of rubber fill the gap between a skier's heels and his skis when he wears an accessory invented by P. B. Sharpe, St. Johnsbury Center, Vt. The device keeps ice from packing in the gap.

Two steel balls rather than customary hands indicate time on a clock invented by Clayton Laughlin of Minneapolis, Minn. The hands are really there—behind the clock face. Magnets on the hands hold the steel balls in their grooves. ★ ★ ★

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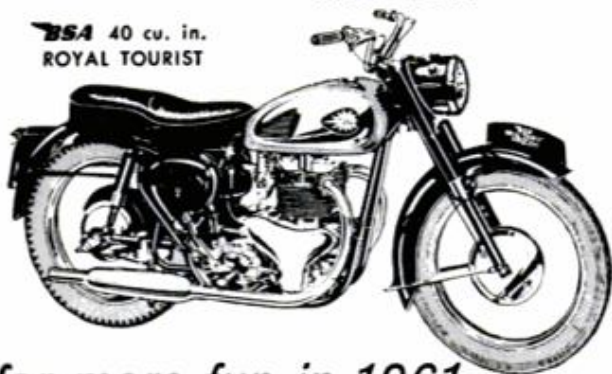
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## BULLETINS

# from the world of SCIENCE

By James Biery

SPACE MAY BE not only a poor place to live but also a poor place to visit. If results from a rocket trip which carried living organisms aloft are confirmed, space may be as healthy for the traveler as a switch-blade rumble in New York City. On September 19, last year, bits of a bread mold known as neurospora spent 26 minutes within the inner Van Allen radiation belt, at a height of 1180 miles. They were stowed on a rocket fired from the Navy missile range at Point Aruello, Calif. When the pay load was parachuted back to Earth and recovered, the mold was found in a state of "physiological death." It took a jolt of super-rich nutrient to jar the mold back into normal activity—and then it produced mutations at the rate of roughly 30 times what is normally expected. While results of the experiment are still being analyzed, it seems that damage done the mold is not explained by the amount of radiation in the Van Allen belt, but from a source as yet unknown.

For the first time, Nobel prizes went to two men in the same university. Willard F. Libby, of the University of California, Los Angeles, won the chemistry prize, announced at the tag-end of last year, for his invention of the "atomic clock," or carbon-14 method of dating plant and animal remains as old as 25,000 years. Since carbon dioxide in the atmosphere contains a constant proportion of its radioactive isotope, carbon-14, and since plants use carbon dioxide to build their chemical constituents, and, in turn, serve as food for animals, carbon-14 is present in all living animals and plants in a known quantity. Dr. Libby suggested measuring the amount of carbon-14 in remains, for the material decreases at a known rate. One-half disintegrates, for example, in approximately 5600 years. Dr. Donald A. Glaser, at U of C, Berkeley, won the physics prize for his invention of the bubble chamber, a radiation detector. "It occurred to me," says Dr. Glaser, "that a superheated liquid, like a superheated vapor, might provide a medium that could be triggered by a small stimulus to yield a large effect. I wondered whether a flying atomic particle might, under suitable conditions, trigger microscopic bubbles that start a boiling process (in the liquid). If so, they might make a visible track which could be recorded by means of high-speed photography." They did. ★ ★ ★

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# Keeping up with the ATOM

By James Biery

FOR 1/1000 OF A SECOND, physicists at the University of California's Livermore Laboratory harnessed the force that runs the sun. They ran a controlled thermonuclear reaction in which hydrogen atoms fused in great heat to form helium. The process gave off great energy—uncontrolled, it would have been a hydrogen bomb reaction—in the same manner the sun gives off energy. Dr. Frederic H. Coensgen, leader of the research team, reported at the end of the year that the reaction—which lasted a great length of time compared to earlier fusion experiments—came when the thin gas deuterium (heavy hydrogen) was squeezed by powerful magnetic forces, igniting at a temperature of about 60 million degrees F. The duration of the reaction is a hopeful sign that some day man will, indeed, be able to peacefully use the energy of fusion process.

Two Swedish physicists, Drs. Hannes Alfvén and Erik Smars, have suggested that a way to longer, controlled reactions lies in bottling the electrified fusion gases up in a magnetic gas rather than trying to insulate the fusion gas from the walls of its container by simply relying on a magnetic field in a vacuum. They believe their method—which has aroused the enthusiasm of British physicists who are attempting fusion experiments—will keep the fusion gas from writhing toward the walls of the container, and will free it from contamination by dirt which lowers the high temperatures required.

Within the next two months, according to political observers, Red China should explode an experimental atom bomb and thus deal itself into the bomb-building game which now has four players: the U.S., U.S.S.R., Great Britain and France. On this subject, the U.S. in December released the first pictures of the types of the first atomic bombs dropped on Hiroshima and Nagasaki 15 years before: The "Little Boy" (Hiroshima) bomb was 10 feet long, had a diameter of two feet four inches; the other, "Fat Man" bomb, was eight inches longer and about three feet greater in diameter. Both were as ugly as the job they did.



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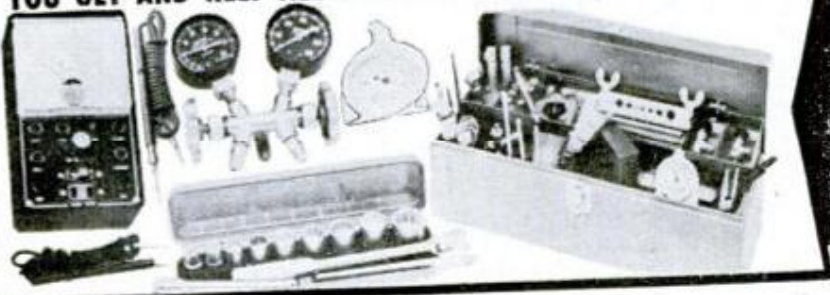
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# WHAT'S UP IN THE AIR

By Kevin V. Brown

DEFENSE SPENDING on missiles continues to increase while money allotted for aircraft continues to decrease. In 1957 aircraft took 59 cents and missiles only 15 cents of every dollar allotted. Estimates for 1961 indicate aircraft will get 44 cents and missiles 26 cents.

Ah, those intrepid airmen!

When a radar squadron stationed atop Mount Hebo in Oregon invited its commanding general to participate in groundbreaking ceremonies for its new bowling alley, squadron members made sure he had some ground to break. Mount Hebo is solid rock, so the airmen dug a hole in the rock with air hammers, then filled it in with soil hauled up from the valley below.

Most mid-air collisions occur below 3000 feet and within five miles of an airport. A new system of flashing lights may help relieve the danger involved in these congested areas. The lights are mounted on the tail of a plane in such a way that they are visible to other planes three miles away in any kind of weather. The angle at which they are seen from the other plane determines the element of danger. The pilot approaching on a collision course sees only the lights that are flashing rapidly. If approaching on a danger course, the lights flash a little slower. The pilot on a safe course sees only the slowest flashing lights.

Airmen like to think of themselves as above average, but the Air Force, after studying its total roster, has announced a set of statistics that represent the average airman at enlistment. He is a high-school graduate, between 18 and 19, from a town of 10,000 to 100,000 population. Physically, he is 5 feet 10 inches, weighs 150 pounds, and wears a size 7 cap, a 15½ shirt, 38 coat, 9D shoes and pants with a 30-inch waist.

Eighteen fellowships, providing tuition and fees up to \$2000, are being offered by the Guggenheim Foundation for potential leaders in rocketry, space flight and other astronomical and aeronautical fields. Applications are available from colleges, government agencies and the Foundation, 120 Broadway, New York City. Deadline for filing applications is March 1. ★ ★ ★

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"You see, this idea has caught on like wildfire in my town. Not a day goes by without my phone ringing with women calling for appointments. The beauty of it is that once a woman becomes my customer, she calls back year after year. Not only that, she tells her friends, too, and they call me. Before I know it I'm swamped with work. (And at \$7.50 an hour net profit it doesn't take long before my bank account is really mushrooming.)

"Funny thing, but back last year, before I started, I never realized the money there was in this business waiting for someone to come along and collect it. Just think: every house in town has furniture and most have rugs or carpeting. I concentrate on just the better homes and have more work than I can handle. You know why? Because women are fussy about their furnishings. Can't stand to see them dirty. That's why they call me over every year.

"The average job is worth \$25.00 to me and takes a little over 2 hours. Out of this, after paying for materials, advertising and other expenses I net about \$15.00 clear profit. This means I need just 3 jobs a day to clear \$11,250.00 in a year. Frankly, since this will be my first full-time year I'll be glad to hit the \$10,000 mark. But after that this business should grow larger each year until I have to hire men to help me handle the business.

## Personally Trained

"Believe me there's nothing magic about it. I didn't know a thing about cleaning home furnishings before I became a Duraclean dealer. But after my application was accepted, I was trained in their factory-training school and by a dealer in a nearby town. I was astonished by the short time it took me to become an expert. Actually, much of the credit must go to the Duraclean process, which is so safe it has earned the Parents' Magazine Seal.

"The portable machine you see is just one of the electrical machines I use. It manufactures a light aerated foam with a peculiar action chemists call 'peptizing'. It means that instead of being scrubbed deep into the fabric, dirt is gently ABSORBED by the foam, leaving the fabric clean all the way down. Women can't believe their eyes when they see how it works. Colors appear bright again, and rug pile unmat and rises like new. I don't have to soak rugs or upholstery to get them clean, which ends the problem of shrinkage, and means the furnishings can be used again the very same day. This alone has brought me a lot of customers.

"As a Duraclean dealer I make money with four other services, too: **Duraproof** . . . which makes furnishings immune to moth and carpet beetle damage (it's backed by a six year warranty). **Durashield**, a brand new dirt-delaying treatment. It coats fabrics with an invisible film that keeps dirt out. **Duraguard**, another new service, flameproofs draperies, upholstery and carpets to reduce charring

by  
**Harold  
Holmes**



and the tendency of fires to flame up. And **Spotcraft**, which consists of special chemical products for removing stubborn spots and stains. On jobs where I perform all five services, I multiply profits!

"One of the nicest things about being a Duraclean dealer is that I get continuous help from Duraclean Headquarters. My services are nationally-advertised in famous magazines like McCall's, House Beautiful and many others. I also get a complete advertising kit prepared by experts. (There's even a musical commercial!) I get a monthly magazine full of methods to build business and I can meet with other dealers at Duraclean conventions. I'm also backed by insurance. In fact there are over 25 regular services I get under their unique System.

## No Shop Needed

"Maybe you too would like to break away from your job and make a fresh start in a business of your own. Do you need a shop? Certainly not. I operate from home. Need a lot of money to start? Not at all. Duraclean finances reliable men, after a moderate down payment, and furnishes enough supplies to return your TOTAL investment.

"You get everything you need: equipment, supplies, advertising matter, personal training, and regular help from Headquarters. To get all the details, fill out the coupon. There's no obligation and you can *decide for yourself*. I'll say one thing: if you DO become a Duraclean dealer, you'll be glad the rest of your life that you took time today to write."

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**Q: WHAT IS A MASTER MECHANIC?**

**A:** He is an all-around mechanic in automobiles (American or foreign) trucks, and heavy engines such as diesels. Or he specializes in his favorite field - Automatic

Transmissions, Tune-Up, Farm Mechanics, Stationary Installations, Auto Air Conditioning, Automatic Power Devices, Engine Rebuilding, and other high-pay fields too numerous to mention. Or, he goes into business for himself. In a few words, a MASTER MECHANIC always has a good job

**Q: CAN YOU BECOME A MASTER MECHANIC?**

**A:** Definitely Yes. National Technical Schools has prepared many men for successful careers in Auto-Mechanics & Diesel. What these men have done... you can do, too!



**Q: HOW DOES N. T. S. TRAIN YOU?**

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you can secure anywhere. This means that your training is developed in our own classrooms, planned in our own laboratories, and tested in our own shops by students attending our Resident School at Los Angeles. Your training is also approved by industry and it is Home Study designed.



**Q: HOW DO YOU LEARN?**

**A:** You study at home - in your spare time - at your convenience. You receive streamlined, easy-to-understand Lessons and Manuals. You work with professional tools and equipment we give

you as part of your course... see them illustrated on the right. Actual job projects - similar to those you will conduct in the field - are also assigned to you for your practical advantage. In addition, you receive Unlimited Consultation and Free Graduate Advisory Service.

You follow the same methods we use for training men in our Resident School at Los Angeles. Thus, you obtain the practical advantage of our Shop Tested training and the convenience and lower-cost advantages of our Home Study method.

**Q: CAN YOU EARN YOUR TUITION?**

**A:** Yes. Early in your course, you are shown how to earn extra money in your spare time, doing actual repair work for friends and neighbors. Many students pay for their entire tuition - and earn much more - with spare-time earnings. So can you!

**Q: WHAT JOBS ARE YOU QUALIFIED FOR AFTER YOU COMPLETE YOUR TRAINING?**

**A:** There are many specific jobs open to you. It is impossible to list them here for lack of space. N.T.S. trains you in ALL PHASES of the industry because a MASTER Mechanic, as an All-Around Mechanic, has unlimited opportunities... with higher-pay, with greater security, with better chance for job advancement. With N.T.S. training to back you up... YOU, TOO, CAN BE INDUSTRY'S MOST WANTED MAN!

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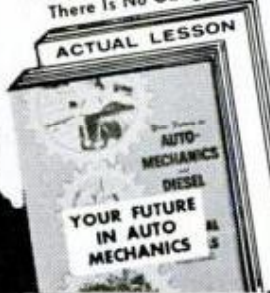
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## ITEMS FROM ALL OUTDOORS

By Dick Kirkpatrick

EVER SEE A SAILBOAT go 34 miles an hour? Neither have I, but a Chicago inventor came in last week to report that he successfully patented a design for a sailing machine which he estimates will do a handy 40 in a good breeze, and up to 60 under ideal conditions. That 34-mile-an-hour figure was the speed of a quarter-scale model that he tested this fall. Just after it clocked that speed, the wind came up, the model outran the outboard-powered chase boat, and the model was doing about 45 when it finally hit the beach. A full-sized prototype is building now, and if it performs half as well as the designer expects, it'll be the biggest thing in sailboating since George O'Day. The inventor is shopping for a manufacturer, and when he finds one, **PM** will have a whale of a story for you. Watch for it.

Did you have fuel left in your outboard tanks at the end of the boating season? It'll be pretty gummy by spring if you did. But what can you do with several gallons of two-cycle motor fuel? Lou Eppel, service manager for Johnson Motors, has an easy answer—burn it in your car. Left with a hundred gallons at the end of the season, Lou ran it successfully through everything but his son's four-barrel high-performance engine. Cars with a liking for regular gasoline burned it without a hitch, though a small amount of smoke was discernible sometimes. He recommends filling the tank half full of your usual fuel, then adding the mix to that, a few gallons at a time. Beats pouring it out on the ground.

Fishermen who use monofilament line will be happy to learn that there's a new way around their old bugaboo—line breaks near the tip from strain, shock, and abrasion. It's the new Gladding shock leader, very much like the fly fisherman's knotless tapered leaders—except that you tie it on backwards, that is with the thick end at the lure. The small end matches your line, and a tidy blood knot goes nicely through the guides. Sizes go from 6-to-30 up to 15-to-50 in 10 and 15 foot lengths, but if you want a lighter tip you can lop off a few feet with no ill effects. It's especially good for landing fish on light tackle, where the last few inches of line are the weak link. ★ ★ ★



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**18 FT. CRUISERS, 8 Models: from \$369**

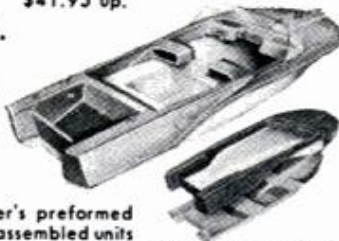


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Interlocking units (lower right photo) snap together, bond into 1-piece boat easily assembled in one evening.



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EASY TERMS 1/4 DOWN**

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BOAT KITS**

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**GOVERNMENT SURPLUS  
Bargain of the Century**

By Robert Gannon

A BIT ACTOR named Bill Farley with a little time on his hands wandered into a surplus-equipment store in San Francisco. "How do they expect to get rid of this junk?" he asked. Then he spotted a three-dollar pump, once a handler of aircraft fuel. "Hey," Farley exclaimed, "this would be great for a back-yard fountain." He bought it. Farley lives in a fifth-floor apartment.

Cleveland handyman Henry Selverstone saw an ad in the catalog of Surplus Center, Lincoln, Neb.—a \$230 gear-reducing unit for \$29.75. Now, using the winch, he can raise his bed to the ceiling during the day for extra floor space.

A surplus dealer named Harold Buck ran across an item listing "60 peloruses" in a government surplus sales catalog. He didn't know what they were, but figured they must be worth at least a cent each, so he entered this figure in a sealed bid. He got the items. Later, a Washington investigation committee found that Buck, for his 60-cent gamble, had won navigational instruments worth \$10,000. (But since then, he has spent nearly a thousand dollars on advertising, and so far has sold two at \$25 each.)

If you need a pelorus, you might call on Mr. Buck. If you need most anything else—from clothing averaging 60 percent off to electronic equipment often sold at two percent of value—you can get it directly or indirectly from the government. The biggest sale in the world's history is on—and there's no sign that it ever will be over.

"Surplus fever" first hit the big time right after World War II, when Uncle Sam dumped 27 billion dollars' worth of equipment in just three years. Surplus stores popped up by the thousands, and even though the war is long gone, 3000 dealers continue selling "war surplus."

You walk around a surplus store and what do you see? Here are some typical 1960 bargains: A gear-reduction motor for \$39.95 which cost the government \$845. Forty-dollar stainless steel air tanks for \$16. Twenty-dollar Geiger tubes for 79 cents. General Electric servo amplifier-rectifiers for \$5.95; they cost the government \$150. Power plants, 7500-watt, worth \$1350; yours for \$498. "World's largest" searchlight—800,000,000 candlepower—for \$1295; this item, outdated by radar, cost Uncle

(Continued to page 42)

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With The ONE Shoe Line That Serves Everyone  
From Baby to "Pop" and "Mom"



Only 5 orders a day can make you up to \$50.00 a day, \$250.00 a week, \$1000.00 a month. It's no trick at all to make big money full or Spare Time with America's most comfortable shoes. Amazing new "Spring-Step" cushion design proves it by actual demonstration. Over 240 styles for men, women, boys, girls and infants! Profits are BIG—repeat orders sure and easy. No experience needed. No investment. Everything furnished free, including finest sales outfit and actual demonstrators: Send today for Free Outfit.



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BE FREE FROM TRUSS SLAVERY

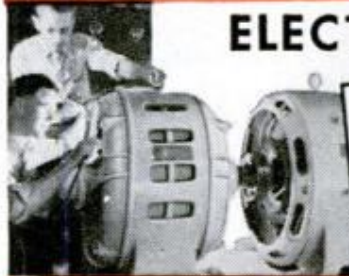
Surely you want to THROW AWAY TRUSSES FOREVER, be rid of Rupture Worries. Then Why Do you put up with wearing a griping, chafing and unsanitary truss the balance of your life? If you do, it will NOT be through necessity but through choice on your part.

Now there is a new modern Non-Surgical treatment that is designed to permanently correct rupture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you desire. There is no obligation.  
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practical training in ...

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## ELECTRONICS

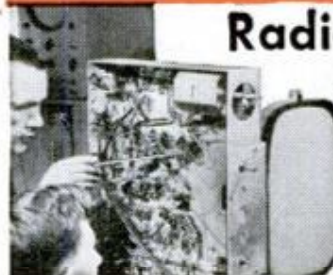


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Professional electric solid body Spanish guitars, amplifiers, electric bass, double-necks, triple-necks, tone changers, double-neck Spanish, electric mandolin, pickups. Parts to outfit your own 1961 Models wholesale - Free catalog.

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Send \$2.00 for photo illustrated brochure, specifications and parts price list. Send an additional \$2.00 for our book "Basic Helicopter Aerodynamics" which will give you a basic understanding of the aerodynamic and physical principles in the building and flying of the Commuter Jr.

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Sam \$36,500. There are binoculars and telescopes at half price, gauges at five percent of cost, electrical components at four percent of their original worth.

In 1959 the government sold more than seven billion dollars' worth of property (some of it as scrap) for a little more than \$200 million, or something like three cents on the dollar. Assistant Secretary of Defense Perkins McGuire says: "It is conceivable that in the near future we may be faced with an *annual* disposal program which will be in the neighborhood of \$10 billion."

A logical question: If much of this material is still usable, why is the military dumping it? Two main reasons are given by the Pentagon—obsolescence and overstocking. Summarizing the Department of Defense's defense: "We are doing no more and no less than private industry and the general public in getting rid of material which is of no further use."

The U. S. Senate takes a somewhat different view of the program. Senator Paul Douglas, chairman of the Joint Economic Committee, said simply, "The situation is a mess," and issued a 236-page report to prove it. In his view, the biggest problems are lack of coordination, excess procurement costs and concurrent buying and selling of identical goods.

Waste or not, necessity or not, the great sale is on, and it's going to continue. Here is how it works:

When the Department of Defense decides that material is unusable, it sends a list around to a variety of other government agencies to see if they can put the equipment to work. If not, it sees if any educational group—Boy Scout, church, school—can use the stuff. Whatever is left is offered for sale. The public can buy it by a number of methods, but the two most popular are auction and sealed-bid sale. Auctions are the most dramatic, but most of the equipment goes in round lots; if you want a half-dozen transistors, you might have to buy a box of a thousand to get them. In general, the best way to buy is by sealed-bid sale.

First, your name must be placed on a bidders list. Write to the Disposal Officer of a supply depot near you, telling him what you're looking for. You can get the names of these depots, as well as the full scoop on disposal operations, by sending fifteen cents to the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Ask for "How to Buy Surplus Personal Property."

Better write to a number of near depots, for answers are not always quick. When

(Continued to page 44)

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**NO SHOP NECESSARY** • You clean upholstered furniture on customers' premises—homes, hotels, motels, etc. Auto upholstering, too. No hauling; operate from your home. Watch business grow as satisfied customers tell friends. Supplies cost little, profits high.

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Gentlemen:  
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Street No. or R.D. ....  
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the things you're interested in come up for sale, the Disposal Officer will send you a bidding catalog. When you spot an interesting item, inspect the property if possible, then fill in your bid and mail it in with a 20-percent deposit. Whether you won the bid or not, you'll be notified a week or two after the sale.

How much should you bid? That's pretty hard to figure unless you have a chance to look over the items. One method dealers sometimes use on a blind bid is to calculate the rock-bottom scrap value, then quote a shade more. That way, even if the stuff is completely worthless for resale, they'll not be burned too badly.

If your bid is highest, you've a certain number of days (often 15) to pay the remainder and move your prize off the lot. If you can't tend to the moving yourself, there often are private craters and movers at the depot who will do it for a fee.

Sometimes you come out way ahead on the deal, like the Texas farmer who bought 168 "aircraft computers" for \$6.89, thinking they were "some kind of cardboard slide rules." When he found that the gadgets actually weighed 770 pounds each and that the government paid \$7200 apiece for them, he asked around for someone in need, finally sold the whole batch back to the Air Force for more than \$60,000.

On the other hand, an apparently inexpensive deal might run you well into the red. For instance, a Miami University student successfully bid \$56 for some rubberized gasoline containers. Only when he went to pick up his purchase did he realize he had bought twelve truckloads of the tanks—and it cost nearly \$500 in transportation fees. It was more than a year later that he finally found someone willing to cart them away for junk. ★ ★ ★

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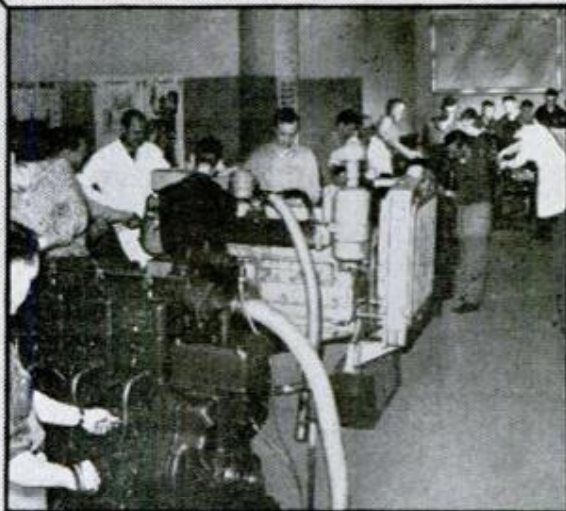
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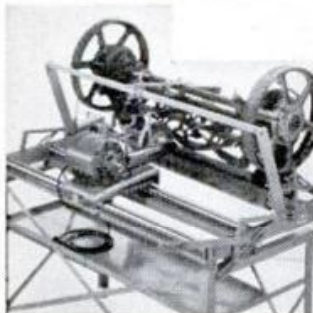
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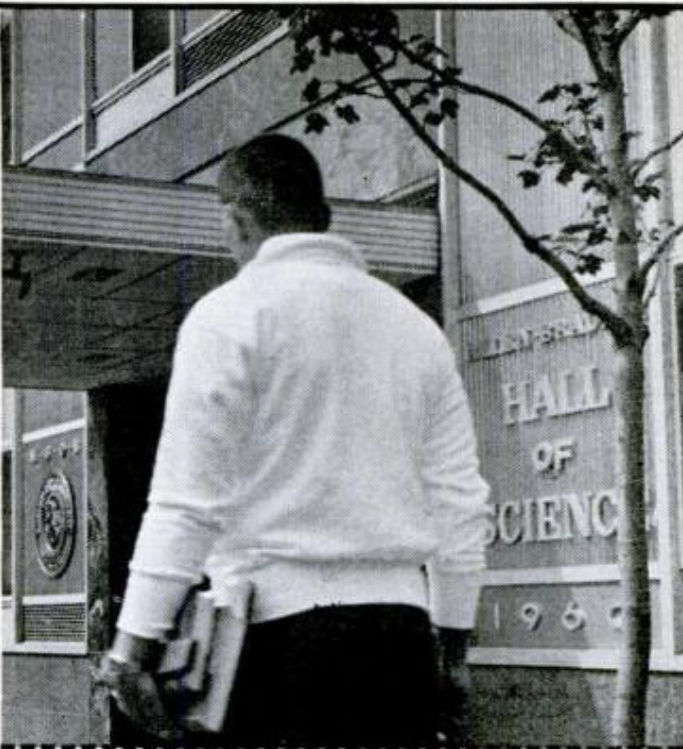
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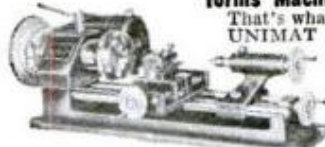


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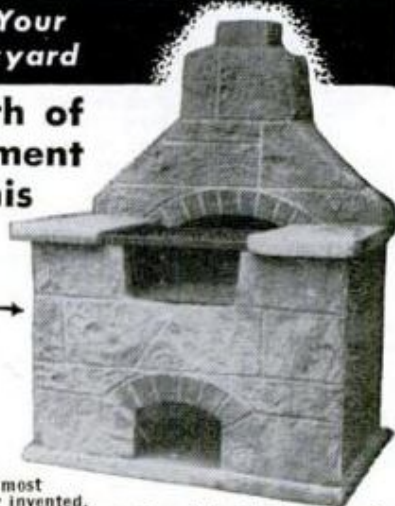
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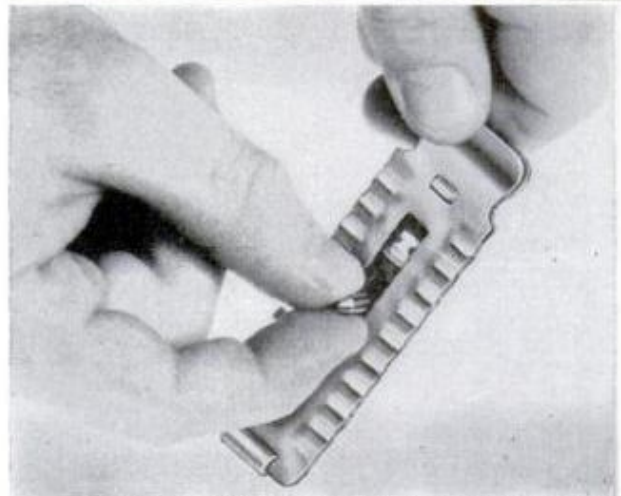
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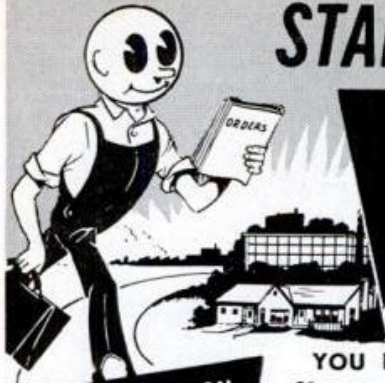
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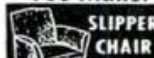
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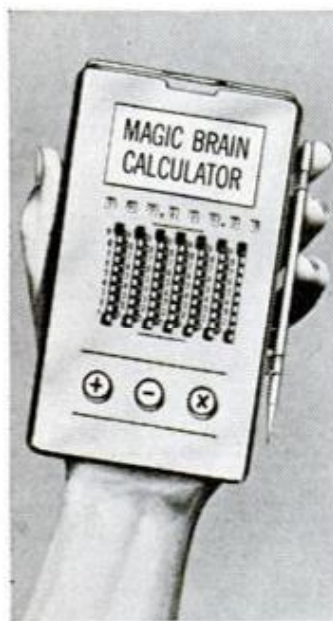
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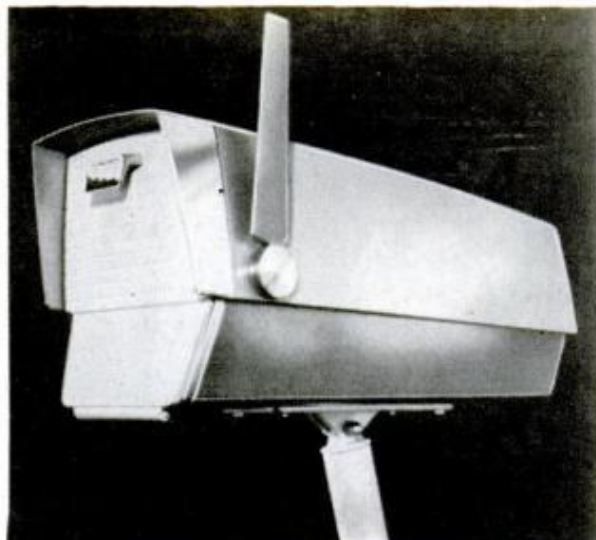
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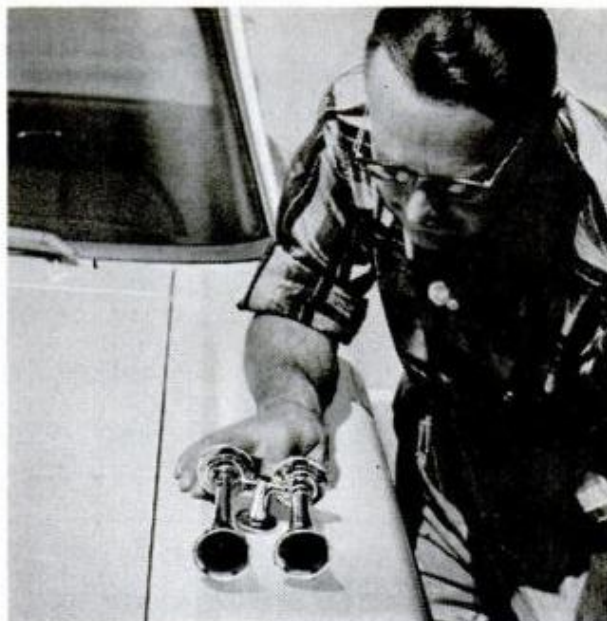
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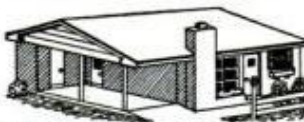
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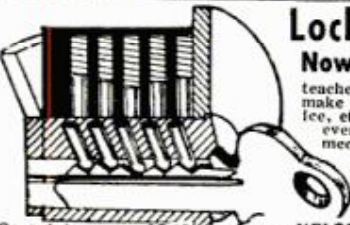
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GIANT Topical collection: Moon-rocket sets, satellites, atomic ship, Boy Scout issues. Complete UN set latest Olympics and sport issues from Togo, Mongolia, Paraguay, Germany, Rumania, etc. Plus big stamp dictionary and approvals. Everything 10¢. Stampex, Box 47-CM, White Plains, N. Y.

WOW! 110 All different Germany 10¢! Zeppelins, semi-postals, airmails, high values, etc. Giant Catalog, bargain lists included with beautiful approvals. Jamestown Stamp, Dept. A21PM, Jamestown, N. Y.

50 CANADA \$1.00. Eagle, 4520 Frances, North Burnaby, British Columbia, Canada.

100 DIFFERENT Belgium free to adults requesting approvals. Includes UPU, Brussels Fair, railroad stamps. Trylon, Brooklyn 30, N. Y.

COLLECTION—Building penny approvals. No junk. (Reference brings better selection.) W. J. Danley, 227A E. Flormann, Rapid City, South Dakota.

250 DIFFERENT. Includes 50 U. S. 25¢ with approvals. Bob's, Box 3045, Saint Louis 30, Missouri.

FIRST U.N. set. Among world's prettiest. Only 10¢. Approvals. Welles, Box 1246R, New York City 8.

300 ALL Different. 25¢ approvals follow. Jim Cusick, 5 Cambridge, Warwick, Rhode Island.

50 ALL Different stamps free with approvals. Wm. Rice, 87 Washington Avenue, Kingston 58, N. Y.

HUNDREDS Of world stamps 5¢ to approval applicants. The Fair Stamp Room, Box 5057, Detroit 19, Michigan.

UNBELIEVABLE! Stamps Afghanistan to Zanzibar! Catalog to 60¢ each. Souvenir, 10¢ with approvals. Weiss, 2021 West Alcazar, Miramar, Hollywood, Fla.

FREE! Giant bargain catalog. New edition listing thousands of bargains including U.S. and B.N.A. stamps, packets, mixtures, albums, accessories and supplies; sent with beautiful approvals. Jamestown Stamp, Dept. E21PM, Jamestown, N. Y.

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GIANTIC Collection free. Includes triangles, early United States, animals, commemoratives, British Colonies, high value pictorials, etc. Complete collection plus big illustrated magazine all free. Send 5¢ for postage. Gray Stamp Company, Dept. PM, Toronto, Canada.

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RUSSIAN Commemoratives, 10¢ with approvals. Schaefer, Californiastrasse 16, Wiesbaden, Germany.

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50 DIFFERENT Orient, 10¢. Approvals. Thiess, 9320-M San Juan, South Gate, California.

1/6 CATALOG. Defective old U.S. Approvals. K. Swartz, Malden Bridge, New York.

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**CRYSTAL** Radio kit \$1.00. Amplifier and speaker for same \$6.95. Catalogue. Clearco Crystal Company, 2966 No. 4th, Milwaukee 12 Wisconsin.

**DON'T** Buy hi-fi components, kits, tape, tape recorders until you get our low, low return mail quotes. "We guarantee not to be undersold." Wholesale catalog free. Hi-Fidelity Center, 1797M First Avenue, New York 28, N. Y.

**FREE!** Giant wholesale catalog on electronics, hi-fi, transistor, scientific hobby, optics, photographic, housewares, jewelry, tools, novelties, toys. Write: Lektron, 241M Everett Ave., Chelsea 50, Mass.

**9 VOLT** Rechargeable batteries \$2.99. Circular free. Torex's, Manvel, Tex.

**RADIO** Course only \$26.95. Includes all tubes, parts, tools, instructions. Write for full information. Progress "Edu-Kits" Inc., Dept. 565B, Hewlett, N. Y.

**FINE** Quality Grill cloth. Send for 9 free samples. Naefly Plastics, 4909 Midmoor Rd., Madison 4, Wis.

## BUSINESS OPPORTUNITIES

**IMMEDIATE** Profits with no capital or experience. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. Write now for complete, free kit. McGregor Magazine Agency, Dept. 116B, Mount Morris, Illinois.

**MAIL** Order, beginners, dealers, hobbyists, extra income. Details: Sterling, Box 626PM, Dania, Florida.

**OPERATE** Prosperous home mail order business. Write: American Distributors, Box 409-P, Niles, Michigan.

**MAIL** Trade magazine has money-making opportunities galore. Sample 25¢. Donovan, 79-PM Greenbelt, Levittown, New York.

**IMPORT-Export.** 20 lines offered. Substantial income opportunity. Individual setup service; not just instructions. Hermes, 152 West 42, New York City 36.

**EARN** Good money sharpening scissors, saws, tools, cutters. Free manual. Treycio, N. Tonawanda, N. Y.

**MAILORDER** — Direct sources 750,000 wholesale items. Deans, Box 40-PS, Elberton, Georgia.

**AMERICA'S** Leading franchise firms are listed in the new 1961 NFR Directory of Franchisors. Use it as your guide to franchise profits. Send one dollar today. National Franchise Reports, DM-528, 333 North Michigan Chicago 1.

**CANDIED** Popcorn and potato chip equipment. Eakins, Box 933-A1, Springfield, Ohio.

**MAKE** Money from old tires. Operators clearing \$400 weekly. Equipment costs \$660. Get facts. S & S Patents, Inc., 1307 N. Clark, Chicago 10.

**SELL** Champion, AC, Autolite spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles. 100% profit. Free sample. Lee Plugs, 1608-A Roberts, Houston 3, Texas.

**UNIQUELY** Different magazine. \$4,500 profit possible! Dignified business. Operate from home! Sample, complete instructions \$1.00. Free details. HBD, GPO, Box 972-PM, New York 1.

**FRANCHISES** Make profits! Operate your own exclusive franchised business. Write today for free interesting details. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

**FREE!** Name brands catalog! Your own high profit business. Sell name brands, full or part time. No inventory, no investment. More than 2,000 name brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi, stereo radios-phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 floors of name brands. Million dollar inventory. Orders shipped complete in 24 hours! Send for free, beautifully illustrated catalog now! Separate wholesale price list. H. B. Davis Corp., Dept. 11, 145 W. 15 St., New York 11, N. Y.

**DISTRIBUTE** Lowest priced wholesale catalog. Felix, 160-04-16th, Whitestone 57, N. Y.

**WANT** To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 6234 Broadway, Chicago 40, Ill.

**LEARN** Sewing machine repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Write today! Taylor Service, Box 2126, San Bernardino, Calif.

**RUBBER** Stamp business of your own. No expensive equipment. Big repeat profits. Catalog free. Schrader Company, Box 55357, Indianapolis, Ind.

**MAIL** Order business of your own. 80% profit. Literature free. Mudge, 26 Main Street Ter., Johnson City, N. Y.

**FREE** Picture folder. "How to Make \$3,000 Yearly, Sparetime, Backyard, Raising Earthworms!" Oakhaven-38, Cedar Hill, Texas.

**VENDING** Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #27, 715 Ensor Street, Baltimore 2, Maryland.

**BUSINESSES.** Resorts, motels, investment property, ranches. Our special service dept. at your disposal. No obligation. World's largest, 58 years' service. Strout Realty, 7-MB S. Dearborn, Chicago 3, Ill.

**BIG** Money raising fishworms and crickets. Free literature. Carter Farms, Plains, Georgia.

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

**PIANO** Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Ill. (Founded 1935).

I want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

**COPUBLISH** Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

**MAILORDER** To motels, churches, institutions. Individual set-up. Not just instructions. Hermes Advertising, 152 West 42, New York City 36.

**11,000 NEW** Prospects daily. Baby record books, shoes, albums. Sell mailorder. Use our literature. Write: No-Co-Ro, Capitola, California.

**BRONZE** Baby shoes: Instructions, equipment and mountings for genuine electroplating process. Largest supplier of all plating equipment, supplies. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First, Los Angeles 33, Calif.

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

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Montgomery, 3605 South 15th, Minneapolis 7, Minnesota.

**\$3.00 HOUR**—Home, sparetime, assembling pump lamps. Easy. Free details. Ougor, Caldwell, Arkansas.

**RAISE** Rabbits on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**\$400.00 MONTHLY** Raising giant worms. Odorless soilless method. Charlie Morgan, Bushnell, Florida.

**LIQUID** Molding rubber, free sample. Shellcraft supplies, Chaney's, 1907-A East Road, Jacksonville 11, Fla.

**PLATE** Baby shoes, jewelry, gifts, bronze and colored pearl. We finance. Free booklet. Platex, 11029 South Vermont, Los Angeles 44.

**RECAST** Junk batteries into new. Latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

**BUY** Direct from factories. Appliances, cameras, watches! Free details! Cam Co., 6910PM-20th Ave., Brooklyn 4, N. Y.

**PLASTERCRAFT** Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

**SELL** Books by mail. 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

**\$70 WEEKLY**—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757A, Los Angeles 34.

**EVERYBODY** Likes candy and popcorn specialties. Learn to make professionally home. (Our 50th year.) Ragsdale Candies, B-107, East Orange, New Jersey.

**OPERATE** Home mailorder business. Vosacek Distributors, 4444A1 Ute, San Diego 17, Calif.

**EXCEPTIONALLY** Profitable opportunity in tape recording! Free information. Baron's, Lynden, Washington.

**JAPAN** Directory, 145 Japanese manufacturing exporters. Japan and Hong Kong trade journal information. Asia opportunities. Just \$1.00 today. Nippon Annai, Box 1150-P, Spokane 10, Wash.

**MONEYMAKING** Franchise can be exclusively yours. For free current franchise reviews information write Franchise Newsletter, P, 9 South Clinton, Chicago 6.

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

**MAKE** Fabulous weekly profits clipping newspaper items for publishers. Some clippings worth \$5.00. Particulars free. National, 81-PM, Knickerbocker Sta., New York City.

**MARKETS** Everywhere. Make artistic concrete birdbaths, pottery. Best coloring. Home workshop. Hundred varieties. Free pictures. Hollywood Cementcraft, 8527-S Wonderland, Hollywood 46, California.

**"WORLD'S Easiest Mailorder Business."** Completely explained. Published especially for beginners. \$1.00 postpaid. Neil H. Tasker, Shamokin, Pennsylvania.

**MAIL Advertising ideas!** Business-building manuscript helps increase sales. ReGal, 904 North Labrea, Inglewood 3, Calif.

**I Got rich in the dry cleaning business** with no investment, so can you. Free details. Write: Imperial School of Dry Cleaning, 1700 Touhy Avenue, Chicago 26, Illinois.

**DOLLS!** Dolls! Dolls! We teach you to repair, make, sell all kinds of dolls and accessories including clothing. Study at home. Earn while you learn. Free booklet. Doll Hospital School, Studio MC-21, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**START** Highly profitable business in rich, undeveloped field. Information free. Baldwin, 826 South Conception, Mobile 26, Alabama.

**INVISIBLE** Reweaving: \$5-\$10 per job possible reweaving burns, tears, mothholes. Spare-full time. Free details. Skill-Weave, Dept. RC-162, 335 W. Madison, Chicago 6, Illinois.

**"RAISING Earthworms for Profit."** Make \$5,000 or more yearly! Best seller, 128 page, fully illustrated manual tells how to raise and sell—\$2.00. Also, "Earthworm Buyer's Guide", 1,375 sources—\$1.25. Both books, \$3.00. Free literature. Shields Publications, Box 472-A, Elgin, Illinois.

**MAKE** Extra money—Big cash commissions plus premiums for you and your customers. Sell advertising book matches. Sensational new tenor, glamour girls, hillbillies; dozens others. All sizes. Quick daily sales; big repeat business. Free master kit makes selling easy. No experience necessary. Superior Match, Dept. MX-261, 7530 Greenwood, Chicago 19.

**MAIL-ORDER** Home business. Get free copy, "Make Money in Mail-Order." Mailco, 1717 Westwood Blvd., Dept. T702, Los Angeles 24.

**MAKE** Durable building plastic easily. Waterproof, fireproof, economical. Bays Laboratory, Chinle, Arizona.

**PACKAGE** At home for profit! We supply everything. No selling, ready market. Free home business details. HPC, 2212-BB, Jesse Street, Los Angeles 23.

**SELL** Diamonite gems: more brilliant than diamonds. Credit arranged. Catalog 10¢. Diamonite, 2420-M 77th, Oakland 5, Calif.

**LEARN** Sign painting, cartooning. Strahley, 410 So. Western, Springfield, Ohio.

**BIG Money** — Operate own fix-it shop. Service household appliances, motors, mowers, saws, skates, etc. Free book. Christy Trades School, A-203, 3214 Lawrence, Chicago 25.

**\$1.00 BRINGS** You \$18.00 spare-full time home business opportunity! Amazing new velvet-spray transforms old cheap lamps, TV-radios, figurines, furniture, anything, into valuable products! Free samples, 50 business opportunities booklet. Send no money. Flok-Kraft FY, Los Angeles 61.

**NEW Home-import** mail order profitability! Your mailbox stuffed with money! No selling. No experience. No investment. We supply everything. Free details. Mail Order Distributors (Import Division) Dept. C52C, 15201 South Broadway, Los Angeles, Calif.

**IMPORT-Export** opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger, T702, Los Angeles 24.

**LEARN** Landscaping and the growing of plants. Start a profitable business part or full time. Free information without obligation. National Landscape Institute, Dept. MC-21, 11826 San Vicente Blvd., Los Angeles 19, Calif.

**INCREDIBLE** New "table-top" machine manufacturers over 15,000 saleable products. Also laminates, encases, moulds and plates in bronze, chrome, or copper. 20¢ materials produce \$10.00 products. Free confidential details and home-business plan. Plasti-Form, Dept. PM-2, Gardena, Calif.

**START** Your own business on credit (U.S. and Canada). Your own boss. 1396 dealers sold \$5,000 to \$25,500 in 1959. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. B-U-PPM, Freeport, Illinois.

**\$250.00 WEEK** Spare time profit possible. Earn at home with new fascinating printing method. \$5 starts you—send no money now. Free confidential facts and valuable sample. Screen-Print, FY, Los Angeles 61.

**LEARN** Professional TV servicing in one week! Fabulous new simplified system. No big expense. No studying. No tools or equipment. Spare, full time. Own your own big profit business! Save! Amazing but true! Free! Write, TV Systems, Dept. EC-172, 1038 So. LaBrea, Los Angeles 19, Calif.

**BECOME** Tax consultant. Graduates earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. Union Institute, Lakewood 2W, N. J.

**IMPORTS** Drop-shipped. Terrific profits. Free details. SM Products, 7401-P Woolston Ave., Philadelphia 38.

**CASH** From sawdust, tin-cans, newspapers. Over 200 methods. Instructions \$1.00. Charles Company, 42-GPD, Norwood, Ohio.

**BUY** Government surplus wholesale direct. Information \$1.00. Surplus. Box 789 BP, York, Penna.

**PRACTICAL** Mailorder. Start small. Money-maker 261, 722 East Silver Spring, Milwaukee 17, Wisconsin.

**OWN** A Mailorder business. Make extra money during spare time, desk work, no merchandise investment. Honest offer. Rite-Way Products, 221M Summit Avenue, Jersey City, N. J.

**OPERATE** Profitable mail order business. Write: Welch, Limited, Black Mountain, North Carolina.

**FIGURINES.** Plaques, liquid rubber, plaster-craft supplies. Sample, details free. Lavin Novelties, Box 296-H, Leavittsburg, Ohio.

**MADE** \$10,000.00 Typing at home. Guaranteed proof. Amazing information 15¢. Lenore Felgen, 30 Washington, Oak Park, Ill., Dept. PM.

**MAKE** \$46 From square foot plywood: jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

**PROSPER** By selling "The World's Most Usable Bible." Sales quick, easy and highly profitable. To start earning a better living, write today. International Book Company, Department M., Box 118, Wichita 1, Kansas.

**YOUR** Own spare time home-operated business. Take over your area as our service distributor keeping retail stores supplied. Nationally advertised 31-year-old line pays up to \$20.00 hour. Under \$100 for merchandise gets you started. For samples, highly successful plan, write Novo, 3855 Lincoln, Desk B-85, Chicago 13.

**EMPLOYMENT** Information is big mail order business. Make up to 100% profit. Free information. International Reports, Dept. 4M, Box 621, San Jose 6, California.

**BIG Money** — Exotic imports sell on sight. Free details! Davis, 1204A Alamo, Anaheim, Calif.

**MOLD** Statuary, pottery, tiles, novelties 5¢ materials makes dollar sellers! Particulars free. Marbleizing Service, Edwardsville, Illinois.

**MOTEL-Resort** management. Quality for hundreds fascinating, leisurely, well-paid executive openings. Learn at home. Free booklet. Motel Managers Training School, PM-B, 612 S. Serrano, Los Angeles 5.

**UNEMPLOYED.** Retired, handicapped. Recondition batteries. \$1 gets bluebook. \$4—hour in neighborhood shop. Drivers, truckers, get these secrets. Little Pal, 1105 Fifth, McKeesport, Penna.

**FREE** Book "990 Successful, Little-Known Businesses." Work home Plymouth-472T, Brooklyn 5, New York.

**98% PROFIT** Mimeograph postcards at home. Free offer. Write — Scheetz's, Sellersville, Penna.

**\$30-\$100 WEEKLY.** Easy home plan revealed. Free details. Sparetime Institute, 15 Beekman Ave., Mt. Vernon 6, N. Y.

**PHYSICAL** Health and massage. Home training. Practice privately or work with doctors. Big profits. Free catalogue. National Institute, Desk 4M, 159 E. Ontario, Chicago, Ill.

**START** A home business in spare time. Make extra money. Experience not essential. Literature free. Write today. You will be glad you did. 4111 9th St. No., St. Petersburg 3, Fla.

**900% PROFIT** Fast sellers by mail. Write: Mos's, 946 Washington, Denver 3, Colo.

**EARN** \$200.00 Monthly. With table saw or jigsaw. Sparetime. Mac-Dan, Box 457, Stanton, Calif.

**WANTED:** Home producers, to be subcontractors. Cast plastic products for manufacturers in our clearing house service. Thousands of easily made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 2-PM, East Boston 28, Massachusetts.

**METALIZE** Baby shoes, jewelry. Formulas, instructions \$2.00. Kemplate, Park Ridge, Illinois.

**BE** Your own boss. Industry sales over \$95,000,000 in 1960. You can be a part of it with a business, sales or mechanical background. Full home-office backing, training, national and local advertising plus sales aids. Exclusive territories. Under \$2,000 inventory investment. Send business and personal details to Sun-Tron Corp., 7447 W. Wilson Avenue, Chicago.

**EARN** Money operating family discount club. Money back guarantee. Hill's Enterprises, 839A New York, Wichita 14, Kansas.

## MONEYMAKING OPPORTUNITIES

**MAILORDER** Business your ambition? Our manuscripts reveal inside secrets. Details free. Esaco, 611-A Eastern, S. E. Grand Rapids 6, Michigan.

**MAKE** \$5,000 Yearly sparetime raising mink, chinchillas, nutria, etc. Free booklet reveals proved plans. Write: Furs, 588 Mt. Pleasant Road, Toronto 1, Canada.

**WIN** Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25¢. General Contests, 1609 1/2 East 5th, Duluth 12, Minnesota.

**DOLLARS** From dolls. Doll Hospital School, Studio MC-21C, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**10,000 MONEYMAKING** Formulas, processes, recipes, trade secrets, etc. Supply sources. Over 900 pages. \$3.95 ppd. Literature 10¢. J & J Distributors, Box 1053, Dallas 21, Texas.

**NEW!** Plastic laminating machine. Hobby. Easy. Profitable. Details. Burr, 330 East Centre, Kalamazoo, Mich.

**BUY** Government surplus cheap. Resell at enormous profit. Latest directory and procedure \$1.00. Aviation Surplus, Box 789PO, York, Penna.

**EASY** To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write Roberts, 1512 Jarvis, Room CR-2-A, Chicago 26.

**START** A profitable subscription business in spare time! We need men and women (young and old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. No experience needed. Send this ad with your name and address to: Popular Mechanics, Room 2-O, 250 W. 55th St., New York 10, N. Y.

**EARN** Extra money now. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. For new profits and pleasure, write today for complete, free kit. McGregor Magazine Agency, Dept. 117M, Mount Morris, Ill.

**START** Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-2-A, Chicago 26, Ill.

**MEN**—Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-A, 1512 Jarvis, Chicago 26, Ill.

**MAKE** Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27A-A, 7464 Clark, Chicago 26.

**PUZZLE** Contests! Cash prizes! Details free! Spence, Box 11569, St. Petersburg, Fla.

**CIGARETTES**—Make 20 plain or filter-tip for 9¢. Factory-fresh pipe tobaccos. Facts free. Moberly, Box 914, Owensboro, Kentucky.

**MAKE** Big easy profits making costume jewelry at home in spare time! Quick, easy to make, easier to sell! Details free! Don-Bar, 3511 W. Armitage, Dept. A-201, Chicago 47, Illinois.

**MUSHROOMS** In 14 days. "Magic" pre-planted trays, 3 for \$5.25, 6 for \$9. Express charges collect. Free literature. Spawn plus newest manureless growing, marketing, \$1. Luxur, 641 South 19th, Newark 3, N. J.

**EASY** To earn extra money! Free 100 page catalog. Tandy Leather Company, Box 791-B40, Fort Worth, Texas.

**MAKE** Fabulous weekly profits clipping newspaper items for publishers. Some clippings worth \$5.00. Particulars free. National, 81-PM, Knickerbocker Station, New York City.

**PLATE** Baby shoes, jewelry, gifts, bronze and colored pearl. We finance. Free booklet. Platex, 11029 South Vermont, Los Angeles 44.

IN 1952 I was unemployed, broke. Today own \$18,000 home, drive Cadillac, have bank account. Anyone can do this. Write Norris Cole, 217 West 49th, Bradenton, Florida.

**MINK** Raising information free. Complete. Lake Superior Mink Farm, Superior, E.E.I., Wisconsin.

**VENDING** Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #26, 715 Ensor Street, Baltimore 2, Maryland.

**GROW** Mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We pay \$4.50 lb. dried. We have 29,000 customers. Free book. Mushrooms Dept.: 173, 2954 Admiral Way, Seattle, Wash.

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

**YOUR Own**, easy-to-start, home mail-order business, sparetime. Fascinating! Profitable! Information free. Alfano, 19-PM Pine, Closter, N. J.

**BIG** Money raising fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

**READ** "Progressive Mailtrade." The magazine that tells how to make money by mail. Quarter brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

**SPARETIME** Homework. Typewriter required. Moneymaking instructions 50¢, refundable. Interstate, 37 Besch, Albany 9, N. Y.

**LEARN** The secrets of repairing junk batteries, profitable, easy, at home. Free particulars. Batteryman, 3465 Forrest, Santa Clara, California.

**\$600.00 PROFIT!** Mailing catalogs! Sample, instructions 25¢. GPO, Box 972, New York 1.

**\$200.00 MONTHLY.** Spare time. With table saw, bandsaw or jigsaw. Write. Holiday House, Box 1825 A, Vancouver, Washington.

**AMAZING** Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, MP-528, 333 North Michigan, Chicago 1.

**SHELLCRAFT** Supplies. Highest quality. Lowest prices. Large catalogue 25¢. Pace's, Cortez, Florida.

**CASH**—Sharpening disc type implements for farmers. Only completely portable sharpener that will double disc blade life, control blade concavity, improve implement field performance. Easy to handle, simple to operate, the Amy portable disc roller makes up to \$10 per hour. Needed everywhere. Nothing like it before. No competition. Tremendous side-line opportunity. Details. Amy, Utica, Kansas.

**OPERATE** Profitable mailorder business. Write Gilbert Riden, 2459 Denton, Hamtramck 12, Mich.

**ARTIFICIAL** Flower woodfibre, leaves, plastic, novelties, birds. Discount catalog 25¢ (refundable). Cleveimports, 4501T162 Lorain, Cleveland 2, Ohio.

**INCOME** Tax. Save money and make your own returns. We furnish a complete service for \$4.00 including forms completely filled out with detailed instructions on all deductions. Accounting Associates, Box 838, Reno, Nevada.

**WE** Buy old and used books. Send 50¢ for lists with prices we pay. Northwest Book Sales, West 3217 Cora, Spokane, Washington.

**BIG** Mail order profits laminating clippings, photos, I.D.s, documents, without heat, press, glue. Permanent Seelux instant, self-sealing plastic sheets. Details, generous sample 25¢; \$5.00 value trial only \$1.00. Utility Products, Cincinnati 2, Ohio.

**LEARN** Typewriter repair at home in spare time. Cash in on 25 million typewriters needing repair service. Earn as you learn. No special skills needed. Send for free facts on home study course. Modern Typewriter Repair Institute, Dept. T-203, 4020 W. Third St., Los Angeles 5, Calif.

**LET** Henry Wood's experience rocket you to success, 35¢. Books, New Palestine, Indiana.

**LEARN** Auto upholstery, body-fender repair and painting at home in spare time. Cash in on 60 million cars needing body, fender, upholstery services. Earn as you learn. Send for free facts on unique 3-in-1 home study course. Modern Auto Institute, Dept. 103A, 4020 W. Third St., Los Angeles 5, Calif.

**PLATE** Baby shoes. Make jewelry, novelties. Start with \$3.00 refundable investment. Free details. JO-CA, 468-D Northwest 79th Street, Miami 50, Florida.

**23 CHOICE** Sparetime money-makers. No experience, no investment. Details free. Cambridge Services, Box 252, Hartsdale, N. Y.

**MAKE** Easy money without selling supplies. Instructions 25¢. Guaranteed! Beecop, Dansville, N. Y.

**ARTIFICIAL** Flowers, purses and other useful articles easily made from plastic foam and readily saleable. Instruction book \$1.50. Write for prices and color chart. Houghton's, 454 Kingston Rd., Toronto 8, Canada.

**MAIL** Order made me rich! Success secret—free! Write: President, Mallord Company, (PM), Southampton, New York.

**FURNISH** Names. Earn commission. Hartford, 127 Highland Station, Denver 11, Colorado.

### EXPORT — IMPORT

**JAPAN:** Buy direct, mail-order. Kimonos, toys, novelties. 26 page catalogue: Manufacturers' names, addresses. Send \$1.00 cash. Clarence Yamagata, 814 Togin Bldg., Marunouchi, Tokyo.

**INDICATEUR** de L'Horlogerie, 1961 Swiss watch manufacturers directory in English! 250 addresses plus products! Guaranteed, postpaid: \$1.00. Specialty Trading Company, P.O.B. 323-D, New York 21.

**100 CONTACTS** Of 100 business classifications from 100 countries, \$1.00 list. Imports Unlimited, 225 Lake, San Francisco 18.

**FOREIGN** Import Directory \$1.00. Lists 400 exporters. Tech Publications, Box 821, Logan, W. Va.

### SCIENCE & CHEMISTRY

**CHEMICALS.** Apparatus, glassware. Illustrated catalog 25¢. Bio Chemical Products, Somerset, Belmont 78, Massachusetts.

**BOOKLETS!** Chemistry, Physics, Astronomy, Science, Relativity, Electricity, Radio, Light, Tables, Mathematics, 10¢ each. Franks, 3121 South Racine, Chicago 8.

**ROCKET** Model kits, parts, chemicals. Catalog, plans 25¢. Central Rocket Company, Waupaca, Wisconsin.

**SPECTACULAR!** Laboratory supplies catalogue and "Experiments Booklet." Only 25¢. Hagenow Laboratories, Manitowoc, Wisconsin.

**MICROSCOPE** Slides, anatomical. Free list. Bay, 409 Roosevelt, San Francisco 14, California.

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

**ILLUSTRATED** Catalog: Chemistry, mineralogy, biology 25¢. Tracey Laboratories, Evanston, Illinois.

**ROCKET** Supplies for amateur rocketry. Catalog 25¢. Mervin Hill Company, R.D. #1, Seward, Penna.

**UNUSUAL** Chemistry books, courses, kits! Rare chemicals, cheap! Catalog 25¢. NSC, Box 11133, Palo Alto, Calif.

**232 PAGE** Catalog \$2.00. Laboratory Materials, 7319 Vincennes, Chicago, Ill.

**AMAZING** New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-2, Lombard, Illinois.

**ROCKETEERS!** High power rocket kits, supplies, telescopes, miniature transistor kits, chemicals galore. Illustrated catalog 25¢. Rocket Model Research, Box 716, Newark 1, New Jersey.

**ROCKET** Test equipment for safe static firings. Catalog 25¢. C-W Products, Box 431, Brigham City, Utah.

**MICROSCOPISTS,** Bacteriological slides. Micro, Box 19, Staten Island 10, N. Y.

**CHEMISTRY** Catalog 25¢. Used equipment bargains! Laboratory Sales, Box 161-A, Brighton, Mass.

### FORMULAS, PLANS, ETC.

**LATE.** Modern manufacturing formulas. List free. Moon Chemical, Martville, New York.

**FORMULAS** For 10,000 products \$4.95. Ervin Sales, Box 366, Roseburg, Ore.

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



**FORMULAS** For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

**MIRROCRRAFT!** Make silver, gold, one-way mirrors. Three \$1.00. Sample glass gold plated mirror \$1.00. Folio, 50 mirrorcraft trade secrets, instructions, formulae, \$5.00. Details 25¢. Mirrocraft, 18518 Winthrop, Detroit 35, Mich.

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## Odd Bird, the Megapode

Somewhere in the scrublands of Australia, a male Megapode—weighing from 3 to 15 pounds and resembling a pheasant, quail or wild turkey—flutters around a nest the size of a compact car. He senses slightest variations in temperature and pecks away enough decaying plant material from the mound, or adds to it, to keep the inside heat at a constant 92 degrees F. This process goes on for eight weeks, until the egg inside is hatched. In odd moments—and Megapodes have more than their share of those—the male builds other mounds to serve as incubators. For the female every four days lays another egg the size of a grapefruit and turns it over to the male for what turns out to be not-so-loving care. As soon as the young Megapode hatches, he begins tunneling out. When he emerges 15 hours later, both mom and pop, engrossed in propagation, have flown the coop and he is left to shift for himself. This is not as bad as it could be, for newborn Megapodes (the name means big feet, a distinguishing mark) arrive fully feathered and quite mature.

These strange birds have puzzled scientists for years. There are 12 known species, all raucous-voiced and ferocious, living in Australia, New Guinea and on remote islands in that area. It is not even known for sure that they are birds: one school of thought proposes they are direct descendants of the reptile since Megapodes, like snakes and turtles, bury their eggs and neglect the care of their offspring. George A. Clark, an ornithologist at Yale University, New Haven, Conn., however, believes he has evidence they are, indeed, avian. To settle this problem and others raised by the birds' queer habits, he recently spent four months in Australia studying them and will have a full report on the subject in 1961. Clark discovered the presence of a vestigial "egg" tooth located on the beak of young Megapode embryos. The egg tooth is used by other birds to crack the egg at hatching time. Clark believes the bird has reverted secondarily to reptilian habits, much like whales and porpoises, which are mammals, but have returned to the habits of their fish ancestors.

Other problems Clark has considered include this: How does the Megapode embryo, buried several feet in a mound, receive oxygen? How does the newborn Megapode, who has never seen its father and mother, know another Megapode when he sees one? Somehow they do, for these strange birds of feather flock together and create other, puzzling Megapodes.



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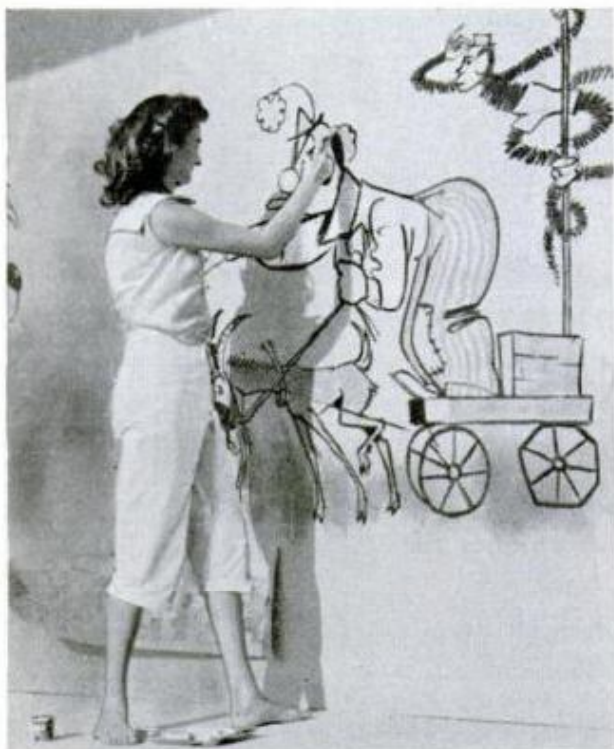
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## Fanciest Fence in the West

STUCK WITH 1300 feet of bare plywood barricade around a shopping center construction site, a San Leandro, Calif., building-management firm asked the public for decorating ideas. To its surprise, 200 artists from the nearby Hayward Art Association volunteered their services in exchange for a contribution to their group's building fund. The artists ganged up on the job on

a Sunday, with one of the group acting as straw boss and another mixing paint, and finished the job in one day. The finished fence features 200 original designs, many by prominent artists, and is thought to be the longest mural in the world—as well as one of the most attractive construction barricades. The panels will be auctioned off when the construction job is completed.



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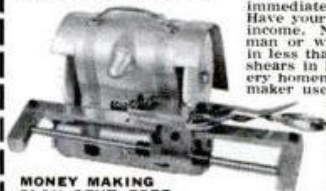
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FOR something like 300 million years the Colorado River has fought its way through mountains and deserts from Colorado's North Park country to the Gulf of California. In that time it has gnawed its way through half a dozen layers of sandstone, limestone and shale, and a thousand feet into the hard Archaean granite. Across the northwestern corner of Arizona it cut the 200-mile-long, mile-deep Grand Canyon of the Colorado. The river's rapids, falls, riffles and runs, formed as it bounces around in its rocky bed, are among the world's wildest — nobody in his right mind would ever call it navigable.

Since 1869, brave men in small boats and gasping tourists in big rubber rafts have shot the river downstream, and in the last 20 years several attempts have been made to run upstream in powerboats, but all have failed at Vulcan Rapid, or Lava Falls, where the muddy river roars down 200 yards of rocky canyon bottom at a 25 percent grade at speeds up to 30 miles an hour. The rapids there would scare the daylight out of anyone but a real fast-water nut or someone with something to prove.

A few months ago, a nine-man crew of men *with* something to prove headed upstream from Temple Bar on Lake Mead in four 18-foot Turbocraft water-jet boats,

POPULAR MECHANICS

aiming for Lee's Ferry, 307 miles away through 200 treacherous rapids.

On the second day, 120 miles upstream, they hit Lava Falls. While a party of Park Service officials watched from the canyon rim 3500 feet above the river, the first boat hit the rapids at 45 miles an hour. Twisting like a broken-field runner, the boat dodged the worst "hay-stack" waves to take advantage of eddies and smooth runs, and burst out safely above the rapids. But repeated attempts by the other boats were forced back. The drivers described the trip as "feeling like running up a wall—if you don't make it, the worst part is turning and falling back down again, twice as fast."

After two days of trying, the other boats made it out and the expedition proceeded upriver. Ironically, the fourth boat was later lost in milder Grapevine Rapid when its fiberglass hull shattered against a boulder. It sank in 40 seconds, but the driver got out safely. Failure of the hulls to stand the pounding against sharp rocks proved the crew's only big trouble—they were forced to stop for repairs 12 times—but they insist that no other type of hull could have survived the trip. After eight wild days on the river, the three surviving boats pulled into Lee's Ferry, much the worse for wear but with their engines and jet units still functioning well, which was the purpose of the test. For the first time, that stretch of the Colorado, through the canyon could be called navigable—by high-powered jets, anyway. But it's unlikely that anyone will do it again. In the words of a National Park official, "It's just too dangerous—even with jets."

FEBRUARY 1961



Straining against the last barrier wave, the first boat to beat Lava Falls breaks free with New Zealander Jon Hamilton fighting the wheel



Big water flexed its muscles and tossed this boat clear out of the river. The tough plastic hull survived, and the jet system, all inside the hull, wasn't damaged. All hands turned to, shoved it back into the current and drove it away. Below, another boat hangs up in the rapids

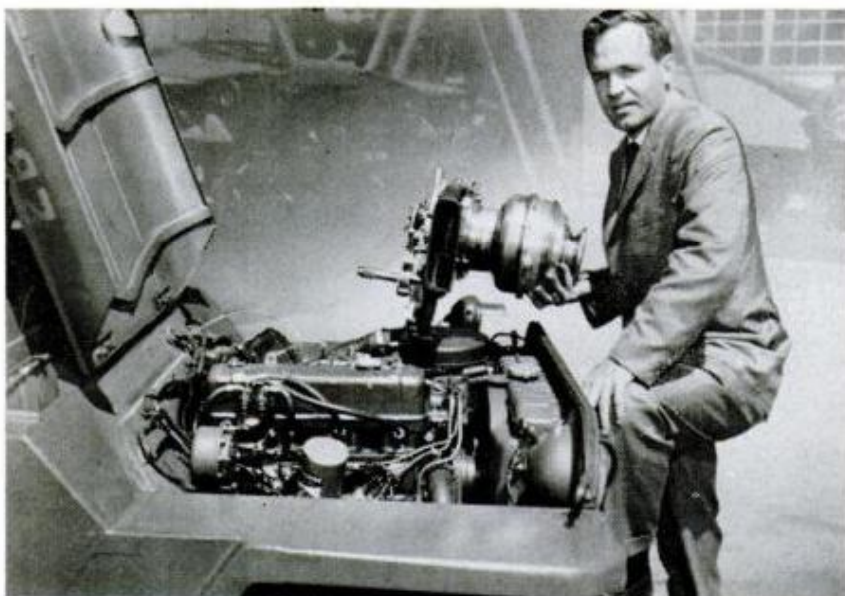
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In place of the standard four-cylinder engine, a revolutionary gas-turbine may appear under the hood of that old stand-by, the jeep. Williams Research Corp., Walled Lake, Mich., has developed the new lightweight turbine. In the photo, Sam Williams, president of the firm, holds the new engine over the present jeep power plant at the Army's Detroit Ordnance Arsenal.

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Radio-controlled tractors and other vehicles will transport the material to be tested. They will be guided over the 6½-acre center by a network of cables buried a few inches underground; electric impulses from the cables will guide the vehicles at desired speeds through the area. Observers will watch the tests through thick glass windows in the concrete wall. Electronic remote-controlled handling devices will allow scientists to control the tests, to record and analyze data.

## French Lobster Boat Carries Own Freezer Plant

Difficult and expensive handling of live lobsters is eliminated for the owners and crew of the new French lobster boat *Francois Christine*, which is not only a lobster trawler but also a floating processing and freezing plant for its own catch. The lobsters are caught with drag-nets, cut immediately into sections, packed in plastic bags under vacuum, quick-frozen and stored in the hold. Built-in refrigeration machinery produces quick-freezing "tunnels" of minus 45 degrees and cold storage for 25 tons of processed lobsters at minus 9 degrees. The instant freezing eliminates the slightly rubbery taste of most frozen lobster meat, and obviates the difficult task of keeping 70,000 to 80,000 lobsters alive until the ship reaches port. The only other method involves having a refrigerator boat accompany a fleet of trawlers, and results in an appreciable loss of weight and lesser quality of meat produced.

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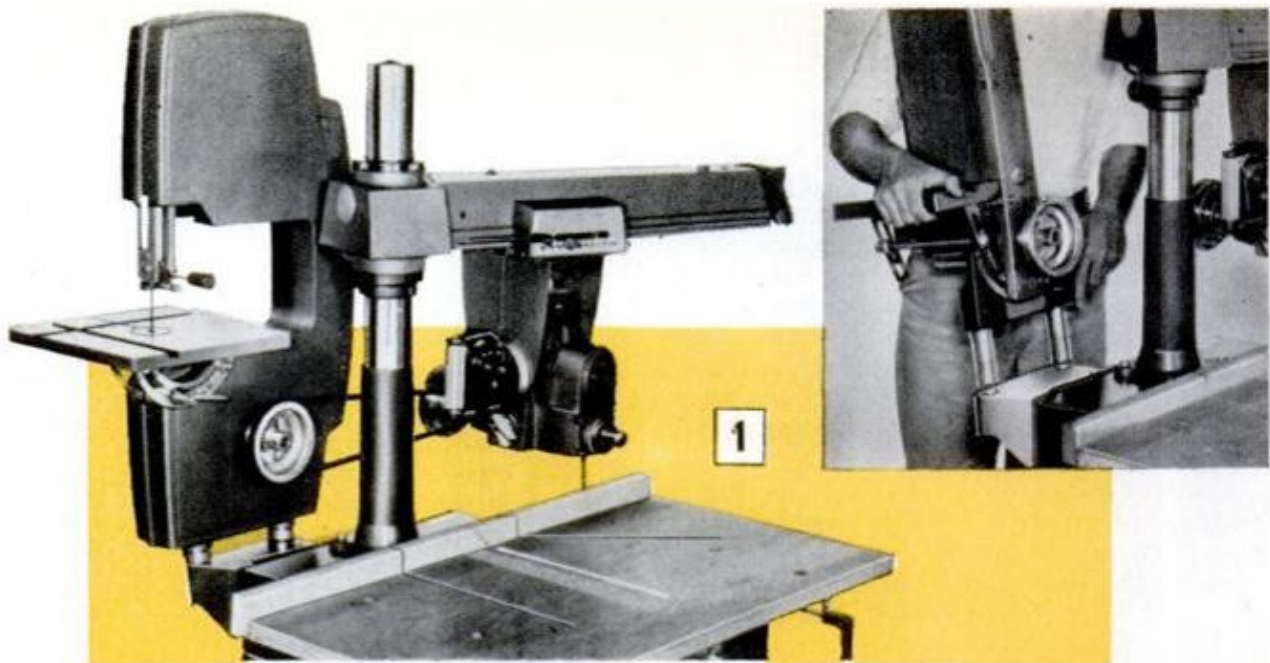
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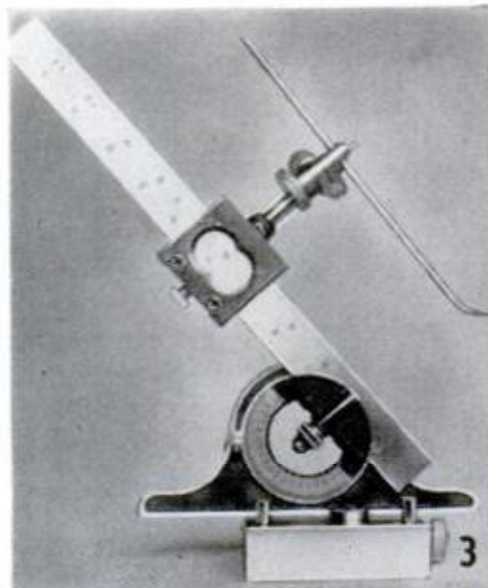
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(Continued to page 88)



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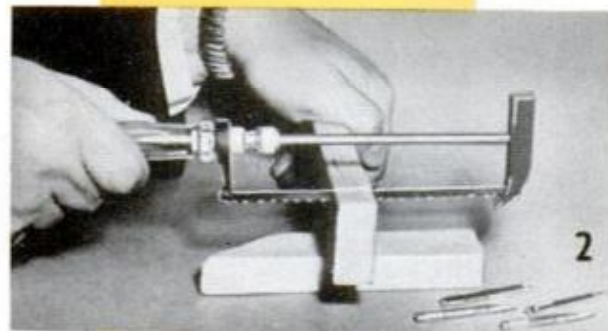
# SHOPPING FOR TOOLS

(Continued from page 86)



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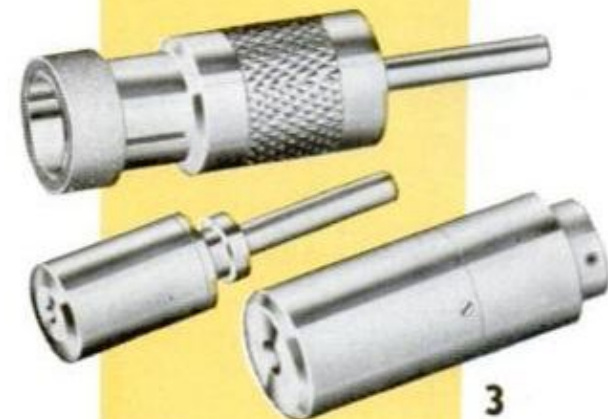
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Mid-American Import Co., Inc., 1919 Champa St., Denver 2, Colo.



2

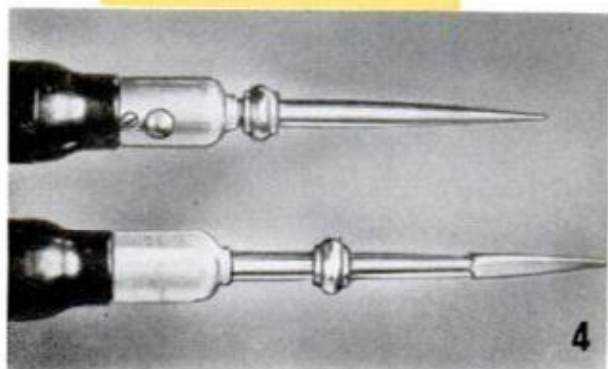
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3

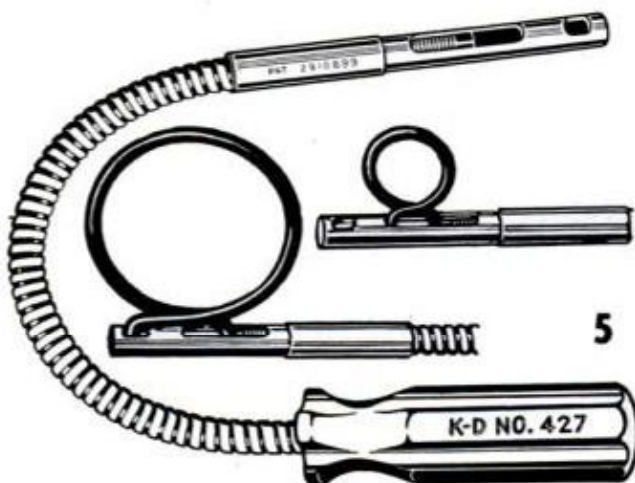
**4. SCREWDRIVER COMBINED** with hole drill, or bradawl, in one tool is simple to operate. Pushing ring forward as in lower view brings awl into position. Pressure on ring causes awl to spring back, exposing screwdriver blade as in upper view. Red plastic handle and cadmium plating give tool attractive finish  
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K-D Tools, Lancaster, Pa.

