

ANNUAL AUTO ISSUE

POPULAR MECHANICS

JANUARY, 1961

35 CENTS



- **ROAD TESTS OF ALL THE NEW COMPACTS**
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- **An Engineer Analyzes the New Engines, Transmissions, Chassis**
- **Is Our Atomic Stockpile Dangerous?**



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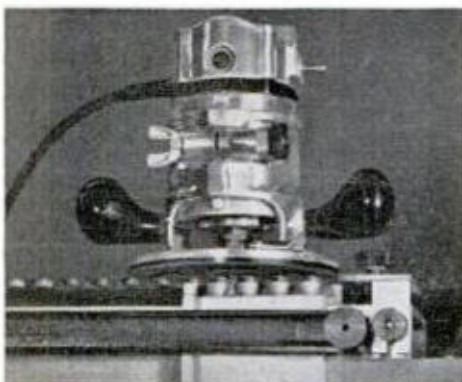
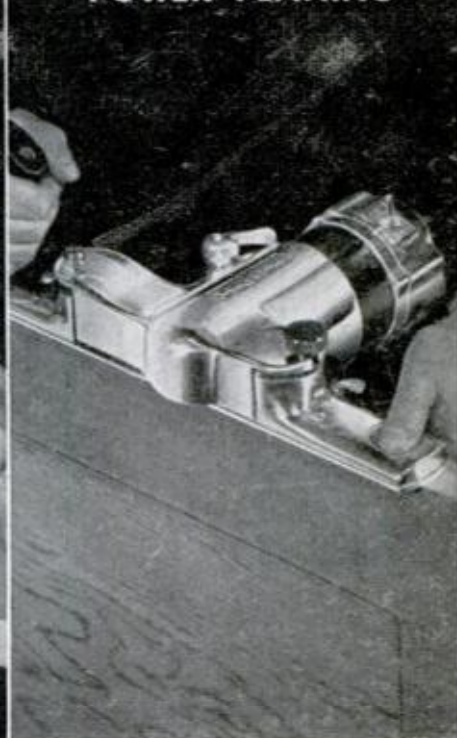
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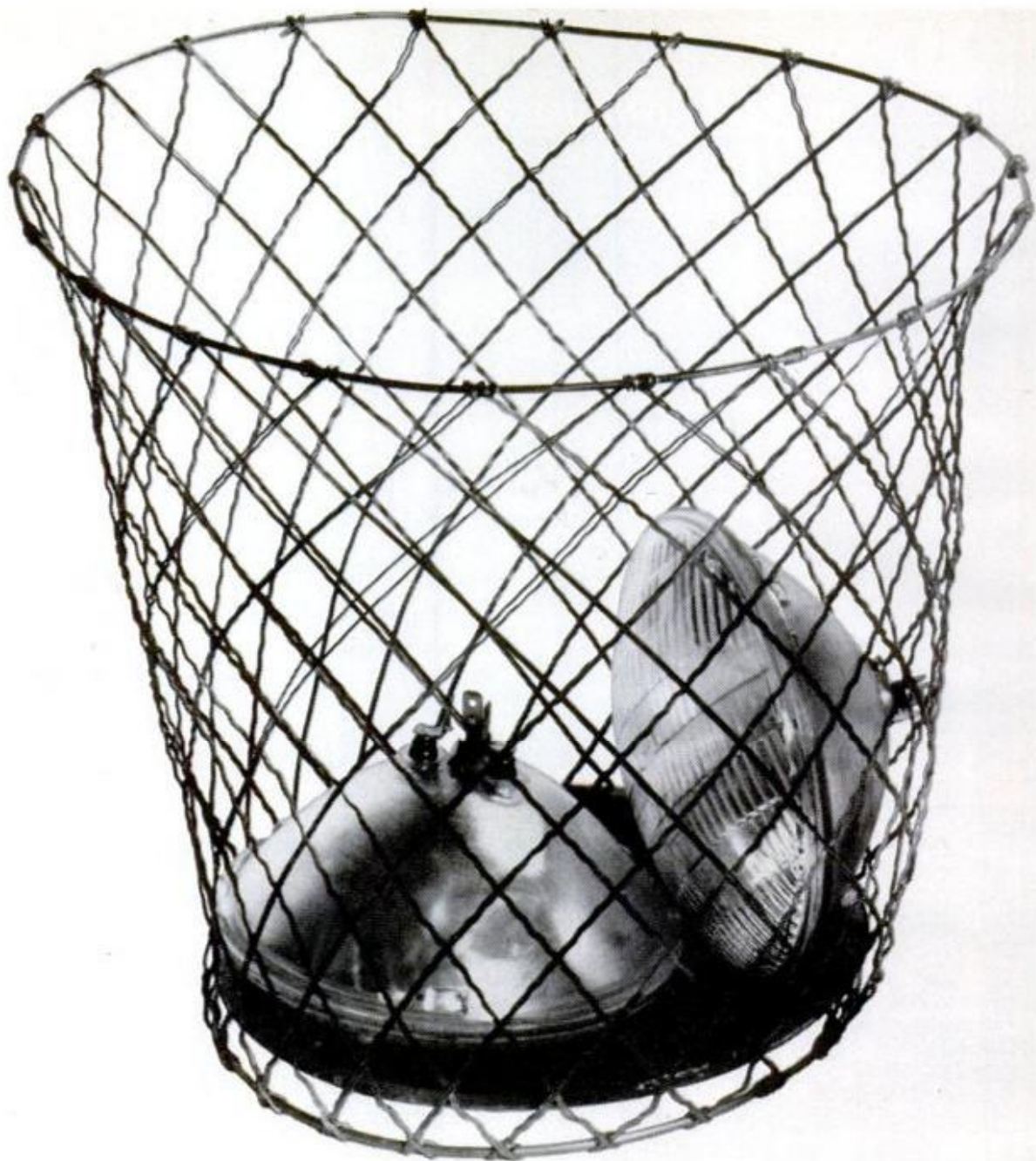
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Next Month...

WANT TO MAKE a safe little car for your youngsters, a car they can proudly drive on the sidewalk? Instead of gasoline, it operates on a 12-volt battery. You'll find complete plans in the February issue... In the same issue: Jim Whipple road tests and evaluates the two new compact wagons, the Corvair Greenbrier and the Ford Econoline Bus... Also: "The Hazards of Owning a Home."

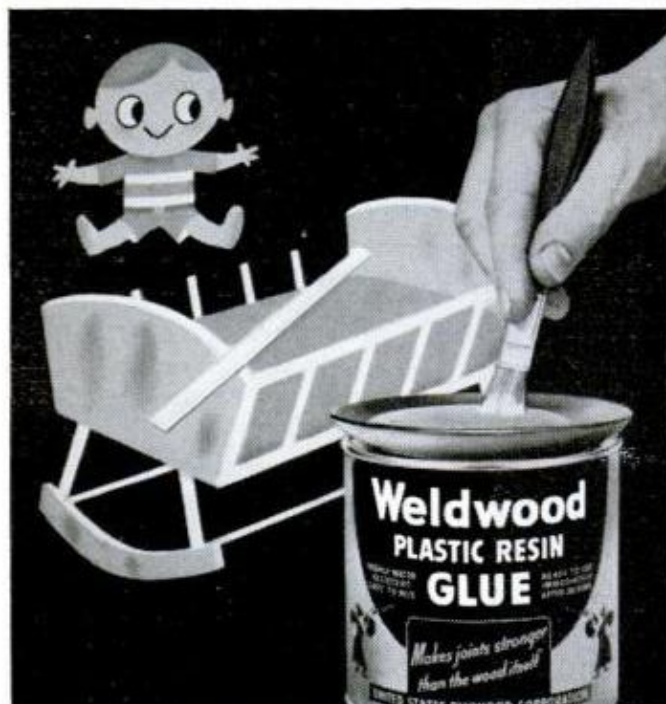
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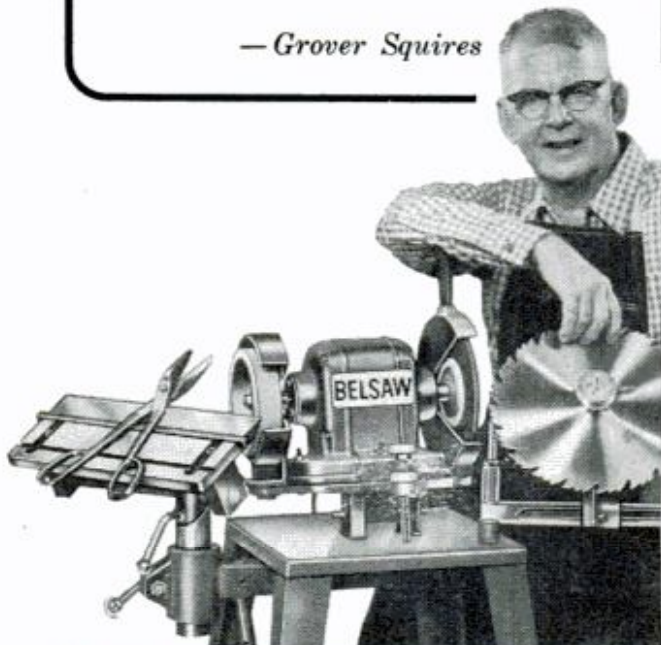


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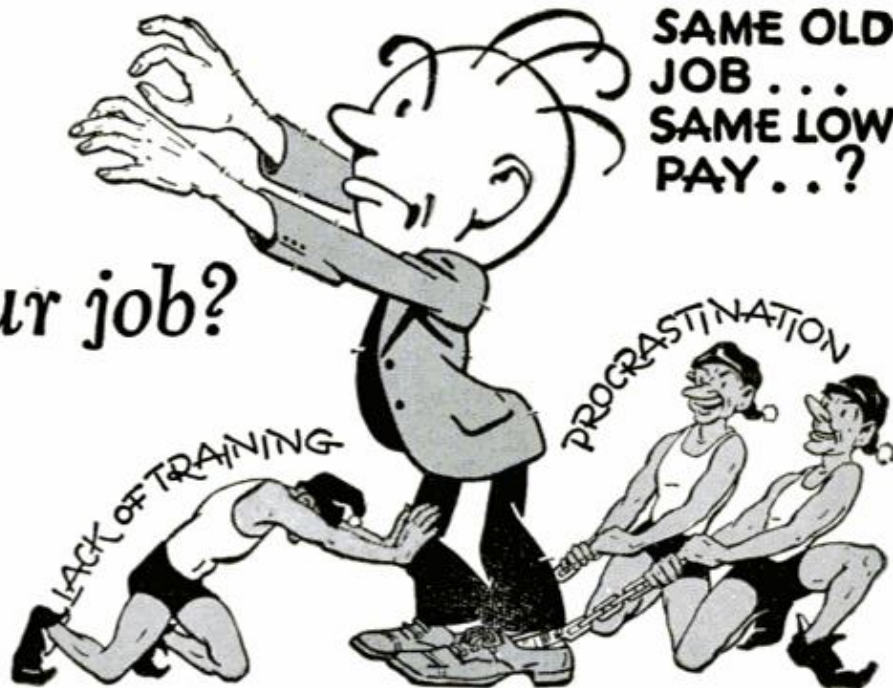
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JOB...
SAME LOW
PAY...?**



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JOB AND GO BACK TO
SCHOOL! AND I SURE
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THE CITY!

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WAY DAD DID...
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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 the magazine to report on the latest developments in the mechanical arts.

Radiation Can Be Felt

Researchers at the National Cancer Institute have demonstrated that mice apparently feel high-energy X-ray beams. This tends to back up reports by a few people who have experienced large doses of radiation that they felt tingling or burning sensations. The mice were placed in a cage that was shielded on one side and open to an X-ray beam on the other. They usually began avoiding the open side after receiving a dose of 300 to 400 roentgens.

QUOTE:

"Don't be premature and ask for purpose in our space research. After all, Columbus set out to solve a trade problem with China, and that still isn't solved. The by-products of his voyage were infinitely more valuable, and it is the infinite itself we now want to solve. We will certainly get to the moon and the planets in this century alone."

—DR. EDWARD TELLER
Physicist
"Father of the H-Bomb"

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Over the
Editor's Desk



Thanks From Korea:



Some time ago we at *Popular Mechanics*
were honored by a visit from 10 top Boy
Scouts from Korea, here on an exchange
visit to the United States. They toured our
plant with two adult leaders as part of a
trip to further world understanding and
brotherhood, while American Boy Scouts
attended a Japanese jamboree at Yoko-
hama. The other day the Koreans' thanks
came back to us in the form of a beautiful
plaque, shown here, the familiar Scout
symbol, the *Popular Mechanics* logotype
and the lettering inlaid in mother-of-pearl.
The group photo shows the visiting Korean
Scouts and their escorts.



(Continued to page 14)

MAKE A FRESH START!

Get ahead faster in Air Conditioning and Refrigeration

IF YOU HAVE A low-pay job with little security and no future, it's time you gave yourself a fresh start. It's never too late to launch a new career in a huge, booming industry such as Air Conditioning and Refrigeration. The government reports that during the past 12 years, production of air conditioners increased 400%. No other industry did better! Thanks to this fabulous growth, over 20,000 newly-trained technicians and mechanics are needed each year to fill a wealth of steady, good-pay jobs. Get set for success: Train at home in spare time. It's easy and it's practical. For full information, fill out and mail handy coupon.

How CTI Home Training starts you in a business of your own or a good job

CTI offers you a short-cut to success. You learn by practicing with real operating equipment! CTI sends you 25 big kits of parts and tools to build a 1/4 h.p. commercial-type, heavy-duty condensing unit (illustrated at right.) You perform experiments, complete many projects, and get experience much like in the field. This is the practical way to learn and only CTI has it. Only CTI combines practice with easy-to-understand theory.



Many students earn spare time cash during their training

Because CTI training is so practical, many students earn extra money by installing and servicing air conditioning and refrigerating equipment. Some work evenings and Saturdays for local dealers; others set up service routes which include restaurants, motels, supermarkets, taverns, etc. You can earn money in spare time as you learn!

These men are making good—You can, too

"I'm in the refrigeration business for myself now. I earn nearly double what I used to. During my training, I made enough to pay my tuition."—*Allred Helm, Ky.* ... "I've started a business and it's a success."—*Otto Degner, Canada* ... "I am in business for myself. I am building a nice trade doing service work."—*Paulie Waters, Tex.* ... "I applied for a job to install air conditioners in autos and got it."—*Richard Vinet, La.* ... "Your refrigeration training helped me get repair jobs after only twelve of your lessons."—*Frank Green, W. Va.*



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YOU PRACTICE WITH
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Over 3 Million Prestos Already Sold!

Presto salesman H. J. Kerr reported making \$20 a day. William F. Wydallis—\$15.20 an hour. Peter Zuccaro, a beginner—\$169 in one week. And this report from Stanley Hyman:

"I have been selling the Presto Fire Extinguisher for well over a year and have found it to be the fastest money-maker and quickest-selling item ever produced. If a man demonstrates it intelligently, sales follow automatically.

"I have made an excellent living with the Presto Fire Extinguisher, having made over \$1,000 a month. Presto is a 'natural.'"

How You Can Make Good Money Too

You can make good money in this way too! Just start introducing this new kind of fire extinguisher to civil defense workers, owners of homes, farms, cars, boats, filling stations, buses, trucks, factories, offices, in your locality and to stores for re-sale.

The Presto is so light—so small—so handy—even a child can put out a blaze with it. So inexpensive (\$4.95) anyone can afford it. Yet its contents (a new wonder chemical developed during the war) have been rated 1.5 to 6 times as effective as other extinguishing agents on an equal-weight basis!

Nationally Advertised

And what sales advantages for you—as compared with large, bulky extinguishers that cost 4 times as much and are 8 times as heavy! Presto is easier to use. No pumping—no heavy tank or tangled tubes to struggle with. Just a twist of the knob . . . and flames disappear as fast as 2 seconds!

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IN CANADA: Mopa Co., Ltd., 371 Dowd St., Montreal 1, P. Q.

To the Editor:

Enclosed is a photograph of Eli Terry clock as described in *Popular Mechanics* a year ago.



I had very little trouble in building this case as the drawings are very good. The design of the finials are from a Terry Clock on display at Old Salem, Inc., of this city. I made the pattern and had them cast in yellow brass. The bottom panel or tablet is a scene from a roll of wall paper.

Peter W. Blum, Jr.
Winston-Salem, N. C.

☆☆☆

To the Editor:

After reading your March issue I became very interested in your *PM Houseboat*. Since I am only 13 years old I was only able to start on a balsa model. I followed your instructions using the scale of one foot to one inch. It took me until the middle of August of after-school work to complete the model. It contains most of the features of the original boat such as lighting, icebox, cabinets, kitchen sink, bunks, a wall-sized bathroom mirror, and a model 35-horsepower Johnson outboard. It takes 12 volts (8 batteries) to run the boat (4½ for the motor, 7½ for the lighting), the price of the materials was \$17.87. The boat is painted inside, has green decks and white sides with black below the water line. I have tested the model and it functioned perfectly.

Francis Lawlor
Waterbury, Conn.



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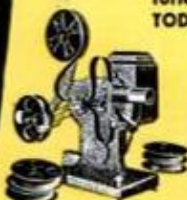
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Sidelights from the PENTAGON

By William R. Kreh

AIR FORCE LANGUAGE has, perhaps, never been as salty as that in the Navy or Marines, but the boys in blue are taking no chances.

Effective immediately all sexy connotations are being removed from official jargon. Postponed missile firings are no longer "aborted," they're simply "cancelled." And the location where the X-15 rocket ship is locked under the wing of its B-52 mother ship will no longer be referred to as the "mating area." It's now the "servicing area." The term "mother ship" offers a problem, however. The Air Force is all for motherhood, but it's not too happy with the phrase. It simply can't think of a substitute.

That static you hear on your radio in the near future may be a top-secret military message.

The defense department is developing a new radio-communications system, called "Phantom," which will let the military broadcast hidden messages over standard broadcasting bands. But the military communications will be buried in so much deliberate background noise that they'll be indistinguishable from static without the right equipment. Most of the project is still heavily shrouded in secrecy.

A king-size throat sprayer may some day replace the needle to vaccinate people against disease. Maj. Gen. Marshall Stubbs, the Army's chief chemical officer, says that mass immunization against normal civilian disease threats, as well as against biological warfare, may be done by spraying large masses of the population with aerosols. The general says that laboratory animals have been given a greater resistance to certain substances by inhaling live vaccine aerosols than by standard injection under the skin.

The hotter you are, the more you eat. At least that's what doctors at Fitzsimmons Army Hospital in Denver say. They've found that soldiers eat more in hot climates, contrary to earlier beliefs, because of increased body activity in throwing off effects of heat.

The Navy's got a television program you won't see on the late show. It's a taped video record of the under-ice "ceiling" along the route through the northwest passage made recently by the atomic submarine, *Seadragon*.

The recording was made by the first underseas video-tape recorder which was installed in the history-making sub. The recording is being used by the Navy to train crews in the touchy art of polar navigation. The new transistorized video tape recorder is small enough—20 x 20 x 100 inches—to fit into a torpedo rack.

Two Hound-Dog missiles carried by the Air Force's B-52 bomber now have double use.

They give the bomber added takeoff power. Their jet engines are coupled with huge ship's eight jets to enable it to get off runways previously too short. Using the missiles this way doesn't shorten their 500-mile range, since they can be refueled by the bomber in flight.

USS *Bondia* of the Military Sea Transportation Service had a cold cargo recently. In fact, it was an old cold cargo.

Two tons of glacial ice, 5000 years old, were cut from an ice shelf near Ward Hunt Island, Canada's northernmost island, and shipped in the *Bondia's* refrigerated hold to Dartmouth College where it will be studied.

The Air Force is trying to develop a fuel that could be used to cool the control surfaces before being burned. The fuel would circulate near the surfaces on planes flying at 3000 miles an hour or better.

The Navy's trying to decide whether to light up the decks of its aircraft carriers during combat operations after dark.

In the past, carriers have had their flight decks dark except for a few lights to show the center line and outline the landing area. This, of course, was to keep the enemy in the dark. Now, however, with long-range radar and sonar, the Navy is wondering if the lights-out policy is really necessary. The accident rate for both pilots and deck crews has always been much higher at night than during the day. So an entire new lighting system is now being tested aboard the supercarrier USS *Saratoga*. ★ ★ ★

"I call it a bad day if I don't make \$25 before noon"

(This chair alone brought \$4.50 with twenty-five minutes work and 32¢ in cleaning materials.)

"Just a few months ago I made the big move. I gave up my job and started spending all my time in the little business I had been running on the side. It wasn't an easy decision, but, now I'm tickled to death I made it. Not just because I'm my own boss or because I have an excellent chance of making over \$10,000 this year. It goes deeper than that.