(Continued to page 90)



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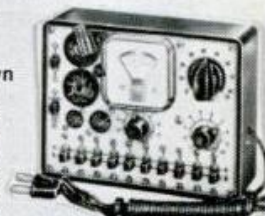
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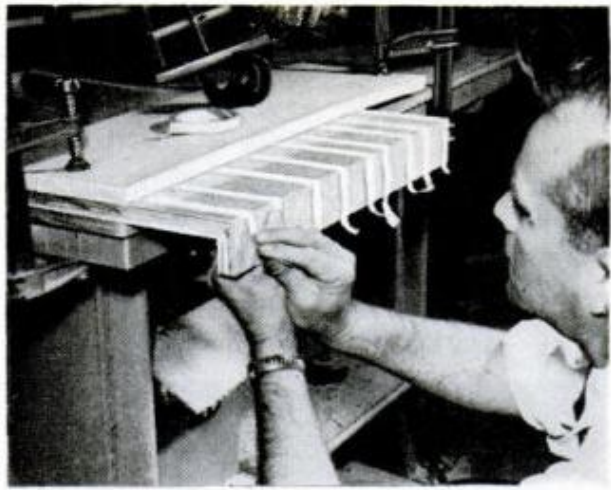
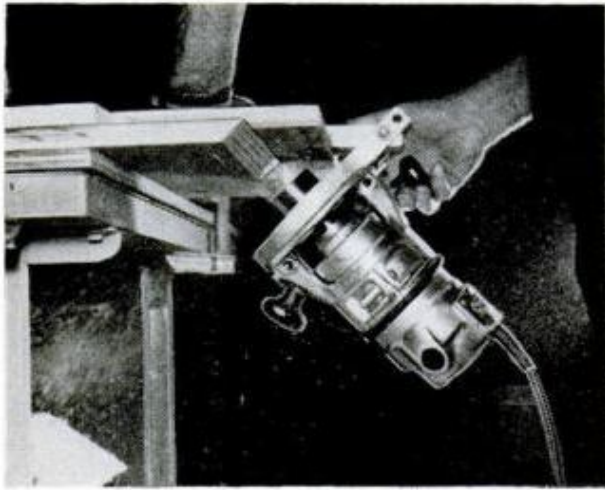
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(Continued from page 88)

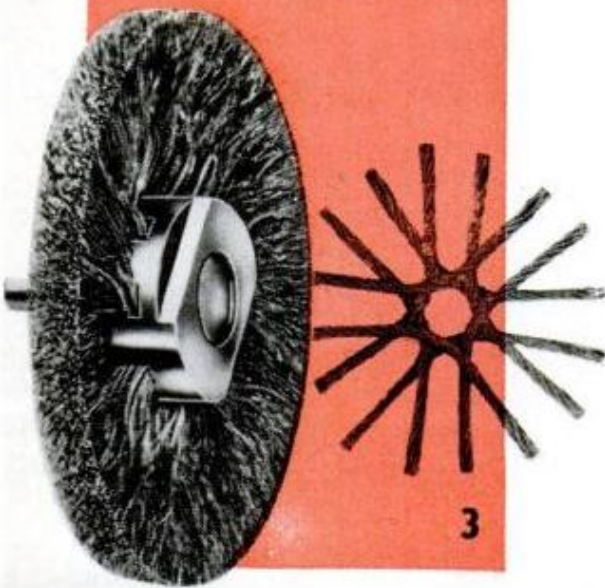
**1. MITERING ATTACHMENT** for electric router makes it possible to cut a perfect fitting miter on edges of table tops, counter tops and in displays and commercial furnishings where plywood is topped or otherwise finished with plastic laminate. Eliminates problem of achieving a perfect mitering of laminate at corner. High-speed router and positive angle guide make clean cuts at precise angles required

Porter-Cable, 101 Seneca St., Syracuse 1, N.Y.



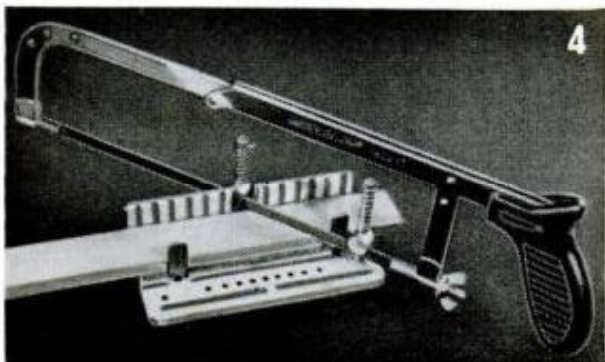
**2. PAD SANDER** is lightweight for tireless operation and is designed with a special pad that permits working flush in a corner. Pistol grip makes the unit ideal for finishing plasterboard joints on walls and ceilings and also for vertical and horizontal finish sanding on cabinets, store fixtures and other large units requiring sanding to produce a smooth surface. A 2.2-amp. motor supplies ample power

Stanley Electric Tools, Div. of Stanley Wks., 195 Lake St., New Britain, Conn.



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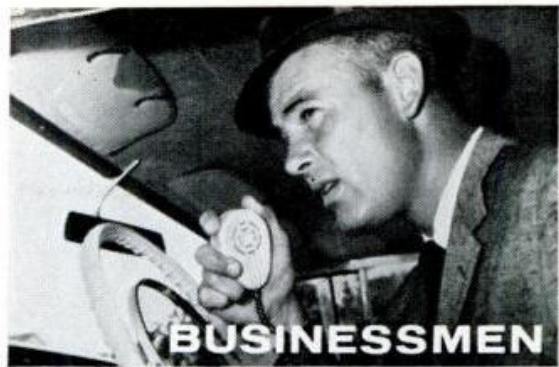
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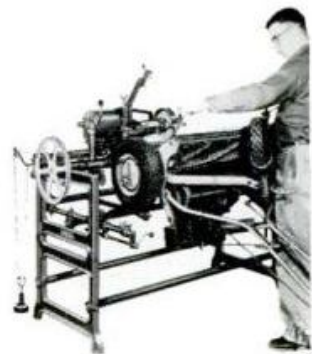
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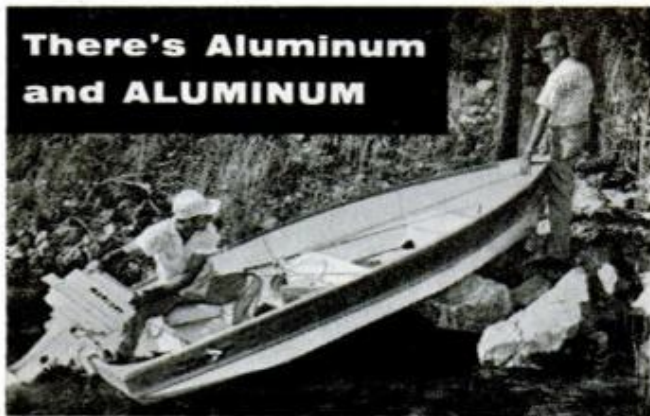


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By Jim Whipple



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All of these jobs are basically passenger cars, and they all have the built-in limitations of the passenger-car chassis. Their load space is limited by their lowness and the fact that their cargo boxes are hemmed in by passenger-car sheet metal.

The only alternative, of course, has been the bona fide pickup truck with its hard ride, "truck" handling and heavy-duty engines and transmissions.

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(Continued to page 94)

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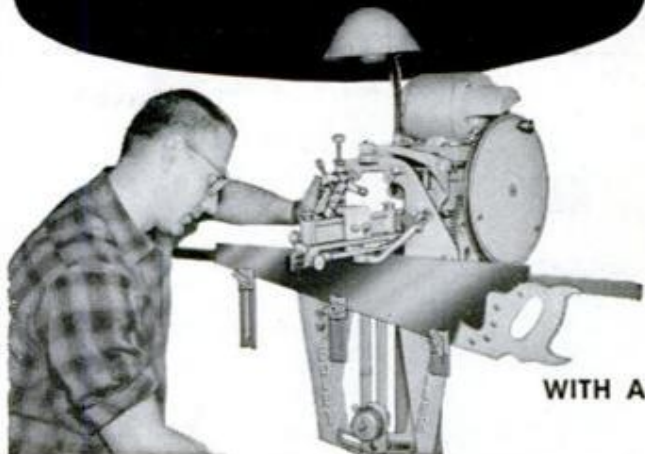


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## Huge Ship Model Promotes Dutch Steamship Line

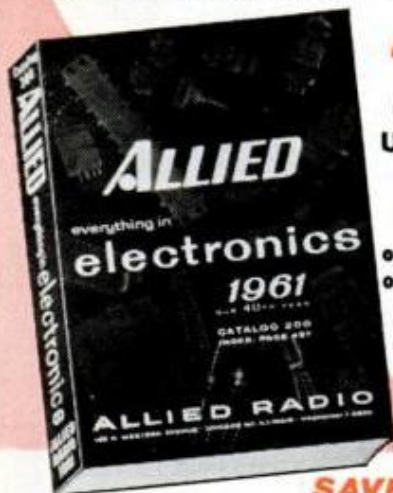
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Our test Dart model was one with an eight-foot body on 122-inch-wheelbase chassis. Power plant was the 225-cubic-inch, inclined six-cylinder engine used in Dodge passenger cars, coupled with three-speed and torque converter "Loadflite" automatic transmission. Rear axle ratio was 3.91 to 1.

The "standard" engine has a bore and stroke of 3.4 by 4.125 inches. Compression ratio is a conservative 8.2 to 1 and it operates quietly on regular-grade gasoline. (There's an optional, shorter stroke—3.125 inches—engine developing 101 horsepower from 170 cubic inches.)

A third engine option is the 318-cubic-inch displacement Dodge V-8, rated at 200 horsepower.

There's also an optional four-speed manual transmission with synchromesh on top three speeds.

The Dart's front seat is a full 60 inches wide and will seat three persons in comfort as there is no big tunnel to "break up" the seating space.

The seat is high and has fair amount of adjustment fore and aft. It could use some vertical adjustment though, to accommodate drivers with very long legs.

The steering wheel is at a comfortable angle and doesn't interfere with either forward vision or a clear view of the instruments. Dart pickup, incidentally has one of the most legible panels around—readable white numerals on neat round dials set in a glare-free, black board.

Under way, the Dart is amazingly quiet. Up to about 55 miles per hour, it makes no more noise than any low-priced passenger car.

Ventilation is effective, and you can ride in cool comfort without wind roar, as air is drawn in through ductwork. The heater and defroster unit is noisy but works well.

Steering the Dart pickup is surprisingly easy, thanks to a well-designed recirculating ball gear. There's very little wind wander, and the steering action is fairly light and quite precise.

(Continued to page 96)

# NEW ELECTRONIC DEVELOPMENT GIVES YOU 110 VOLT 60 CYCLE AC FROM 12 VOLT STORAGE BATTERIES



Now—from the laboratories of ESB—comes a major breakthrough in "packaged power"! Using advanced solid-state electronic components, ESB engineers have developed a revolutionary, transistorized inverter-charger, the ESB ACTIVERTER. This amazing new product means that you can now have the convenience and the utility that 110 Volt AC current can bring, and you can have it wherever you can take a 12 Volt storage battery! Just connect the ESB ACTIVERTER to a battery and you can plug in portable electric power tools, an electric blanket, electric lights, even a television set! A flick of a switch and the ESB ACTIVERTER becomes a battery charger.

## The miracle of transistors makes "house power" truly portable!

ESB ACTIVERTERS are the result of a totally new concept in electronic design. They are fully transistorized to reduce weight, increase reliability, and to provide the ruggedness that a portable power package must have. There are no moving parts or vibrators—ESB ACTIVERTERS are quiet in their operation!

The compactness of the ESB ACTIVERTER design makes it possible to have a 12 Volt storage battery, an inverter, and a battery charger all in one self-contained and truly portable package. One PAK-O-POWER model provides a source of 110 Volt alternating current, with an output rating of 500 Watts, in a package the size of a portable picnic cooler!



## Dependable current for hundreds of applications!

Where in this wide world would you like to have the convenience and versatility of "plug in" 110 Volt AC current? With the ESB ACTIVERTER you can have it instantly, anywhere, for many hours! On camping trips you can have the comfort and pleasures of television, radio, electric lighting. On and off the highway you can power general service tools and impact wrenches, or use the ESB ACTIVERTER for car starting and emergency lighting. Boat owners can have 110 Volt AC available afloat or at dockside. We have compiled a list of several hundred ESB ACTIVERTER applications, yet many uses for this revolutionary new product have not even been thought of. They will come from people like you who want and need portable power for specific and perhaps unique purposes!

## Battery charger is built in!

In designing this remarkable new product we've considered every feature that would increase the versatility and usefulness of packaged power for you. And that includes a built-in battery charger, electronically designed, without increasing ESB ACTIVERTER weight and size. A simple switch lets you convert alternating current from a household outlet into direct current for either fast or slow charging of 6 and 12 Volt batteries.

## Four different models provide from 150 to 500 Watts!

**MODEL I-152 INVERTER**—Inverter only, operates from direct connection to 12 Volt battery or through cigarette lighter socket of cars with 12 Volt systems. Output ratings: Intermittent Use—150 Watts, 1.5 Amps. AC... Continuous Use—125 Watts, 1.2 Amps. AC. Shipping Weight: 8 lbs.

**MODEL IC-252 ACTIVERTER**—Inverter-Charger operates from direct connection to 12 Volt battery. Output ratings: Intermittent Use—250 Watts, 2.3 Amps. AC... Continuous Use—200 Watts, 1.8 Amps. AC. Shipping Weight: 15 lbs.

**MODEL IC-202P PAK-O-POWER**—Inverter-Charger with compartment for 12 Volt battery. Completely self-contained unit. Output ratings: Intermittent Use—250 Watts, 2.3 Amps. AC... Continuous Use—200 Watts, 1.8 Amps. AC. Shipping Weight less battery: 22 lbs.

**MODEL IC-506S PAK-O-POWER**—The Multi-Service Inverter-Charger-Car Start unit, with large 12 Volt battery compartment and Car Start leads. Completely self-contained with built-in fast and slow charger—Charging rate: 60 Amps. for 6 Volt, and 40 Amps. for 12 Volt batteries. Output ratings: Intermittent Use—500 Watts, 4.0 Amps. AC... Continuous Use—300 Watts, 2.5 Amps. AC. Shipping Weight less battery: 55 lbs.

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A woman who feels the need of power steering on a full-sized passenger car will miss it on the Dart pickup as it requires about the same steering effort as a Ford or Chevy with manual gear.

Power steering is available on the V-8 model only. The Dart's brakes are smooth and effective, but require a fair amount of pressure for quick stops. Here again, power would be appreciated by the less athletic.

The automatic transmission proved very satisfactory. The push-button cluster is more accessible than on Chrysler Corporation passenger cars and is easy to read day or night. Transmission action is not as smooth as in the passenger cars; all up and down shifts are quite perceptible but not annoying. By flooring the accelerator, you can downshift into intermediate and get passing power up through 55 miles per hour.

But, the real eye opener in the Dart's behavior is its ride. This practical truck is almost as comfortable as the average compact car today. All the pogo-stick jouncing that you normally expect from a truck has been engineered out.

What makes it all the more interesting is that this soft, yet controlled ride stems from the most conventional type of suspension system in the world, four leaf springs supporting the frame over two straight solid axles.

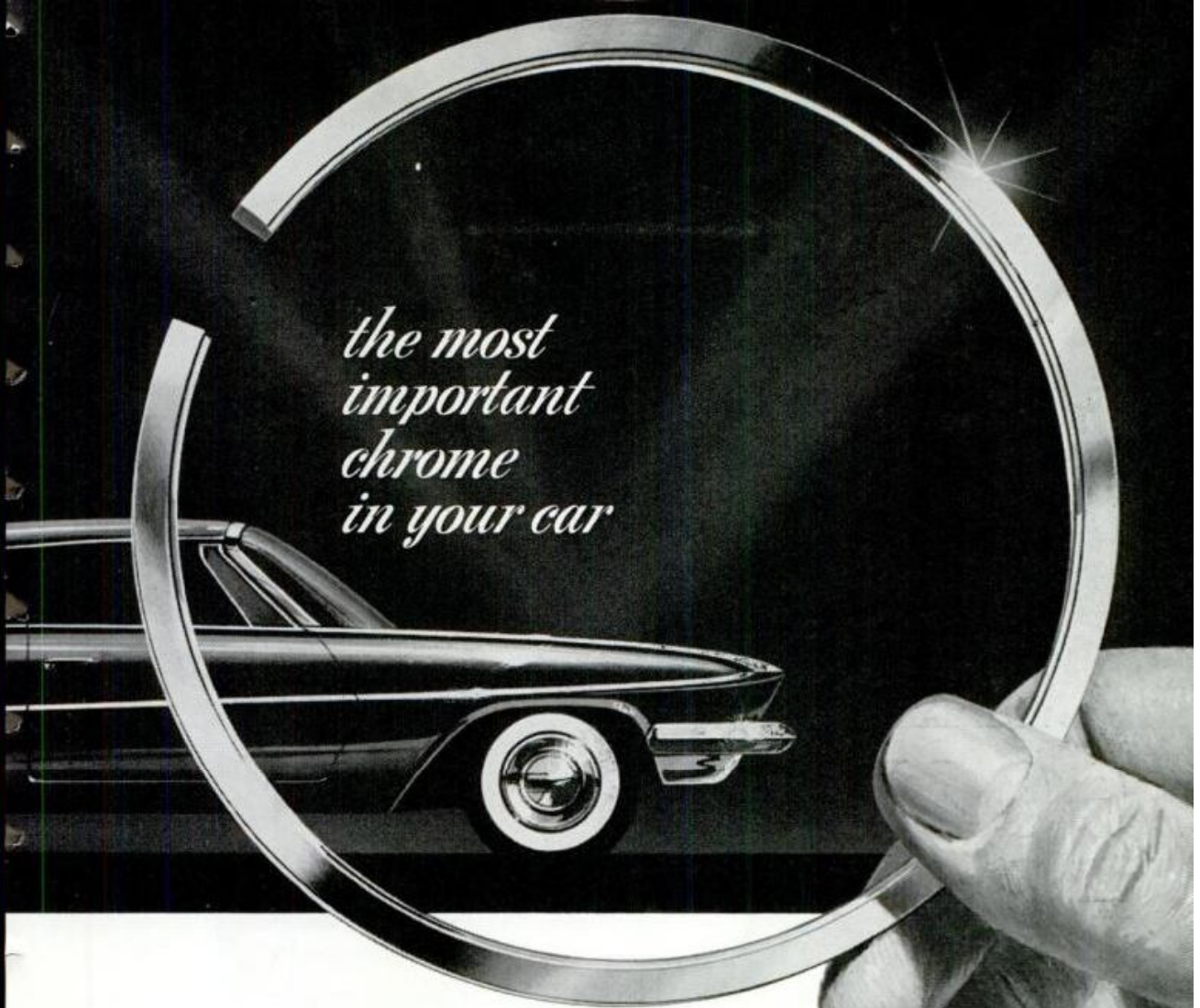
There's no independent suspension, no torsion bars, links or torque rods. The secrets of the Dart's ride, which is equally good on rough dirt roads or smooth turnpikes, are 1) front leaf springs of unprecedented length (50 inches), 2) big Oriflow shock absorbers and 3) a perfectly engineered balance between all suspension parts.

To top the comfort picture, the Dart had no rattles and very little vibration.

Here, then, is an excellent dual-purpose vehicle. It's one that you could load up with camping gear and drive all day, relaxed and comfortable, over the highways, then take up an old wood road to your camp site.

Even more good news about the Dart pickup is the gasoline mileage. With a total load of 450 pounds and most of the mileage put on at 55 to 65 in the open country, the Dart logged 17.8, and this, remember, with standard 3.91 to 1 axle and automatic transmission.

Now for the clincher: The 6½-foot-body Dart costs \$1973 (suggested factory list including federal excise tax). Automatic transmission adds \$221 at list price, fresh-air heater is \$68.10, and a limited slip differential is \$63.90. The 200-horsepower V-8 adds \$130. ★★★



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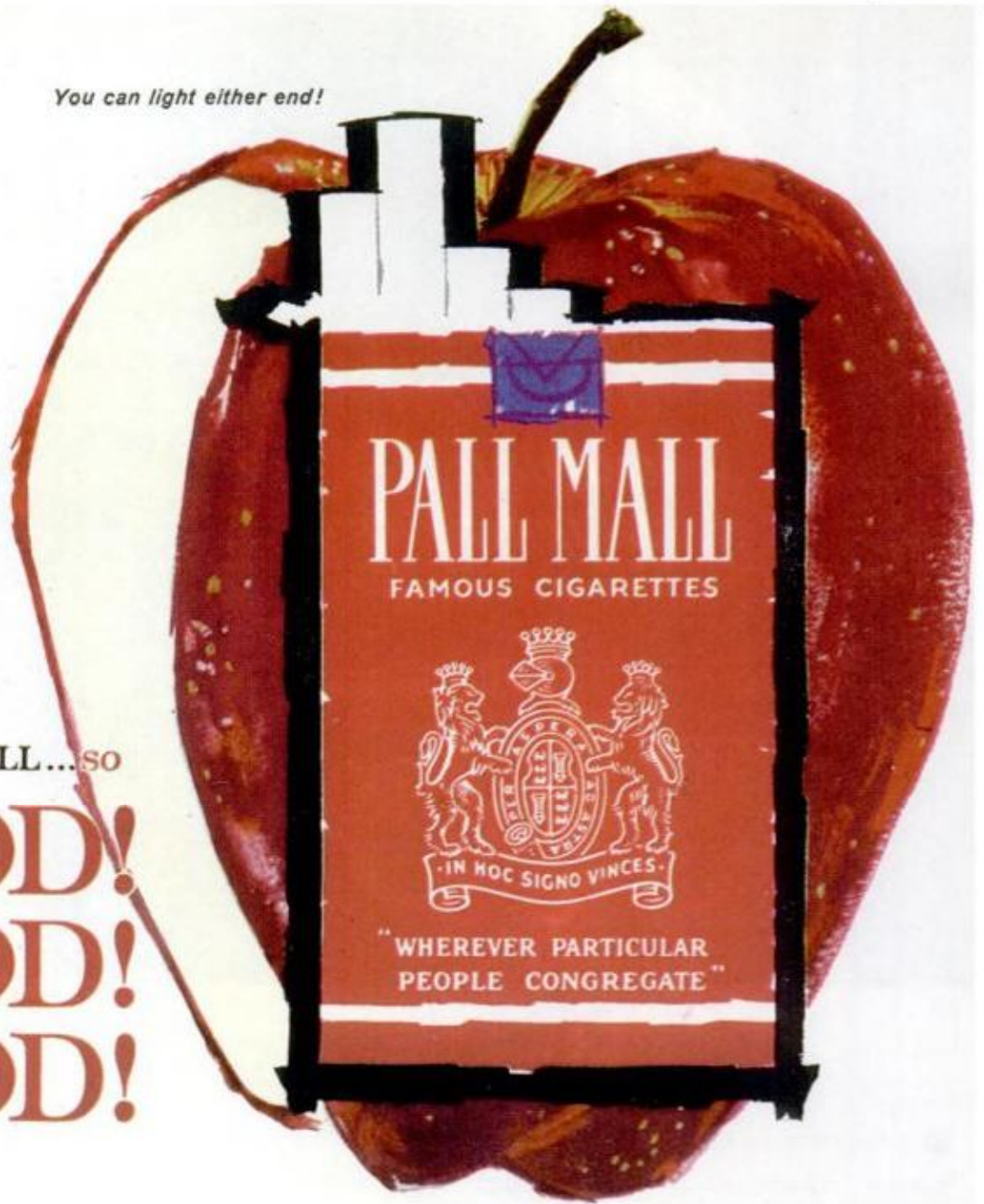
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**By David Levinson, Jr.**  
Member of the Illinois Bar

**S**UPPOSE YOU happily acquire a home of your own, a place on a nice lot in an average suburb. You settle down and prepare to enjoy your own little castle, complete with carport and wading pool. And then disaster strikes. In fact, it strikes over and over again, all year long.

First someone sues, claiming your title is defective and he owns your property. Next, you get a real-estate tax bill from the county, about twice as high as you had expected, and a personal-property tax bill on your furniture, which you hadn't expected to receive at all.

A tree on your neighbor's land drops some apples onto yours. Before you can say "apple pie," your neighbor informs you that regardless of where the apples fall, the tree belongs to him—and so does its fruit, and he will thank you to return same immediately to him.

Shortly thereafter a tree on your land drops some pears on another neighbor's property. With the lesson of the apples fresh in mind, you start to pick them up, only to be told that while the pears may be yours, you are trespassing if you go on your neighbor's land to get them.

During the winter a guest slips on ice you forgot to clear off your sidewalk and breaks a leg. You are sued.

This is followed by the city's arresting you for failure to shovel your walk, contrary to city ordinance requiring it.

# The Hazards of Owning a Home





An apple dropping onto a neighbor's property still belongs to the original owner—though the owner of the apple tree will be trespassing if he walks across the neighbor's yard to retrieve the elusive fruit

You decide to enclose the carport and hire a local contractor for the job. In short order you are visited by various city officials who order work stopped for failure to obtain a building permit and further inform you that someone apparently forgot to get a driveway permit, which may require tearing the whole thing up.

#### Workman Is Injured

When the work finally gets under way, a platform built by the contractor for work at the top of the wall collapses. A workman is injured, and YOU get sued.

An old do-it-yourselfer, you take a copy of *Popular Mechanics* and, using excellent plans there provided, you build a grill in your back yard. No sooner is it completed than you discover you have built too close to the lot line, and you will have to tear the whole thing down.

When you get it rebuilt in a proper spot, your first use results in sparks setting fire to your neighbor's porch. Quite aside from the effect on neighborhood relations, you now find yourself charged with both civil and criminal complaints.

And once you repair the damage and put in screens for the sparks, you find yourself served with an injunction forbidding you to use it anyhow, on the grounds that the fumes are a nuisance.

Not surprisingly, your expenses are now rather heavy. As a devoted reader of *Popular Mechanics*, you have saved yourself bills for years by becoming an expert mechanic and electrician. So in an effort to

make a little extra money, you paint a sign and go into business as a neighborhood repair man. Right in the middle of an interesting job, a city official calls to tell you that your property is zoned strictly residential, and that your business must cease forthwith.

No sooner have you hung up the phone than you hear screams from the garage. You rush out to discover that a child, while playing with your new mower, has injured himself. Result? You guessed it. Another lawsuit.

By this time you are understandably fed up, so you decide to sell and move back to the city. You place your house with a broker and, having ascertained what kinds of signs are legal (several are not, and you have learned your lesson) you post a "For Sale" notice. Eventually someone wanders in and offers you more than you paid. Pleased with the profit, you accept the offer.

But wait! There's no profit after all.

#### Contractor Didn't Pay

It seems that, first, the contractor who fixed your garage neglected to pay his material suppliers. You paid him but got no waivers of lien, and as he is now out of business and out of the state, liens have been filed against the property. As these are claims against the property itself, the purchaser insists that you either pay them or deduct the amount from the purchase price. And second, the real estate agent claims that your contract with him entitles him to a commission even though he did no





Swimming pools, desirable as they are, are "attractive nuisances" in relation to the neighborhood kids. A pool owner—or owner of anything else that children find irresistible—is liable when accidents occur

work in arranging the sale. He may well be right.

#### **Pity the Homeowner**

Well, pity the poor homeowner. By this time you may imagine yourself buried under an avalanche of legal-size foolscap bearing ominous words like "writ," "claim," "complaint," "lien," "injunction," "summons," and even (horrors) "warrant"!

No, don't burn the house down yet. In the first place, the deed to the place may be inside. In the second, even if you don't carry fire insurance and so cannot be accused of trying to defraud the insurance company, and even if smoke and sparks don't injure someone, it is, believe it or not, criminal arson to burn your own home.

More realistically, it is, to say the least, somewhat unlikely that all—or even a substantial number—of the mishaps above will ever happen. And for the most part you can protect yourself against those that do happen by insurance.

But insurance has its limits, both as to amounts, which may be exceeded by some costs, and as to possible or economical scope of coverage. Accordingly, it is a wise homeowner who spends a little time learning some of the fundamental law of home ownership. Failure to do so may be more than just expensive. It may cost you your life savings: it may lose you the ownership of your home; it may even drive you to the point of bankruptcy.

The list of legal problems that confront the home owner is practically endless. They

can be divided a number of ways, one of which is as follows: (A) Title and ownership; (B) Maintenance and improvement; (C) Taxes; (D) Personal injuries, and (E) Disposition.

(A) Making sure you own your home free and clear is obviously of prime importance. Fair price quite aside, a lack of caution may end in the discovery that you have a defective title or that others have claims against the property. The services of a lawyer are desirable. He will probably advise you also to make use of title insurance. Title insurance companies will check your title, report on it to you, and insure you against claims not in their reports. Do not sign land purchase contracts before consulting an attorney. At least read the things. It is incredible how many people sign contracts without even reading them.

#### **Mortgages Vary**

Financing may also lead to some trouble. While most mortgage arrangements are standard, there are variations, and your lawyer can check them. Foresight will save you money initially, will make refinancing easier should it be desirable, and will facilitate future sales.

Once in occupancy, learn what it is you own, what your rights are, and what your duties are to your neighbors. Neighbors frequently end in court over trivial matters because they did not know their rights to begin with. Know your boundaries. Then avoid building or planting too close to them. You might have to destroy a new



tool shed, built with your own sweat, because it extends one inch over your lot line. If you mistakenly plant trees or bushes on someone else's land, he may be able to keep them, though you might force him to pay you for the expense and time of putting them in.

Remember, too, that possession is not always nine points of the law. A frequent problem in rural or exurban areas, and one which may arise anywhere, involves the ownership and possession of the personal property of one homeowner found on the land of another. Livestock wandering on your land, fruit dropping on your property from trees planted next door, children's toys—these still belong to the original owner and must be returned. On the other hand, land is inviolate. Technically, no one can simply walk onto someone else's land to retrieve his property. That would be trespassing. So keep your possessions at home to avoid the problem.

Above all, avoid being overly technical about your rights. You won't make friends with your neighbors by stuffiness. And even the most successful lawsuit, if it is merely the assertion of technical rights, is expensive and time consuming. Robert Frost, once wrote, "Good fences make good neighbors." Lawsuits never do.

#### Maintenance and Improvement

(B) Maintaining and improving your home can lead to peculiar pitfalls. It is wise to remember that most counties and municipalities have rules about zoning, building permits and the like. A phone call to your county courthouse or city hall may save you time, trouble and money. If you are a do-it-yourselfer, remember to get receipts for your materials. If you hire someone else, again, read the contract or have your lawyer look at it. And before you pay a contractor, remember that suppliers of material have a claim against the property itself and can place a lien on the property to enforce that claim. You should always obtain lien waivers before you pay.

(C) Almost all land in the U.S. is taxed by states, counties or municipalities. Some familiarity with the taxing system is advisable and can frequently result in lowering your taxes. In addition, there are federal income tax consequences involved in home ownership, maintenance and improvement. The most obvious of these is the casualty loss, whereby the uninsured portion of certain damages to your property can be de-

(Continued to page 264)

Little-known "Scaffold Acts" may hold you liable for an accident caused by a defective ladder on your property—even though you don't own the ladder



By Jim Whipple



## Shakeout in medium-price field claims DeSoto. Fifteen-inch wheels come rolling back.

It was inevitable. Ever since DeSoto left its own plant on Detroit's Wyoming Avenue back in 1958, people in the industry have been speculating over the dubious longevity of the make. The recession year of 1958 struck the mortal blow from which DeSoto never recovered. Sales fell from the 100,000-plus of 1957 to 47,000. In 1959, sales dropped to 42,000, and for the first nine months of 1960 totaled only 19,491, a figure 43 percent lower than the similar period in 1959.

Now come the usual post mortems. Why? DeSoto was a good car; certainly as good as other Chrysler products.

Its designers never committed any great styling blunders such as the "bathtub" look that destroyed Packard back in 1948.

Some observers claim that the multicolored, finned and triple-tail-lamped models of 1955 through 1957 offended the traditionally conservative, loyal DeSoto owners.

This doesn't seem to hold too much water though, as sales didn't fail until 1958.

Probably the best explanation is a combination of factors, with the principal one being the shrinkage of the old, "medium-priced" field, as buyers moved down into the Ford, Chevy, Plymouth luxury lines to get approximately the same comfort and performance for less money.

Combined with this was the fact that DeSoto never had a strong personality or "image." It lacked Chrysler's glamor and performance reputation, yet did not have Dodge's public profile, a combination of sensible luxury and reasonable price.

Chrysler Corporation claims that over a million DeSotos, of the total of two million produced, are still on the road.

For the "orphaned" million, things aren't as bad as they might be, for DeSoto has shared all mechanical components with Dodges and/or Chryslers for years.

For owners looking for another car "like DeSoto," either the '61 Dodge Polara or Chrysler Newport, both on identical, 122-inch unit-body chassis, will do just fine.

Ultra-compact cars (four cylinders, four-passengers), are generating larger-than-life rumors these days. (Note: some rumors may be defined as "unconfirmed facts.")

Ford's upcoming small car, the Cardinal, could contain many English-built parts. Recently the Ford Motor Company spent over \$350,000,000 to buy full controlling interest in Ford of England, its British subsidiary.

All Ford of England cars have SAE-sized threads and fittings, so "borrowing" from the British assembly line should be no problem. Among the more important parts well suited for a U.S. ultracompact is the efficient, smooth-running little overhead-valve, four-cylinder engine now used in the Anglia.

Another fascinating story comes from Chevy's Messena, N.Y., aluminum foundry. This one concerns a four-cylinder engine block, virtually two-thirds of a Corvair air-cooled engine. If it's really in the works, this development would presage a GM "Volkswagen," probably along with the 1963 models.

Studebaker-Packard is rumored to be tooling up for a smaller, lower-priced Lark.

Big wheels are making a comeback. The 15-inch rim size, almost universal 10 years ago, has newly appeared on two '61 cars. The Chrysler 300G sports coupe has been switched from last year's 14s to the one-inch-larger size. The reason: better brake cooling resulting from more space around the drum for air circulation.

Buick Special, normally equipped with 13-inch "skatewheels" makes 15-inchers optional for the sake of increased clearance needed by some rural owners. Cost is \$19.

Current 15-inch wearers are: Cadillac, big Buicks, Corvette, Imperial, Tempest, Rambler and Studebaker.

There are other advantages to 15-inch rims too. Ride, for instance, is potentially better with the larger tires which walk over certain size cracks and potholes while smaller tires tend to drop in.

As for wear comparison, if 13-inch tires and 15s are carrying equal weight, the larger tire, which makes fewer turns per mile, will last longer. Weight is the big factor. A recent, controlled test by a major tire maker showed 13-inch tires on a light-weight compact lasting 38,000 miles while tread from 15-inch tires on a heavier standard-size car was gone at 33,900. ★ ★ ★

# Ships That Fly on Wings

By C. Lester Walker

## Water-transportation speed will triple with boats that don't float, but fly

**P**ASSENGERS FERRYING ACROSS the Strait of Messina between Italy and Sicily have always had to endure nearly an hour of the rough, eight-mile crossing. Today, however, they cross in about 10 minutes in a new kind of ferryboat—a trim, smoothly streamlined craft about 68 feet long that looks much like a small-scale ocean liner except for some strange red struts that extend into the water at her bow and stern. The boat is the *Freccia del Sole* (Arrow of the Sun), and it crosses the strait like an arrow, indeed, skimming above the waves with her 75 passengers at speeds up to 45 miles an hour.

The *Freccia* is a hydrofoil—a craft that travels through the water on wings. The wings, called “foils” because of their resemblance to the airfoils, or wings, of an airplane, create lift for a boat by deflecting water flowing over their surfaces in the same way that an airplane's wings deflect air. Rising clear of the surface, the hull escapes the drag of surface friction, and does not have to fight the bow wave that a conventional surface craft creates in front of itself. So it can go twice as fast as a conventional hull with the same engine. Marine engineers predict that, eventually, hydrofoils will be able to triple hull-in-water speeds.

What this will mean to big ships of ocean-going size is particularly spectacular. In 50 years, naval architects and engineers have been able to raise the speed of big ships only 10 knots or so. “But now comes the hydrofoil,” one distinguished marine engineer said to me recently, “and shatters this speed barrier almost overnight. It will bring us 100-mile-an-hour ocean liners.”

Most of the hydrofoils in commercial operation today are seen in European waters. Maybe there are 25 of them, ship size—on the Adriatic, the Swiss and Italian Lakes, and out of Southern Italy to ports in Sicily. Probably the biggest and newest is a Russian craft carrying 150 passengers between ports on the Volga. Puget Sound and Venezuela boast the only ones in the Western Hemisphere. The U.S. presently has none of even ferryboat size, although one of ocean-going dimensions is currently abuilding for the Maritime Administration.

In Bethpage, Long Island, Grumman Aircraft Corporation, which (with Dynamic Developments Inc., its hydrofoil research affiliate) is building this experimental vessel for the Maritime Administration, showed me this first open-sea hydrofoil under construction. William P. Carl, Dynamic's 43-year-old president, explained, “She'll be 104 feet long, capable of carrying 150 passengers, and make about 75 miles an hour. She may be able to do New York to Bermuda in eight hours, riding five feet above the water.”

“How seaworthy will she be?” I asked Carl. “Up there on her stilts, suppose she meets mid-ocean waves 10 feet high?”

“Most often she keeps going,” Carl said. “Especially if they are long waves, crest to crest. She will ‘contour’ them, like an automobile going up and down little hills. A sister ship of the *Freccia del Sole*, designed to run on foils in seas no higher than four feet, ran into 16-foot waves in the Caribbean and kept right on going.”

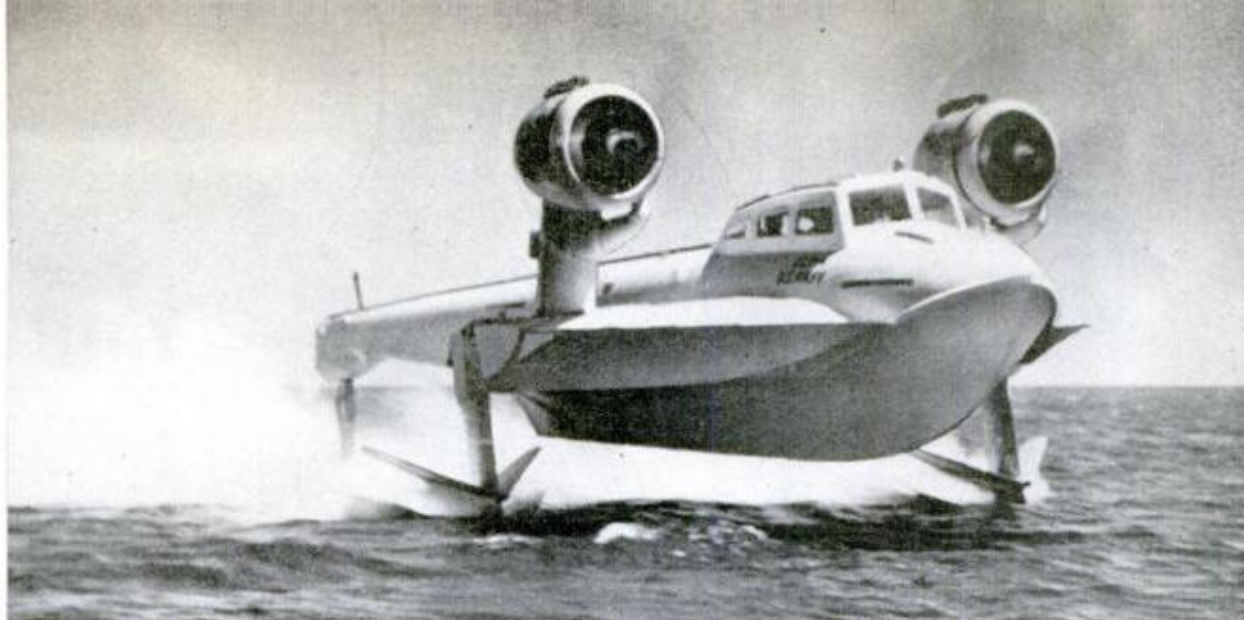
I asked what about hurricane-size waves—say 35 to 40 feet high. “Then the hydrofoil just sits on her hull,” said Carl, “and rides out the storm the way a traditional ship would do. But the hydrofoil is still better off because of her foils. They damp out about 80 percent of her rock and roll. A big break for seasick-prone passengers!”

“Suppose this hydrofoil, going full tilt, hits some floating obstacle?” I asked.

“We've run small hydrofoil test craft through all sorts of debris—branches, crates, coconuts, fish. . . . We found the foils either toss the stuff harmlessly aside or break it in pieces. If a hydrofoil hits a very large object—like, say, tree-trunk size—then a safety device comes into play. There are shearing points—rods of softer metal—where the struts join the hull. The rods break off at a predetermined stress and prevent any major injury to either the hull or the strut structure. Then the ship drops safely to the water like a seaplane landing.”

I learned that the hydrofoil craft would have a 20,000-horsepower gas-turbine engine, capable of driving the hydrofoil at least 50 percent faster than it could ever drive a traditional ship of the same size.

Along the seaboard, the hydrofoil should



**XCH-4, the Navy's 53-foot experimental hydrofoil, makes 90 miles an hour with two big aircraft engines. Built like a flying boat without wings, it is the fastest and steadiest of all known open-sea vehicles**

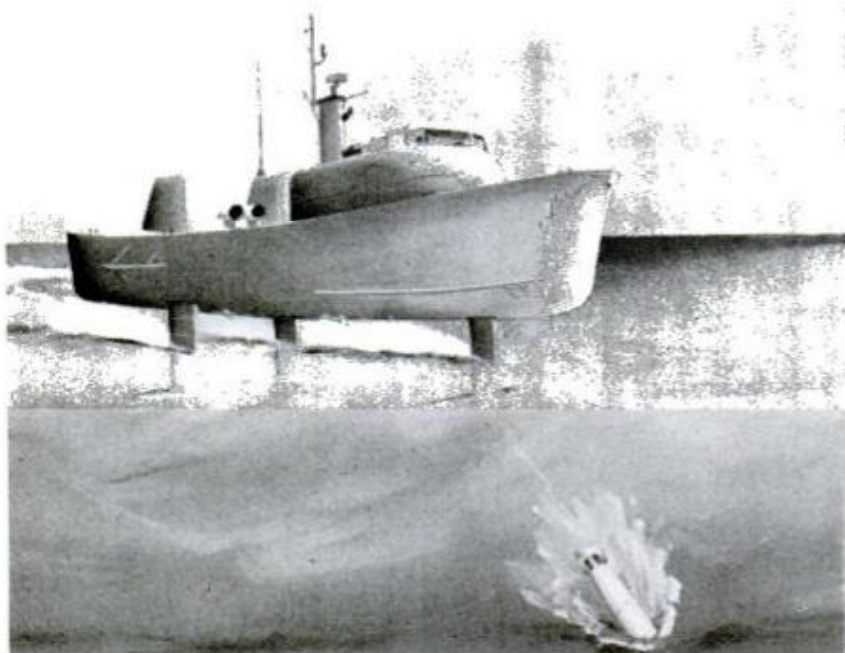


**Sea Wings, above, Grumman's 23-foot test boat for the Office of Naval Research, turns in 70 miles an hour. Italian Freccia del Sole, below, does 45 carrying 75 passengers across the Strait of Messina to Sicily**



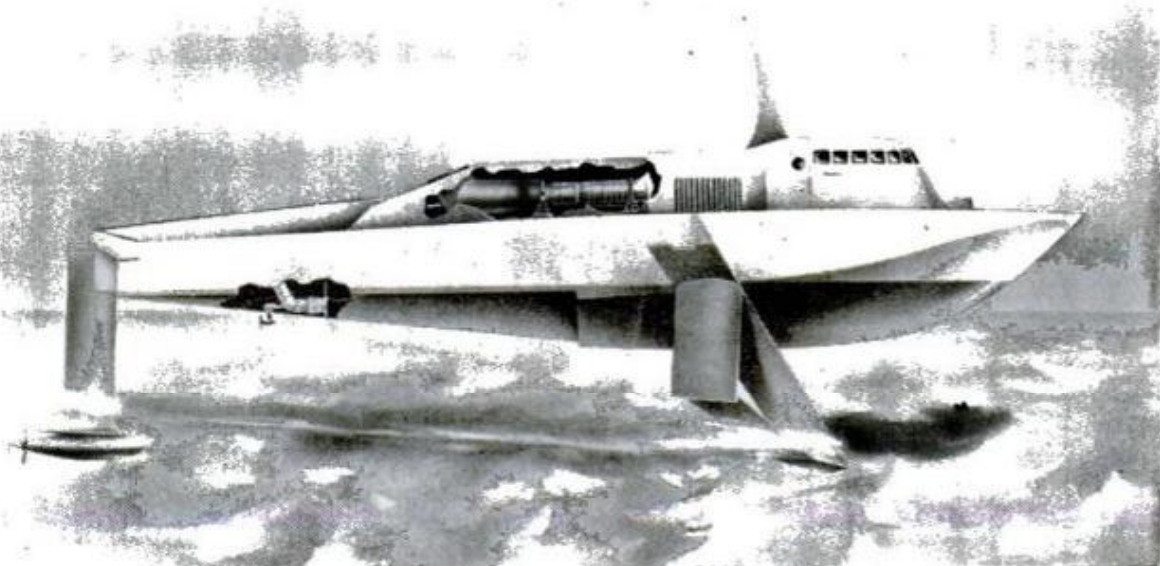


Grumman's 15-foot consumer model, on the market since '58, gives a skier good speed even with a moderate-sized outboard. Skiers like foils because there's very little wake behind the boat to give crossover trouble



First military hydrofoil design is Boeing's high-speed antisubmarine patrol craft. The 115-foot, 110-ton boat uses conventional diesel engines for low-speed operations, but rises onto foils and does 50 knots with two 3000-horsepower gas turbines for chasing down subs

Under development by Grumman for the Maritime Administration, this 90-ton ocean-going hydrofoil uses a 20,000-horsepower turboshaft engine (top cutaway) for speeds up to 80 knots, small engine for harbor speeds





star as a transporter of fruits and vegetables. The ship's fast transport could make refrigeration of cargo almost unnecessary. Another success role for this ship may be as a new kind of rapid-transit aid to sea-coast and inland waterway cities which are currently plagued with commuter problems. Take New York, for example, where the ancient, slow-moving New Jersey-to-Manhattan commuter ferries are going out of business one after another. Hydrofoil ferries, capable of making 10 times as many trips daily, could succeed them.

Hydrofoil experts believe that the craft will be crossing the Atlantic "sooner than you think." Picture, if you will, a transoceanic, gas-turbine-powered hydrofoil liner to carry 300 to 400 passengers, doing about 100 knots and riding on retractable stilts 20 feet above the sea. What would a crossing on such a ship be like? Your fare will be cheaper than on regular ships or planes, but your accommodations will be less luxurious. You'll have Pullman-type

(Continued to page 268)

Russian hydrofoil *Meteor* carries 150 passengers at 50 miles an hour on the Volga River. They expect to have 150 such boats in operation there by 1962



Hydrofoils on the Grumman runabout at left fold up out of the way for normal operation. Several manufacturers are producing attachable foils for any boat

Even sailboats can use the hydrofoil principle. The Navy's *Monitor*, built by the Baker Company, will do up to 30 miles an hour — faster than the wind



# Comparing the New



Ford's Econoline, left, is almost 10 inches taller than the Chevy Greenbrier, and from normal angle it appears to have greater road clearance, but the camera tells all: Both have seven inches clearance

**T**WO OF THE most intriguing vehicles to roll off Detroit assembly lines in many a year are Chevrolet's Greenbrier and Ford's Econoline Bus.

The first question you're likely to ask—and you're certainly entitled to ask—is “Just what are they?”

Well, like the world of *The Walrus and the Carpenter*, they're “full of a number of things.”

When their bench-type rear seats are bolted to the floor, they're roomy station wagons. Greenbrier seats nine on three full seats. Econoline's engine housing “breaks

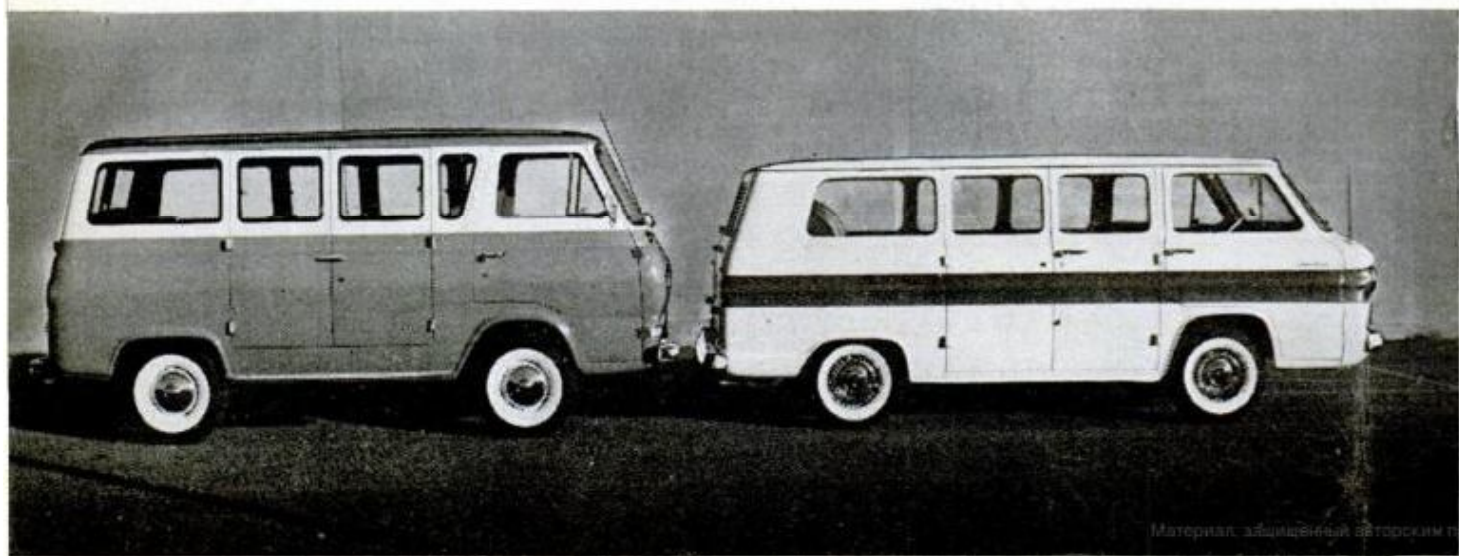
up” the front compartment into two single seats. As a result the wagon's total seating capacity is eight persons.

With their center and rear seats removed, both vehicles turn into useful cargo vans, with just about double the cubic capacity of a contemporary passenger-car station wagon.

To be specific, the Econoline has a capacity of 204 cubic feet, the Greenbrier, 175. In both cases counting of cubage begins immediately behind the front seat.

For lengthy objects, the Greenbrier stands ahead with 115 inches of load space

Here's a classic optical illusion. Greenbrier appears to be a couple of feet longer than the Econoline because it's lower and has full-length contrasting stripe. Actually, the Greenbrier is only 11 inches longer





# Camper Wagons

A  
PM  
ROAD  
TEST

By Jim Whipple



Getting out is a matter of leaping and entry a climb on either wagon. Practice makes the act graceful

between the back of the front seat and the closed rear doors. Econoline measures 84 inches along the same dimensions. Thus, if you were fitting bunks into the cars for camping, Greenbrier's extra length would be an advantage. For wide objects however, the Econoline has the edge, 65 inches to 61 in wall-to-wall measure across the interior of the bodies.

Both wagons have double side and rear doors, with the right-hand of each pair designed to open first independently of the left, or "anchor" door. Left-hand doors latch securely at top and bottom. For

Here are Chevy's Corvair Greenbrier sports wagon and Ford's Econoline station bus—two unique new vehicles. They combine advantages of both large passenger-car-type station wagons and small trucks and add some of the convenience and much of the operating economy of the compact passenger cars from which they are derived.

Photos by Don Honick



Econoline's engine box necessitates locating the second and third seats nearer to the rear of body

Rear-engine location on Greenbrier permits better placement of rear seats, both of which are easy to enter or leave, left. Forward seat can be reversed for use of table—a great setup for rained out picnics



safety's sake both wagons have their side doors on the right-hand or curb side of the body.

Greenbrier's engine-transmission and drive components are under a raised rear deck which is twice as high (26 inches) from the ground as the low floor in the mid-section (13 inches). This, plus the fact that Greenbrier is narrower, means that the height of the rear door opening is cut to 36 inches and width at the bottom is 44 inches.

The flat expanse of center load space in the Greenbrier—the area where, for example, you would load a large object such as a stove, washing machine or television console—extends about 55 inches from the forward edge of the engine box step up to the riser panel under the front seat. This corresponds to the Econoline's 84-inch total length of flat floor.

But the law of compensation catches up with the Econoline where its engine box intrudes into the load area.

### Econoline Carries More

To sum up the load capabilities of the two cars, Econoline will do better on carrying more large, bulky items, and offers greater convenience in that a large, heavy object may be loaded at a loading dock through the rear doors and unloaded just as easily through the side door.

In taking small items the Greenbrier does equally well except for the slight advantage in cubic capacity (25 cu. ft.) of the Econoline.

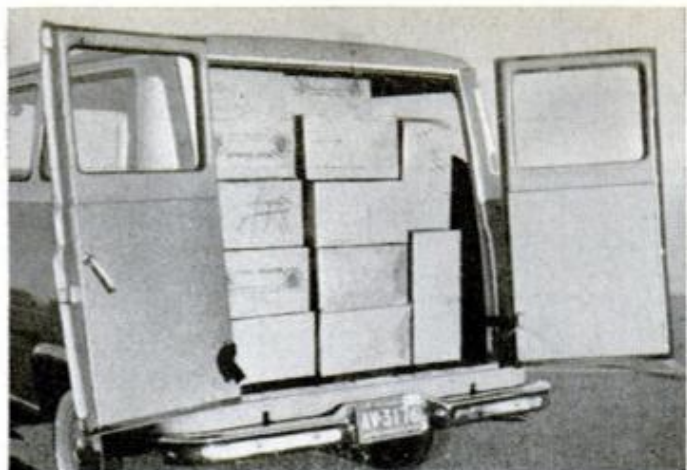
As a passenger carrier, the Greenbrier comes out on top with its low floor and more convenient center seats, either of which can be entered from side doors.

On the road the two wagons have different personalities. The Greenbrier, with its four-wheel independent suspension, gives a softer ride on rough surfaces. The fact that the Greenbrier is lower too, limits the sway in cornering to no more than you'd experience in a passenger car.

In spite of its "old fashioned" solid axles, the Econoline bus still gives a very acceptable ride on turnpikes and smooth-surfaced roads. It is a well-controlled ride so that it never pitches or "seesaws," but on poorly-graded bumpy blacktop it will jiggle and jounce the front seat passengers a good deal.

The feel of taking corners in the Econoline is a lot different than doing the same maneuver in the Greenbrier. In the Ford you sit higher and are much more aware of the greater roll. A curve that you take easily at 25 m.p.h. in the Greenbrier will bring you down to 15 m.p.h. when you're driving the Econoline.

(Text continued on page 270)



There's quite a difference in loading at the rear of the two wagons. Econoline, left has 4 by 4-foot opening, takes 12 boxes to fill. Greenbrier's rear door opening, right, measures 44 inches wide and 36 inches high. Interior at the rear will hold two stacks of just four boxes



Here's where the big difference in the design of the two wagons shows up. Econoline's floor is higher (25 inches) off the ground, as it must be to clear drive shaft and rear axle, at left. Rear engine design of Greenbrier, at right, permits a lower (13 inches) floor, but makes the 13-inch step-up over the engine a necessary handicap. Greenbrier's lower body brings an added plus in greater passenger comfort due to less noticeable lean or sway



Carburetor and ignition of Econoline are easy to service from driver's seat, left, when insulated top of engine housing is raised. Heat and noise are effectively blocked out by one-inch glass fiber liner. Greenbrier's engine is easy to reach for everything short of a valve job, by unbolting floor panel. For routine oil-level checks, small door opens easily in seconds



# AN EYE ON SPACE

By **Dr. Dan Q. Posin**

PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY  
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM

U-2 FLIGHTS, with their quaint photographs of various inaccessible regions of Earth, may have come to an end, but something much better is in the offing. The National Aeronautics and Space Administration is planning to launch a 3000-pound orbiting astronomical observatory. Of course, this one is an *astronomical* satellite, and points up NASA's interest in peaceful scientific projects. At the same time, if Earthlings want to make clear photos from on high, they can do it with telescopes adapted to cameras. Scanning devices can televise the pictures down to Earth.

Part of this project has already been in operation for a considerable time. Didn't the Russians make photos of the Moon's *derriere* (back side) and televise them to their stations on Earth? And hasn't the U.S. been collecting thousands of pictures of Earth regions—clouds, lands, waters—which are televised by the Tiros family of Earth satellites?

What we need for very sharp and detailed Earth study from satellites are principally these components: near-perfect stabilization and orientation systems, medium-power telescopes associated with cameras, and televising systems. All these are at hand.

Let's look a moment at the space observatory plan. It is to be more than just a visual system. Several kinds of cosmic phenomena are to be investigated, such as X rays from space, ultraviolet light, and infrared rays. All these normally do not penetrate down to Earth in their full glory because the Earth's atmosphere absorbs most of the energy. But, in a satellite, coursing high above the atmosphere, the instruments can enjoy themselves all out, with no atmospheric interference.

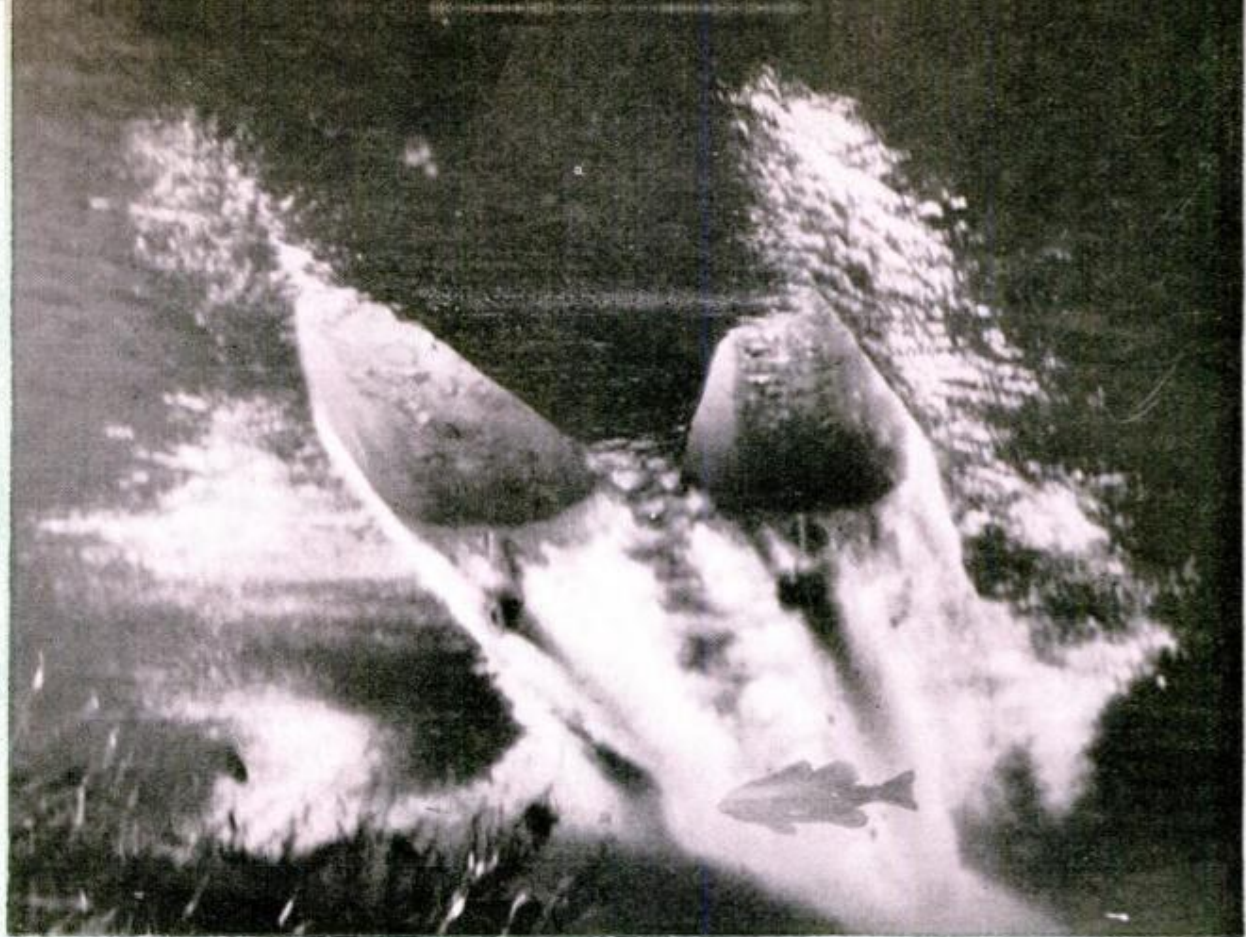
The space observatory is expected to be an eight-sided satellite, 9.5 feet high, 6.5 feet in diameter, weighing 3200 pounds, including 1000 pounds of experimental equipment. It will be a standardized shell containing, among other items, stabilization systems, and power and telemetry instruments. The astronomical equipment is to use reflecting mirrors up to 36 inches in diameter, as well as a number of telescopes. This equipment will be mounted in a cylindrical chamber running through the satellite. We might add that the cost of the device—or shall we forget it?—is \$23,000,000 in round numbers.

The first of these observatories should be launched in late 1963. The launching site will likely be the Atlantic Missile Range, and the observatory would go into a circular orbit 500 miles above Earth. The observatory's stabilizing system will "lock" its astronomical equipment on a star or the Sun, or some planet. This locking mechanism will make it possible to track a star with an accuracy of a second of arc, which is equivalent to latching onto a basketball 500 miles away.

A TV tube will transmit pictures to Earth stations, and the telemetry system will send down information from the various experiments. If the satellite does not feel like sending its information down right away, it can store at least 100,000 bits of data, until it feels better.

On the outside, there will be paddles covered with solar cells to generate 350 watts of power to operate the experiments and sundry equipment.

Besides X-ray studies and the others mentioned, the observatory will study the radiation of hydrogen gas in space, the ultraviolet light from new stars in order to learn something of their birth and early life. Much will be learned from these space observatories about the majestic universe. ★ ★ ★



Photographed for PM at Florida's Silver Springs by Bruce Mozart

# **COMING YOUR WAY**

## **NEXT MONTH IN** **POPULAR MECHANICS**

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**IN THE MARCH ISSUE OF**  
**ON YOUR NEWSSTAND FEBRUARY 28**

**POPULAR  
MECHANICS**



**COMPONENTS** of the sealed battery are the welded steel case, nickel-oxide (dark) plates, cadmium (light) plates, special-alloy cover with terminal studs and separator of synthetic fabric. Dr. Robert Shair (right) shows how the separator weaves between plates

# Is This the 10-YEAR

**A sealed cell which will last 10 years in outer space may be the forerunner of the long-life auto battery**

*By John Linkletter*

**A** RECHARGEABLE BATTERY that lasts longer than a present-day car—and completely without maintenance!

Such a battery is already in existence as a power source for space-vehicle instruments. The technology behind it promises to produce a long-lived, maintenance-free auto battery. Right now, the latter is only a matter of economics.

When costs make it practical to place the battery in autos, it can be expected to last well over 10 years—even 15 or 20, predicts the manufacturer.

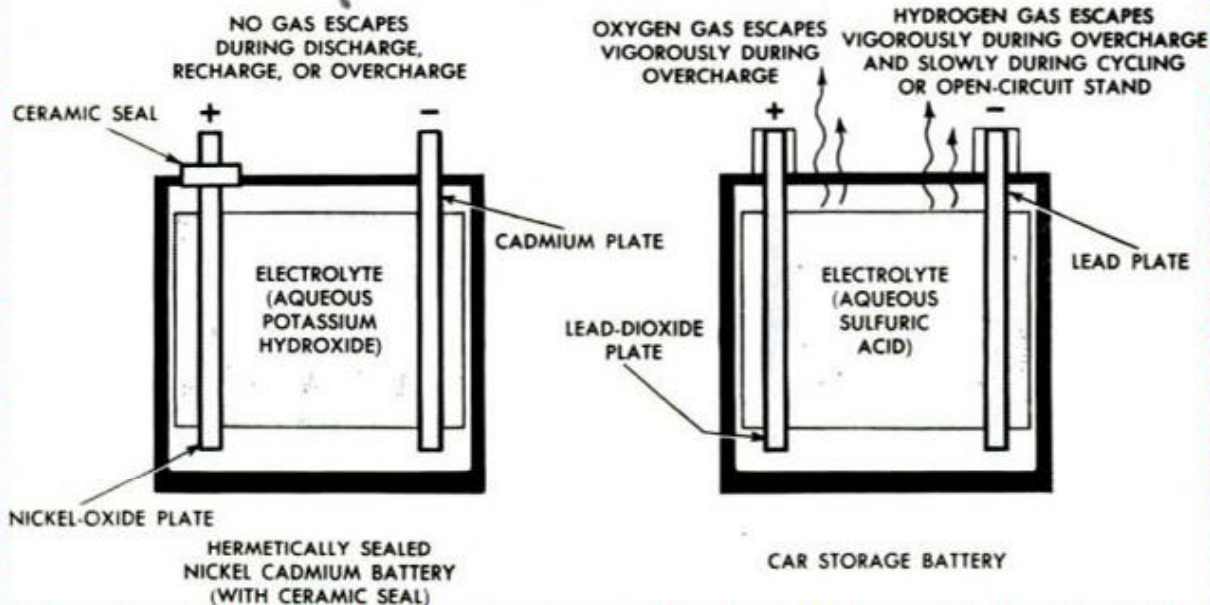
Developed by the Alkaline Battery Division of Gulton Industries, Metuchen, N. J.,

the nickel-cadmium ceramic-seal battery is basically the same as that in Gulton's rechargeable flashlight, explains Bernard Mayer, general manager of the division.

Nickel-cadmium batteries are not exclusive with Gulton. But the refinements which Gulton has added—a notable one being a ceramic seal that allows the battery to be hermetically sealed—make the newest cell ideal for space use. The same developments increase its value in such other applications as communications and cars.

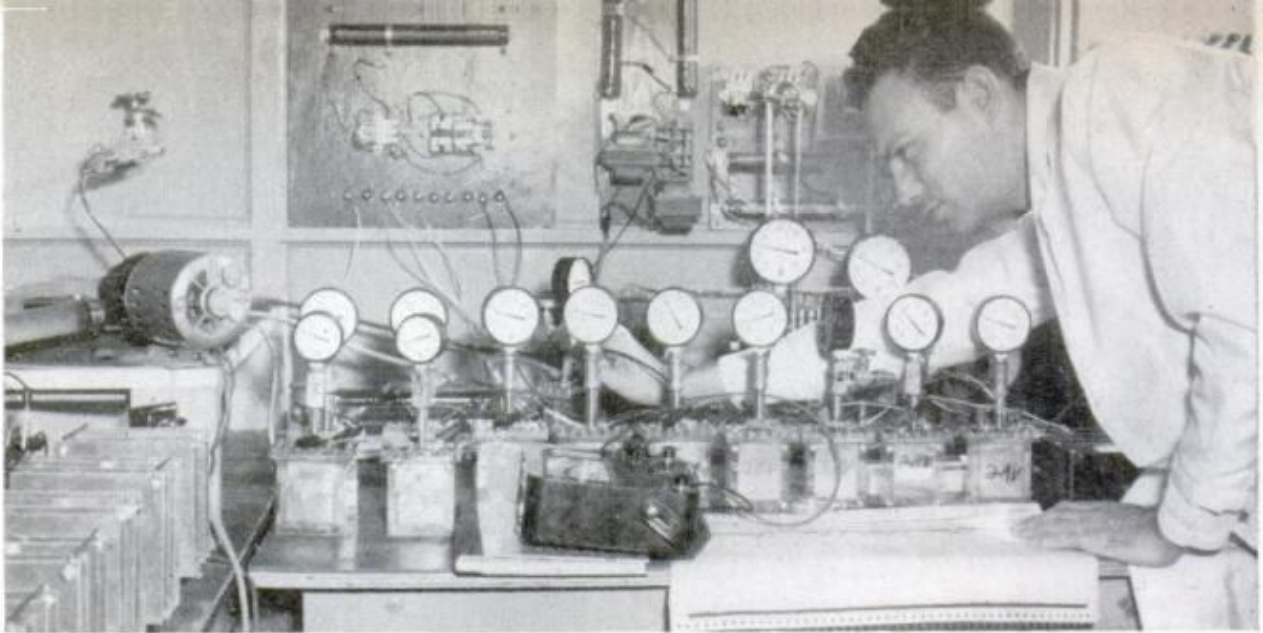
"There are three basic reasons for designing this battery," points out Dr. Robert Shair, youthful director of research of the

## HOW IT DIFFERS FROM TODAY'S STORAGE BATTERY



# BATTERY?





**INTERNAL PRESSURE** of sealed batteries is checked on instrument dials by Norman Scheckner, junior engineer

Alkaline Battery Division. "First is the need for a battery that will operate in the environment of outer space. This one will last 10 years out there. Second, it's needed as a source of battery power in remote parts of the earth where regular maintenance is impossible. And third, there exists a need in many fields for a foolproof battery."

And a foolproof battery it appears to be. Nothing need be added to it during its lifetime. The only gas generated inside, oxygen, does not build up high pressures; rather, it is recombined and reused. The present sealed cell allows recharging by electrical current for five hours; after that it *wastes* incoming energy so that the battery does not suffer damage while being overcharged. No auxiliary equipment to prevent damage by overcharge is needed.

"The most significant new feature of this battery is the ceramic-to-metal seal which makes it a truly hermetically sealed container," says Dr. Shair. "There is no other rechargeable battery system today which has been proven hermetically sealed."

(Actually, he explains, only these five rechargeable systems are commonly used: 1.) lead-acid, 2.) nickel-iron, 3.) nickel cadmium, 4.) silver-zinc, and 5.) silver cadmium. Because of gases, only the nickel-cadmium cells—and possibly the silver-cadmium cells—can be sealed.)

Why seal the battery?

In outer space, it's imperative. In the virtual vacuum of that environment, a slight leak in the case causes internal pressure to force electrolyte out — eventually causing failure.

The second significant development of the Gulton cell is a "mechanism" that controls battery pressure. Dr. Shair explains it as the method that keeps gases from being given off as waste during battery cycles; it reassimilates gases into cell components.

A third major feature of the battery, according to Dr. Shair, is the material used in the separator — and he isn't revealing that secret. The separator is a synthetic, nonwoven sheetlike material that winds over the plates to keep positive and negative from touching. The new material, which allows the free transfer of oxygen between plates, is unusually long lasting.

The new ceramic-seal battery is about the size of a pack of cigarettes. It has a five-ampere-hour capacity and produces 1.25 volts. It is capable of being continuously overcharged at one ampere.

"No battery heretofore available could withstand this high an overcharge," points out Dr. Shair.

At room temperature, the pressure build-up as a result of overcharge is 40 pounds per square inch. This is actually a low pressure, since "standard" under these conditions is about 200 pounds per square inch.

The low pressure is an obvious advantage in space. It's also advantageous in consumer applications because it minimizes the danger of violent eruption, and, since stresses are less, allows longer life for the battery.

Gulton is beginning to build a similar cell with a 20-ampere-hour capacity, and the firm has plans for 10 and 40-ampere-hour cells. The firm *has built* nickel-cadmium batteries up to 200-ampere-hour size, though these are not the hermetically sealed type.

Active in developing the sealed cell—along with engineers and scientists of the research department — was Dr. Leslie K. Gulton, president, whose background of chemistry and ceramics closely parallels the technology of the battery.

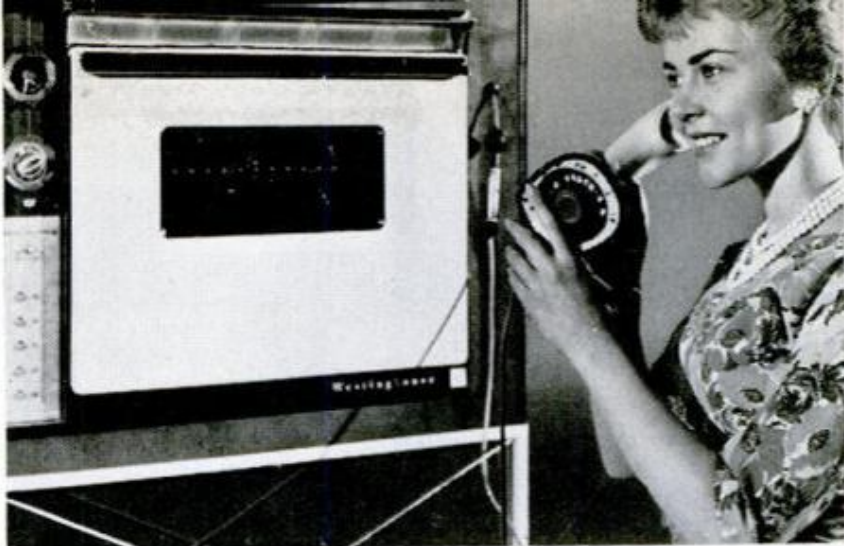
The ceramic seal used on the battery was designed and developed by the Gulton firm, and it's manufactured by the company's

(Continued to page 237)



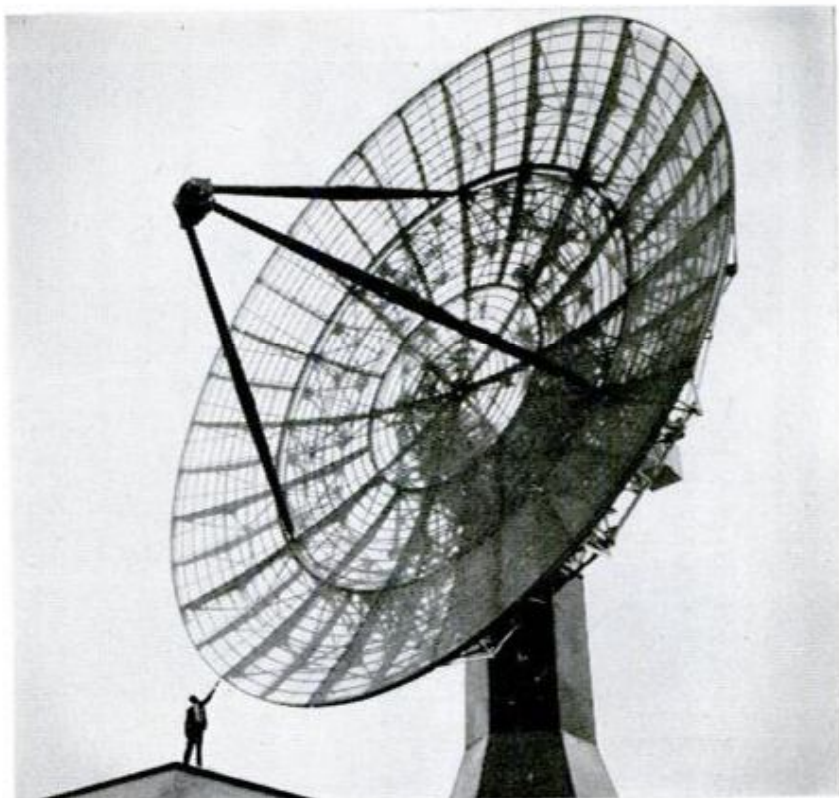
## Long-Distance Oven

Gone will be the day when a housewife on vacation will have to worry about whether she turned off her oven before leaving. She can turn it off—or on—from any dial telephone in the country. She dials her home number, and, by a special relay system, the oven, the lights, the air conditioner, the refrigerator or anything electrical can be controlled.



## Eye on the Sky

Under construction at Cornell Aeronautical Laboratory, Buffalo, N.Y., is the 60-foot antenna of the world's most powerful microwave radar apparatus. When the experimental 50-million-watt installation begins operation this fall, scientists will study the ability of "high-peak power" radar to penetrate the earth's ionosphere. This, it is hoped, will make it possible to track ballistic missiles and satellites with greater accuracy and at considerably longer range than has been possible so far. CAL is conducting its research program as part of a broad Defense Department program.



## Army "Eye Armor"

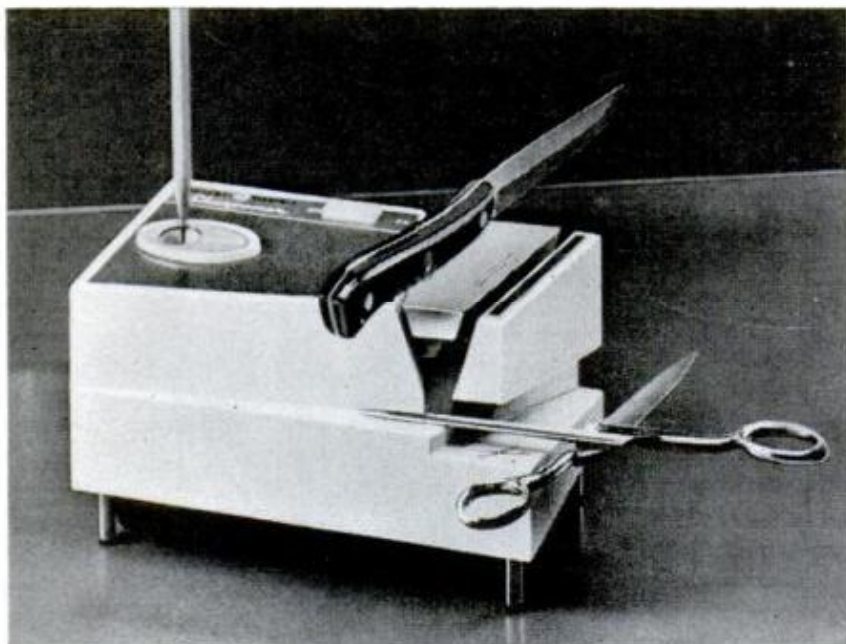
Latest development in the field of personal protection for troops is the Army's "eye armor," being tested at the Combat Experimentation Center at Fort Ord, Calif. The goggles not only provide good protection from shell fragments and flying debris, but also are "phototropic"—the lens will turn opaque within microseconds if exposed to the flash of a nuclear explosion, thus shutting out the blinding fireball to prevent eye damage.





## Stern-Wheeler

Fast vanishing from the Mississippi, the stern-wheeler is making a comeback on Florida's Braden River, where Jimmy Tench of Bradenton churns his way in and out of shallow-water bass-fishing spots in *Pogo*, his own three-horsepower model. Built around a lawn mower engine at a cost of about \$50, *Pogo* turns up a respectable nine miles an hour, in only three inches of water.



## Keeps 'Em Sharp

One self-contained unit sharpens knives, scissors and pencils. Standard-size household knives can be sharpened to a flat-ground edge, and any standard-size household scissors can be honed to a hollow-ground edge. Magnetic knife guides help hold knives in correct sharpening position, and a shelf on the case guides scissors blades for correct sharpening angle. The pencil-sharpening disk will sharpen any standard-size pencil automatically, and is easily cleaned.



## Auto Headrest

Only a few makes of cars feature built-in headrests, though they're a mighty comfortable addition. One new adjustable model fits any make or model and provides a good head support for resting or sleeping, plus a safety factor in reducing the chances for a "whiplash" neck injury. Called a "Nab-a-Nap," the headrest adjusts to any type of seat, then to any angle or height of support. The zippered corduroy cover comes in six colors and comes off for easy cleaning. The rest will fit on most furniture, too, for reading, TV, or snoozing.



Tourists trundle around the 4900-acre field in rubber-tired train to gaze at jets, exciting architecture

# IDLEWILD: Jet Capital of the World

By James Biery





Covered bridge called Jetway is extended from the United Air Lines terminal to jet's door in less than a minute. It is driven by a passenger agent in outboard cab section, and can be raised or lowered



Arrival information board is remotely controlled. It can quickly display news about 94 flights of 25 airlines

**N**EW YORK INTERNATIONAL Airport, better known as Idlewild, is built for speed. This jet-age dream field won't be completed until 1963, but the color-splashed architecture already installed on Jamaica Bay, 15 miles from midtown Manhattan, forms a breath-catching reality that hums with the excitement of fast-as-sound flight.

Idlewild has been so planned—and equipped with time-saving electronic and mechanical devices—that the seven million travelers who used the field in 1959, its 10th full year of operation, had to make only quick pauses before speeding on their way.

A departing passenger, for example, can check in at an airline terminal—there are a couple of dozen!—and be aboard his plane in less than two minutes. A passenger arriving from overseas can pass through U. S. Health Immigration-Naturalization and Customs inspections and be headed for home 20 minutes after his plane rolls to a stop at the cavernous International Arrivals Building. For, like the jet planes it serves, Idlewild helps get people where they are going in a hurry, with comfort and in style.

The 4900-acre field is nine times larger than La Guardia Airport, chief New York



Fitting flush against plane's door, Jetway gives the passengers protection from vagaries of the weather

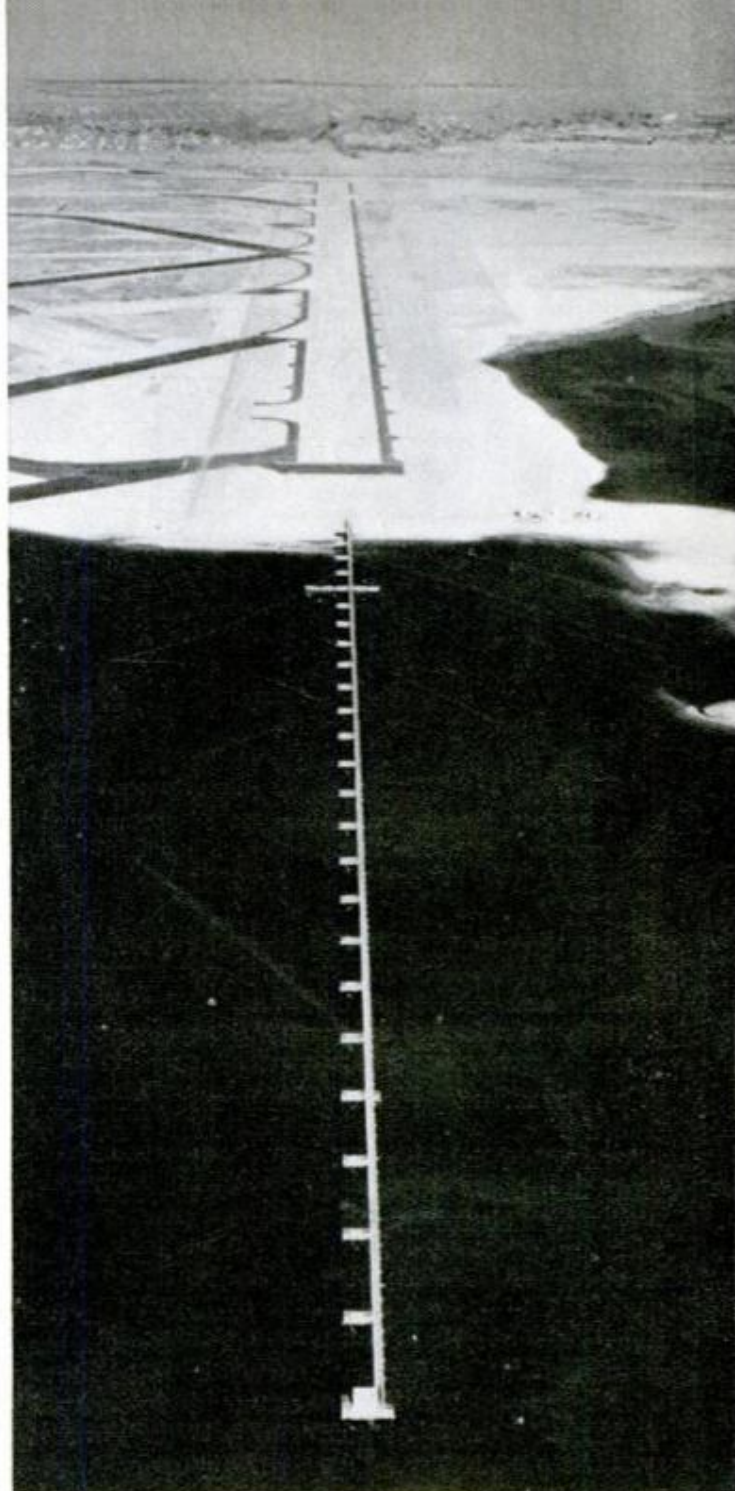


Operator on ninth floor of tower monitors the arrival board via closed-circuit television, and posts times

landing strip of the propeller era, and takes its popular name from Idlewild Golf Course, the marshy tidelands it took over in 1942. Eighteen years in building, Idlewild so far represents an investment of some \$325,000,000 by the city of New York and the New York Port Authority. Much of this money has gone to provide a variety of airline terminals instead of a bottleneck of only one. This was necessary because, by 1965, 12 million passengers will pass through each year. A single terminal capable of handling such a throng would be a nightmarish two miles long.

Idlewild's planners—it is operated by the

FEBRUARY 1961



Approach light lane, 3000 feet long, leads from a pier directly to the end and center of a new runway

Port Authority, which also manages La Guardia and Newark airports—thought big and created a field that looks like a huge wheel. Runways form the rim; the spokes are fast-exit taxiways; the hub is a 655-acre, landscaped area called, for obvious reasons, Terminal City.

The "City" is a glittering, \$150,000,000 showplace for modern architecture, art and scientific wizardry. Besides terminals, it holds the International Arrivals Building, check-in point for passengers arriving from abroad; an 11-story control tower packed with electronic gear; an operations building; a \$7,000,000 central air-conditioning

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Customs inspection is handled on a "supermarket" basis. Arriving travelers roll their luggage to 72 check-out counters in shopping carts. Visitors may watch inspection through a glass wall running along second floor

and heating plant; a temporary terminal building; a 220-acre park, with a lagoon and sparkling fountain, that will be the site of chapels for Catholic, Protestant and Jewish faiths; seven and a half miles of taxiways; and five automated parking lots with space for 6000 automobiles.

Nearby is the first airport-based hotel and the first airport-based animal shelter in the U. S.; a bank offering drive-in service; a food-production center for preparation of in-flight meals; and an airport mail facility which in 1959, its first year in operation, handled 63 million pounds of airmail. Most of the 23,000 airport employees work in the "City." As in other bustling towns, there's good and frequent bus services over the 10 miles of two-way roads which link the shopping-center-size buildings.

Dominating Terminal City is the control tower which is connected by a broad ramp to the three-story International Arrivals Building. To the east and west extend wing buildings which contain terminals of 20 of the 22 foreign-flag carriers. The three structures together have an 11-block-long frontage. The IAB holds shops, airline service counters and, among its restaurants, the Golden Door, a gourmet establishment which prints its menu in six languages.

All passengers arriving from abroad go through inspection setups which are lo-

cated in first-floor arcades, or fingers. Customs can process 1200 incomers an hour, using a "supermarket" system. Passengers first make token stops at the quarantine area and at the immigration office for passport inspection and clearance of aliens. By the time they reach customs, their baggage has been stowed in bins. Using supermarket carts, they wheel luggage to 72 stainless-steel check-in conveyor desks. Inspectors in the two-story room move baggage along the conveyor by pressing a button; once inspected, it is carried to the end for transport by passenger or Skycap. Time consumed: about 10 minutes.

Visitors may watch this procedure through a glass wall in the second-floor lounge. They also may watch the flashing letters and numbers of the world's first electronically operated, remotely controlled arrival information board, which displays information on 94 flights of 25 airlines. An operator in the control tower, monitoring the board via a closed-circuit television system, posts a full line of information within eight seconds of receipt from an airline. Since Idlewild runs around the clock, there's always fresh information; planes from Western Europe come in from about 6 a.m. to 3 p.m., then traffic from South America, and, still later, planes from the East.



**Here is view from control tower, facing into heart of Terminal City, 655-acre service center of the field. Past the lighted fountain is a \$7,000,000 heating and air-conditioning plant. It displays colorful pipes**

**View from the tower, facing the runway and taxiway system. The five long runways stretch as far as 14,600 feet. One runway, lit with flush-set fixtures, has taxiway exits taking planes from runway at 60 knots**



FEBRUARY 1961

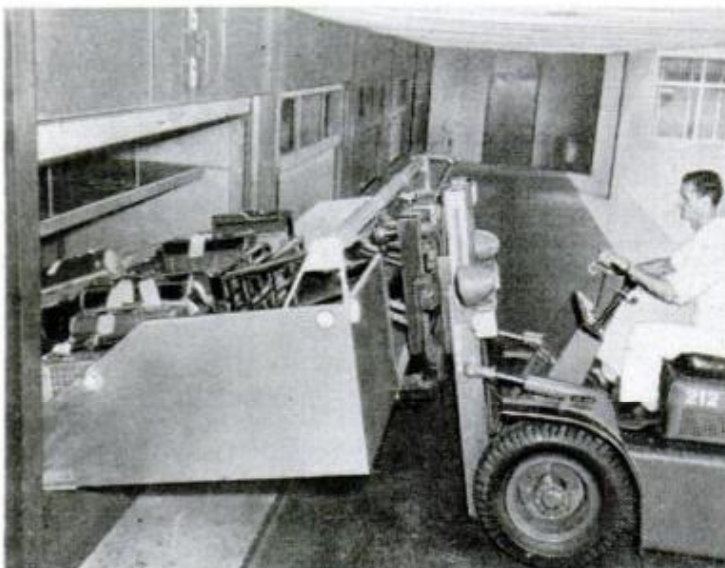
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Catholic chapel, above, and view of control tower, below, show the pleasant sweep of the field's award-winning architecture



Luggage is sped from arriving Pan American planes in mechanical baggage bins and set down for claiming by travelers



Outbound travelers may leave Idlewild from unit terminals of foreign-flag carriers. These are in the wing buildings of the IAB and are equipped with speed-up devices and aids to comfort. But it is in the terminals built for large American carriers that speed, functional architecture and art combine to give jet-age zest to travel. Accessible from the road circling International Park, terminals in business include those of Pan American World Airways, Eastern, American and United Airlines, which also houses the Delta Airlines terminal. All have opened since September, 1959. Trans World Airlines' terminal is under construction; work has begun on one for Northwest Airlines and, eventually, the Temporary Terminal Building, thrown up so the field could open in 1948, will be replaced by a modern terminal housing smaller carriers.

#### Four Terminals

A look at four now open gives some idea of what's been done to keep travelers moving at the pace of jet transportation. All are three stories tall, and have air-conditioning, fine restaurants, lounges and systems of fast check-in for both passengers and baggage.

To the right of Terminal City's entrance is the granite-trimmed, concrete, steel and glass terminal of Eastern Airlines, largest in the U. S. operated by a single airline. Capacity is about 2,300,000 passengers a year; eventually it will handle six million a year. Its marble-columned main lobby has more uninterrupted floor space than the concourse of New York's Grand Central Railroad Terminal. Fan-shaped, it has two loading arcades leading to the runway area and is laid out on a functional "down-hill flow" principle: Passengers walk downhill to board planes and walk downhill when leaving them to pick up luggage. Eastern's seven, sealed-down versions of the IAB flight board show departure times as well. At the gate leading to the aircraft there is a pneumatic tube outlet through which messages may be whisked to agents.

To the right is the terminal of Pan American World Airways. Its four-acre umbrella roof of

(Continued to page 240)

POPULAR MECHANICS



## Big Glass Band Plays Transparent Notes

Playing probably the most delicate instruments in the world, an intrepid group of Danish musicians gives concerts on glass horns. False notes are relatively rare, since the musicians are good and the unusual instruments are true, but false moves are unknown because the first one would be disastrous. If one of the horns were dropped and broken, it could never be replaced. The horns were made in 1934 by a Danish glass blower who never told anyone how he did it, and he took his secret to his grave. His name was Hugo Moller and he worked at the Kastrop Glassworks in Copenhagen. He made 10 of them in all—cornets, trombones and tubas—and when they were finished he recruited 10 of his fellow workers to give a concert on the occasion of the annual Children's Aid Day in Copenhagen. Later a musical conductor, Kaj Olsen, and some of the musicians bought the instruments from the glassworks, paying only the value of the glass. The instruments are still intact today and are played regularly but only at concerts for charity. When not in use, they are packed carefully in specially padded wooden boxes. The instruments are not insured, because it is impossible to place a value on them. They are unique and priceless. One of them, a tuba, is a masterpiece, consisting of 21 feet of continuous tubing.

## Flameproof Rubber Puts Out Fire

If flames lick at objects made of a new nitroso rubber, the rubber not only will refuse to burn, but will give off a gas which tends to extinguish the fire. Dr. J. C. Monteroso of the U. S. Quartermaster Research and Engineering Command, Natick, Mass., where the new rubber was developed, said it also can take extremes of cold and heat. It remains flexible, for example, at minus 40 degrees F., is resistant to solvents and many strong chemicals and does not deteriorate in sunlight. Dr. Monteroso said it will also give some protection, if used to coat clothing, against the heat of nuclear blasts.





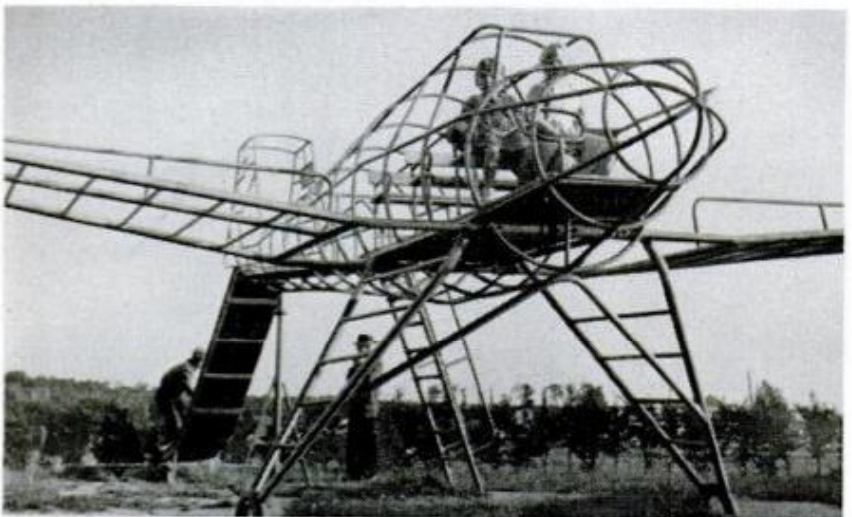
### 'Bitsa' Goes Anywhere

Bits of this and that were combined to make "Bitsa," a hybrid vehicle that'll go just about anywhere. With four-wheel drive and a flexible swivel "backbone," it can negotiate rough terrain; add tire chains and it will go through marshland. The vehicle was built by Leonard Kaminski and his son, LeRoy, Oconto Falls, Wis. Parts are from trucks, cars, even a manure spreader.



### Electronic Timepiece

Power cell for Accutron, Bulova Watch Company's new electronic timepiece, is a 1.3-volt mercury cell (shown on finger) which can be replaced merely by unscrewing cap on the back of the case. Recessed handle for setting the hands is also on back of the case. Heart of the timekeeper is an electromagnetic tuning fork, powered by a transistorized electronic circuit, which replaces the balance wheel and hairspring of the conventional watch. An index wheel transposes the fork's 360-cycle-per-second vibrations to rotary motion to drive the hands. The maker guarantees accuracy within one minute per month.



### Playground Airplane

Children at the Rhein-Main air base in Frankfurt, West Germany, emulate their high-flying fathers by taking over the controls of a playground airplane fashioned from tubular steel. The plane has seats for pilot and co-pilot and simulated controls. When the flying game lags, there is a slide, at the rear of the plane, for more conventional playground fun.



# ***Oil Hunt in the Arctic***

**By Harry Rowed**

**E**SKIMOS AND INDIANS of Canada's northland have learned to view with complacency the white man's activities in the Arctic. These long-time residents of barrens and forests have seen river-barge traffic and the airplane "open up" their tremendous country. They have watched and participated in development of natural resources. Native men have proved themselves competent mechanics and carpenters during construction booms along the DEW Line and at northern centers like the new

town of Inuvik. Some wives are as familiar with refrigerators, electric washers and propane cooking as they are with their seal-oil lamps.

But many northern eyebrows were raised last summer when Canada's "Little Navy," a flotilla of wartime landing craft and revamped mission cruisers, pushed steadily upstream along the Mackenzie River. In its wake, violent depth-charge explosions spewed water high in the air and set up multiple echoes between the ramparted



banks. Between blasts, melodic strains of hi-fi music reached the ears of the mildly perplexed natives.

Farther north, along the Arctic coast and only a few miles from the permanent ice pack, a helicopter carried on a hop, skip and jump routine in the treeless barrenlands. For 16 of the North's 24 hours of summer daylight, its pilots shuttled teams of skilled technicians over the lake-strewn tundra. Elsewhere in the Arctic and sub-Arctic, even in the vast archipelago of the off-coast islands, geologists were flown to isolated regions, experimental vehicles fought through muskeg, and powerful diesel tugs herded great barges of equipment and fuel down the Mackenzie.

This was the Arctic, 1960. This had become the springboard year for oil companies jumping into major exploration programs. Millions of acres are now under lease to United States and Canadian companies. On June 24 about 40 million acres of the Arctic islands alone were taken out under permit from the Canadian government. Salt domes similar to those which are flanked by substantial oil reserves off

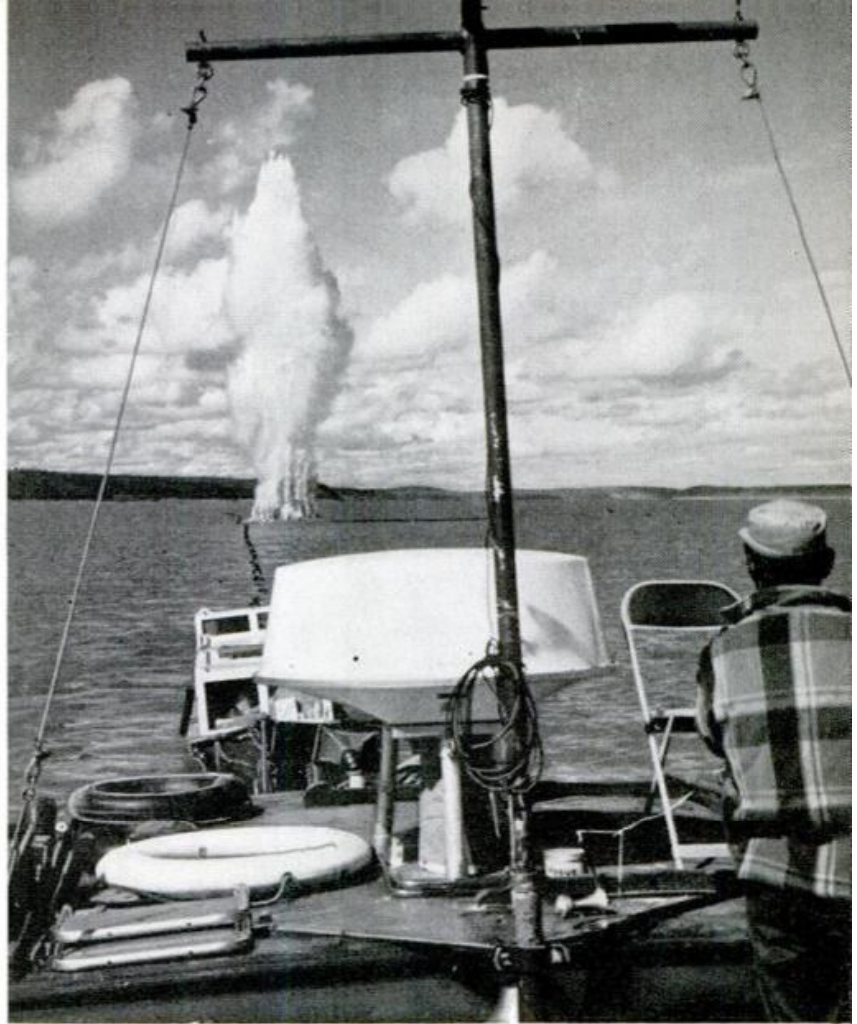
the coasts of Louisiana and Texas have been detected in these Arctic islands.

Oil exploration in the Arctic isn't an overnight development. Imperial Oil's field at Norman Wells has been a producer for more than 30 years. The Canol line tied into its production during World War II. During the 50s, after oil and gas discoveries changed the economic complexion of the western prairies, petroleum interests began to probe the potential of the mineral-laden northland.

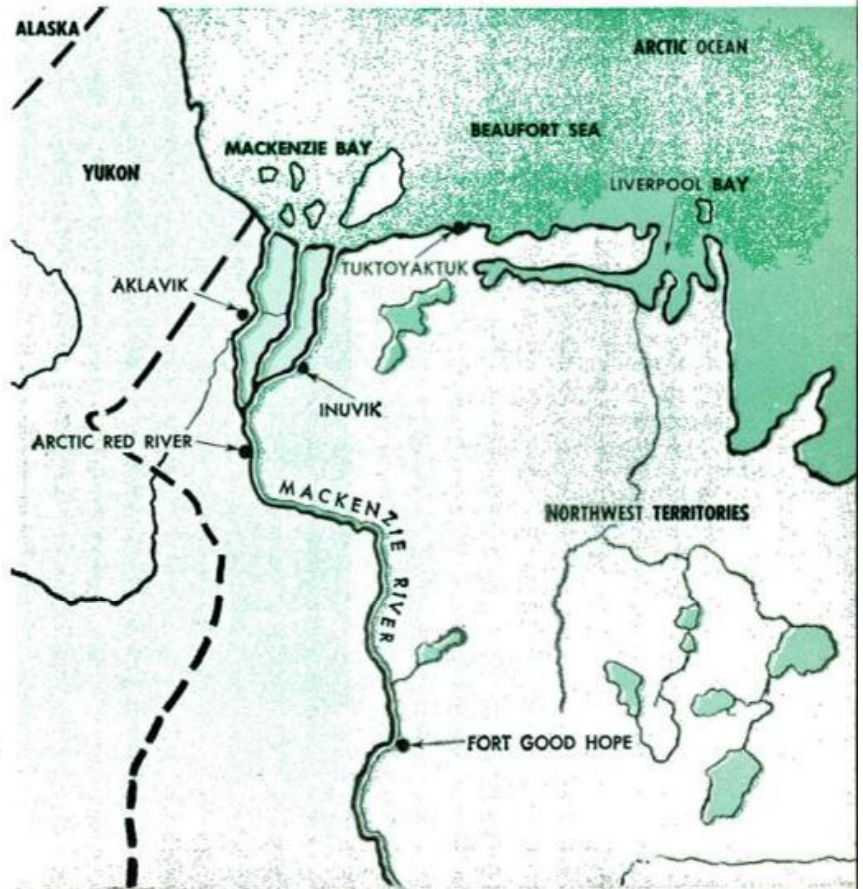
And relentless exploration during the next decade is forecast by Gordon Robertson, commissioner of the Northwest Territories and deputy minister for Canada's Department of Northern Affairs. He points to the fact that the Arctic islands are closer to the United Kingdom than oil-producing areas of the unstable Middle East. Possibility is foreseen of a suboceanic pipeline. Harry Carlyle, chief geophysicist for British American Oil Company's exploration department, stresses that any worthwhile oil discovery in the Arctic must be of major proportions, sufficient to warrant the formidable expense necessary to transport

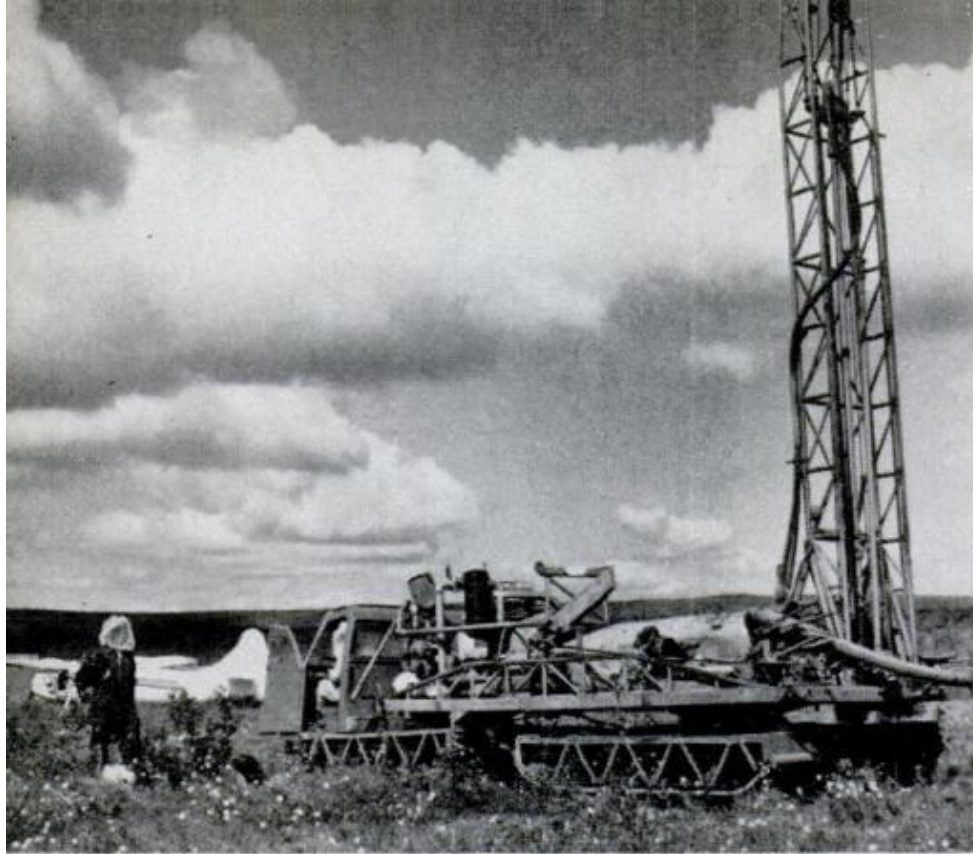
← Tent camps were both mobile and self-sufficient. They were served by bush planes, which also moved them about

Shot points for seismic soundings were spaced 700 feet behind boat. With motors idling, readings were taken immediately →



Chief explorations were made along Mackenzie River and Arctic coast, areas inhabited chiefly by Eskimos and Indians





← Special drill was shipped to oil party to test it in permafrost, ice layer which often is only a few inches below surface of ground in Arctic area

"Tex" Watson releases → charge tied to balloon, which suspends it at a precise level

Geologist Bob McKee (far right) dons skin-diving gear to check a foul-up below water line →

products to market. Airline distance from his company's Calgary headquarters to present exploration activity is more than 1500 miles.

Oil exploration anywhere in the world follows a generally uniform pattern. First in the field are the geologists, seeking surface clues to the nature of the rock layers beneath, and trying to establish whether trapped oil might be contained. Airborne magnetometer survey sometimes follows the geologists, as slight variations in the earth's magnetism may yield further infor-

mation about subsurface structures. The pull of gravity, recorded on an expensive and delicate gravity meter, reveals high and low spots in geological formations. In Canada, the surveys of the geologists, the magnetometer and the gravity meter are generally supported by seismic exploration, the technique of measuring waves of energy from the earth and mapping the outline of underground layers where oil may be trapped. Last of all comes the "wildcat" rig which may drill thousands of feet below the surface to search out the oil and gas.

Canadian Indian, Vital Bonnetrouge, river pilot for many years on Mackenzie, was chief pilot for oil hunters' boats

Vagn Madsen, who headed expedition, checks rubber boot which waterproofs a geophone





The Arctic is running the complete gamut, with some exclusive difficulties and unknowns. Ground transport and drillers must contend with the permafrost, the ice layer which often is only a few inches below the surface of the ground. The Arctic's workable summer season is extremely short, three to four months. Communications can hardly be termed dependable, so great are the distances involved. Despite the adequate protection of nets and new chemical preparations, the vicious northland mosquitoes constitute a real nuisance value. Still rampant beyond the Arctic Circle are the GIs' stories of mosquitoes

which touched down at wartime airfields, only to be pumped full of high octane fuel before ground crews realized the mistaken identity of the "aircraft."

It's a brief summer but during these months the days are literally without end. This can lead to amusing complications. British American's gravity-meter party, which spent the 1960 summer barrens-hopping by helicopter near Tuktoyaktuk, worked out a time schedule especially designed for its own operations during the period when the sun never dipped below the horizon. Once, when an aircraft dropped in with projector and films, an in-

Helicopters played vital role in surveys, transporting crews to and from sites, stopping only to refuel





Chief geophysicist, Henry Carlyle, sets up seismic instruments in tundra. Note protective mosquito net



Polaroid camera, mounted on radar set, gives immediate picture at time of shot. Below, firing of shots was controlled from cabin of river boat



visitation to attend shows at 8 p.m. went out to friendly Eskimo neighbors. When no Eskimos showed the party members finally viewed the films and rolled into eider-downs. At midnight the Eskimos arrived, promptly on the stroke of eight by *their* time.

Cost of transportation in an isolated area also was amusingly demonstrated. One day (or night!) a pilot from Fairbanks, Alaska, landed at the tent camp for coffee and mentioned that he'd be returning the following week. Party Chief Lindsay Ingall thought this would be an opportunity to surprise his crew with something special, and asked that a watermelon be flown over. The watermelon arrived on schedule, along with a bill for \$14.80!

The gravity-meter operation would be impractical in the barrens without services of the helicopter. For two-thirds of the 24 hours of daylight the versatile machine stopped only for refueling. Two pilots alternated in the shuttle service which transported the gravity-meter operator and survey team. An ingenious method of survey utilized a 35-mm. camera with a 135-mm. telephoto lens which photographed and exactly pinpointed the locations. When the survey crew returned to camp, the film was processed immediately in a single bath solution, and the gravity meter operator hopped out to take readings at the marked locations.

The Arctic appears to be an area where high and low spots in underground formations cause perceptible variations in the pull of gravity, with the result that the gravity meter can be used to determine the presence of prospective anticlinal formations below the permafrost.

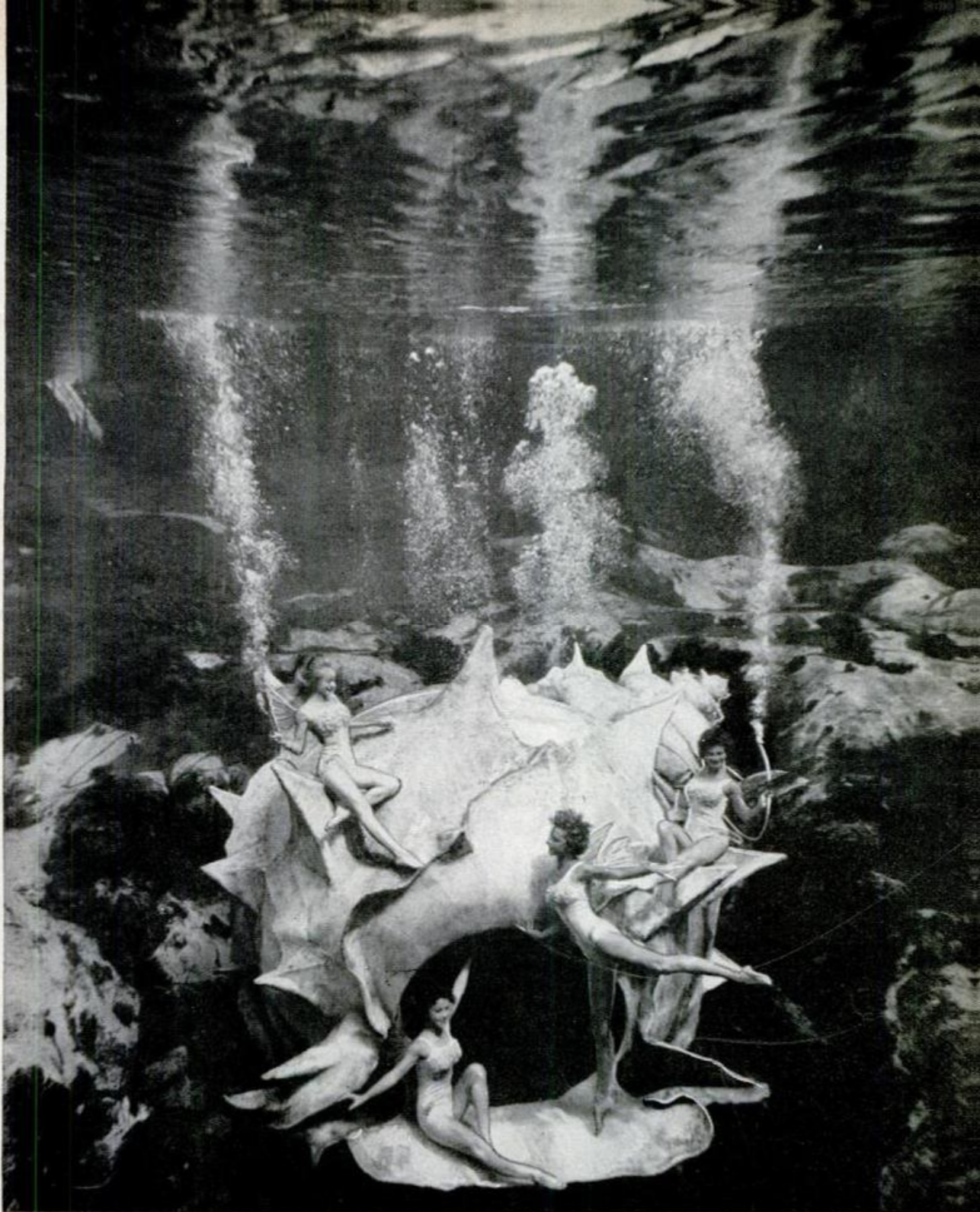
But what of the "Little Navy" and the explosions that shattered the quiet of the northern summer? And what of the soft music wafting over the waves from a former Church of England mission boat called *Night Beat*, but which once was known along the Mackenzie as *The Beacon*?

Oil people will have guessed correctly that this is a marine seismic operation. A project of Accurate Exploration Limited of Calgary — for a group of United States, Canadian and French clients — it marked Canada's first venture into river seismography. The brightly painted river force last summer completed a survey of a long stretch of the Mackenzie River. In August the boats and crews moved to the coast for further exploration in Liverpool Bay.

Because of its unique character this is one of the most interesting features of the oil search in the Canadian North. Here is how it works:

(Continued to page 248)





## Underwater Ballerinas Get Air in Conche Shell

Sleek mermaids who wheel and pirouette through the graceful maneuvers of an underwater ballet performed at Weeki Wachee Spring in Florida do not have to come up for air during the show. To get a breath of fresh air, they duck inside a huge

queen conche shell which is part of the setting of the ballet. Made of glass fiber, the shell is connected to an air source. Inside, the swimmers stand waist up in air. This breathing station allows the girls to perform as if they were indeed mermaids.



# WHAT'S NEW FOR Your Home

**SWITCH PLATE** glows as a night light when switch is off, is extinguished when switch is on. Simple to install, it produces light by principle of electroluminescence, and costs five cents a year to operate

Sylvania Electric Products, Inc.,  
730 Third Ave., New York 17, N. Y.



**PORTABLE DISHWASHER** weighs 11 pounds, gets power from sink faucet and contains a rotary washer-spinner that sends jet spray of water and detergent over dishes and silver. It both washes and rinses

Bayuk and Co., 704 Pennington St., Elizabeth, N. J.



**PAN HANDLE** makes frying pans for camping trips out of aluminum pie plates. It snaps onto the plates, and snaps off when cooking is completed. The aluminum and plastic handle does away with pan washing

The Coleman Co., Inc., Wichita 1, Kansas



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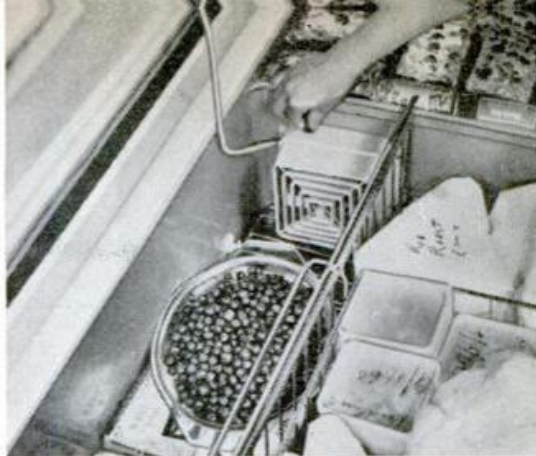


POPULAR MECHANICS



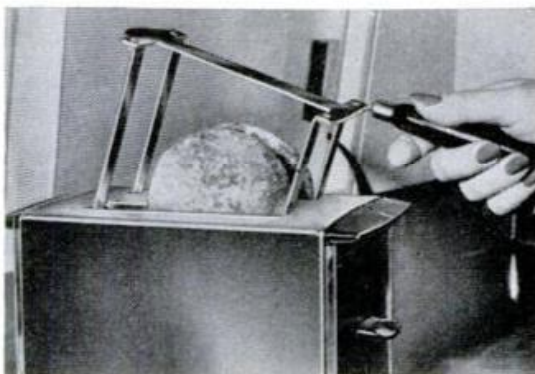
**HAIR CUTTER** rolls over the head, its mechanism automatically positioning and operating the cutting blade. It is not electrically operated, and according to its manufacturer, requires no special skill to use

Patented Products Corp.,  
4420 N.E. 20th Ave., Ft. Lauderdale, Fla.



**FREEZER FAN** mounts in a special louvered port in a new chest-type freezer. Blowing jets of cold air against foods, it makes them freeze up to twice as fast as do ordinary freezers. It is an optional aid

Whirlpool Corp., Merchandise Mart Plaza, Chicago, Ill.



**TOASTER CRADLE** holds foods otherwise too small to be toasted. It fits into both sides of a toaster at the same time, and is lifted when toaster pops. The cradle is made of an aluminum alloy, is shockproof

House of Eljean, 280 Madison Ave., New York 16, N. Y.



**GLOVE RACK** was made for children who lose their mittens. It holds six pair and mounts with screws to any convenient location, such as a door. Mittens then dry fast, are not misplaced. It is rustproof

Mitt-Rak, 4715 Groveland, Royal Oak, Mich.

← **WIRE SHELF**, shown at far left, is made to fit in open stud construction in basements or garages. It fits between studs and is clinched to them by a nail built in at each end. The shelf may be removed

Kwik-Khem Products, Inc., 1816 E. 14th St., Oakland, Calif.

← **FABRIC MENDER**, left, squeezed from a tube, is applied to tears or patches and will withstand washing, ironing, boiling. It can be used on most fabrics, and is water-resistant, nontoxic and nonflammable

Woodhill Chemical Co., Cleveland, Ohio

**CONVERTIBLE CRIB** also serves as playpen or → table. When the movable floor is down, it's a pen; halfway up, a crib; and when up to within inches of the top, a table with a sunken seat. It folds flat

Jane Trent Co., Inc., Menlo Park, N. J.





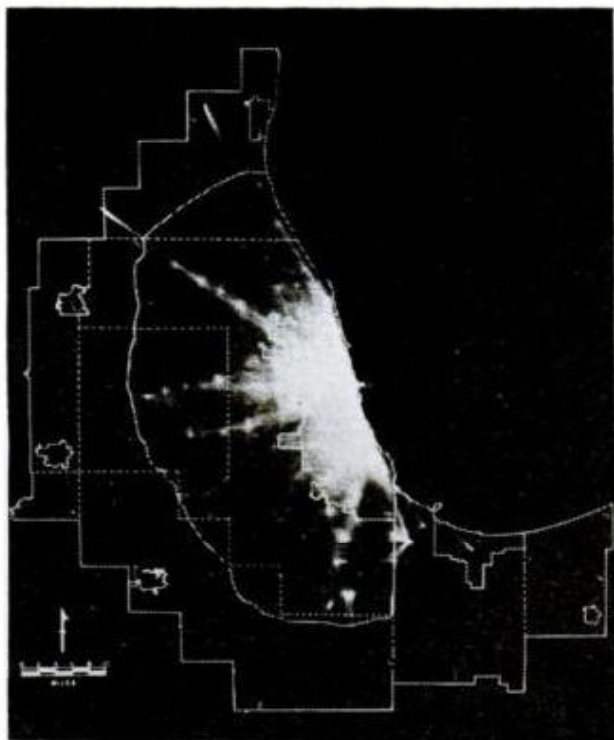
### Survival Suit in Small Packet

U.S. Air Force cold-weather survival clothing for emergency use in jet bombers and space capsules now comes in a vacuum-packed box measuring 5 by 7 by 10 inches. The seven-piece outfit gives protection and mobility at temperatures of minus 50 degrees F. Fashioned from lightweight materials such as nylon and pure goose down and using miniaturized fastening snaps, the suit also provides friction devices on drawstrings so no knots need be tied. The coat converts into a sleeping bag.



### Weight Aids Brake Adjuster

For equal brake adjustment of all four wheels, one mechanic came up with the device shown above. Two iron straps are swivel joined at center and tensioned by a spring. A weight swings freely from the juncture. The device is clamped on the tire, the brake is tightened and the wheel backed up 45 degrees. Brake bands are then loosened one notch at a time, allowing the weight to fall gradually. When it hangs straight down, the bands have been adjusted. The job is repeated on each wheel.



### Photo Map Shows Traffic Flow

Engineers at the Illinois Institute of Technology in Chicago have built an electronic device called a Cartographatron that displays, in map form, the routes over which traffic flows. When traffic experts plan new routes, they first gather (usually by interviewing motorists) masses of data that contains points of origin and destination for a trip. One recent Chicago study had nearly 370,000 such records. To show these routes by the general practice of carefully filling in maps by hand would be an impossible task. The Cartographatron has a magnetic tape on which trip information is stored. It then makes a photo map on which the desired lines have been recorded through a cathode-ray tube. An advantage of the machine is that it can select and display only required information. If only information about trips from home to work is needed, the machine can be set to make a photo map showing only these routes.



### Powered Dolly Climbs Stairs

Capable of handling loads up to 1200 pounds, a two-wheeled dolly with an auxiliary set of rubber tracks can climb (or descend) stairs the same way an Army tank climbs embankments. It operates from any 115-volt a.c. outlet with either a half-horsepower or one-horsepower motor. The operator pushes either the "up" or "down" button from the handle position.

### Welding Gun for Outer Space

Already looking toward the day men will be erecting structures in outer space, Richard Watts of the Los Alamos Scientific Laboratory, N. M., has produced a one-pound, sun-powered electron-beam welding gun. Designed to hurl electrons at materials like aluminum and magnesium, the gun requires about as much power as a 100-watt light bulb. In use, it is held about three-eighths of an inch from the welding target. A simple device, it incorporates only a tungsten or oxide-coated filament, a metal shield and two electrical circuits. One circuit heats the filament, driving off electrons which are focused through a tiny hole in the plate. The second voltage, placed between gun and the weld material, speeds up the electrons to their violent impact. The gun uses a two-kilovolt, 50-milliampere power supply and would get voltage from the sun's rays by means of existing solar and transistorized converters. Only small amounts of power would be required in the vacuum of space.

FEBRUARY 1961



### Man in the Moon Suit

For astronauts, being dressed for the occasion is a must, and this aluminum "moon suit" is the last word. Developed by Republic Aviation scientists, lunar work clothes will feature complete indoor environment, from climate control to food supply. To take a rest, the astronaut lowers tripod legs and curls up inside on a built-in seat 'til ready to resume exploration.



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# Scientists on the Brink of Hell

**They seek secrets of creation—and save lives  
—amidst the flaming destruction of volcanos**

**By Ed Engledow**

**S**TRONG EARTHQUAKES rattled the walls of the Japanese grocery store in Kapoho, a village on the island of Hawaii.

A can toppled from a shelf.

Dr. Jerry Eaton, a stocky young seismologist from the U.S. Geological Survey's Volcano Observatory, frowned and spoke more rapidly into the telephone.

"If we are going to get these people out, we should do it now," he told Thomas Cook, in Hilo, 24 miles away. "An eruption is almost certain." Cook, the island's top administrative official, was the only person with power to declare

Three scientists from the Volcano Observatory work in choking fumes swirling over the cone of the volcano, Kilauea Iki, upper right, to gather samples of gas. Lower right; Molten rock rising from the Kapoho volcano and flowing lava engulfed the village, and pumice buried the farm truck below







**Into the air:** Observatory scientists often have to improvise. To get gas samples free of contamination, they sent a balloon and sampling flask over this smoking pit. The balloon crashed. Pit is 3000 feet across



a state of emergency and trigger evacuation of the plantation village. It had been tickled by earth tremors for weeks and battered this day, January 13, 1960, by heavier quakes.

As Eaton talked, he gazed somberly beyond us and out the window. I was covering the story for my newspaper, the *Honolulu Star-Bulletin*. With me was an official of Civil Defense, a well-run, active organization in an area of earthquakes, tidal waves, hurricanes and volcanic eruptions. Outside, the observatory director, Jack Murata, and members of his staff, were eyeing a huge crack in the street which grew wider with each successive quake.

After a moment, Eaton nodded into the phone and hung up.

"The order's signed," he said. "Let's go."

Within minutes the National Guard and plantation trucks, which had been standing by, began to roll. The evacuation went smoothly, and by late afternoon the village was as empty as a ghost town. The people had left their homes where they raised sugar cane, papayas and Hawaii's most beautiful orchids. They had left their homes for the last time.

**Into the ground:** To sample lava, they made a drill

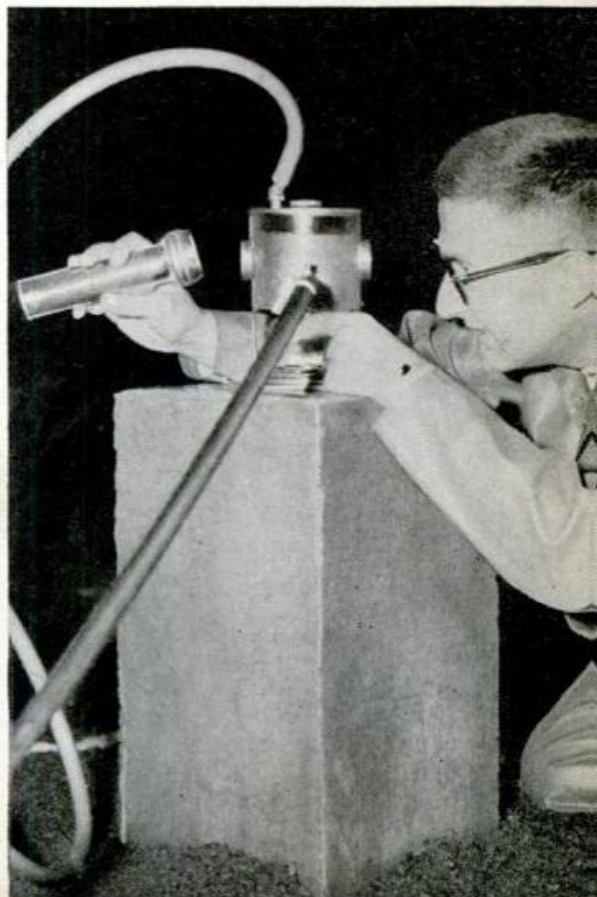




Seismographs: Jerry Eaton unloads portable machine with which he tracked volcano. Below, he studies one in lab



Meters: Wayne Ault, above, measures lava heat. Harold Krivoy, below, reads tilt-meter at night





Volcanos in action around the world are shown on these pages. Above, Mt. Ngaurhoe, on North Island, New Zealand, roared into life in 1948 after being inactive for 14 years. Volcanos are a major land builder

This volcano burst up in 1952 some 780 miles south of San Diego, Calif., on San Benedicto Island, Mexico. Spewing clouds of boiling smoke and gas every 20 minutes, it built 1050 feet above the sea in six weeks





Paracutin rose from a Mexican cornfield in 1943. Its lava flows destroyed this temple four miles away

Last year, this volcano near Puyehue, Chile, poured ashes and lava over earthquake-caused destruction



FEBRUARY 1961

Earthquakes continued to shake the deserted village, adding to the air of gloom and eeriness, until just after dark when the *expected* happened. With a shattering roar, a huge vent opened on the northern edge of the village and a thundering, flaming fountain belched fire and molten rock hundreds of feet into the air.

The volcano was to flow and spurt 36 days in one of the most disastrous eruptions the island has ever known. Its black, molten lava was to form flows, some as thick as 50 feet, which would cover 2500 acres of rich farm land. Pressured by masses of magma thrown out the fiery vent, the flows were to crush and then bury the homes of the 300 villagers and obliterate the hamlet for all time. But because of the observatory's warning that an eruption was imminent, the fiery monster, which at times seemed alive and vicious, injured no one.

Since 1912, when the observatory was established on the island, its staff, which now numbers about a dozen scientists, has been active in developing such a warning system. Primarily, though, the men seek to learn the secrets of the volcano—the secrets of land building, mineral creation and the effects of subterranean gases. It is, however, during such disasters as at Kapoho that their work is most dramatically displayed.

Through it all, they worked around the clock, advising Civil Defense officials and police, and risking life and limb to gather from the blazing jaws of the monster fresh samples of lava and gases used in a never-ending study of the volcanic beast.

They kept running reports on the spreading flows as one prong moved into the Pacific, causing a spectacular steam cloud visible for miles, and another prong fanned out to encircle a Coast Guard lighthouse and destroy part of a fashionable beach development.

Twice a day, staff members flew in a small National Guard plane which bounced through the tricky currents above the heated lava as they observed the flows and captured hot gases for chemical analysis.

The unassuming scientists shrug off efforts to label them as daredevils.

"When we take chances, we also take precautions," explains Eaton, the present director.

Murata, who has returned to the Survey's headquarters in Washington, D. C., will tell, when pressed, of the night he approached the cone built by the Kapoho eruption when the fountain was blazing a thousand feet into the air.

Suddenly the fountain stopped spurting, and the area was plunged into darkness. This usually means one thing—material on



**Flaming fury engulfed Kapoho. Two weeks after the volcano blasted up it had buried thousands of acres of land**

the inside of the cone's shaft has sloughed off and choked the flow of the fountain. When that happens something has to give way to the tremendous pressure below. This time the flaming stream of lava worked its way through a vent on the side of the cone. With tons of pressure behind it, it shot straight at Murata. But he had read the signs and was well under way.

"I looked over my shoulder and it seemed like I wasn't moving fast enough," he recalls, "but I made it without even a blister."

When working near a fountain the scientists wear hard hats because the fallout can carry brick-sized chunks of pumice. Asbestos suits are worn for very close examination of the fire geysers, and filter masks furnish protection against the deadly gases which often pour from the vents.

Authorities may bar sight-seers from all areas around the fountains, but the scientists' work doesn't stop. Fresh lava samples may be picked up with tongs. But if these

(Continued to page 252)

**Surging lava is timed by geologist Don Richter, left, as it moves down Hawaiian road several inches a minute**

*Photos this page by John Tichen*



Astronomer Clyde W. Tombaugh, 54, has searched the skies since his youth. He discovered the planet Pluto as well as star clusters, variable stars, asteroids and nebulae, and is continuing his explorations at New Mexico State University Research Center



## *My Most Exciting Moment*

By Clyde W. Tombaugh

ONE FROSTY MORNING in November, 1928, on a Kansas farm, I experienced one of the greatest thrills in my life.

When a boy, I became interested in the geography of other planets. In those days much discussion centered on Mars as a possible abode of intelligent life. Some thought that the straightness of the so-called canals indicated artificial origin. I had a strong desire to see these for myself, if they really existed.

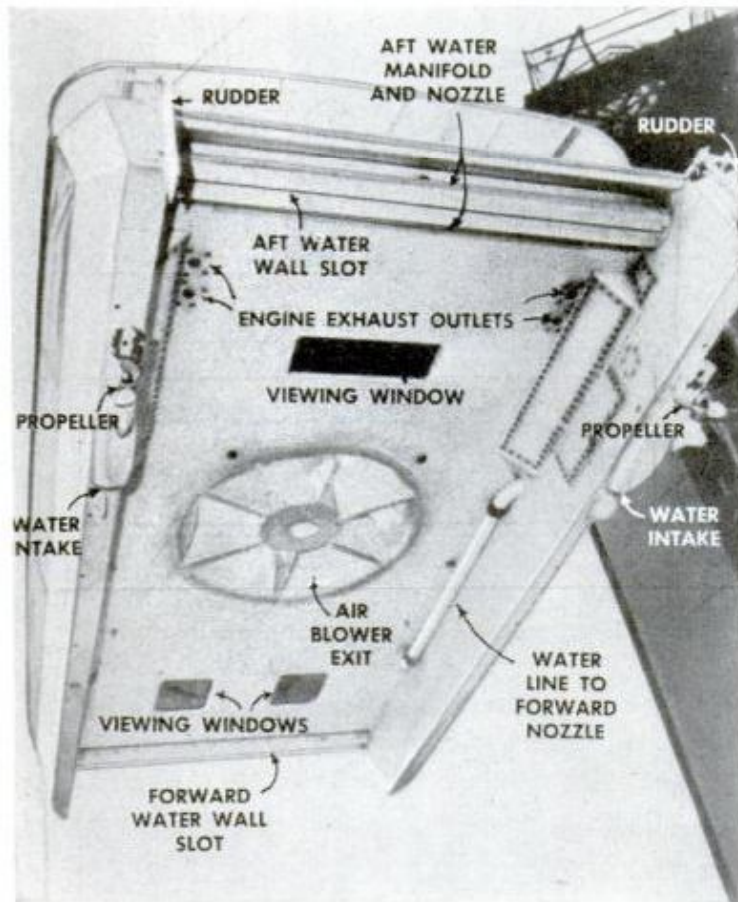
I could not afford to buy a telescope of the necessary power, so I started grinding mirrors. Materials and instructions were hard to get.

During the previous year, I constructed my third reflecting telescope, a nine-inch of excellent optical quality. When the seeing was good, it yielded a sharp image under magnifying power as high as 400 diameters. It was a gratifying reward after months of careful grinding, polishing and testing. The telescope was designed to be left outdoors in all kinds of weather so that it would always be in thermal equilibrium and quickly readied for observations.

Mars was approaching "opposition," and I frequently got up before dawn to observe the planet. On this particular morning the seeing was unusually steady. After a few seconds peering into the eyepiece, suddenly I spied a radial network of narrow, dark streaks running from a central dark spot across the reddish desert to some dull green areas to the west and south. "The canals!" I exclaimed to myself. Again and again I glimpsed them each moment the air steadied. The appearance of the region was distinctive. It closely resembled a picture I had seen. I went into the house and found it in one of my books. It was the famous Solis Lacus region, nicknamed "The Eye of Mars."

I started making sketches of Mars and Jupiter at the eyepiece. As a result the whole course of my life was changed. I was invited to join the staff of the Lowell Observatory, where I found the images of the ninth planet, Pluto, one year later.

*Clyde W. Tombaugh*



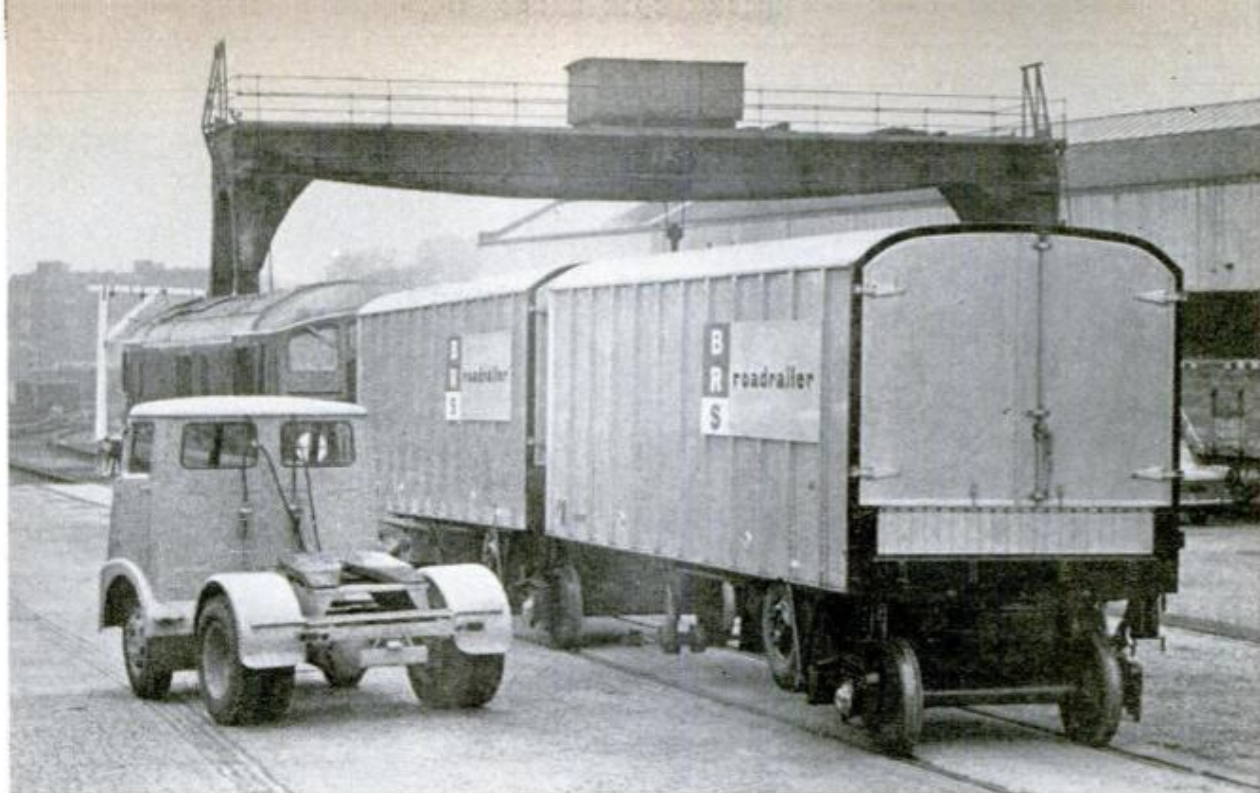
## Boat Floats on Air

Skimming over water on a cushion of air that's trapped between thin walls of water fore and aft and solid fins (or "skegs") on the sides, the Hughes Hydrostreak is undergoing tests by the Navy. Forward motion is achieved by conventional propellers and by the force of water being discharged at an angle. Navy officials say this is one of several craft being developed to test methods of supporting vessels on air cushions. They feel that such craft will be more efficient than ordinary surface craft.

## Ten-in-One Fishing Lure

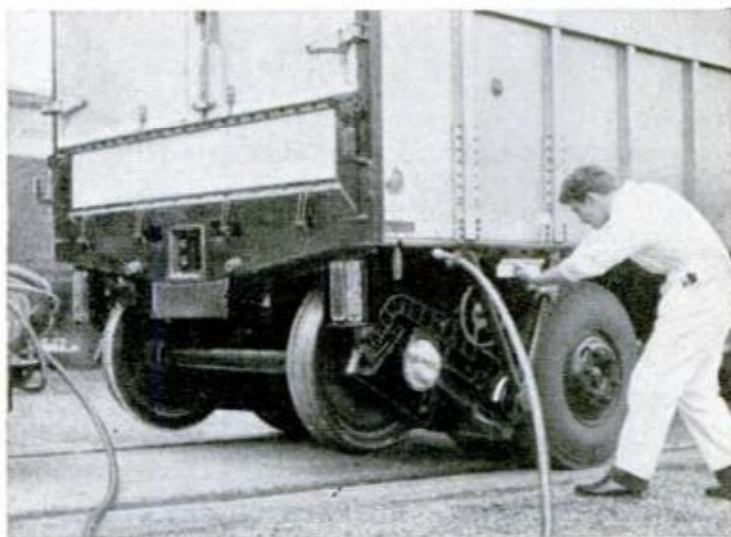
Possibly the most versatile artificial lure yet, the new "Whirl-Lure" has a range of 10 actions, controlled by the setting of three swivel-mounted diving planes. It will spin or wobble either fast or slow and run at any depth—even splash along the surface. It's designed to be fished with or without a pork strip and is available in three sizes and several styles.





### Rail Car Becomes Trailer

British Railways' answer to the problem of moving freight past railheads, the "Roadrailer," can be switched in minutes from a railroad car to a semitrailer by retracting one set of wheels and extending another at one end. The tractor backs under its coupling at the end with the fixed railroad wheels, hooks up and takes off down the road. The wheel change is done by compressed air; the coupled wheels provide their own support and allow easy alignment during the change to flanged wheels.



### One-Man "Steam" Roller

One man can do a five-ton roller's job of compacting asphalt pavement with a new self-heating roller which carries its own fuel supply. A small tank of bottled gas on top of the roller pipes fuel to a torch in the roller axle. The heat from the axle torch raises the outside roller temperature to 800 degrees in four minutes, 1400 degrees in 10 minutes—enough heat for a satisfactory job on hot-mix bituminous paving. The handle telescopes from 6 to 10 feet to keep the operator at a distance; a bracket halfway up the handle allows easy carrying on a truck.



☛ Shortest lifetime for a subatomic particle is that of the pi meson—a quarter of a millionth of a billionth of a second.

# Ever Chat With a Fish?

NO? You don't know what you've been missing. For 40 years Marie Spijker has been on speaking terms with the perch, roach (a European cousin of our carp) and eels that live in her back yard, and the sound of her voice will bring schools of them hurrying to her like a flock of hungry chickens.

Miss Spijker's farmhouse, near Rijpwetering, The Netherlands, is completely surrounded by water; you must row in to visit her. At the back of the farmhouse, the network of drainage ditches has formed a large pond where her friends live. Every morning she kneels at the bank and calls, and the fish come at the sound of her voice to get their cheese or worm breakfast from her hand. They become so tame that she can lift them from the water for short periods, but she is careful not to keep them out for too long. Only once, during the war when food was very scarce, did Miss Spijker take an eel home for dinner. She felt so badly about it that she never did it again.



Miss Spijker's pets join her daily for breakfast

Friendly eel comes partly out of the water for his breakfast cheese, and allows himself to be chucked under the chin, but won't come clear out for a chat. Perhaps he remembers the eel who went home for dinner







Perch and roach, regular freeloaders, allow themselves to be picked up, but the eels won't stand for it

Miss Spijker's eels will allow handling, but if she takes them out of the water, they never come back. The one-woman fish will come only for Marie—when her brother calls them they scatter and won't feed at all



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## Cleansing Cloud May Save Britain's Beaches From Oil

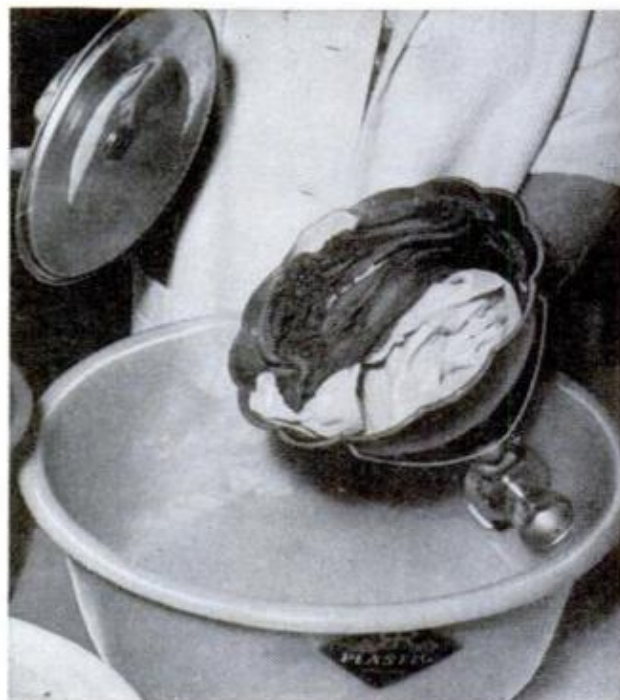
Oil pollution of English seashores may be prevented by a special spray called Oil-sink. It's composed of a number of ingredients which first absorb the oil and then, by increasing its specific gravity, break it up

into particles and sink it into the mud on the sea bed. It remains permanently anchored, and is finally silted over. A slick of oil three feet wide and 10 miles long could be sunk by one ton of Oilsink.

## "Spin-Drier" Speeds Nightly Hand-Washing Chore

World's smallest, and probably simplest, spin-drier for clothing is being marketed by a Paris firm. Designed for the ladies who do a hand washing in the evenings, it

turns up 400 revolutions per minute with its nylon-g geared egg-beater mechanism, and will all but dry nylon and other synthetic fabrics. Water exits around the edge.





### **Ground-Effect Machine Designed for Carrying Bananas**

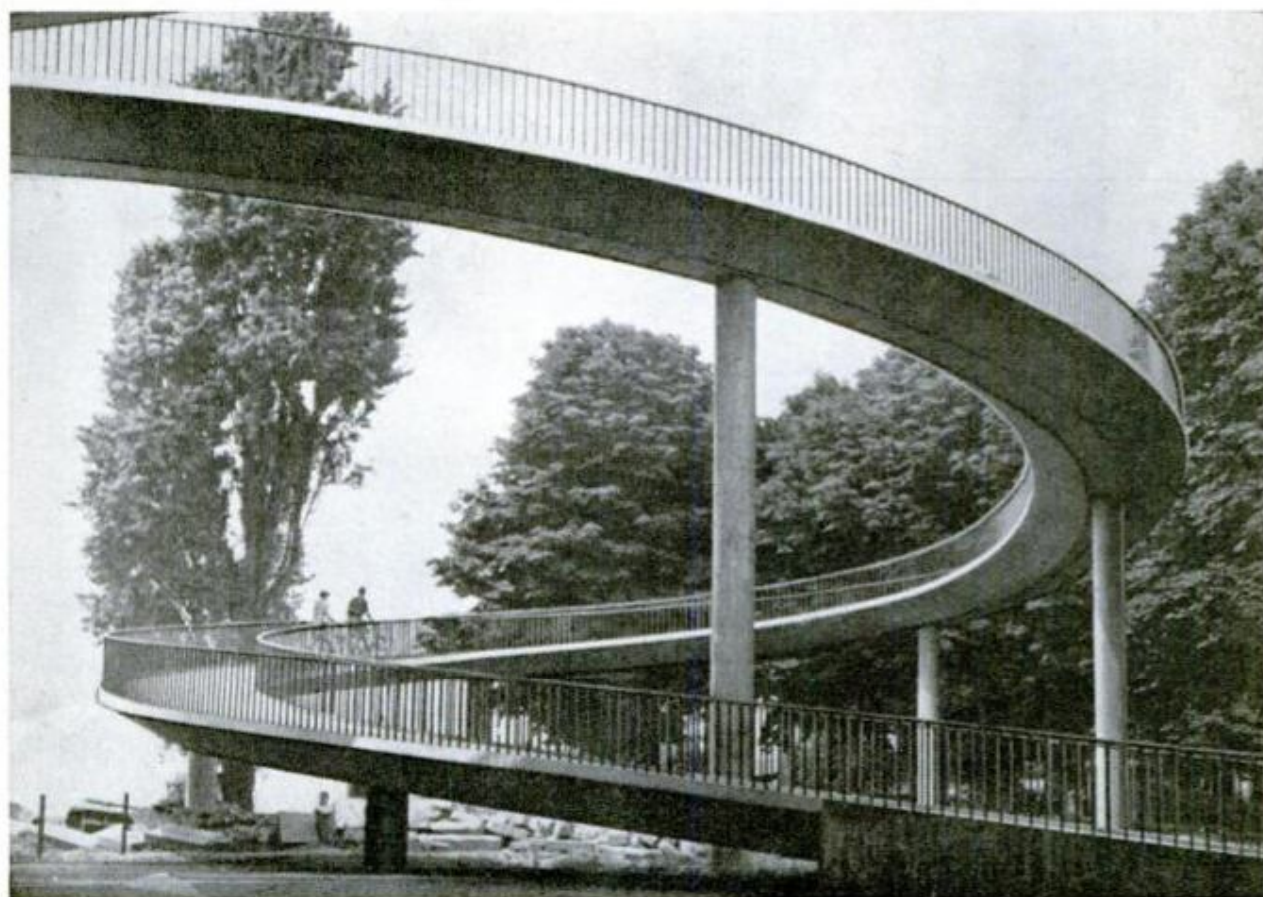
Traveling a few inches above the ground on a cushion of air, the experimental ground-effect machine, the Britten-Norman *Cushioncraft*, makes a demonstration run

on the Isle of Wight. The craft was specially built for a fruit company which intends to use it to carry bananas from plantation to port in the Cameroons.

### **"Cycle Spiral" Beats Stairs for German Travelers**

Spiralling down from the lofty Rhine bridge at Dusseldorf, Germany, a graceful ramp provides easy access to the main span for pedestrians and cyclists on riverbank roads. The ramp replaces a flight of stairs

that were difficult for walkers and almost impossible for cyclists, who, before, were forced to haul their bikes up 50 stairsteps, across the bridge, then down the same number on the other side.



# Master Violin Maker

There are only a handful of men left in the world who have the talent and training to produce the most beautiful instrument in music

By Jack B. Kemmerer

ONE OF THE WORLD'S most ancient and exacting arts—that of violin making—is gradually disappearing from the scene. According to most music authorities, there are probably less than a dozen men in the world today that can be considered true master violin makers.

Actually, the art of violin making has never been a widespread profession and the perfection of the instrument as we know it today is due primarily to the three Italian families of Amati, Guarneri and Stradivari in the 16th, 17th and 18th centuries. First on the scene was the Amati family. Andrea, the eldest, born about 1510, founded the famed Cremona school of violin makers. Both Giuseppe Guarneri and Antonio Stradivari were pupils at the school.

Most popular of all stringed instruments, the violin is of extremely ancient origin. In

its primitive form it is a development of the lyre and monochord, the strings from the former, and the elongated resonant box with its sound holes, fingerboard and movable bridge from the latter. The violin as we know it begins with the invention of the bow which was first used sometime before the 13th century when the viole of the troubadours appeared.

From that time on the rebec, the geige, the fidel and many kinds of viols and violas underwent changes until, toward the middle of the 16th century, the true violin model appeared and superseded most other instruments of its class.

During the next century, the sound holes were shifted all over the violin, and it was not until the violin model had been in use some time that they were located in their present place with the bridge fixed between





**1.** Back is foundation of violin and its most important piece, giving violin its brilliance of tone. Roberds uses template to trace its shape in block of maple



**2.** Back is arched out with woodworking tools, then planed to shape with special tools Roberds made himself. Wood is all imported from Europe



**3.** Ribs are made from six strips of maple, planed down to 1-mm. thickness and bent and glued to corner and end blocks. Ribs are lined for additional strength



**4.** Finished ribs are glued to back. Ribs, back, neck and sides of violin are made of maple imported from Carthaginian Alps in Central Europe

**5.** Front, or top, of violin is made of spruce imported from Austrian Alps. Since spruce cracks easily, top is glued on very lightly so that it can be replaced

**6.** Scroll is finished by hand, and it is here that master violin makers work in small degrees of difference. Hand saw cuts it to rough shape





**7.** Roberds adjusts ebony fingerboard on violin. Pegs which stretch four strings to give proper tune are made of rosewood or boxwood. Finished violin is given six to eight coats of varnish. First, oil varnish filler is used to fill pores and make wood sparkle. After a week, a second coat is applied. Then a week separates each new coat of varnish

them. The bridge was the last point perfected, and that by Antonio Stradivari, the last of the great violin makers.

The master violin maker must be an expert in the art of woodwork as the instrument consists of 70 different parts, all of which, except the strings and loop, are made of wood.

In Southern California, a brother and sister team assist violin students. The pair are Joseph Roberds of Redondo Beach, a master violin maker, and Virginia Lewis of Burbank, a concert violinist.

Roberds repairs the instruments of the pupils who are taking lessons from his sister. Both the repairs and lessons are given without cost to the youngsters in Mrs. Lewis' Burbank home. Both are donating their time because they have a deep conviction that children should be encouraged in the good things of life and, to them, music is of major importance.

"I became interested in building violins and other stringed instruments when I was 15 years old," Roberds says. "My mother had forced me to take lessons on a violin to divert my attention from collecting bugs and butterflies."

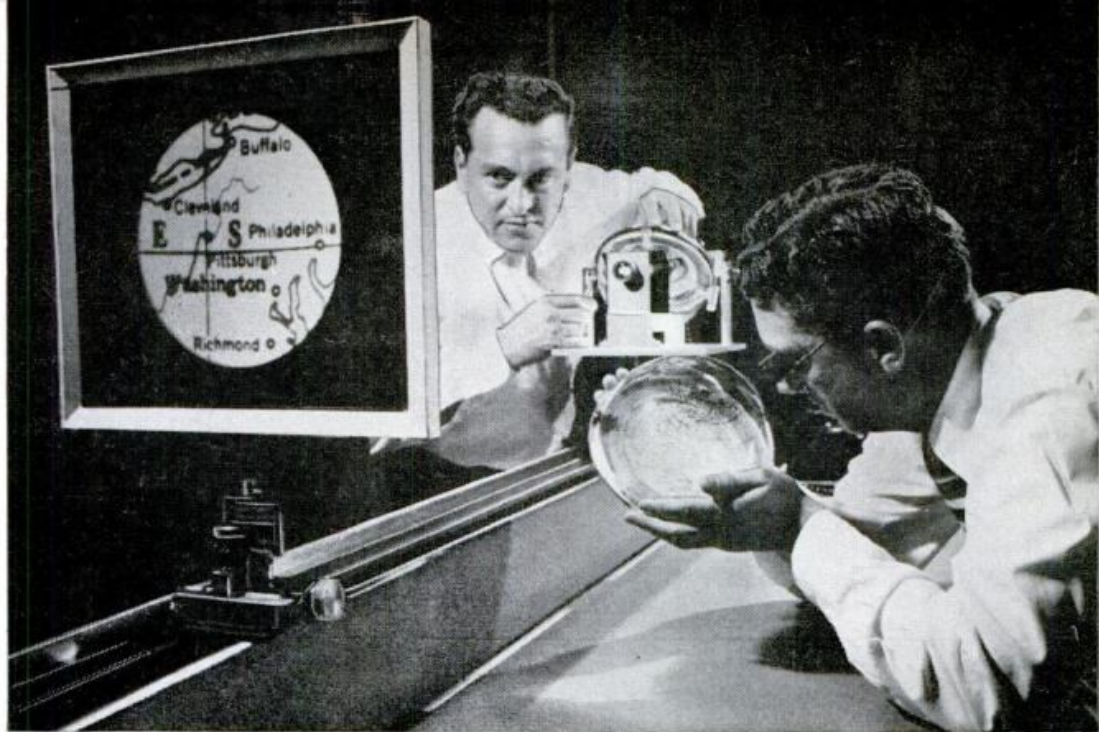
Roberds then went into the Navy and in his spare time built a couple of violins aboard ship. From these two attempts he realized that if he was to become a maker of really fine violins he must devote considerable time as an apprentice to a master violin maker.

When he left the Navy, Roberds began his studies with a very famous violin maker, Mario Frosali of Los Angeles. He spent six years with Frosali and also studied bow making under the guidance of Frank Kovanda, one of the best bow men in the country.

A good violin is an expensive instrument because its creation cannot be hurried, Roberds pointed out. "When I began making violins each one had to meet the exact standards set by Mario Frosali or I tore it down again. Now I have learned enough about building stringed instruments so that it is no longer necessary to tear one down because it is inadequate."

According to Roberds, most master violin makers follow one of two distinct schools in the creation of their instruments—the Guarnerius School or that of Stradivari. Antonio Stradivari (1644 to 1737), most famous violin maker of all time, built about 1000 violins during his 93 years and over 500 of these are still in use. The instruments from what is termed his "grand period" (1700 to about 1725) are unrivaled for elegance of form, beauty of workmanship and tonal qualities.

Giuseppe Guarneri (1687 to 1745) made violins which alone compare with those of Stradivari in tone-producing qualities. Guarneri's violins represent the other school and his instruments are more remarkable for power and brilliance of tone than beauty. ★ ★ ★



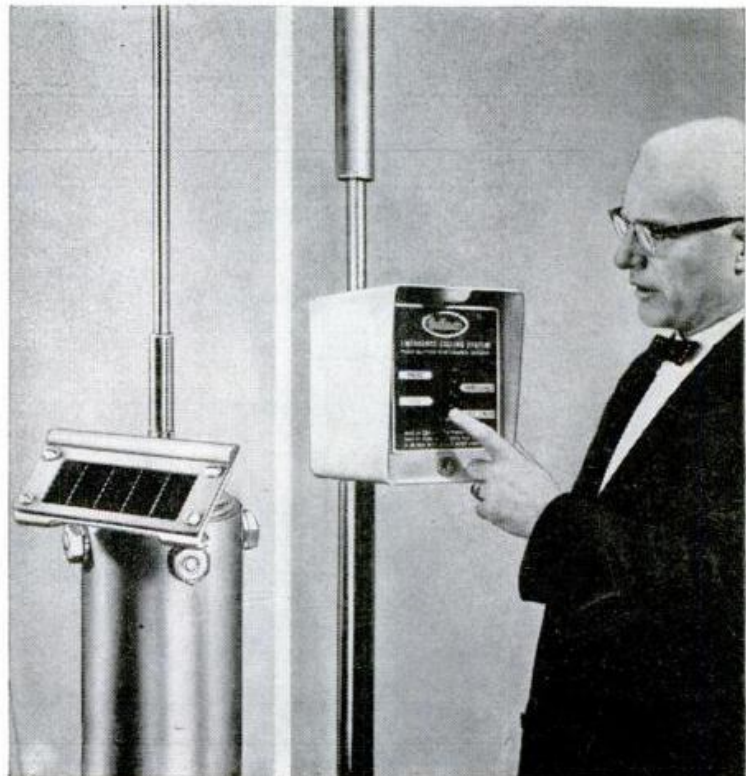
### Map Projector Aids Supersonic Navigation

Controlled by a computer, an aerial navigation device will continually pinpoint his exact location and project it on a screen for a pilot flying faster than sound. A glass hemisphere (held by man at right) has a detailed map of half the earth reproduced photographically on its inside surface. It is placed over the projector and a beam of

light illuminates a small portion of it and projects it onto a translucent screen in front of the pilot. The airborne computer makes all the calculations necessary to position the map properly to pinpoint the pilot's exact location. A similar device is under study for possible use in space navigation, using a stellar map.

### Press a Button, Get Highway Aid

Motorists who find themselves in trouble on highways equipped with a new emergency calling system can press any of four buttons on a roadside radio transmitter and beam out a call for help. The transmitter is powered by nickel cadmium batteries that are recharged by five silicon solar cells mounted on the transmitter's antenna (picture at near right). Pressing a button summons the police, an ambulance, fire truck or service truck. Coded messages transmitted are unscrambled at a central headquarters located up to 18 miles away from the transmitter. The battery pack will power 150 transmissions without recharging.



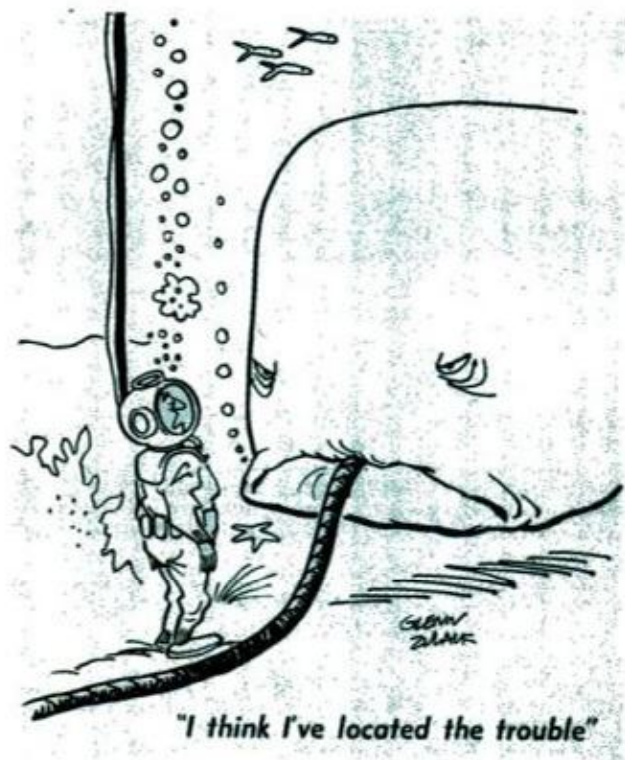
# Toughest Splicing Job of All

By Robert A. Kelly

**T**HE SMALL fishing trawler veered sharply away from the big ship lying some 2000 yards ahead. A tiny, fluttering flag—two red spheres separated by a white diamond—was the reason. To the fishermen, it promised broken nets and high-voltage burns in return for too close an approach to the trim transatlantic cable-ship, its eel-like cargo already splashing into the water from a reel on its bow.

Slipping to the ocean floor, a newly repaired section of telephone cable means only one thing to the trouble-shooting cablemen aboard this unusual ship—the biggest and toughest splicing job there is.