"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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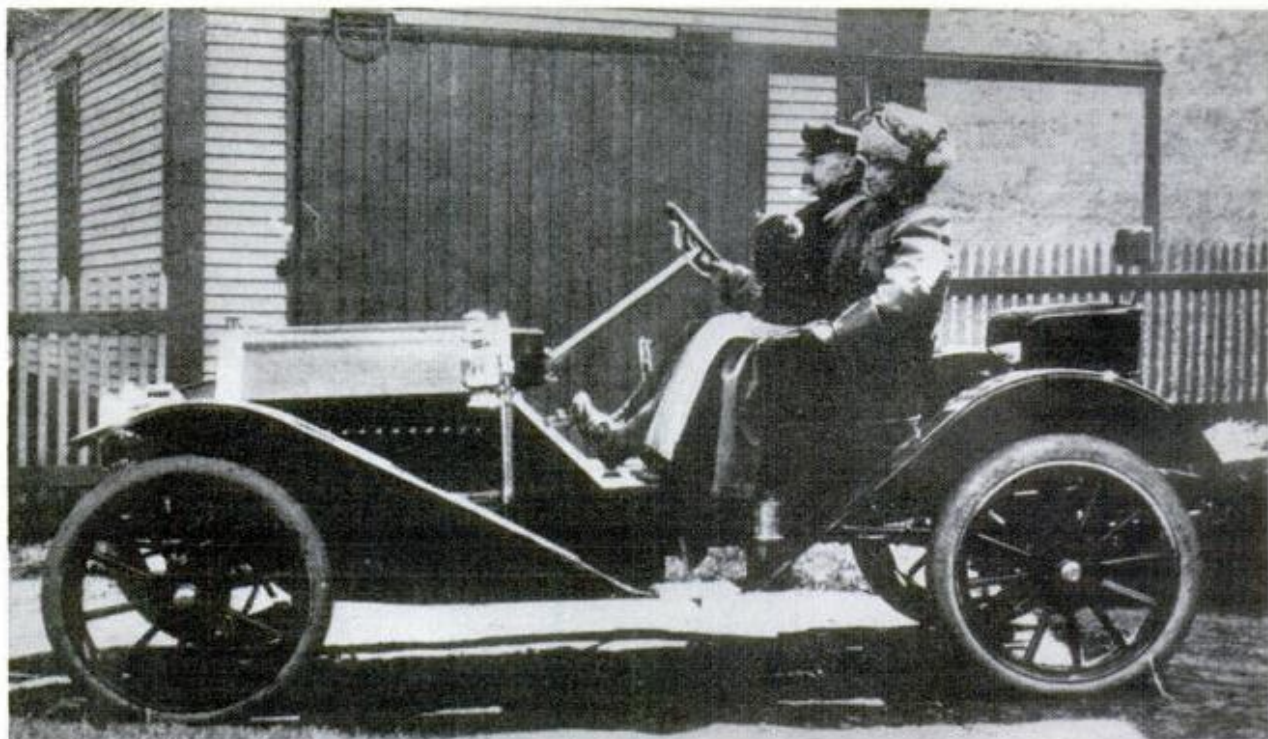
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crankshaft (1915), ignition-key starting (1931), and the first "step-down" body design in 1947. Merged with another make in 1921, models carried the name of a famous American river. Answer on page 270.

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YOU'RE NOT TOO HAPPY in your present job — right? Not enough money. Work not interesting enough. Don't like the people you work with.

What you *really* enjoy is puttering around the house, getting things shipshape. Fixing that doorbell or squeaky hinge. Putting a new washer in that leaky faucet. Getting the motor of that balky power lawn mower to run smooth as silk.

And sometimes you wonder, "Why can't I do something like this all the time? Why can't I get PAID for doing what I really enjoy — instead of what bores me? Why can't I start some sort of little home business that would be fun and profitable?"

This is "Made to Order" for You

If that's the kind of fellow you are, here's a little business that's "made to order" for you. Servicing Electrical Appliances. No big investment or elaborate equipment needed. A few simple hand tools are all you need — and a corner of your basement or garage to work in.

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CASH IN ON THE BIG BOOM IN ELECTRICAL APPLIANCES

The coming of the auto created a multi-million dollar service industry, the auto repair business. Now — with 400 MILLION electrical appliances in American homes — the same thing is happening in that field. No wonder that men who know how to service them properly are making \$3 to \$5 an hour — in spare time or full time!

example, 4,750,000 new coffee makers, 2,000,000 new room air conditioners, 1,425,000 new clothes dryers. And now that Americans have become so absolutely dependent on these electrical aids, they are dependent on the men who can service them. As a trained Appliance Service Technician, you will be needed — respected — well paid.

Don't worry about how little you may now know about electricity. That's where we come in. We'll train you at home, in your spare time, using methods proven successful for over 45

EARN WHILE YOU LEARN

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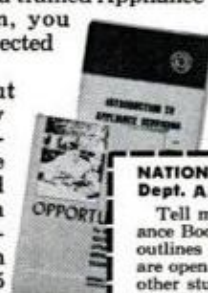
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Business A Success

"Since taking your course 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 the shop."—J. G. Stinson, 1506 Potsettia St., Long Beach, Cal.



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I'd like to give this to my fellow men...

while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to a level of personal independence heretofore undreamed of.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of immutable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to independence without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. One of these businesses is that of putting other men in business for themselves. And, I have the satisfaction—the deep satisfaction—of knowing that I have helped more than three hundred other men find independence from job worries by starting "side line" business that could be operated from the home in spare time. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. Although I may help finance you in a business-like

way, I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least part of the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the information I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

One of the businesses in which I have helped others get a start is a peculiar one. The unusual thing about it is that the product is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that, with my help in financing, is within the reach of anyone.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying as much or more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to personal independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will

keep your "factory" running 24 hours turning out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day—a maximum daily profit of \$33.00.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in knowing the sweet fruits of success, in becoming your own boss, send me your name. That's all. Just your name. I am not asking you for a penny at this time. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about one of the businesses that has now been started by more than 300 men—and several women. After that, you make the decisions. Remember, if you decide to go ahead, I'll help you finance your start.

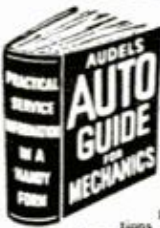
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Keeping up with the ATOM

By James Biery

ATOM BOMBS can probably soon be made by any country that buckles down to the task. A West German development—the uranium-separating centrifuge—has removed the major obstacle to obtaining the fissionable uranium-235 needed for a bomb. The four bomb-possessing countries—the U.S., U.S.S.R., France and Great Britain—have had to use an expensive gaseous-diffusion method of getting pure U-235. Huge plants were built to pump uranium hexafluoride, a uranium-containing gas, through thousands of porous barriers. The U-235 goes through the pores a bit more readily than does U-238 and is separated. The centrifuge scheme, which was set aside by U.S. scientists early in the effort to build the first atomic bomb, was perfected by West German scientists, among whom are Prof. Wilhelm Groth, of Bonn University and Gernot Zippe, who is associated with the Degussa Co., of Frankfurt, which is manufacturing the centrifuge experimentally. Using a much improved centrifuge, the West Germans pass into it uranium hexafluoride which is then spun at high speeds. The slightly lighter molecules containing U-235 tend to stay near the center of the centrifuge, while the heavier molecules containing U-238 move toward the sides. Prof. Groth says the existing centrifuges require only one-tenth as much electric power as diffusion apparatus of the same capacity (the three diffusion plants in the U.S. take 10 percent of the nation's electrical output). The Degussa model can be built for about \$1000 and, according to Zippe, it will produce in one year about one pound of U-235. Only a few pounds, or less, of U-235, are needed to make the detonator for a hydrogen bomb.

Twelve miles outside of Bombay, India, one of the largest international projects in peaceful uses of atomic energy is humming along at near full power. It is the Canada-India reactor constructed at a cost of \$20 million to meet India's demand for radioactive isotopes for agriculture, biology, industry and medicine. Canada supplied about half the 10½ tons of natural uranium required to begin operation, India supplied half, and the U.S. supplied heavy water.

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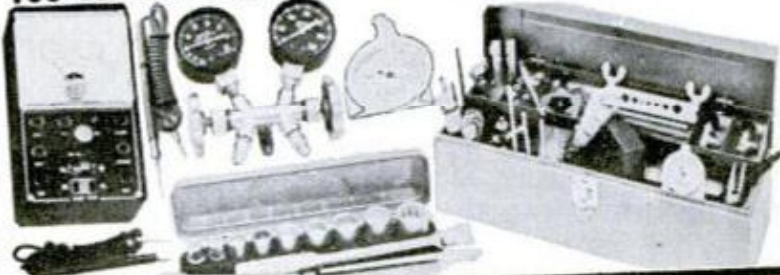
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TUNE IN ON THE INVENTORS



By John Linkletter

FOR THE JET PILOT who has to use his ejection seat, there's a new foot retraction apparatus that keeps his feet and legs from floundering. Metal slippers clamp the feet in place at the pilot's discretion, allowing free foot movement until the moment of escape. When ejection is complete and the chair is falling free, the pilot can escape the chair and use his parachute. Inventors are Robert Drew of Reseda, Calif., and Klaas Hendricks of Van Nuys. Patent No. 2,955,786 was granted them.

Gregory Keller of North Little Rock, Ark., won patent No. 2,956,520 for a machine that puts the crook in a candy cane.

Now there's an electric eraser that is equipped with a suction device that disposes of the paper fibers and rubber crumbs that are created when mistakes are erased. The device won patent No. 2,956,546 for Emily S. Teters of Portland, Ore., Warren A. Aikens of Longview, Wash., and William E. Strader of Kelso, Wash.

A ski-tow gripper that attaches to the skier's belt lets him engage a moving tow rope, travel up a hill, then easily disengage. The device, which can be operated by only one hand, will grip the tow rope gradually. Inventor is K. M. Bieber of Montreal, Canada.



A hub-cap plate invented by Thomas Matin of Perth Amboy, N.J., goes over the hub of a car wheel and carries an advertising message. The plate doesn't spin, so the message is always upright.

Ralph H. Heacock of Medford Lakes, N.J., has patented a stereophonic sound system for drive-in theaters. The system, which won patent No. 2,956,129, uses a speaker on each side of the car. The windshield of the car serves adequately as a sound reflector. ★ ★ ★

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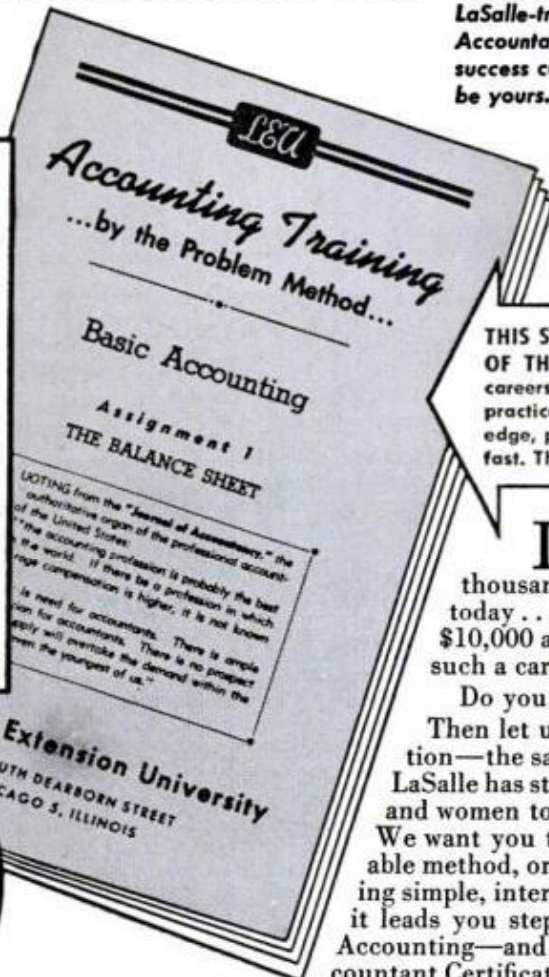


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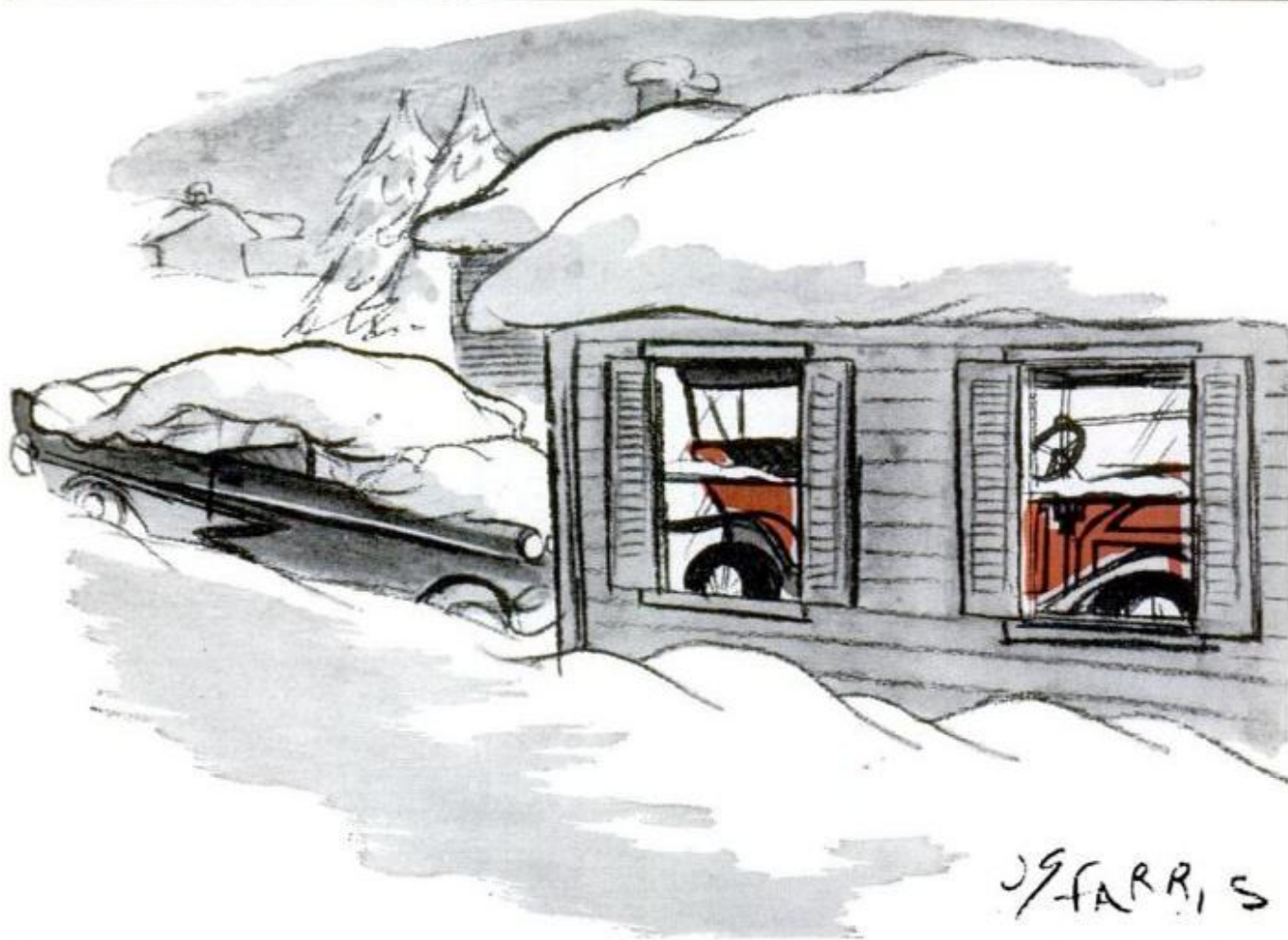
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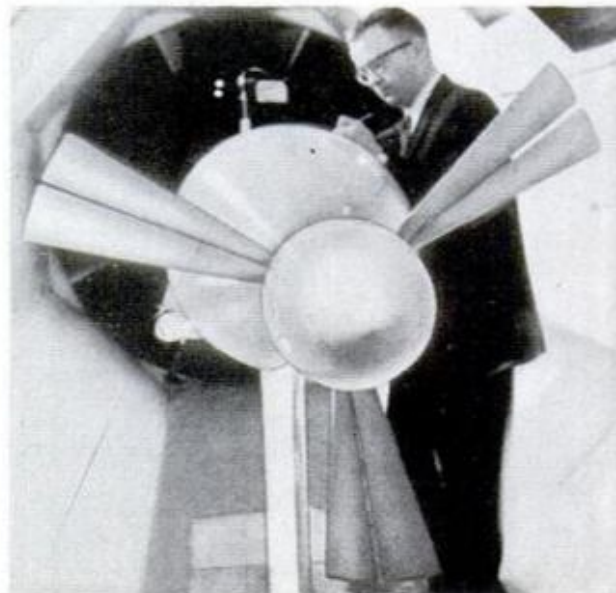


By Kevin V. Brown

IT COSTS an airline nearly \$100,000 a year to suppress the sound of a single jet airliner, or more than \$2 million for a typical fleet of 25 planes. One executive growled that the airlines might be money ahead if they all got together and used the money they spend on suppressing noise to buy up all the real estate around all the airports and move the noise-weary residents out.

An engineering professor, who has been studying jet noises, offers a saner solution. His studies show that after the propulsive jet of gas leaves the engine it fans out and mixes with the atmosphere, creating violent turbulent eddies that produce sound waves. He suggests, since the noise level depends more on the velocity of the jet stream than on its diameter, that engines with larger but slower jet streams could be built to give the same thrust with less noise.

Meanwhile, back at the wind tunnel, the Navy is studying a propeller that can change the surface curvature of its blades to increase or decrease lift, eliminating the traditional compromise between a high-lift airfoil for takeoff and a low-lift airfoil for cruise. The new prop has three sets of twin blades. Changing their angular relationship has the same effect as changing their camber—the same way flaps change the camber of a wing. The props would be used on aircraft where short takeoff and long cruise are essential.



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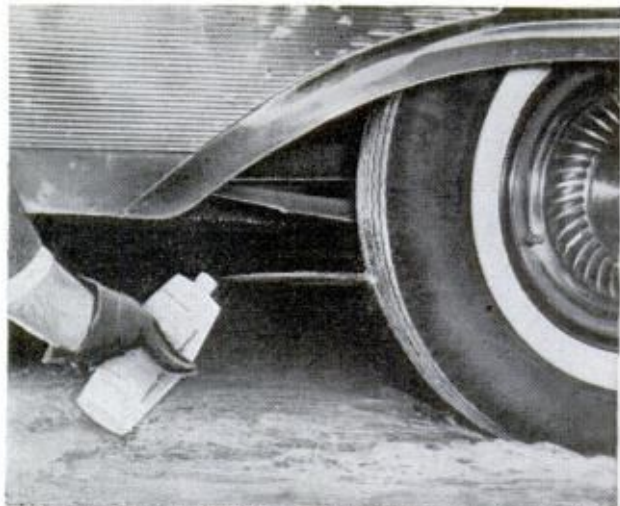
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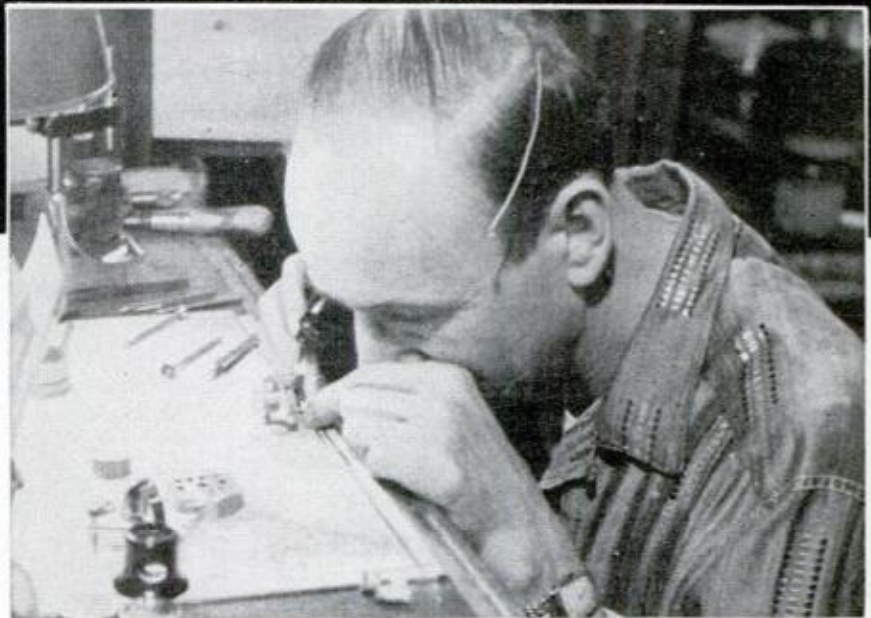
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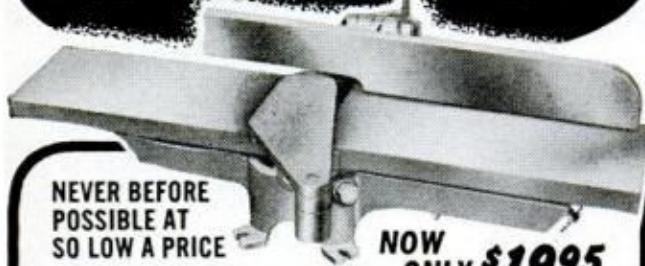
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By James Biery

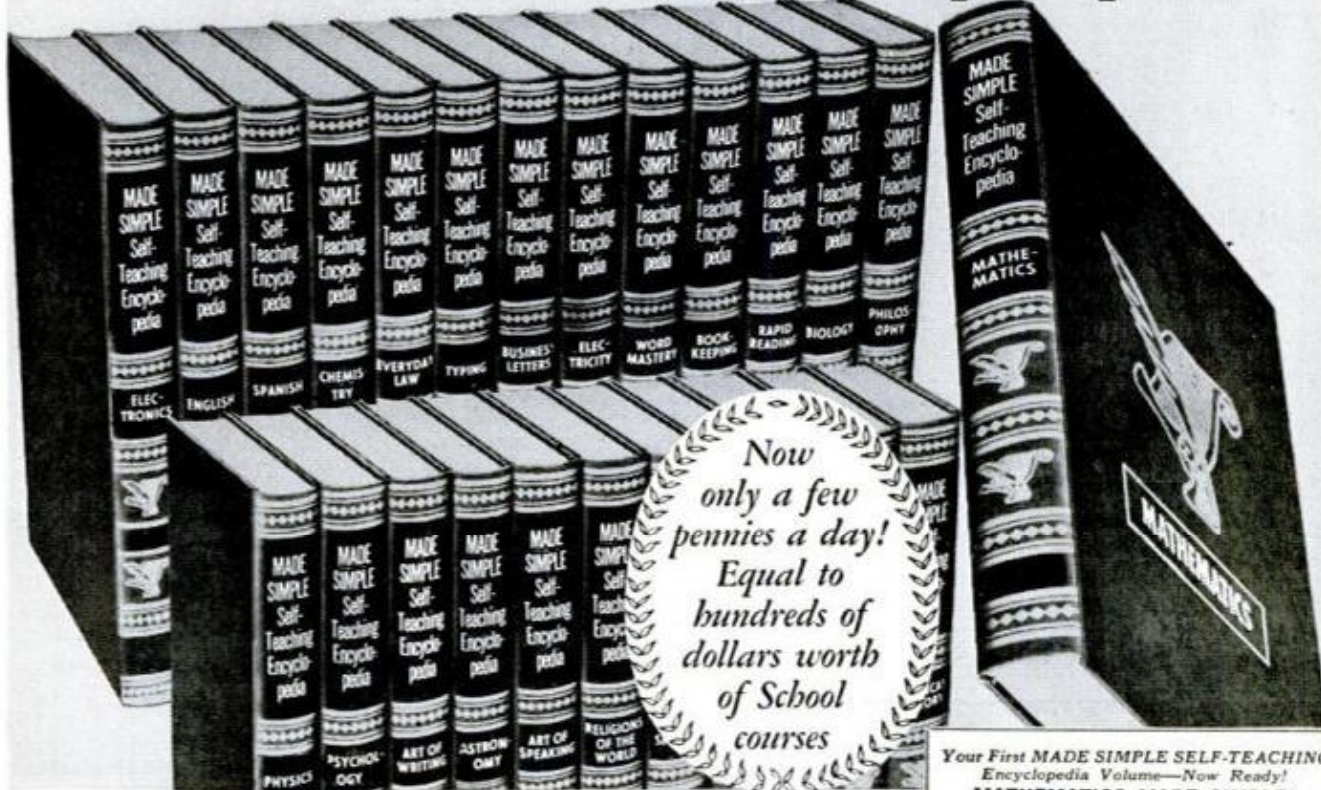
MAN'S EFFORTS to gain knowledge of (and control over) the sky, land and sea have led to development of some unusual tools and devices. These, and the problems they were designed to solve, are described below.