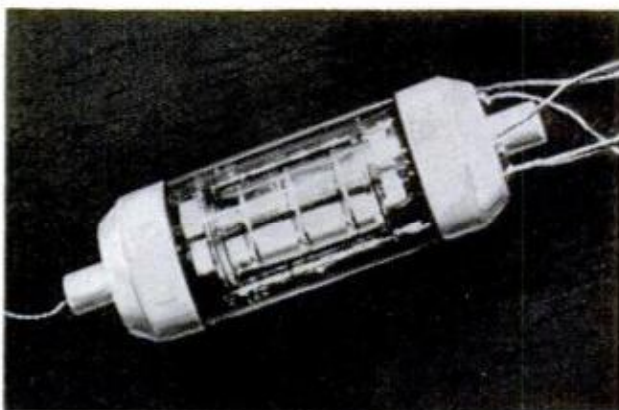
Damage to deep-sea cables can stem from a dozen causes. Cables become frayed as the restless sea lashes them against the rocks. In tropical areas, marine borers drill holes into cables between the armor wire, and lightning has even struck the cable in shallow water. On other occasions, icebergs have run aground in shal-



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Spliced into the deep-sea portion of the cable every 44 miles, 114 electronic amplifiers boost the voice signal a million times, using power transmitted through the cable itself. Below, one of the three big vacuum tubes in the eight-foot-long, three-inch-thick amplifying section. They're assembled under microscopes and exhaustively tested to operate without attention for at least 20 years under bottom pressures up to 7200 pounds per square inch. Tapering the section into the 1¼-inch cable makes an 80-foot splice

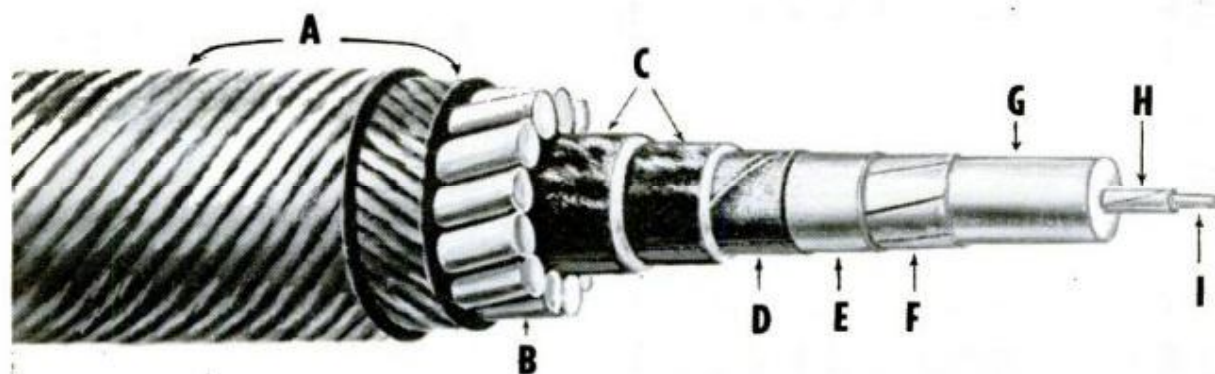


POPULAR MECHANICS





As if it weren't enough trouble finding and repairing the cable, the Atlantic occasionally kicks up a blow and shuts down operations. Sitting it out at sea, the repair crews use the enforced vacation to catch up on maintenance chores. Below, cutaway view of the many-layered cable itself. A—double jute wrappings. B—high-tensile galvanized steel armor wire for strength and flexibility. C—double jute bedding layer to cushion the inner layers. D—cloth tape, applied mostly to hold the core components during manufacture. E—copper tape, to guard the core from teredo worms. F—copper return tapes, the grounded return conductor that completes the electrical circuit. G—polyethylene plastic insulation. H—copper guard tapes. I—solid copper-wire core. The finished cable for laying in the depths is 1¼ inches in diameter and weighs just over a pound per foot. For laying in shallow water, the cable is wrapped in much heavier armor to protect it from wave and tide action, ice, ships and their anchors, or fishing equipment. It can go up to 12 pounds per foot



low water and have crushed the cable or torn it up against the bottom.

From the moment the slender cable leaves the weather-beaten coasts of Newfoundland until it's escorted ashore beneath a bobbing line of barrel buoys in Penmarc'h, France, it is the prime responsibility of the cable ship. Actually, it is a double worry because there are two cables—one for messages in each direction—lying 20 to 30 miles apart along the ocean floor at depths of up to three miles.

Early cables suffered their greatest damage from mankind. In 1850, for example, the first cable between France and England was severed near the French coast when a fisherman caught the cable with his anchor, hauled it aboard and became intrigued with what appeared to be a new kind of seaweed. He was more mystified by what he thought was a thread of gold running through the center. He cut out a piece to show his friends. He didn't make any friends in the telephone cable maintenance business.

Landslides too, have caused serious damage to cables. One of the worst in history occurred in November, 1929, when a vast submarine landslide, starting at the Grand Banks off Newfoundland, swept away all the telegraph cables crossing that section. As a result, Wall Street could not get reports from financial centers in Paris or London, and newspapers went to press without the foreign news. One of the cables was later located beneath tons of sand and rock; lengths of others were never found at all.

The word "millions" best describes the quantities of materials that go into the average cable. The first transatlantic telephone cable system, for example, required 25,000,000 pounds of steel wire; 7,500,000 pounds of copper; 5,000,000 pounds of tar compounds; 4,000,000 pounds of jute and 3,000,000 pounds of plastic.

The *Monarch*, a typical cables ship in that it has never failed to keep the cable whole, is designed to carry over 1600 miles of deep-sea cable in its four holds. The 480-foot ship is capable of laying cable from its big reel at a rate of six miles per hour.

A sister cables ship, the *Stanley Angwin*, was involved in a unique cable mishap off Manila in March, 1955. The ship was grappling for some 300 miles of dead cable at a depth of more than three miles. When they snagged on and brought in the cable, the hauling line suddenly became taut. The ship's dynamometer, an instrument measuring cable tension, recorded an extremely heavy pull. It seemed that the

(Text continued on page 258)



Bearded cableman winds armor wire over a splice. Below, critical wrappings are done in a tent on deck





Tricky job of lifting and lowering the cable without changing the tension is helped by this tension drum. Using stripping disks to keep all the wires separated and in order, all hands fall to stripping a new section

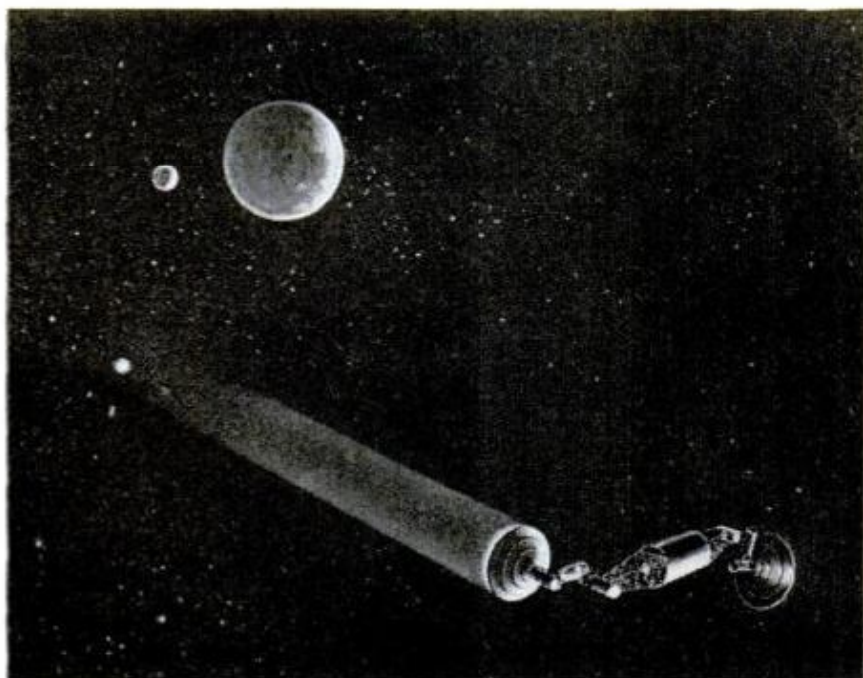
American Telephone & Telegraph Company photos





## Viewer Beats Owl

Even the horned owl's eyes depend on some available light for his night vision, but not the new infrared viewer developed by International Telephone and Telegraph Corp. The little unit, using its own built-in power supply, enables its user to see very well even in total darkness by projecting a beam of invisible infrared light, then translating the light reflected by the subject back into visible light for the user's eyes. It's designed for security, police and photographic work.



## Talk on Sunbeams

Light rays from the sun may do a powerful job in transmitting conversations or messages in space. A sun-powered transmitter has been developed by Electro-Optical Systems of Pasadena, Calif., to send information over distances exceeding 10 million miles. It uses mirrors to gather sunlight, which is then chopped into signals or varied in intensity, and beamed by mirrors to a receiver where the light beam is decoded to give either voice or dot-dash messages.



## Self-Docking Boat

No tugboats, power steering or fancy piloting is needed to dock this boat in its slip on Alster Lake near Hamburg, Germany. A battery of powerful electromagnets, mounted at the edge of the dock, maneuver the steel-hulled boat neatly into place. The magnets, operated by remote control from the boat's bridge, exert a pull of six tons. The skipper need only run his craft into their zone of attraction, then relax. The boat need not be tied while the magnets hold it in place.

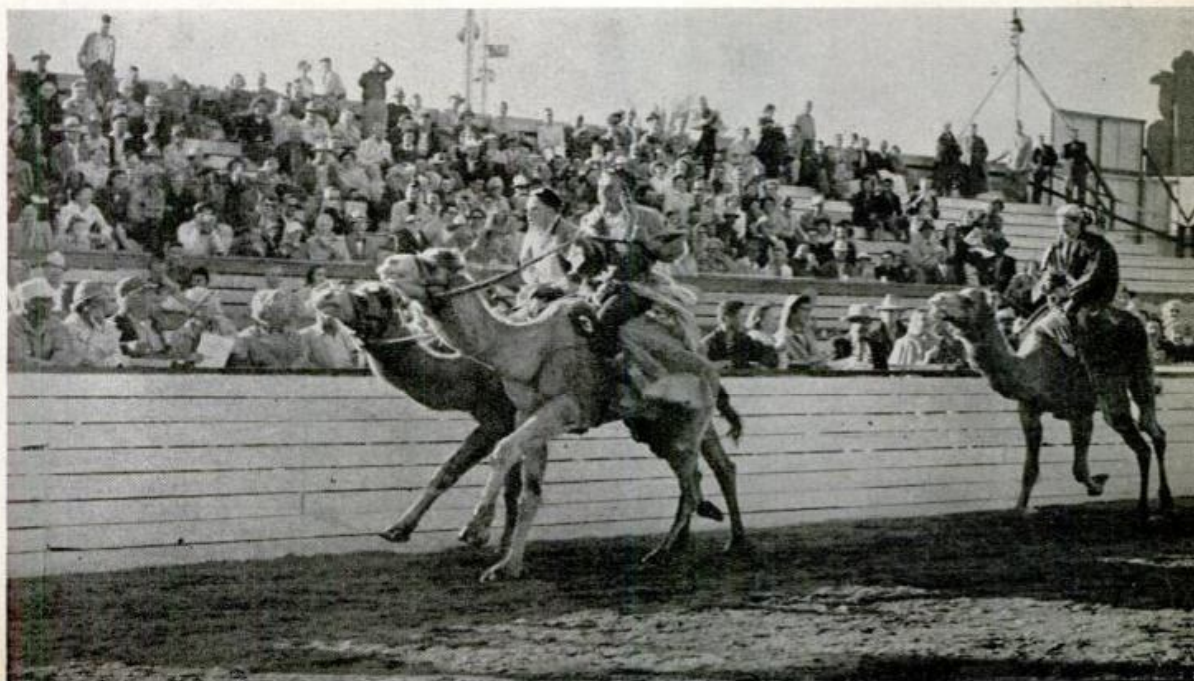


Charles Mathis photo

## The Camels Are Coming—and Ostriches Too

EVERY FEBRUARY, two of the strangest contests in the country take place at Indio, Calif., when ostriches and camels race during the National Date Festival. The most popular of the two unusual dashes is that featuring camels, who pit their rocking gaits against one another. The swaying beasts pay little attention to their riders'

frantic efforts to control them and carry on pretty much according to their own whim. The ostriches tow sulkies much like those pulled by harness horses. Indio is the center of a date-growing area, thus giving cause for the annual festival which brings up scenes that one might expect to find only in Arabia.



# Potatoes Start A Revolution



Rolling across an Idaho field, a tractor-drawn mechanical planter drops seed potatoes, covers them with dirt

By Rafe Gibbs

**A** REVOLUTION—scientific and mechanical—is going on in the potato world, and it will probably affect your eating habits if it has not already done so. By 1965, it is estimated, half the potatoes consumed in the United States will be processed—produced in precooked-dried or frozen form.

Headquarters for the revolution is Idaho, which has become the world's largest potato-processing center. The state is now processing about two billion pounds of its potatoes annually—more than three times the amount processed 10 years ago.

Because so much in the Idaho plants is newly developed—equipment as well as products—secrecy pervades many aspects of this competitive industry, as I discovered on my state-wide fact-finding trip.

“To do research, the potato processors have even been hiring away some of our atomic-plant scientists,” said an official of the Atomic Energy Commission headquarters at Idaho Falls. “The scientists should feel right at home in the ‘hush-hush’ atmosphere of the processing plants.”

For years, per capita potato consumption

in the United States had been declining. Then, in 1957, the downward trend stopped; during each succeeding year consumption has been increasing. Major reason: The housewife, who first learned how easy it is to whip up a cake from a package, has discovered that it is equally simple to prepare varied potato dishes out of a box.

Don L. Cazier, processing-plant manager for R. T. French Co., at Shelley, said:

“My wife and I have been married 13 years. We both like scalloped potatoes. But, for the first 12 years of our married life, we probably had scalloped potatoes no more than three or four times a year. Now, during the last year, we sometimes have had them several times a week. The scalloped potatoes—dehydrated—came out of a box, and took just minutes to prepare.”

Idaho, famed for its big baking potatoes, has for many years been primarily an agriculture state, with its industry largely in timber and mineral products. But now, with processing plants sprouting beside potato rows throughout the southern part of the state, Idaho has achieved new industrial status.



Moving along with a truck, a combine digs potatoes, frees them of debris and dumps them into rubberized bed

It is hard to tell the population of some potato-belt towns by the signs on the highways. The townspeople are too busy with booms from new processing plants to bother about changing the figures.

At Heyburn, for instance, the highway sign reads: "Population 539." But a new processing plant has just gone in there. It employs 800 persons. Burley, a population reading 5924, now has four huge plants operated by different organizations.

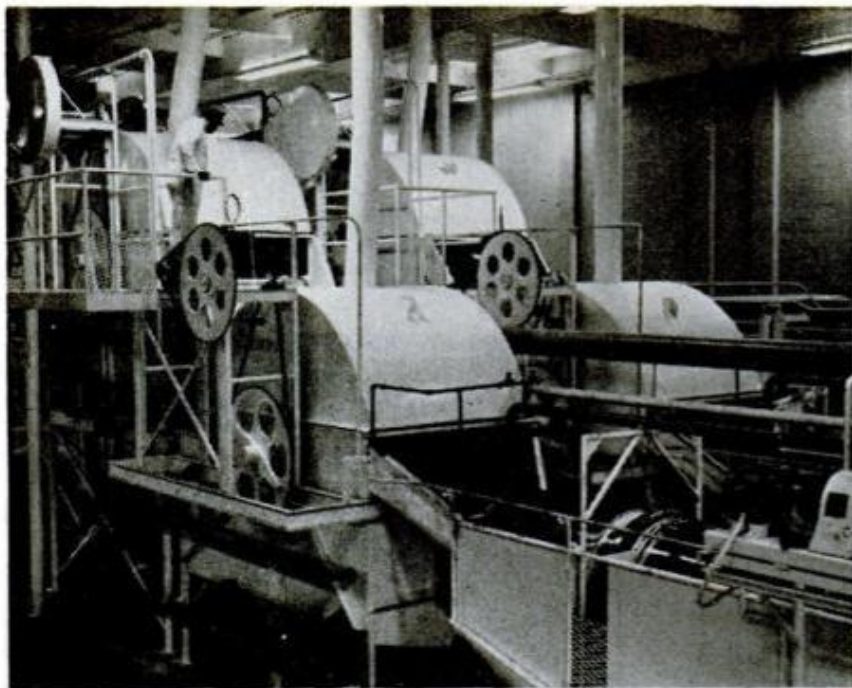
Stopping at a service station in American Falls, population 1874, I commented on the bypassing of the town by new transcontinental Highway 30, and asked if it had hurt business.

"Some," admitted the attendant. "But we're not worried. We're getting a new potato-processing plant."

Idahoans expect to continue to hold the world lead in processing, because their potatoes are as peculiarly adapted for processing as they are for baking. The state's volcanic-ash soil, high elevation, abundant cold water for irrigation, warm days and cool nights produce a potato that is considered a natural for processing.

Passing from the fields are scenes such as this one: harvesters performing their time-consuming chore





**PEELED.** Potatoes are surface-cooked in these rotary peelers and skins are then blown off by high-pressure jets of water

"Natural" as the potatoes are, scientists are continually striving to improve quality of both the raw and processed products. The University of Idaho's College of Agriculture is engaged in dozens of potato research projects.

At the world's largest potato-processing plant, run by the J. R. Simplot Co., at Caldwell, I was given a tour of the various operations. The automation was fascinating.

Machines took shredded potatoes, pressed them, and neatly dropped them onto a moving belt in small cubes; they emerged like bonbons in a candy factory. Then the potato cubes tumbled into hot cooking oil (300 degrees F.), bobbed along to pop up on another belt with exact timing that assured proper tenderness and brownness.

Now the belt moved the hot, freshly cooked cubes into a cooler that quickly brought them down to room temperature. Still moving, the belt next hurried the cubes into the quick-freeze room, with the temperature at  $-30$  degrees F., and a 30-mile-an-hour wind blowing.

Frozen solid, the cubes clanked out of the quick-freeze to drop into packages for machine sealing. Every 24 hours a freight-car load of tubers moves through this single assembly line for the special type of frozen potatoes.

Other frozen products that follow somewhat the same process are French fries—both regular and crinkle cut—patties, hashed browns, and mashed potatoes. The latest form of potato on the market is a



**FRIED AND FROZEN.** French fries going to market first pass through a room where they are blasted by a 30-mile-an-hour wind, chilled to  $-30$  degrees F.



**PARED.** To maintain quality, hand work is still employed. These women spot bruises, cut them out with paring knives



frozen, stuffed baker. It is ready for butter or sour-cream dressing after being warmed in the housewife's oven.

In the dehydrating process, intense heat evaporates the water from the potatoes—about seven-eighths of the product. In the dry, packaged form, these “instant cooking” potatoes can be obtained in either granule or flake form. Dried potatoes also come in sizes cut especially for serving in salads, as hashed browns or American fries, au gratin or scalloped.

Being an ex-GI, I was intrigued by the potato peelers in the Caldwell plant. These comprise huge horizontal drums, rotating slowly. In one section, the potatoes get a quick surface cooking in a hot solution to loosen the peelings.

After discharge from this section, the potatoes go through a barrel washer where jets of water, under pressure of 150 pounds per square inch, literally blast off the peelings. The tubers, gleaming white, come out on a moving belt. Standing beside the belt are rows of women—yes, with old-fashioned paring knives. But there is actually little left for the women to do on any one potato.

They spot and cut out bruise marks. Here and there an eye hole needs coring, but for the most part even the peeling in the potato eyes has been whipped away by hydraulic pressure.

The Caldwell plant is particularly significant, for it was here that Jack Simplot

(Continued to page 242)

**FRESH AND PACKAGED.** Making the potato even more attractive to housewives has led to new marketing techniques. Even the famed bakers are boxed





## Station-Wagon Home

Americans may find one answer to outdoor living in the Hillman-Commer Caravan, the latest concept in "rolling homes." The caravan combines an automobile and living quarters on a single chassis and sleeps four adults and a child. It features a two-burner stove, cupboards, closet space, kitchen and dining tables and a water supply. Interior furnishings may be removed to convert the caravan into an all-purpose vehicle.



## Hot Snow Remover

Making short work of snow and ice, a new British "Snow Locust" machine blazes away with 12 jet oil burners, clearing up to five miles of highway or other paved surface in an hour. Each burner generates 120,000 B.T.U.s an hour at a temperature of 1200 degrees, not only melting the snow and ice on the surface but warming the runoff water enough to allow it to escape to either side before freezing again. Thin coatings are evaporated almost completely, leaving a dry surface.



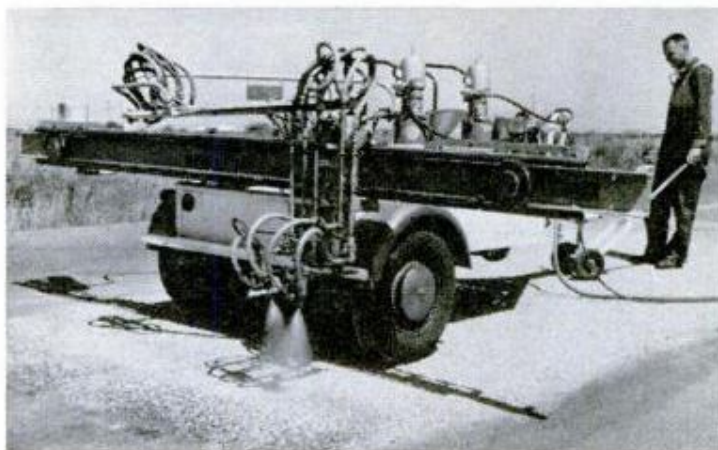
## Farm Sculpture

Sculptor without clay or stone, South Dakota farmer Earnest Bures works with farm products and pieces of discarded farm machinery to build animated floats for parades. On the float at left, the horses bob their heads and switch their tails while "walking"; the woman turns her head while the man nods his head and strums his guitar. The materials are oats, corn and grasses over a green willow frame, animated by a shaft from the tractor power takeoff.



### Rumbling Road Signs

It is possible a driver might not notice signs painted on a road near Richmond, Calif., that warn of a curve, but it is impossible not to hear the rumbling sound produced when a car passes over strips of sound-producing rock chips that are set in asphalt and covered with an isopolyester resin. Several of these strips are placed, as a test of the warning technique, along a one-mile stretch approaching a dangerous curve.

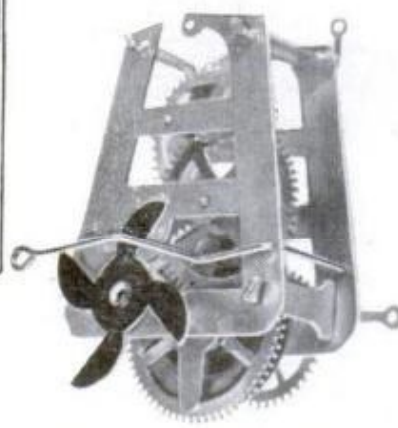
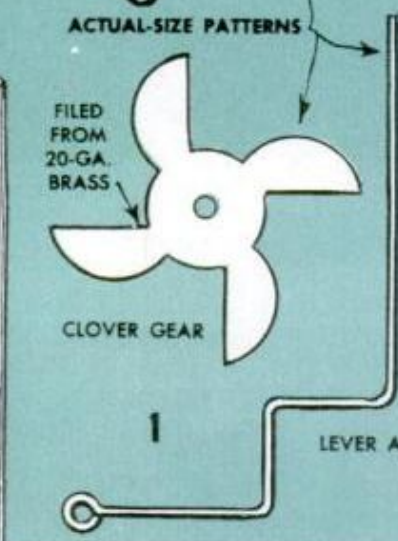
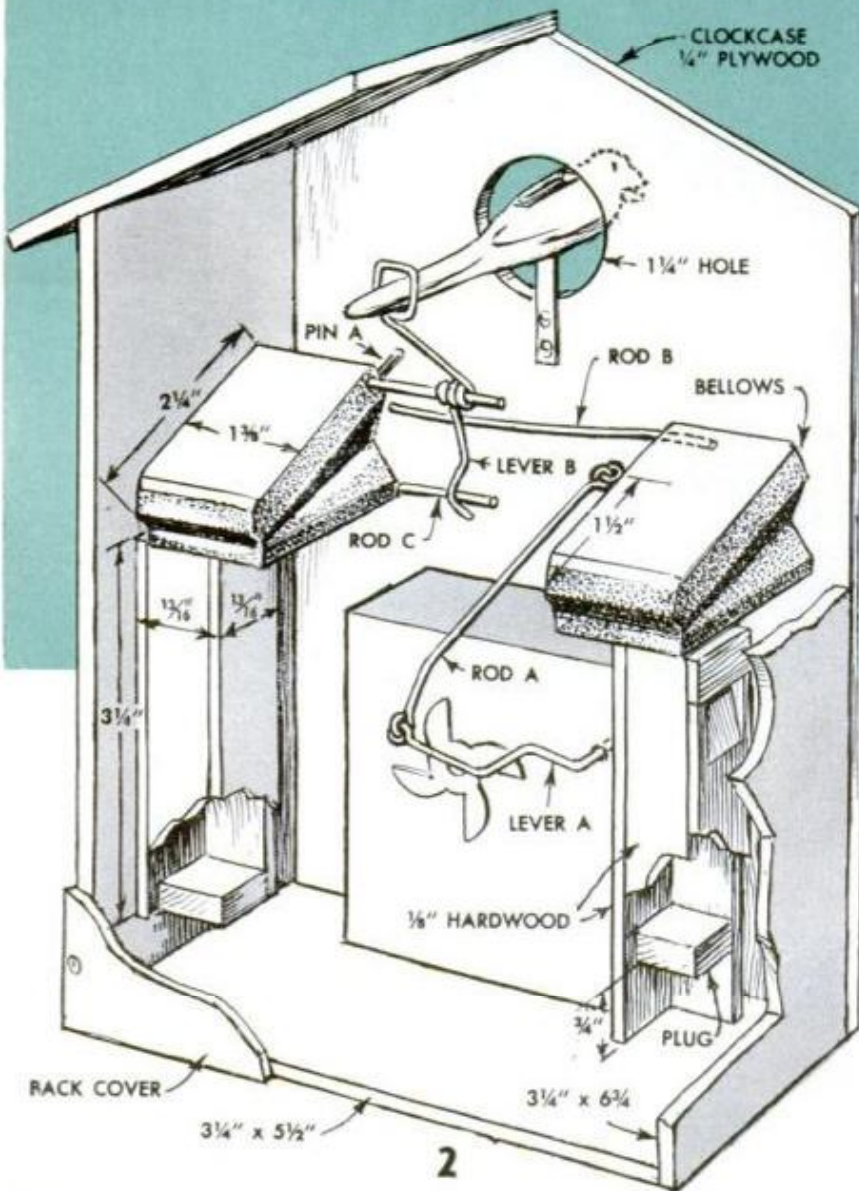
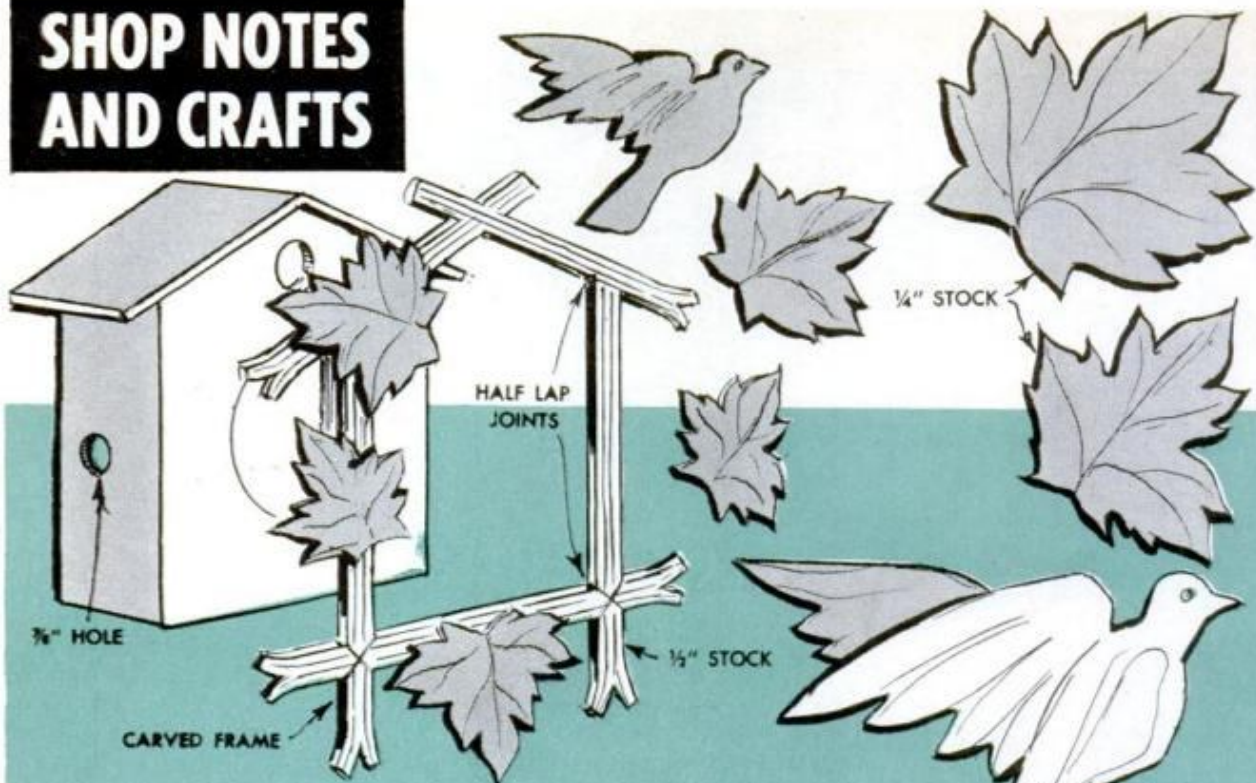


### Two-Way Rod Grip

Every fisherman knows he's supposed to hold a bait or spin-casting rod by the cork grip, but most let their left hand drift forward during the retrieve to a better-balanced grip under the reel. One rod manufacturer has finally yielded to this near-universal habit and built a rod grip that can be held either way. It's the new Style-Cast series by the Yankee Manufacturing Co., Royal Oak, Mich.



# SHOP NOTES AND CRAFTS



# CLOCK IN A BIRDHOUSE

Although the cuckoo clock is old in origin it still is one of the most popular of the wall timepieces

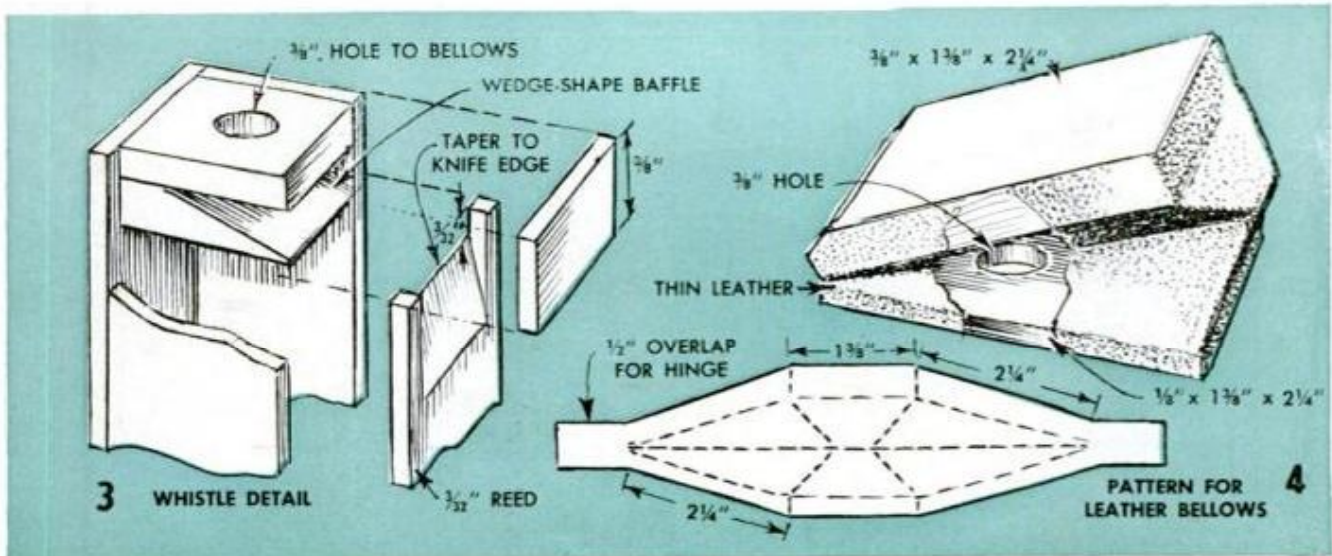
By Tom Riley

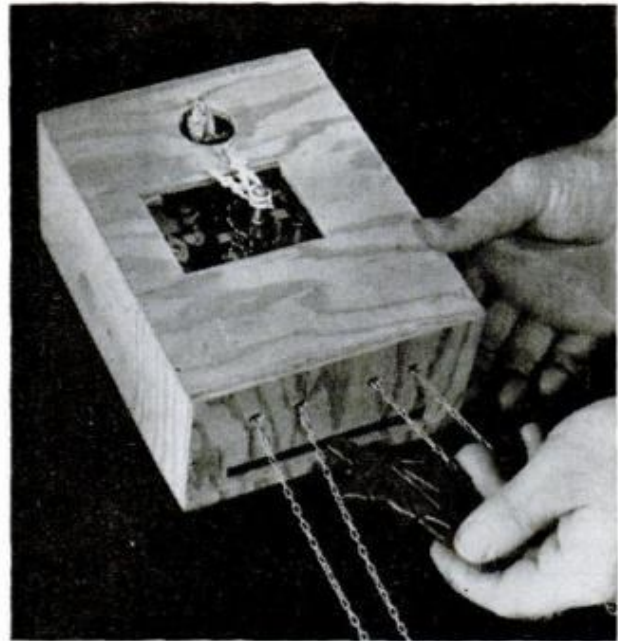
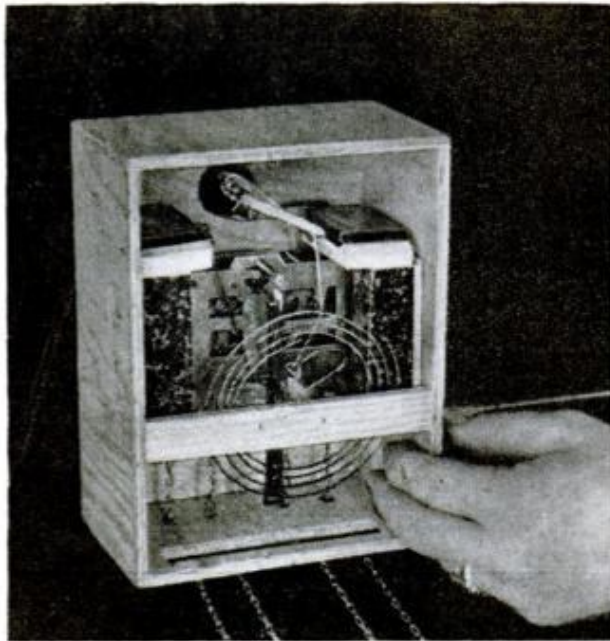
SO YOU'D LIKE to make a clock. One of the most intriguing and one of the simplest and most inexpensive to put together in its basic form is the cuckoo clock. You have a wide choice of movements, sequence of bird calls and types of cases.

You can go all out and purchase a movement and accessories which control two birds, a cuckoo calling the hours and a quail whistling the quarter hours, both calls being so remarkably realistic that you'll almost find yourself looking for the live birds in the room. Or, if you wish, you can have quaint music or even operatic selections of a sort on the hour and the quarter hour. In addition to the birds and the music these clock types are weight driven, have pendulums and strike the hour on a gong. For much less movement cost you still can have the basic cuckoo clock, a comparatively simple affair known as the hour type, in which the animated cuckoo bird calls the hour and half hour. This clock also is weight driven and has a pendulum. Finally, there's the simplest and least expensive of all, known as the 15-minute clock in which the bird is fixed and calls every quarter hour. This type is



detailed in Figs. 1 and 2 and a typical commercial movement also is shown in Fig. 2, the lower right-hand photo. Here again you have a choice. You can purchase and use the imported movement shown or you can adapt certain spring-driven alarm clocks to the purpose simply by making and attaching a clover gear, or clover wheel, Fig. 1, to the end of the minute-hand post, or cannon post. This projects at the back of the movement and usually carries a knurled hand wheel for setting the hands of the clock. Only this type of alarm clock can be used. Usually it is possible to use the alarm clock intact, installing in the manner shown and utilizing the dial, hands and bezel simply by cutting an opening in the case, or birdhouse, to admit





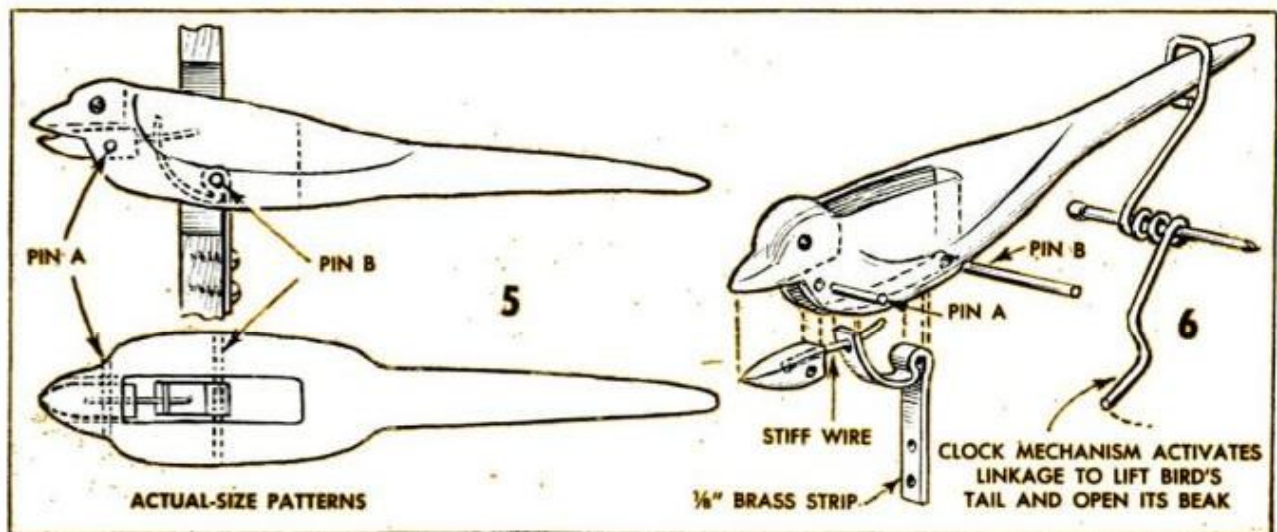
**THIS IS** the hour movement referred to below in which the bird is actuated by the movement, that is, it appears in the opening above the dial, calls each hour and half hour and withdraws. Clock is weight-driven

the bezel. This makes it unnecessary to purchase the standard wooden cuckoo-clock dial. Also, if you wish, you can purchase the whistles and cuckoo bird, Fig. 1, or you can make these parts as detailed in Figs. 3, 4, 5 and 6. Opening in whistle is located opposite opening in side of case.

Note carefully the position and relationship of levers A and B and rods A, B, and C, Fig. 2. At the start of the sequence the clover wheel, Fig. 1, gradually lifts lever A, which in turn gradually lifts, or opens, both bellows through movement of rods A and B, the latter rod contacting pin A after the first bellows has started to open. Then when the minute hand of the clock movement reaches any quarter hour, the clover wheel releases lever A, the bellows close, one after the other, sounding the "cuc-koo" call. As rod B falls the end strikes lever B which raises the tail of the bird and opens the bird's beak to complete

the sequence. The lower half of the beak pivots on pin A in Fig. 5 and the body of the bird pivots, or tilts, on pin B. Both pins are shown in Figs. 5 and 6.

The case shown in Figs. 1 and 2 is about the smallest and simplest which is practical. It can be built with a plain straight front as in Fig. 1 with a roof slope of about 30 degrees and ornamented with simple carved leaves and a bird attached to a carved frame which is screwed or bradded to the front. Or, the roof can be made with an overhang at the front and the carved frame made in two parts, the top A-member being attached to the roof overhang and the balance to the front of the box, or house. Or if you wish, you can go in for a more detailed and elaborately carved case, or house, starting with an hour movement and basic case like that shown in the photos above and adding a carved front piece and A-member on the overhang. ★ ★ ★





## Dry Ice Pops off Asphalt Tile

Removing asphalt tile from a kitchen, basement or bathroom floor is easy to do if dry ice is used to freeze the tiles and adhesive before trying to take them up. A block of dry ice laid on a tile, freezes the mastic and tile in minutes after which the tiles are easily pried up or may pop up freely. A

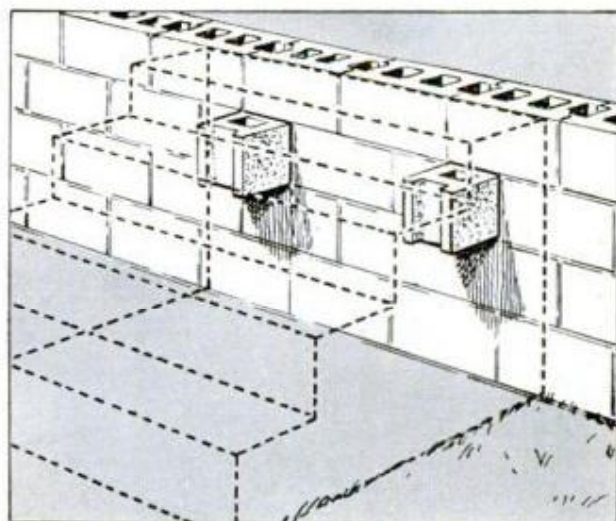
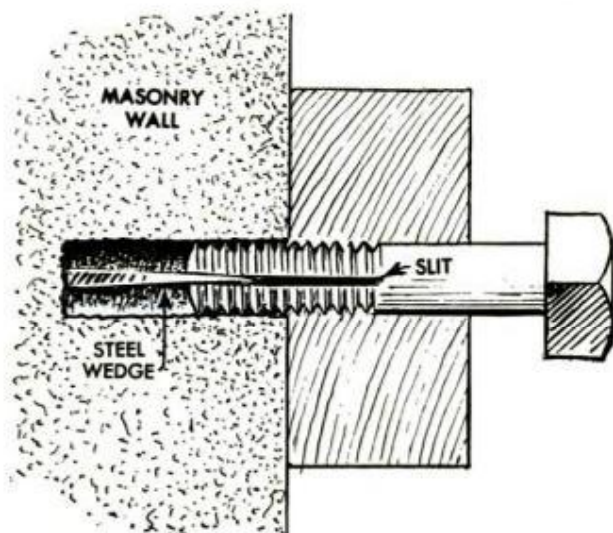
50-pound block is usually large enough to remove all the tile from a 9x12-ft. area. Dry ice normally is available from ice and ice-cream distributors. *Caution:* Blocks should be handled with gloves or wrapped in cardboard to avoid "burning" the hands. And remember, work in a well-ventilated room.

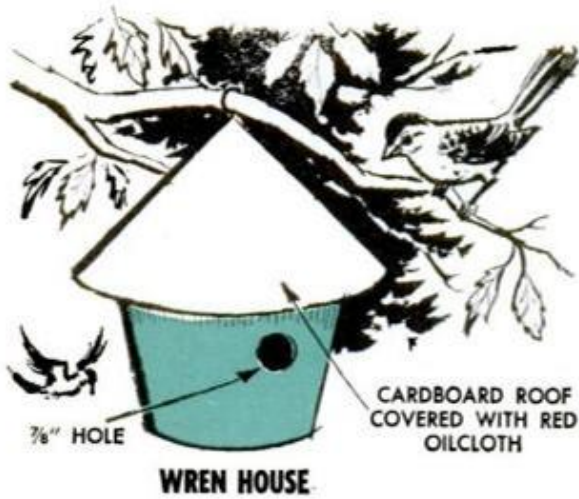
## Bolts Convert to Anchors

Don't throw away those old square-headed machine bolts. Instead, convert them to anchor fasteners for masonry work. Threaded portion of bolt is first slit about half way up the shank and then fitted with a steel wedge that spreads the two halves when driven into place.—Robert Beasley

## Anchoring Steps to Wall

Poured concrete steps are keyed to a concrete block wall by setting two or three of the blocks at right angles to the wall, as shown in the illustration. The blocks extend from the face of the wall into the step form to serve as anchors which prevent the steps from settling.—Bill Horrell



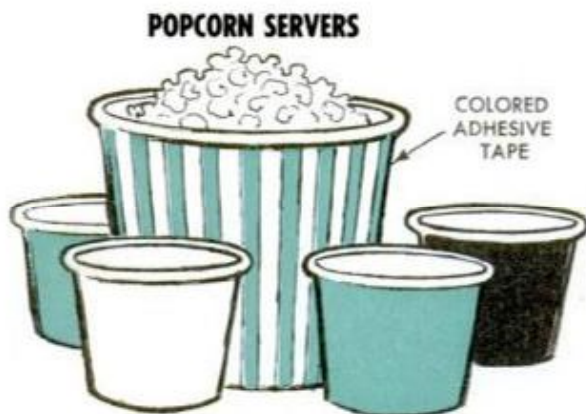


# Bucket-Liner Craft

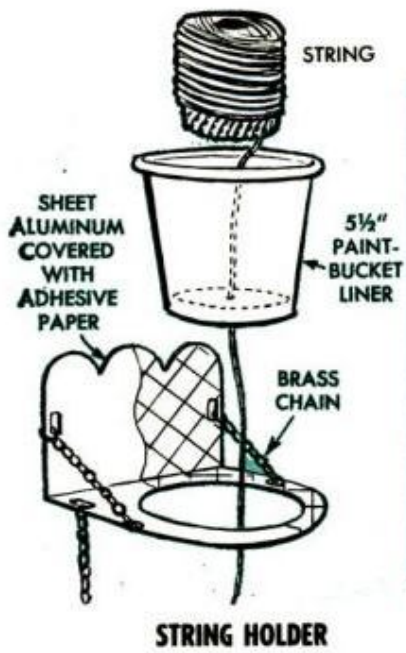
IF YOU PUT your mind to it, you can make all sorts of novelties from the disposable cardboard paint-bucket liners that paint stores sell



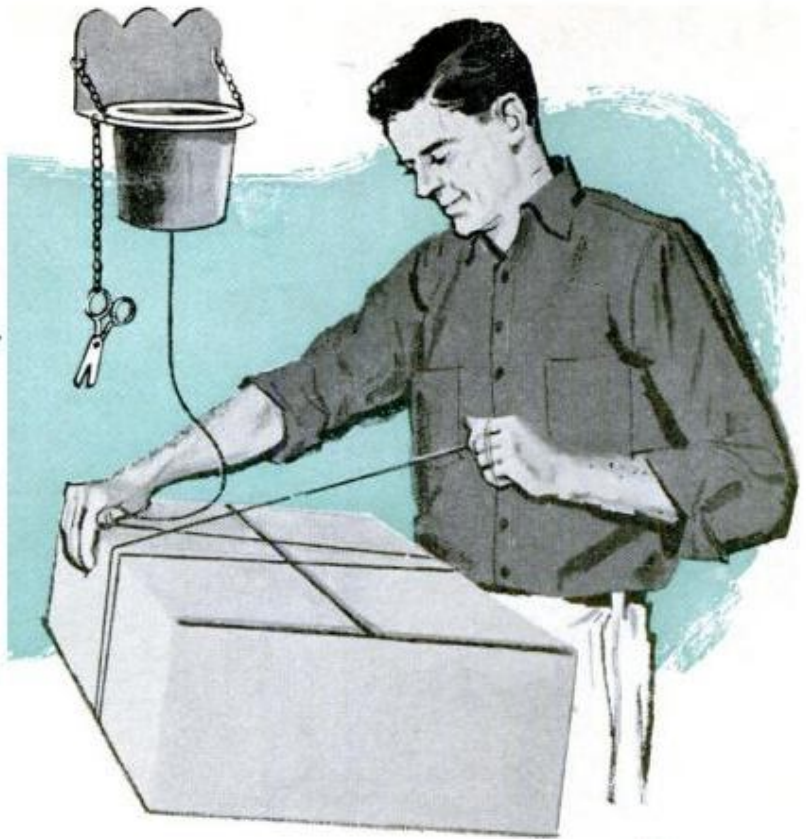
By A. and B. Joselyn



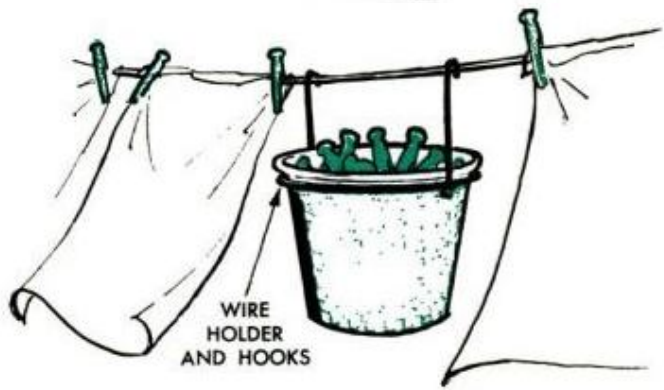




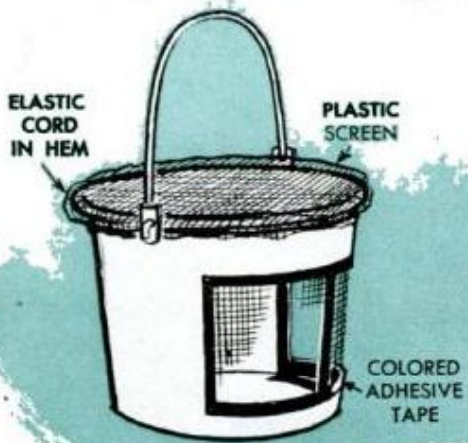
**STRING HOLDER**



**FLOWERPOT JACKET**



**CLOTHESPIN BASKET**



**INDOOR ZOO**



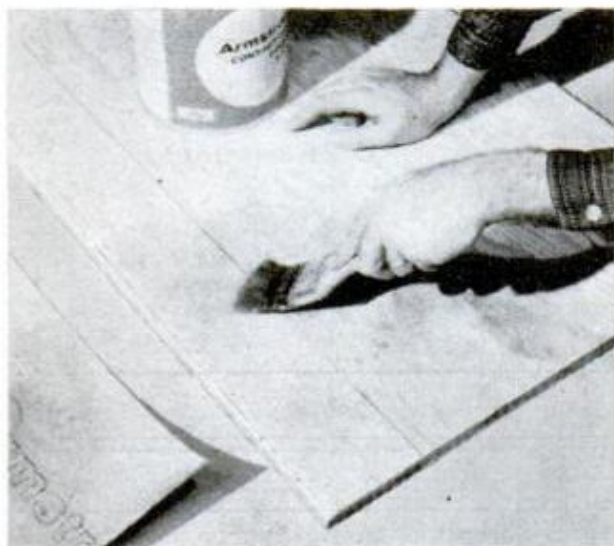


WITH BACKSPLASH and counter members placed edge to edge on floor, adhesive is applied to both surfaces

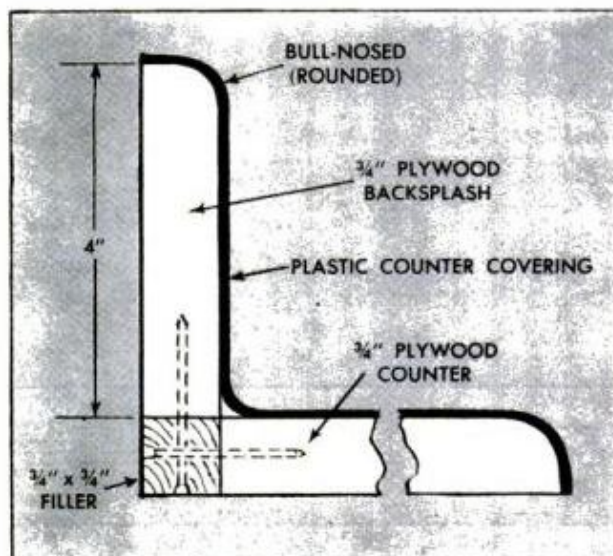
## COUNTER ATTACK

ATTACKING the problem of putting a slick top on a new kitchen sink counter has been made exceedingly easy for the do-it-yourselfer by following this clever installation technique when working with flexible vinyl counter-top material. Developed by the Armstrong Cork Co., this new method permits the backsplash and counter surfaces to be covered with a single sheet of plastic without a seam for dirt and moisture to collect.

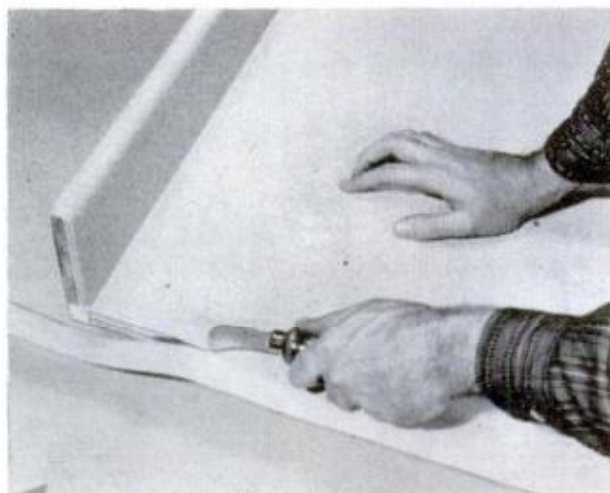
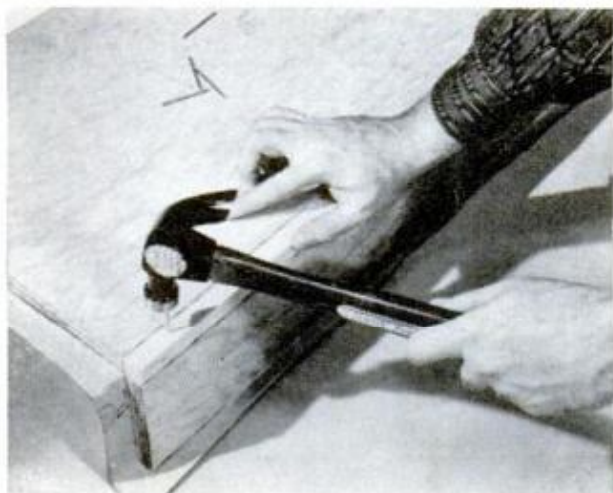
Here's how it is done: First the top edge of the plywood backsplash and the front edge of counter surface are rounded and then the two are butted edge to edge flat on the floor. A coat of contact cement is applied to the back side of the vinyl covering and to the plywood and allowed to dry until tacky. Then the vinyl is applied without disturbing the plywood pieces and rolled smoothly over both rounded edges. Finally, the backsplash is bent up to form a 90-deg. angle and nailing a  $\frac{3}{4}$ -in.-sq. filler strip added as shown in the detail.



AFTER VINYL is applied, neat cove, is formed by bending backsplash 90 deg. and securing with cleat

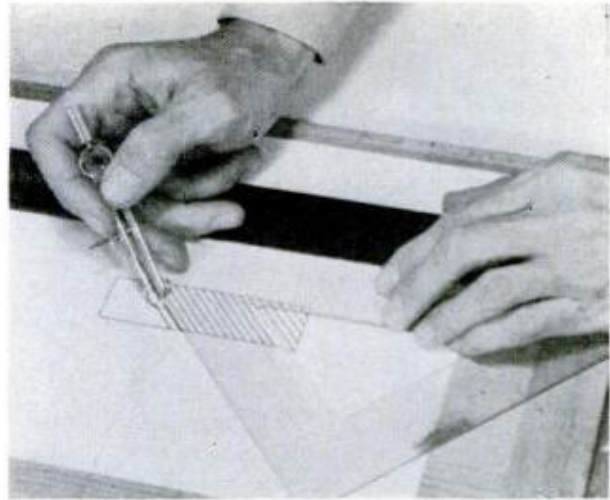


EXCESS IS TRIMMED off even with sides with linoleum knife, then completed top is installed as single unit



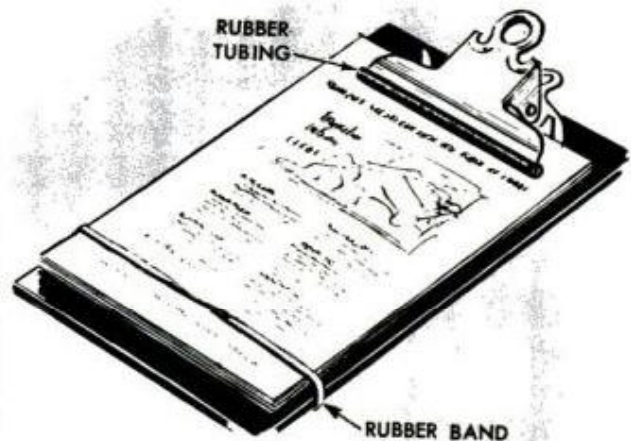
## Bow Compass and Triangle Used for Crosshatching

Drawing multiple, closely-spaced parallel lines, as in crosshatching, can be done quickly with the aid of a bow compass and plastic triangle, one edge of which is placed on the preceding line as shown. The triangle serves as a guide against which the steel-pointed leg of the compass is held lightly, while the crosshatch lines are drawn with the lead point of the other. Spacing of lines desired is easily obtained by adjusting the knurled nut. The steel point may be replaced by a rounded one to avoid scratching the paper.—H. Hanscom



## Rubber Band and Tubing Improve Clipboard

Clipboard users will find that the addition of the two items shown in the drawing at left will make the board more useful. A slit length of rubber tubing slipped over the edge of the clip blade, gives the latter a better grip on thin sheets of paper and also prevents it from smudging carbon copies. A rubber band wrapped around the board and lower margin of the paper keeps the latter from being blown about in a wind.—D. O. Van Gilder



## Shotgun-Shell Candle Lights Camper's Fire

Campers and other sportsmen who may have difficulty starting a campfire on wet days can make this job easier by carrying a few shotgun-shell candles with which to provide a sustained flame. The candles are made by pouring melted paraffin into empty shells in which string wicks are suspended. The casting of the shell protects the candle from breakage, while the flat, heavy metal end keeps it upright when used as a light.—Bil Toman



## Fruit Jar Improves Tone Of Pocket-Size Radio

Some pocket-size transistor radios produce a deeper, more melodious tone, when placed speaker down on top of an open fruit jar as shown in the photo at left. The jar acts as a resonance chamber which seems to add more of a bass tone to the speaker, eliminating the diminutive flat sound common to many small speakers. For best results, the mouth of the jar should be just large enough to leave a small opening on each side of the radio case as shown. A large glass tumbler also may be used for this purpose.—Wayne Floyd





**1. LACK OF TROUSER HANGERS** is no excuse for getting unsightly fold creases on trousers that are hung on bare-wire hangers. Slip a magazine or newspaper over the hanger at the fold to give it a larger radius. Then place the trousers on the hanger as shown

**2. PARAKEET NEED A MANICURIST?** The next time your parakeet's claws get so long that they snag clothing, wrap sandpaper around a length of garden hose and slip it on the perch. In a few days the bird will have accomplished a fine do-it-yourself manicure

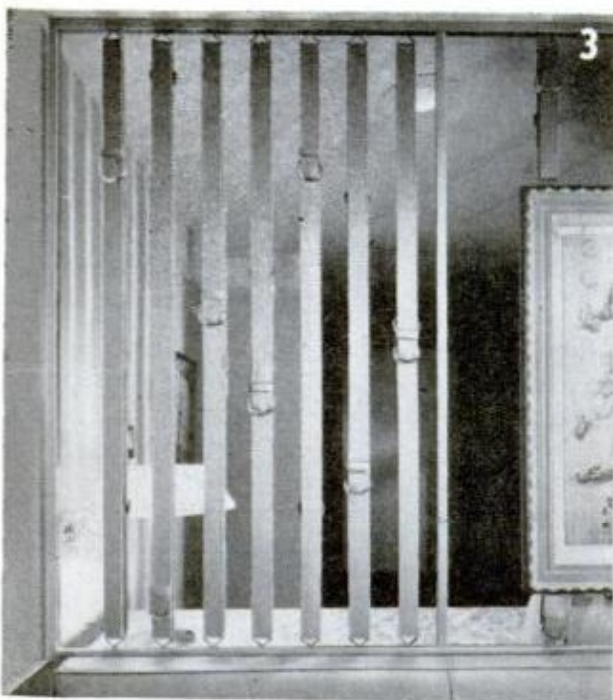
**3. THIS UNUSUAL ROOM DIVIDER** consists of what appears to be several trouser belts attached to a frame, which is fastened to the ceiling at the top and dresser back at the bottom. "Belts" are strips of plastic material on which buckles are positioned



**4. PHONE NUMBERS OFTEN USED** but not always remembered are kept at your fingertips when recorded on a card that is inserted in this combination base and holder. The accompanying drawing shows how it is glued together from 1/4-in. plywood

**5. WOODEN POTATO MASHER** will not take on permanent stains when crushing fruit if a plastic bag is slipped on it and tied around the handle. An added bonus is that elderberry, grape and cherry skins don't cling to the masher, saving cleaning time

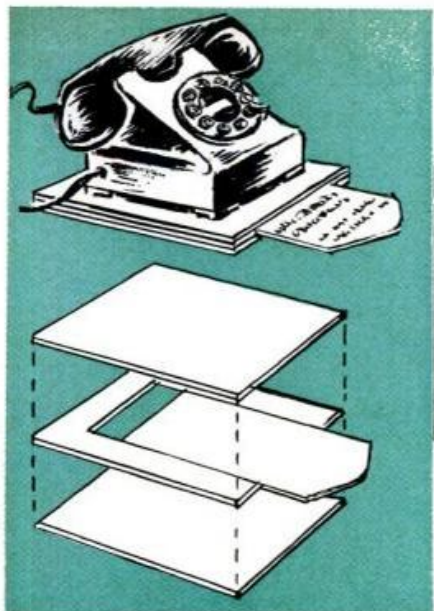
## SOLVING HOME PROBLEMS



**6. NO PAINT MESS** is left to clean up when brush, paint, mixing paddle, etc. are carried to small jobs or touch-ups in a cut-down corrugated-cardboard box such as this. Everything needed is close at hand and when the box becomes soiled it can be discarded, or lined with newspaper and used again

**7. AN OLD STUNT** but one often forgotten is to use a pencil as a means of pouring liquid from a large container into a small one without spilling it. The pencil is held against the open top of the larger container, the point centered within the opening of the smaller one while pouring as shown

**8. SMALL SPICE CANS** stored on a cabinet shelf are easy to get to when placed on swing-out shelves that pivot on wooden dowels fastened between cabinet shelves. A 1/2-in.-thick plywood spacer fitted on the lower end of each dowel, provides clearance at the bottom. A backboard holds each shelf unit together



5



4



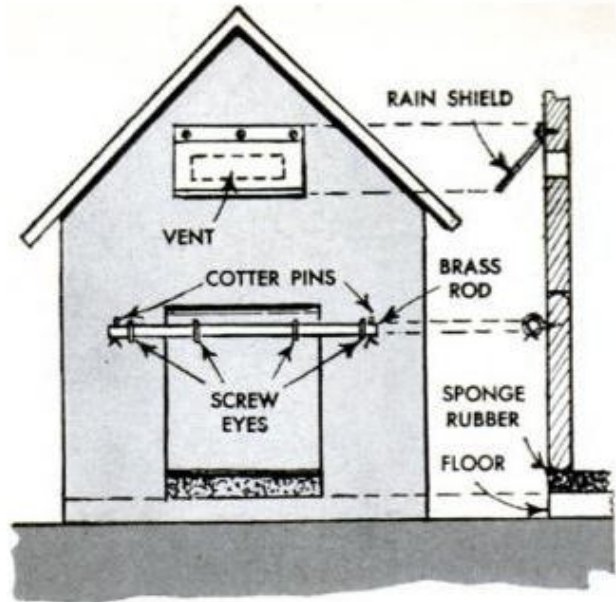
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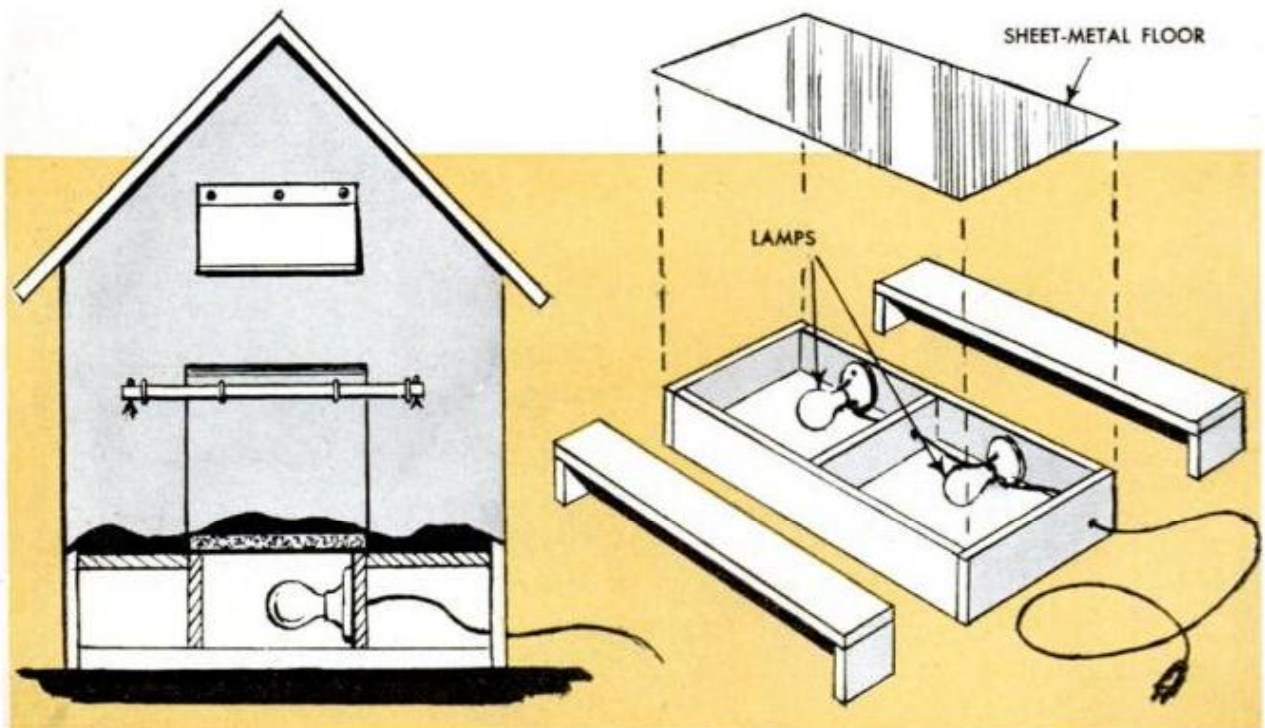


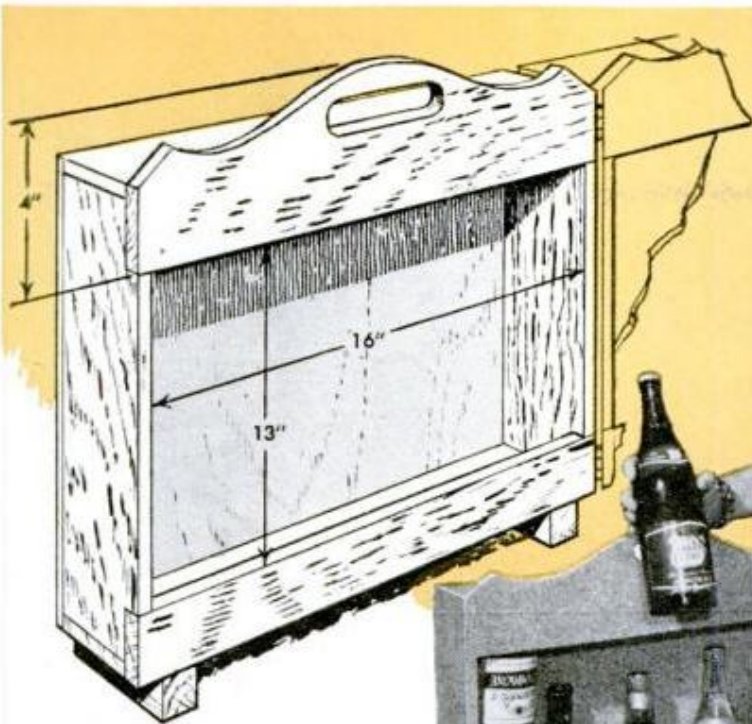
## "Radiant Heating" for Rover

AS LONG AS your pooch pays his dog-house rent (in the form of companionship, watchdog service, entertainment, etc.), the least you can do is winterize his outdoor quarters. To make him comfy and happy to have you as his master, cover the entrance with a door to keep the cold out and provide a rain-shielded vent at the top. If you live in an area of rugged winters, you might even consider installing "radiant heating" of the type illustrated below. The heating unit consists of two 40-W. lamps mounted in a drawer-type compartment. The top is covered by sheet metal ( $\frac{1}{16}$  in. to  $\frac{1}{8}$  in.) which also serves as part of the dog-house floor. The metal, being highly conductive

of heat, does an efficient job of warming the blanket or straw used as bedding. Two non-removable side sections provide the remainder of the floor. If heavy-gauge, sheet metal is not obtainable for the floor, use the heaviest available and nail it in place permanently, leaving the bottom of the unit open for access.

The top and bottom edges of the door are rounded so it will swing in and out and close snugly against a sponge-rubber threshold. A brass rod screwed to the face of the door at the top pivots in screw eyes. The rain shield over the vent is formed from a piece of sheet metal bent as shown in the detail and attached with screws.





DESIGNED to hold up to quart-size bottles, the overall dimensions of the bottle compartments can be altered to suit individual requirements



## Suitcase Bar Is the Life of the Party

For informal entertaining this portable refreshment bar is sure to make a hit with guests and at the same time give the host a chance to relax and enjoy the fun. It can be used to serve refreshments to guests outdoors or carried to the gang in the basement recreation room. And the kids will feel grown up when mother serves them

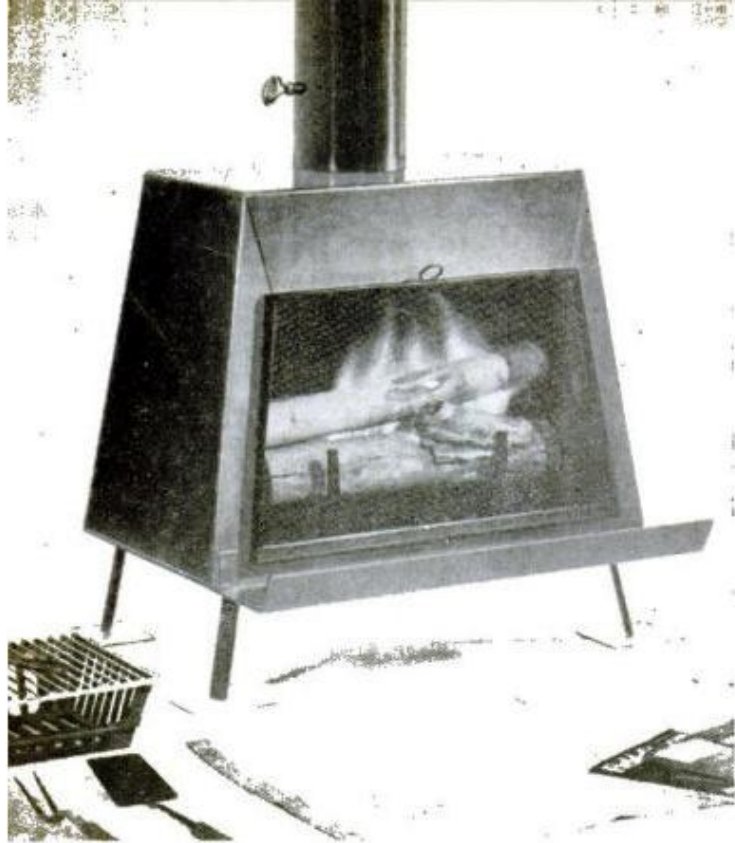
soft drinks from the bar. To make the case, lay out parts for two identical sections. Backs are of  $\frac{1}{4}$ -in. plywood, and the feet are of 2 x 2 stock. The rest of the parts are cut from 1-in. stock. Two hinges hold facing sections together. If a clear finish is used, make the case of choice hardwood, but for a painted finish pine will do.

## Protect Gluing Surfaces With Wax-Paper Shields

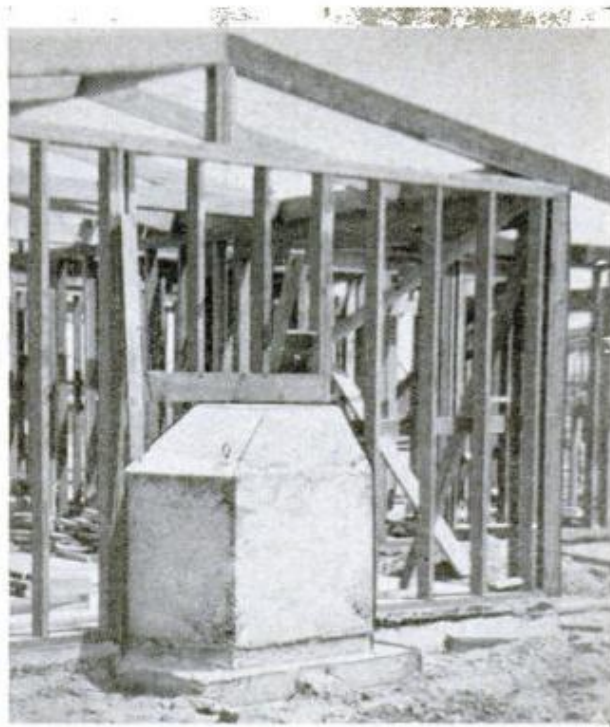
When using wooden blocks to protect a clamping job from being marred by metal jaws, the blocks sometimes stick to the work because of excess glue. But this can easily be avoided by placing a double thickness of wax paper between the blocks and the work. After the glue dries, the clamps can be removed without damaging the finished surfaces.—Bil Toman

**Cleaning grease and oil** from small parts can be a real chore when equipment must be taken apart before dunking it in solvent. An easier way to clean small pieces of metal is to paint them with ordinary rubber cement. When the cement dries, rub it off and the dirt will go with it.—Dave Parker





**THIS FIREPLACE** works on the order of an old-fashioned heater and comes complete with a firescreen



**PRECAST FIREPLACE** sets on an outside wall and adds little to original cost of new construction work

## SEARCHING FOR A FIREPLACE

ALTHOUGH no longer necessities in present-day homes, the firelight and candles of an earlier day still hold a place in modern living. A large percentage of new homes include fireplaces, many of traditional masonry construction. And coming rapidly into favor with young homeowners are the prefab hearths, many of which are self-contained, free-standing units that match the open architecture of new-home planning. A sharp do-it-yourselfer can install a pre-

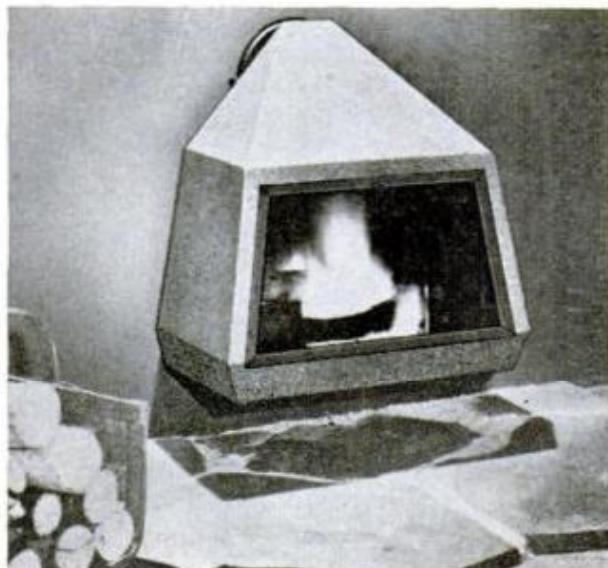
**NOT A WOOD BURNER**, this fireplace uses gas or electric heat in artificial logs and requires no flue



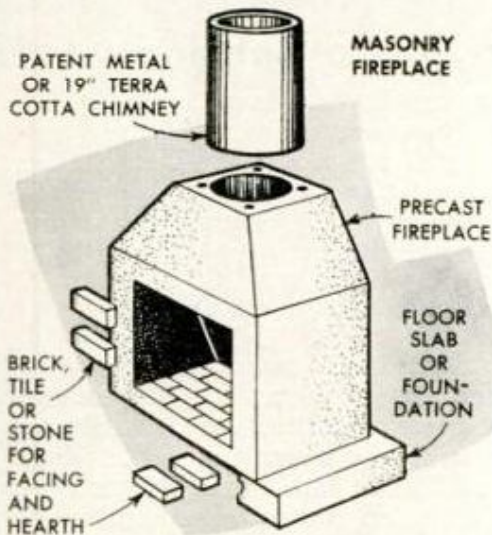
fab in a day or so at half the cost of a conventional fireplace.

Prefab fireplaces can be located almost anywhere in the home as most of them are light enough to be supported by conventional floor joists, especially those of the free-standing types. Others are designed to be located along the wall, in the wall or even hung on the wall. There also is the prefab masonry fireplace you see detailed. It consists of masonry parts precast to size.

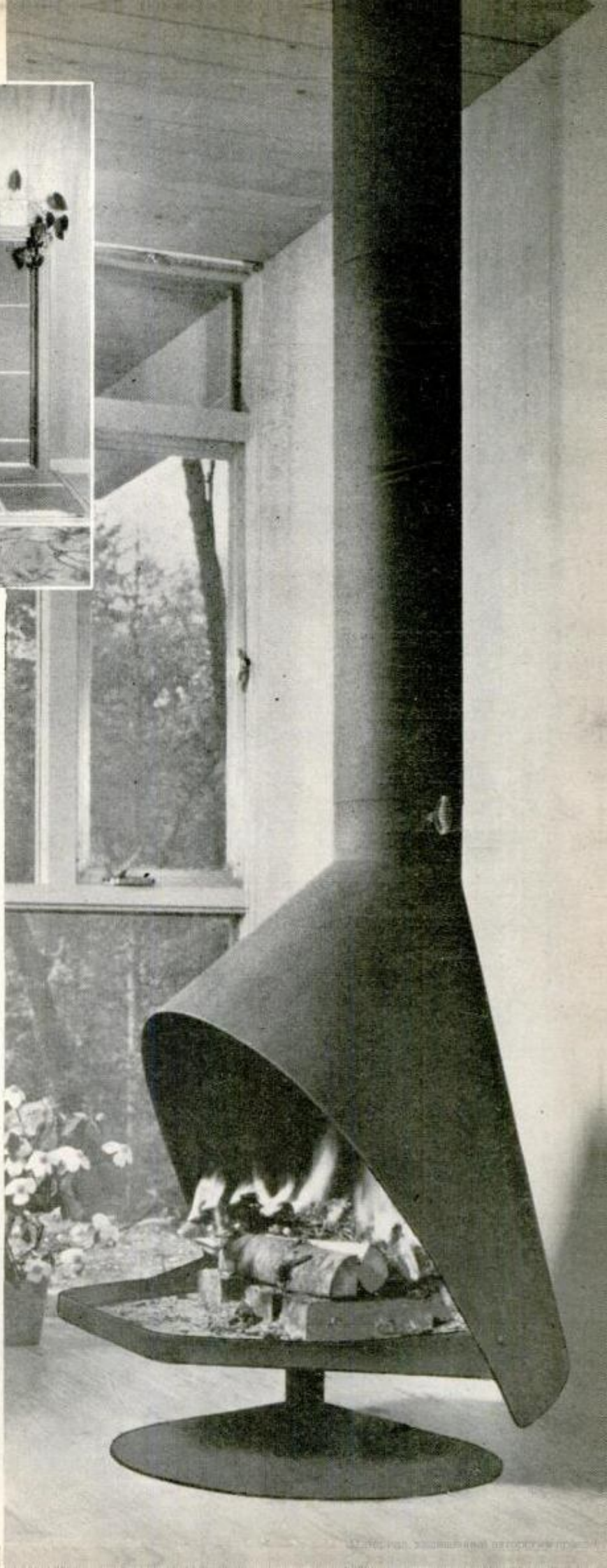
**FIREPLACE CONNECTS** to flue with 6-in. ventpipe. Metal firebox is coated with a vitreous porcelain

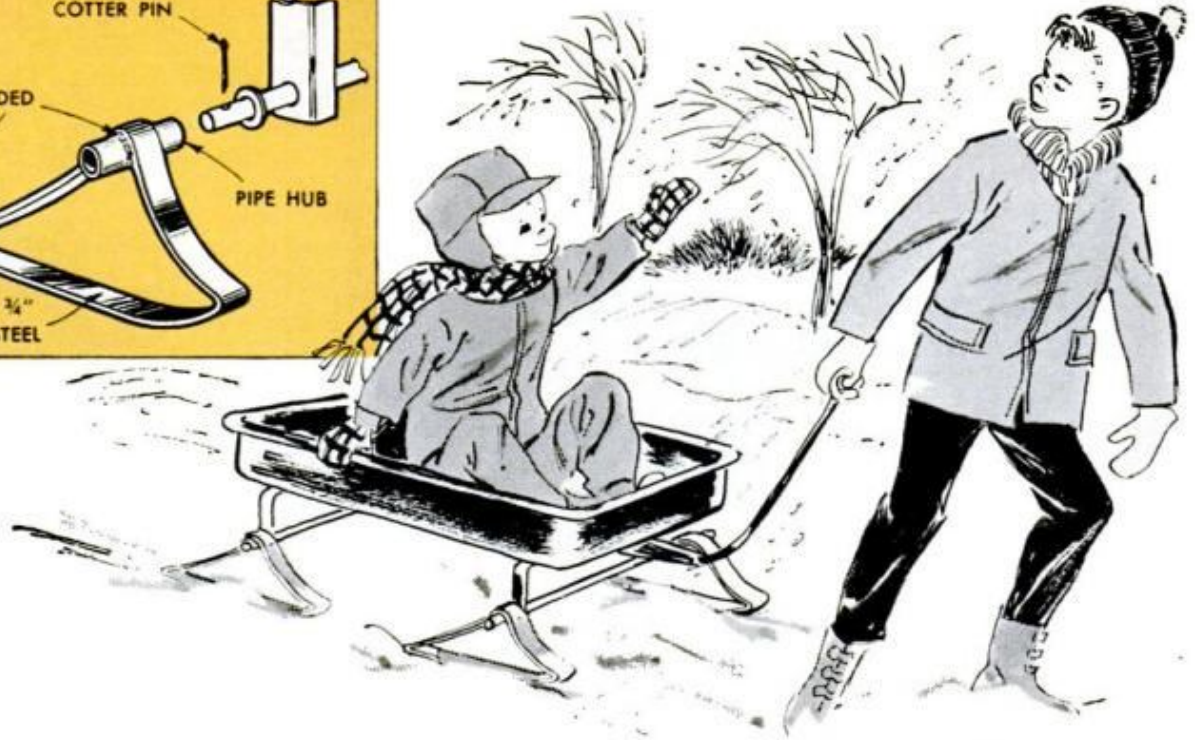
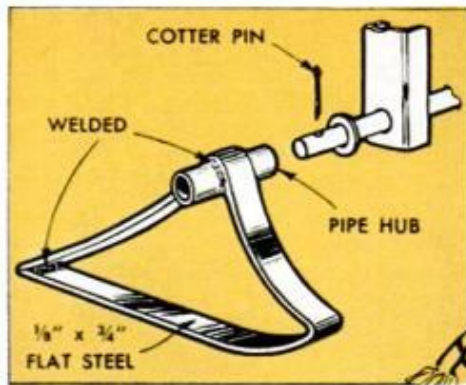






Before you shop for a prefab fireplace decide where you're going to locate it in your home. Then, if it's to be a free-standing type having a smokepipe or a metal or ceramic flue, check to locate any ceiling joists and rafters that may have to be cut to provide openings for the flue through the ceiling and roof. Mark the location of the openings and if rafters and ceiling joists must be cut remember that the cut ends should be supported by headers spiked to adjacent rafters and joists. As a rule a single 2 x 6 header will be sufficient to support the ends of rafters and joists cut away for small openings. Only large openings require use of doubled 2 x 6 headers. Other steps in the installation will be covered by instructions that the manufacturer includes with the prefab unit.





## Demountable Runners Convert Wagon to Bobsled

Changing over to runners when the going gets slick means you can get year 'round fun from a coaster wagon. No longer need it be put away for the winter. Besides converting a wagon into a sled, the runners also can be mounted on a baby carriage to

make pushing easy in heavy snow. The detail shows how each runner is formed from a single length of flat steel, welded together and then welded to a short pipe nipple of a size to fit the axle. The original cotter pins are used to hold the runners.—Hi Sibley

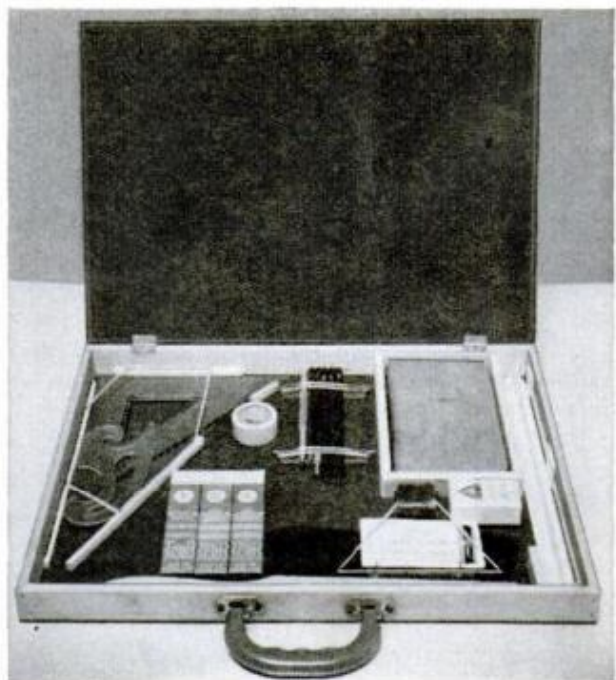
## Steel Wool Holds Screw

When a wood screw works loose and won't tighten due to an oversize hole, try packing the hole with steel wool. Force in as much as possible, cut off excess and then replace the screw. The wool will bite into the wood and wedge the screw tightly.



## Case for Drafting Tools

One student draftsman solved his problem of carrying drawing instruments by making this custom-fitted case. Hardboard applied to a light wooden frame forms the bottom and lid, the latter being hinged and fitted with a catch and suitcase handle.



# My Problem Was How...

WITH A wheelchair patient to bring in and out of the house several times a day, my problem was to find a way of setting up a permanent ramp that would not block doorways or sidedrive, yet have an easy slope of 10 percent or less. Since the front entrance is 45 in. above ground level, a 23-ft.-long ramp was required. Much too long to extend from the front or side of the house, the only possible solution was to build the ramp along the side over a flower bed as shown in the photos. It is made of 2-in. lumber, except for the hinged  $\frac{3}{4}$ -in. plywood platform at the top, side door panel and extension into the driveway, all of which flip out of the way when not in use. Built to a width of 34 in., toe cleats along the center of the inclined portion and a high sturdy railing, make the ramp safe and easy to use.—Frank H. Kirchner



**PLYWOOD PLATFORM IS LOWERED** into position by rope to connect head of ramp with porch floor. Platform is stored on porch when ramp is not being used

**HINGED "DRAWBRIDGE"** across side entrance is swung back onto ramp when latter is not being used so that door can be opened without interference

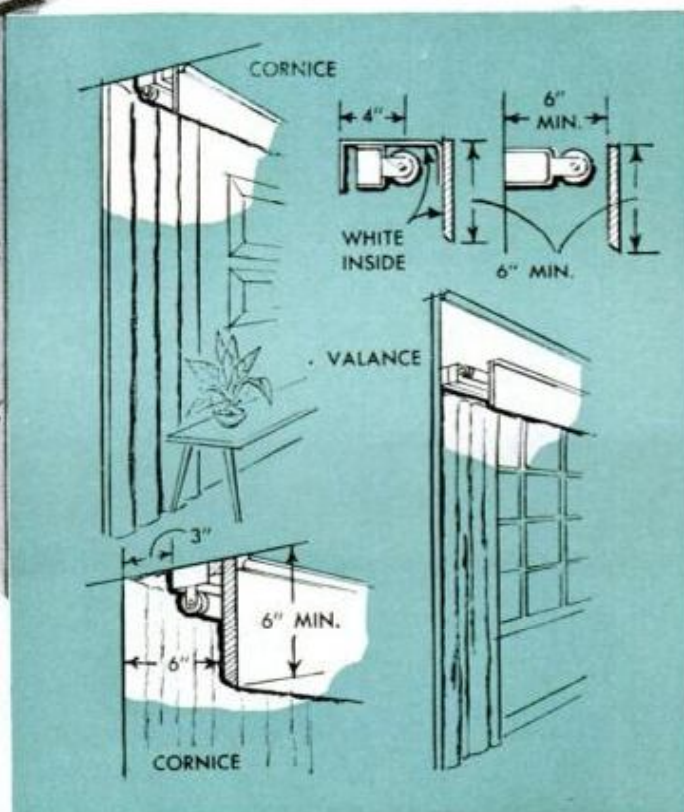




# ACCENT WITH LIGHT

**G**OOD LIGHTING is more than candlepower. It's visual comfort, convenience, safety and relaxation in your home. It can dramatize decor in any room, create a mood, provide an emotional lift at the end of the day. It's not expensive and you can build many of the most attractive accent lighting pieces yourself with only a few household tools.

Lighting should provide both, general accent and spot illumination. General lighting eliminates pockets of darkness and floods rooms with low-level light for reading or relaxing. Without general illumination, strong lights produce glare, caused when you look from a dark area into a bright area. There are also spots where accent lights may be used to achieve a decorative effect. Over the planter-divider is

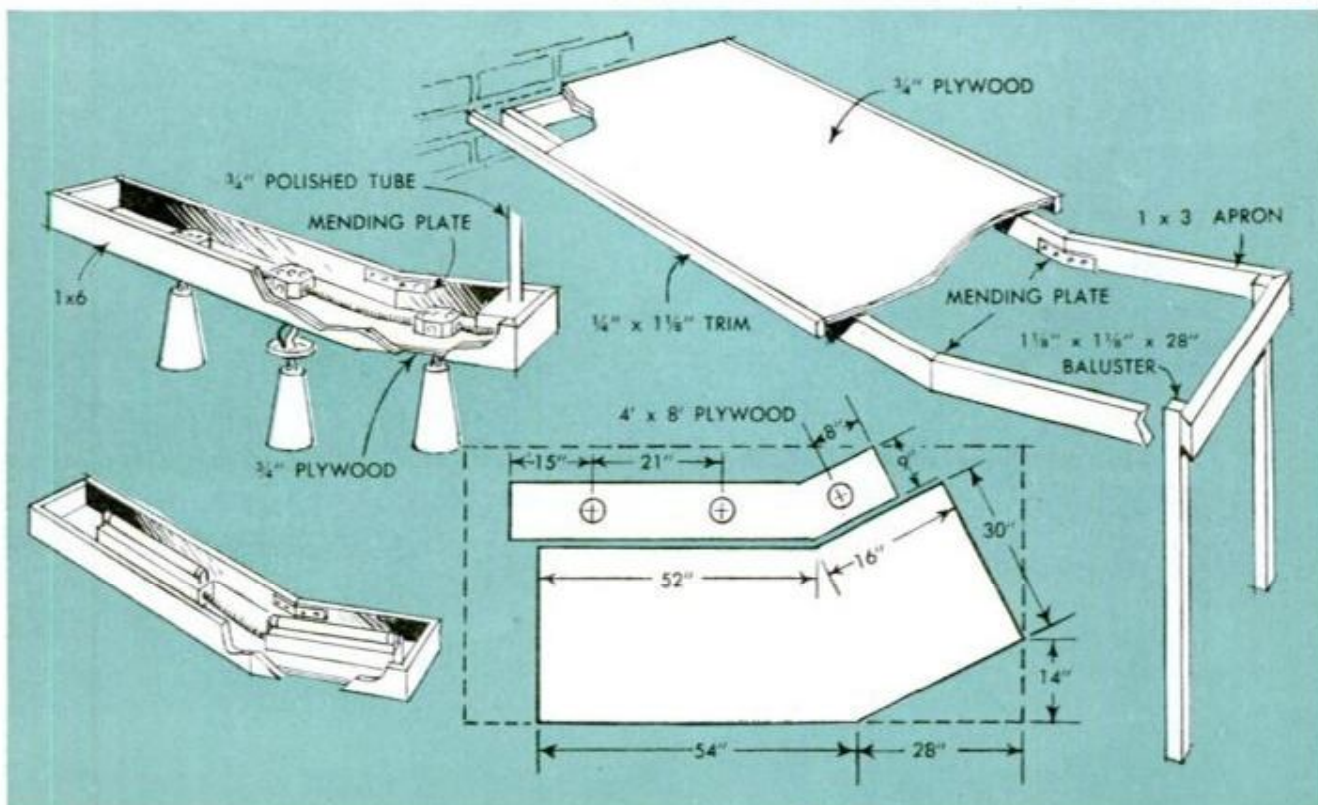


such an area. The top light gives sheen and richness to plants, even helps stimulate growth.

The hanging planter supports the light fixtures and hides wiring and outlet boxes. At the wall end, box is nailed to studs. Metal tubing supports the hanging end and is secured to the box and joist by metal pins or flanges. Built-in lighting on walls and over windows is functional as well as decorative. A cornice is often placed along an entire wall, sends a wash of light down the draperies.

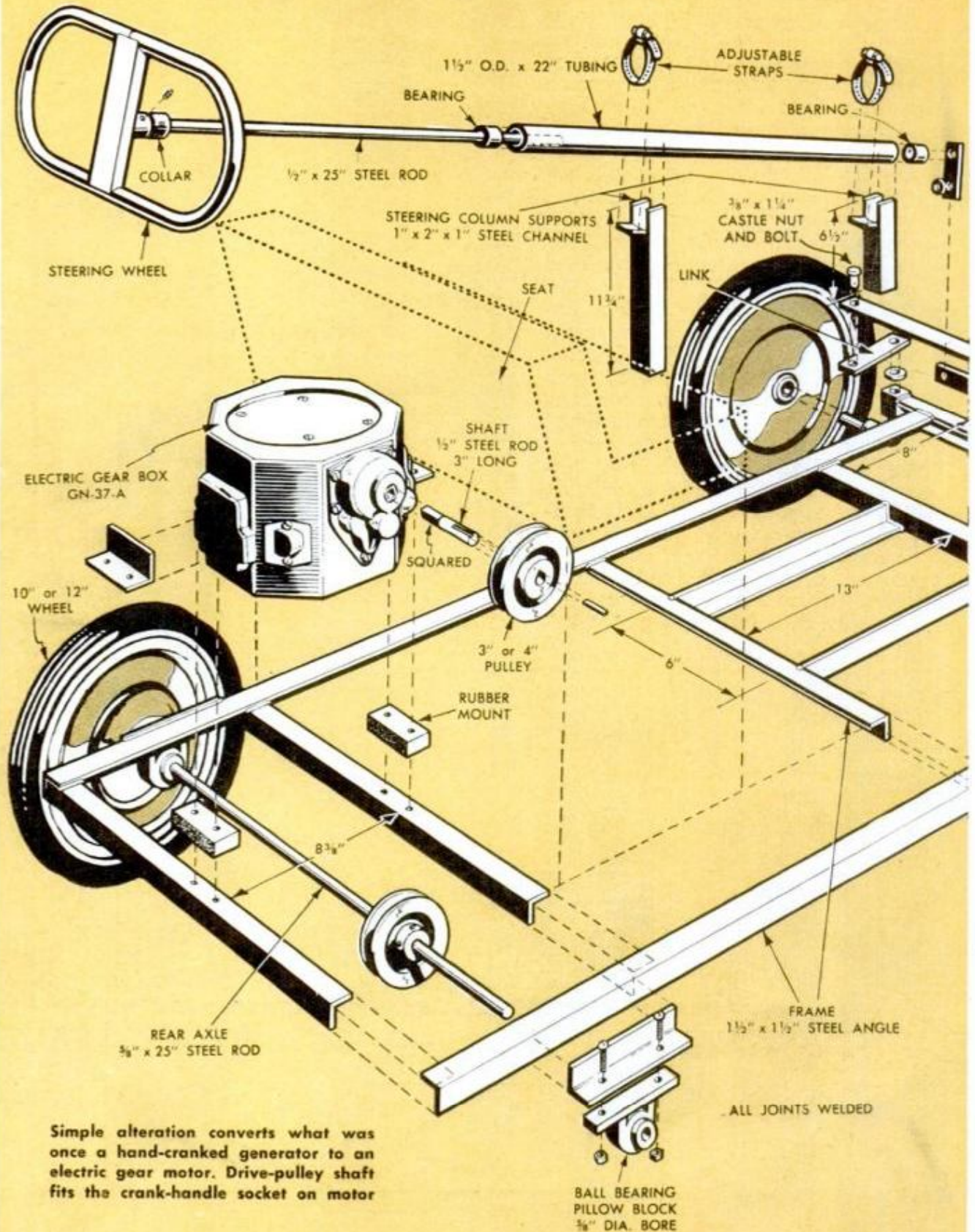
Boxed wall units are inexpensive and easy to make. Inside surfaces are painted white to reflect as much light as possible. Generally, warm white fluorescent tubes are best for wall units. A dimmer control adds flexibility for controlling the level of illumination.

The dining-table divider and fixture canopy detailed at the right are cut from one piece of plywood, the apron for the table is 1 x 3 stock and baluster stock is used for legs. If the table and fixture are fastened to a masonry wall, as in the case of the original shown at the right, attach them with masonry anchors. Use metal mending plates to reinforce the apron and fixture canopy. If wiring extends from the ceiling, wire may be concealed in the metal tubing which serves to support the outboard end of the canopy. ★ ★ ★

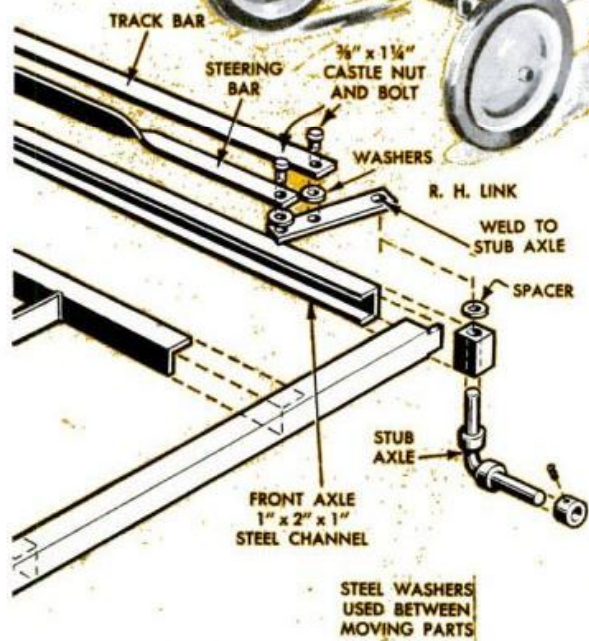
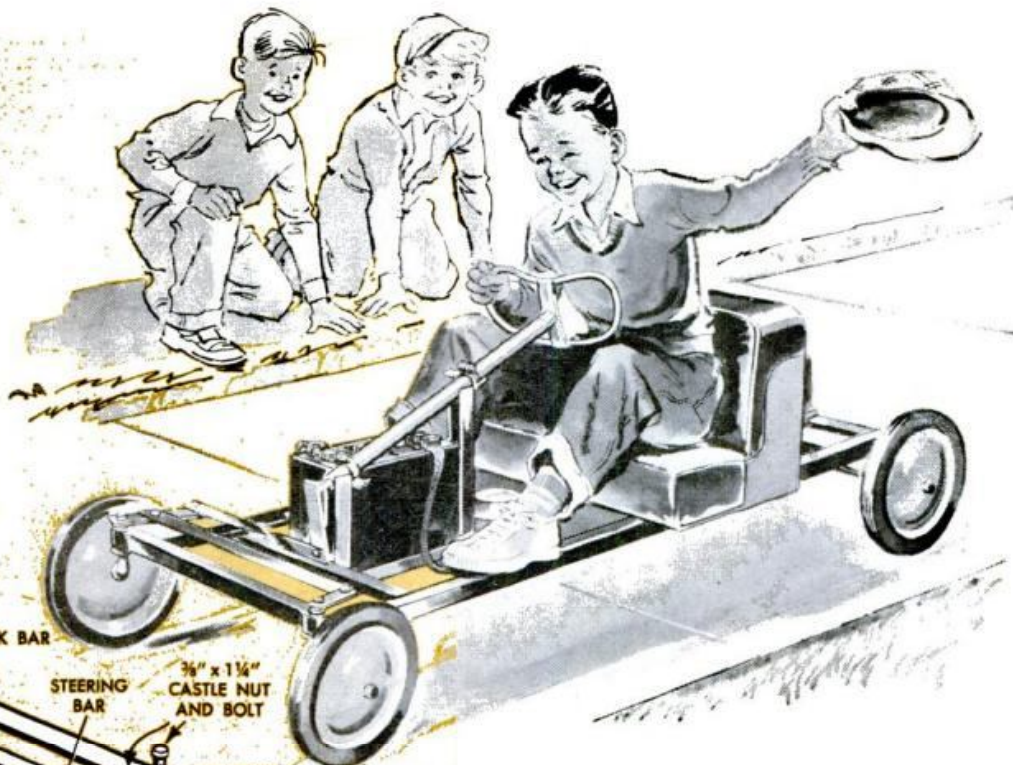


## SIDEWALK HOT ROD

By Ruth VonGnechten and John Ringle, III



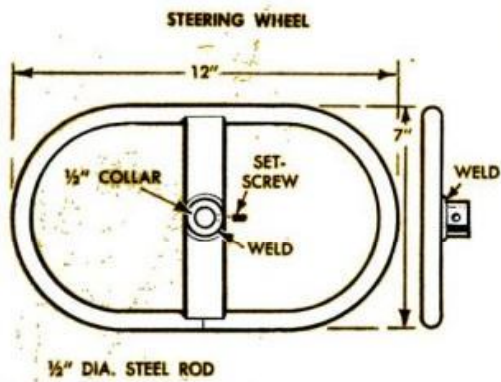
Simple alteration converts what was once a hand-cranked generator to an electric gear motor. Drive-pulley shaft fits the crank-handle socket on motor



**Safe electric power cart for the junior sports-car set is powered by 12-volt car battery**

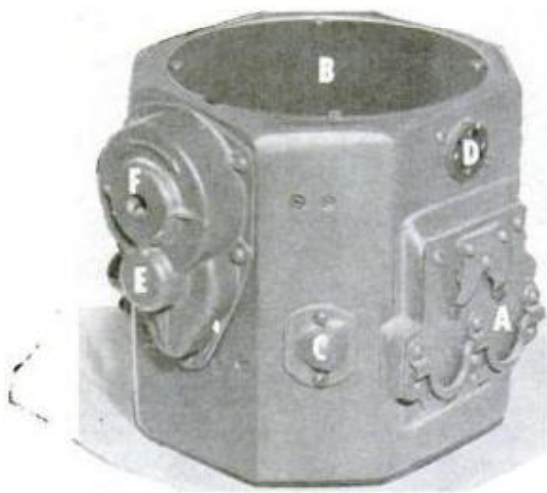
**S**MALL-FRY hot rodders will have great fun imitating their big brothers with this sidewalk version of the real thing. It's the safest car you can build for a youngster for it not only is powered by a battery but it won't go faster than a fast walk. The heart of the toy is a converted electric gear motor which is a government surplus item that sells for \$15.00 and works off a 12-volt car battery. With an average payload of 60 lbs., the car will run for approximately 10 hrs. on one charging. This, however, will vary with the ampere hour rating of the battery.

As you will see in studying the pullapart drawing at the left, the entire car frame is made of steel angle except for the front axle and the two support posts for the steering column. These three parts are of steel channel, the front axle being 21 in. long. The frame itself measures 17 x 52 in. overall and is welded for maximum rigidity. All members which are steel angle are placed edge down with the exception of the two pieces which form a shelf for the battery. These are placed edge up. You'll notice that the front ends of the side rails are notched to fit the U-shape of the channel axle, whereas the ends of the four cross



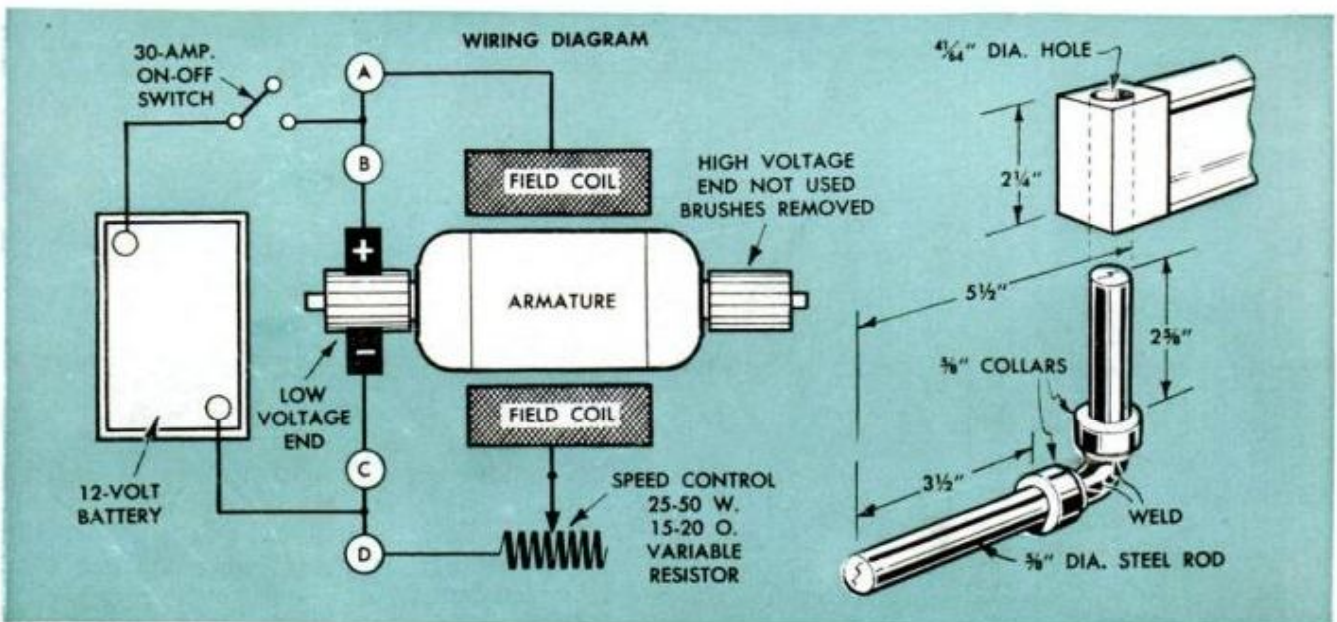


This photo of the original car built by the author shows installation of an ampere meter. Connected in series, the meter indicates amount of drain on the battery—approximately 4-5 amps. Meter is optional



members are merely sawed off square and butted, the side rails resting on top. The forward cross member is located 8 in. from the front end.

Ball-bearing pillow blocks provide bearings for the rear axle and these are bolted to short sections of steel angle drilled and then welded to the outer face of the side rails at points 4 in. from the ends. In the case of the front axle, two steel blocks 1 x 1 x 2 1/4 in. are bored for 5/8-in. wheel kingpins and welded to the outer corners of the frame. These blocks should be positioned so they project 1/4 in. above the frame, and should be reamed to 41/64 in. The one piece kingpin-and-wheel-spindles for the front wheels are made from 5/8-in. mild steel, heated and bent to a sharp right



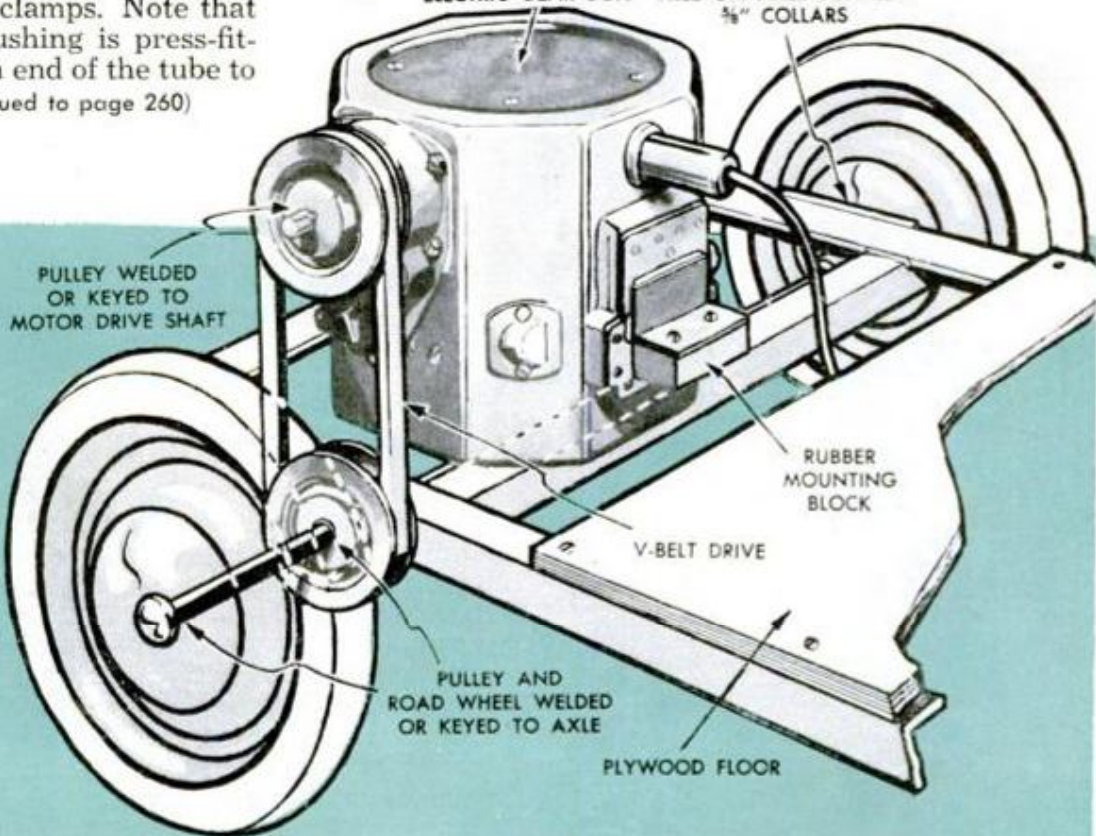
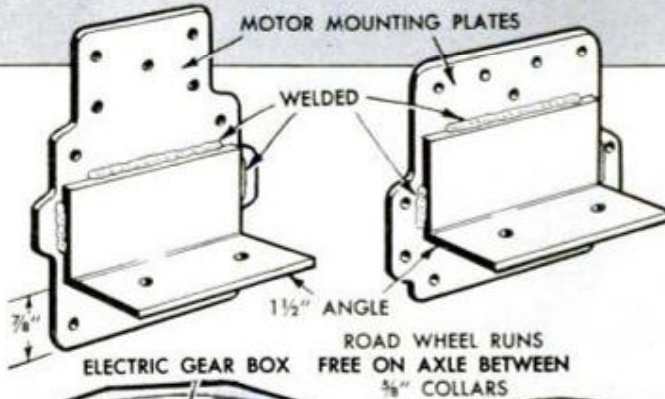
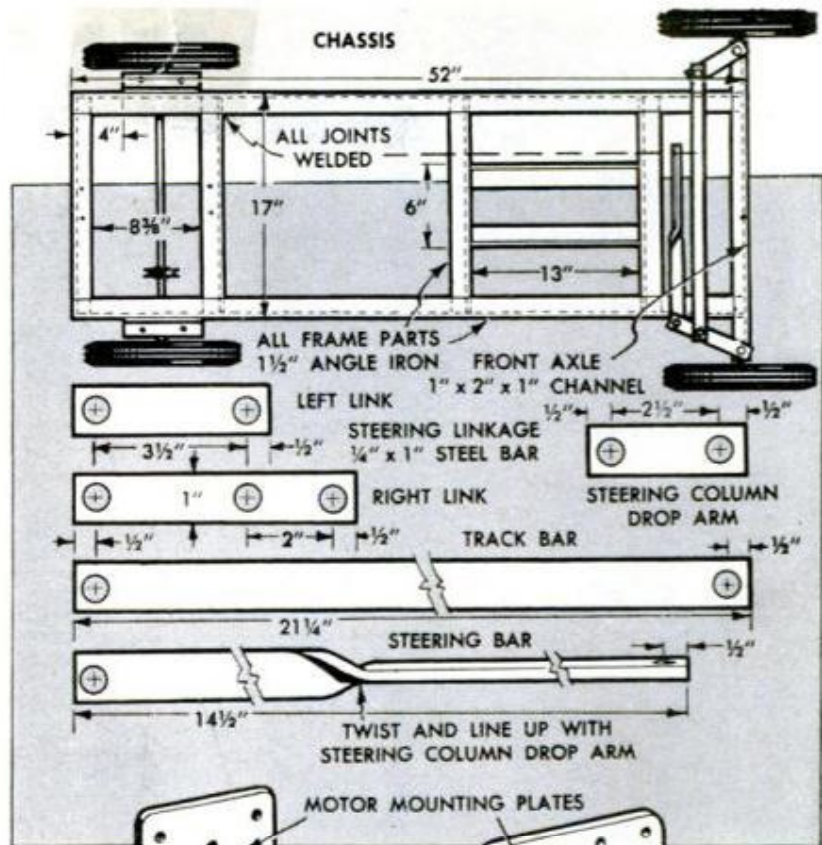


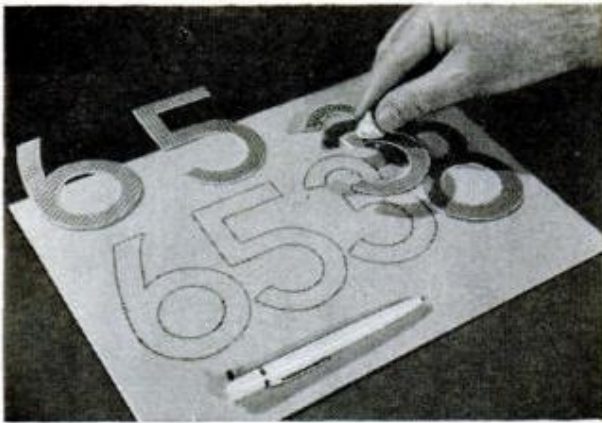
angle. Shaft collars brazed at the points indicated form shoulders. This assembly is detailed at the bottom of page 186.

Parts for the steering linkage are cut from  $\frac{1}{4}$  x 1-in. bar steel and the drawing at the top of page 187 gives the size of each one and shows where to drill them. The right-hand link is  $6\frac{1}{2}$  in. and the left-hand one  $4\frac{1}{2}$  in. Make a  $\frac{5}{8}$ -in. hole in one end of each of these links, make all others  $\frac{25}{64}$  in. The links are welded to the kingpins which is done after they are in place in the axle blocks and a collar and a washer placed over the ends. When welding, make sure that the links are at right angles in relation to the wheel spindles. The track bar is pinned to the links with  $\frac{3}{8}$ -in. bolts fitted with castle-type nuts. The steering bar is attached to the right-hand link in the same manner.

The steering rod which is a length of  $\frac{1}{2}$ -in. mild steel 25 in. long, is supported in a  $1\frac{1}{2}$ -in. tube 22 in. long. The latter is cradled in the notched ends of the two support posts and held by strap-type hose clamps. Note that a  $\frac{1}{2}$ -in. bushing is press-fitted in each end of the tube to

(Continued to page 260)





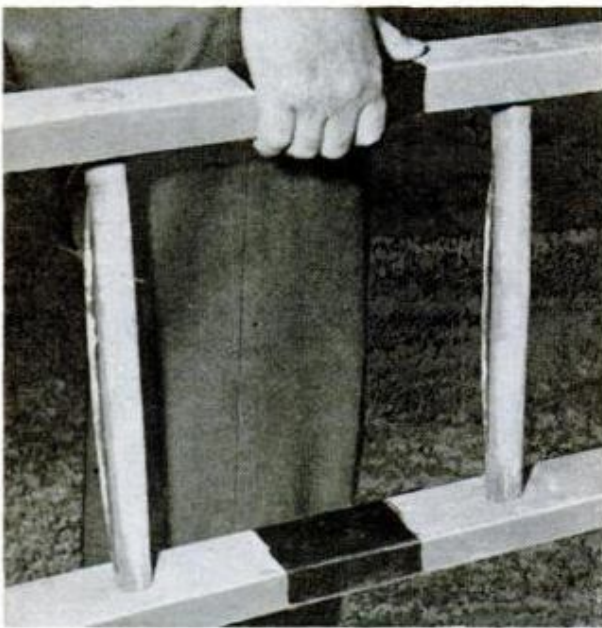
### Metal Numerals Aid Sign Makers

Metal house letters and numerals can serve as accurate lettering guides when laying out and painting temporary signs. Each character is selected and spaced along a straight-edge and is outlined in pencil before painting in the body. Have more than one alphabet and set of numerals at hand so that the complete wording of a sign can be laid out on the signboard and checked for spacing and appearance. One trick in handling the characters is using a lump of putty as a lifter in the manner pictured.—Ken Murray



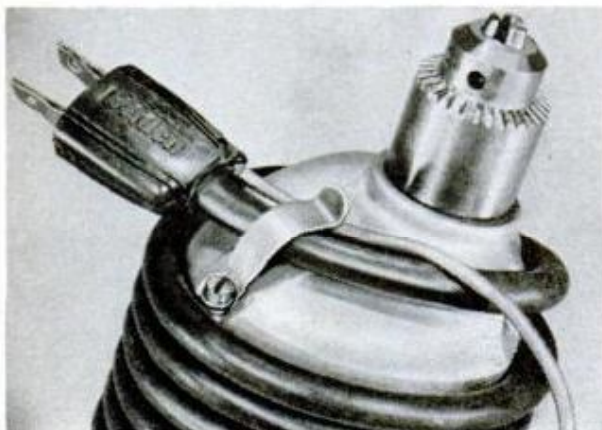
### Magnifier Enlarges Map Detail

Have you ever taken the wrong road because of an error in map reading? Then keep this suggestion in mind: Carry a small magnifier on your key chain to bring out those details you may miss when you have to check a road map in poor light. A plastic-framed magnifier is ideal for the purpose as the frame can be drilled, when necessary, to fit the key chain. The magnifier can also serve as a locator in case you lose the keys.—R. Hanscom



### Paint Bands "Balance" Ladder

Next time you're painting the house and before you clean your brush, take time to determine the point at which your ladder balances. Then paint a band about the width of the palm of your hand around each rail of the ladder at the balance point. This will save you the bother of shifting the ladder so that it carries easily without one end dragging or the opposite end gouging into the lawn before you get things under control. Of course, the paint should be of a contrasting color.—Bil Toman



### Clamp That Power Cord

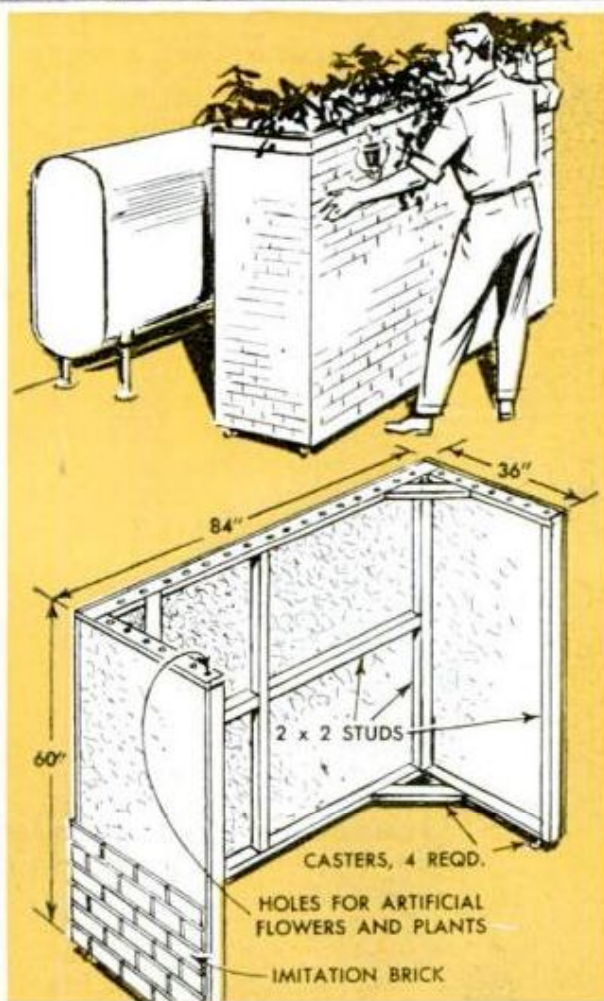
When not in use portable power-tool cords can get to looking like the ravelings from a ball of twine or a tangled fishline, unless, of course, you tire of the nuisance and do something about it. On nearly all portable drills there are capscrews that hold the gear housing at the chuck end. Turn out one of these screws, then make a clip from spring brass, drill a hole near one end to take the screw, tighten the clip in place, wind the cord around the drill and slip the end under the clip.



## "PLANTER" HIDES FUEL TANK

WHAT LOOKS like a king-size planter standing in the corner actually is pure camouflage. For even though it is decorative in itself, its sole purpose is to hide a fuel-oil tank—an eyesore when it comes to fixing up the basement. Fitted with casters and faced with imitation brick to match surrounding wall paneling, the screen is easily rolled out when you must get at the tank and yet it looks like a permanent part of the wall when in place. Artificial plants and vines stuck in holes drilled in the edges of the screen creates a clever planter effect.

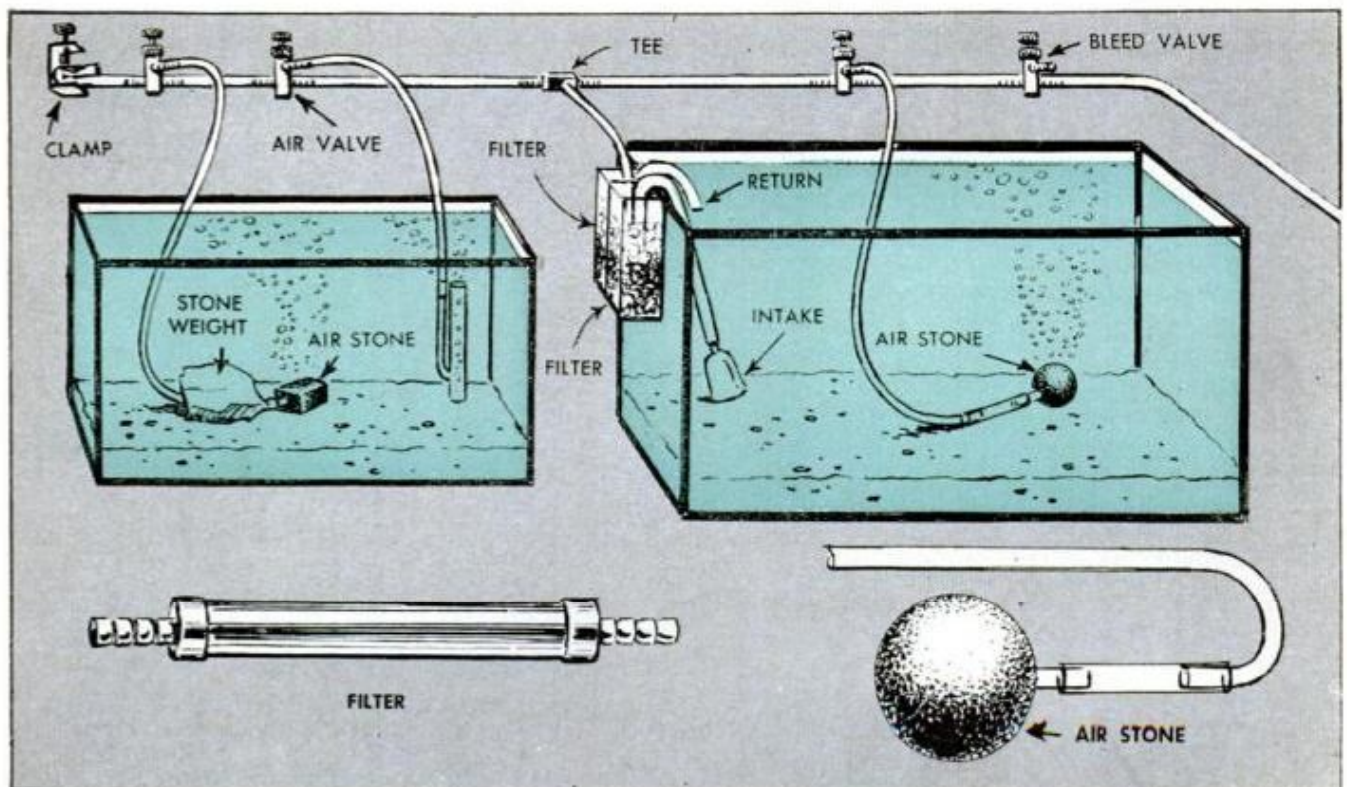
As dimensioned, the screen will hide a standard 275-gal. tank. Almost any material at hand can be used to assemble the framework and it can be covered with plywood, hardboard or plasterboard. While shown as a three-sided enclosure, it can be made with two sides if you wish. If you stick with brick as a covering, there are several imitation kinds you can use, ranging from embossed sheet plastic to the plaster of paris variety which you cast individually in brick-textured molds.—Cortland Smith



# LET YOUR



Aquarists who have advanced the hobby of fish-keeping beyond the goldfish-bowl stage usually go in for exotic fish and accessories that make showpieces of aquariums. One of the necessities to successful fish-keeping is an air pump. Here's how you decide what pump you need



# GOLDFISH BREATHE EASIER

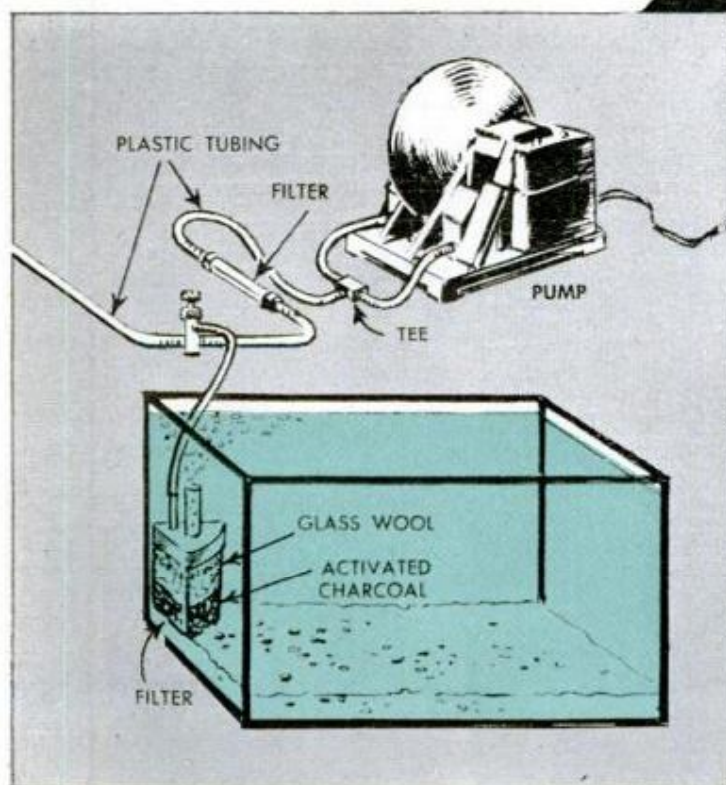
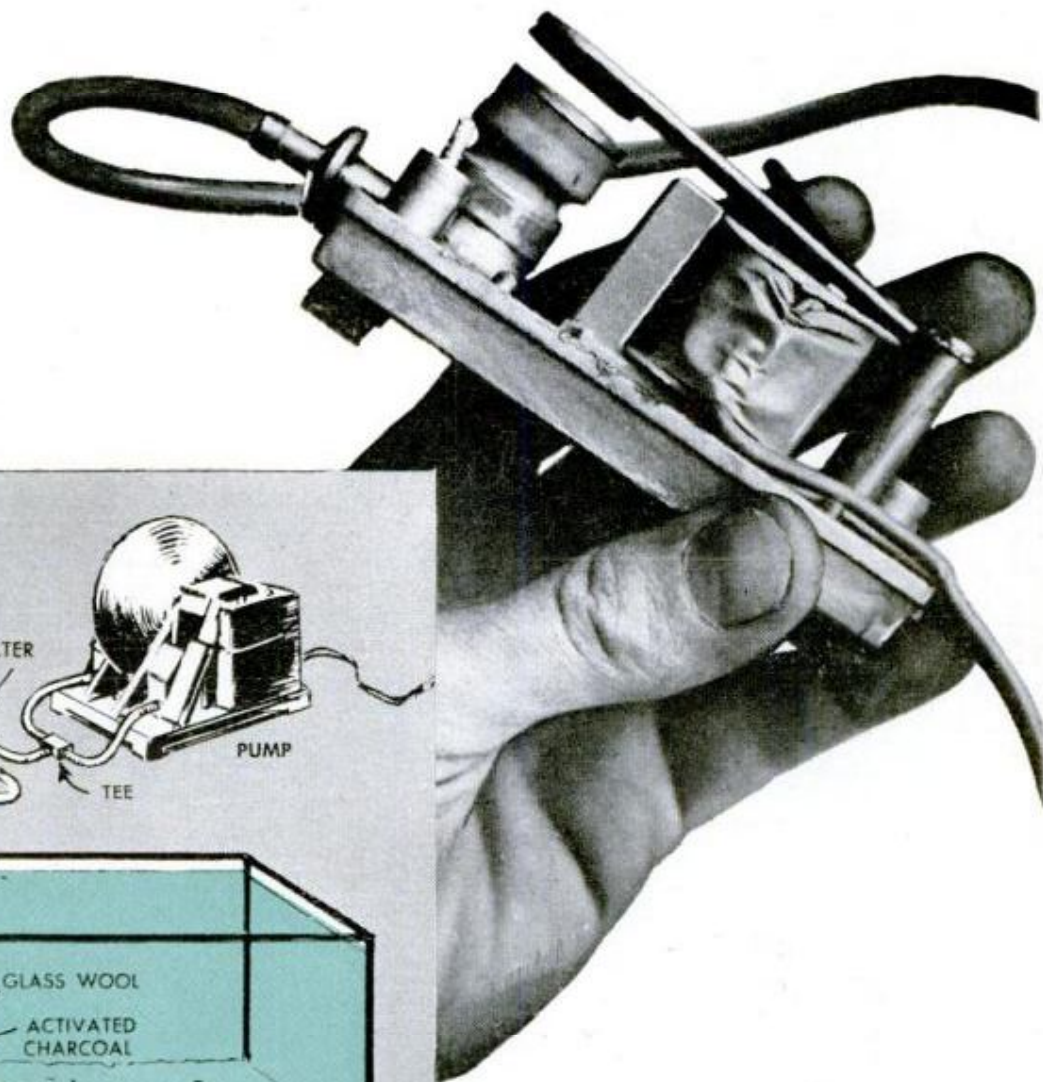
By Robert Gannon

**F**ANCIERS OF exotic fish may go in for rows or banks of individualized aquariums and furnishings, special lighting, gushing fountains and select water plantings but they all have one problem in common—constant aeration of the water in which their charges are kept. Without active and adequate aeration of the water in the restricted space of the average aquarium, valuable fish may die within a few hours. That's why experienced aquarists regard the selection of an air pump as a most important step to successful fish keeping.

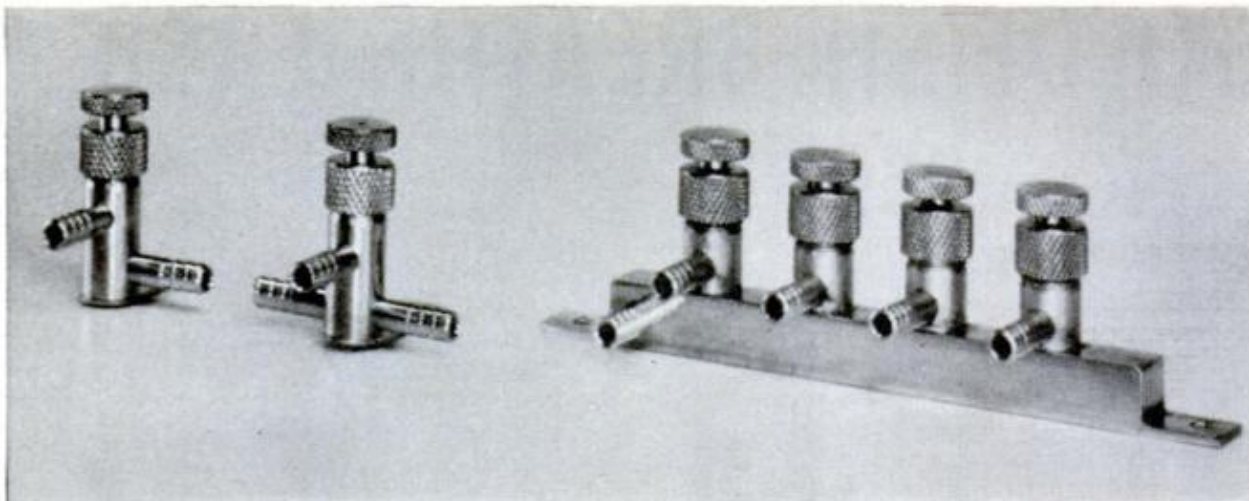
An air pump does two things—aerates and circulates the water. As a rule the air pump is used in connection with a filter and air stone, a typical setup being diagrammed

below and on the opposite page. In most types of filters the water passes through glass wool, which removes large waste particles, then through charcoal, which absorbs chemical impurities. Air pumps in general use are the vibrator and piston types. Aquarists generally favor the vibrator type, the main reasons being that vibrator pumps are practically maintenance free, and are ordinarily quite compact and relatively cheap to buy and operate.

Vibrator-type pumps in general consist of a flexible strip of metal, an electromagnet and a rubber diaphragm which pulsates 60 times per second, forcing air through a flap-per valve into a tube leading to the fish tank. Air flow often is controlled by a screw



**TYPICAL VIBRATOR-TYPE** air pump shown above with cover removed. Air flow is controlled by adjusting screw. Diaphragm is only part that may require occasional replacement. Left, typical aerating installation



**AQUARIUM AIR VALVES**, left to right, include 1-way, 2-way and 4-way types. Other combinations are available

## PUMP DON'TS

**Don't** locate pump on floor; dust will mar closely machined surfaces and will be blown into the aquarium.

**Don't** oil vibrators, but don't fail to lubricate piston-type pumps.

**Don't** connect vibrator pumps to d.c. lines.

**Don't** run pumps in smoke-filled or newly-painted rooms; poisonous fumes will be drawn into the tanks.

**Don't** let pressure in the lines build up; it shortens pump life. Insert a bleed valve somewhere along the line.

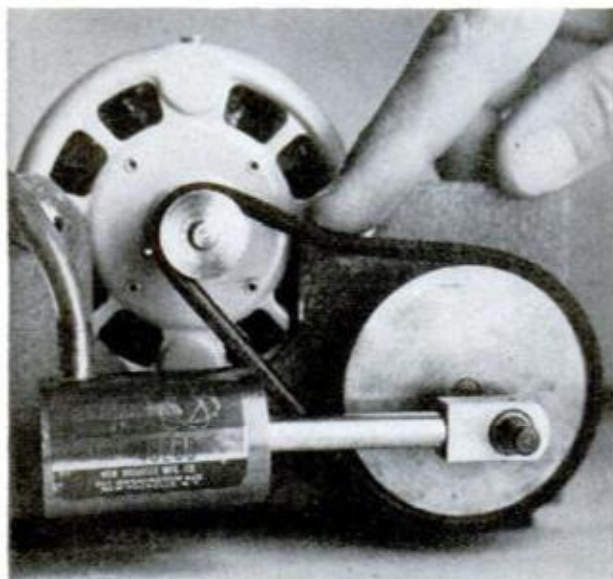
**Don't** locate pump below water level unless you loop the air hose. Otherwise when the pump is turned off, water may siphon into the mechanism.

which adjusts the distance the diaphragm flexes. Because of the high frequency oscillation, many vibrator pumps are rather objectionably noisy. In some cases the sound may be reduced somewhat by maintaining a certain amount of back pressure. Ordinarily, the only wear part in this pump is the diaphragm. Replacement diaphragms can be purchased cheaply from aquarium supply stores.

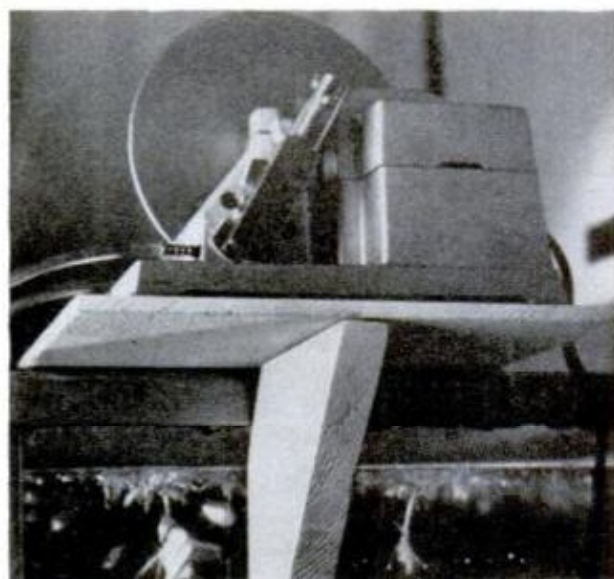
Piston pumps are driven by motors ranging from about  $\frac{1}{15.0}$  to  $\frac{1}{7.5}$  hp. They produce a considerable volume of air and are considerably more expensive than diaphragm pumps but where an unusually large amount of air is needed, the piston pump usually is the best choice. The only maintenance ordinarily required is lubrication and an occasional belt replacement. Most piston pumps operate on much the same principle as a tire pump, but unlike the tire pump, air flow is regulated by the angle at which the piston enters the cylinder, not

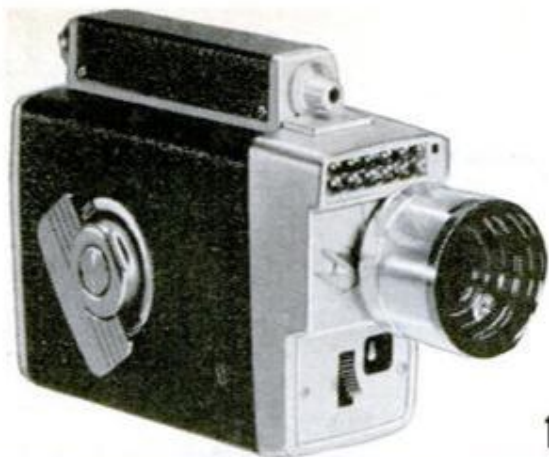
(Continued to page 236)

**BELT TENSION** should be correct for efficient pump operation. Air flow is regulated by angle of piston



**SHELF SUPPORTS PUMP** high enough above tank to prevent water from siphoning into unit when pump stops

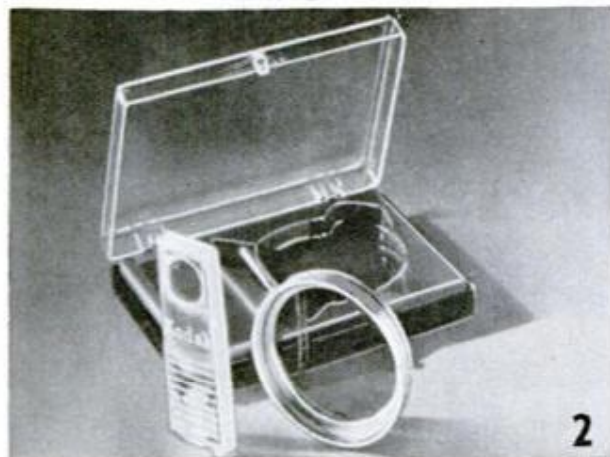




# NEW FOR SHUTTERBUGS

**1. VIEWFINDER THAT ZOOMS** with lens is outstanding new feature of this 8mm movie camera. Lens and viewer zoom from 9 to 25mm, shrinking and stretching camera-to-subject distance as the lens slides in and out. Camera features built-in exposure meter

Eastman Kodak Co., Rochester 4, N. Y.



**2. POLA-SCREEN** with a new, separate viewer is now packaged as one unit in a plastic case. Pola-Screen produces a variety of effects on film by rotating the screen to control sky tones and soften glare. Viewer shows visually what effect is being produced

Eastman Kodak Co., Rochester 4, N. Y.



**3. COMBINATION SLIDE-FILMSTRIP** projector features pushbutton film advance that operates from anywhere in room. Lecturer faces audience with freedom of movement. This projector is for automatic or manual use and also for synchronizing with a tape recorder

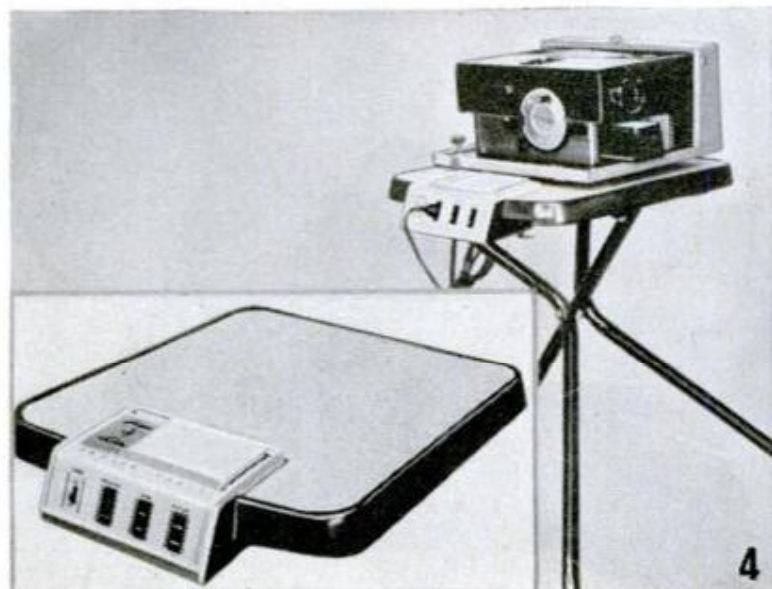
Victor Animatograph Corp., Plainville, Conn.

**4. PROJECTION TABLE** provides convenient fold-away tripod with self-leveling legs. Power panel includes outlets, service light and power cord. A switch controls viewing window for previewing your slides. Table opens to 30 in. and features a 15x17-in. top

Acme-Lite Co., 4646 W. Fulton St., Chicago, Ill.

**5. CONTROL CAP** designed for Polaroid Land camera is a new accessory used with 3000 ASA film in bright sunlight. Tiny hole in center reduces amount of light reaching ultra-fast film and permits better control. The cap also increases the depth of field

Tiffen Optical Co., 71 Jane St., Roslyn Heights, L. I., N. Y.

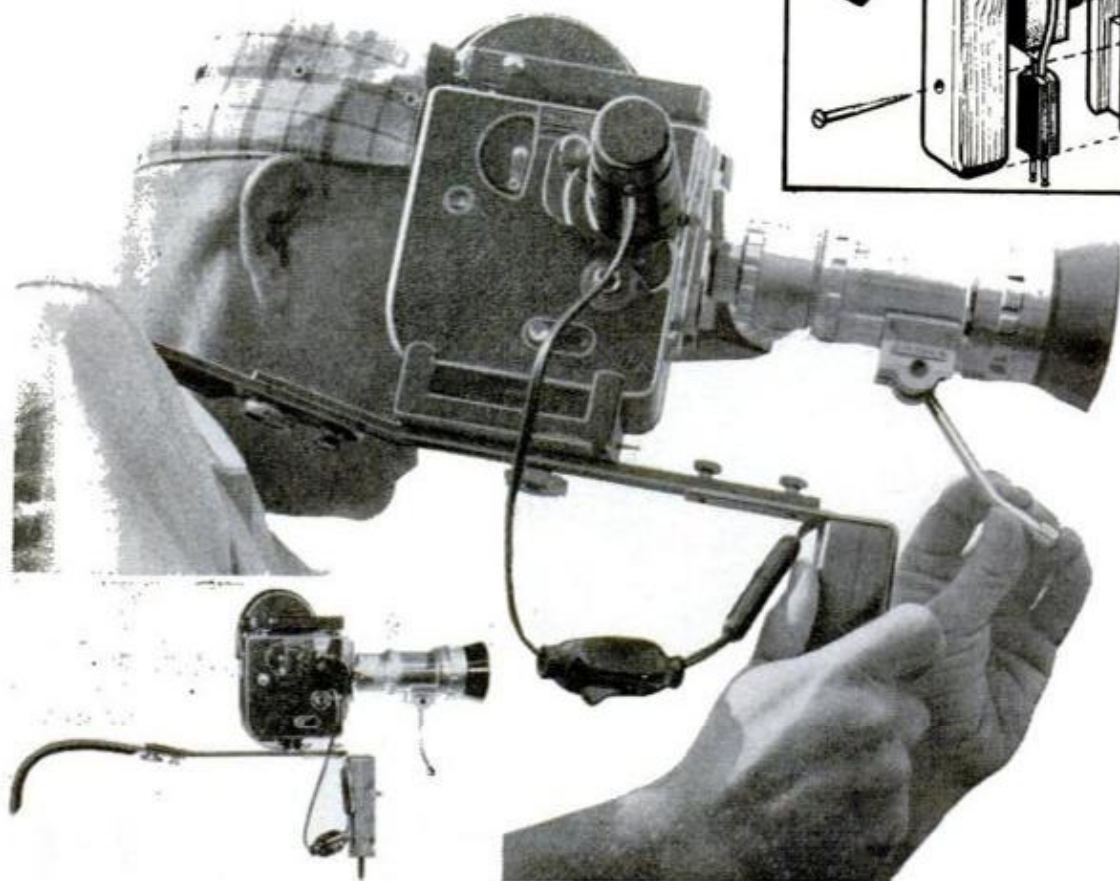
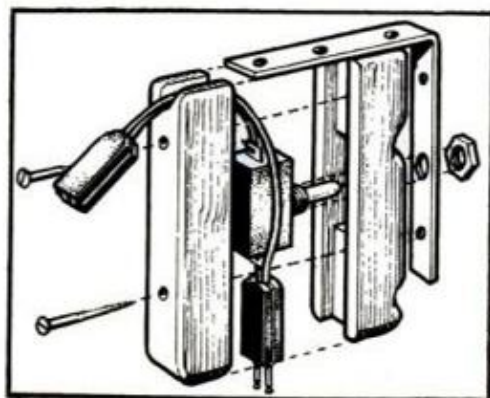


# THIRD



**Switch handles solve problem for cinematographer when he needs to pan while switching camera motor with one hand and working zoom with other**

**By Frank P. Fritz**  
Chief PM photographer





# HAND

CINEMATOGRAPHERS who operate motor-driven cameras with zoom lenses and variable shutters often wish they had another hand or perhaps one or two good assistants. But you don't need either if you build the shoulder-pod handle and switches, shown on the opposite page. These two gadgets permit you to control pans and tilts and at the same time zoom the Zoomar lens and operate the motor-driven camera, all with your own two hands.

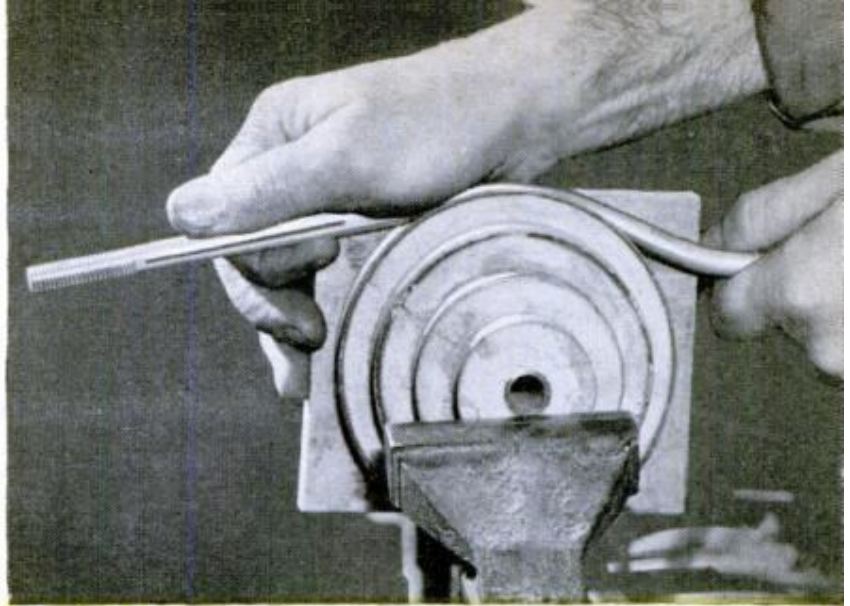
The homemade handle on the shoulder-pod consists of a  $1\frac{1}{2}$  x 2 x 6-in. pine block sawed lengthwise. The sections are gouged out to accept a switch, wires and plug. This should be carefully done to assure that the parts fit snugly yet permit normal operation. For the wires, channels are cut in the facing surfaces of the handle.

A special snap-action, panel-type switch (No. 750-350) is set between the halves of the handle. This switch may be obtained at a radio and electronic supply house. A male plug made by Switchcraft fits a recess cut in the lower end of the handle. The plug should fit snugly to keep it from being pulled out when the battery is disconnected. The matching female plug at the opposite end of the handle connects to the camera motor cord. The detail on the facing page shows how an L-bracket is used to fasten the switch handle to the shoulder-pod bar.

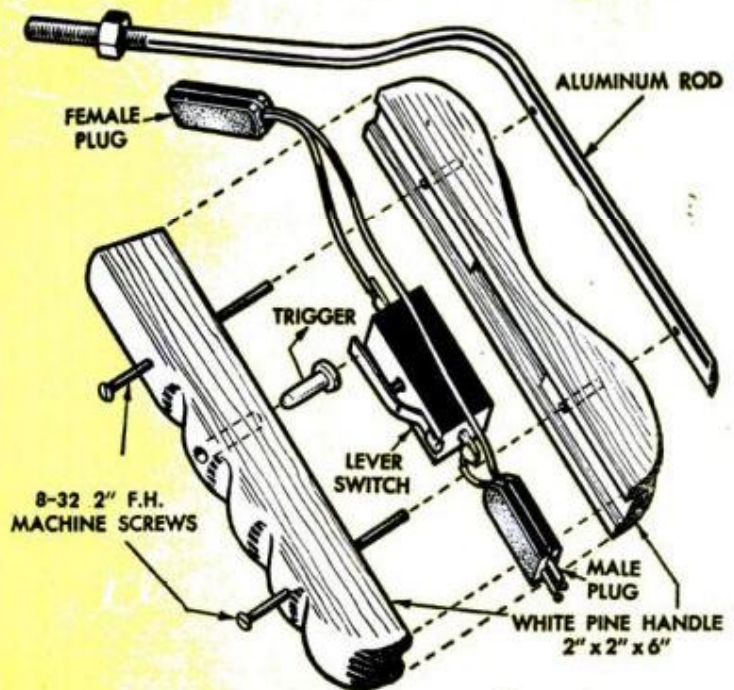
Originally the switch is made for two-way use with three contacts. To convert it to an off-on switch, one contact on the two-contact end should be removed. Remove the one in which tests indicate that current flows when the button is not depressed.

The pan-head switch handle detailed at the right functions similarly to the shoulder-pod handle except a lever-type snap-action switch (No. 750-250) is used. An aluminum rod threaded at the end replaces the original pan-head handle. The length of the rod is unimportant but in bending it to accommodate the handle it is im-

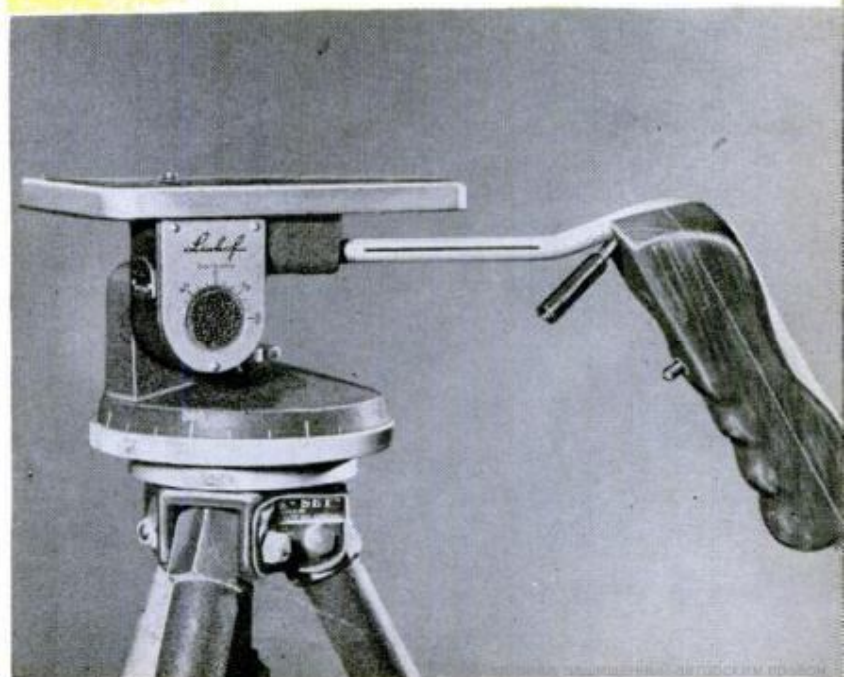
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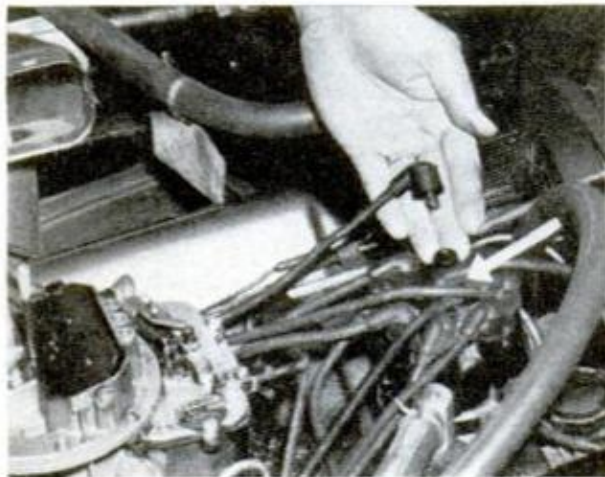
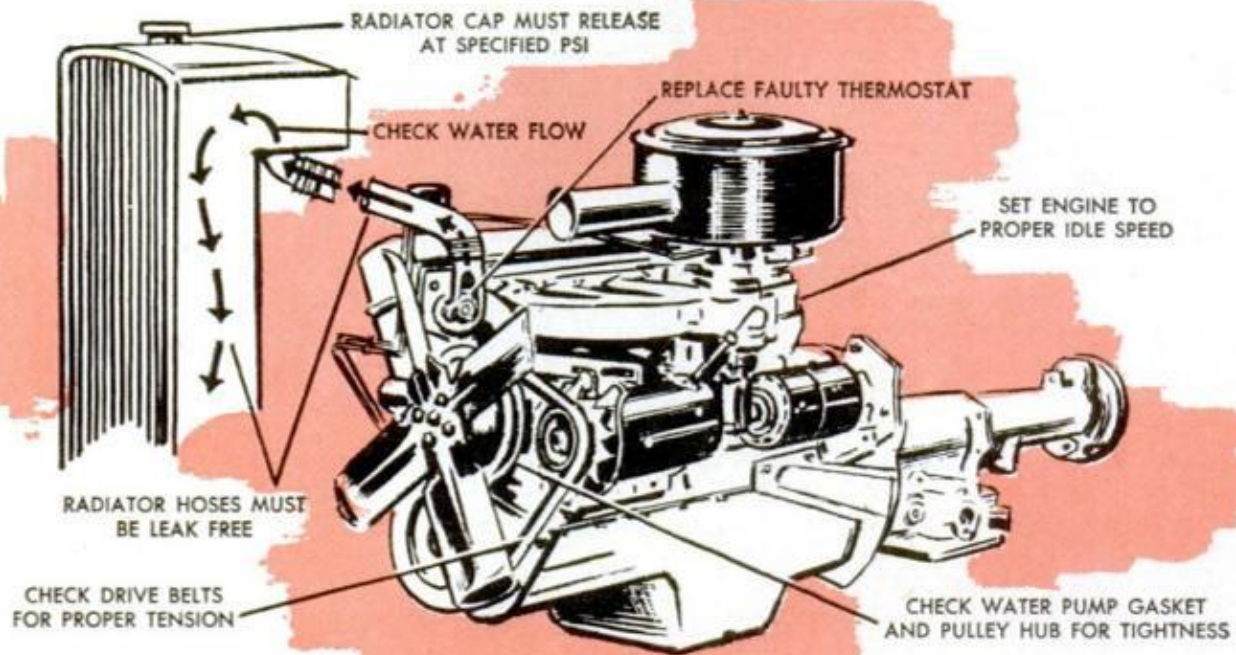
**NEW PAN-HEAD HANDLE** is bent over pulley. Note line marked on rod which acts as guide in positioning rod for bending



**SWITCH HANDLE** allows tripod to be used as before when supporting still camera. Sideward turn locks the pan head



# SERVICE TIPS TO REMEMBER



**FAULTY SPARK-PLUG BOOTS**, insulation that becomes hard and brittle can result in engine misfiring. It's then that high-tension current takes the easiest route



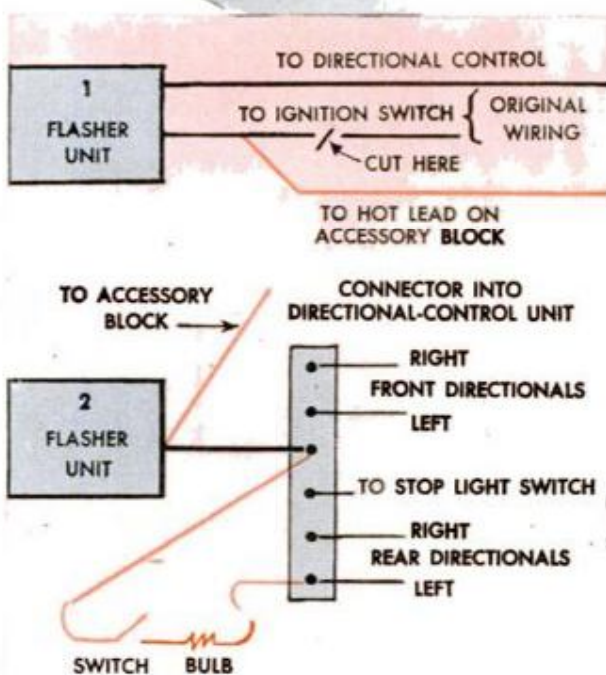
**OFTEN THE** simplest routine check under the hood of your car, carried out periodically, can spot trouble in the early development stages and head off a whopping repair bill. It helps to keep a dated check-list which includes those points that sometimes are missed in maintenance once-overs. Take a good look at the checkpoints noted in the detail above. Think, for example, of the loss of antifreeze should the radiator cap fail to release at the specified PSI (pounds per square inch pressure). It could cost you a complete antifreeze refill, and should the engine overheat—well, we'll leave it to you to figure the cost of repair. Much the same is true of a faulty thermostat that permits the engine to run too cool in winter, too hot in summer. If this is neglected, repairs to the engine can come pretty high.