What effect will weightlessness in space have on man's level of awareness, his pattern of sleep and wakefulness as he rockets through the sky? Dr. Ross Adey of the University of California Medical School and engineer Raymond Kado have developed a transistorized brain-wave machine that may help answer those questions. It can be used to pick up and amplify the electric signals from the brain's center of consciousness; this information then can be telemetered to Earth for the benefit of space travelers to follow. The U. S. Air Force's Air Research and Development Command sponsored the project, and tests made on animals in centrifuge and in acceleration experiments indicate the device, which looks like a little black box no bigger than a bedside radio, can do the job. Its electrodes would be planted in consciousness centers of animals orbited in space to obtain preliminary answers.

A one-inch wire cable which performs the task of more complicated drilling pipe arrangements is twisting through Greenland's icecap and will eventually carry ice-sampling instruments 10,000 feet down to the island's bedrock. The U. S. Army Corps of Engineers is drilling, taking core samples every 10 feet to gain information about the structure and chemical composition of the icecap as well as clues to the history of previous climates. The multitextured cable not only is the connecting link for power to the drilling unit—which in essence is a device for melting through the ice—it is used to lift and lower the unit. In the past, Greenland drilling had been limited to 1300 feet because to go down deeper required too much equipment.

Fresh water from the sea? Maybe. And perhaps a synthetic membrane developed by two University of California engineers may help provide it. By casting a number of chemicals on a glass plate and immersing it in cold water, Sidney Loeb and Srinivasa Sourirajan got a film 4/1000 of an inch thick which is 100 times more effective than previous commercial films in filtering salt from sea water. ★ ★ ★

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ITEMS FROM ALL OUTDOORS

By Dick Kirkpatrick

HOW WAS YOUR HUNTING SEASON? Not so good? Well, there are years like that. The ducks turned out to be better than we expected, but the flights were still pretty skinny compared to the fat 40s. Upland birds and small game certainly didn't get any easier to find or hit; neither did big game. And good public shooting over open country gets a little harder to find every year, especially around the big population centers. So maybe you're still hungry for a little game meat.

Your answer might be a shooting preserve, free enterprise's answer to heavy hunting pressures and the demand for more and better hunting. All over the country, and especially around the larger cities, chunks of land (usually so rough that it's wasted anyway) are being bought or leased by individuals or groups for the sole purpose of providing the best possible hunting—at a price—for members, guests and customers. Since it's private land and the game is pen-raised, native game populations aren't affected, seasons are stretched out into February and March or open the year around, and there is seldom any limit to the amount or type of game that can be taken.

Preserves range from plain stocked land that can be hunted for a fee to posh installations that qualify as full-fledged resorts with lodging, meals, guides, dogs and handlers, skeet and trap ranges—the works. Prices, of course, vary with the arrangement, and as usual the shooter gets just about what he pays for. But at the average five bucks per bird, almost any hunter can shoot a five-bird bag for less than it will cost him to traipse around after his own. And you can mix the bag in most places: pheasants, ducks, quail, chukar partridge—even deer or imported Asian and African big game in some spots such as the Rickenbacker Ranch in Texas.

A national directory of shooting preserves for the 1960-61 season has been prepared by the Sportsmen's Service Bureau, 250 East 43rd Street, New York 17. It's available—free—at most sporting-goods stores, through Studebaker Lark and Ralston Purina dealers, or by mail from the Bureau in New York. ★ ★ ★

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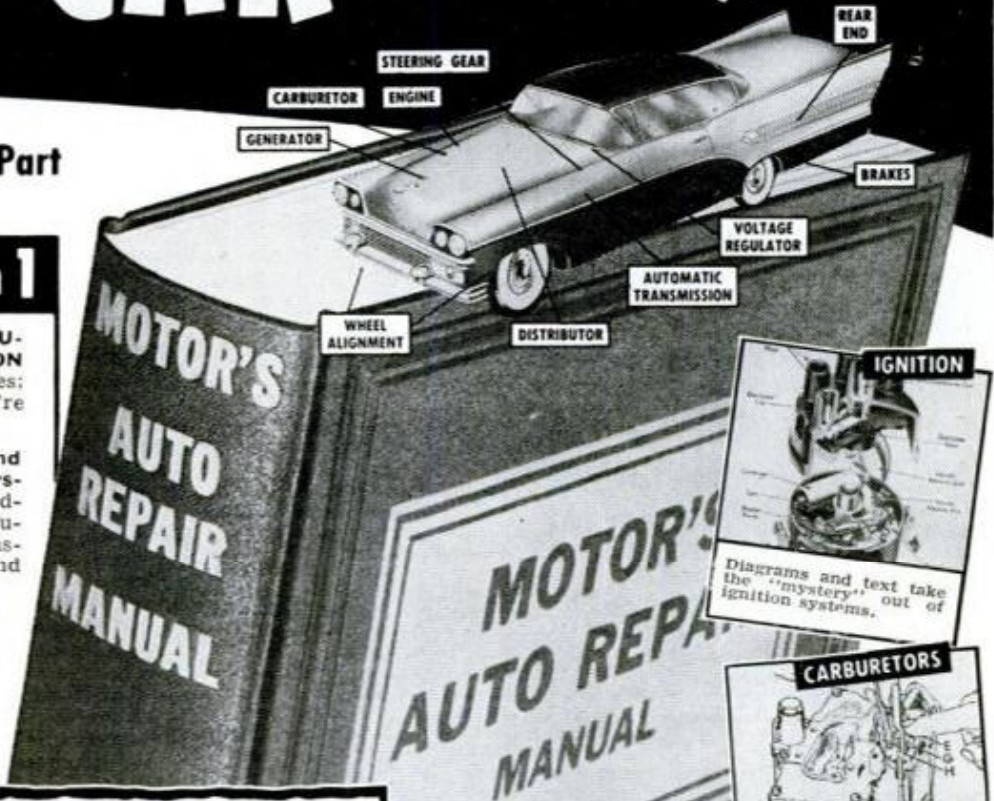
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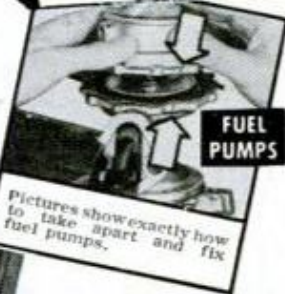
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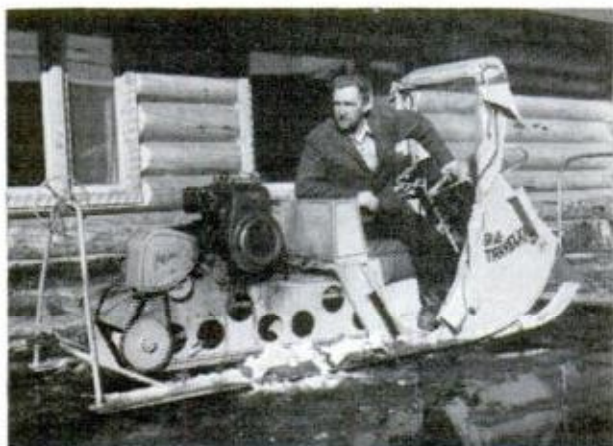
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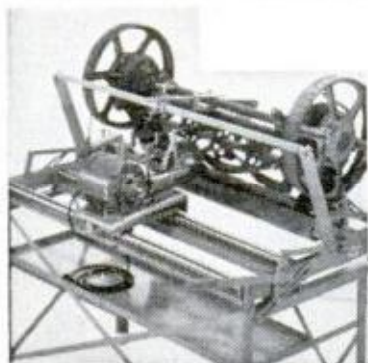
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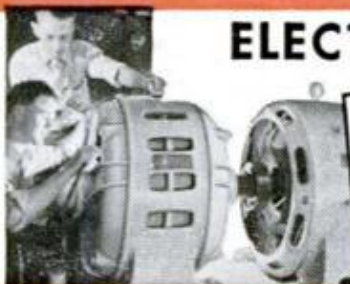
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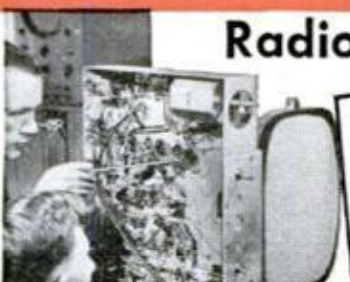


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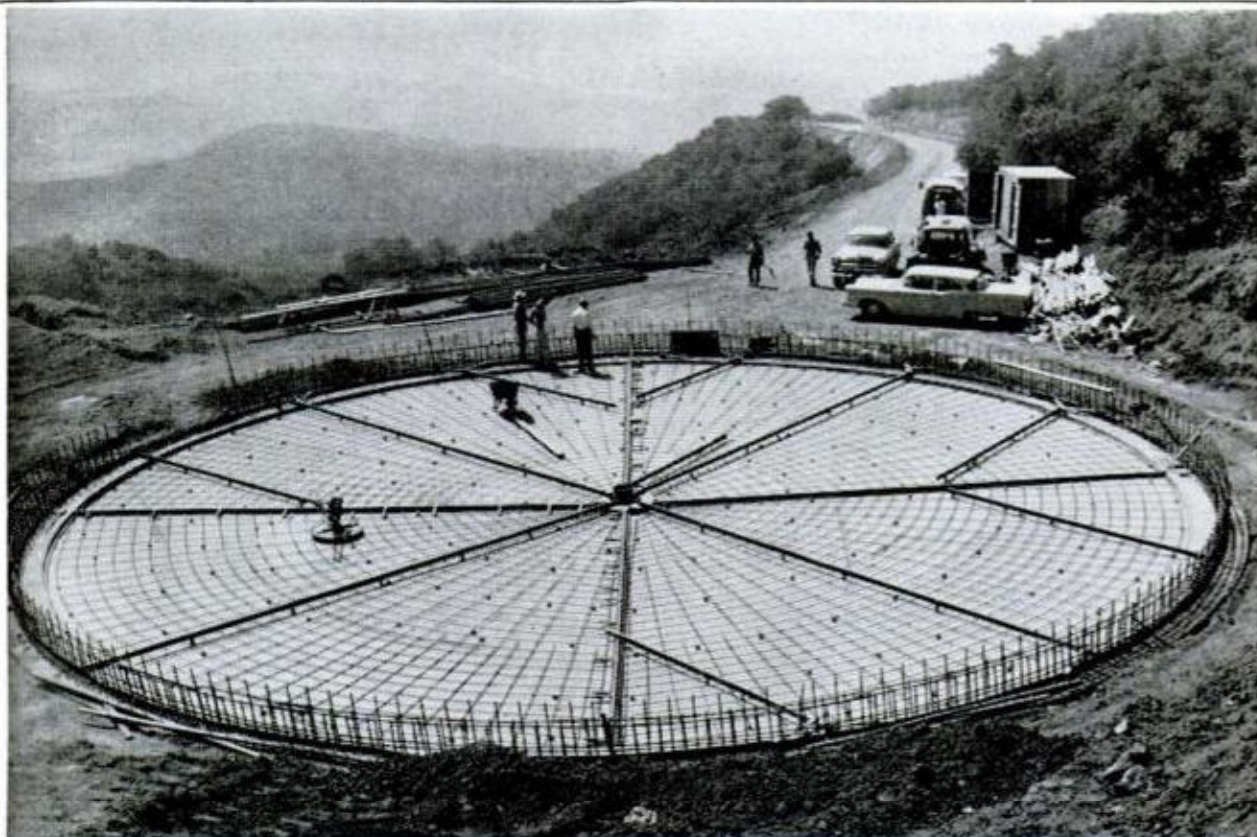
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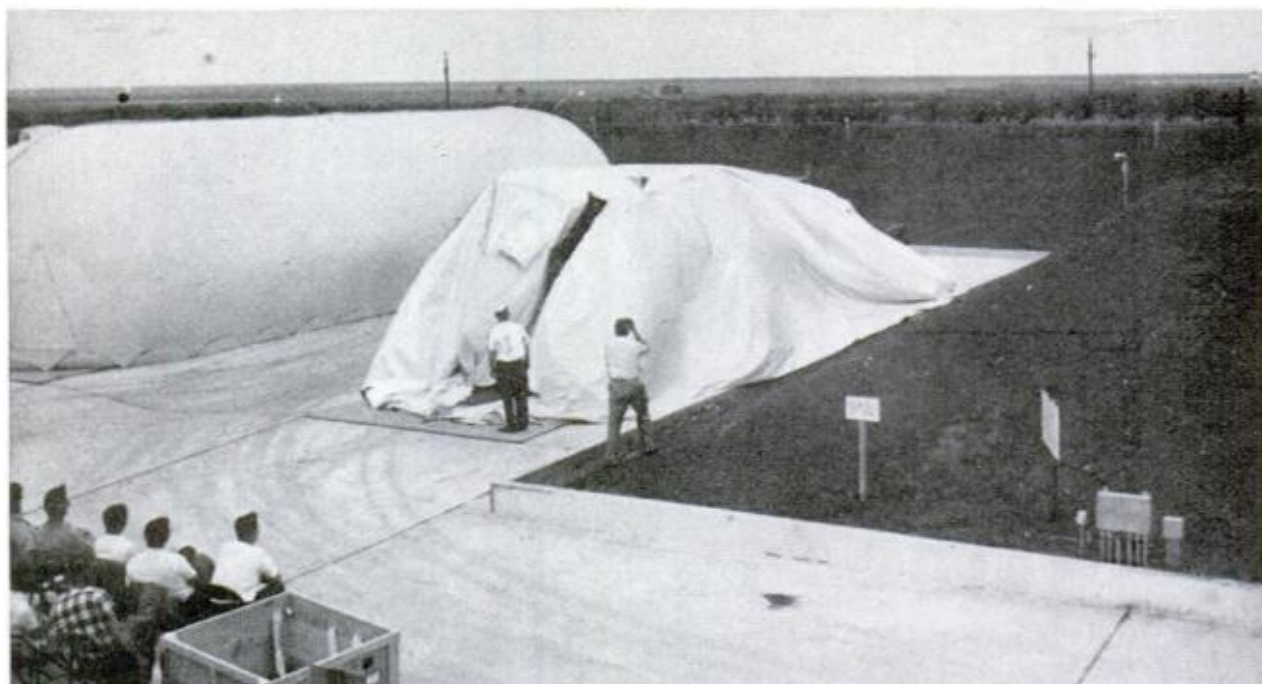
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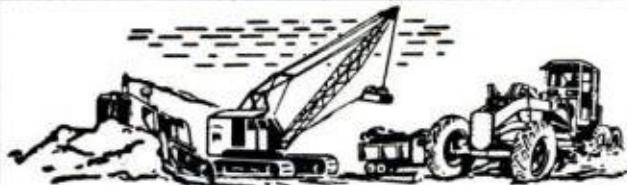
When they ring out the church bells in Wiernsheim, Germany, the booming peal is made by shell casings from unexploded bombs that fell near the town during a 1945 raid by Allied bombers. The citizens of Wiernsheim removed the casings and installed them in the church tower. They are rung by knocking weights, hanging on nearby ropes, against them.

Biologists Seek Life on Other Planets

Out of all planets in the solar system, does Earth alone support life? Many biologists think not, and they are coming forward with tentative plans for finding out if some sort of plant life exists on neighboring planets. If such a discovery is made, then the chances are good that higher forms of life could be found on planets revolving around stars other than our own sun.

A likely candidate for exploration is Mars, where seasonal color changes have led some astronomers to believe that some form of life, such as plant life resembling Earth's mosses and lichens, has been established. Further evidence for believing life of some sort exists on Mars is based on the fact that sunlight reflected from the planet is seen in the far infrared, which indicates hydrocarbon-like materials.

Among biologists interested in investigating the possibility of extraterrestrial life is Dr. Joshua Lederberg, professor of genetics at Stanford University Medical Center, Palo Alto, Calif. The method he has suggested to the National Academy of Sciences is microanalysis. He believes a microscope-television combination would be a good way to obtain information from atmospheric dust or surface soil. The device would be landed on the surface of the planet Mars, then a ribbon of transparent tape would be thrown out. After collecting samples, it would be rewound. The material would be inspected by microscope and the inspection televised back to Earth.



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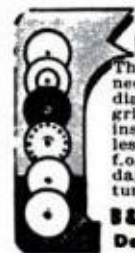


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Auto Mechanics --

HIGHLY SKILLED SPECIALISTS NEEDED FOR TODAY'S CARS

by B. Richard

In 1958 there were 68,000,000 cars, trucks and buses registered in this country. This total has been increasing steadily since 1958 and is expected to increase at an even greater rate with the growth of two-car families and the continuation of farm mechanization.

In fact, while America's population has increased roughly 15 per cent in the past 10 years, car and truck registrations have increased 43 per cent. The greatly increased numbers of vehicles on our roads today is one of the reasons for the predicted 12,000 to 15,000 annual openings for auto mechanics during each year of the 1960's.

But that's not the whole story. The fact is that today's cars and trucks are getting more and more complicated. Two or three highly-trained mechanics are needed to do the same repair job that one mechanic could do several years ago. Mechanics are becoming specialists in certain kinds of repair jobs, and more specialists are needed as the complexity of our vehicles increases.

To give you an idea just how big the auto industry is, look at the following facts:

An average of 2,500,000 new drivers get licenses each year.

Over 36,000,000 households in the U.S. own automobiles.

There are 79,000,000 car, truck and bus drivers in America.

The automotive replacement parts business accounted for \$2,400,000,000 in sales in 1957 alone.

54% of all die castings made in the U.S. go into auto plants.

The auto industry buys almost 20% of all the steel produced in this country.

24% of all retail sales are for automotive products.

These are a few of the reasons America's auto industry is one of the greatest industries in the world, and these are the reasons you will want to consider the field of auto mechanics carefully before you select a career.

Despite the tremendous demand for trained mechanics, figures show that less than one-tenth the required number of men are getting any kind of an automotive education. This means that there are endless opportunities in this field—opportunities just waiting for alert men with an eye to the future.

One of the best features of this field of work is that the demand for auto-mechanics isn't confined to big cities. Jobs are available in small towns from coast to coast. This means that, no matter where you live, jobs are waiting, and while you're learning auto mechanics, you can get practical experience in your home town.

The earning power of a qualified mechanic is comparable to that of a college graduate, and yet a qualified mechanic doesn't need the years of formal schooling required in other professions. In Chicago, for example, mechanics are earning, on the average, \$3.00 an hour. And this is just an average figure for a qualified mechanic—opportunities for more responsibility and greater specialization can lead to an income of as much as \$15,000 a year.

Another advantage of this field of work is that mechanics are seldom, if ever, out of work. There is always a demand for a skilled man — he can choose where he wants to work, and if he desires, he can make a comfortable living with a repair business of his own.

How can you get started in this lucrative field? You can actually become an expert in a matter of months, not years, and one of the best ways to start is to take a correspondence or resident-training course in auto mechanics.