Just a careful periodic check of the spark-plug boots as in the center photo can head off several possible repairs to the ignition system. See that the boots are in proper condition and that they seat properly to keep out dust and water. Keep a regular watch on other moving and non-moving parts of the ignition system. Pull off the distributor cap regularly and examine it closely for spark streaks which indicate arcing. Keep always in mind the possibility of air leaks in parts of the fuel system. A tiny air leak can cause no end of trouble until discovered and eliminated. Plugs that foul continually warn that something is wrong. The sooner you locate the trouble and fix it, the less it'll cost.

## DIRECTIONAL LIGHTS WARN OF EMERGENCY

Two bright red flashers side by side on the highway shoulder can protect you on the darkest, rainiest night when you are forced to make an emergency stop to change a tire or leave your car to call a serviceman. You don't carry these lights in the trunk or attach them to the fenders as such lights, being battery powered, may not work when you need them most. Rather you simply use the directional lights on the car, altering the wiring system so that by closing a switch both lights will flash continuously when parked on the shoulder.

On nearly all cars the directional lights will not operate when the ignition is turned off so to make the change to permit the lights to be operated when the car is parked, you cut the wire leading from the flasher unit to the ignition switch and rewire to the hot terminal on the accessory block, or panel. Then install a switch on the dash as in the diagrams.—C. R. Moase



## Reflective Tape Protects Parked Car at Night

If you must park your car on a side road at night protect it with these easily-made reflectors. Just wrap three or more strips of reflective tape around each of several freezer cartons. Then stack several of them together and store in the trunk of the car. In use, the cartons are weighted down with stones or gravel to hold them in place. Several of these reflectors placed around a parked car may prevent serious pile-up and even save a life. Once the signs are made they require no attention.—Bil Toman

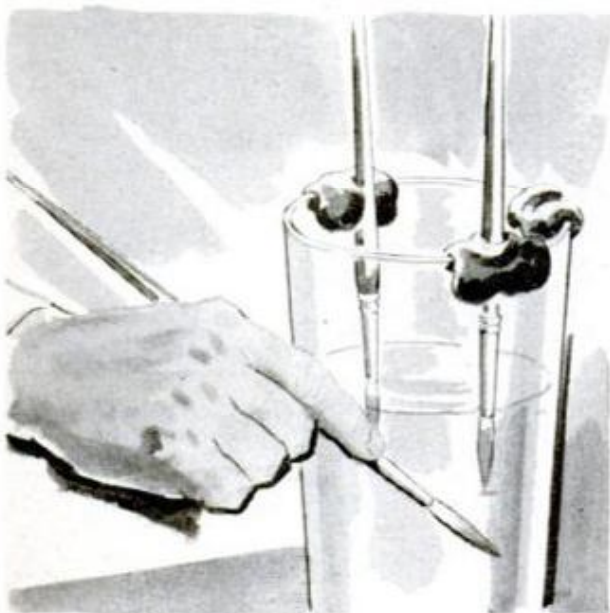
Tie an old tire to the front or rear bumper of your car when you need to push another. The tire will prevent damaging the car being pushed and the car pushing.





## Curved Runner on White Cane Is Aid to Blind Person

I am one of those who carry a white cane and I know that white canes for the blind have been accepted and used for so long in the standard form that awareness of their purpose is universal. But I wasn't satisfied with mine. I added a curved metal tip, or runner so I could slide the cane in front of me. This not only prevented me from falling over objects but I found I could walk much faster. It also eliminates the task of tapping to determine the nature of the surface over which one is walking. The runner is simply a  $\frac{7}{16}$  x 6-in. bolt with the head cut off and the body bent to an easy curve. To attach it to the cane, drill a hole through the ferrule and into the wood and turn the threaded end of the bolt into the hole. A drop of cement on the threads will hold it in place.—John Schut



## Modeling Clay on Rim of Jar Suspends Brushes in Solvent

Artists and sign painters often have need to keep small brushes suspended in solvent while working on projects requiring frequent changes of color. How to suspend the brushes in the container with the bristles above the bottom is the problem. Drilling holes through the brush handles and suspending them on a short length of wire is one solution. But where several brushes are suspended in this fashion it often is necessary to remove several in order to reach the one wanted. A better method is to use a small piece of modeling clay to hold each brush. The clay will stick to the rim of the container, of either metal or glass, and by pinching the clay around the handle, will hold the brush in any desired position and at any point on the rim.

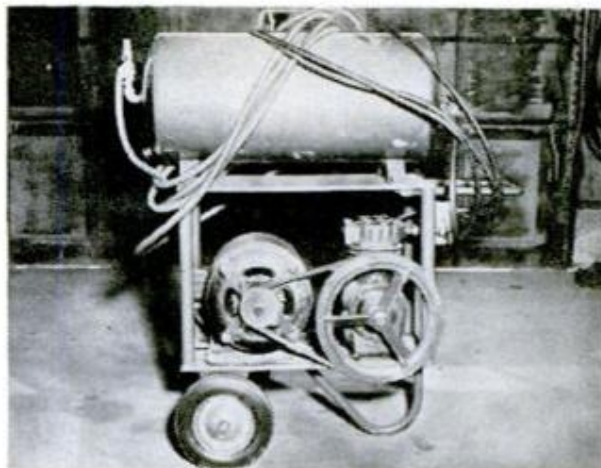


## Children Know Family Mailbox By Its Identifying Color

One day when the kids brought home the neighbor's mail instead of their own, a rural mailbox owner thought of painting his box, which was one of a group of several, a bright orange color. It worked. Little tykes who could reach the boxes but couldn't read the names knew their mailbox by its color. The idea caught on immediately. Owners of adjacent boxes in the same group, who depended on small children to bring the mail occasionally, also painted their boxes in varying colors and thereafter the youngsters had no trouble knowing which was which. After painting, names were relettered on the boxes so that they were easily identified by the carriers.

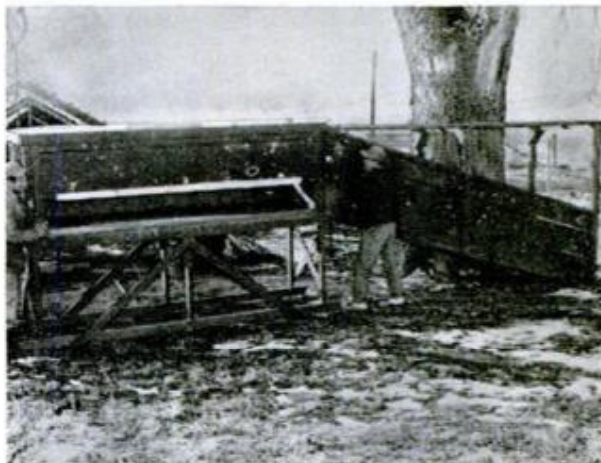
## Portable Air Compressor

Designed and built by a farmer for farm use wherever and whenever it's needed, this compressor differs from standard types in that the tank is mounted on the top of the dolly and the motor and compressor underneath. This makes the unit more stable and permits it to be wheeled to the job over rough ground when necessary. The frame of the dolly is made from lengths of 1-in. pipe and 1 x 1-in. steel angle with all parts welded to form a rigid unit. The pressure tank is held in place with four thumbscrews and is easily removed if desired.



## Tame-Turkey Trap

One of the problems of turkey raisers is that of transferring birds from open range to shipping crates without crowding them into fence corners or frightening them into a stampede. A good solution is to build an elevated enclosure, or trap, approached by a ramp. The end of the trap opposite the ramp is left open but is covered with hardware cloth. The birds are herded to the ramp, which they will ascend quite readily when they sight what appears to be the open end of the trap. Once in the enclosure they are easily transferred to crates.



## Non-Tip Feeding Trough

To prevent waste when starting young calves on dry feeds one farmer made use of his welder to build this sturdy, non-tip feeding trough, or bunk. The semi-circular legs are made by cutting a steel implement tire in half and then welding the two halves to a discarded tank from a hot-water heater which also has been cut in half. The two halves of the heater tank form a double feeding trough which permits the animals to reach the bunks from two sides and the ends. This avoids crowding and wasting of dry feeds.



## Rolling Feed-Bunk Hopper

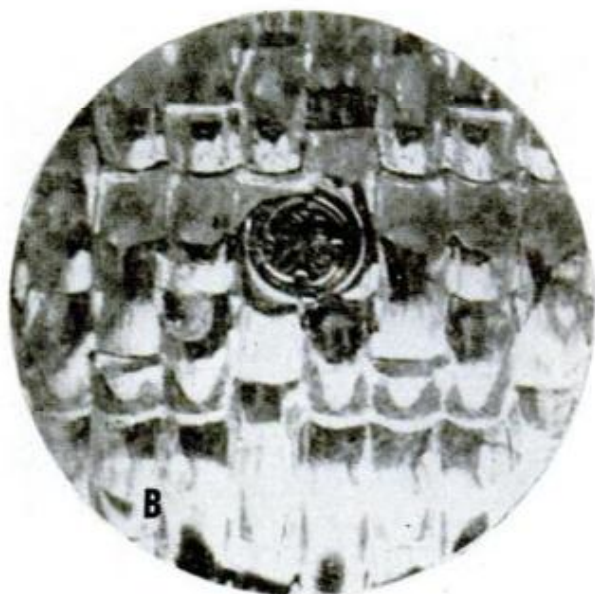
This rolling hopper, or trolley, delivers silage and dry feeds to several feeding bunks which have been placed in line so that the top edges of the sides form a track for the flanged wheels of the trolley. The wheels are truck brake drums and are welded to heavy steel axles. Lengths of flat steel screwed to the sides of the bunks form durable rails. The hopper bottom is in two pieces, hinged at the outer edges. Opening and closing of the hinged bottom is lever controlled so that the load can be evenly distributed along the length of the bunks.





# FARM QUIZ

**IT'S BEEN SAID** that a picture tells more than a thousand words—but does it? Real farmers, others who knew the farm in earlier years can have fun naming these objects, the one above, for example



**LOOKS LIKE ANYTHING** except what it is, part of a tractor. That's right, but you looked at the answer



**YOU NEED NOT** be a farmer or ever have been on a farm to guess what this is; everybody has at sometime owned one

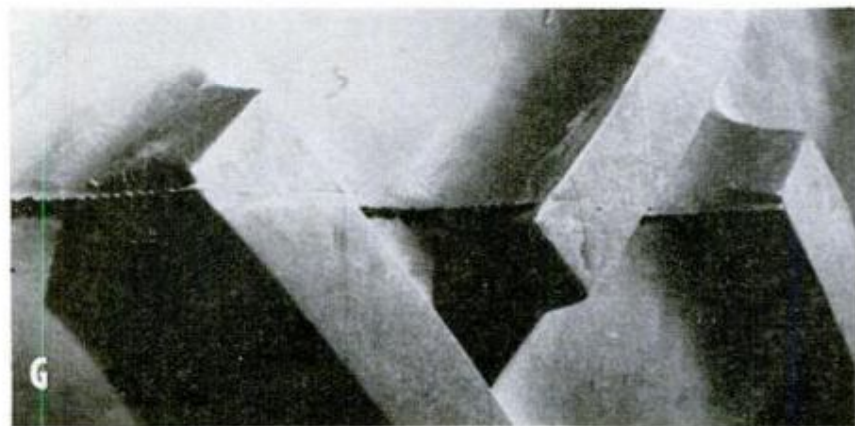


**HE'S LOOKING** right at you but only his nose shows. He's homely so perhaps he'd rather have his picture taken this way

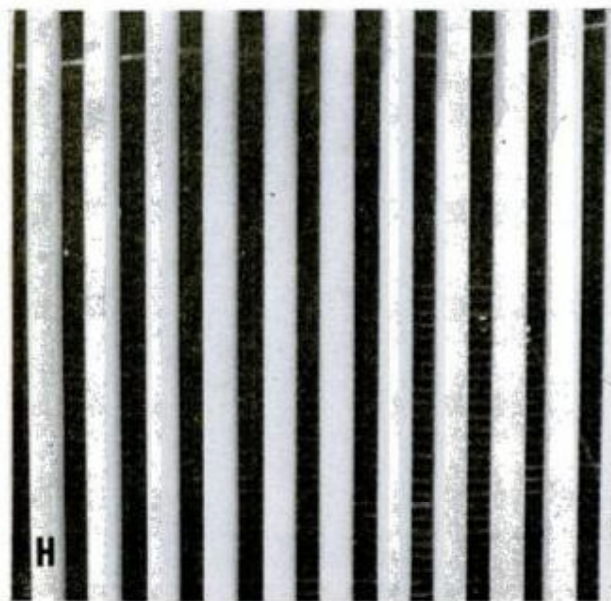
200 POPULAR MECHANICS



**LOOKS LIKE AN ASTRONAUT'S** view of a cloud formation, doesn't it? But look at it more closely and then guess again



**NOW AN EASY ONE.** It's a—but that would be telling. And the more you look at it—careful, you could miss



**FINALLY, THE REALLY** easy one. Could be a room divider, an electric fly killer, a—just what is this thing? Answer is close by so don't sneak a look—yet

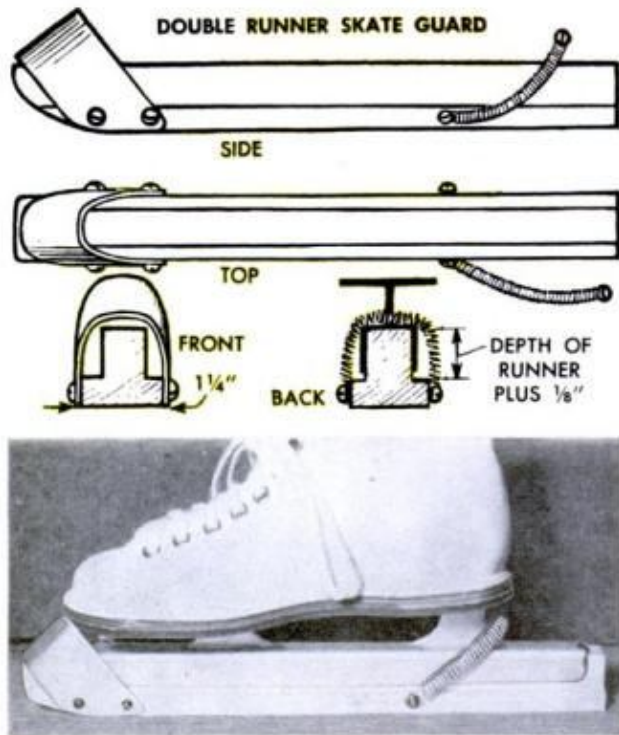
FEBRUARY 1961



**ANSWERS:** A—Farm gate latch. B—Tractor headlight lens. C—Galvanized pail. D—Nose, or nostrils, of mule. E—Wool, or fleece, on back of sheep. F—Garden rake. G—Tread of tractor tire. H—Tractor radiator grill

**HERE YOU COME** right up with the right answer. Of course, it has to be a ladder placed so that the shadows of rungs fall on the wall. Sorry, come again

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## Walking "Shoes" Protect Twin-Runner Skates

When wearing these skate shoes, or guards, tots can walk to the skating pond on bare sidewalks, streets or gravel roads without damaging the blades. As you can see from the sectional detail, the guard is simply a square of hardwood rabbeted on opposite sides, leaving a tongue that will fit snugly between the skate runners and bear the weight of the wearer. The full-width face of the square of hardwood left after rabbeting on opposite sides forms the sole of the shoe as you see from the sectioned end views. Each guard is then cut

to a length about  $\frac{1}{2}$  in. greater than the over-all length of the skate runner. Next, you cut and fit a metal toe grip, using 18 or 20-ga. aluminum, bending it to a U-shape and attaching the ends to the sole of the shoe with flat-headed screws. Note that the metal grip is attached at an angle so that when the shoe is in position the grip hooks over the forward ends of the runners. A coil spring attached to the sole of the shoe as in the photo and details holds it firmly in place.

—Hugh F. Williamson

## COMING UP NEXT . . .

**"Cog" Railroad for Your Layout.** It takes little imagination to think of this as the Pike's Peak or Mt. Washington Cog Railroad. It's that realistic in the HO size. Tiny locomotive pulls car to top of incline, reverses and returns down incline. Operates continuously as long as current is on.

**Making a Life Mask.** Wouldn't you just love to have somebody smear your face with mud and in good time lift off a spitting image for posterity. Then here's your chance. William Tuttle, famed head of makeup at Metro-Goldwyn-Mayer Studios, tells how you, too, can use a new, easy process he has developed.

**Rust Preventive Paints.** A micro-thin film of the right kind of paint can prevent metals from rusting and pitting indoors, outdoors, anywhere oxygen and water can get together to cause corrosion. Article tells in detail how to prepare surface and apply various types of these special paints.

**Refracting Telescope.** You say you're not a stargazer. Okay, but we can assure you that one look through this powerful refracting telescope will convince you that you need to know more about what's going on overhead. Part I of a two-part feature tells how to build a telescope you'll be proud to own.



# 7 WATER HEATER TIPS



**DON'T** install a gas water heater in a sleeping room. Even though vented, heater still consumes oxygen

**DON'T** pile things around a gas heater. Leave 3 ft. of air space near floor and ceiling

**DO** keep ventilating flue clean to carry off unburned gases. Clean out soot annually

**DO** drain off sediment in bottom of heater tank every six months by opening valve until water runs clear

**DO** install a pressure relief valve in hot-water line from heater. This relieves pressure at a safe level

**DON'T** turn up thermostat setting unless you want hotter water. Higher setting won't make burner heat faster

**DO** make certain rain cap on vent pipe is anti-downdraft type. Downdraft could blow fumes into room, extinguish pilot



# IT'S THE HUMIDITY That Gives Winter Comfort

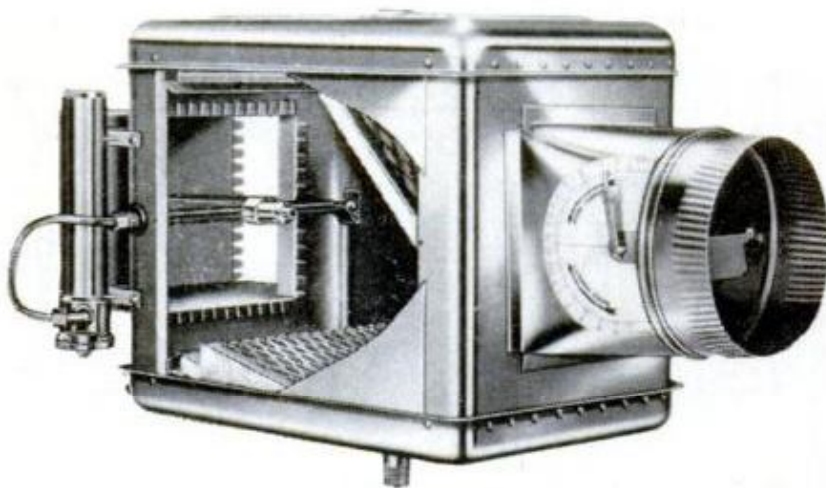
This spray-type humidifier gives you better health and reduced heat requirements through closely controlled humidifying of the air in your home

**I**F YOU WERE to make an accurate check of the relative humidity of the air in the rooms of your home on an average winter day, or night, you probably would find it considerably below the comfort level of 30 to 40 percent. That's because the evaporating capacity of many humidifiers is not sufficient to maintain humidity at these levels during the peak heating season. In most well-constructed homes humidity levels ranging between 30 and 40 percent will not create a moisture condensation problem, although in some localities it may be necessary to settle for a somewhat lower reading during the coldest weather.

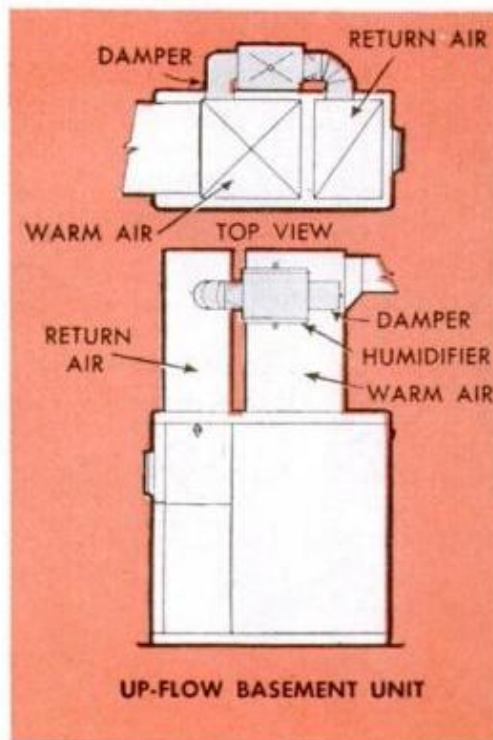
Called Humidispray, this humidifier differs from other types in that it is designed to spray a fine mist onto a glass-fiber filter where the moisture in droplet form is released into an air stream passing through the filter and into the return plenum. Here it mixes with the air stream and is delivered to the rooms during the operating cycle of the furnace fan. The amount of relative humidity delivered to the plenum can be closely controlled by a damper in the humidifier air-inlet duct.

An air-volume indicator comes with the unit which you see ready for installation in the photo below. This indicator enables you to calculate the amount of water that is evaporated by using the prepared table given on the opposite page. To make this calculation you first determine the temperature drop of air passing through the unit. This is done by inserting thermometers in the inlet and outlet ducts and noting the temperature variations recorded. Next, you determine the CFM (cubic feet per minute) reading on the air-volume indicator after the damper has been set in the desired position. Then by referring to the table you can determine the amount of water evaporated. In this way you can control humidity levels by checking with any inexpensive instrument made for the purpose. From these calculations you can come up with an average setting that will give you seasonal relative humidity ranging somewhere between the recommended 30 to 40 percent. As you can see from the accompanying diagrams the humidifier can be installed on nearly all types of warm-air systems. Instructions for installing and operating come with the unit.

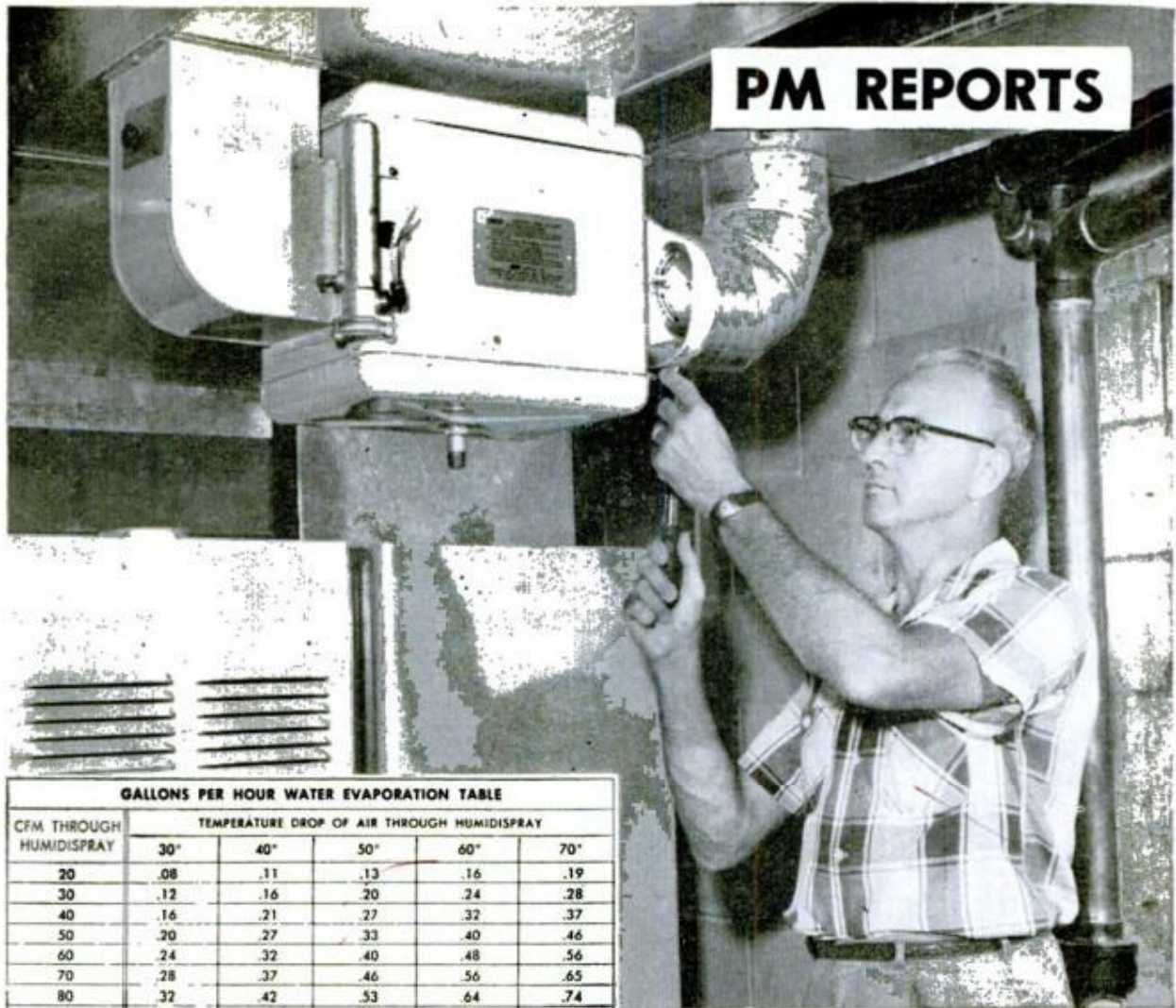
**IN THIS CUTAWAY VIEW** of the spray-type humidifier you see the glass-fiber filters, the damper and the water-spray mechanism. Diagrammatic views at the right and on opposite page show various installations



## TYPICAL INSTALLATIONS



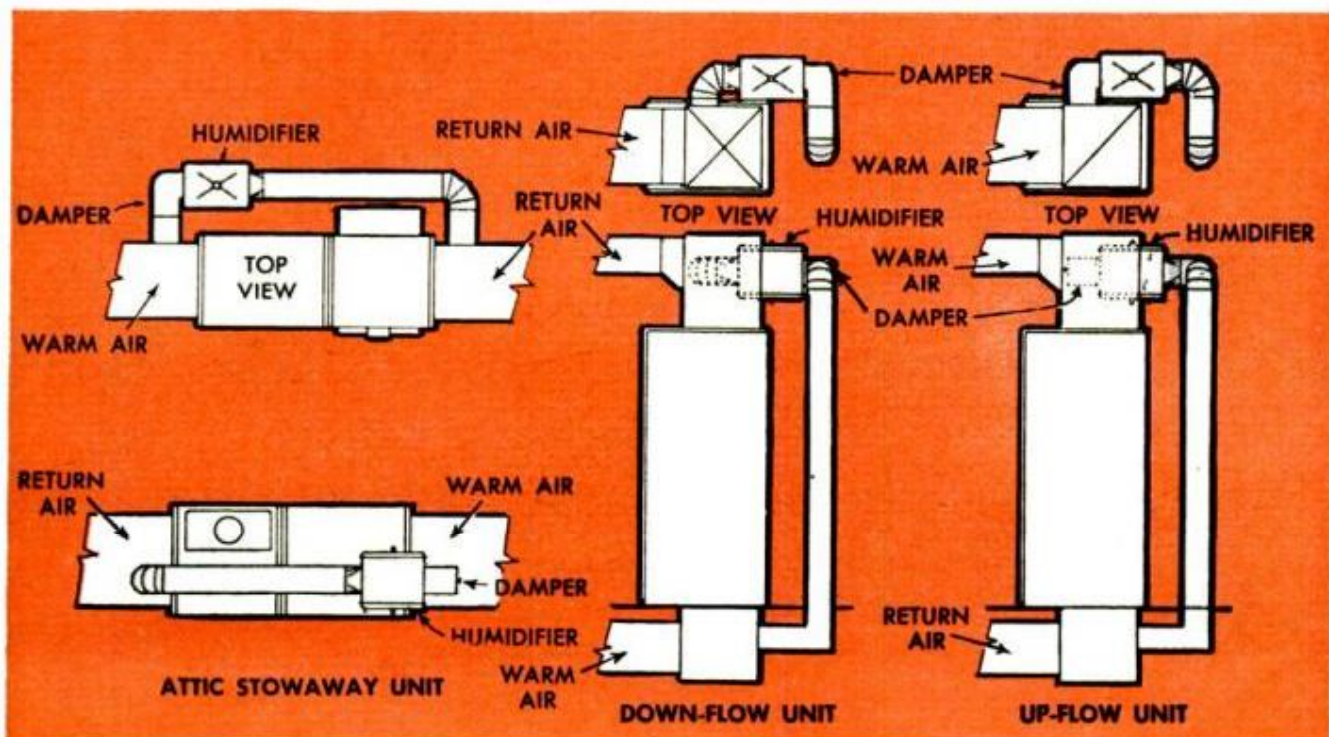
# PM REPORTS

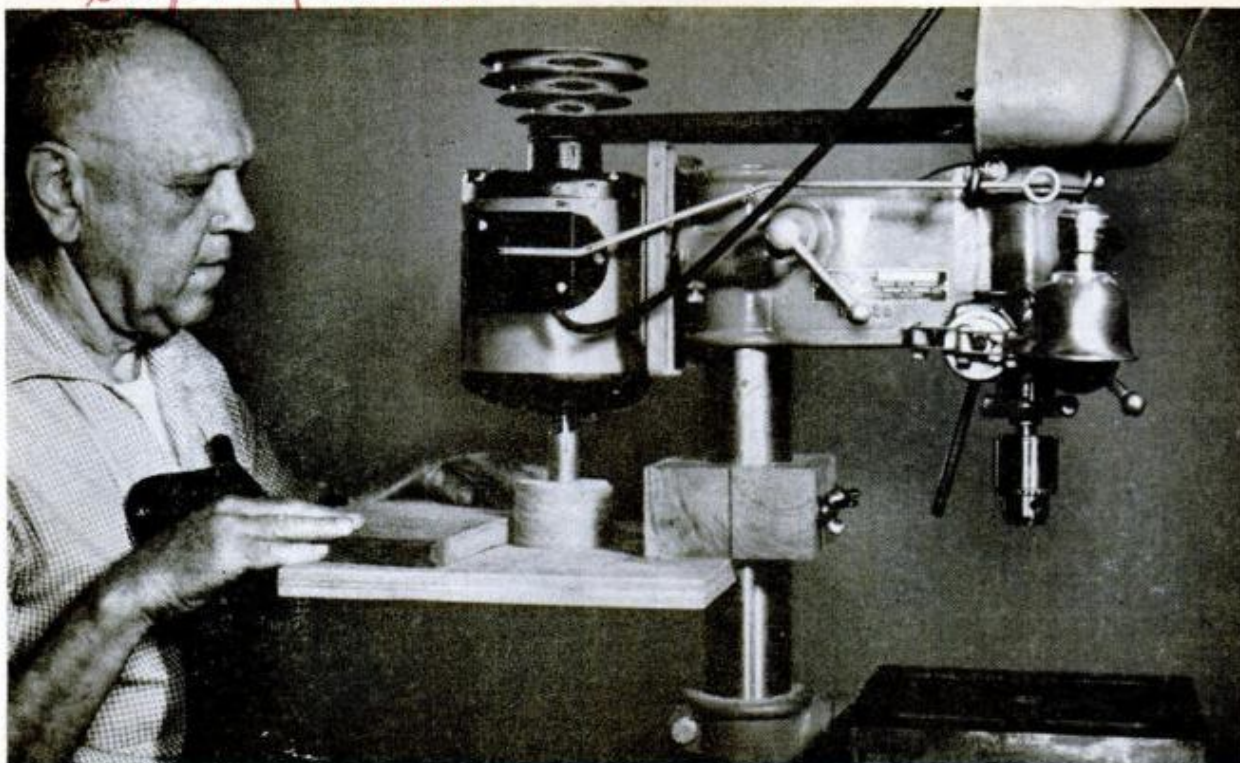


**GALLONS PER HOUR WATER EVAPORATION TABLE**

CFM THROUGH HUMIDISPRAY	TEMPERATURE DROP OF AIR THROUGH HUMIDISPRAY				
	30°	40°	50°	60°	70°
20	.08	.11	.13	.16	.19
30	.12	.16	.20	.24	.28
40	.16	.21	.27	.32	.37
50	.20	.27	.33	.40	.46
60	.24	.32	.40	.48	.56
70	.28	.37	.46	.56	.65
80	.32	.42	.53	.64	.74
90	.36	.48	.60	.72	.84
100	.40	.53	.66	.80	.93
120	.48	.64	.80	.95	1.11
140	.56	.74	.93	1.11	1.30
160	.64	.85	1.06	1.27	1.48
180	.72	.95	1.19	1.43	1.67
200	.80	1.06	1.32	1.59	1.86

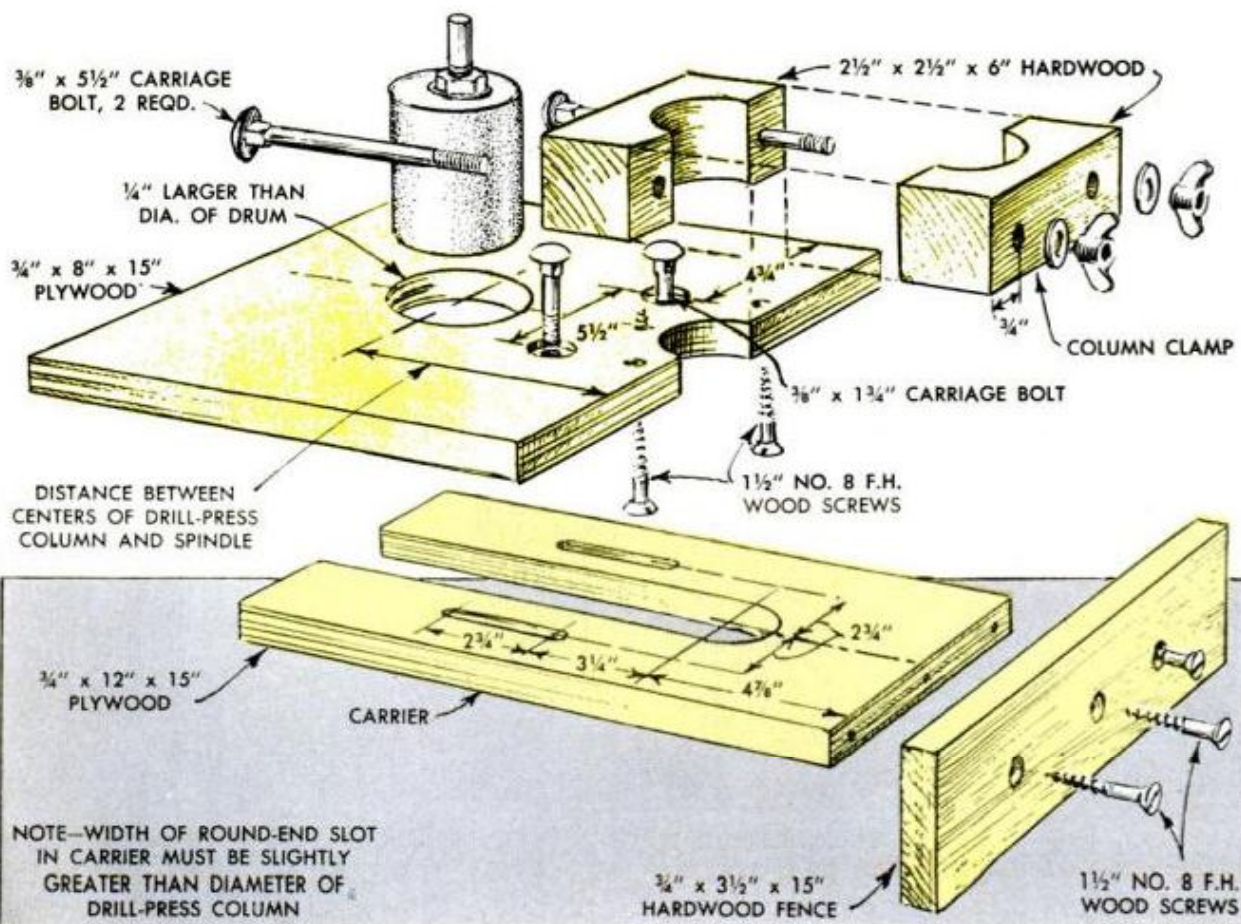
ABOVE IS TYPICAL installation of the humidifier being made in a forced warm-air heating system. Using the table at the left and a simple instrument for checking humidity you can regulate unit to give controlled relative humidity

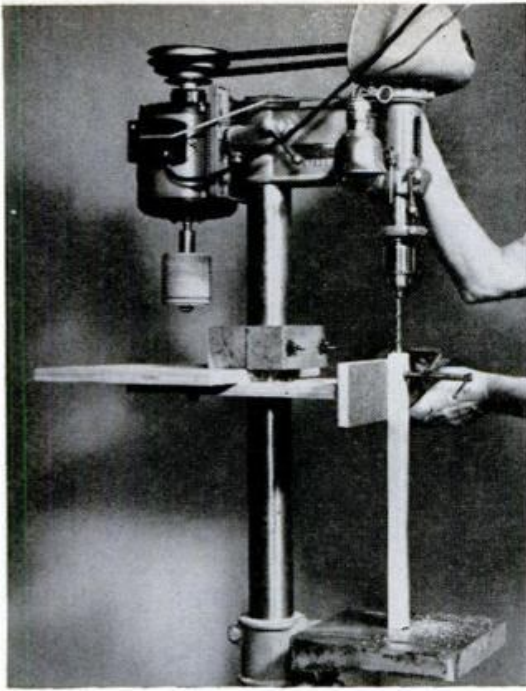




An always-ready setup for drum sanding, a handy fence for end-drilling long stock—both in one

## AUXILIARY TABLE FOR YOUR





TRY THIS without the fence to steady the upper end of the stock and you'll see how helpful this accessory to the auxiliary table is when end-drilling

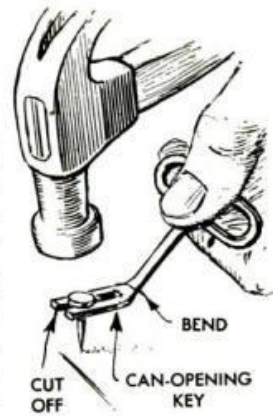
## DRILL PRESS

THIS AUXILIARY swinging table puts that idle shaft of your drill-press motor to useful work. Not only that, the table is fitted with an extensible fence which can be moved out over the lowered machine table to provide for accurate end-drilling of long stock as you see in the photo above. A look at the details on the opposite page will tell you at a glance how simple it is to build the table and sliding fence and attach to the drill-press column. The hole for the sanding drum, which must extend below the surface of the table to be effective, is bored about  $\frac{1}{4}$  in. larger than the overall diameter of the drum. To make the clamping block, or pinch clamp, first drill holes for the clamping bolts, then center a hole through the block of the same diameter as that of the drill-press column. Next, rip the block through at the center and screw and glue one of the halves to the table in the position indicated. The slide, or carrier, is slotted to fit around the drill-press column and is also slotted for bolts which, when loosened, permit it to be moved out so that the face of the fence is directly over the center of the drill-press table. In this position it provides a backing, or rest, for stock which is to be end-drilled for dowels. Use hardwood for the fence and clamping block.—Howard R. Clark

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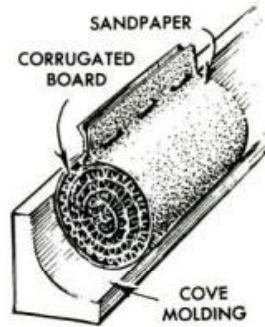
## Tack Starter

Save your fingers by making a tack starter, or holder, from a can opening key. Just unwind the tin strip from the key, bend the key at the point indicated and cut off the slotted end to form two prongs. Slide the tack between the prongs.



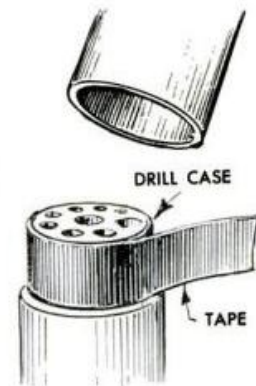
## Curve Sander

Roll up a short, narrow strip of corrugated board, wrap with a piece of sandpaper, staple the ends tightly and you have the perfect hand sander for smoothing cove molding.



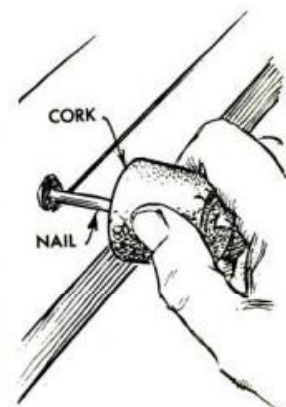
## Tight Cover

Telescoping lids, or covers, on older-style wooden drill cases, also file cases, often become loose due to wear. A single thickness of gummed tape will tighten the lid effectively.



## Marking Gauge

Drive a large nail through the center of a sizeable cork and you have a practical marking gauge. Slide the cork along the edge of the stock and the nail head will score a mark that is easily seen.



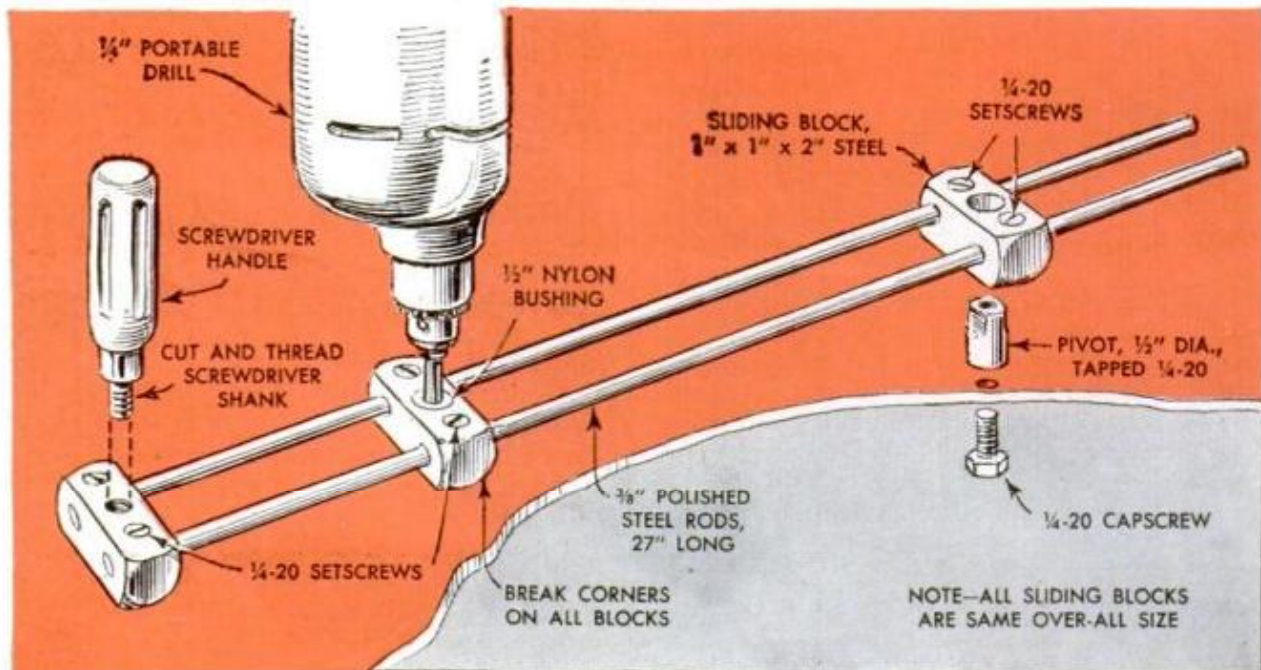
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# CUT TRUE CIRCLES IN JIG TIME



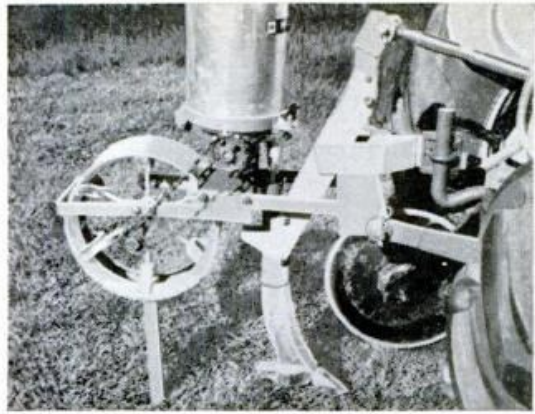
IT'S QUITE A CHORE to cut a true disk or circular opening from a sheet of hardboard or plywood with hand tools, and, of course, it can't be done handily on ordinary power tools with small work tables. But with this jig, a portable electric drill, and a bit of the router-drill type you can cut circular openings or disks in these materials accurately and speedily, and you have no special problems in holding the sheet while the cutting is going on. The jig is a simple affair easily made from everyday materials. It swings on a pivot "stand" which is center-drilled and tapped for a

capscrew, the latter passing through a hole drilled in the material at the center of the desired circle. The rods permit positioning the drill holder, or carrier, to make a circular cut ranging from about 6 in. to 48 in. in diameter. Once the jig is in position on the stock, you insert the drill bit, which has been chucked in the portable drill, in the bushing, drill through the material, then move the jig right or left to make the circular cut. An ordinary twist drill can be used, but you'll find it will cut more slowly than will a conventional bit of the router-drill type.—Arnold Stern



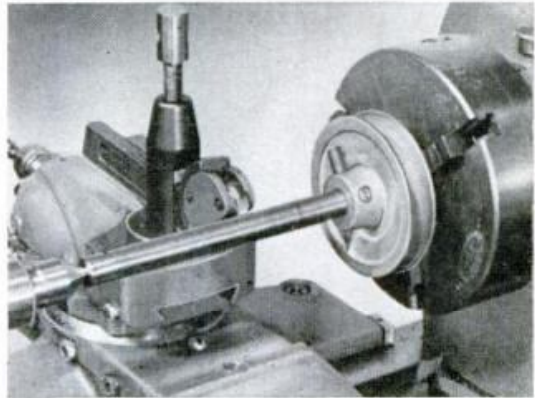
## Tractor-Drawn "Gopher"

Designed by engineers from the Department of Agricultural Engineering, University of California, this mechanical gopher simulates the natural underground burrows of the pocket gopher and simultaneously lays a trail of poison bait. The machine consists mainly of a shank, a burrow-forming steel mole, or shoe, a rolling coulter to cut trash ahead of the shank, a bait-metering device and a press wheel. Plans for construction are available from the University of California, Dept. of Agricultural Engineering, Davis, Calif.



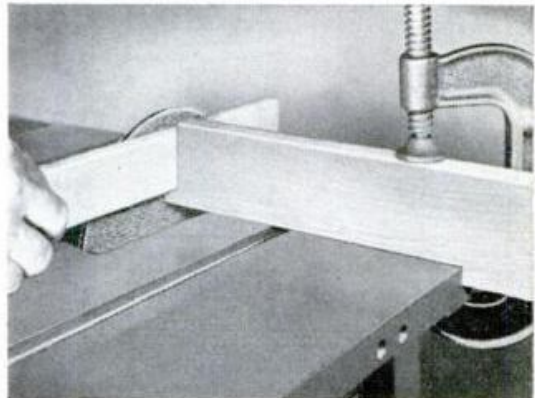
## Pulley Prevents Work Slippage

You'll appreciate this simple kink if you've ever had a workpiece slide through the lathe chuck while machining or knurling. Usually you have to discard the piece and start all over again. The simplest way to prevent slippage of the work is to slide a V-pulley over the end, insert the work in the chuck and clamp. Then press the pulley tightly against the chuck jaws and lock the pulley setscrew. You can proceed with assurance that the work won't slip even though you apply a lot of lateral pressure as in knurling.—H. Hanscom



## Thickness Sanding on Saw

It's no simple trick to sand thin stock to thickness, but you can improvise a jig for use with a sanding disk on a table saw that will do an accurate job. The jig is made by notching a length of 1 x 4 stock and clamping it to the saw table. The offset of the notch at the end of the jig must equal the finished stock thickness. The length of the other notch must equal the distance from the edge of the saw table to the face of the sanding disk. To use, pass the stock through the opening between the end of the jig and the disk.—Bil Toman

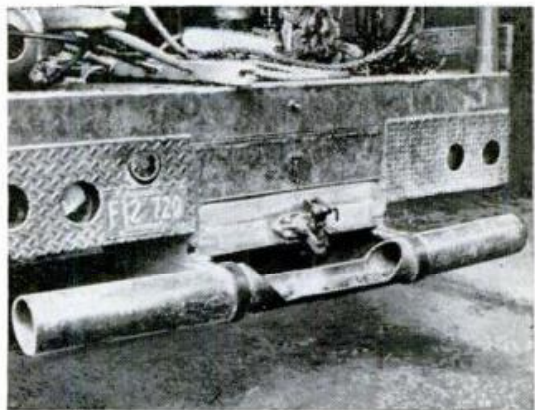


## Foot Step in Tubular Bumper

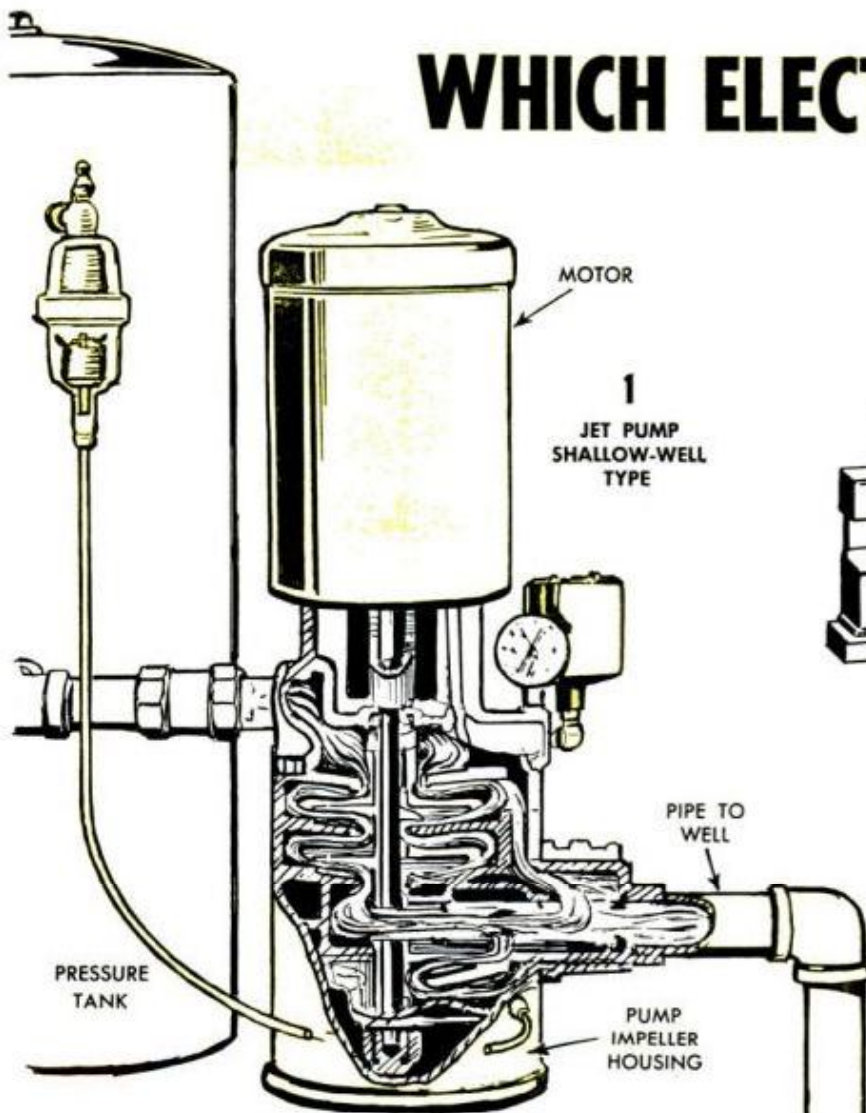
Members of a utility crew didn't wait for an accident to happen before cutting a safety step into the tubular rear bumper of their truck. The shape of the step which was flame-cut at the center of the bumper prevents slipping, even though the bumper might be coated with mud or ice.

—Grover Brinkman

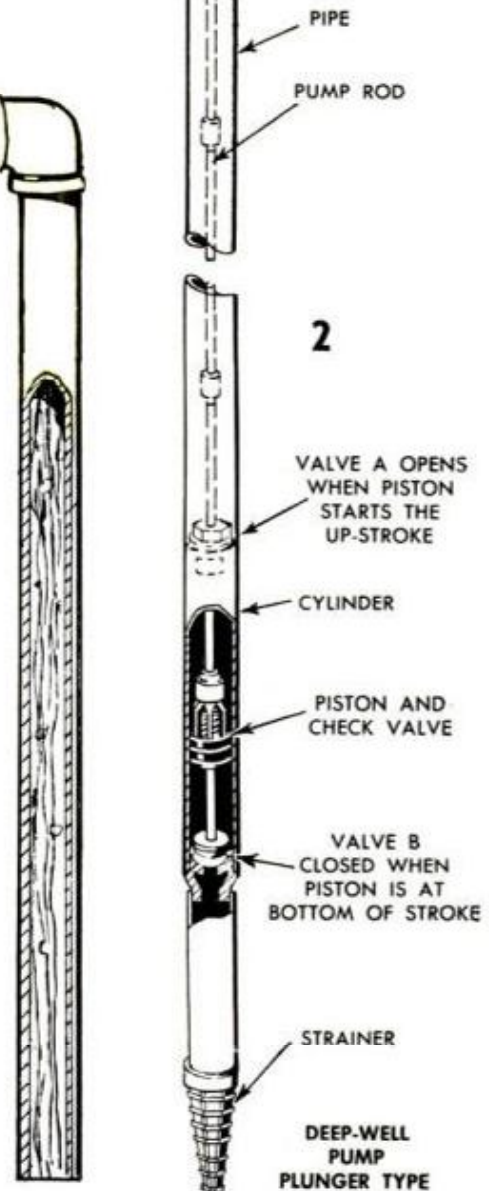
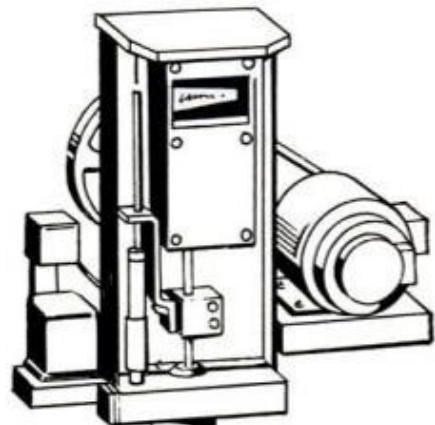
**In a pinch** you can use the tang of a file to remove a socket setscrew. Grind off the squared end until it's a snug fit in the socket, then use a wrench to turn the file.



# WHICH ELECTRIC PUMP



FIRST STEP in installing a submersible pump in a deep well is to screw a 1 x 6 pipe nipple into the top pump fitting. Note the coil of electrical power cable which is lowered into well





# FOR YOU?

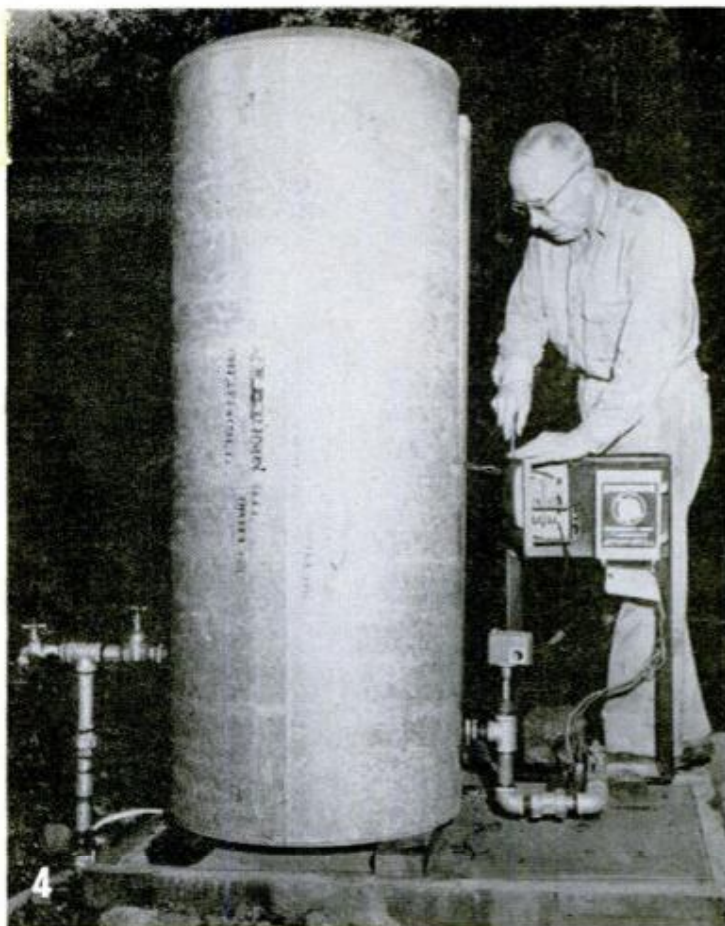
By Paul Corey

**I**F YOU ARE planning to live in a suburban home beyond the water mains, in a year-'round country home, or in a summer home with all the accessories to good living, then you need to know about pressure water systems and which electric pump to choose for service on a shallow well or deep well. Or if you are modernizing outmoded equipment, you will need to know what unit to select as a replacement. There are several types of electrically operated shallow and deep-well pumps available to homeowners who must install their own pressure water systems. All are good but each must be selected on the basis of the service it is expected to perform.

If yours is a shallow well, and this generally means that the distance to the pumping surface of the water is 25 ft. or less, then the jet, or ejector type, pump is generally recommended. This type of pump is easy to install and relatively efficient. It can be installed at the well head or any convenient distance up to 300 ft. or so from the well. A complete system, if you put it in yourself, will be quite moderate in cost.

If the pumping surface of water in your well goes below 25 ft., you'll need a deep-well pump, a type now more commonly used simply because the considerable increase in the number of wells drilled in the suburban areas, also the increasing industrial uses of water, have lowered the water table in many parts of the country. Shallow wells go dry and must be drilled to much deeper levels to reach an adequate water supply. In the deep-well field you'll have a choice of plunger pumps, deep-well ejector, or jet, pumps, turbine pumps and submersible pumps.

Although it has by no means gone out of use, the plunger pump, Fig. 2, is less commonly installed for deep-well service on home water systems. For many years the plunger-type pump was the only deep-well pump available for the small water system. Although its efficiency is rated quite high, the plunger pump, sometimes called lift pump, has some disadvantages. The longer the pull, the longer the pump rod must be. This rod can break or become disconnected



and then there is the problem of "fishing" the parts out of the well casing and making the necessary repairs. Also, it is a "positive" action pump which means that should the switch on the automatic pressure system fail, the pump will continue to run, forcing up water until something breaks. For these reasons the plunger-type pump has been largely replaced by other types generally considered more adaptable to the requirements of modern pressure water systems.

The deep-well, or two-pipe, jet pump, Fig. 9, has a lift capacity varying with the well depth, or distance to pumping-water level. Usually tables of rated capacities in gallons per hour begin with a maximum at 60 ft. Gallons-per-hour ratings reduce proportionally as the well depth increases below 60 ft. If you compare the shallow well jet, Fig. 1, with the deep well jet, Fig. 9, you will see why. The jet uses part of the water it pumps to maintain pumping action. In the shallow-well jet pump this action takes place at the well head. But the deep well jet bypasses a portion of the water lifted back into the well through a return pipe to create the lifting action that forces water from the well. The pump can be installed at the well head or can be offset from the well head as much as 300 ft. To lift water from a deep well the jet pump must be fitted with suction and pressure pipes as in



**NEXT STEP** in installation is to clamp pipe vise onto 1 x 6 nipple and lower pump into well until vise bears on 2 x 4s placed across well head above casing

**AT THIS POINT**, with pump supported by pipe vise, first 21-ft. length of pipe is screwed to end of nipple, using coupling. Screwed joints must be drawn tight

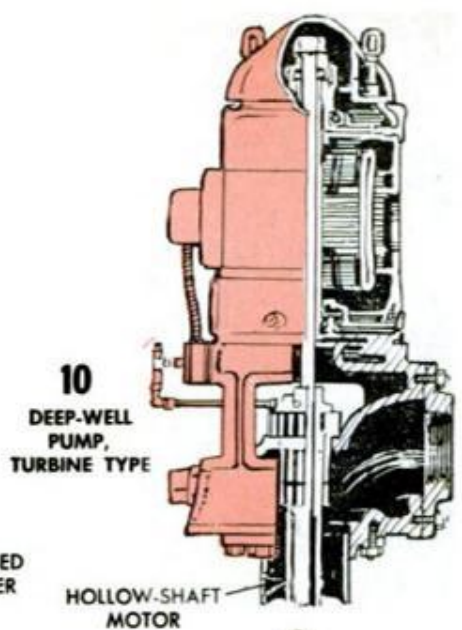
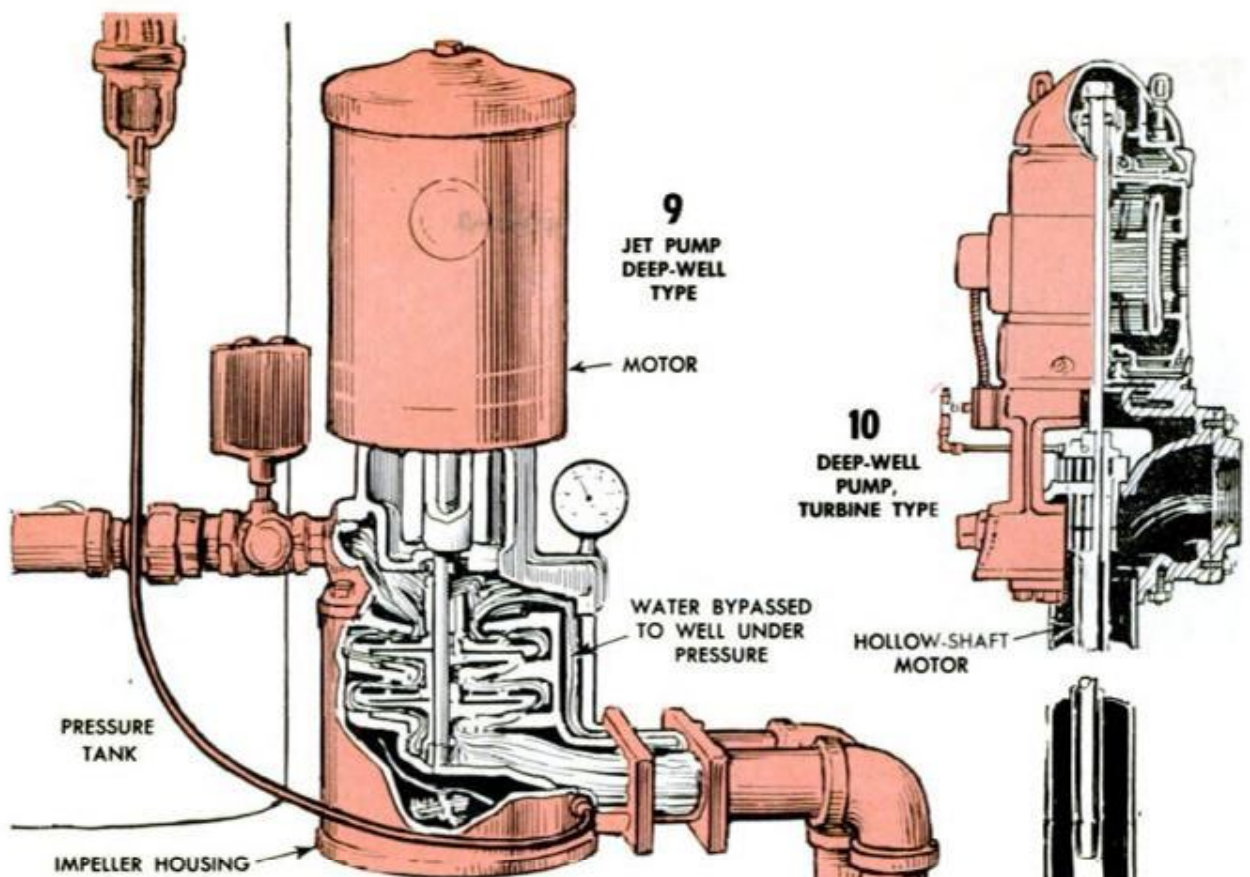


**Fig. 9.** The pipes reach below pumping-water level and are equipped with foot valve, strainer and injector. The pipes should enter the casing at the well head through a sanitary seal fitting to keep out dirt and seepage. Motors fitted to deep-well jets range from  $\frac{3}{4}$  to 3 hp., the size depending on factors which are peculiar to each installation and which must be taken into account beforehand. Manufacturers and dealers have available data from which it is possible to select a jet pump to meet almost any normal service requirement. The turbine pump, Fig. 10, is an efficient shallow-well unit and it also has certain advantages for deep-well service. It requires a smaller motor than other types for a given capacity. It requires somewhat less space at the well head. The pumping mechanism consisting of a system of impellers is in the well and is connected to the motor at the well head by a stainless-steel shaft, Fig. 10. The deeper the draw of water, the longer this shaft must be, of course. Casings in drilled wells in which the turbine pump is installed must be fairly straight as the shaft will not take any appreciable curve and operate satisfactorily.

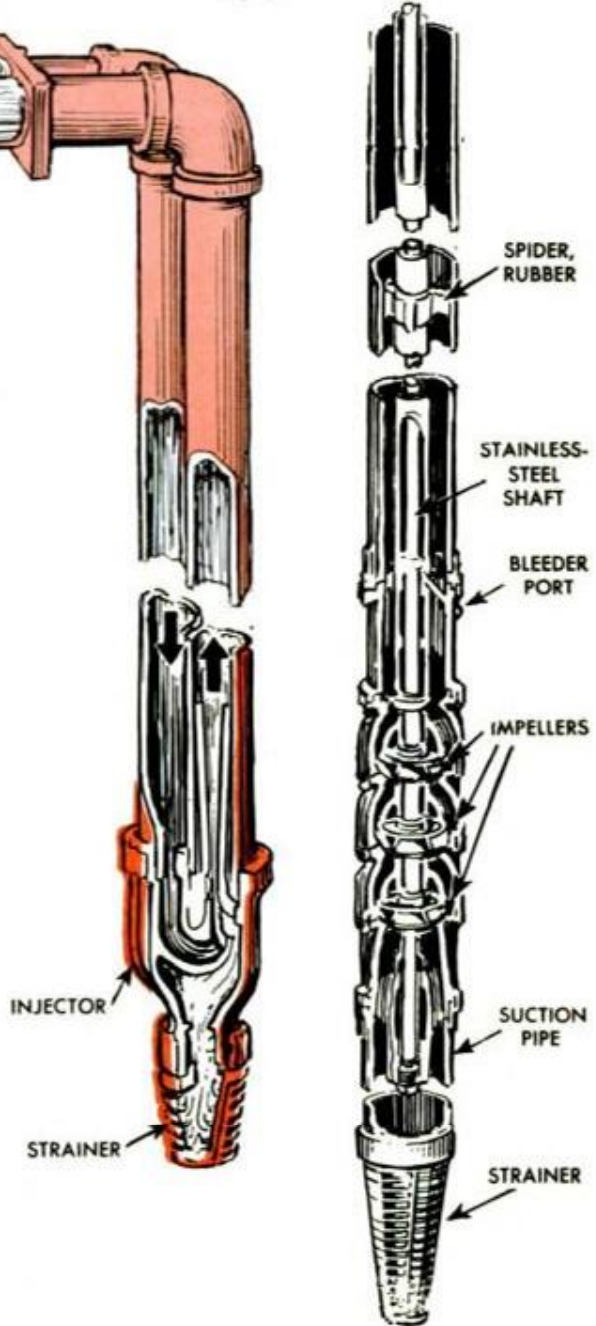
In nearly all respects the deep-well submersible pump, Figs. 12 and 13, is rated best for suburban-home water systems. It is highly efficient and extremely quiet in

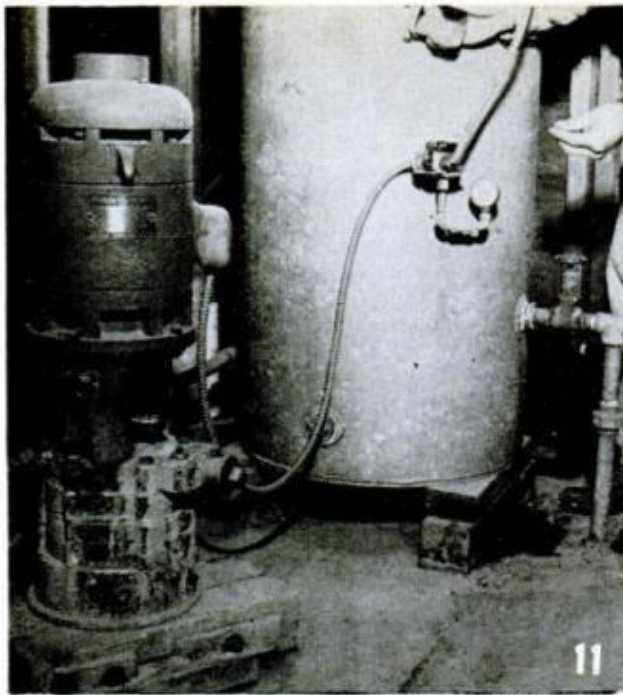
**AS PUMP IS LOWERED**, power cable is taped to pipe above and below each coupling. Keep cable taut, but not tight, to prevent kinking as pump is lowered



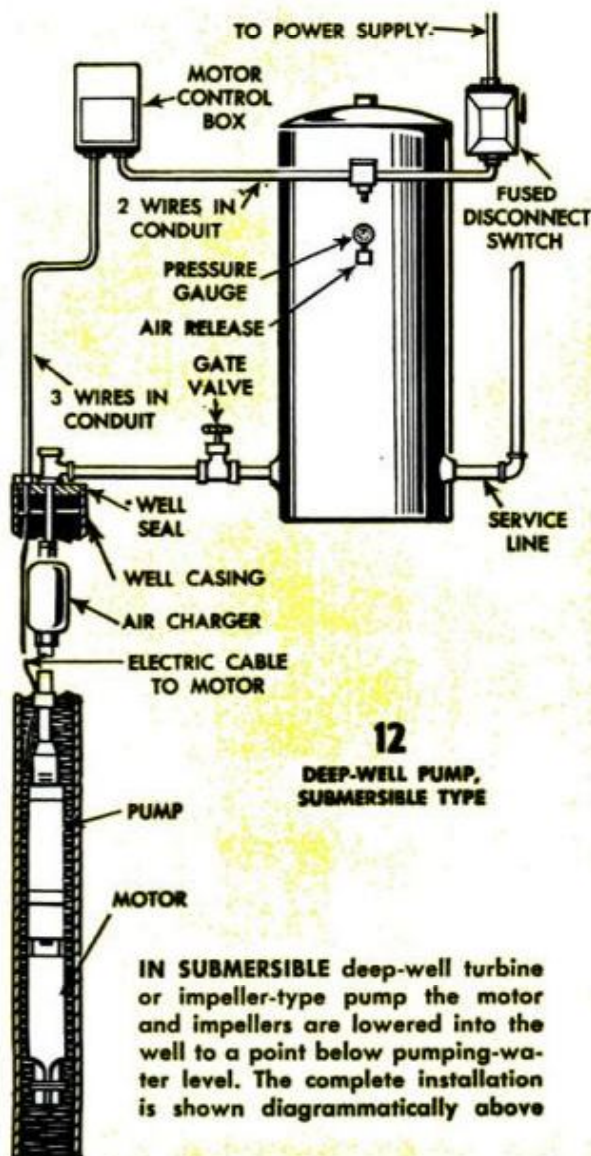


**ASPIRATOR** in T-fitting is screwed in place before adding final length of pipe. Purpose of aspirator is to keep head of air balanced in pressure tank at well head





ABOVE is typical installation of a deep-well jet-type pump powered by a 2-hp. motor and having the pressure tank and fittings installed at well head



**13**  
CUTAWAY VIEW  
MOTOR AND PUMP

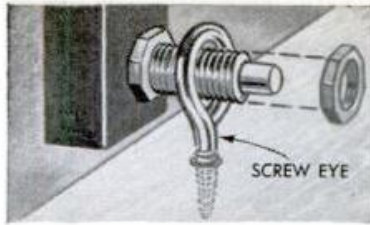
operation. It requires the least space at the well head as motor and impellers are submerged below pumping-water level inside the well casing.

Mechanically the submersible pump is simply a turbine pump, with essentially the same impeller assembly as you will see by comparing the details in Figs. 10 and 13. Among its several advantages over other types are its comparatively light weight and ease of installation. The pump, motor, pipe and electrical cable for installation in a 200-ft. well will weigh about 450 lb. While the pipe alone for a jet pump for a well of comparable depth will weigh 1200 lb. or more. A single 1-in. pipe is adequate for a  $\frac{3}{4}$ -hp. unit, while  $1\frac{1}{4}$ -in. pipe is required for larger motors and deeper wells. The motor is submerged and can't overheat and the pump can't freeze in cold climates. Operating noise is reduced to the minimum. The size of motor required is half that needed to operate a jet-type pump of comparable capacity and current consumption is comparatively less. The pump never needs priming. The cost for jets, turbines and submersible pumps averages about the same. A plunger-type deep-well pump can be installed at somewhat less cost. Fig. 3 and Figs. 5 through 8 show the several essential steps in installing a deep-well submersible pump.

The size of the pump you install will depend upon the capacity of your well, the amount of water you will need and the depth from which the water must be drawn. The U. S. Department of Agriculture has estimated that adults use from 50 to 100 gal. of water a day; children under 2 yrs. require 100 gal. If you need water for lawn and garden

(Continued to page 238)

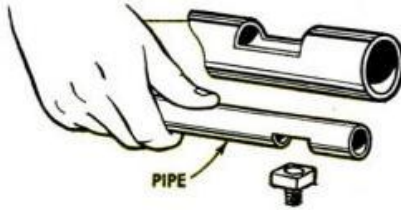
POPULAR MECHANICS



## Surface-Mounting for Switch

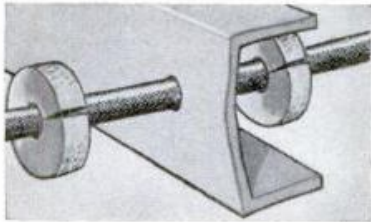
In experimental work it often is handy to mount push-type switches on a wooden panel in either the vertical or horizontal position. Here you can use a screw eye as a holder, making the temporary installation in the manner detailed.

—Stephen N. Stresnic



## Improved End Wrench

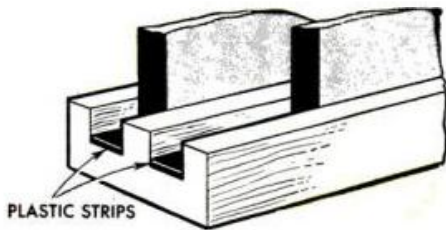
What to do when the wrench won't fit, or when there is no wrench at hand and you have to tighten or loosen a nut? Here's one solution: Measure the nut for over-all size, then file a notch in a short length of pipe or tubing and use as a wrench.



## Cord Grommet From Cork

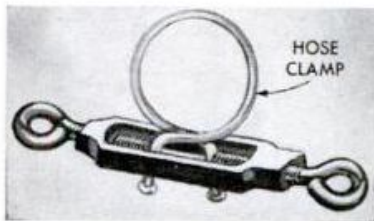
Electric power cords should never pass through metal without some protection from a break in the insulation. If you don't have a rubber grommet at hand, you can make a temporary grommet from two slices cut from a large bottle cork.

—Victor H. Lamoy



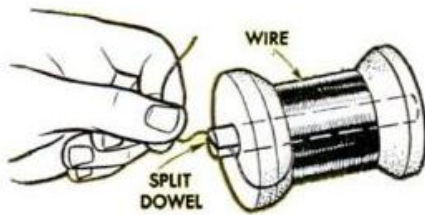
## Sliding Door Glides

Slide-past doors of hardboard or plywood sometimes stick in the grooves. The sure remedy is to cut a strip from counter-top plastic and place in the bottom of each groove. If necessary, plane the edge of each door to compensate for the thickness of the plastic.—Frank Moore



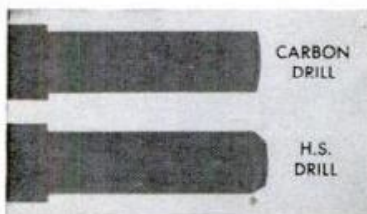
## Turnbuckle Doubles as Clamp

Spring-type radiator hose clamps are rather difficult to remove without the tool made specially for the purpose, but in a pinch you can use an ordinary turnbuckle. Open the turnbuckle so it will slip over the prongs of the hose clamp and "unlock" it.



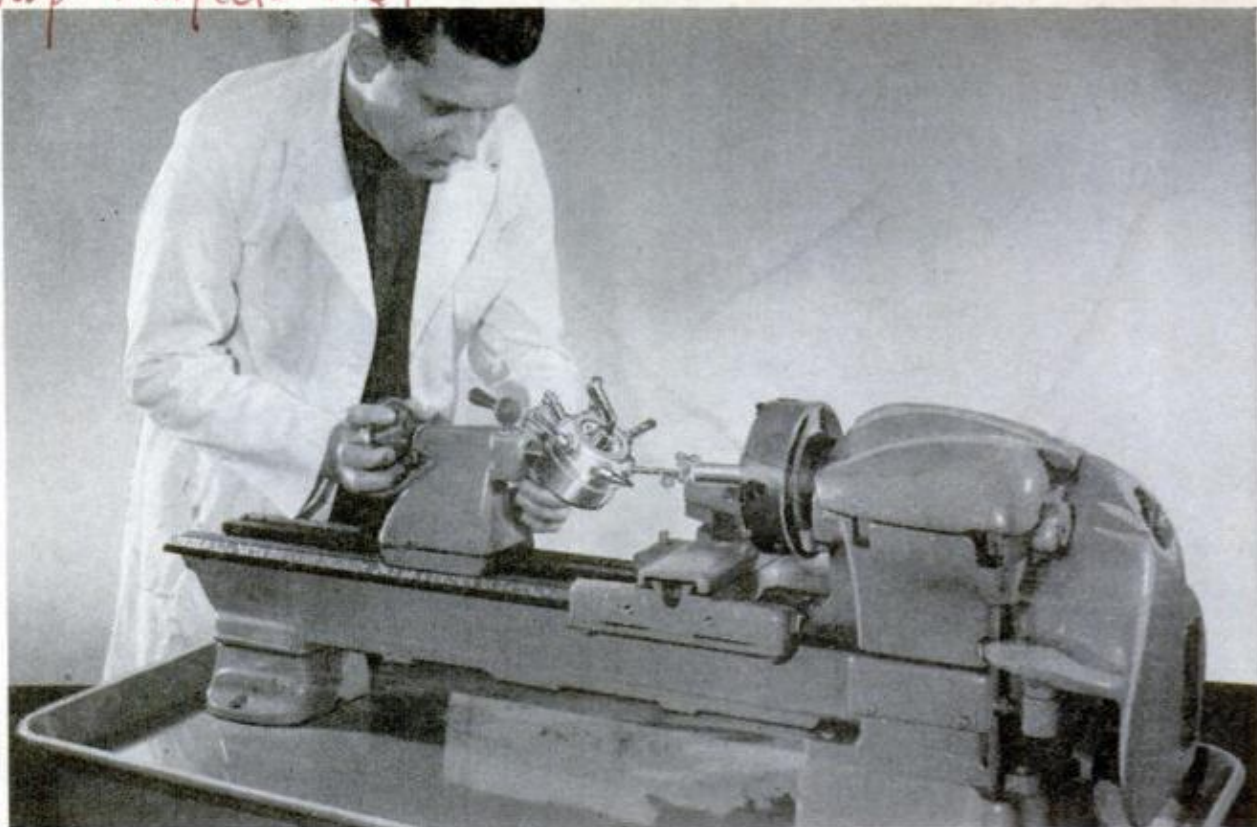
## Split Dowel Keeper on Spool

Spoiled wire tends to unroll from the spool when the end is free. One radio serviceman inserts a dowel in the hole in the spool, splits the projecting end and pulls the free end of the wire into the split in the dowel.—William B. Eagan



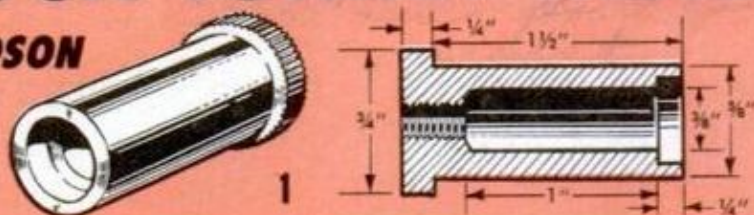
## Altered Tangs Identify Drills

In a kit containing both carbon drills and high-speed drills it is often difficult to identify the two types. One way is to grind a bevel on the end of each high-speed drill tang. This makes it easy to pick the one you want.—Burton L. Wollenzien



## TAILSTOCK TURRET HEAD

By C. W. WOODSON



**L**IGHT, SHORT-RUN JOBS involving internal and external operations on duplicate workpieces can be handled on a small lathe accurately and economically by fitting it with a six-position tailstock turret, or rotating tool head. All parts of the turret can and, in fact, should be made on the lathe on which the unit is to be used. You can go even further in increasing the range of usefulness of the basic lathe by working a cross-carriage turret, Figs. 2 and 3, in conjunction with the tailstock turret. This increases the range by four additional operations, and makes it possible to turn out duplicate small parts involving repeat operations of a more intricate nature.