One top correspondence school offers a total of 86 lessons covering every phase of car repair and diesel-mechanic training. If you're good with tools, if you like to know what makes things work, and if you take pride in workmanship, you probably have the natural ability to become a professional auto mechanic. You don't need

(Continued to page 50)

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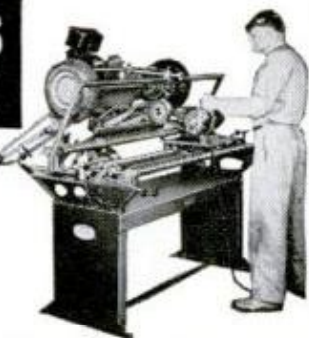
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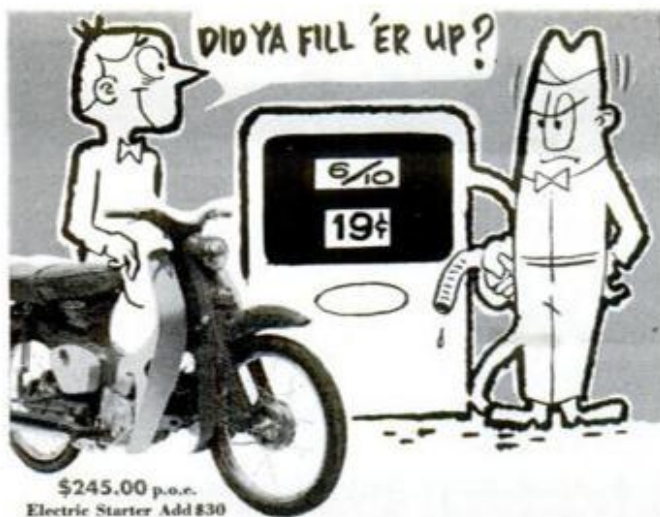
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previous training to become successful—just the will to get ahead and the desire to work with tools.

It isn't necessary to have a high school degree to take auto-mechanic training. This is a special field of practical knowledge in which the will to learn is more important than previous formal schooling.

Correspondence training offers some advantages. You can set your own classroom hours and allow yourself plenty of time to complete your courses, although most students finish up within a year. Your lessons are graded and evaluated by qualified instructors and the correct answers are returned to you in the mail.

What about practical training? Many students find that after a few lessons they are able to make money with part-time repair work right in their own neighborhoods. If you own a car, you can put your correspondence training to practical use, but having a car isn't essential. When you learn the "how" and "why" of automotive maintenance, you'll find it easy to put your knowledge to practical use when the opportunity arises.

Resident training has the advantage of offering on-the-spot practical lab work to supplement lesson material. Many resident and correspondence schools offer special job-counseling services specifically designed to help you get the job you're looking for.

One highly-regarded school offers students a complete set of hand tools including a socket wrench set, pliers, screwdrivers, a ball peen hammer and a metal carrying case. Testing equipment is also offered—timing light, compression tester and vacuum gauge. In addition repair manuals are provided, and it's all included in the cost of tuition. Other schools offer similar equipment to help you get started in your repair jobs.

Training in auto mechanics might provide the pathway for a better job for you in one of America's leading industries. No question about it, the opportunities are almost unlimited, and if you're looking for a solid career, be sure to check this field.

And training is your key to progress and earning power. In large shops, for example, mechanics specialize in certain types of repair work. They might repair only automatic transmissions, or brakes, for example, and must have thorough knowledge so that they can handle any repair problem on these parts.

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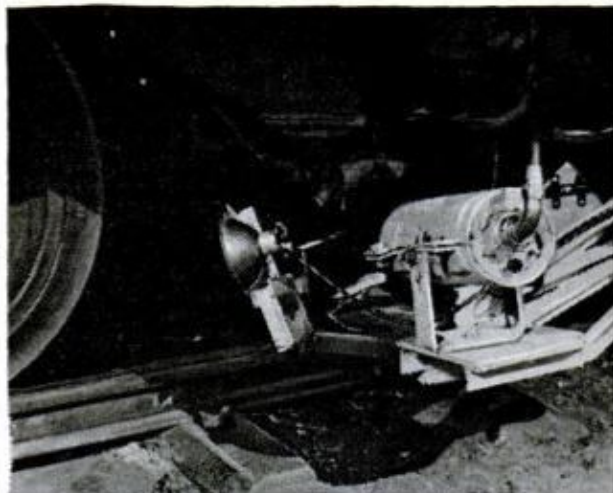
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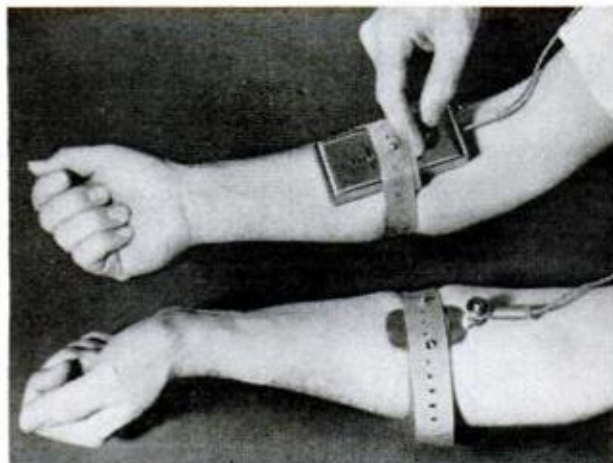
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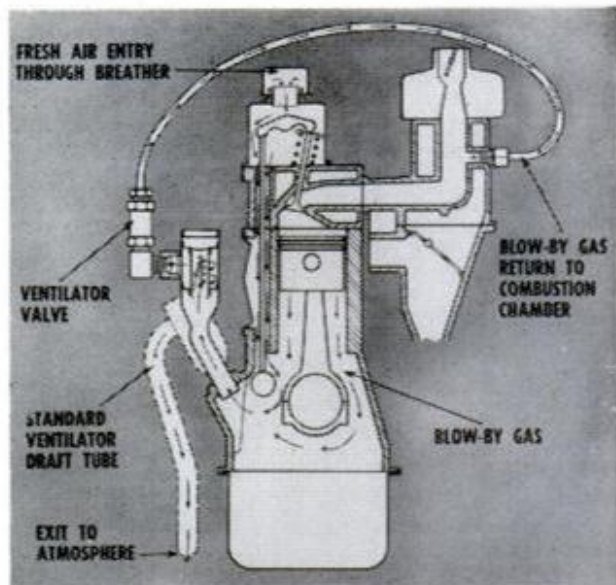
Mr. C. J. Nowak, Screen Print Co., 15127 S. Broadway Los Angeles 61, California, Dept. 21

Dear Mr. Nowak! I am genuinely interested. Please rush your "FINANCIAL ASSISTANCE PLAN" Revealing Screen Print HOME BUSINESS Details, Real SAMPLES, and "HOW TO" BOOKLET. I am under no obligation now or ever.

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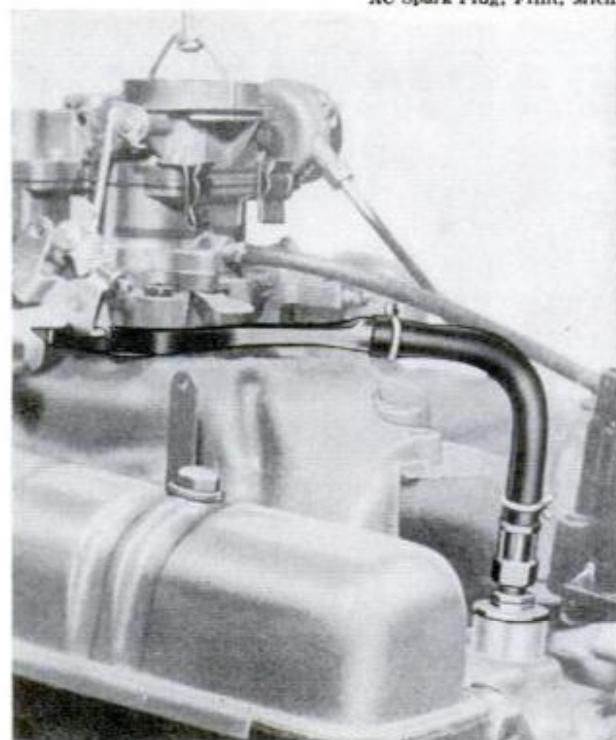


Crankcase-Ventilation Kit Reduces Sludge, Saves Gas



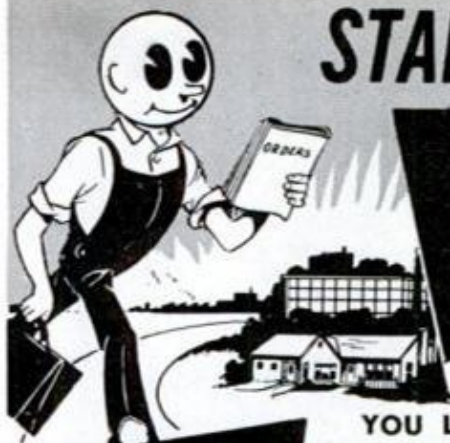
Ventilate the crankcase? Yes. According to AC Spark Plug Division, manufacturers of the kit shown above, "positive" ventilation reduces sludge formation in engine oil, saves gasoline and prolongs engine life. Kits available for any car include an adapter to replace the standard road draft tube, a ventilation control valve, tubing, and an adapter plate which fits under the carburetor. Vapors entering the crankcase from the combustion chamber are returned to the cylinders to be consumed in the normal combustion process, thereby also dealing a blow to smog and air-pollution problems.

AC Spark Plug, Flint, Mich.



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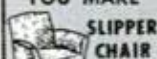
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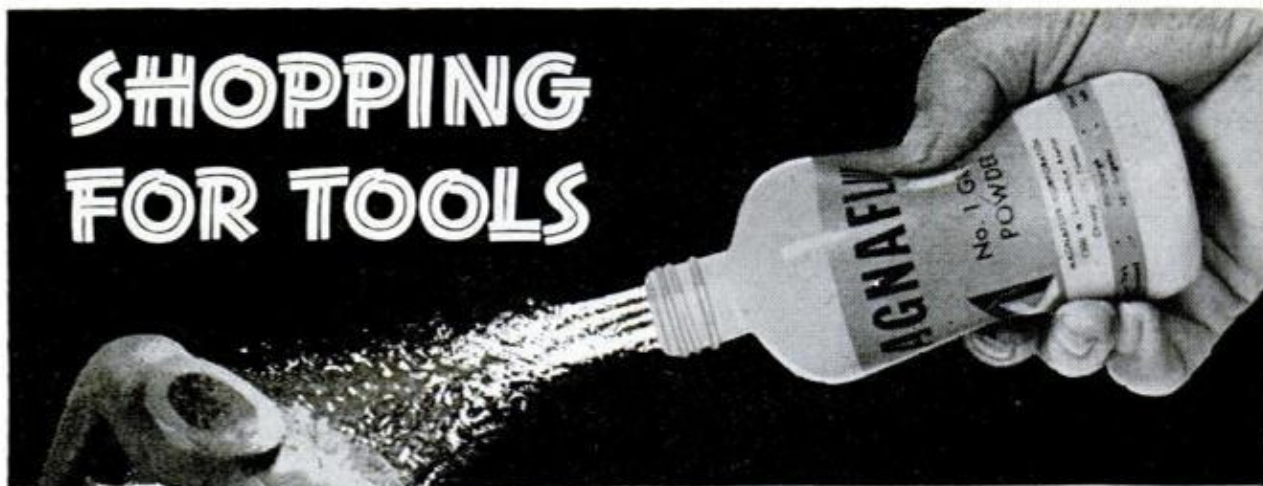


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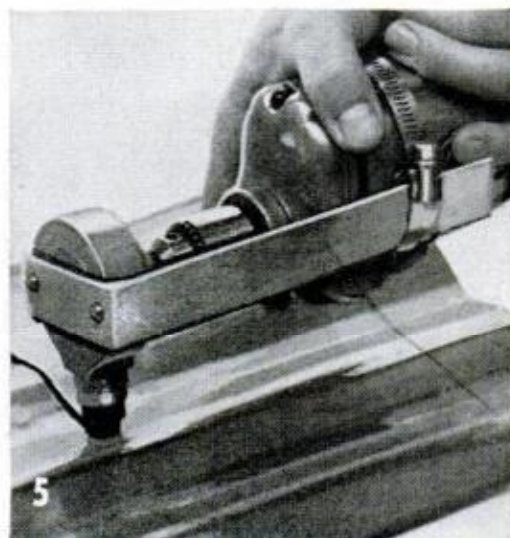
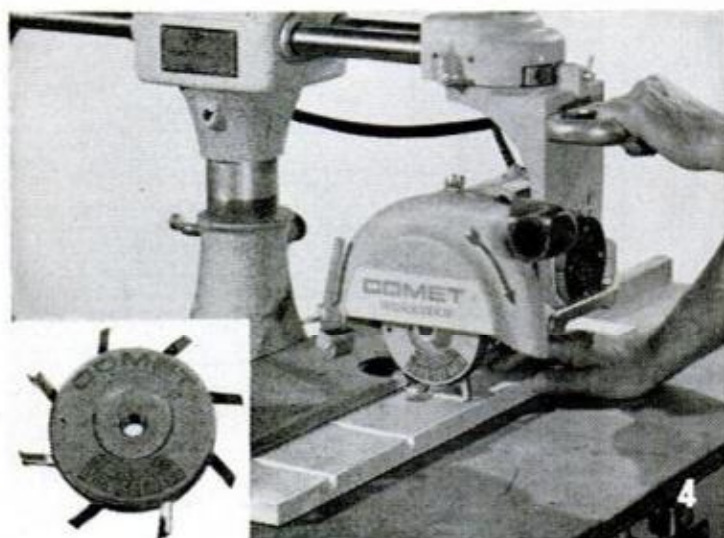
2. T-SLOT CLEANER shortens the time consuming job of thoroughly cleaning the T-slots in machine tables. T-shaped scraper comes in several sizes, also can be ground to fit odd sizes. Chip brush is replaceable
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4. DADO HEAD can be adjusted to cut perfect grooves from $\frac{1}{4}$ to $\frac{13}{16}$ in. width and any depth up to $\frac{3}{4}$ in. without removing it from the arbor. Simply set dial to width of groove and then tighten the arbor nut
Comet Mfg. Co., Div. of The Siegler Corp., 875 S. Arroyo Parkway, Pasadena, Calif.

5. NIBBLER cuts flat and corrugated sheets up to 18-ga. carbon steel and can be used as an accessory to any $\frac{1}{4}$ -in. portable drill. Makes curved cuts at a 1-in. radius. Average straight cutting speed is 7 f.p.m.
Hedstrom Tool Co., Montclair, N. J.

(Continued to page 58)



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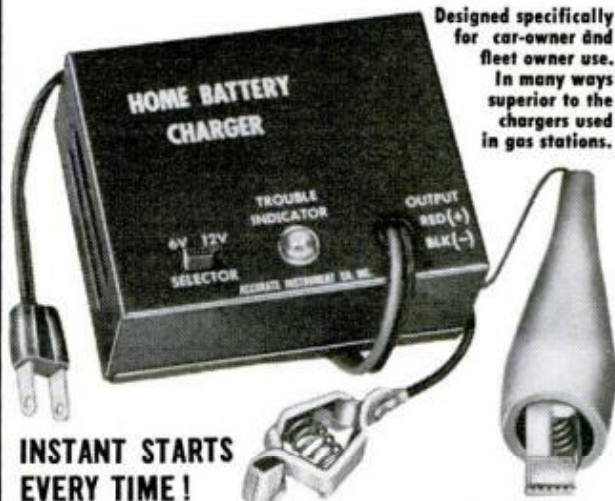
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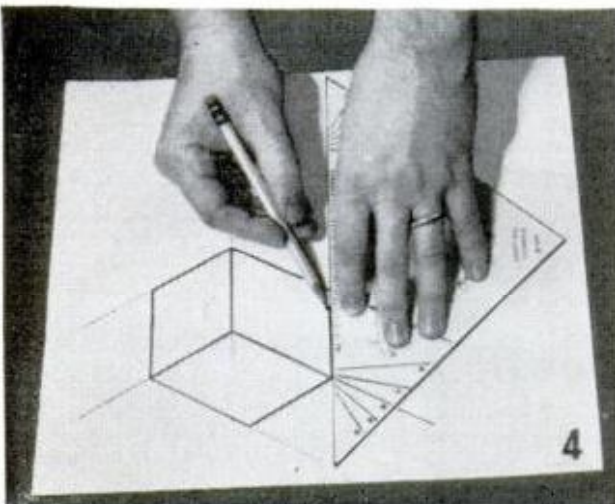
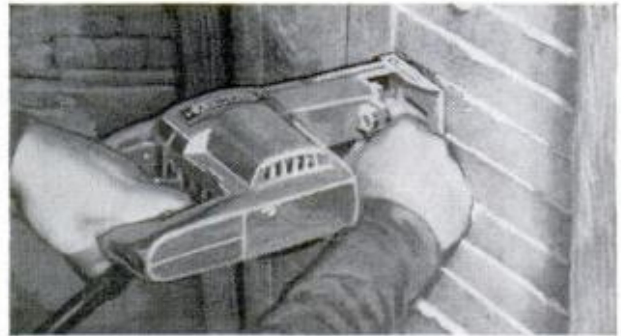
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The Black & Decker Mfg. Co., Towson 4, Md.

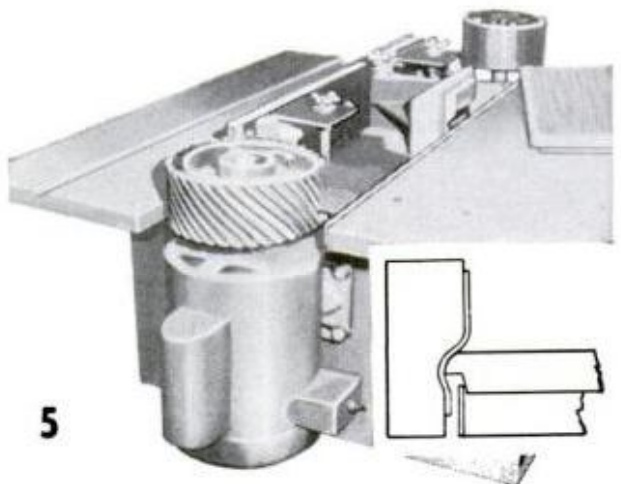
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(Continued to page 60)



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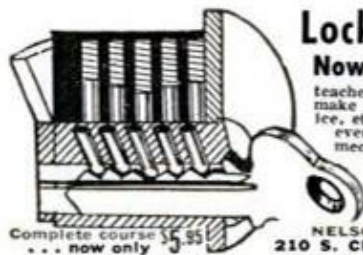
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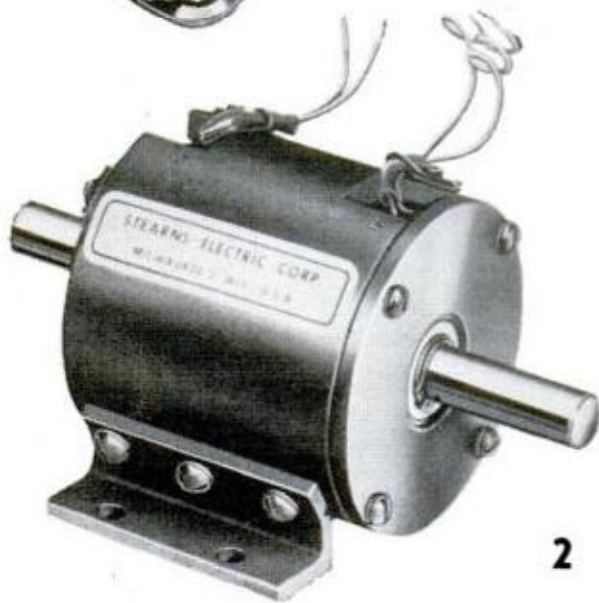
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MAILORDER To motels, churches, institutions. Individual set-up. Not just instructions. Hermes Advertising, 152 West 42, New York City 36.

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

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

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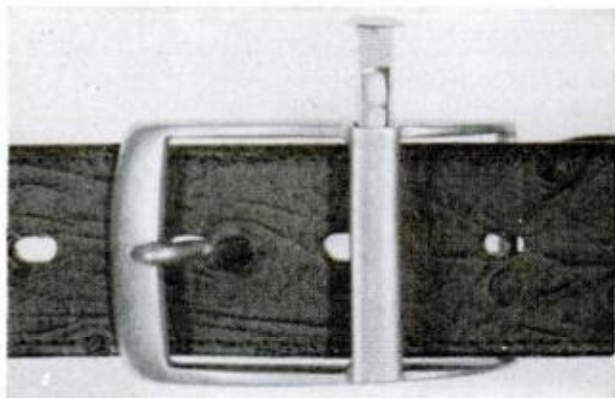
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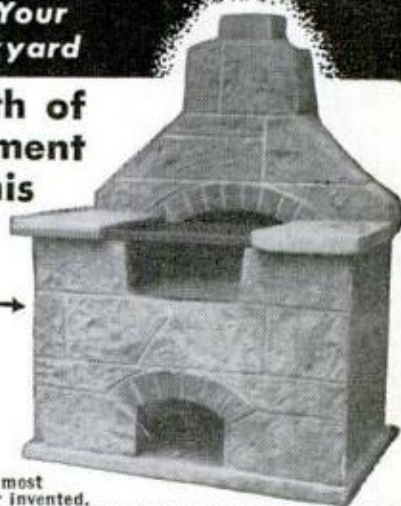
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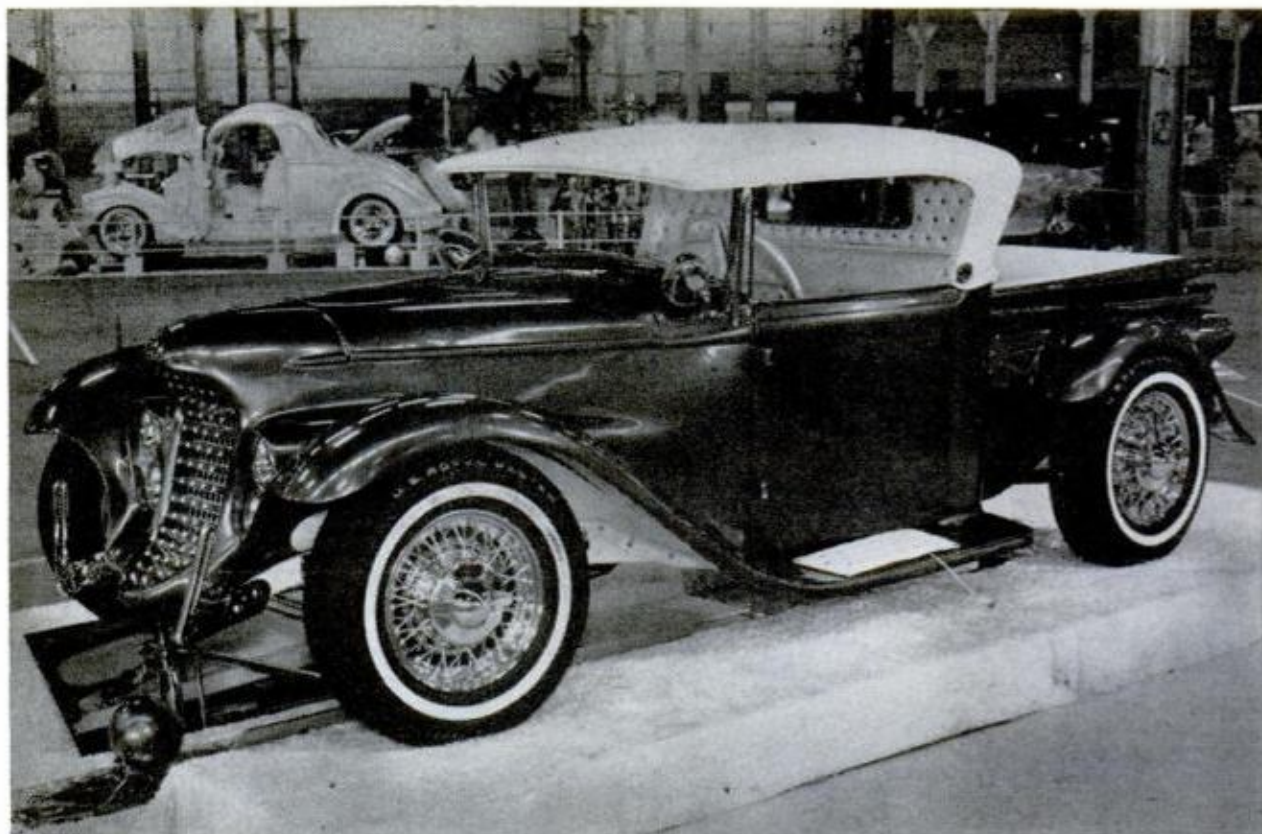
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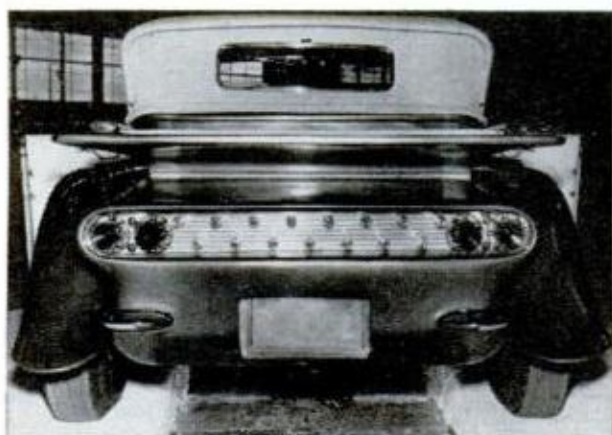
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Detroit Would Hardly Know 'Em



PM photos by Don Honick

Ray Farner of Independence, Mo., took sweepstakes honors with *The Eclipse*, a 1932 Ford roadster pickup

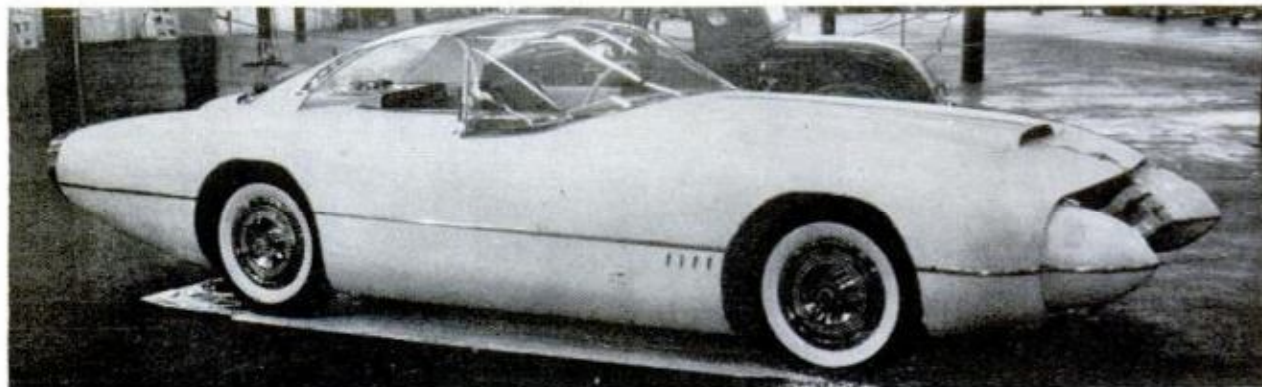
INGENUITY was the universal characteristic of the automotive creations shown at the second annual National Champion Custom Car Show in Detroit. The National Hot Rod Association sponsored the show.

The vehicles had such unusual features as upholstering on exteriors, complete bars, television sets, high-fidelity units and chrome galore. About 10 percent of the 150 cars were built primarily for show; they are never driven on streets or highways.

The sweepstakes winner, Ray Farner's *The Eclipse*, had undergone such body changes as the addition of a hand-formed grille, shell, hood and pickup bed. Farner also lowered the top, carpeted the interior.

(More on page 84)

Custom roadster with glass-fiber body—on 1957 Olds chassis—was shown by J. K. Osborn of Livonia, Mich.



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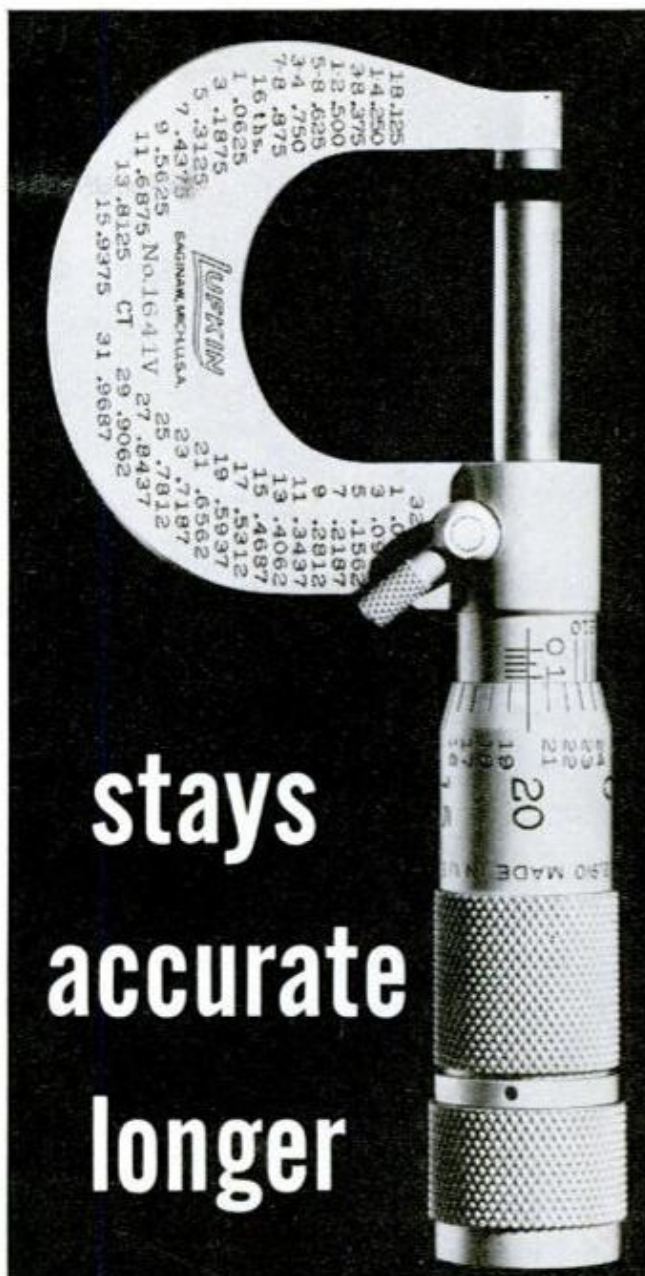
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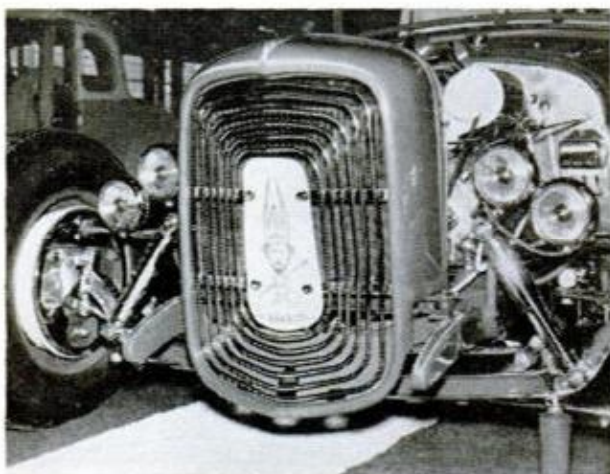
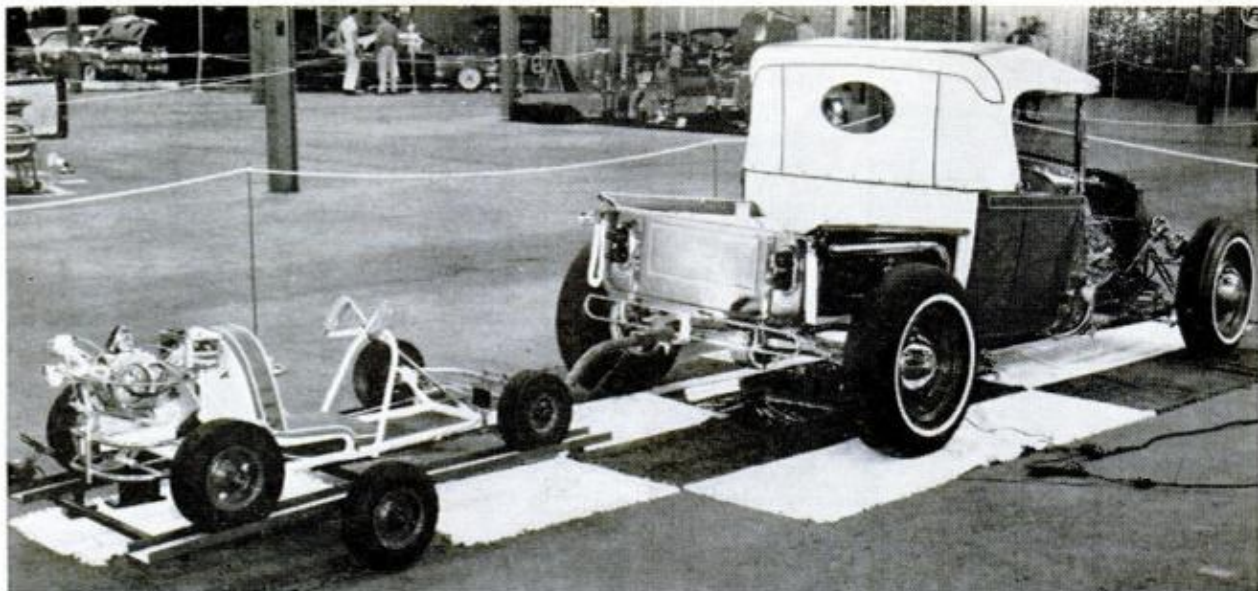
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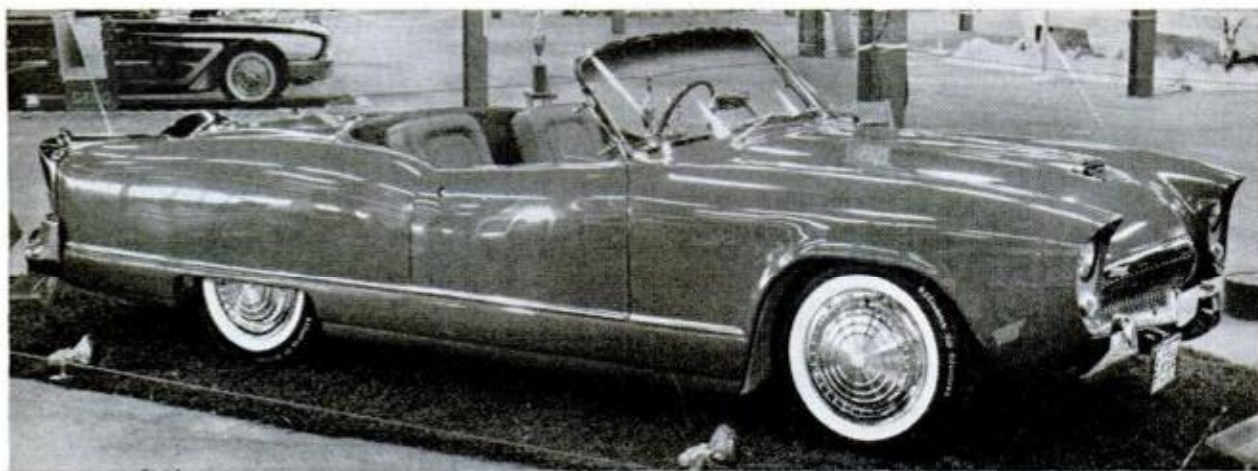
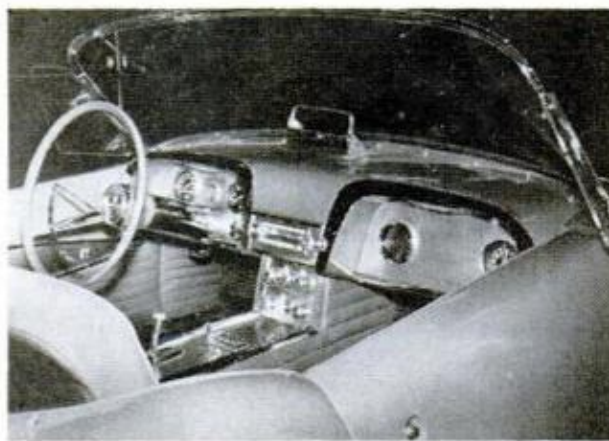
SAGINAW, MICHIGAN



Ford pickup, vintage 1928, and handmade cart and trailer won first place in the Rod Pickups (1931 and earlier) competition at the second annual National Champion Custom Car Show in Detroit. Owner is Herman Rost of Fort Wayne, Ind. The car has a 1948 Mercury block. Rost shortened the pickup bed 24 inches, lowered the floor 8½ inches and lengthened the frame 8 inches. Finish is red lacquer. Interior of the pickup was done in gold and white plastic material and floor is covered with red carpet
(More on page 86)

(Continued from page 82)

Tom and Dick Holynski of Lackawanna, N.Y., started with a Henry J chassis and added parts of nine different stock makes to build *The Flame*, which won first place in the Handbuilt class at the custom car show. The engine is a 1956 Packard V-8 power plant with dual four-throat carburetors. Dash is from a 1958 Thunderbird—made narrower and deeper. Instrument panels were custom built, and the Volkswagen seats were cut down six inches. Exterior finish of *The Flame* is 30 coats of gleaming lacquer



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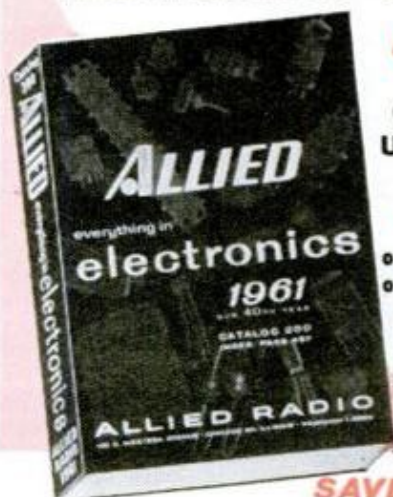
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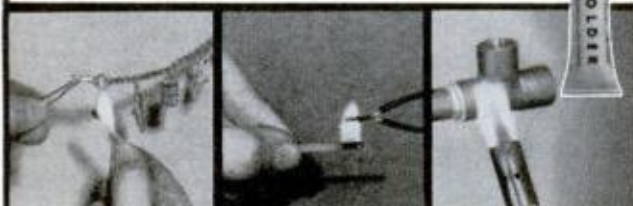
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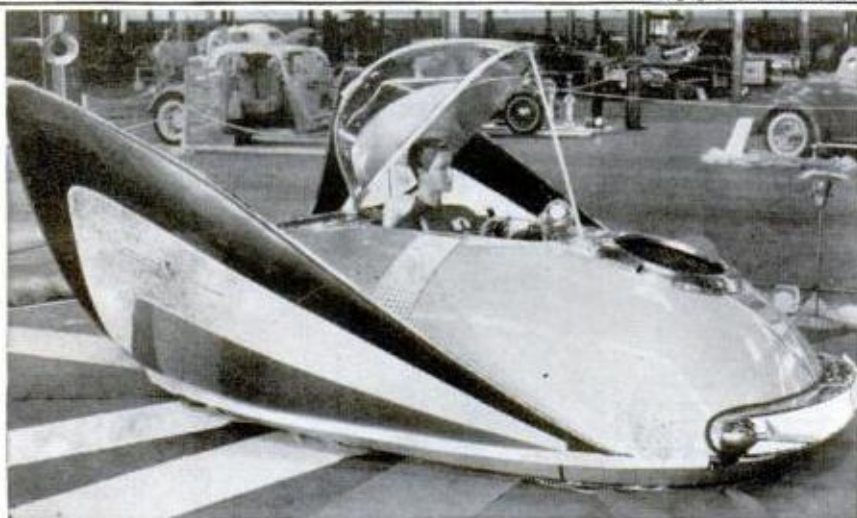
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Oil Hunt in the Arctic



(Continued from page 84)

Offbeat display at the custom car show was the XPAK-400, a ground-effect machine built by George Barris of Lynwood, Calif. Two four-horsepower electric motors operate the lifting fans



William Zahora, LaGrange, Ill., took first in Custom Rods class with *Fantabulous*, a 1936 Ford with a 1958 Olds engine. Upholstered inside, car has 18 coats of black paint on the outside

(More on page 88)

MEN PAST 40

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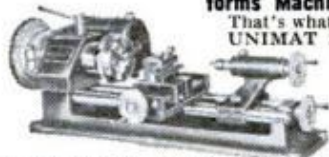
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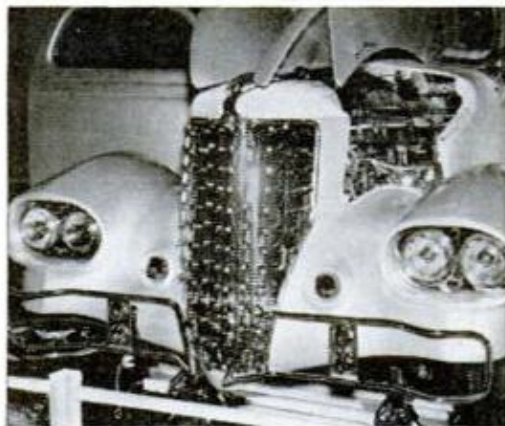
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(Continued from page 86)

Brandy's Chariot, a 1936 Ford owned by William Block of Kenosha, Wis., sports a 1959 Corvette engine and 30 coats of mother-of-pearl paint. Doors operate electrically

Interior of *Brandy's Chariot* features white pleated upholstery. Even safety belts are pleated. Car won first place in Special Rod Show Car class at national custom show

(More on page 90)

HOWARD BROWN, well-known Florida news commentator, says:

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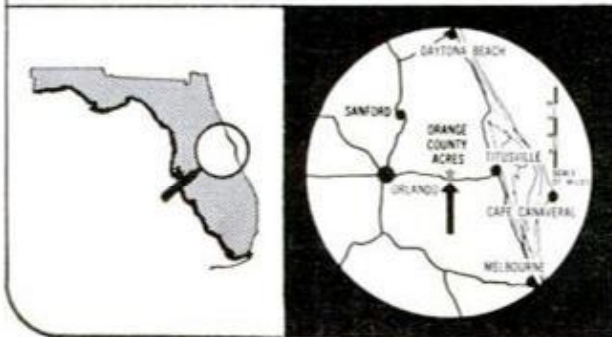
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(Continued from page 88)

Black Jack, owned by Geno Jankowski of Dearborn, Mich., was customized at a cost of only \$125 by the owner, who operates a trim shop. Jankowski built and upholstered the front swivel seats. Flat deck over rear seat enables him to use car somewhat like a pickup. The car is a 1960 Ford with a stock engine. Knobs on grille are kitchen cabinet pulls

(More on page 92)

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chandise. Every neighborhood needs a FLOK-
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Since succeeding beyond my wildest dreams in
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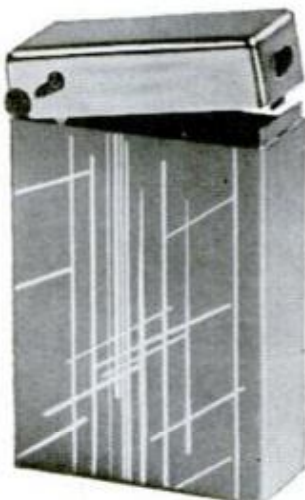
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JANUARY 1961