The workpiece sectioned in Fig. 1 is a typical example of the multiple operations that can be carried out with a tailstock turret. The initial internal work on round stock requires six different operations, the full range of the six-position turret. The dimensions given have no special signifi-

cance. They are merely indicative of the over-all size of a workpiece which can be handled on a small lathe of 9-in. swing.

When both types of turret attachments are used together the tailstock turret is generally set up for internal operations while the cross-carriage turret is tooled for turning, knurling, cutting off and other external work, avoiding the necessity of changing tools repeatedly in the standard lathe toolpost and tool-bit holder.

The details, Figs. 2 and 4, show the tailstock turret tooled for turning out the knurled and threaded bushing, Fig. 1, from finished bar stock extending through the headstock spindle and gripped in a chuck or collet. Drilling the center hole, A, Fig. 4, is the first operation, followed by the tap drill B, Fig. 4. This small hole is opened out part way by a larger drill, detail C, and then is reamed to final size as in detail D. The end is counterbored as in detail E, and the small diameter hole tapped, as in detail

F, completing the internal work on the bushing. The outside is next turned to diameter leaving a narrow shoulder which is then knurled and the piece cut off in the completing operation.

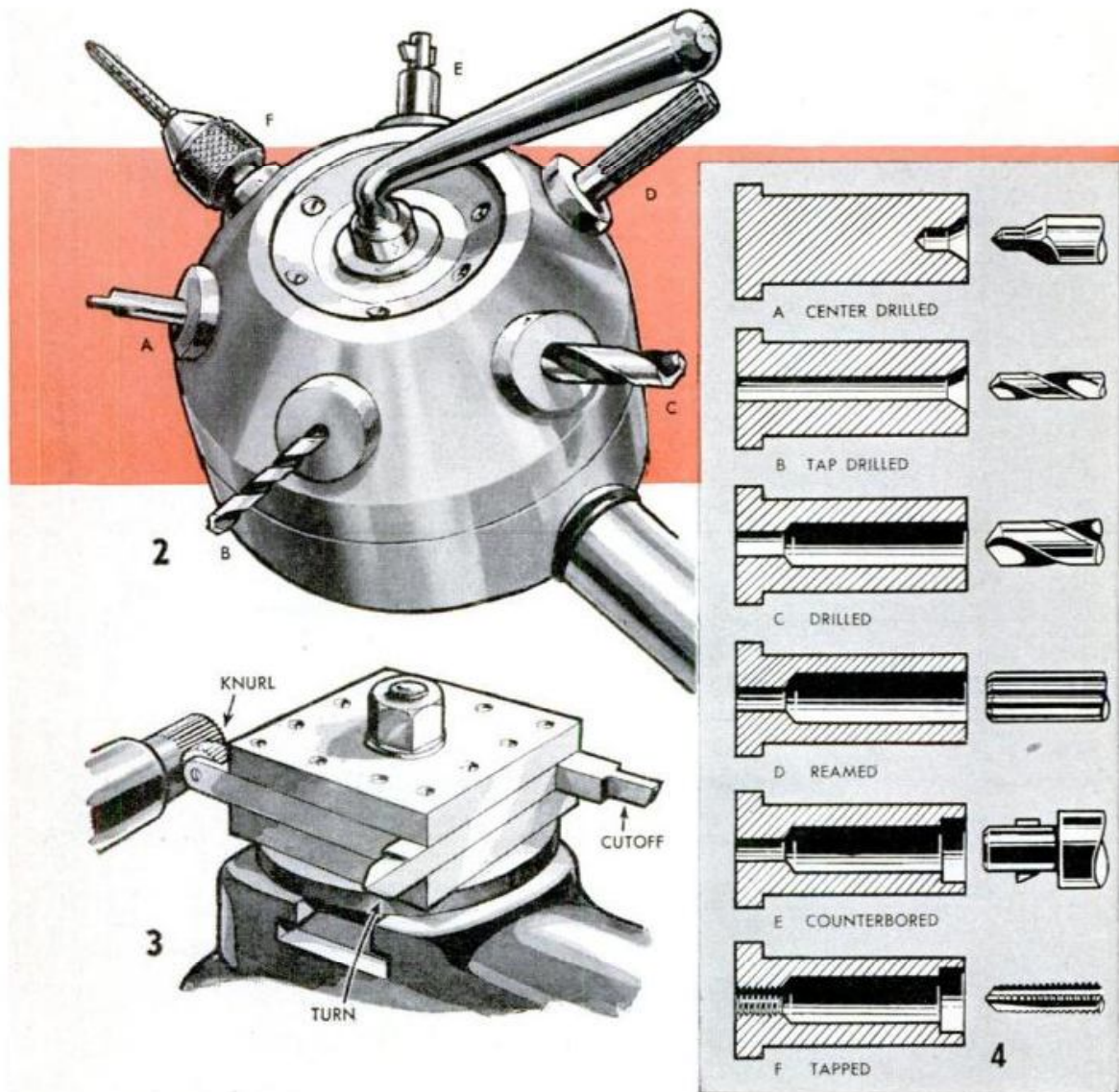
No automatic stops are provided on the tailstock turret detailed but where the depth of cut must be controlled the graduations on the tailstock spindle can be used with sufficient accuracy for average work. The depth of cut is controlled on the cross-carriage turret by the micrometer dial on the cross-feed screw.

As the first step in machining parts of the six-position turret on the lathe on which it is to be used, select mild-steel stock for the base and the rotating tool head. These two parts are turned to the dimensions given in Figs. 6 and 8, and a  $\frac{7}{16}$ -in. hole is drilled through the center of each piece to receive the threaded stud, Fig. 7. The hole in the

rotating head is reamed to a smooth finish, making it  $\frac{1}{2}$  in. in diameter to receive the larger diameter of the stud in an easy, sliding fit.

The hole drilled in the edge of the base to receive the No. 2 Morse taper shank is drilled at a 60-degree angle as indicated in the detail, Fig. 8, with the work held in the angle vise or by tilting the drill-press table. The big end of the shank is turned 0.002 larger than the diameter of the hole and a shrink fit is made by first heating the base to enlarge the hole by expansion. Then the shank is driven in cold. When the base cools and shrinks onto the shank it will be held rigidly and permanently in place.

With the tool head turned bottom up, Fig. 6, the six index holes are accurately laid out and drilled for the locating or index pin, Fig. 5. The spring-loaded index pin is made up and threaded and finally

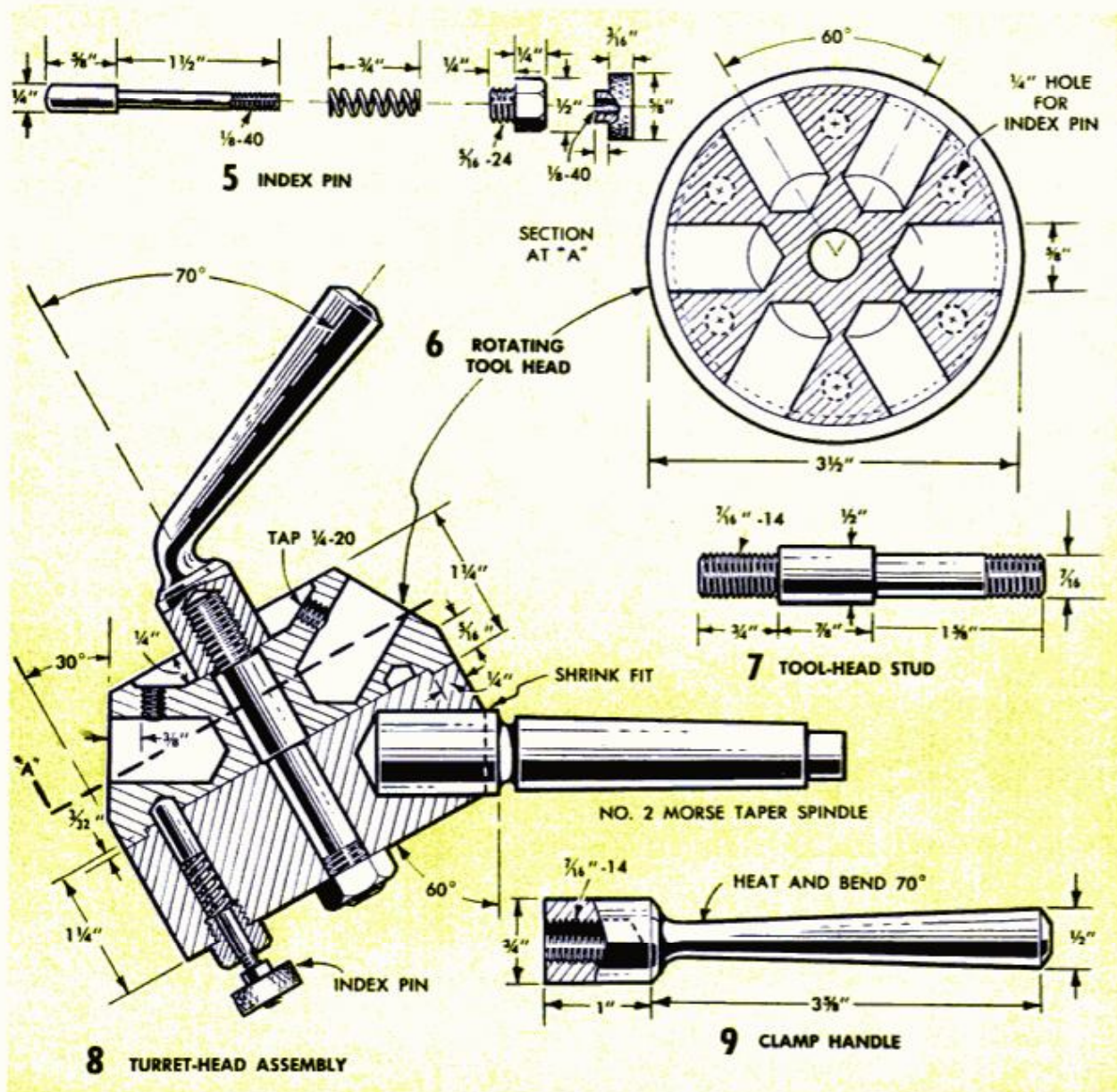


screwed into the corresponding index hole drilled in the base. The guide for the index pin is made from  $\frac{1}{2}$ -in. hexagonal brass rod while the pin itself is turned from drillrod with the head rounded and hardened. The loading coil spring is made of piano wire and slipped over the shouldered end of the pin and a knurled and shouldered nut is screwed onto the lower end to provide a finger hold.

With the stud and clamp handle, Fig. 9, made up to the dimensions given in the details, the parts are assembled and the completed turret mounted in the tailstock spindle where the final operation of accurately locating, drilling and reaming the  $\frac{5}{8}$ -in. tool holes is completed. This is done by mounting a heavy center drill in the headstock chuck and accurately starting each tool hole in the turret head by rotating and locking the head securely at each indexing position and feeding the work to the drill by the tailstock handwheel. Each

hole is drilled  $\frac{9}{16}$  in. in diameter to its proper depth, and brought to a smooth finish and final size by reaming. Screw holes are accurately located above each tool hole, Fig. 5, and drilled and tapped for hollow setscrews which anchor the tools firmly in place when in use. Drilling and reaming the tool holes in the completed turret head, while each is indexed and locked in position, assures accuracy for each tool.

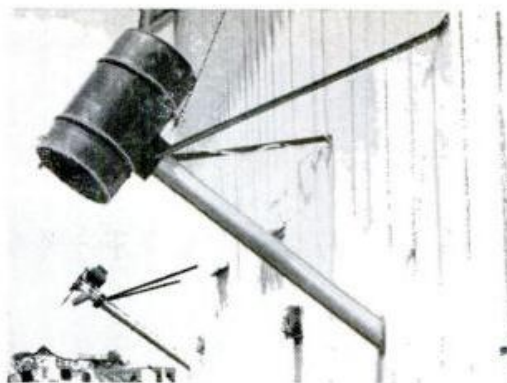
In operating the turret head it is necessary to make certain that the taper in the tailstock sleeve is free of chips, dirt, grease and oil and that the tapered shank of the turret is wiped clean before insertion in the sleeve. A drop or two of very light oil on the tapered shank to prevent any tendency of it to seize in the sleeve may be permissible, but no other lubricant should be used, as otherwise machining inaccuracies may result. When a run of work is finished it generally is best to remove the head from the tailstock. ★ ★ ★





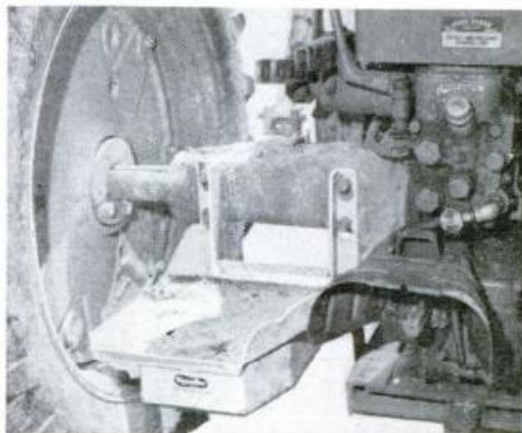
## Drum Shields Elevator Motor

Exposed motors and V-belt drives need weather protection. On the farm this can be something of a problem, the motorized elevator drives pictured being a typical example. Here the auger-type elevators are supported on brackets at a distance from the side of the building that makes construction of a canopy impractical. So the owner cut out one end and slotted the sides of 15-gal. steel drums to make removable, weatherproof covers, one of which is shown in position.—A. M. Wettach



## Double Duty Safety Step

What farm tractor owner has not wished for a safe, rigid step to ease the tiresome climb on and off the tractor seat as is necessary in some types of field work? Without a safe step the operator is always aware, too, of the danger of slipping when mounting or dismounting, especially when the rear axle housings of the tractor are coated with snow, ice or mud. Here's an all-metal non-skid step which is hinged so that it also serves as a tight cover for the tool box mounted directly below it. The whole thing is supported by brackets which are bolted to the axle housing.



## Mailbox Initialed With Chain

There's no mistaking the ownership of this rural mailbox, even from a distance. The owner, as you can see from the photo, welded a length of chain to form the first letter of his name, then welded the letter to two short lengths of chain, one L-shaped, to form a bracket which is attached to the mailbox at one end and to the metal post at the other. The letter and rigid bracket are made by welding each chain link to the one adjacent.



## Coal Scuttle Fills Feeders

Small self feeders of the type used in poultry houses are difficult to fill without waste, especially when filling with small grain and dry mash. The job can be speeded considerably and waste eliminated by using an ordinary coal scuttle for this purpose. The shape of the spout on the scuttle permits controlled pouring without spilling the contents.

**When several sprayers** are used for different jobs, such as applications of DDT, moth spray and garden sprays, it's a good precaution to label each unit so that there can be no mistake as to the spray material being used. Type or letter the information on strips of adhesive tape.





## LIGHTWEIGHT MOBILE PA AMPLIFIER

By Otto Fried

*319 Huntington Lane  
Elmhurst, Ill*

**H**OW MANY TIMES could you have used a PA amplifier for a picnic, back-yard party, boat or other application? How many times did you miss some musical entertainment during your club outing? How many times did you simply shrug your shoulders and say to yourself that it is not worth carrying around 50 or 60 pounds of amplifiers with mobile power supplies for a few hours of use? Well, here is a good quality PA amplifier that does not require any special power supply, and its weight is not more than a medium-sized portable radio.

The amplifier is designed to operate from 12-14 v.d.c., and any 12-volt car battery will do very well as a power source. The power consumption is very low (1.2 amps at maximum output, 300 ma. at no output), so that the battery can deliver the necessary power for hours without any appreciable drain and without the necessity of starting the engine. The amplifier will deliver more than 10 watts into an eight-ohm speaker.

We have included four inputs: Two microphones, magnetic cartridge, and a jack for a tuner or ceramic cartridge. Both microphones and the phono inputs have separate preamplifiers with volume controls,

so that any combination of signal mixing and fading is possible. A simple tone control circuit was added, which primarily attenuates the higher frequencies. This will, by the way, vary slightly with different potentiometers, because of their wide tolerance. Any of the four included inputs can be omitted, if your application does not call for it. This, of course, means that you can also omit the preamplifier with the volume control. If, for instance, you wish to use one mike only, you simply disregard J<sub>2</sub>, TR-4 with all its associated circuitry up to R<sub>20</sub>. On the other hand, if you need three microphone inputs, add another input jack and duplicate the circuitry between J<sub>2</sub> and R<sub>20</sub>. Mike 1 input is designed for crystal or ceramic microphones; Mike 2 should be used with dynamic types. If you have two high-impedance mikes, simply omit C<sub>11</sub>; if you wish to use two low-impedance mikes, add .1 mfd. to J<sub>1</sub> input, wired the same way as C<sub>11</sub>.

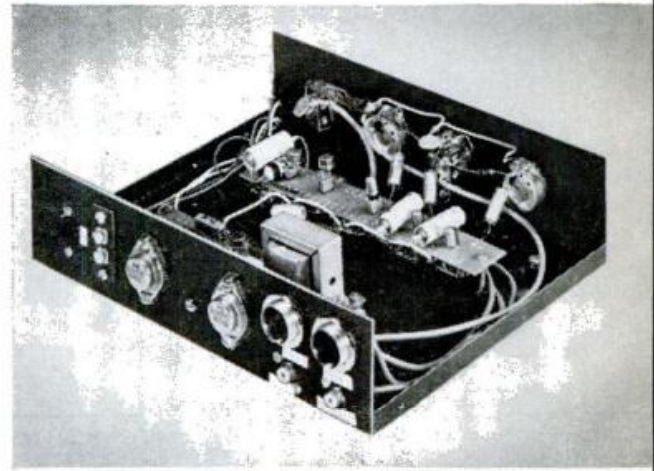
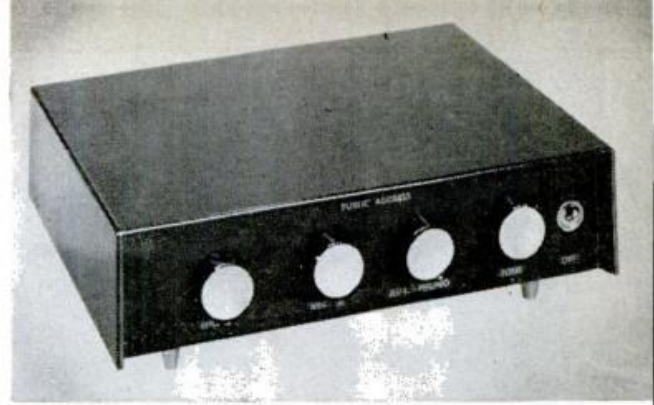
The construction is fairly easy, and as usual, it is advisable to collect all necessary components before the final layout. The Erie strip-packs were found very convenient for mounting the majority of components, including the transformers. They

help to make the final product smaller, neater, and they eliminate the necessity for drilling holes. One word of caution about transistors: These devices are quite immune to practically any mechanical shock, but they are very sensitive to higher temperatures. It is recommended that transistor sockets be used for all six small transistors (TR-1 to TR-6). These eliminate any contact between the hot soldering iron and a transistor lead. For those who are more experienced and wish to solder transistors directly to other components, we have shown both types of mountings.

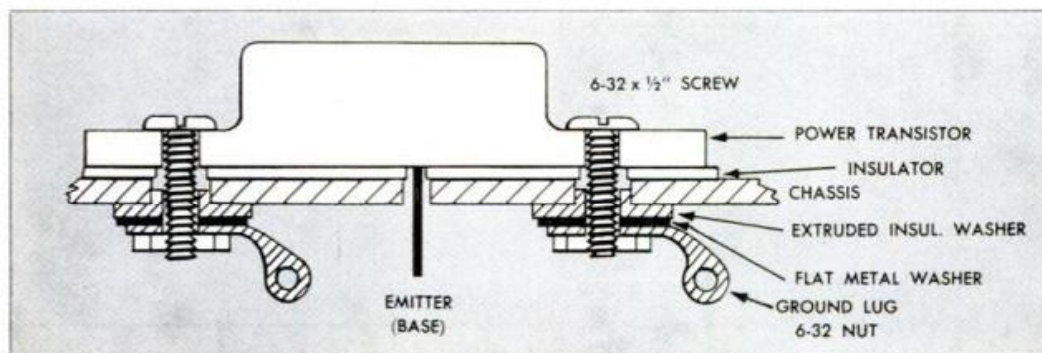
The power transistors (TR-7 and TR-8) can be mounted directly to the chassis (which acts as a heat sink) without any danger providing the mounting procedure is followed. You can use either transistor mentioned in the parts list; the only difference between 2N257 and 2N268 is a voltage rating and price.

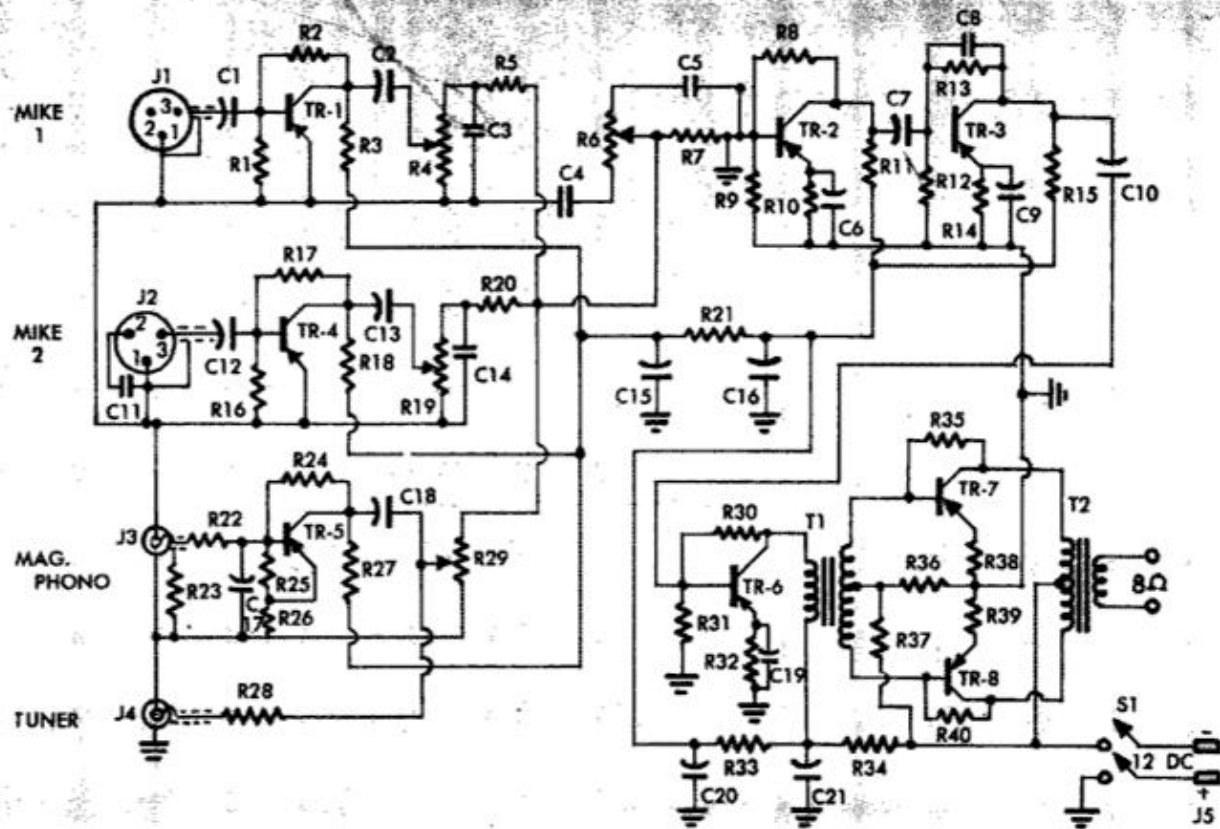
Shielded cable must be used between all inputs and the rest of the circuitry; it is also recommended between the tone control ( $R_6$ ) and TR-2, as indicated in the schematic diagram. Transformer T-1 (Stancor TA-38) has both windings center-tapped. When wiring the low impedance winding, clip off the red wire, and use the blue and brown only. All three leads (black, green, yellow) on the other winding are employed as shown. The output transformer TA-12 has a fixed impedance of 8 ohms on the secondary winding; the maximum power transfer will occur with an eight-ohm speaker, but a 4-ohm or 16-ohm speaker can be used without appreciable loss of audio output.

We have found it more convenient to form our own chassis and cover, because all commercial chassis were either too large or they did not have sufficient depth to use the Erie strips. A creditable bending job can be done on a medium-sized vise with No. 20 gauge steel or aluminum. However, a larger commercial chassis with the necessary depth can be used without any problems. The bottom plate, then, can also serve as a simple cover.



Above, three views of amplifier. Note transistor mounting on back of chassis pan. Transistor heat is drawn off by chassis which serves as heat sink. Below, proper method of assembling transistor and hardware provided with transistor, to the chassis





SCHMATIC DIAGRAM OF PA AMPLIFIER

The amplifier can be operated from any 12-v. battery, but caution must be taken to provide the proper polarity. As in much other transistorized equipment, this amplifier has grounded B+. If you plan to use the chassis of your car as one of the power leads, be sure that your car also has B+ grounded, otherwise any contact between your car body and the amplifier chassis will blow the fuse. This does not imply that only a car with positive ground can be used, but be certain that you keep the amplifier on the seat or any other insulating fabric in case the ignition system of your car is of the opposite polarity.

The power cable can be connected directly to the battery (not too convenient), to the ignition switch contacts, or to any other points under the dashboard, possibly the fuse box. However, the most convenient way seems to be to use the lighter socket, which is not wired through the ignition switch, so that the amplifier can be used without turning the key on. We have used a plug with the cord from an auto bottle warmer, designed for 12-v. operation, and it works like a charm. The plug locks it firmly in the socket, and the amplifier can be turned on in seconds without any modifications of wiring in the car.

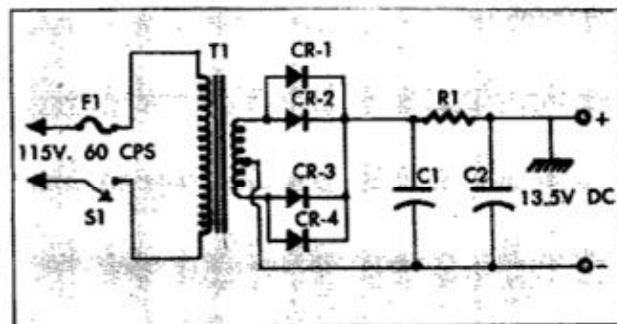
Next time your club, church or school needs a PA amplifier for outdoor use be ready with this "Little Giant"; start assembling now.

#### PERFORMANCE DATA

- Rated power: 8-10 watts at 12.8 v.d.c.
- Harmonic distortion: Less than 7 percent at 8 watts
- Frequency response: -3db +2db from 200 c.p.s. to 8.5 kc.
- Hum: Inaudible (-85 db below 8 w.)
- Hum and noise: -65 db below 8 w.
- Sensitivity: Aux: .250 volt  
Phono: (mag.) 6-8 mv.  
Mike: 1 mv.
- Power consumption: No signal: 300 ma.  
Full signal: 1.2 amps

(Parts List on page 238)

Diagram below provides alternate power supply circuit for use with 115-volt a.c. lines. Connect output of a.c. power supply to 12-volt d.c. input on amplifier unit. This permits the use of the amplifier on house current. It replaces the 12-volt battery normally used. The a.c. power supply is also a convenient means of testing amplifier on workbench



# Make Your Own Etched Circuits

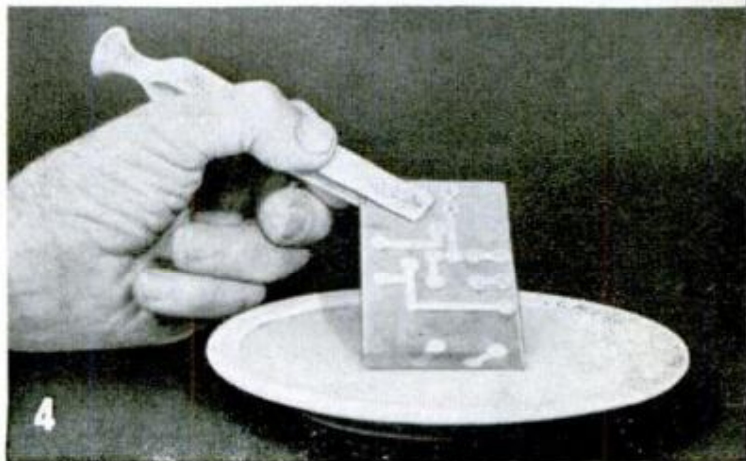
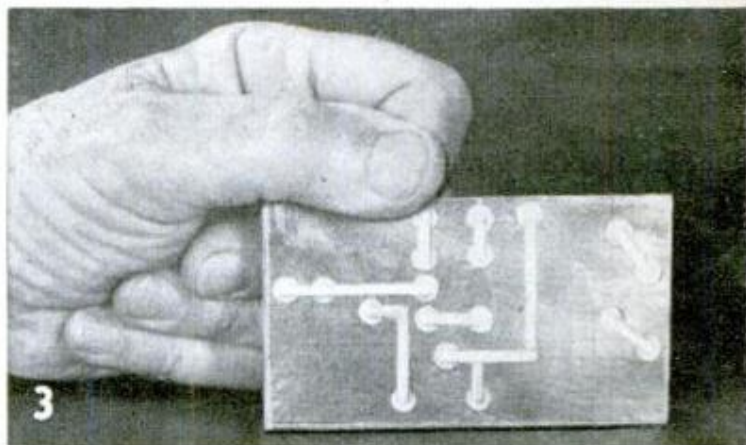
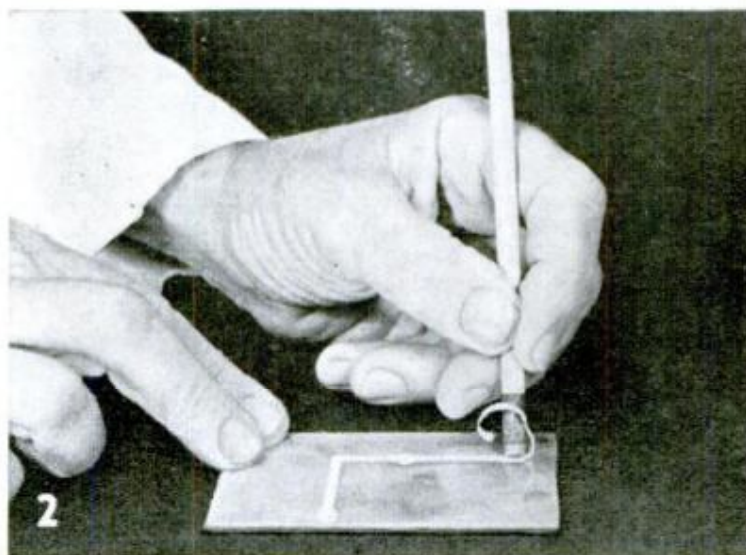
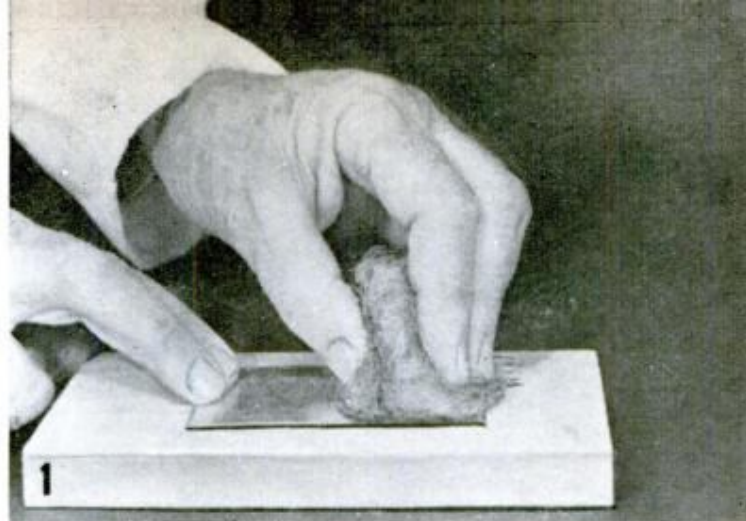
By Walter B. Ford

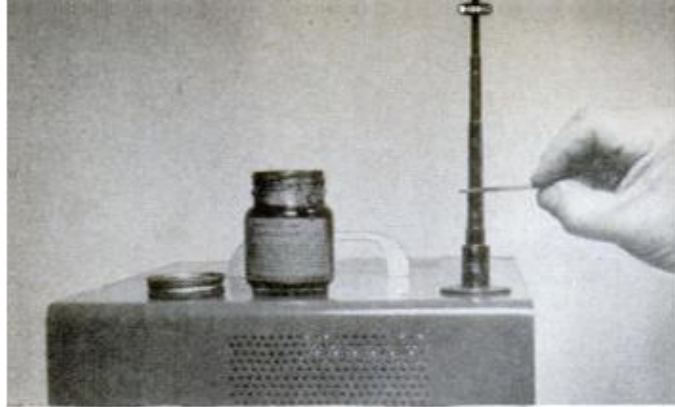
**W**OULD YOU LIKE to make your own printed electronic circuits, from the base material to the finished product? The process is easy and the readily obtained materials make this fascinating hobby available to almost everyone.

When printed electronic circuits were first introduced a few years back, an era of miniaturization of electronic equipment began which today has extended over the whole electronic industry. Electronic circuits can now be made to take but a portion of the space required for conventional wired circuits. This has permitted designers much more latitude in offering radio, hi-fi and TV equipment with much greater eye-appeal. The space-saving feature of printed circuits has also made lighter weight units possible. This is of considerable importance in the production of portable amateur and commercial communications equipment. From the experimenter's viewpoint, one of the main advantages of printed circuits is the ease with which they may be traced. Anyone who has had an opportunity to compare the neat straight lines of a printed circuit with the usual "rat's nest" presented by the conventional wired circuit will appreciate this feature.

To make your printed circuit you will need a piece of insulating material for the base, such as fiber, Bakelite, Micarta, or plastic at least  $\frac{1}{16}$  in. thick; a sheet of household aluminum foil; a roll of masking tape; some muriatic (dilute hydrochloric) acid; and some epoxy resin adhesive. Cut the base and sheet of aluminum to the desired size and smooth the aluminum until it is free of creases and wrinkles. Rub one side of the aluminum sheet with steel wool to remove the gloss (1). Mix the epoxy glue according to directions and apply a thin coating to the base material. Epoxy glue is a new adhesive which makes a practically unbreakable bond between any kinds of materials. Being both waterproof and acid resisting, it is ideal for making printed cir-

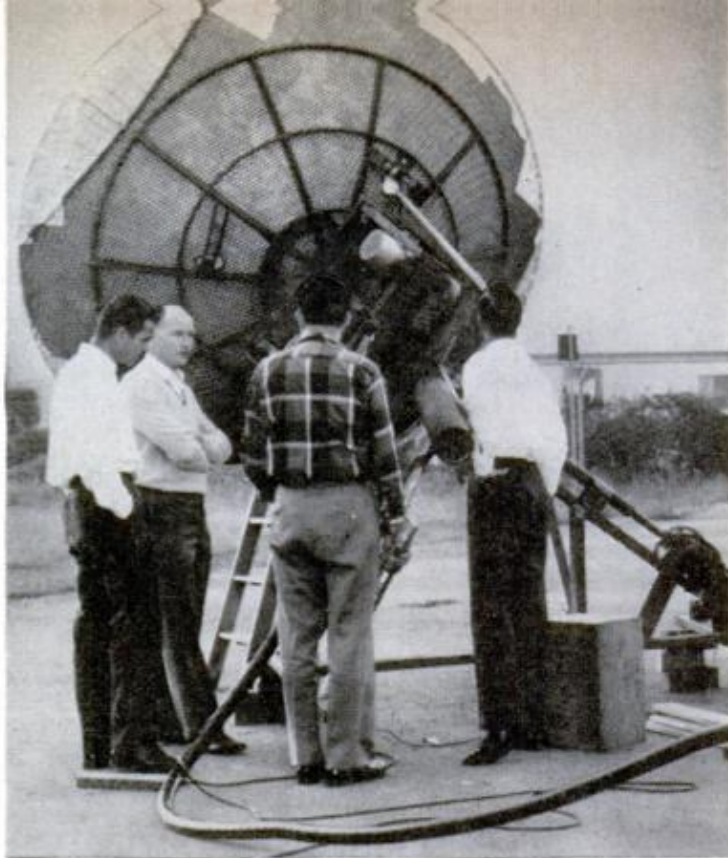
(Continued to page 234)





Sections of telescoping antennas do need occasional lubrication to guarantee free movement. Use only conductive lubricant such as graphite, and work in. Don't use oil. It insulates, causes noisy antenna

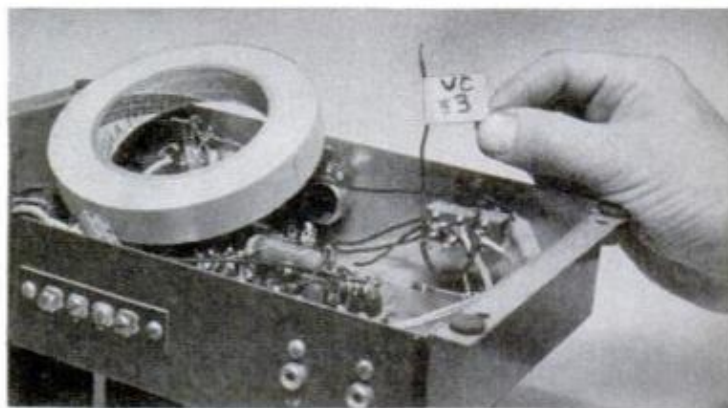
First coast-to-coast communication using amateur radio signals bounced from moon. W6HB, California, uses eight-foot parabolic, foil-covered antenna. Signal was two-way contact to Medfield, Mass., W1FZJ



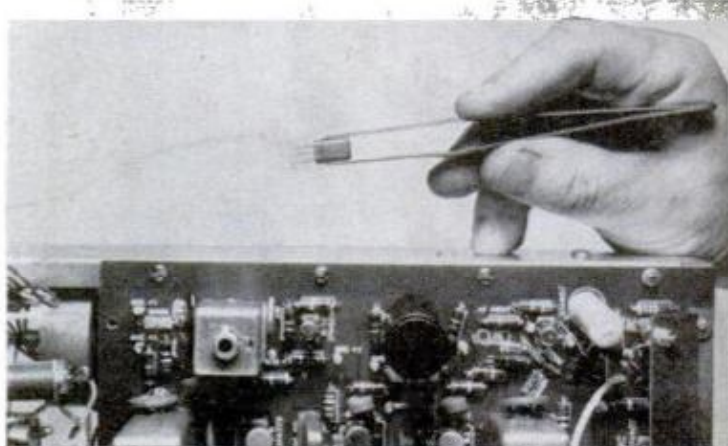
Lightning protector works all the time. Using the spark-gap principle, this unit constantly discharges static build-up on antenna and feed lines. By de-ionizing air, reduces danger of lightning damage



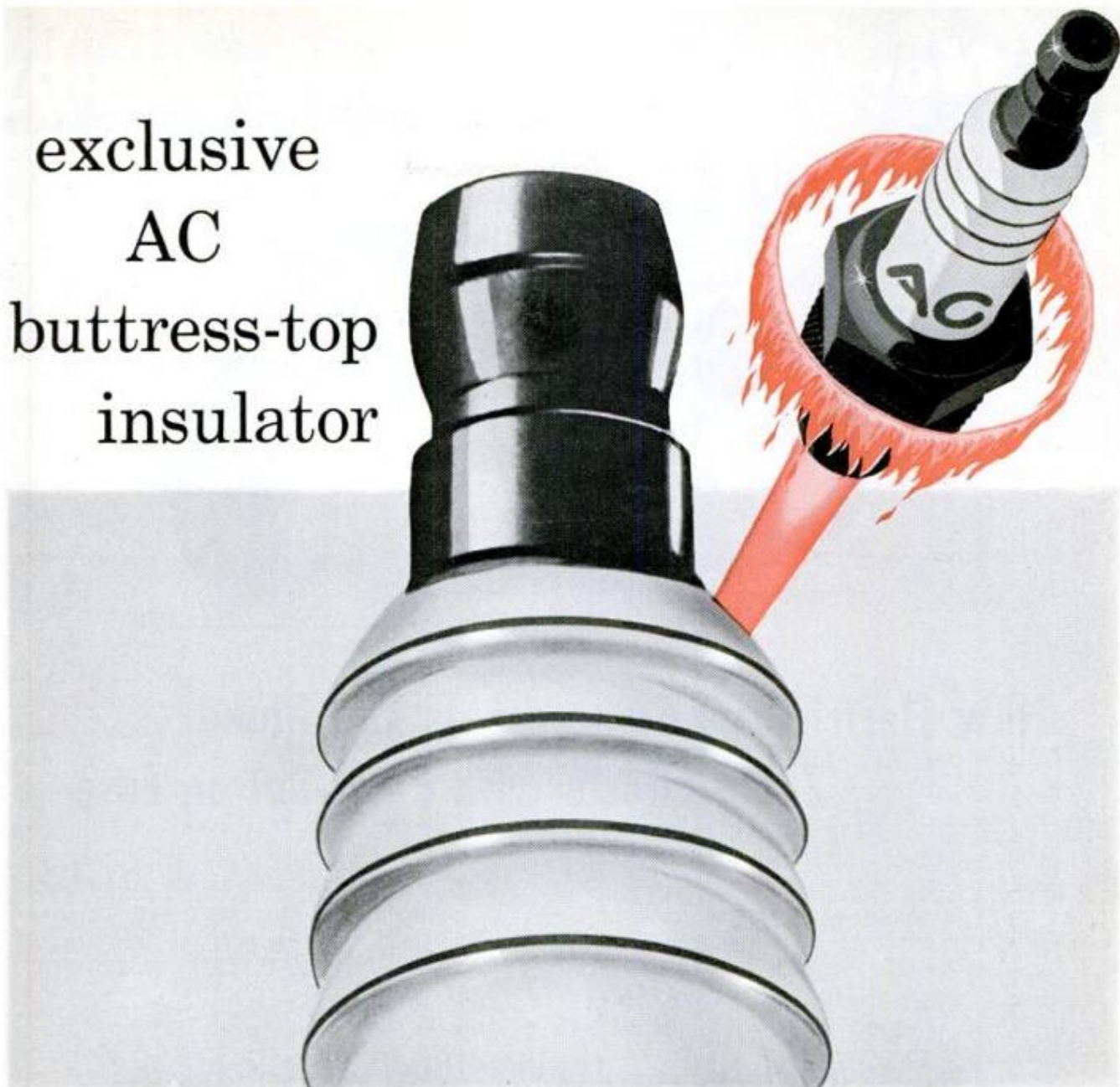
Masking tape applied around wires during circuit changes helps identify leads. A pen or soft pencil may be employed as a marker for the tabs. Masking tape makes good insulator if wires aren't rubbing



When you place a transistor in its socket, there isn't always room for fingers. Pliers often substitute, but if too much pressure is used, damage may occur. An easy solution is to use tweezers instead



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AC Fire-Ring Spark Plugs offer a unique combination of features for finest car performance. Outstanding among these is the Buttress Top Insulator.

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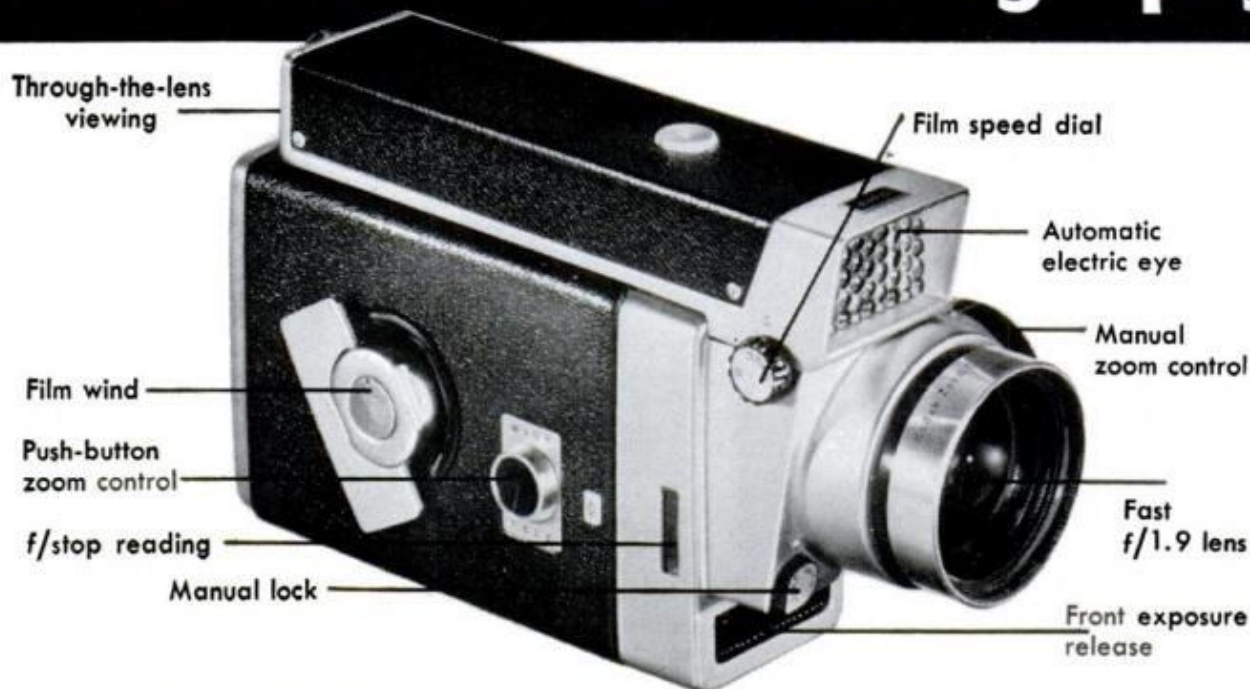
AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS



**Fire-Ring spark plugs**

*They must be the best!*

# New Ideas in Photography



## New Electric-Eye Camera Lets You Make Zoom Effects with Push-Button Ease

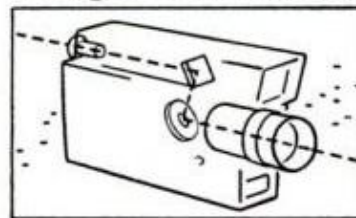
With the new Kodak Zoom 8 Reflex Camera, one button operates the camera *and* zooms the lens. Push down, and the lens zooms automatically for a screen-filling close-up. Push upward for a wide-angle view. Zoom in or back—not a second of action is lost. And you see it all, right in the viewfinder, just as it will appear on the screen.

This remarkable 8mm camera also lets you follow the action without stopping to adjust exposure. A built-in electric eye sets lens to changing light conditions automatically. For special lighting effects, you can lock the

meter at any indicated exposure that you wish.

Move in as close as 16 inches, using Portra Lens attachments. There's no "parallax error" since you view through the lens (*see the diagram*).

Priced at less than \$200, the Kodak Zoom 8 Reflex Camera (Automatic f/1.9) can be yours for as little as \$20 down. See your Kodak dealer for exact retail price.



New Kodak Sound 8 Projector—less than \$350

## New Sound Projector Can Turn All 8mm Home Movies Into "Talkies."

Would you like to add voices, music, sound effects to your 8mm movies—old or new?

It's easy—with the new Kodak Sound 8 Projector. Have Kodak Sonotrack Coating added to your edited film. As you project this film, record your comments, using the microphone that comes with the Sound 8. To add music, connect your phonograph or tape recorder. Immediate playback. To make changes, merely re-record. Recording head is made of Alfenol, ultra-durable new alloy. Kodak Sound 8 Projector shows films at 16 or 24 fps.



# from Kodak

## One-Billionth Horsepower Controls Exposure in Automatic Cameras

Imagine a rating of  $1/1,000,000,000$  horsepower. At Kodak, it's jokingly called "oatpower." Yet one "oatpower"—generated by the photocells of Kodak automatic cameras—insures correctly exposed snapshots, slides and movies.

Each photocell is composed of a thin steel plate coated with layers of selenium, cadmium, and gold or platinum. The last layer is about one molecule thin, and is covered with lacquer to seal out moisture.

Works this way. When you aim a Kodak automatic camera, light from the scene falls on the photocell and is converted into electric current. This generates the power that operates the balanced meter mechanism.

The position of this mechanism determines the lens opening. On a sunny day, when you press the shutter release of a Kodak automatic still camera, the lens "squints." In the shade, the lens opens up.

With Kodak automatic movie cameras, the lens opening adjusts *continuously* to changing light conditions.

See your Kodak dealer. He can help you choose the automatic camera that best fits your needs from those shown at the right.



**These bearing pins** are from a Kodak electric-eye system. They have the same .001 points as the LP phono needle shown with them. So precisely balanced is the system that a human hair can be used to move the meter needle through its full range.

**Picture it now . . . enjoy it again and again**

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

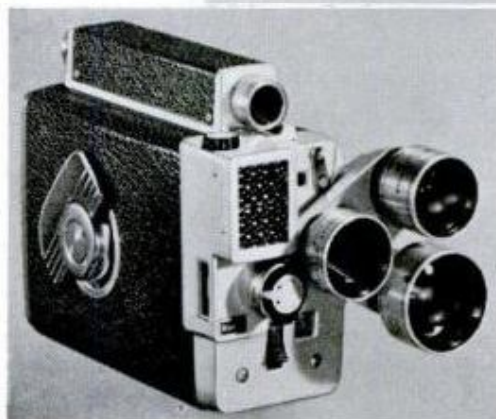
See Kodak's "Ed Sullivan Show" and "Adventures of Ozzie and Harriet"



Brownie Starmatic Camera, less than \$30.



Kodak Automatic 35 Camera, less than \$90.



Kodak Cine Automatic Turret Camera,  $f/1.9$ , less than \$125.

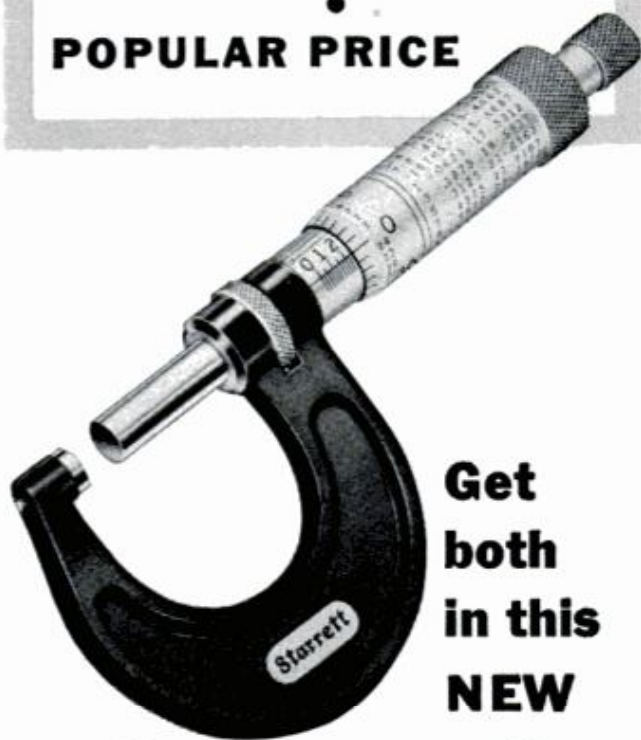


Brownie Automatic Movie Camera,  $f/2.3$ , less than \$78.

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**Rusty Shotgun**

Q—It may be that my problem would not be considered one for your department, but I'd like to know what happened and why. So, I'm addressing my inquiry to you. About two years ago I stored a rather valuable shotgun in a case of sheepskin. It remained in the case until last fall just before the hunting season when I took it out of the case and found it badly rusted. The gun, in the case, was stored in an upstairs room closet where it would be dry if anywhere. Yet the metal parts of the gun were badly rusted. Why?—J.P., Pa.



A—It wasn't dry, as you say, where the gun was stored. We wouldn't attempt to guess the humidity level (moisture content) of the air in the closet, but it is safe to say that it was very high at times during the summer months. This was the cause of the badly rusted shotgun. You do not describe the sheepskin case so we'll have to assume that it was a full length, unlined case. These cases are ideal for storing a rifle or shotgun as they protect the wood and metal from dents and scratches. But such cases do absorb moisture under certain conditions, especially in a closet where there may be inadequate ventilation and air circulation. Rusting of a rifle or shotgun (also handgun) can be

(Continued to page 230)



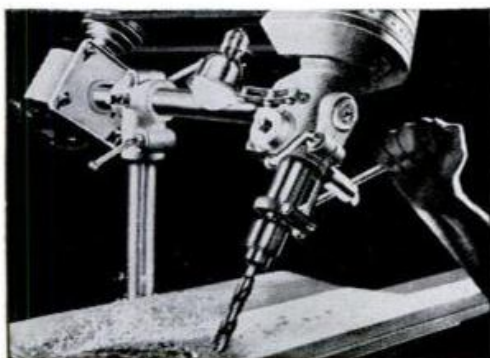
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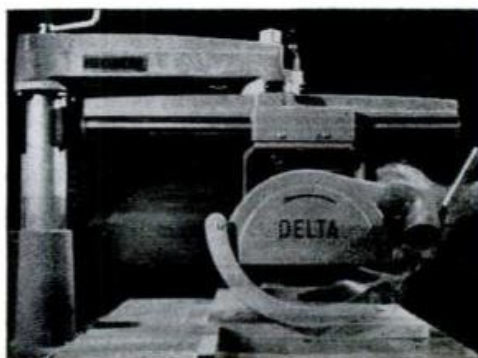
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C-5

prevented simply by making a sheath, or envelope, of plastic sheet, sealing the edges or sewing with a rolled seam, and tying the open end tightly to prevent entrance of moisture. What to do with the present gun is, of course, your immediate problem. We'd suggest that you send it to the service department of the manufacturer. If the gun still is in fixable condition and if you are willing to pay the cost, they can return it to you as good as new.

## Blanching Home-Grown Celery

*Q—I grow a vegetable garden as a hobby and this year I want to grow a row of celery. What are the propagating, growing and particularly the blanching procedures recommended? I have both hot and cold frames and well cultivated and enriched garden plots and also facilities for supplementing natural rainfall with a sprinkling system.—L.W., Ind.*



*A—There are self-blanching varieties of celery and there also are methods of blanching with plaster-lath screens which are quite effective on early plants. Also, you can purchase blanching aids at seed and garden supply stores. One of these consists of a spring-type metal sleeve which is opened and placed around the plant. This serves as a "placer" for a waterproofed paper cylinder that slides down over the metal sleeve, which is then removed leaving the paper cylinder or bleacher in place. The paper bleacher shuts off all light from the lower portion of the plant, leaving only the foliage exposed to the light. Or, if you wish to make and use your own bleaching equipment, this can be done by placing boards on edge on both sides of the row close to the plants and holding them in position with stakes. This method is quite satisfactory for short-row plantings.*

Another method of blanching, thought by many experienced growers to produce the finest table celery, is to hill the plants by stages as growth progresses, keeping the level of the soil just beneath the foliage until the plants are mature. Propagating usually is by seeding in flats early in March, or late February, covering the flats with newspaper until the seeds sprout. When the seedlings are an inch or so tall they are reset about 2 x 2 in. in rows in larger flats and placed in a cold frame.

(Continued to page 232)

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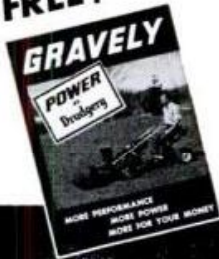


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DELTA ELECTRIC CO., 323 W. 33rd St., Marion, Indiana

## Paint Peels From Gutters

**Q**—What makes paint peel from gutters? My home was built two years ago and the gutters were painted immediately, along with the siding and trim job. Within a few months the paint peeled in places. I cleaned the gutters, removing all the loose paint and repainted them. Now this second application of paint is peeling, but peculiarly enough, it seems to be peeling only in those areas where it did not peel the first time. The areas I repaired do not seem to be affected.—M.A., Ohio.



**A**—You do not say whether you have aluminum or galvanized steel gutters, or tell us what kind of paint you used. And did you use a suitable primer? Ordinary house paint applied over unprimed metal gutters is likely to peel. New galvanized gutters are coated with a residue of the galvanizing process which tends to prevent ordinary paints from bonding properly to the metal. Although aluminum gutters do not need painting for protection from the elements they usually are painted for the sake of appearance. Heretofore it has been the custom of builders and painters to allow the metal to weather for six months or more before painting, but this is no longer necessary if a suitable primer is used. Also there are some special gutter paints available which do not require a primer. These are said to have proved quite effective. In your case, inasmuch as the gutters have already been painted and the peeled areas have been repainted there is little you can do in the way of remedy until time proves whether or not the present paint will stay on. There is a good chance that what remains of the original coating has bonded solidly to the metal. If this is so, then you are not likely to have further trouble.

## Preparing Screens

**Q**—What's the best coating to use on window screens before putting them up in spring? I'm referring to the wire screen and not to the frames.—L.B., Kans.

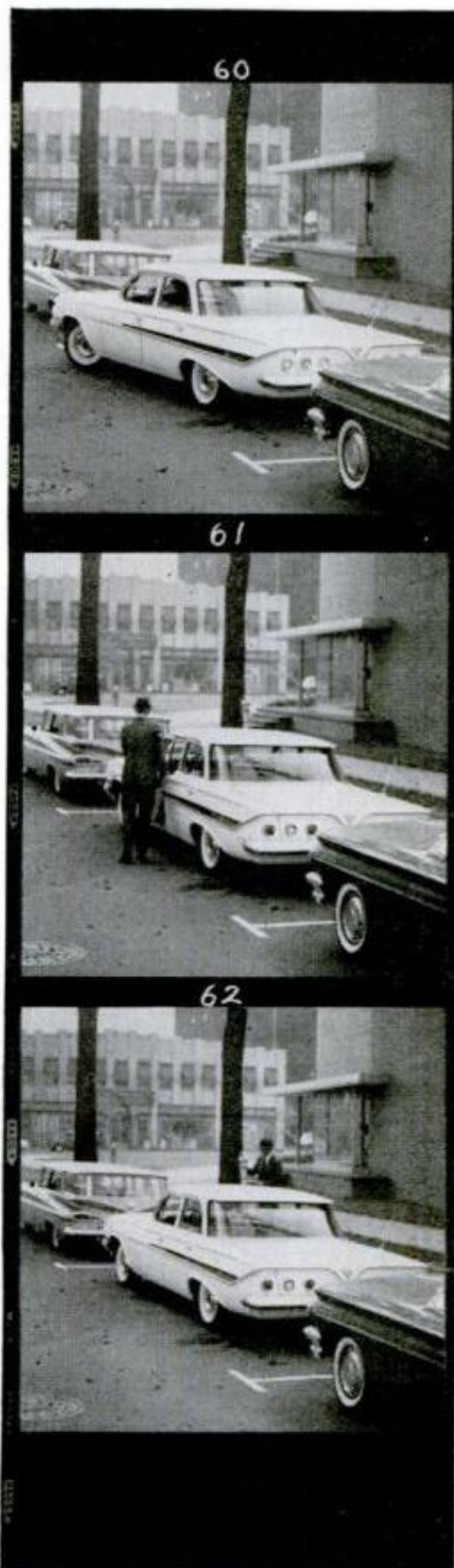
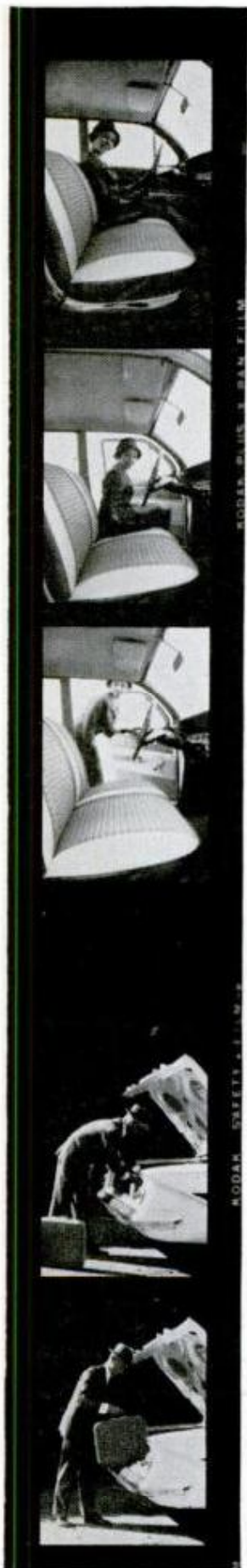
**A**—We assume you are referring to galvanized screens. Bronze or aluminum screening does not require a protective coating. One of the best coatings is a mixture of 2 parts boiled linseed oil and 1 part turpentine. Apply with a pad made by tacking a piece of carpeting to a wooden block or with a special pad made commercially for the purpose.

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*Easier to get your baggage in and out*  
*Easier to get in and out of parking places*

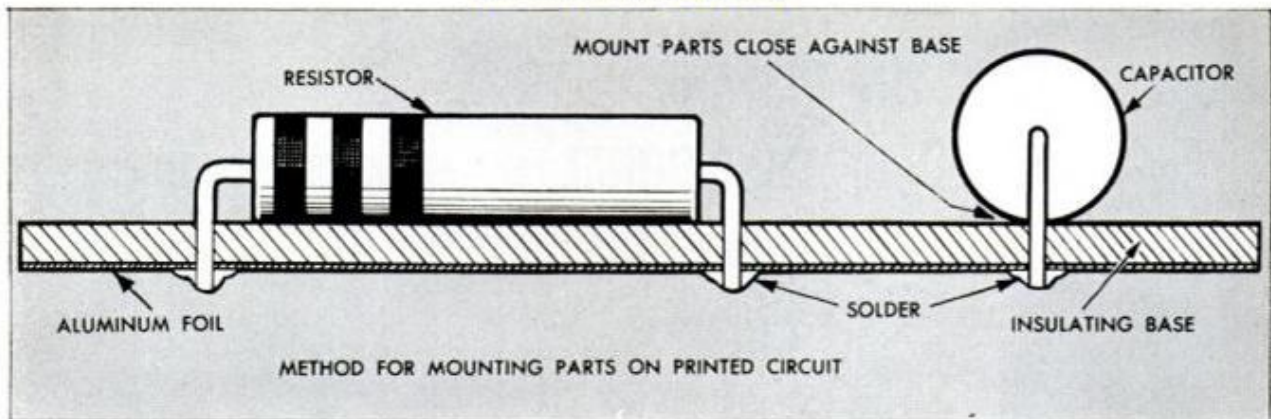
It's as easy as slipping into the driver's seat to see that this new '61 Chevy has got people sized up in beautiful style. For this is one car that makes beauty make sense—from its slimmer, trimmer out size to a remarkably roomy in size. Larger door openings—as much as 6 inches wider—are an open invitation to get in and be on your way. Entrance height is up, too—as much as nearly 2 inches in hardtops. And there's more front seat leg room, more foot room in the rear and generous head room (up to 2 inches more in the sport coupe). Seats—as right for sitting as they are for seeing—are up to 14% higher.

These sensible new dimensions even reach right back to the easier loading new deep-well trunk that lets you pile baggage 15% higher. Packing it is child's play with the loading height dropped as much as 10½ inches down to bumper level. And to wrap it up, that slimmer outside design makes for easier handling, parking and garaging. But really, the best way to see how this '61 Chevy fits your style is to try it on for size at your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



## Make Your Own Etched Circuits

(Continued from page 223)



cuits. Apply the dull side of the aluminum sheet to the base and use just enough pressure to assure a good contact between the adhesive and aluminum. Too much pressure may force the adhesive out and weaken the bond. Clamp lightly and put aside to dry. Drying at room temperature requires about 12 hours, but this may be reduced by placing the unit in an oven, for only 10 minutes at 300 degrees.

After the adhesive has set, lay out the desired circuit on the face of the aluminum sheet with strips of masking tape about  $\frac{1}{16}$  in. wide. Place small circles of tape (2) about  $\frac{1}{4}$  in. in diameter wherever a soldered connection is to be made. The best procedure is to locate the circles of tape first, then pass the strips of tape over them. Press the masking tape firmly against the aluminum to prevent the etching acid from flowing under the tape (3).

Muriatic acid (for etching the circuit) may be obtained from drug stores, or sheet-metal shops where it is usually used for making soldering flux. Mix the acid with water in the proportions that will provide the desired etching action with the particular thickness of aluminum foil you are using. A solution of half water and half acid works very satisfactorily, but the acid content may be reduced if a slower acting mixture is desired. Although the action of

muriatic acid is far less violent than acids such as sulphuric and nitric, used for etching other metals, certain precautions should be observed when handling. Primarily, it should be poured so as to prevent splashing on the skin or clothing. If any acid does contact the skin it should be washed off at once. Finally, *always pour acid into the water*, never the reverse. Some etching acids such as nitric and sulphuric react in forming steam when they first come in contact with water, which may cause the acid to spray out of its container. By observing the general precaution for handling all acids listed above, that possibility may be avoided.

The etching should be done in a non-metallic dish, such as glass or ceramic (4). Leave the circuit in the solution until all of the exposed aluminum has been etched away, after which it should be washed in running water and the tape removed. After the circuit has been thoroughly dried the components of the circuit may be soldered in place.

To mount the components first drill small holes through the base for the lead wires and insert the leads through the holes on the opposite side of the etched circuit. Press the part firmly against the base and solder the lead to the etched circuit with aluminum solder. ★ ★ ★

## Here's a Switch: Airport Protects Birds

While most airports fear birds and try to get rid of them because of the menace they present to aircraft, Miami's International Airport has been designated a wildlife sanctuary to protect a huge colony of burrowing owls that have made their homes in the grassy areas between the runways. They shun the concrete runways and stick to the areas between. The Dade County Port Authority, which operates the airport, claims that the owls are fine tenants and so, with the cooperation of the Florida Audu-

bon Society, made them legally immune to human marauding. In spite of the fact that birds are generally a danger around airports—a flock of starlings is credited with causing 61 deaths in the crash of an Electra airliner at Boston's Logan Airport—the Dade County action has raised only one protest. The local bird watchers are a little put out because the public is not allowed in the runway areas. The only way they can watch the owls is to buy an airline ticket and watch while taking off.



# WHY ISN'T THIS SPARK PLUG CHROME PLATED



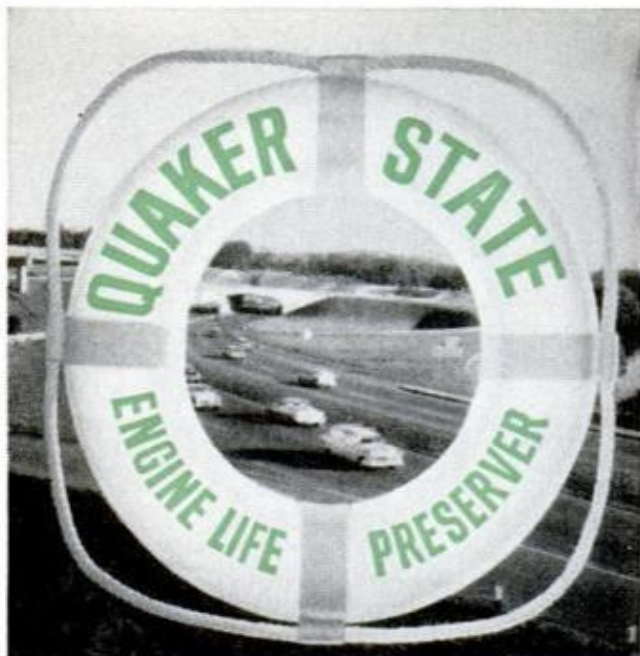
?

Almost everyone agrees, Autolite doesn't make the prettiest spark plugs in town. The new shiny kind are much more attractive. Obviously, there is a reason why these plugs are blue. The color itself doesn't make any difference. But it does tell you a lot about the way the spark plug is made. Example: The way the shell is sealed to the insulator. This seal guards against loss of compression, sluggish performance, poor fuel economy. In building its blue plugs, Autolite seals the shell to the insulator under tremendous heat and

pressure. No plated shell could stand this treatment; it would crack, peel, discolor. Plated spark plugs are usually caulked with powder and the shell crimped to the insulator. Is this difference in sealing methods really this important? It is if you are an economy nut, or a performance nut, or just a guy who doesn't take chances on anything he buys for his car. Next time you need a new set of plugs, remember two things. For top performance and economy, the color is blue, the name is Autolite. Toledo 1, Ohio.



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the world's best engine  
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Keep your car on the road, out of the repair shop. Insist on Quaker State Motor Oil, super-refined from 100% Pennsylvania Grade Crude Oil, for complete engine protection. *For the name of your nearest dealer, call Western Union by number and ask for Operator 25.*



Quaker State Oil Refining Corp., Oil City, Pa.

## Let Your Goldfish Breathe Easier

*(Continued from page 192)*

by the speed. Several types are pictured. Some models have a double set of pistons and cylinders, producing twice as much air.

Selecting the right air pump for your purpose is done on the basis of the number of tanks (aquariums) to be serviced, the size of the tanks, the noise factor and whether you intend to increase the number of tanks later. Using a rule-of-thumb that's fairly accurate, figure that a releaser requires about four cu. in. of air per min. and a filter needs an average of 12. Decide how many releasers and filters you plan to acquire, add them up and then shop for a pump producing air approximating your total.

Manufacturers say that 75 percent of the piston-type pumps returned for repair have failed because of improper oiling. Vibrator types should never be oiled, for there is no metal-to-metal contact. Piston types, however, do need a lubricating at regular intervals. All manufacturers supply oiling instructions, and these vary with individual models. Motors of many piston pumps are designed to operate at medium high temperatures. Vibrators are not; if a diaphragm pump heats up, something is wrong.

Piston-type pumps operate very quietly but vibrators may produce an irritating background hum similar to that of a defective transformer. Installing on a sound-absorbent base such as layers of cardboard or sheet cork often silences the unit. ★ ★ ★

## Third Hand

*(Continued from page 195)*

portant that the curved end be vertical when it locks the pan head. To assure this, first tighten in place so it locks the pan head. Then mark a witness line lengthwise of the rod and use the mark as a guide in bending the rod over a round object, such as a V-pulley. Holes in the rod aligned with ones in the two-part handle will allow all three to be clamped together with two 2-in. machine screws. A nut run back on the threaded end of the rod serves as a jam nut to lock the rod and prevent it from accidentally locking the pan head during panning shots with a movie camera.

If you find that the plugs on the camera motor and battery differ from the plugs used in the switch handles, simply substitute mating plugs and jacks on the motor and battery. Since some movie cameras will reverse, reels and all, when the plugs and jacks are mated improperly, mark the plugs and jacks for the forward position. For continuous running, the handle may be unplugged.

## Is This the 10-Year Battery?

(Continued from page 114)

Materials and Ceramics Division. The seal, as it comes from the kiln, looks something like the tiny rubber tire of a toy car.

Fitted around the positive electrode of the space battery, the seal effectively separates that electrode from its steel case and provides the necessary seal strength for hermetically closing the entire case.

(The negative electrode is connected directly to the steel can and provides a thermal contact from inside to the casing so heat is transferred out and dissipated.)

Dr. Shair explains that ceramic was selected for the seal because of its great chemical resistance and mechanical strength. Glass, for instance, will do the job, but the inside atmosphere of "pure, moist oxygen" attacks glass. Its mechanical strength includes resistance to thermal shock—both during the manufacturing process and in use on a space vehicle.

The ceramic-to-steel bond is an alloy bond—a true molecular bond.

### Different from Lead Battery

Dr. Shair makes the action of the battery more understandable by comparing it with the more familiar storage battery.

In a storage (lead-acid) battery, the positive plate is lead dioxide and the negative is lead. The electrolyte is aqueous sulfuric acid. As the battery discharges, lead dioxide becomes converted to lead sulfate and the lead also converts to lead sulfate.

While recharging, the original lead dioxide and lead are reformed, and when the battery is completely recharged, the water in the electrolyte begins to be electrolyzed, that is, broken down into hydrogen and oxygen gases. Oxygen is given off at the positive electrode and hydrogen at the negative electrode. The gases escape, and water in the electrolyte is thus consumed.

Both during use and while awaiting use, the lead in a lead-acid battery is corroding in the sulfuric acid, liberating small quantities of hydrogen gas. It's because of the evolution of gases that the cell cannot be hermetically sealed.

In the nickel-cadmium ceramic-seal battery, the positive plate is nickel oxide and the negative is cadmium. The electrolyte is a strong caustic, potassium hydroxide (or, as it's sometimes called, caustic potash).

During reaction, the nickel oxide is reduced to a less oxidized form,  $Ni(OH)_2$ , and the oxygen which had been associated with the nickel is transferred to the cadmium plate where it combines with the cadmium to form cadmium oxide  $Cd(OH)_2$ . During this process, no gas is evolved.

(Continued to page 255)

FEBRUARY 1961

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Bend**

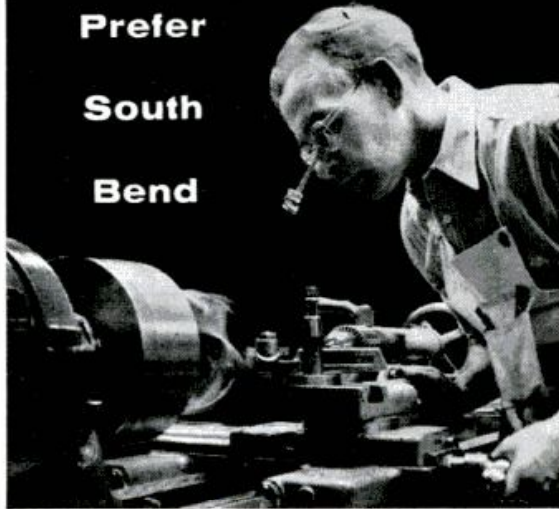


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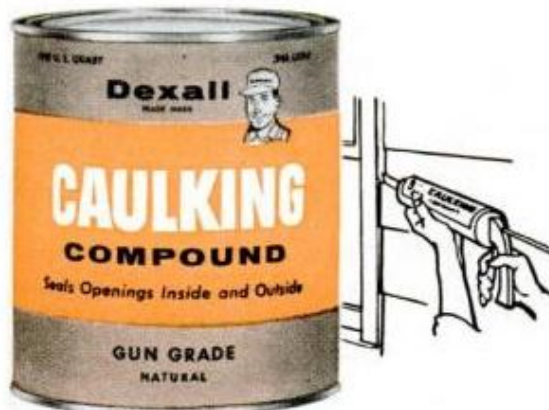


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DESHLER PRODUCTS, INC., Deshler, Ohio

## Which Electric Pump for You?

(Continued from page 214)

sprinkling, a flow of 300 gal. per hour will keep one sprinkler going an hour, using 3/4-in. hose. If your well will permit it, a pump that produces the required amount of water in 4 hrs. is more economical to operate than a pump which requires 6 hrs. to raise the same amount of water.

The man who drilled your well will give you an estimate of its capacity. His estimate usually is quite accurate. Manufacturers and local dealers will have tables which will tell you the size of pipe, pump and motor required to give you the amount of water you need.

A large pressure tank will give you greater efficiency as it will be equipped with an air volume control to keep a head of air constant in the tank above the water. A fuse box, pressure switch and control box, Fig. 4, are required for the electric connection to the motor. Pipe and fittings, including a slip coupling, aspirator and check valve or gate valve between the well head and the pressure tank, complete the round up of materials that are needed for a pressure system. ★ ★ ★

## Lightweight Mobile PA Amplifier

(Continued from page 222)

### PARTS LIST

C1, C2, C7, C10, C12, C13, C18	10 mfd., 15 v.
C3, C5, C8, C14, C17	.01 mfd., disk
C4, C11	.1 mfd., tubular, 50 v. or higher
C6, C9, C20, C21	50 mfd., 12 v.
C15, C16	100 mfd., 12 v.
C19	90 mfd., 3 v.
R1, R3, R5, R9, R11, R12, R15, R16, R18, R20, R22, R25, R27	10k, 1/2 w, 10%
R2, R8, R17	100k, 1/2 w, 10%
R4, R6, R19, R29	10k potentiometer, audio taper
R7	4.7k, 1/2 w, 10%
R10, R21, R33, R35, R40	1k, 1/2 w, 10%
R13	33k, 1/2 w, 10%
R14	470 ohm, 1/2 w, 10%
R23	12k, 1/2 w, 10%
R24	120k, 1/2 w, 10%
R26	270 ohm, 1/2 w, 10%
R30	47k, 1/2 w, 10%
R31	4.7k, 1/2 w, ±5%
R32	51 ohm, 1/2 w, ±5%
R34	47 ohm, 1w, 10%
R36	2.2 ohm, 1w, ±5%
R37	680 ohm, 1/2 w, ±10%
R38, R39	47 ohm, 1w, ±5%
T1 Driver Xformer	Stancor TA-38
T2 Output Xformer	Stancor TA-12
TR-1, TR-4, TR-5	RCA-2N591
TR-2, TR-3	Raytheon-2N633
TR-6	Philco-2N224
TR-7, TR-8	Clevite-2N257 or 2N268
J1, J2	3-prong socket—amphenol 91-PC3F
J3, J4	Phono jack
J-5	Cinch-Jones socket S302 AB P302-AB—matching plug
Erie strip-pack	(2)
S.	d.p.s.t.—toggle switch
Chassis	See text
Lighter plug	See text
Wire, hardware, transistor sockets, etc.	

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Ariens IMPERIAL mows any lawn without scalping! Powerful 5½ h.p. engine. Fingertip controls. 4 forward speeds; reverse. Many Insta-Hitch attachments. So safe . . . so easy to use!