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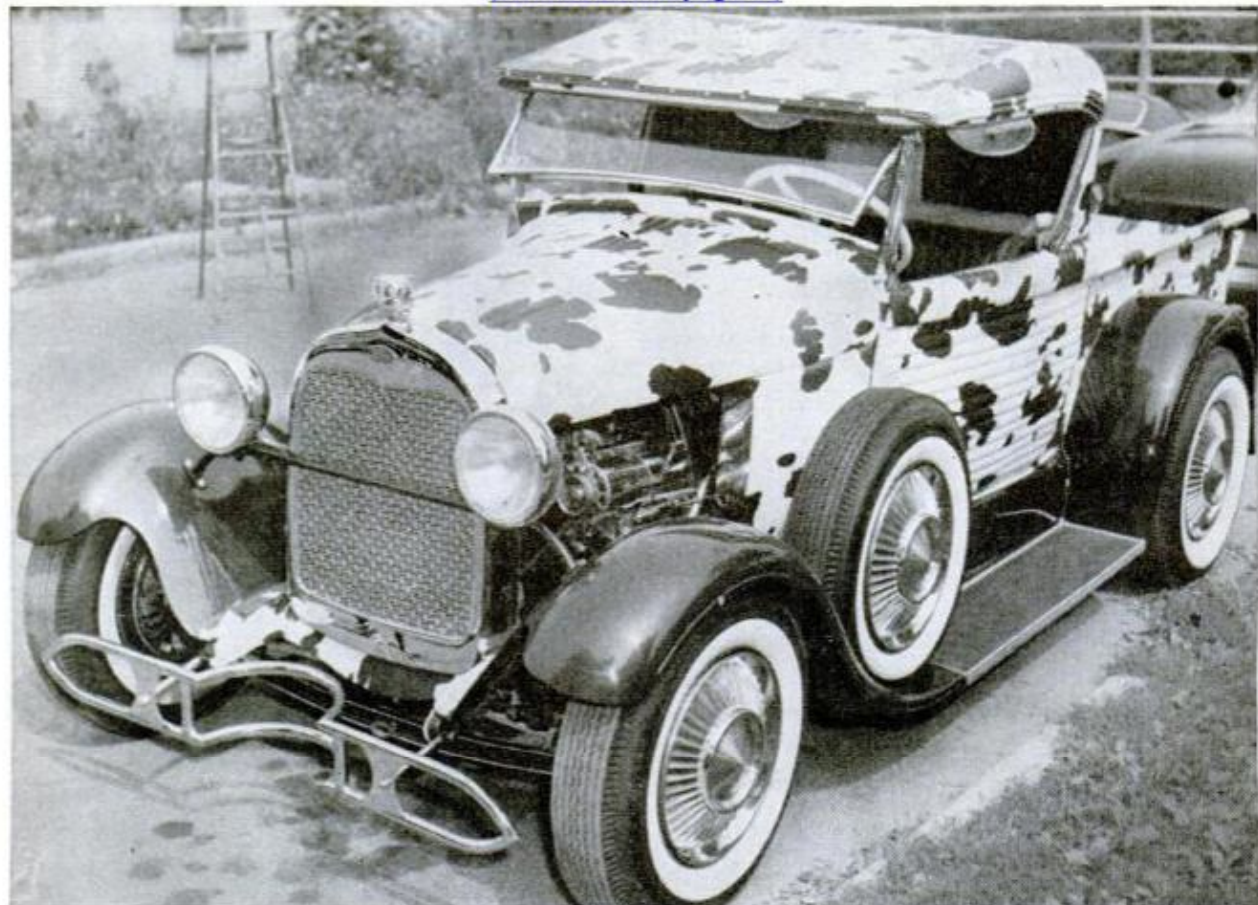
*Write today for prices and FREE MOTOR SELECTOR GUIDE
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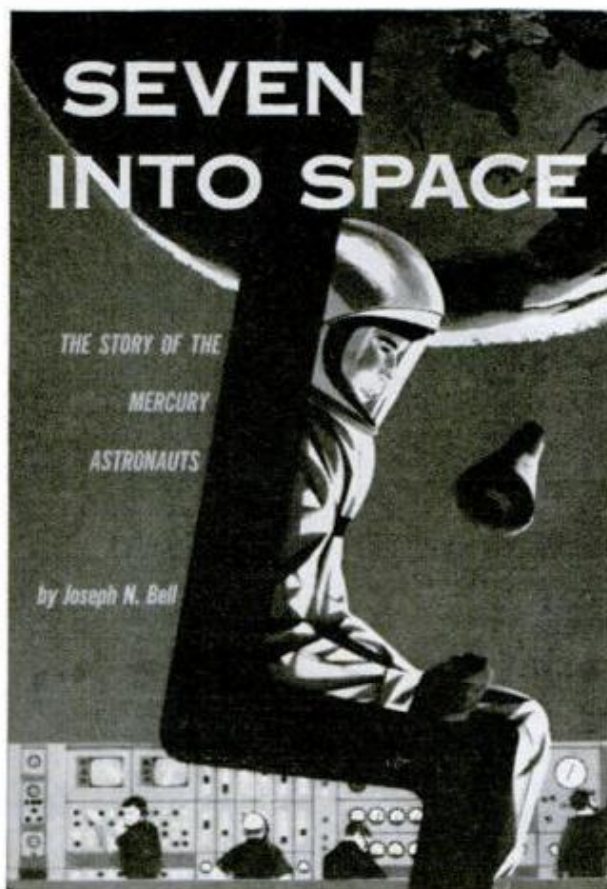
National Multiple Sclerosis Society

(Continued from page 90)



Walter Pasternack of Michigan took second in Special Rod Show Car class with *The Comanche* at custom show

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JANUARY 1961

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Bruce Laminated Oak Block

Modernize your home by installing this beautiful hardwood floor over your old floors. Or use low-cost Bruce Laminated Blocks to create new living space in attic, basement or addition.

Easy to lay — Just apply adhesive (Bruce Everbond Coldstik) and lay blocks. Tongues and grooves assure tight fit. No nailing . . . and no sanding or finishing either, because Bruce Laminated Blocks are completely prefinished at the factory. Your new floor is ready to be used and admired as soon as you lay it.

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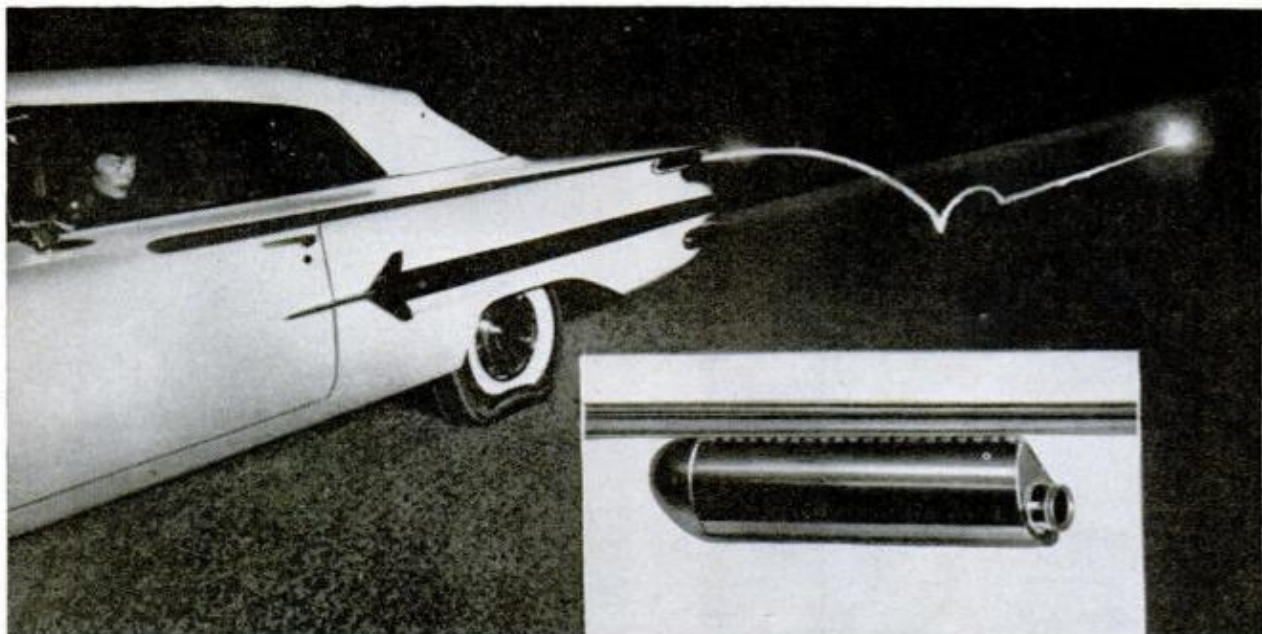
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Send complete information on Bruce Laminated Oak Block Floors.

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93



Button on Dash Fires Emergency Flare

In case of a blowout or other road emergency, the driver of a car equipped with a new safety device has merely to press a button on the dash and a flare will be ignited and projected 25 feet to the rear of the car. Ignition and projection are accomplished by a .22-caliber blank cartridge in the device. Design of the flare prevents it

from rolling off the highway after it's fired. The flare tube may be mounted on either the right or left rear fender or under the car; a weatherproof cap in the end of the tube protects it from moisture. By using the flare, a driver avoids the danger of getting out of the car in traffic to position a warning.

Plug-Ins Control Special Effects for TV

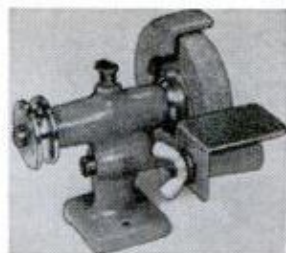


Typical transition from one scene to another is this change from picture A to picture B. Picture B first appears as corner insert, and, as the control lever moves (arrow), picture B is completed by a "wipe"

As many as 154 transitional and split-screen effects for television may be programmed with a Radio Corporation of America special-effects system. These effects include horizontal and vertical wipes, corner inserts, horizontal and vertical splits and rectangular, circular and diamond-shaped iris effects. The special effects for a given program can be preselected, and the plug-in modules that control those effects put in place on the switching control panel. Control of the special effects is accomplished by a fader lever. All effects operate with either color or monochrome signals. Diagram on each plug-in shows effect it produces.



No. 14 ASTRA TOOL GRINDER



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4" DIA. PULLEY (1/2" BORE)
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"My wife wants me to build a fallout shelter—with a picture window!"

JANUARY 1961



*Over 50,000,000 factory-installed
Stainless Steel oil rings*

EVERY ONE SEALED POWER DESIGNED

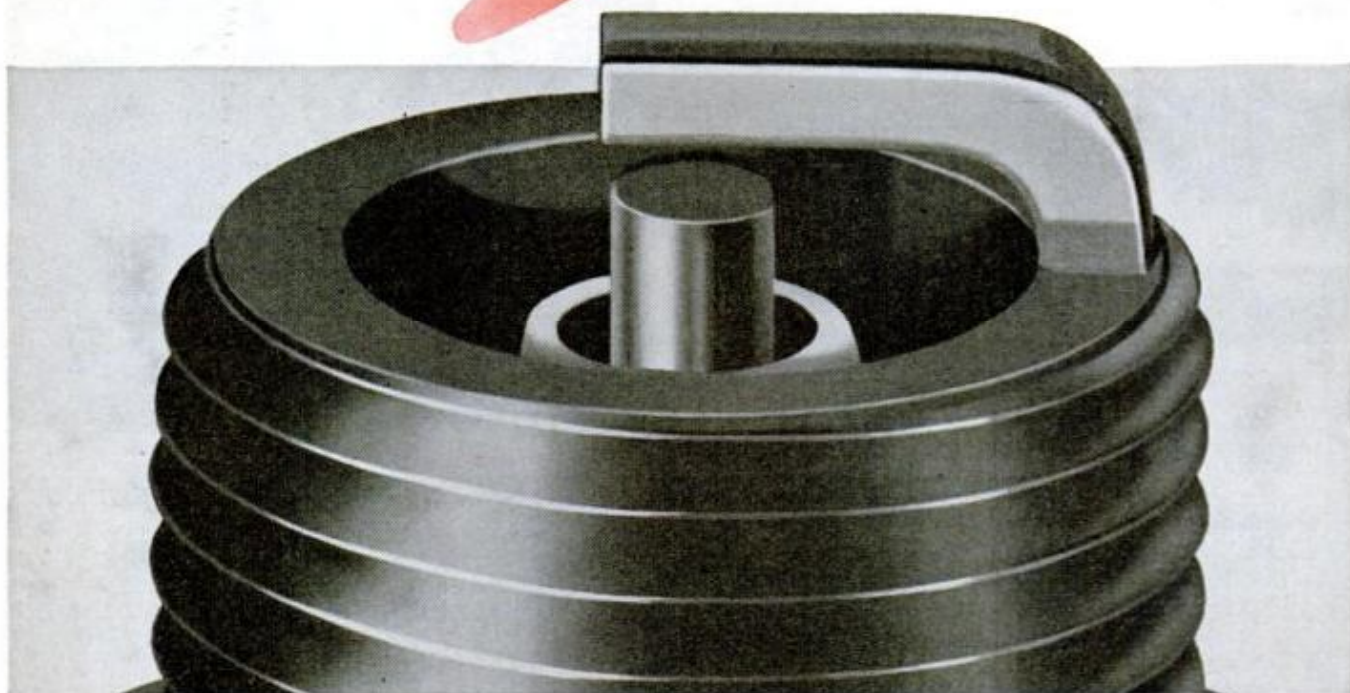
Since its introduction in 1957 engines, Sealed Power's Stainless Steel oil ring has won acceptance with car and truck builders faster than any other by far. With mechanics, too.

This universal acceptance is important to you. The engine designers staked their reputations on it. The ring proved them right. Hundreds of thousands of car owners now enjoy the finest oil control and performance they have ever known.

The Stainless Steel oil ring side-seals, holds its fit, retains its tension, resists sludging and corroding, is easy to install and stops oil pumping. Sealed Power Corporation, Muskegon, Mich.

Sealed Power Stainless Steel
oil rings stop oil pumping

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run cooler, wear better to give you
best performance and economy!

You'll get superior spark plug performance and economy when you switch to AC Fire-Ring Spark Plugs. There are many reasons why. But one big one is the structure of AC electrodes.

AC electrodes are heavier and more massive than ordinary electrodes—and this alone gives them better heat dissipation and longer life. But the pay-off is in their exclusive

- Isovolt alloy—a patented formulation of nickel, chromium and barium—that provides
- maximum resistance to gap growth and gap bridging.
- AC Fire-Ring Spark Plugs with Isovolt electrodes and AC's famous "Hot Tip" insulator give you longer, surer firing, with
- less service and maintenance. Whenever
- you need spark plugs, ask for ACs. ■ ■ ■

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS



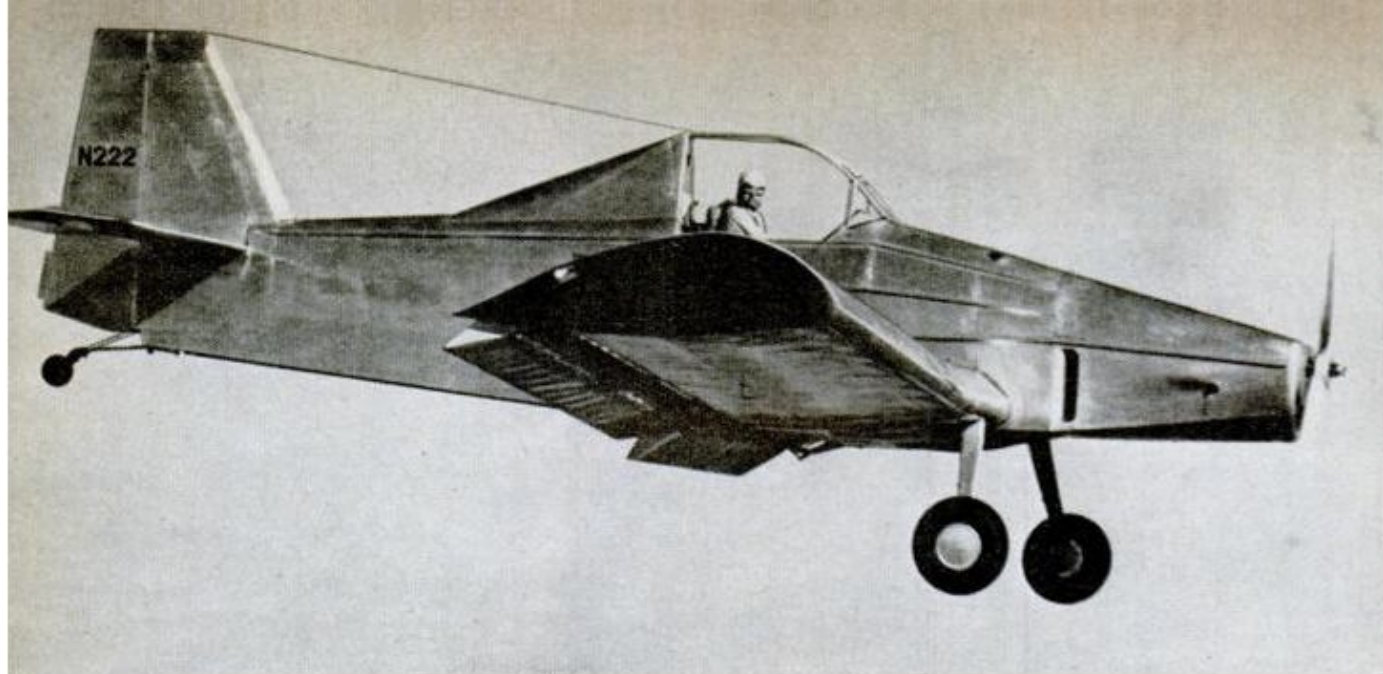
fire-ring spark plugs

They must be the best!

A Crash Need Not Be Fatal

A silvery low-wing monoplane took off from an airstrip at Lubbock, Tex., one afternoon recently. When it was about 60 feet above the ground and starting into a climbing turn, the power suddenly began to fail.

Frantically, the pilot struggled to regain full power. It was useless. The plane began losing altitude rapidly. Knowing he was going to crash, the pilot swerved the plane to avoid a telephone pole. But one wing struck the pole



Crop duster, designed for safe crashes, features high cockpit for greater visibility, long forward section for cushion in head-on collision, and wide, well-balanced landing gear for landing in rough areas

By Joseph Stocker

and ripped off. The other wing smashed against a fence post that was made out of a railroad tie. The ship did a cartwheel, hit the ground belly-up and slid to a stop, a pile of debris.

Witnesses rushed to it, fearing they would find the pilot's crushed body. But even before they reached the wreckage, they saw him disentangle himself from the snarl of metal and step out. He was shaken and dirt-smeared. But the extent of his injury was a sore thumb. He had bruised it pressing hard on the control stick.

For his survival the pilot had a little-known organization called Aviation Crash Injury Research to thank — at least to a considerable degree. The plane, an experimental crop-duster dubbed the AG-1, was built under the supervision of a professor

of aeronautical engineering at a Texas agricultural college. But many of its safety features had been inspired by Aviation Crash Injury Research—AvCIR for short. Crop-dusting being the perilous enterprise it is, AvCIR and the professor had got together to design a duster which could crash and not kill its pilot. How well they succeeded was proved by the incident at Lubbock.

A good many other people who have survived plane crashes may—like that Texas crop-dusting pilot—be able to give a fair share of the credit to Aviation Crash Injury Research. A nonprofit organization, with headquarters at Phoenix, Ariz., AvCIR was launched by Cornell University some years ago. It has since moved under the wing of the Flight Safety Foundation, an interna-



AvCIR representative consults with doctor on design of airplane seat to provide greatest protection in event of crash

Wreckage of plane (right) in which 22 died showed many were killed when heads hit rigid steel backs of seats in front



Crop duster (left) actually *did* crash, but pilot miraculously escaped with only a bruised thumb. Wreckage (above) shows the plane's cockpit area still intact. Plane was built to AvCIR crash-survival specifications

tional organization having offices in New York and Los Angeles and members on five continents. AvCIR draws its financial support from the aircraft industry, airlines, Army, Navy and National Institute of Health. And it is doing what was once considered impossible or, rather, what never really occurred to the aircraft industry: It is showing how airplanes can be made, not merely safe to fly, but safe to crash as well.

AvCIR's premise is that as long as airplanes are manufactured and flown by human beings with human fallibilities, there will be crashes. So planes should be built such that, if and when they crash, their occupants can walk away.

Actually, AvCIR points out, people can stand an unbelievable amount of buffeting, and there are countless cases to prove it. Like that of the janitor who was repairing

a flagpole on the roof of a 14-story building when suddenly his foot slipped and he plunged 145 feet, landing on the top of a parked car. His total injuries were a broken arm and ankle, and in two months he was well and back at work. In another city a middle-aged woman jumped out of a sixth-story window and landed in a garden. As the superintendent of the building ran up to her, expecting to find her dead, she raised herself up on one elbow and said, "Six stories and not hurt!" And indeed she wasn't.

These incidents and many others like them have proved to AvCIR that impact alone—the slamming of a plane into the ground—isn't necessarily fatal. Often, when people are killed in plane crashes, what kills them is being thrown against or impaled on something, or being hit by





Production model of crop duster adopted many safe-crash features developed through AvCIR investigations

something or somebody that is thrown against them by the force of the crash, or being crushed by the fuselage when it gives way.

In one airliner crash probed by AvCIR, 22 people were killed in spite of the fact that the cabin came through pretty much intact. Eleven of them had identical holes punched in the middle of their foreheads. Investigation showed this is what happened:

Each seat back had a top made of padded soft metal head roll riveted to vertical steel supports. The tops of these vertical supports were beveled to sharp points in order to fit the design of the seat. When the plane hit the ground it yawed slightly, causing

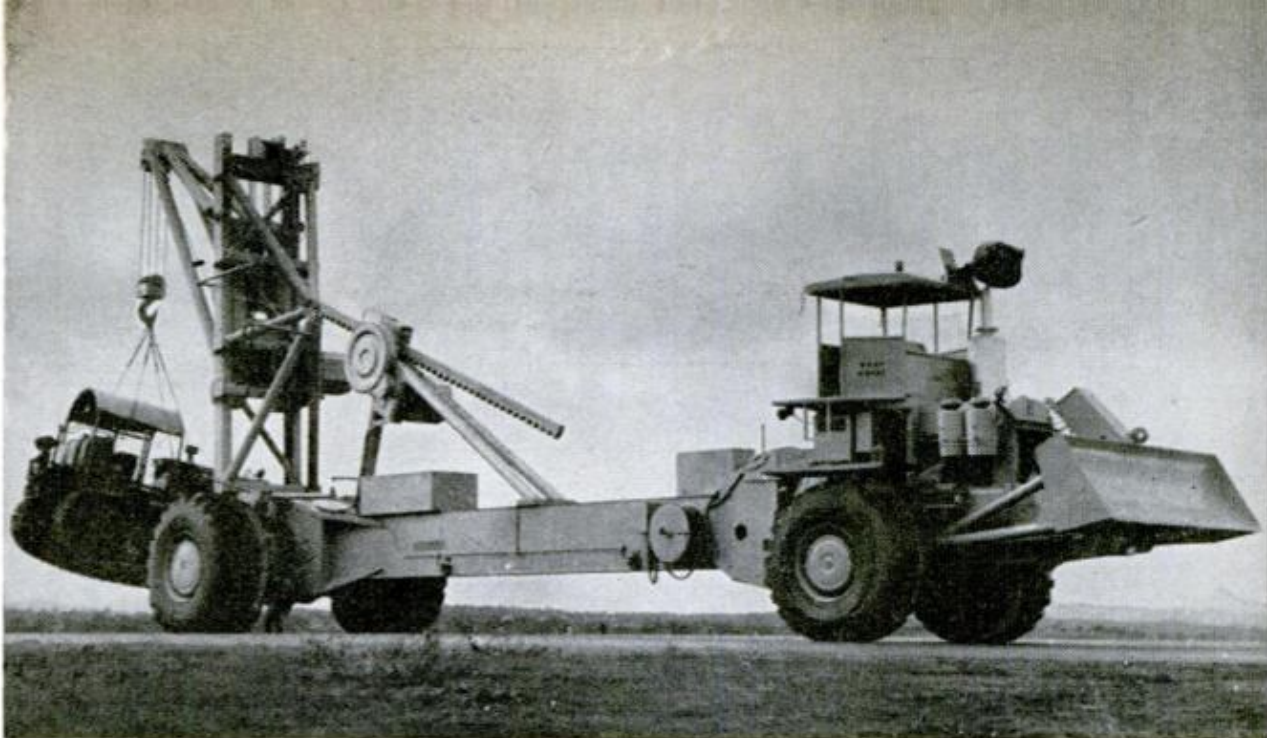
the passengers to lunge forward and to the left over their seat belts. Their right shoulders struck the head rolls of the seats in front and knocked them from between the steel verticals. That left the pointed ends bared, and the passengers' heads were impaled on them.

In the wake of another airliner crash, AvCIR's investigators discovered that all the passengers sitting in aisle seats had sustained identical head injuries. It was as if they had been clubbed. Groping for an answer to what obviously was more than mere coincidence, investigators set up the airliner's battered seats just as they had

(Continued to page 256)



Anything wrong here? AvCIR posed this scene to prove hazard in new troop carrier. When one crashed, paratroopers impaled themselves on their own rifles. Army changed seating



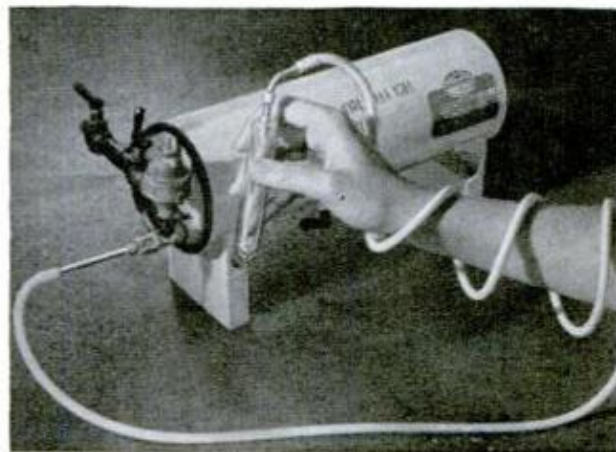
Crane Hauls Tractors Over Paved Roads

To avoid the time-consuming chore of fitting its tracked vehicles with roadplates to protect paved surfaces from the treads, airmen at an Australian air base have

adapted a crash crane to carry tractors weighing up to 100,000 pounds. The tractors must be moved about the base occasionally, and the runways could become scarred.

Baby, It's Cold in There!

Liquid nitrogen flows through an un-insulated tube at temperatures down to 320 degrees below zero F. without any discomfort when handled with the bare hand. The method by which it is done, called a "cryogenic phenomenon," is still a trade secret, but involves the way the nitrogen enters and leaves the tube. The near-absolute temperature of the liquid nitrogen is necessary to cool infrared detector cells used in missiles to search out enemy objects. They operate more efficiently at those temperatures.



Soviet Jetliner Designed for Short Runways

Built for passenger and mail service on hops up to 900 miles inside Russia, the Soviet TU-124 jetliner requires a takeoff run of only 2500 feet and can operate safe-

ly from runways no longer than 4800 feet. It can handle 44 first-class passengers or 68 economy passengers in addition to its four-man crew.



AN EYE ON SPACE

By Dr. Dan Q. Posin

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

SOME OF THE satellites we have shot into orbit are forerunners of a worldwide communications system, but let's not confuse a couple of things.

When a big *Echo* balloon is launched, it is not for the purpose of establishing a bona fide communications system in space. *Echo* is just that: an echo. It is used to reflect messages, to bounce them off its aluminized plastic body. This is why *Echo* is called a "passive" communications satellite.

On the other hand, *Courier* is an "active" communications satellite: it can receive messages, record them on tape, and broadcast them to Earth at any desired time and over any desired place.

In defense of *Echo*, however, it must be said that one very important use looms for it in the near future: it can be fired at the Moon and, because of its huge size (20 times larger than *Courier*), it can be followed visually, by telescope, as it travels to another world. There's no denying that it will be exciting—and valuable—to see a shiny sphere run for the Moon.

Courier has a much greater degree of permanency, because it is rigid and is launched as a hard sphere. It is long-lasting in its broadcast power supply, too, and for a very good reason: *Courier* has more than 19,000 solar cells on its body, which capture sunlight and convert it to electricity for recharging its batteries. The batteries, of course, run the receivers and transmitters and the tape-recording devices.

Courier-type satellites will bring a new world of communication to the old world, Earth. Both TV and radio can be sent from Earth to a set of orbiting *Couriers* which then can relay this information to other satellites for beaming to Earth stations. These latter satellites can, in turn, pick up other TV and radio messages and send them along, to other *Couriers*. As a minimum, three *Couriers*, spaced 120 degrees apart, could cover the Earth.

But for really adequate communications coverage—encompassing TV and radio programs, government and private communications—a group of about 50 *Couriers* is necessary. The stations on the ground, while receiving messages and pictures (stills and live) stored in the satellite, will transmit back to *Courier*, on a different frequency, to avoid interference. While the satellite is in view of each ground station, it sends at a very great rate, the message-handling volume being equivalent to that of 20 teleprinters operating continuously at about 100 words per minute.

Perhaps the most economical and startling communications systems imaginable will be this one scheduled for 1963: three *Courier*-type satellites with active repeaters orbiting the Earth in the equatorial plane, each at a height of 22,300 miles. At this height, the satellites must travel at about 7000 miles an hour. It then turns out that, as the Earth turns, each satellite remains poised over its home station below—all the time. It is just as though we had three telephone poles, each 22,300 miles tall. With such simple installations—one satellite over Athens, one over Tokyo and one over Houston—nearly Earthwide telephone, TV and teleprinter coverage will be obtained. Only the polar regions would be missed, but this could be remedied by including special ground-relay systems.

Then, it will be possible to institute a worldwide telephone dialing system, some day to be accompanied by a view of the person with whom one is chatting. Great things are coming. ★ ★ ★



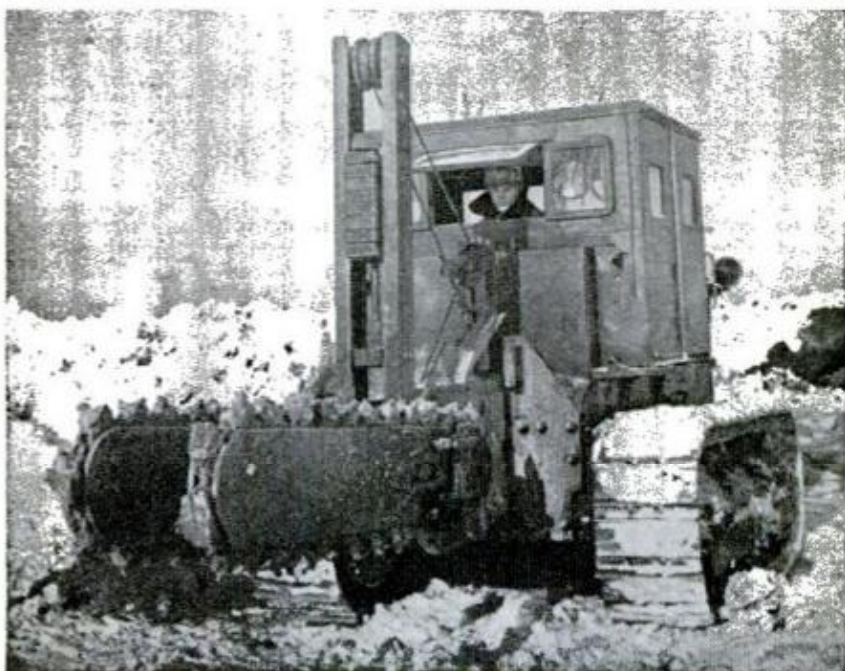
Do-It-Yourself Helicopter to Be Offered in Kit Form

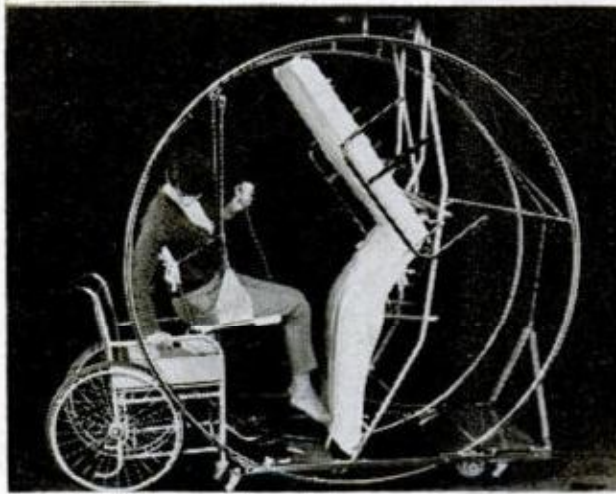
Costing an estimated \$3500, including engine, a one-man helicopter has been designed for sale in kit form. Based on a minimum horsepower of 65, it will develop a speed of 75 miles an hour, a vertical rate of climb of 500 feet per minute at sea level, a range of 150 miles and/or two hours, and a service ceiling of more than 10,000 feet. The Commuter Junior, as it is called, weighs 500 pounds empty and has a useful

load of 300 pounds. Its two-bladed rotor measures 21 feet and its fuselage 23½ feet over-all. The machine was designed and manufactured in six years by a father-and-son team in Long Beach, Calif. The father is a former aircraft designer and research engineer for the U.S. Air Force, and the son is a graduate aeronautical engineer. The 'copter shown is the prototype, which is undergoing final tests.

Russian Ditcher Cuts Frozen Soil

Built to dig trenches and pits in rock-hard frozen soil, a new Russian ditcher uses twin parallel cutting bars weighted by the beam extending above them. By adding or moving weights on the beam, the downward pressure on the cutting bars can be regulated to suit the type and hardness of the soil. The operator can control the downward force on the bars without leaving his seat. A friction transmitter warns the operator if the cutting bars meet resistance that could damage the mechanism.





"Ferris Wheel" Bed for Invalids

Bedridden patients, either in hospitals or at home, can achieve a high degree of mobility and comfort without the help of a nurse or attendant with an electrically powered bed. Set in a double circular frame, the bed changes position from prone to backrest, sitting, sitting erect and dangling, standing or complete facing about, all at the touch of a control button that the patient can operate alone. The bed can even lift the patient into a wheel chair, using an accessory sling seat as shown at left. Other attachments are reading table and castored wheels, with which the bed can be used as a walker or simply pushed from room to room. It is the invention of Dr. Homer H. Stryker, an orthopedic surgeon of Kalamazoo, Mich. One of the beds was presented to Sergeant Alvin C. York, bedridden veteran of World War I, on the 42nd anniversary of the heroic feat which earned him the Congressional Medal of Honor.

Recent developments in automatic control systems for boats will make 100-knot hydrofoil boats possible within 10 years, according to Dr. R. C. Seamans, Chief Engineer of RCA's Missile Electronics and Controls Division.

Automatic Electronic Thermometer Gives Remote Temperature Readings

Nurses in hospitals of the future may be able to check their patients' temperatures without leaving a central office, thanks to a remote temperature-recording thermometer invented by Dr. D. C. Simpson, of Edinburgh University, where the device is being tested. The new thermometer

reads the patient's temperature electronically through a highly sensitive thermistor, or probe, strapped to the patient and connected by wires to the central recording point. An unlimited number of probes can be wired to a single meter, so a ward could be monitored by a single nurse.



Catwalk Car for Tunnel Patrol

Police who patrol New York's Lincoln Tunnel are testing a single-wheeled, gasoline-powered catwalk car which is expected to get them between posts faster, helping them provide more thorough supervision of traffic. The 550-pound car, made of aluminum and transparent plastic, has open-top construction, is 20 inches wide, 6 feet 10 inches long and 4 feet 7 inches high. It is equipped with an eight-horsepower engine and can be operated in either direction by means of duplicate set of controls at speeds up to 30 miles an hour. It rides on a single rubber-tired wheel and is guided and supported by smaller metal wheels running along a rail attached to the catwalk floor. Results of tests will determine how many cars will be installed in the two-tube Holland Tunnel and the three-tube Lincoln Tunnel.

We Discover a Phantom Coast



First photo of "phantom" coast, never before seen by man, at easternmost point made by Navy expedition

By Capt. Edwin A. McDonald

The commander of a U.S. Navy expedition to Antarctica describes a voyage other explorers had declared impossible, and also tells of the later efforts of his ships and crews to rescue two other expeditions marooned in the frozen ice packs

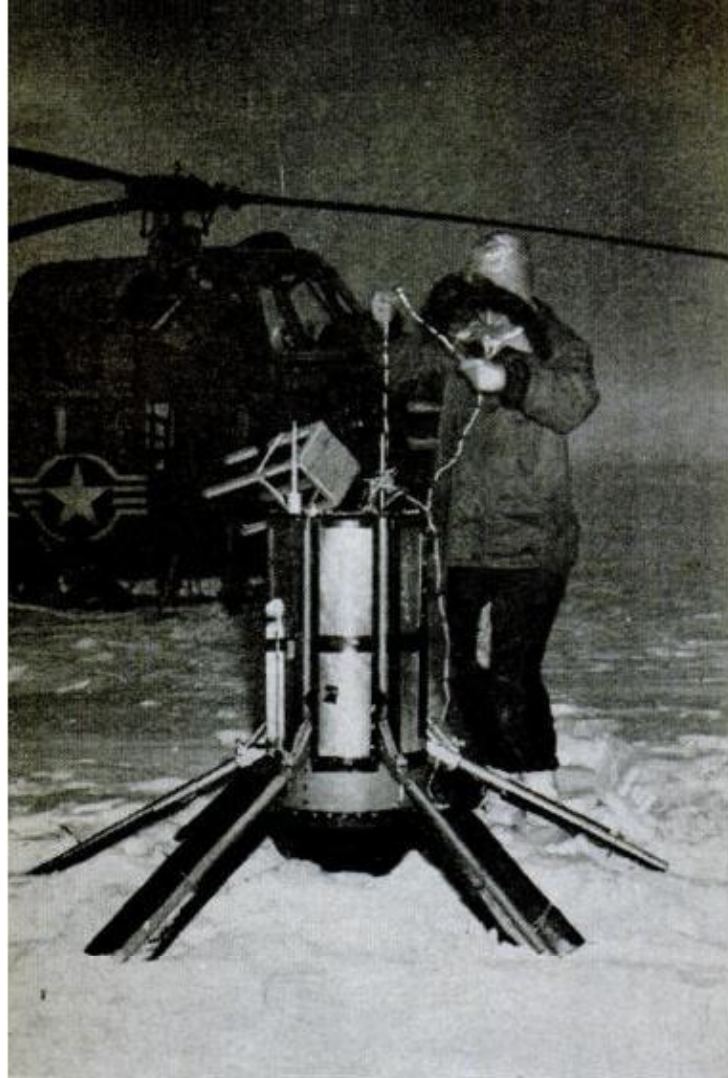
AHEAD, across 30 miles of pack ice separating us from the Antarctic coastline, we could see the snow mantle of a new mountain. With bare white shoulders in clear sunlight, radiant with untouched beauty, it beckoned to us like an ethereal siren—a mysterious woman promising us a closer insight into her secrets, if we could only approach closer.

We were not looking for a new mountain to climb, nor were we particularly impressed by its womanly attributes. Our interest lay in the fact that no one from shipboard ever had seen this mountain before. What made us so excited was that we were seeing it from icebreakers, an impossibility according to statements by more than one explorer.

After a 1926 flight over this section of Antarctica, Sir Hubert Wilkins had said, "It is my opinion that no surface ships, no matter how strong, could have punched through (the Bellingshausen Sea ice pack)

Sir Vivian Fuchs, famed British explorer (left), was on one of ships rescued by American icebreakers. With him are Dr. Robert Murphy, chief scientist aboard USS *Glacier*, and author, Capt. McDonald (right)





Voyage of discovery had scientific goals. Helicopters made frequent flights ashore, as this one did to set up "grasshopper"—automatic weather station

and USS *Burton Island*, were launching themselves into battle with the full strength of their 21,000 and 10,000-horsepower engines. Collisions with cement-hard ice threw plumes of crystals high into the air and caused us to reel and stagger like drunken men.

Our icebreakers were short, squat and rigid, and looked somewhat like overgrown tugs. Blunt inclined bows permitted them to ride up on the heavy ice and crush it by sheer weight. Hard steel, barrellike hulls gave added strength and protected them from ice damage. Designed for one purpose only—that of breaking ice in the polar regions—they were clearing a path through Antarctic ice like a pair of giant bulldozers.

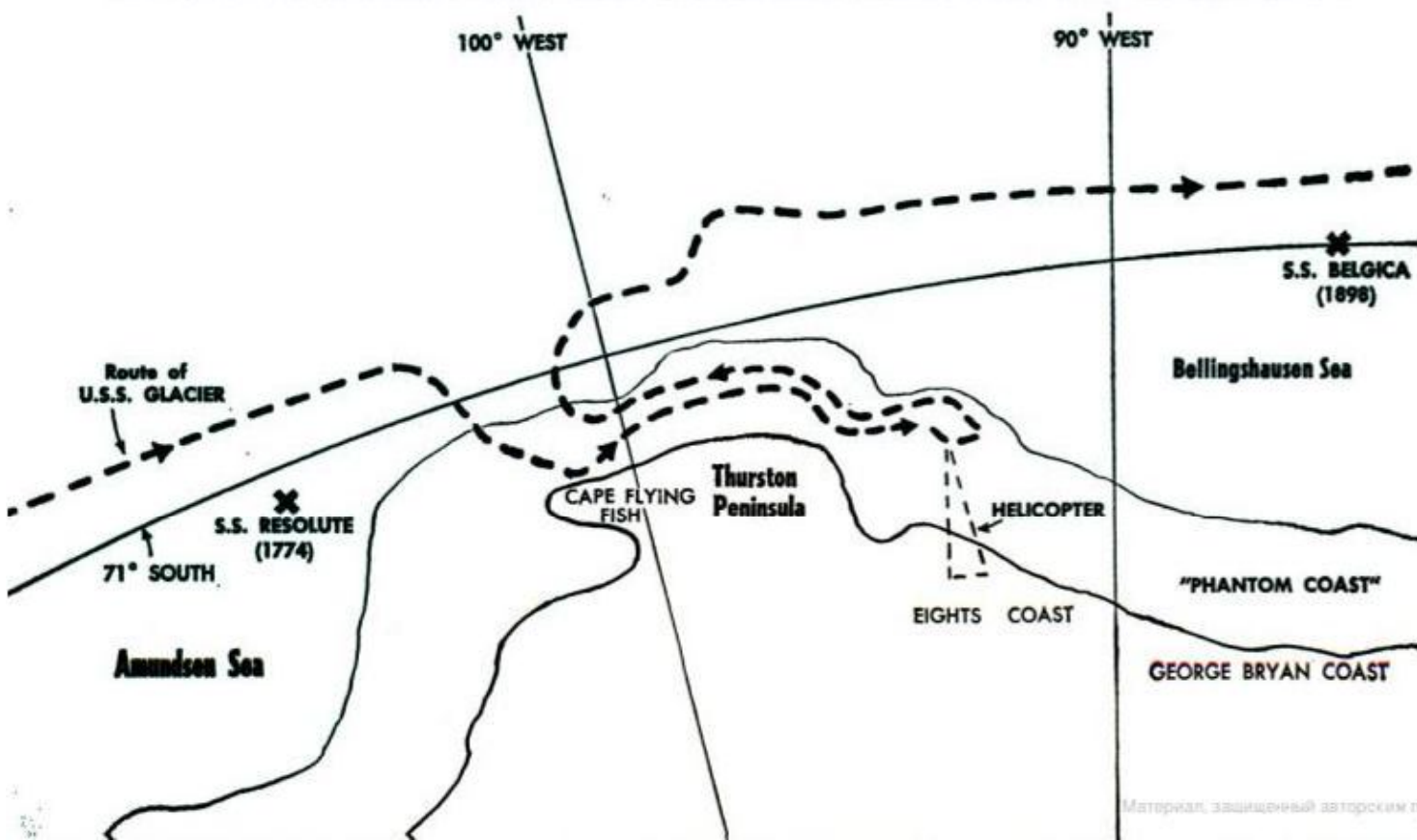
Excellent reasons existed for a breakthrough to the Bellingshausen Sea Coast at that time. As a portion of the only coastal sector of the Antarctic still unclaimed by any country, it would increase United States' rights to a land area twice the size of Texas. Also, it would give us the jump on Russia which has repeatedly announced plans to penetrate the region by ship. Soon, too, all claims and rights in Antarctica were to be frozen by an international treaty signed by 12 nations (and since ratified by the U.S. Senate).