For descriptive literature, write:

**ARIENS COMPANY, 161 Calumet, Brillion, Wis.**

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## Jet Capital of the World

(Continued from page 122)



Animals have it made, too. This is the large animal room of shelter run by ASPCA. Board costs up to \$7 a day

concrete extends beyond two stories that are glass-enclosed so planes may be nosed under it and passengers may board or depart unaffected by weather. Passengers enter on a semicircular ramp leading to the doorless second-floor entrance. A downward flow of air over a 90-foot expanse keeps out the weather. The "air door" is protected from gusts by a glass windscreen which also serves as a mount for bronze sculptures of signs of the zodiac. (Art, functional and decorative, is widely used at Idlewild.) Pan Am's automated counters can weigh and check the baggage of 1000 passengers an hour. When flights are called, passengers follow a series of colored lights which guides them from lounges to planes. Looking ahead to the day of faster fueling—when aviation fuel will be pumped throughout the field—Pan Am has already installed a high-speed hydrant fueling system. At present, the terminal is capable of handling 160 jet passengers every 15 minutes and provides seating for more than 1000. You get the idea of the size of the new travel domes when you compare one to the terminal at La Guardia; the latter has seating, for all airlines, for only 358 passengers.

### A Park, Some Pipes

Down the road a piece: Right is the IAB, left is the park. Its lagoon mirrors gliding clouds and the dashing dot of a high jet. Beyond the lagoon, the glass facade of the heating and air-conditioning plant discloses

a colorful twine of coded pipes—blue, black, yellow, red. Rimming the park are the parking lots.

The road curves left past the Temporary Terminal Building and the operations building and approaches American Airlines' terminal which, perhaps, turns the most artful face of all toward the sun. The facade of the U-shaped building has probably the largest stretch of stained glass in existence. It measures 317 by 23 feet and is a blue and red abstraction suggesting flight. American uses canned magnetic flight and passenger announcements which are stored in memory racks. To announce an arrival, for example, an operator dials a letter to establish the type of announcement, then dials the three digits of the flight number. Two concourses handle as many as 16 of American's largest jet airliners. The planes move in under their own power adjacent to the passenger departure lounges. Once a plane is in position, a telescopic corridor pivots from the terminal, extends mechanically to fit against the jet's rear door; at the same time, a similar device connects the lounge with the airliner's front entrance. When the plane is ready to depart the bridges can be moved away quickly.

United Air Lines' terminal, next door, is a crescent of aluminum and glass that can handle 2000 passengers a day and 13 jets and four piston-engine aircraft at one time. Located on a 27-acre site, the terminal has

(Continued to page 246)

# The magic is in the metal!



**And the metal is aluminum—  
Buick's new aluminum V-8 that gives  
the Special big-car go on small-car gas**

How come the engine and automatic transmission\* on the '61 Buick Special gives you *twice* the pow per pound of most compacts? Just take a peek under the hood.

Its 155-h.p. Fireball V-8 is made of *aluminum*. It weighs in at a trim 318 pounds—up to 200 pounds less than engines with only two-thirds its power. Its power-to-weight ratio—.487 horsepower per pound—is highest in the industry. Less dead weight, plus 8.8:1 compression, means this baby thrives on small-car *regular* gas for extra savings.

And this Fireball V-8 is built to last! The aluminum block has rugged cast iron cylinder

\*Aluminum Dual-Path Turbine Drive—  
optional at extra cost.

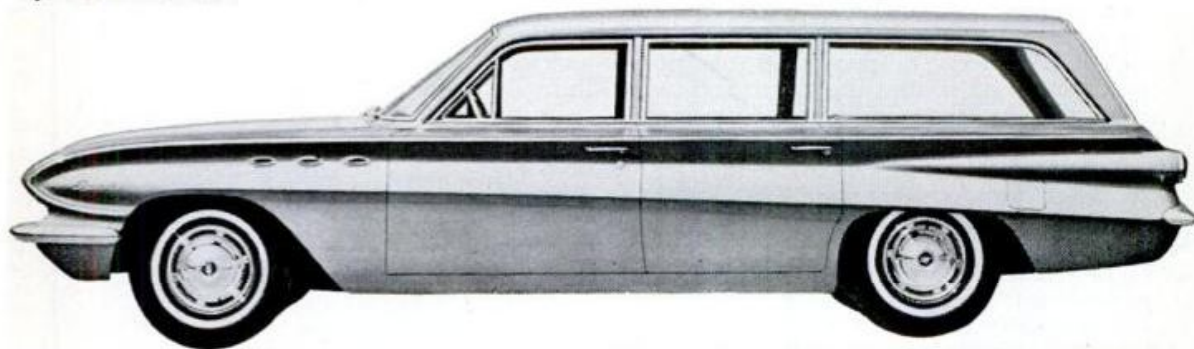
sleeves integrally cast with the block. This means long life, faster heat transfer from cylinder walls to the aluminum water jacket. Intake manifold is also aluminum for uniform heating of air-fuel mix. Spark plugs are surrounded by a water jacket for better firing, less fouling, longer service.

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SPECIAL-SIZE

## BUICK SPECIAL



BUICK MOTOR DIVISION—GENERAL MOTORS CORPORATION

FEBRUARY 1961

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## Potatoes Start a Revolution

(Continued from page 163)

did the pioneering in potato processing that eventually made him one of the West's biggest and most colorful industrialists with an empire that now includes, besides potato processing, such varied operations as phosphate and clay mines, and hotels.

A former potato broker from Burley, Simplot came to Caldwell at the start of World War II with an idea. He figured the armed forces would need potatoes in dried form—lots of them. In a machine shop, he sketched on the oily floor with chalk his conception of a drying apparatus.

"Now, build me that," he said.

The mechanics got to work on the drying equipment, but they were not up to building a boiler. And, with steel rationed, boilers were hard to come by. Simplot, however, was as lucky as a lumbermill operator at McCall, about 60 miles away, was unlucky. The mill burned down.

As soon as he heard the news, Simplot jumped into his car, and raced to McCall. He bought the mill's boiler.

Simplot originally planned the plant for about 50 employees. But he did not figure on the war getting so big or lasting so long. Eventually, 10 million GIs overseas ate dehydrated potatoes. The Caldwell plant grew till it needed 2000 employees. Of all the dehydrated potatoes used in the war, Simplot supplied about a third.

In my three-year stint in the Pentagon during the war, I ate a lot of dehydrated potatoes. Frankly, I considered them gluey.

My comment to this effect to plant officials led to my taking a blindfold test. With a cloth covering my eyes, I was served fresh mashed potatoes and dehydrated mashed potatoes. I couldn't tell which was which.

Millions of people who think they have never tasted dehydrated potatoes have eaten lots of them. They have been served them in restaurants or in institutions such as hospitals and colleges.

Scientists since World War II have discovered what caused the gluey formation, and licked the problem. Free starch was the stickler. The processing has now been controlled so that the starch cells are not broken up, but remain in their natural state.

Simplot also pioneered in French fries for the frozen-food market. The first attempt was with a second-hand potato-chip frying machine.

The experimenters poured strips of raw potatoes into one end of the machine and waited tensely to see how they would taste and look when they came out the other end. Nothing came out.

More strips went into the machine. Then came the odor of burning potatoes. The experimenters knew. Thin slices used for potato chips float. Strips for French fries sink. Entirely new equipment had to be designed.

The newest Simplot plant at Heyburn is considered a model in the industry. It is integrated—that is, it takes field-run potatoes, and each potato goes to the product or use for which it is best suited. Fresh potatoes are packaged here as well as frozen and dehydrated.

Also, part of the plant is a starch factory which utilizes everything which cannot be adapted to other products. After starch extraction, the potato pulp becomes livestock feed.

Unique at the Heyburn plant is its gravity-flow design. The potatoes are elevated from the trim tables to a battery of strip cutters, which are located near the top of the plant. From this point, the potatoes flow from one process to another without the necessity of mechanical elevation. Chutes and short flumes accomplish the transfer.

To turn out more and better potatoes for the nation's growing market, highly specialized mechanization has come to the potato field itself.

"It used to be thought that seed potatoes had to be hand cut to be sure to get an 'eye' in each piece," commented Leon Jones, vice-president and manager in charge of processed foods for J. R. Simplot Co. "Now we favor machine cutting—there are so many eyes on a potato you can hardly miss—and the uniform size makes for a uniform drop from the mechanical planters."

Seen moving over the Idaho potato fields at harvest time are huge, two-row potato combines. The machine digs the potatoes, propels them up a rubberized elevator, blows off dirt, vines and other debris, and dumps the potatoes into a moving truck with a rubberized bed.

The trucks then roll either to a processing plant or to a storage center. At the processing plant, the potatoes are likely to be dumped into water to prevent bruising, and then moved into the plant via water. Individual farm potato cellars are now fading from the scene. Replacing them are big storage centers where the potatoes can be deposited to await handling in air-conditioned quarters.

"A potato should be handled almost as gently as a peach," said Jones. "Even the time of day potatoes are harvested can make a difference in the bruise marks."

"A farmer was greatly puzzled because some of his potatoes showed bad bruises after being in storage, and others did not.



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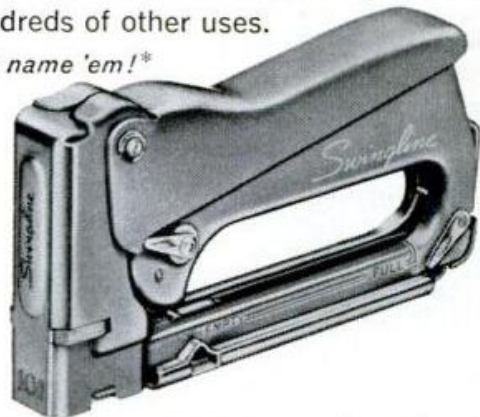
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All the potatoes were handled exactly the same way. Finally, the mystery was explained. The badly-bruised potatoes had been harvested early in the morning when it was still cold. The unbruised potatoes were harvested under a warm, mid-day sun. Cold potatoes bruise more easily than warm ones. "We used to store potatoes at 29 degrees. Now we keep them at 40."

Jones also explained that bulk trucking of potatoes from a combine has cut down greatly on bruises. There is no dropping of sacks. Neither is there stepping on sacks by workmen while loading potatoes for shipment by truck.

**Bakers Boxed**

Many of Idaho's famed fresh bakers are now shipped to market in cardboard boxes instead of sacks. This also cuts down on bruising.

Today almost one-third of all the farms in Idaho (11,409 out of 38,740) grow potatoes. With the farmers utilizing the latest knowledge in agriculture science, yield per acre has been increased from 18,000 pounds in the 1949-56 average to about 20,000 pounds (national average: 17,450 pounds).

Bob Hope, who has done a lot of hunting in Idaho, summed it all up this way:

"Idaho—that's the place where even the village bells peel potatoes." ★ ★ ★

**England Selects Men To Rocket Into Space**

Astronauts are being chosen by the English space agency for a trip into space. Like the U.S. venture, Project Mercury, the English program will be costly. Parliament, according to Science Service, a world-wide newsgathering agency, has appropriated some \$384,200,000 to get the job done.

**Do You Know This Old-Timer?**

(Answer to quiz on page 20)



**1906 Reo**



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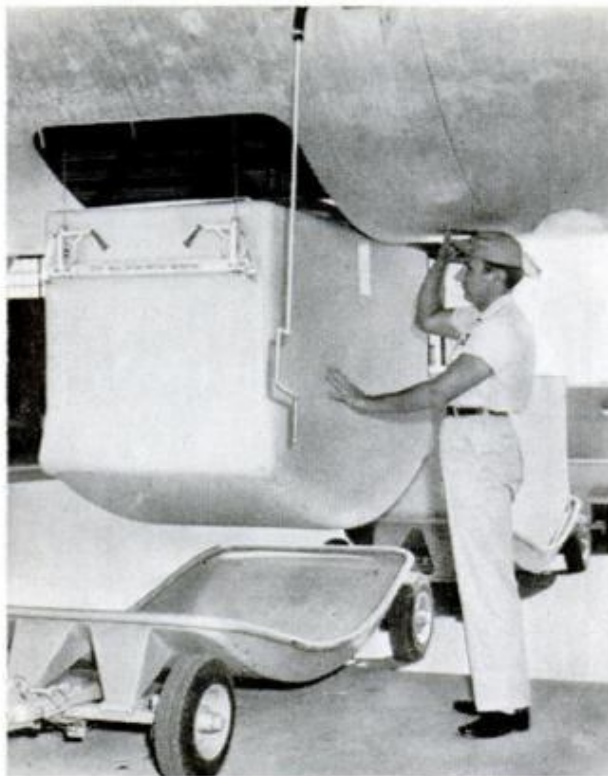
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GRAND RAPIDS 2, MICH.



Baggage pod fits into jet. Eleven such containers, each holding 25 bags, are strung down DC-8 fuselage

250,000 square feet of floor area. As they do in many terminals, passengers place luggage on a conveyor which carries it to a scale, then to a baggage room. At United, it is then placed in tub-shaped glass-fiber containers contoured to match the cargo compartment of the airplane; these containers are lifted in and out of DC-8 jets by a self-contained hoist which positions them on a track inside the compartment like beads on a string.

Each month, some 8000 travelers put up at the 320-bedroom International Hotel. Six stories high, it opened in early 1958 and has been virtually 100 percent occupied ever since. It cost \$5,000,000 to build (single accommodations for the night start at \$9.50) and, like many other Idlewild installations, it will be enlarged. Construction of a 200-room addition should begin in 1963.

### Skunks to Storks

Idlewild's Animalport, operated by the American Society for the Prevention of Cruelty to Animals, has not wanted for guests either. Opened in 1958, it sheltered some 7000 animals within the first six months. Token fees are charged for boarding animals awaiting shipment. They range from 50 cents a day for birds to \$7 for large animals. Guests range from snakes to sea lions, skunks to storks, anteaters to elephants. Monkeys imported by research

laboratories are by far the most frequent boarders. Cattle, another class of traveler, displaced horses in the stalls. "We expected some livestock now and then," says George Bauer, shelter manager, who, with his wife and son are the only Idlewild residents, "but this place looks like a ranch much of the time. One day we had 90 bulls in the building and paddock."

It takes 900 men to keep Idlewild clean. They sweep, scrub and dust around the clock; their work is coordinated through use of 30 radio-equipped cars and trucks. The 85-man police force becomes the fire department during emergencies. Four carbon-dioxide foam trucks roll on every alert from the control tower to meet any returning plane, whether the trouble appears to be major or not.

### Runway Lights

Ground control of five long runways is handled from an octagonal room on top of the control tower while, below, seven men in the instrument flight room track approaching planes on radar screens. Runways extend as far as 14,600 feet; the newest runs 8400 feet and incorporates latest developments in instrument runway facilities. It has narrow-gauge lighting, and center-line lighting fixtures flush with the runway in addition to conventional high-intensity lighting, and high-speed taxiway exits with center-line and blue, columnar, edge lighting. Both narrow-gauge and center-line lights are heated to keep them free of ice and snow. As the pilot approaches the new runway he sees, in addition to conventional lights, two rows of flush lights spaced 60 feet apart and extending 3000 feet down the runway. The flush lights go 1000 feet into the center of the high-speed taxiways. The runway has four high-speed taxi exits (two for each direction) which permit aircraft to turn off the runway at speeds up to 60 knots.

Although Idlewild has made landing and takeoff of airplanes, the disembarking and departure of passengers as rapid a proposition as technology permits, there are, of course, those who push for still more speed. One man had imported a race horse that had to remain in quarantine until a blood test was made. Impatient, he flew the blood sample to Washington, D. C. that evening and flew the results back the next morning. But who can find much fault with his attitude? Idlewild is 6½ jet hours from London, six hours from Los Angeles. Such speeds, to mean anything, must not be lost in outmoded handling of passengers at their destinations. Idlewild's tempo, fortunately has been set to suit most passengers during this, the dawn of the jet age. ★ ★ ★

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## Oil Hunt in the Arctic

(Continued from page 130)

Accurate had eight craft, four of which were for sleeping, eating and transporting supplies, because this operation had to be virtually self sufficient. A crew of 15 men, mostly hand picked from prairie seismic parties of the company, was headed by Party Manager Vagn Madsen, a Dane whose offshore seismic experience in Borneo and Africa served him well in the Arctic. All his river pilots were native to the North. Chief Pilot Vital Bonnetrouge, an Indian from Fort Providence, has followed channels of the mighty Mackenzie for many years. The others were Indian John Bouvier and Alaskan Eskimo Jonas Meyook.

In principle, the operation of Accurate's river survey differed little from seismic searches on western plains. In both cases, sound waves were created by explosions. These waves travel downward to underground layers of rock and bounce back to sensitive geophones which record them graphically on tape. The wavy lines of the record tell the layman nothing at all, but to a skilled seismologist like Jim Fowlie aboard the "Little Navy" the fine tracings revealed many facts concerning the formations underground. Often these seismographic records lead to the discovery of oil.

Accurate trailed 96 geophones which stretched out on a cable buoyed by inflated inner tubes. Midway in the string, Shooter "Tex" Watson attached a toy balloon to a waterproof canister containing a specially developed explosive charge. These he dropped into the river alongside metal diverters designed to keep the charge clear of the valuable cable which carried the signals to the seismic instruments. The balloon was important. If the charge is set too shallow the resulting records may be unsatisfactory; conversely, if too deep, gas bubbles are created by the explosion and show up on the taped records. Hence the balloon, which floated and kept the charge at the required depth below the surface.

Shot points were spaced at 700 feet, time for Watson and his pilot to "clear" the area. On a radio signal from Chief Operator George Koenig the motors throttled down almost to a dead stop as vibrations created by the noise would affect the record. Koenig simultaneously started his magnetic recorder which set off the charge and received the incoming seismic signals. The tape recording was then played back. By means of an electric stylus the complete seismic signal was reproduced on electro-

(Continued to page 250)

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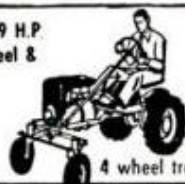
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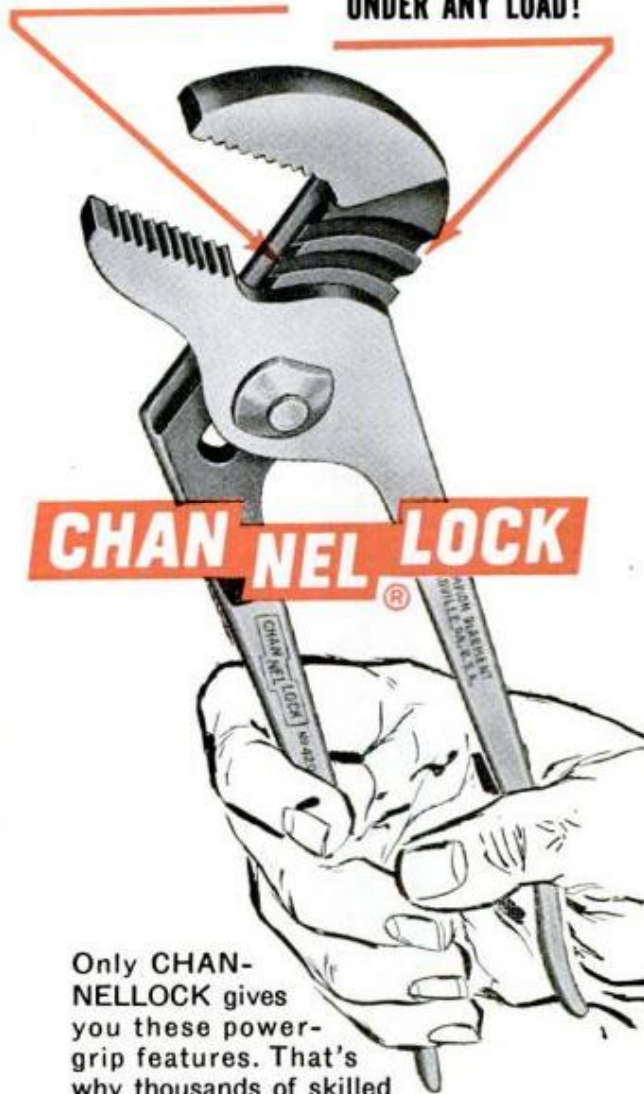


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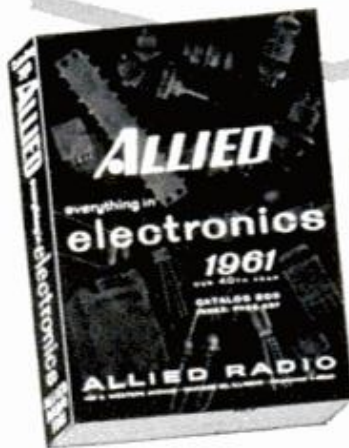
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sensitive paper. Finished records were available to the seismologist, Jim Fowlie, less than three minutes after the shot.

Advantages of river seismic over conventional land operations are immediately apparent. It is capable of an average of 75 shot locations a day without the drilling of a single hole. Ten miles of river may be surveyed in a 12-hour shift along the Mackenzie, at a cost well under that of land coverage. There's a disadvantage, too. This type of survey is confined to the meanderings of the river and because of the current a cross grid is not considered too feasible. However, should a section of the river appear promising to the oil-seeker, thousands of dollars and months of time may conceivably be saved by concentrating further exploration to that specific point.

How can the client be assured of the exact location of a shot record? It is relatively simple. Geologist Bob McKee had the answer in his combination of a Polaroid camera and radar instruments. A photograph of the radarscope taken at the instant of the seismic shot was superimposed over an actual aerial picture of the section of the river. The radar photo was matched exactly to the shore lines and also revealed sand bars and other pertinent features. It was a positive placement of the location.

Oil exploration parties in Canada's Arctic during the 1960 summer program averaged about four months on the job. It was an adventure, and it was a grind. Accurate's men were on duty a minimum of 12 hours every day unless weather turbulence or fog curtailed operations. Days off? There were none. Instead, hours were permitted to "pile up." For his four months' service in the North each of the party accumulated about two months' with-pay holiday to be taken during fall or early winter.

Boredom? There was hardly time for it. At the barren lands gravity-meter camp of British American, angling for trout in the clear waters of virgin lakes was the most frequent off-hour recreation. Accurate, with its party confined to boatside except when tied up along shore at night, found that good music piped over a hi-fi system proved a popular morale stabilizer during the long months away from home.

At the same time, the unlikely combination of explosive blasts and orchestral music created a gentle perplexity among imperturbable natives along the Mackenzie.

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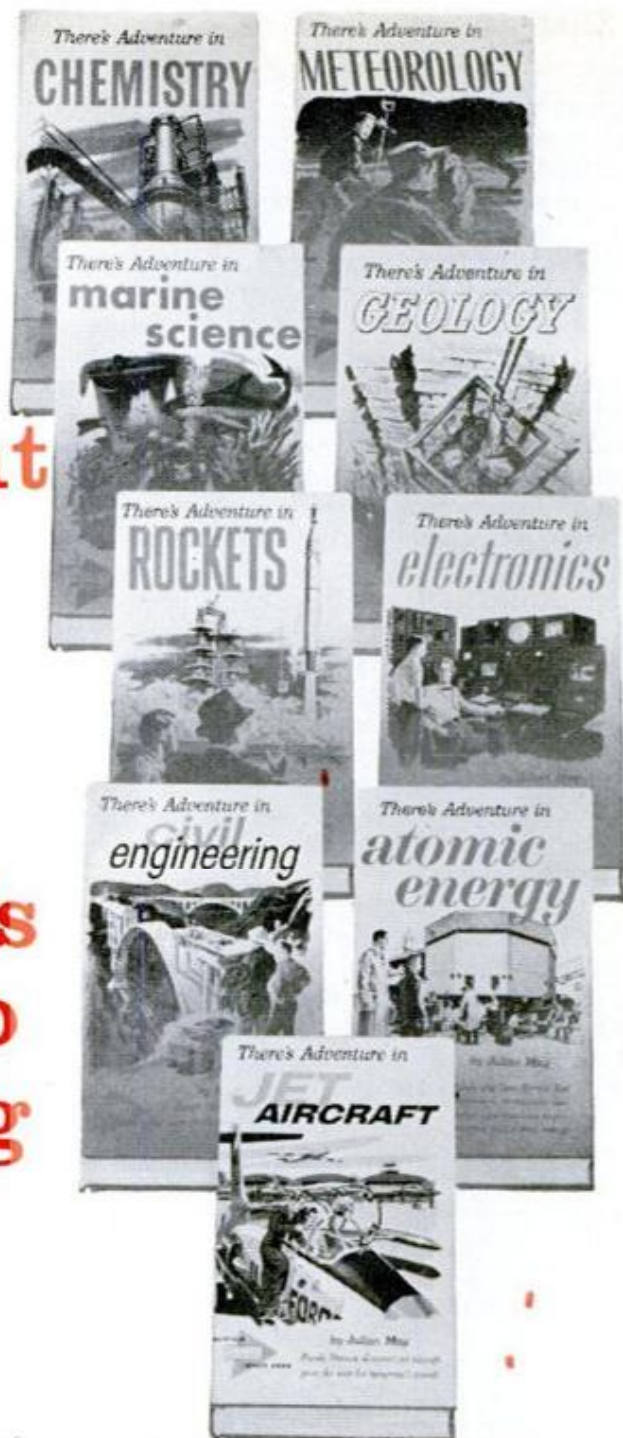
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## Scientists on the Brink of Hell

(Continued from page 142)

instruments are not handy, a tree branch may be used to root out a promising specimen. Glass tubes are used to trap the volcanic gases, and they are designed to withstand heat as high as 2000 degrees F.

Most of the tools used in the study of volcanos are not things you can order from a catalogue. The observatory instrument shop, for example, modified tilt-meters perfected in Japan to adapt them to Hawaiian conditions, and the Omori-Loucks seismograph is the result of its development by a Japanese scientist and refinement by B. J. Loucks, observatory instrument maker.

Eaton designed the most sensitive seismograph in use in the observatory's net which stretches from 10 stations throughout the island. It is located in a vault nine miles from the observatory on Mauna Loa and records vibrations from vehicles on a jeep trail half a mile away.

Experiments with new methods of using the standard machines have also brought results. Eaton cites the use of tilt-meters in forecasting the November, 1959, record-breaking eruption of Kilauea Iki, a relatively small pit crater adjoining Kilauea Caldera in Hawaii National Park on the slope of Mauna Loa where the observatory is located. It is here that most eruptions occur. It is here that the observatory scientists work in a living laboratory. The park itself offers strange contrasts.

The area untouched by the lava flows abounds in lush, tropical foliage and surrounds the caldera where the volcanos have erupted, creating stark, naked deserts, black, forbidding cinder cones and weird fire pits which at times give forth huge plumes of smoke, steam and sulphur fumes.

An eruption here offers a twofold advantage—the scientists can concentrate on their studies with little worry about protecting a civil population, and the thousands of sight-seers can view the fiery spectacle of an eruption under the watchful eyes of Park Service rangers.

Eaton recalls that the caldera had not produced a full-scale eruption in several years when indications of underground activity were noted at the observatory.

The seismograph network was registering light quakes and spasmodic tremors which indicated the shifting of great masses of lava beneath the surface.

This activity continued from October, 1958, to February, 1959. It was "interesting but not unusual."

But early in the spring of 1959 the network of liquid-level tilt-meters installed around the caldera in 1957 began to pay dividends.

Tilt-meters are a refinement of instruments designed to measure by leveling of the type done by surveyors. Those at the observatory are sensitive enough to record a change in the angle of the bulge of the caldera's dome of less than one-tenth of a second, a tilt angle which would displace the top of a pole 10 miles high by about a quarter of an inch laterally.

As the caldera dome swells and deflates with increases and decreases of underground pressure the scientists can tell when the subterranean power which causes an eruption is seeking a soft spot in the surface to emerge.

The meters indicated in early 1959 that the entire caldera region was bulging upward and outward.

Then suddenly, in midsummer, the swelling subsided and great swarms of quakes registered on the seismographs.

Then, just as suddenly, the rapid swelling began anew. It continued through the autumn months, and early in November the caldera was swelling at a rate three times faster than ever before recorded.

The quakes increased and became harmonic tremors, a sure indication that the lava masses were literally flowing beneath the surface, seeking the soft spot to emerge.

On the afternoon of November 14, I talked to Eaton from my home in Hilo, 30 miles from the observatory.

"An eruption is imminent," he said.

I raced to the observatory and arrived in time to secure a news beat for my paper, as the only newsman present when Kilauea Iki erupted.

Later Eaton credited the tilt-meter network with his correct prediction.

The instruments had been operated during the crucial months before the eruption on a new theory.

"We had stretched the net only by placing our bases farther apart," he explained. "This gave us the 'big picture' of sub-dome pressure even though we were taking a calculated risk that we would miss more restricted readings by having our instruments far apart.

"From the seismographs we were getting the picture of the lava movement, but it can move without an eruption if it lacks the pressure to work to the surface," he continued. "The tilt-meter network kept us abreast of the buildup, and without it the eruption could have taken us by surprise."

The development of a portable seismograph has given the volcanologists another effective tool. Its value was best seen in the weeks before the Kapoho eruption when swarms of quakes were building up on the lower reaches of the mountain near the Pacific.

(Continued to page 254)

# STUCK garage DOOR?

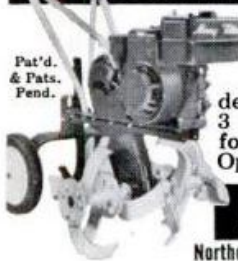


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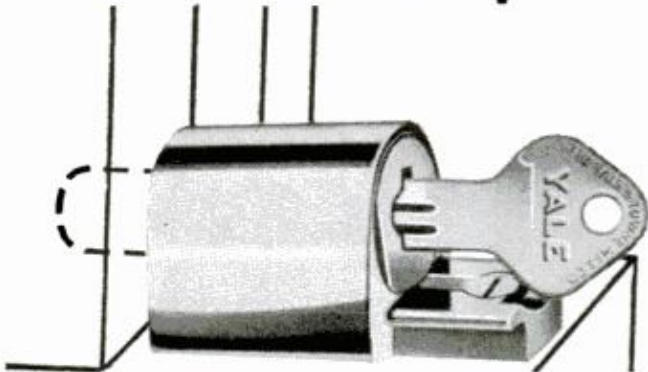
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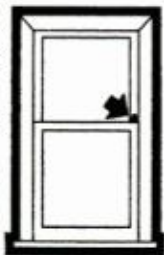
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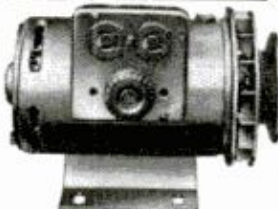
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Eaton, traveling in a green jeep, became a familiar figure in the cane field and papaya patches of the rift zone. His continued reports alerted Civil Defense officials who were ready when the outbreak came.

The portable machine, which was refined by observatory technicians, has only one drawback—it will record the footsteps of people working in the area.

Despite the increase in the observatory's success in issuing volcano warnings, the scientists steadfastly refuse to claim accurate predictions.

"In fact," said Eaton, "we do not make predictions. We report conditions as they are and attempt to interpret what they may mean in the light of the little knowledge we have.

"It's like saying a rooster is crowing and that this condition usually exists before a sunrise," he added.

Actually, operation of the warning system, important though it is, is the secondary mission of the observatory. Primarily, the staff seeks to learn secrets of volcanos.

"We need to know the products of nature and how they change in time," said Murata. "There is no science which will not benefit when these things are learned."

It is almost certain that most of the natural deposits of metallic ores were formed by emanations—the gases and liquids given off by bodies of molten rock beneath the earth's crust. The days of the scientific prospector, who finds something because he knows how it was formed and where to look, is at hand and his need for more knowledge grows each decade.

The only place where the emanations can be studied directly is at active volcanos and hot springs where the gases and liquids from the bowels of the earth come to the surface in their natural state.

Hawaii's rock formations are of a type which does little to change or clutter the emanations with foreign material.

Dr. Wayne Ault, observatory geochemist, ranges the caldera, gathering gas samples from the fumaroles and volcanic cracks. The gases are run through a mass spectrometer where they are bombarded by electrons and broken up.

To study sulphur formations and their gases, he places rocks in the fumaroles which pour forth sulphur fumes and removes them a few weeks later to find them covered with a tiny forest of tree-like formations concocted by the flow of sulphur.

The excitement of an actual eruption comes infrequently to men of the observatory. In between, there are the long hours of painstaking study and recording in the laboratories.

(Continued to page 256)

(Continued from page 237)

During recharge, the processes are reversed and the nickel oxide and cadmium are reformed.

The "mechanism" mentioned earlier which keeps gases from forming during the recharging process is this:

The sealed cell uses an excess of negative electrode present in the discharged state. Therefore, the positive electrode becomes charged before the negative electrode. As a result, the gases which are normally evolved from a fully charged battery are limited to oxygen coming off the positive plate only.

The oxygen is transported to the negative plate and reacts with it to cause self-discharge of that plate. This self-discharge is exactly equal to the amount of oxygen formed at the positive electrode. Because of self-discharge, the negative plate never can become fully charged and, therefore, never evolves hydrogen gas.

(Oxygen readily recombines, whereas hydrogen does not—therefore the presence of hydrogen is carefully avoided.)

#### Oxygen Recombines Swiftly

Dr. Shair explains that the rate at which oxygen can be recombined after the cell is fully charged has been speeded up in the sealed cell. Thus, a fully charged cell can be continuously overcharged without building up excessive pressures within the cell.

The power for recharging the battery will come from solar cells when the cell is used in space. In an auto, it will come from a generator, and in many other applications on earth, it will come either from solar cells or from a "trickle" charge fed through relatively light wire. An example of the latter might be in a communications line, explains Dr. Shair. The only time that full power is necessary is when the transmitting instrument, a telephone, for instance, is in use. The battery would supply this peak power, and all the time that the telephone is not in use, a "trickle" charge would come through the wires to keep it charged.

The relatively small size—as compared with a lead-acid battery—is also an advantage in many cases, he added. The nickel-cadmium cell has a "much greater" power output than a lead-acid cell of the same size. The ratio of watts to weight is about 200 watts to one pound.

The chances are good that the new sealed cell will go into space—as other Gulston-built batteries have done in the past. And it may also be the predecessor of a car battery that you won't even have to think about once it's installed. ★ ★ ★



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There are the long, cold nights on Mauna Loa when the tilt-meter chain must be checked in an operation which takes over a week and must be conducted in the lower temperatures of the late evening.

There is the manual labor of climbing up and down the steep walls of dormant craters which still may have some secret to yield to scientific study.

There is the frustration of improvising to find a way to do a job never done before.

The volcano scientists, however, are getting one break on the latter score. The University of California has contracted with a commercial driller to sink a slender shaft into the floor of Kilauea Iki crater. That eruption went through 16 phases in 30 days, dumping tons of lava into the pit and then dying down while the molten material flowed back into the vent.

In the end, 414 feet of new lava was spilled into the pit and a thick crust formed over it rapidly, trapping a mass of material, believed to be 200 feet deep, which still is molten.

### Once in a Lifetime

Because of the manner the lava was trapped and because of its accessibility, Eaton terms the formation a "once in a lifetime" chance to study magma's cooling and changing processes.

The university will drill a slender shaft over 100 feet into the molten lava and install a temperature recorder which observatory scientists will check for years.

Before the school entered the picture, the scientists were sinking a shaft of their own—practically with their bare hands. They borrowed a half-horsepower motor from the National Park Service and back-packed it down a narrow trail to the floor of the crater which is 350 feet below the rim.

Mustering their inventive abilities, they attached the motor to a common masonry hand drill and built a drill shaft of one-inch pipe. They tempered some masonry drill and set to work. To cool the shaft the scientists carried water on their backs to the floor of the crater.

Their makeshift operation functioned long enough to sink a hole 14 feet in the hard-crust layer of lava atop the molten mass. Temperature readings of 1900 degrees F. were recorded at that point.

Despite the frustrations and physical hardships, the volcanologists tackled the drilling operation with zeal. They were moving a painful step closer to knowing the volcano, a step closer to an understanding of how the Earth was created millions of years ago.

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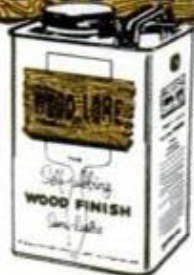


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(Continued from page 157)

cable was bringing something up with it, and it was—a 1900-pound boulder with the cable knotted neatly around it.

The actual grappling is a sequence of systematic steps. Once the cable has been located through underwater radio gear sensitive to electrical current, the ship must "fish" for it. The crew has a variety of grappling hooks, or grapnels, at its disposal. When one fails to do the job, they use another. The kind of grapnel used depends upon the nature of the ocean bed, the age of the particular segment of cable to be replaced or repaired, and the depth of the water. There are over a dozen designs, some rigid, some flexible. There are also types that will cut the cable and bring up one end. One design even sends signals to the ship when it reaches bottom or snares a cable.

An unusual kind of damage occurs rather often along the coast of China. Sharks there like to test their teeth and jaws on the cable's sheathing and often leave their teeth imbedded clear through to the copper core.

Often, when a cable is brought up from great depths, the strain is so great that the cable actually parts and falls away. To prevent this, a special grapnel with jaws on both sides is used. Cutting edges slice through the cable while the other jaw holds the end.

### Whale Trouble

The most peculiar break of all time, as well as the most amusing, happened 30 years ago when a big bull sperm whale became hopelessly entangled in a cable off Cape Breton Island, Nova Scotia. The creature had obviously battled the intruder in its undersea domain and was somehow strangled. After a time, the whale floated to the surface bringing the entangled cable with it. An officer aboard the cable ship *Cyrus Field*, dispatched to repair the cable, said: "We didn't have the least trouble locating that break. It was right on the surface in the warm sun and you could smell it for miles. We didn't even stop to disentangle the monster—just cut the cable well to the right and left..."

Once aboard, the cable must be stripped and separated into its component parts. The cablemen strip away jute wrappings, armor wire, bedding, and cloth and copper protective tapes to get down to the copper return conductors and the copper core. The repair and splicing job takes place in a tent on deck, where the cablemen,

POPULAR MECHANICS



shielded from weather, work around the clock until the repair is finished.

The deep-sea sections of this 40-million-dollar cable system measure over 1 1/4 inches in diameter and weigh about a pound per foot. The cable sections located in shallower water require heavier armor to protect it from tide action, marine life, ice, fishing trawlers and other shipping activities. The heaviest sections weigh more than 12 pounds per foot depending upon the amount of armor required.

Many breaks in cables are caused by ship's anchors. One communications company found that 45 percent of its faults were due to anchor damage. Fortunately, these occur close to shore where locating and repairing breaks is easiest.

### Fishermen, Too

An even greater threat to the costly Atlantic cables are otter boards, pieces of wood and metal used to hold open the mouths of the fishing nets. Weighing from 150 to 1800 pounds, these boards are dragged, along with the net, over the ocean floor at depths of 100 to 1200 feet. They may be pulled along for 10 miles before a catch is hauled aboard. An otter board, unlike an anchor which only strikes the ocean floor in one spot, can tear or pull up a lot of cable very easily. The unpleasantness involving a Russian fishing trawler some months ago was alleged to have developed from the ship's otter boards damaging the cable. In 1958, trawlermen off Newfoundland caused 44 breaks. A full time job for the cable splicers from this one trouble source alone!

The men who man the cableships are contributing to improved communications across vast reaches of water. As a result of their vigilance, a simple telephone call can be made to almost any location in Europe with the connection as clear as a local conversation. While current equipment does not permit transmission of television signals, this possibility is being researched by the American Telephone & Telegraph Company, and 16-mm. news film can now be transmitted directly from any European location to the United States. But to the cablemen, the more they use the cable the more cable it'll take, and that makes more possible trouble. And more work on the world's toughest telephone-line job. ★ ★ ★

☐ Ships will be using the Panama Canal at night for the first time when powerful fluorescent lights are mounted atop the walls of the locks.

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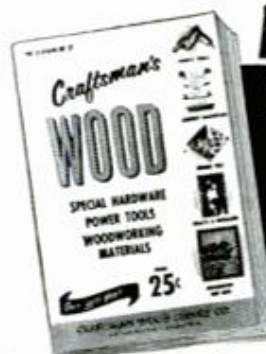


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## Sidewalk Hot Rod

(Continued from page 187)

support the steering rod. Finally, a 3½-in. flat link is welded to the lower end of the steering rod and this in turn is pivoted to the steering bar with a bolt and castle nut as before. A ½-in. collar placed over the upper end of the steering rod to bear against the end of the tube takes up any play in the rod. It is best to test the steering linkage to see that it works properly before actually welding the support posts to the frame. An elongated steering wheel can be fashioned from ½-in. steel rod and welded together as detailed or any suitable wheel that will fit a ½-in. shaft will do.

Twelve-inch wheels fitted with 1.75 semi-pneumatic tires were used on the original, although you can use smaller 10-in. wheels if you wish. Except for the right rear wheel which is the drive wheel, ⅝-in. collars fitted with setscrews are used to hold the wheels in place. The drive wheel is welded to the end of the axle. A 3 or 4-in. V-pulley and suitable belt are slipped over the axle and left free for final alignment when mounting the motor.

### How to Convert the Motor

When you unpack the gear motor which is actually a hand-cranked generator, you'll find a cloth bag containing brushes. Save the large brushes in the bag for spares. Referring to the keyed photo of the motor on page 186, first remove plate A and a similar plate on the opposite side and then strip all the parts from the face of these plates by grinding or filing off the rivets. A 3-in. length of steel angle is tack-welded to each plate to serve as mounting pads, after which the plates are put back on the motor in their original positions. Next remove cover B. Inside the motor you will find a condenser, a coil of wire (reactor) and a relay. Remove and discard these parts as they will not be needed. Also, remove the wiring leads from the high-voltage brush holders. Next, remove cover C and its mate on the opposite side of the motor. Under these you'll find plastic brush holders. Unscrew the cap, remove both brushes, then replace the cap and covers.

Following the wiring diagram given, connect the two field-coil leads previously removed from the high-voltage brushes to terminals A and D on socket D. Connect the two low-voltage brush leads to terminals B and C. If you find that the motor rotates in a reverse direction (counterclockwise) it can be made to rotate clockwise to drive the car forward by simply interchanging

(Continued to page 262)



The Netercraft Co., 3101 Sylvania Ave., Toledo 13, Ohio

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Unlimited variations of color and pattern in a proven fishing lure are possible—at low cost—with a new kit that gives the fisherman the materials for making eight fast-wobble plugs. The lure body comes in two halves, with an assortment of inserts and lacquers to provide the body color. The decoration goes inside the clear plastic shell, which is then fused together with a special cement. In the finished lure, the color or pattern shows through the transparent body in a scale pattern. Kit includes hooks, eyes, balancing weights, decal "eyes" and three lacquer colors.



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## The Hazards of Owning a Home

(Continued from page 100)

ducted from your taxes. Expert advice here may save you real money.

(D) "Personal injuries" is a rather special type. Let's leave it till last.

(E) Disposing of your home, by sale or by will, usually involves the services of a lawyer. Remember that a contract to purchase land is generally not enforceable unless in writing. Remember, too, that the law will decide for you what will happen to your home on your death unless you do otherwise by valid will. Wills are rather technical matters, and the help of a lawyer in drawing them is most desirable.

### 'Personal Injury' Liability

Now, let's return to that so-called "personal injury" category.

Owning property frequently means that you are liable for accidents that happen or originate on the property and injure someone personally or damage property.

No one expects accidents, and many people are woefully unaware of their legal responsibilities for them. As accidents can be very expensive and their occurrence may find the homeowner completely unprepared, any such unexpected incident can be financially disastrous.

The number of specific accidents that can occur is almost infinite, of course, and no one can detail or guard against them all. But remember some general rules.

First, avoid damaging your neighbor's property. A common example of this is the fire set by leaf burning. A wire leaf basket to cut down sparks is a good idea.

Second, avoid creating a nuisance. Fumes from a back-yard incinerator may bring the wrath of your neighbors, both social and legal, down on you.

Third, look out for the so-called "attractive nuisance." Few situations result in more tragic accidents, and few legal doctrines are more frequently invoked against the homeowner — to his financial sorrow. The attractive nuisance doctrine, applied to children, states simply that if you have on your property one of those dangerous objects or conditions that children seem to find irresistible, and a child, even if disobeying specific warnings and orders by you or his parents, is injured or killed while playing around that attraction, you can be held liable.

The newspapers have been full of such tragedies in the last few years. A little caution will help you avoid responsibility.

Dangerous machinery, like power mowers, tractors, electric drills and the like should be kept locked up.

Swimming pools are terribly dangerous. Children find them irresistible. If you have one, even if it is only a wading pool, put a fence around it.

Discarded iceboxes or food freezers are death traps. Always destroy latches so kids can't get locked inside.

Keep dangerous medicines out of reach, not only to protect your own children but also their playmates.

An unlocked car, parked on a hill, out of gear, is not only attractive but dangerous to exploring children.

Unguarded excavations, plastic clothing bags, untended open fires—the list is endless. A dead child is not only a tragedy for which no one would wish to be responsible, but the law, through the "attractive nuisance doctrine," may also charge you with an amount of compensation for the death which could ruin you.

### 'Scaffold Acts'

Fourth, beware the "Scaffold Acts." Few people are familiar with these, and many states have them. They are statutes which make property owners liable for accidents caused by dangerous or defective ladders or scaffolds being used on the property. Now, understand, the law may not look to your "fault" here. The statutes vary from state to state, and so do judicial interpretations, but you may be charged with a responsibility which, as a practical matter, you cannot exercise. Collapsing scaffolds erected by a contractor you engage, or defective ladders supplied by workmen you hire—if these result in injuries, the scaffold acts may hold you, as homeowner, liable, and you may have to pay.

Your best protection here is insurance. Most standard construction contracts require the contractor to show you evidence of sufficient insurance, obtained by the contractor, to protect you not only against scaffold accidents, but also against that other bugaboo, workmen's compensation, as well as property damage, public liability and the rest. Make sure that these policies name you as one of the insured.

If you hire workmen directly, you should definitely call your insurance agent. Short-term comprehensive insurance is available and cheap.

And, incidentally, if you are a do-it-yourselfer engaged in possibly dangerous work, some extra short-term insurance for yourself might also be desirable. People are very careful to buy flight insurance, and check their wills before a trip, but in actual fact the number of deaths and accidents resulting from travel are insignificant com-

(Continued to page 266)

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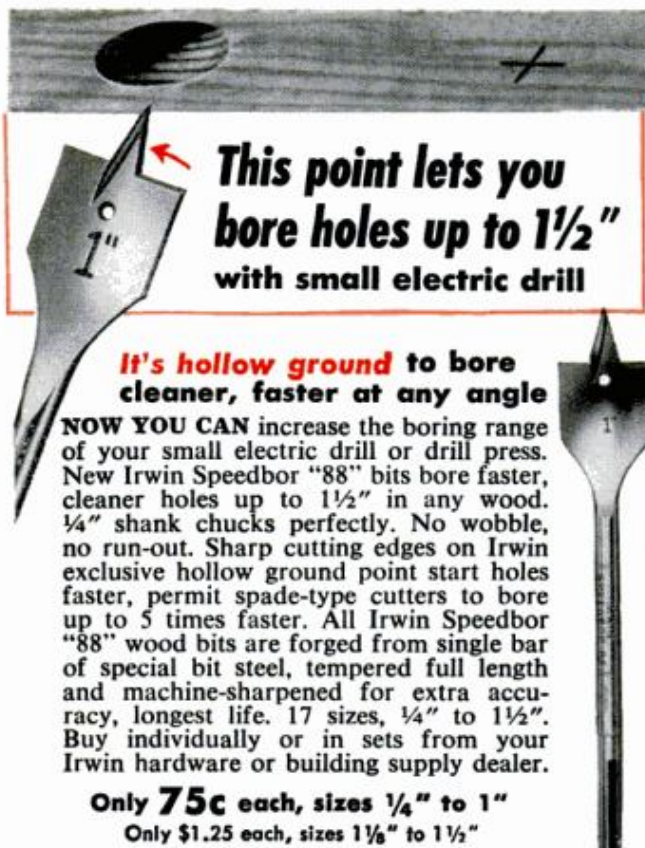
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**Only \$1.25 each, sizes 1½" to 1½"**

**IRWIN SPEEDBOR "88" WOOD BITS**  
 at Wilmington, Ohio, since 1885

**STOP WATER DAMAGE...**



Wood  
 Plywood  
 Shingles  
 Asbestos siding  
 Concrete blocks  
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 Mortar  
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 Plaster  
 Brick  
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 Fabrics

**Prevents warping, swelling, mildew, mold, water stains, seepage, dampness, rot.**

**Keeps moisture out 5 years and longer.**

Use on all woodworking jobs, boats, patio furniture, planter boxes, shutters, screen doors, window sash, shingle roofs. Stops seepage in basement walls, concrete siltos, foundations. Waterproofs canvas, tarps, tents, awnings, leather boots, shoes, outdoor clothing. Won't harden or crack leather or fabrics. Perfect underseal for oil base or alkyd paints. Deep penetrating, colorless. Apply by brush, spray or roller. At paint or hardware stores or order direct. 16 oz. spray can \$1.89, Qt. \$1.75, Gal. \$5.35, 5 Gal. \$25.25, ppd., tax incl. Send check or money order to **E. A. Thompson Co. 1355 Market St., San Francisco 3, Calif.** No COD's please. (Since 1929.) Dealer and jobber inquiries invited.

pared to the number that happen at home. Short-term insurance can also protect you against the "helpful neighbor" who can sue you if his helpfulness hurts him.

Fifth, avoid ordinary negligence. The law makes a number of nice distinctions between "licensees," "invitees" and such, which are not too important for the layman. What is important is that accidents that happen on your property, caused by your carelessness, may, legally, be your financial responsibility. A broken or icy sidewalk or front step may cause a nasty fall, for which you may legally have to pay. (Many cities, by the way, have ordinances requiring snow and ice clearance by property owners.) Children's roller skates or marbles left on front porches or inside hallways are dangerous. So are unmarked excavations and vicious dogs. Guests and tradesmen have a legal right to expect reasonably safe conditions around your home. Failure to provide same may result in costly lawsuits.

Finally, beware the trespasser. If you have trouble with trespassers, buy a dog and post a sign. Build a fence. Call the police and/or your lawyer. But *do not lay a trap*. It is a little-known fact of the law that while you may bar a trespasser, sue him, or even have him arrested, you may not set a trap for him. If you do, and it injures him, *he* can sue *you*, and collect.

While this article is not written to scare the homeowner, it should be obvious that property ownership entails many legal problems. Especially is this true in the field of personal injuries, or "torts" as the lawyers call them. And you cannot prevent every form of trouble.

So what can you do?

Well, as has been pointed out, a little time spent learning some fundamental rules and a little thought spent applying them can save you trouble and money. For the rest, your best defense is insurance and expert advice. A comparatively few dollars spent on insurance premiums, title guarantees and legal fees may save your bank account or even your home itself. ★ ★ ★

**Rocket-Riding Telescope**

Mounted on a rocket, a telescope equipped with six photo-amplifiers will hurtle up 100 miles and then transmit to Earth television-type pictures of ultraviolet light. The telescope was developed at University College, London, England, and will be tested at the Woomera Range, South Australia. It will provide new information about the atmospheres of stars as well as discover objects radiating invisible light.



**WAR SURPLUS AND OTHER BARGAINS SAVE UP TO 90%**



**BATTERY OPERATED CAPSTAN**—Terrific power for pennies. Use for rope rigging of any type as anchor windlass on boats. Can be bumper mounted for pulling power, lifting or dragging on jeeps, tractors, trailers, trucks and campers. Will operate on 6, 8, 12, 24 or 32 V. Fully enclosed weatherproof case, 5 1/2" dia. spool. Capacity 2500 lbs. plus. Shipping weight 66 lbs. 18" long (including spool) x 8" high x 12" wide. 3 horsepower motor with tremendous reduction. NEW. Another Airborne exclusive — **\$89.95.**



**AUTOLITE DC GENERATOR** Terrific gen. for arc welding, battery charging or wherever DC power is required. Low 2275 RPM. 140-200 Amp. Approx. GOVT. COST \$350. NEW, factory boxed, **\$17.95.**



**R3 GENERATOR** Terrific for making arc welder. 3000 RPM. 30 V. 300 AMP output. Approx. GOVT. COST \$750. Like NEW. **\$29.95.**



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**ELECTRIC STORAGE BATTERY WINCH** Fully reversible, drum switch. Runs from car or truck battery. Lifts 2,000 lbs. plus. **\$46.50**



**AIRBORNE ALL-PURPOSE ELECTRIC WINCH** Fully bearinged 3 HP motor with a reduction of 240 to 1. Will operate on 6, 8, 12, 24 or 32 V. Will lift up to 2 tons. Safety clutch set at 3 tons. Fully reversible. Adjustable hand brake and lock. Drum will handle over 500' of 1/4" steel cable or 5/8" rope. A terrific, compact power takeoff for beaching boats, etc. Will work off any battery within the range from 6 to 32 V. Cost of this unit is less than an installation for a competitive brand. Shpg. Wt. 130 lbs. Complete, ready to run (less cable). Dim.: 8" W x 34" L x 18" H. NEW. **\$99.50.**



**BUILD YOUR OWN ARC WELDER, LIGHT PLANT OR BATTERY CHARGER \$37.50**  
Kit incl. 1 Navy NEA-5 Gen. combination AC-DC type. AC 115 V. DC 24 V., 200-300 Amps. 2 complete generators in 1, yet no larger than reg. gen. Ideal for home, shop and farm lighting plants. Delivers 1200 Watts AC, DC side for charging batteries, welding and operating war surplus motors. Also in kit: 2 Voltage Regs., AC & DC, Reverse Current Relay, 30' New Welding Cable, 1 Ammeter, Rheostat, Electrode Holder, Toggle Switch, Welder's Shield, Wiring Diagram for kit. Wt. under 100 lbs. Approx. GOVT. COST \$850. Kit—**\$37.50.** Navy NEA-5 Gen. as above, purchased separately, **\$23.50.**



**SOUTH WIND HEATER & ACCESSORIES**  
Manufactured for govt. antarctic expeditions for jeeps and half-tracks. Heating unit puts out over 20,000 B.T.U.'s. Late recirculating type. Burns any type gas. 6 volt system. Fuel consumption extremely low, 1 gal. per 8 hrs. Terrific for trucks, etc. With service & installation manuals & many components. Approx. GOVT. COST \$550. Shpg. wt. 50 lbs. gross. NEW. **\$39.95.** Limited quantity. Also available in 24 volts. **\$39.95.**



**CHRONOMETRIC TACHOMETER** Built to U.S. Navy & Air Force specs. Jaeger Watch Co. For counting revolutions per min. of any rotating shaft. Can be used on speeds up to 3000 RPM. Accuracy to 1/10 of 1%. Complete with male & female tips & leatherette hand case. GOVT. COST \$87.50. LIKE NEW. Only **\$19.95** ppd.



**140-1 REDUCTION GEAR** For beaching boats, winches, hoists. Ideal motor in golf or boy's electric car. DC motor & clutch. Easily reversible wiring diagram furnished. Hi torque, 105 RPM. Runs on 6-12 or 24-32 V. 65 lbs. gross. Approx. GOVT. COST \$300. **\$12.00.** Matched spined gear — **\$3.00** ea.  
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**AIRBORNE SALES CO., INC. DEPT. PM 261**  
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## ARE WE FLYING JUNK?

An airline pilot takes a critical look at some of the overage and battered planes flying our airways. Don't miss this revealing feature in the

## MARCH ISSUE

FEBRUARY 1961

## Make \$20 to \$30 a Week EXTRA MONEY!

With the high prices of food, clothing and everything else, just think what you could do with extra money every week! Turn your spare time into CASH—sharpening saws with a Foley Automatic



Saw Filer pays from \$3 to \$6 an hour. Start in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws—says M. L. Thompson. With a new model 200 Foley you can file all hand saws, also band and both combination and crosscut circular saws.

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## Ships That Fly on Wings

(Continued from page 105)

roomettes instead of cabins, eat at snack bars instead of big dining salons. No palatial ballrooms, no swimming pools. No open promenade decks, either, because the high-speed ship will be all-enclosed for wind protection. But you'll leave New York this morning and arrive in Liverpool tomorrow before noon. Stormy seas will not slow these hydrofoils. Riding high on their stilts, the craft will not have to reduce peak cruising speeds except for waves over 20 feet high. And on the North Atlantic, hydrofoil engineers point out, the waves are less than 20 feet high 93 percent of the time.

The U.S. Navy began exploring the hydrofoil in 1947, and today can point to some very satisfying results. There are now Navy hydrofoil landing craft—LCVP's and DUKW's—which have exceeded all previous landing boats in speed. Another experimental Navy hydrofoil, the XCH-4, an air-propeller-driven 53-footer, has turned out to be the fastest and steadiest open-sea waterborne vehicle in existence, doing over 90 miles an hour. "This craft rides so smooth," says one Navy hydrofoil researcher, "that at 70 miles an hour in a four-foot sea I could almost stand on one foot."

### Foil Subs With Foils?

The Navy also says that the hydrofoil may bring the solution to its most worrisome problem—how to combat the atom-powered submarine. These subs will outrun and outmaneuver any present antisubmarine surface vessel. Faster conventional destroyers are not the answer, for faster destroyers, especially in rough water, would shake themselves to pieces. And any ship of destroyer length would take too long to turn. Nor is the solution in the high-speed PT boats, because they too have to cut their speed in rough seas. Otherwise their bottoms could be smashed in, as happened to one of them in the late war when going only 30 knots in a three to four-foot sea. "We needed speed in all sea conditions for antisubmarine warfare," testified a Navy admiral to a Congressional committee recently, "and we found it in the hydrofoil."

I rode in one Navy experimental hydrofoil at Dynamic Developments' research center on Great South Bay, Long Island, to see how these new craft perform. This boat was only 23 feet long, and a rough sea was slapping the pier piles as I climbed aboard. As we headed into the waves, our bow lifted on the front foil, then our stern on the tail foil, and in a matter of 10 seconds we were riding high above the whitecaps as smoothly as though we were skating on ice.

"She'll go 60," said the operator. "And watch her turn." He put the wheel over, and the hydrofoil spun around almost as if she was pivoting. "The hydrofoil can out-twist any of the new subs," the operator yelled at me. "And notice—she doesn't skid like other speedboats on turns. Her foils check side-slip."

A big power yacht passed abeam of us, leaving a high cresting wake behind. "Look at our wake," said the operator. I looked astern, to see in surprise we were leaving practically no wake at all. "That's a hydrofoil. Almost no wake. So you can run her right in among small boats and never swamp them."

Boeing Airplane Company, Seattle, is now building the Navy's first PC(H) (patrol craft, hydrofoil), with the guarantee that she will break 50 miles an hour. She will be 115 feet long and displace 110 tons. Still bigger Navy hydrofoils are in the offing. Navy planners are working on development of hydrofoil destroyers which may go to 500 tons in size, in speed to over 100 miles an hour. Equipped with rocket and torpedo launchers, these ships will function both as submarine killers and missile destroyers, firing antimissile missiles at an enemy submarine's missiles after they break from the sea. "Because they are hydrofoils," said one Navy official recently, "it will be almost impossible for any submarine torpedo to score a direct hit on the boat. Nothing to hit but the speeding, quick-turning foils." Some hydrofoil experts say that a coastal screen of 200 or 300 such hydrofoil destroyers may be among our most effective defenses against the Soviet's atom-powered, missile-firing sub fleet.

### Foils for You, Too

Hydrofoils have been found to function well on small pleasure craft. They work on everything from eight-foot outboards to cabin cruisers, and many are being adapted to them. Grumman pioneered hydrofoil motorboats in this country with an aluminum 15-footer two and a half years ago. Now several firms are manufacturing hydrofoils, with sales reported brisk.

Some of these companies sell hydrofoil "kits" with which a boat owner can convert his old boat into a hydrofoil speedster overnight. The foils are made of aluminum or fiberglass and are easily mounted; one type goes on with just eight bolts. Prices (dependent on size of boat) run from \$200 to \$500. On an outboard with a long-shaft lower unit, a standard optional feature, the foils can double a boat's speed. Even sailboats can now ride on hydrofoils. One Wisconsin firm makes attachable foils which have given some boats, wholly under sail, speeds of 30 miles an hour.

With all their superiorities, will the hydrofoils in time sweep conventional vessels from the seas? They won't, for the new craft, phenomenal as they are, do have limitations. In a fast-following sea from astern, some hydrofoils will occasionally "stall"—that is, refuse to stay up on their foils. Then they must "tack," take a zigzag course, inevitably time-wasting. Small hydrofoils can have trouble with seaweed accumulating on the foils and reducing their lift, much like ice on a plane's wing. And the larger hydrofoil craft in general are expensive to build. Because they are technically and scientifically more complex than a conventional displacement craft, they may cost twice as much, or more. And there is a probable limit on how big the hydrofoil ship can be. As they grow larger their foils and struts tend to become too long and too heavy to be practicable. Double the hull size, and foil size must increase four times, the foil weight eight times! So designers now speculate that the top size is probably 3000-4000 tons. "But that doesn't matter," hydrofoil enthusiasts counter. "The hydrofoil will make up for its lack in size with its speed, just as the clipper ships did."

In light of such facts, I understood when I heard a well-known ship designer say: "The hydrofoil—watch it. It may well be the greatest advance in naval architecture since steam took over from sail." ★ ★ ★



Garret Thew Studios, Westport 7, Conn.

## Solar Cigarette Lighter

By focusing the sun's rays from a parabolic reflector, cigarettes may be lighted in seconds with a new cigarette lighter. Made of highly polished aluminum sheet, it comes in two sizes: a round model, 4½ inches in diameter, and an oval model, three by four inches. The round model requires about five seconds to light a cigarette, and the oval model about 10 seconds.

## SAVE UP TO 85% ON GOVT SURPLUS

**SAVE 82%**

**HWY. DUTY 2000 PSI CYLINDERS**  
Engineered for earth moving equip., tail gates, presses, agricultural equip., lift assemblies, industrial machines, etc. Ideal for backhoes and front loaders.

Part No.	Bore	Stroke	Eye-to-Eye Lgth.	Shaft Dia.	PRICE
H-70A	2-1/2"	8-3/8"	18-3/4"	1-1/2"	\$9.88
H-70E	2-1/2"	30"	40-1/2"	1-1/2"	24.88
H-70G	3-1/2"	8"	19"	2"	17.88
H-70L	3-1/2"	43½"	55-1/8"	1-3/4"	44.88

**WRITE FOR INFO. ON BACKHOES AND FRONT LOADERS. SAVE \$300 TO \$1000**

**SPECIAL AIR TANKS**  
G-1 TANKS - Stainless steel. Tested to 400 PSI. 12½" x 24", ½" ports. Used - **1195**

**NEW G-1 Tanks . . . . . 15.95**

F-1 Stainless Steel TANKS - 500 cu. in. capacity. Size: 10" x 18" . . . \$ 10.95

Stainless Steel J-1 AIR TANKS - Size: 24" x 45". Capacity 18000 cu. in. \$95.00

**1500 PSI Dbl. Action HYD. CYLINDER**  
Has 2-3/8" bore, 19" stroke, 1-1/4" shaft, 30½" lgth. Gov't cost approx. \$75.

**NEW LOW PRICES**  
No. H-53AU - USED . . . **1275**  
No. H-53AN - NEW . . . **1975**

**1500 PSI HYDRAULIC CYLINDER**  
Has Bore of 3-1/2", Shaft 1", Stroke 21-5/8", Length 29-3/4", Ports are 3/8" AN (9/16"-18 thread).

Cat. No. H-27-ASU NEW . . . **2975**

**1500 PSI - Double Action CYLINDER**  
Bore 2-3/8", Stroke adjustable from 7-3/8" to 9-5/8", Shaft 7/8", eye-to-eye length is 20".

No. H-17USU - Used . . . **788**  
No. H-17NSU - New . . . . . \$14.88

**Double Action Hydraulic Cylinder.** Will stand 2000 PSI. Steel barrel. Ideal for hydraulic press. Has 2-1/2" bore, 7" stroke, 1-5/8" shaft, 19" length.

Catalog No. H-240  
Pulley Cat. price \$12.75 . . . **995**

**1500 PSI Double Action CYLINDER**  
Bore 2", Shaft 7/8", Stroke 9", eye-to-eye length 14-1/2".

Catalog No. H-48 . . . **595**

**2000 PSI HYDRAULIC HAND PUMP**  
No. HP-3V **988**

Capacity is 1.5 cu. in. per cycle. Has operating pressure of 2000 PSI. Built-in diverter valve allows selection of suction and pressure ports for two independent systems. Regularly \$11.75.

**4-WAY HYD. VALVE**  
No. H-V7A-1 **395**

A spring loaded, poppet type valve. Pressure balanced. Off in neutral. Has ½" tube ports. Cost Gov't approx. \$30

**AIR FORCE 100% NYLON COVERALL**  
**Now 488**

Genuine Nylon Air Force coveralls. Has six pockets with zipper closure. An adjustable waist. Full zipper on front and ankles. Sizes: Small-long and medium-short. Color: Air Force blue. Cost Gov't approx. \$15.00.

**TO ORDER** - Send check or M.O. 1/2 deposit with C.O.D.s. All prices are F.O.B. Los Angeles Warehouse. All items sent postage or freight collect.

**2500 lb. LIFT HOIST**  
Ideal for garages, shops, on boats, jeeps, trucks, etc. Has a 24 to 1 ratio through a worm gear drive, a free-spool, pull-out clutch and a three-speed crank. Comes with 18 ft. of 3/16" steel cable. **3795**

**MOUNT FRAME for Hoist . . . . \$5.00**

**85 TO 1 GEAR BOX**  
Drives through a 6-gear train that rotates on self-lubricating, high speed roller bearings. Has 180° offset drive. Take-off shafts are 1-1/4" and 3/8" diam. Overall size: 6" x 4" x 2½". **995**

**112 HP MOBILE AIR COMPRESSOR**  
**99.50**

Delivers 90 PSI. Adjusts up to 125 PSI. Displaces 2-3/4 cu. in. per minute. With automatic pressure switch, relief valve, gauge, pressure regulator, hose and blagun. Has 10 gal. tank and wheels.

**NEW 3-3/4 HP ELECT. MOTOR**  
An ideal motor to operate a portable winch such as tow truck or utility boat. Series wound for continuous duty. Rated 3.75 HP at 2300 RPM. Draws 240 Amperes on 24 volt DC. Has 5/8" diameter drive shaft . . . . . **1295 NEW 895 USED**

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Has 11-1/4" tempered steel blade, hardwood handle and genuine leather sheath to hang on belt. Ideal for hunter, camper, etc. May also be used as meat cleaver or chopping blade. **249**

**U.S. CORPS OF ENGINEERS CLINOMETER**  
**A SPECIAL BARGAIN**

Ideal for preliminary survey work. Reads approximate elevation or depth of any point on the horizon. Gives degree of incline or decline. 2-3/4" in dia. by 5/8" thick. In new condition complete with leather carrying case. A \$12.95 Value for only . . . **688**

**LEATHER PILOT-NAVIGATORS BRIEF CASE**  
**USED 1.98 NEW 2.98**

Made of the finest cordovan leather with extra tough twill lining. Inside has 3 small pockets and 2 large pockets. Cost Gov't approx. \$25

**palleys**  
2263 E VERNON AVE., DEPT. PM-21, LOS ANGELES 58, CALIFORNIA

## Comparing the New Camper Wagons

(Continued from page 109)

On rough, high-crowned two-lane roads, you feel that 50 m.p.h. is about all that's comfortable in the Econoline, while you can roll along comfortably at 60-65 in the Greenbrier.

For day-long turnpike travel, the Greenbrier will cruise at an honest 70 m.p.h. with a stretch up to 75 for passing.

Our test Greenbrier had four-speed manual transmission and 3.27 to 1 axle ratio which was the secret of its cruising ability. The three-speed standard manual transmission carries a 3.80 to 1 axle ratio, which would definitely limit its cruising speed.

The Econoline offers no transmission other than the three-speed manual column shift with a standard axle ratio of 3.50 to 1 (4.0 to 1 is optional). This gearing is a pretty good all-round choice, as it provides good pickup through 45 m.p.h.—which is near the peaking point for the engine.

### Greenbrier Is Heavier

At 2659 pounds, the Econoline is 346 pounds lighter than the Greenbrier's 3005. This explains the former's acceleration of 13.2 seconds to 40 m.p.h. Up to this point it leads the Greenbrier (0-40 in 15.1) but soon that old devil air resistance drags at Econoline's greater frontal area (it's 748 square inches greater, as a matter of fact) and even things out so that the comfortable cruising speed of the Econoline is just over 60 m.p.h. and all-out top, about 63 m.p.h. Wind resistance notwithstanding, the Econoline does its job on less gasoline, with 19.0 miles per gallon in a combination of turnpike and city driving. Greenbrier logged 16.8 m.p.g. under approximately the same conditions.

An average of four acceleration runs from 0 to 60 m.p.h. put the Econoline a bit ahead with 26.2 seconds for the run compared to 26.8 for the Corvair Greenbrier.

Both vehicles are vulnerable to cross winds when lightly laden and traveling at 50 m.p.h. or more. But both wagons have good, precise steering, making it easy, but not very relaxing, to keep them on course in a quartering wind.

The "cab forward" driving position of these vehicles is a boon when you're easing through thick traffic, but the real problem arises when you're backing up, due to the high location of the seat and the rear windows. It is all too easy to back up into unseen ash cans or top-down sports cars. Another worry comes in multilane traffic when cars overtaking in the lane to your right are hidden by the rear panels of the wagon.

To sum up: It takes some adjustment for anyone who has never driven anything but a passenger car to step up into these compact, cab-forward wagons.

Corvair's Greenbrier with its optional Powerglide automatic transmission, easy steering and more comfortable ride would probably be the ladies' choice. Incidentally, neither car's front seat (perched over the wheels) is easy for women wearing skirts to clamber into or slide out of.

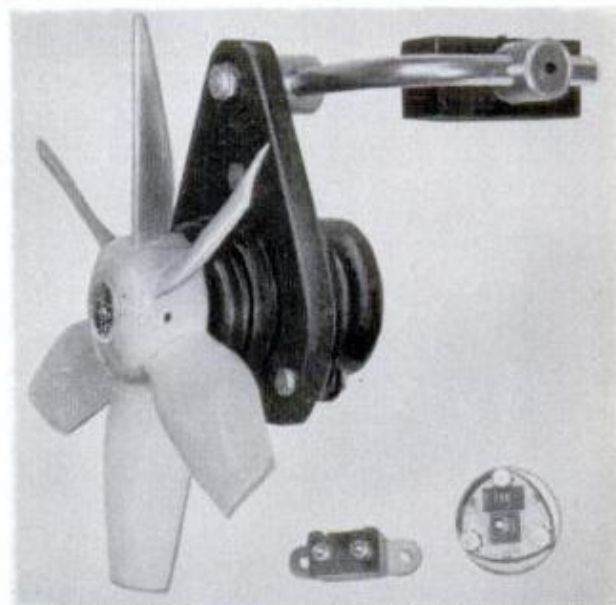
For hauling loads of eight or nine people alternated with bulky (i.e. 200-cubic-foot) cargoes and doing so with the advantages of total length of less than 15 feet and short turning radius, the Greenbrier and Econoline are the only answers except for Volkswagen's Microbus.

The latter shares many of the advantages and disadvantages of its U.S. counterparts but doesn't have the power for cruising at much over 55 m.p.h. on level ground.

For many people, a compact or "low-priced-field" station wagon will do, as it has the passenger capacity, convertibility to cargo hauling, and half the capacity, at prices that are competitive or better.

Factory advertised prices of the two U.S. camper wagons are \$2651 base for the Greenbrier and \$2378 for the Econoline.

★ ★ ★



Kentlowe Accessories & Co., Ashford, Middlesex, England

### Thermo-Controlled Engine Fan

Thermostatically controlled, a British-built electric engine fan operates only when water temperature is above 190 degrees. Power is thus saved on long, high-speed trips when extra cooling is not needed most of the time. Standard blades are removed and unit is mounted from either side of the radiator. Heat-sensitive switch fits into radiator header tank or the cylinder head.

"bargain"  
batteries?

OH YEAH!



Why try to get by with a "bargain" battery. Save time, money and trouble with a dependable Delco DC-12 Dry Charge! You can figure this one out fast. What does it cost you to be late for work? A couple of hours missed because of a bad battery adds up to inconvenience . . . and money. You'll avoid such trouble with a sure-starting Delco Dry Charge Battery.

**ALL THE POWER YOU PAY FOR . . . DELCO!**  
A Delco DC-12 stays bone dry . . . can't lose any "zing" on the shelf! When you buy it, the dealer adds the fluid that activates it with 100% fresh starting power . . . plus the reserve power required for modern automotive electrical equipment.

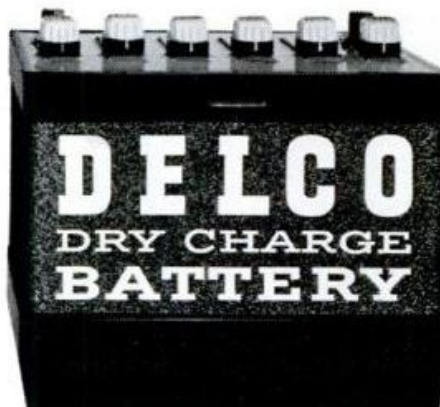
**YOUR BEST QUALITY BUY . . . DELCO DC-12!**  
*Extra fluid capacity*—Less refilling, less danger of damage from low fluid level. *Hard rubber case*—Stronger, also resists heat distortion. *Microporous rubber separators*—More current flows between plates, means peak power at all temperatures. Ask your dealer about these and many other Delco quality features.

**A DEALER NEAR YOU . . . DELCO!**  
He's a *local* businessman who appreciates your service business, wants to keep it. Automotive service is not just a sideline with him . . . it's his

*specialty!* He knows your driving needs, can recommend the right Delco Battery for your car.

**BE SURE . . . REPLACE WITH DELCO!**

For dependable starting in any weather, replace with 100% fresh Delco. It's "Designers' Choice" for most new cars, survey-proved as "Drivers' Choice" for replacement, too. When it's time to replace your old battery, make sure you get a Delco DC-12! *DELCO ENTERTAINS YOU*—*"Stagecoach West"* and *"The Islanders"*—ABC-TV.



DELCO... "A GOOD NAME FOR GOOD SERVICE!"

Another reliable  
General Motors product,  
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FEBRUARY 1961

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# A BOY NEEDS A DAD HE CAN BRAG ABOUT!



Remember when you were a kid — and your Dad was the strongest, smartest, bravest guy in the world? "That's my Dad," was your big claim.

Now you're the "Dad"—and that's *your* kid looking up at you.

You're a hero in his eyes. You *know* that. But how do you look in your own eyes? Are you using your abilities to build a secure future for your family — to give them the good living and advantages that could be theirs? Maybe you

lost a few years in military service — or a lack of formal education has shut you out of the big-pay jobs that could be yours.

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(Partial list of courses)

Without cost or obligation, send me "HOW TO SUCCEED" and the opportunity booklet about the field BEFORE which I have marked X (plus sample lesson):

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- Air Conditioning
- Architecture
- Arch. Drawing and Designing
- Building Contractor
- Building Estimator
- Carpenter Builder
- Carpentry and Millwork
- Heating
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

### ART

- Commercial Art
- Magazine Illus.
- Sign Painting and Design's
- Sketching and Painting

### AUTOMOTIVE

- Automobile
- Auto Body Rebuilding and Refinishing
- Auto Engine Tuneup
- Auto Electrical Technician
- Diesel Engines

### AVIATION

- Aero-Engineering Technology
- Aviation Engine Mech.
- Reading Aircraft Blueprints

### BUSINESS

- Accounting
- Advertising
- Bookkeeping and Cost Accounting
- Business Administration
- Business Management
- Clerk Typist
- Creative Salesmanship
- Managing a Small Business
- Professional Secretary
- Public Accounting
- Purchasing Agent
- Real Estate Salesmanship
- Salesmanship
- Salesmanship and Management
- Traffic Management

### CHEMICAL

- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry

- Oil Field Technology
- Pulp and Paper Making

### CIVIL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Professional Engineer (Civil)
- Reading Struc. Blueprints
- Sanitary Engineer
- Sewage Plant Operator
- Structural Engineering
- Surveying and Mapping
- Water Works Operator

### DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Drafting & Machine Design
- Electrical Drafting
- Electrical Engineer Drafting
- Industrial Piping Drafting
- Mechanical Drafting
- Sheet Metal Drafting

### ELECTRICAL

- Electrical Appliance Servicing
- Electrical Engineering

- Electric Motor Repairman
- Elec. Engr. Technician
- Elec. Light and Power
- Practical Electrician
- Practical Lineman
- Professional Engineer

### HIGH SCHOOL

- Good English
- High School Diploma
- High School General
- H. S. College Prep. (Eng'r'g & Science)
- High School Math
- High School Science
- Short Story Writing

### LEADERSHIP

- Industrial Foremanship
- Industrial Supervision
- Personnel-Labor Relations
- Supervision

### MECHANICAL and SHOP

- Diesel Engines
- Gas-Elec. Welding
- Heating and Air Conditioning
- Industrial Engineering
- Industrial Instrumentation

- Industrial Safety
- Machine Shop Practice
- Mechanical Engineering
- Plumbing and Heating
- Professional Engineer
- Quality Control
- Reading Shop Blueprints
- Refrigeration and Air Conditioning
- Tool Design
- Tool Making

### RADIO, TELEVISION

- General Electronics Tech.
- Industrial Electronics
- Practical Radio-TV Eng'r'g
- Radio-TV Servicing
- TV Technician

### RAILROAD

- General Railroad

### STEAM and DIESEL POWER

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- Stationary Diesel Engr.
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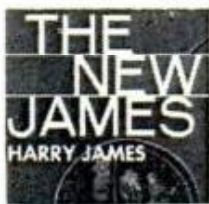
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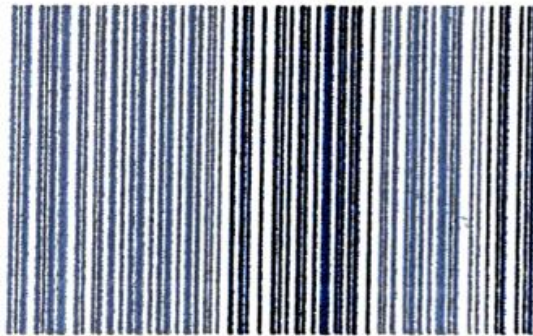
PM-2



1. Follow instructions on the other side

Back

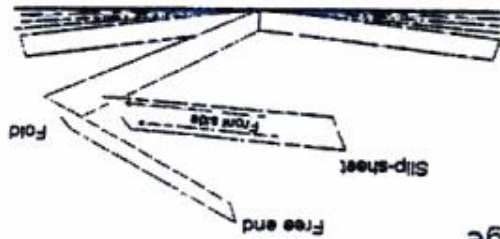
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4. Close the page and slip-sheet



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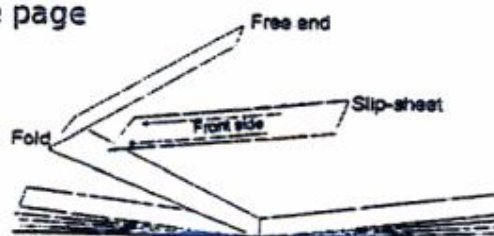
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Folded edge of the page

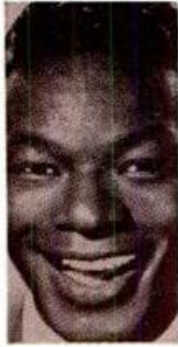
### Inverted Foldout slip-sheet

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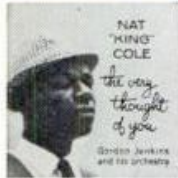


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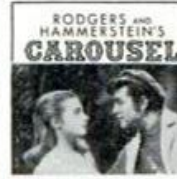
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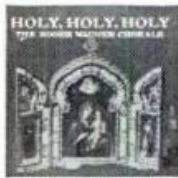
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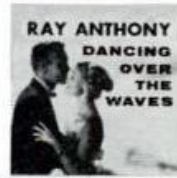
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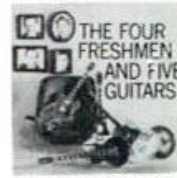
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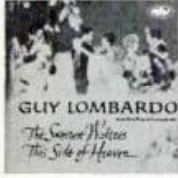
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