Would we find minerals? Quite possibly, because 16 minerals of potential commercial value and extensive coal deposits have

to a point south of latitude 71 degrees (between Palmer Peninsula) and longitude 100 degrees West."

Against the combination of massive ice fields and bad weather we were now encountering, our icebreakers, USS *Glacier*

Map shows route of American ships, starting with pioneer penetration of area along Thurston Peninsula



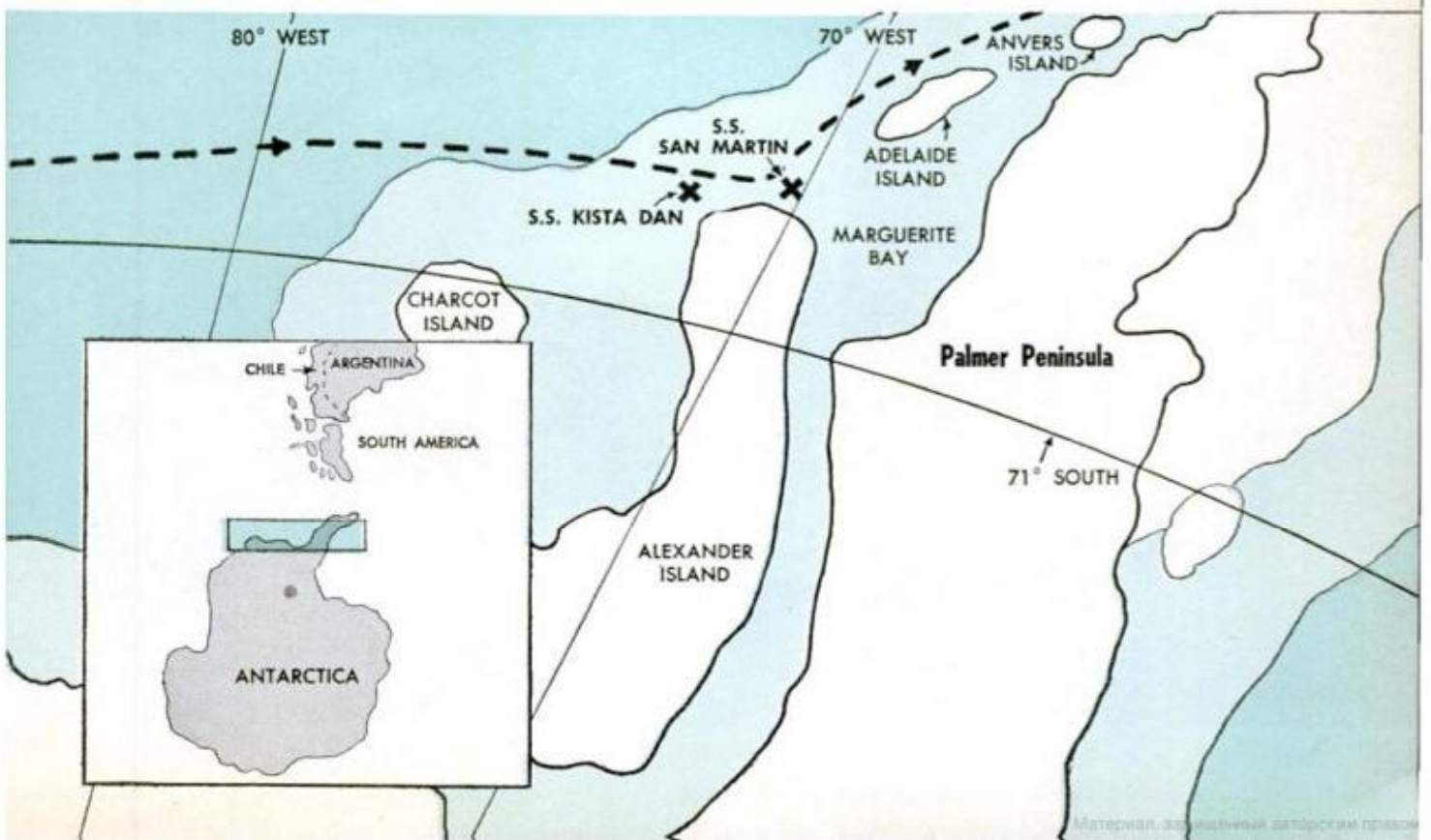


Off Anvers Island, toward end of voyage, ships head for horizon in isolated world, ethereal in its beauty

already been found in the Antarctic. One of the most important of these are the recent discoveries of uranium-bearing ore by the Japanese, in the vicinity of their

scientific station on the Prince Olav Coast. From studies of the geological structure and sub-sea level areas, this unclaimed sector of Antarctica promises to be the most

It continues across Bellingshausen Sea to rescue of Argentine and Danish ships. Inset shows area involved





Palmer Peninsula islands show remnants of civilization. This is abandoned Norwegian whaling station

interesting and revealing of all. Some questions still to be answered include: Do outcroppings and mountains show that they are geologically the same as the South American Andean chain as is true of the Palmer Peninsula to the east? Does evidence support the continental-drift theory which holds that present-day southern continents were joined together through

most of geologic time and began separating slowly about 100-million years ago? Is there a trough or an arm of the sea connecting the Ross and Bellingshausen Seas as many assume?

To reach the "phantom coast," so labeled by the late Rear Admiral Richard E. Byrd, we had probed first along the 104th West meridian, at a point where the

Argentine weather station off Anvers Island is still occupied. Note small figures waving at helicopter





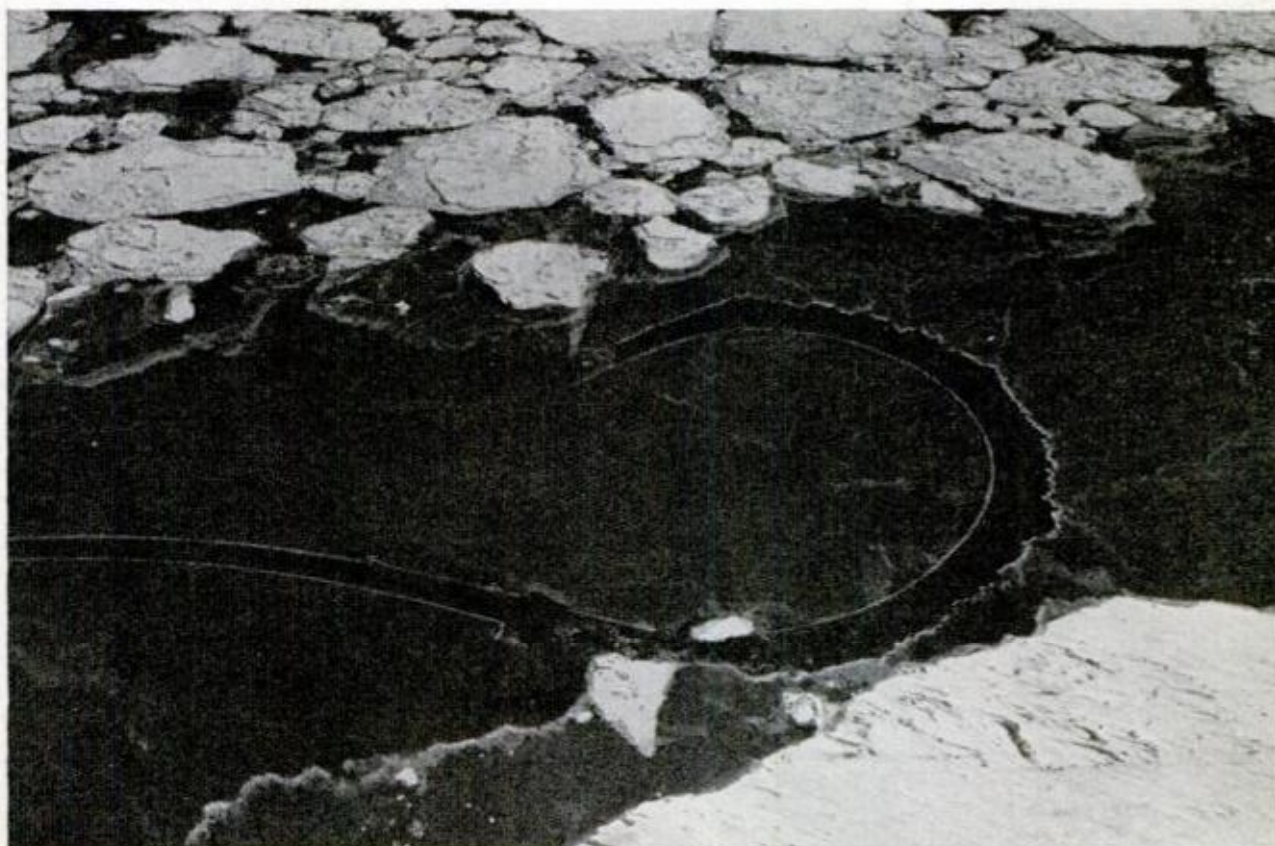
Not all attempts to land by 'copter were as successful as this one. Often snow was too soft for safety

deeper indented Amundsen Sea joins the Bellingshausen. Here, in this magic niche, ships over the years have penetrated further southward than at any other point in their attempts. None with success, however. We were now steering to the southeast toward Cape Flying Fish, westernmost point on Thurston Peninsula, and the mountain that we had sighted was a

coastal prominence located in this area.

Although the ice pack covered 60 percent of the sea, it had not thus far imposed any serious resistance. We were not tricked into thinking that it would be like this all the way, however. If the pack tightened under pressure, we were prepared. The orders under which we operated told us to give it a good try. The

Aerial view of USS *Glacier* shows typical conditions it met: huge ice floes, thin ice crust, solid ice pack





Sometimes *Glacier* could pull up alongside ice pack and entire crew would disembark and throw party to break monotony of long, cold trip on cramped vessel. Note one helicopter has wheels, other rubber floats

author's participation as commanding officer of an icebreaker during a 1948 attempt, and as the unit commander on another abortive try in 1958, made the challenge a rather personal one, too.

Lashed securely in the holds of the 29-foot-draft icebreakers, so that the prodigious rolling of the open seas and the sudden shock of breaking ice within the pack would keep it in place, were one-hundred tons of materials and equipment to construct a seasonal station ashore. Laboratories and staterooms held additional scientific gear such as theodolites, Nansen bottles, weather balloons and gravimeters. The men who would use these tools, the National Science Foundation scientists and Navy personnel, were aboard and ready.

We had now passed the furthest point attained by any ship toward the Bellinghausen Sea Coast, beyond Latitude 71°10' South of England's Captain James Cook in the *SS Resolute* in 1774, and beyond Latitude 71° South of Belgium's *Adrian de Gerlache*, whose *SS Belgica* became beset in 1898, and, drifting helplessly with the ice pack, was unable to emerge free for 13 months.

A tangerine-colored helicopter shot away into the wind, arcing southward over a white frozen sea to reconnoiter ice conditions. There, by radio and visual maneuvers, it would indicate the recommended paths and turning points for the ships.

Meanwhile, our meanderings through the ice floes were puzzling even to the curious penguins. But the seals, resembling lazy garden slugs, took no notice whatsoever, except when the individual floes upon

which they were sleeping were suddenly rent asunder by the onrushing icebreakers.

In the distance, the dark contrasting streak of "water sky" was mirrored on the cloud layer overhead. This meant that open water existed to the south, in the form of a coastal channel between the ice pack and the continent itself.

Shortly, the ice observer in the helicopter radioed a most satisfying message. "As far as I can see there is nothing between the ships and the ice shelf except small floes. The ships won't have a bit of trouble!"

As we progressed toward the coast, marble-white cliffs, resembling a cloud bank aglitter with the lights of a million facets, could be seen from the bridge level. With bays and headlands, covers and abutments, rises and dips, walls and crevasses, they stood in solemn majesty—sleeping giants fronting the coast of the Bellinghausen Sea. We knew, however, that the giants were not really sleeping at all. They were wide awake and on the move, glacial tongues pushing out constantly from the continent's center.

When the ships' fathometers recorded shoaling depths too shallow for our ships, and as the ice shelves towered above us, course was changed to velvet-smooth, ice-free water to the eastward. We now could erase that sentence from Antarctic sailing directions, "No ship has ever penetrated to the coast in this area." We had gone further than any ship in history, and we were still going.

Our present plans called for steaming eastward along the 120-mile front of Thurston Peninsula, then the 300 miles

[\(Text continued on page 266\)](#)



Glacier and smaller Burton Island are moored together for transfer operations before leaving Thurston Peninsula area for long trip across Bellingshausen Sea to rescue two ships mired in solid ice packs



Dr. Murphy rests awhile on Anvers Island to visit with quizzical but unafraid Blue-Eyed Shag. Seals, also found on ice floes near Anvers, would wait until ship was alongside before sliding en masse into sea





World's Highest Cable Car?

Built in the beautiful Andean Mountains near Merida, Venezuela, what may be the world's highest cable-car system reaches Espejo Peak, 15,629 feet above sea level. Regular runs on the four-span, eight-mile trip take one hour going up and 45 minutes coming down. Each trip involves three car changes. The fourth and last span, 10,070 feet in length, is believed to be the longest uninterrupted cable-car span in the world. Passenger cars (top) seat 46 and travel about 16 feet per second on the first three spans, but slow down perceptibly on the steep fourth span because of noticeable wind sway at this height. During construction, workers used open-air flatcars (bottom).



Machine Replaces GI Ditch Diggers

"Man Overboard" Boat Launched in Seconds

Spring-loaded launcher fires raft package when its foot-pedal trigger is depressed





GIs everywhere will stand up and cheer when they learn about the Army's new ditch digger. It can carve a 24-foot trench or a two-man foxhole in one minute. It can move as fast around curves and up and

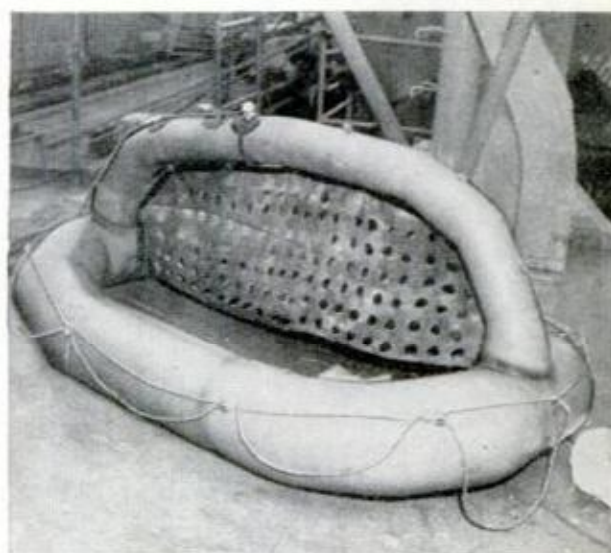
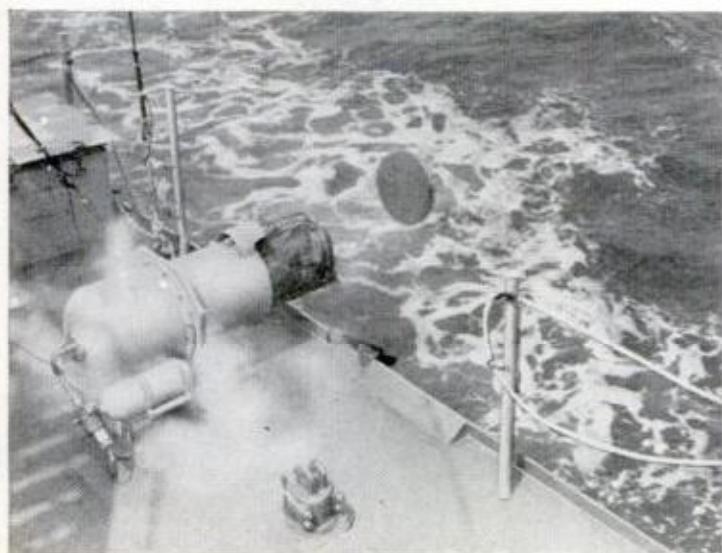
down hills as it can on the straight and level. It can carve out weapons emplacements in less than five minutes. And best of all, a small version can be air-dropped into front-line situations.

Activated from a ship's bridge or any vantage point, the Navy's new quick-launch life raft goes over the side at the touch of a foot pedal for the fastest possible assistance to crewmen lost overboard. It can also be fired remotely from a cannon-like cylinder with compressed air. The one-man raft

is stowed in collapsed condition in both types of launchers. It begins to inflate with carbon dioxide the instant it is launched. The raft and launchers are currently being tested by the Navy experimental ship *USS Fairview*. The raft includes a full supply of survival equipment.

Compressed-air version blows its top off ahead of the raft, can be fired electrically by a lookout

Self-inflating raft weighs 65 pounds, has radar screen, automatic light, sea anchor, pump, and sealing gear



Upside Down World

By Weldon D. Woodson

DR. IRWIN A. MOON, manager of Moody Institute of Science of Los Angeles, knows how it feels to see the world upside down for an extended period. He did this with a pair of inverting spectacles.

But he warns others not to do it. The mental and emotional disturbances associated with wearing inverting spectacles may result in permanent damage.

Dr. Moon demonstrated that we do not "see" with our eyes but rather with our brains.

The eye is actually a miniature camera. Just as in a camera, the image on the light sensitive surface is formed upside down. The image we actually see is formed in the brain, and we see it as right side up!

But what would happen if the image in the eye were formed right side up? Of course, the brain would immediately be tricked into seeing things upside down. The big question, however, is whether the brain could be permanently tricked.

To answer this, Dr. Moon had his optical expert design a pair of inverting glasses. He put them on and wore them every waking moment during the entire experiment.

Dr. Moon was able to walk from the very beginning. It didn't take him long, however, to develop a case of seasickness.

Dr. Irwin Moon generally reached the wrong way in the first tests while wearing the inverting glasses



Then he decided to conduct his first tests sitting down. But sitting down wasn't so easy. Groping for a chair, he was finally able to seat himself in front of a table. An assistant rolled balls on the table within his reach.

"No amount of concentration or effort could overcome the compulsion to reach in the wrong direction," Dr. Moon said. "Not only were all objects inverted and reversed left to right, but objects which were far away appeared to be in front of those close at hand."

He was able to walk to work wearing his unusual glasses. This was an exhausting experience, but it provided a valuable period of relearning and reorientation.

Gradually, it became easier for him to get around in his upside-down world. After wearing the inverting spectacles constantly for eight days, the inverted image was perceived as right side up.

At this point, Dr. Moon's problem was to devise a convincing demonstration showing that reorientation had been achieved.

The riding of a motorcycle seemed a good test. Dr. Moon mounted the motorcycle and rode it as well as he would have if he were seeing normally.

Then it was decided to extend the experiment to flying an airplane where visual co-

After wearing the inverting glasses eight days, Dr. Moon was oriented well enough to ride a motorcycle





Moody Institute of Science photos

So complete was Dr. Moon's adjustment to the inverting glasses that he was able to pilot an airplane. This demonstration proved that he had regained visual coordination. A copilot rode with him, in case of trouble

ordination and depth perception are even more critical.

There would be a copilot, but Dr. Moon, who has logged 1000 hours, would do all the flying. The copilot would be there just in case of a lapse to inverted vision.

Dr. Moon piloted the plane more than an hour, executing all normal flight maneuvers.

After he had landed, he was asked to describe his experiences. He said:

"Well, everything was quite normal. The restricted field of vision probably was the most difficult thing."

Finally, the day arrived when the experiment was to end. Dr. Moon, before he began the experiment, had studied the subject for over a year. Yet, he was totally unprepared for what happened.

He knew that there would be a period of adjustment as he put the glasses on, and he expected a period of readjustment when he took them off. But he was not geared for the mental and physical torture when he removed them. He spoke of the seemingly endless days and nights of disorientation when he started wearing the glasses and again when he took them off. He stated that at times it was difficult to think clearly or even to speak coherently.

"The experience is one I would not recommend to anyone," he said.

Dr. Moon's experiment would seem to have implications for space travel. He stated that in normal vision our mental picture is kept erect and stable because of

thousands of little cues which we receive all day long. We learn to see things upright as a result of gravity cues experienced throughout life and in spite of a normal inverted retinal image.

A space traveler in a condition of weightlessness will lose the gravity cues which keep his vision organized in an "upright" position.

The mind probably will continuously seek to re-orient the visual image in some manner. The physiological and psychological stresses induced by such a situation are unknown but a frustrating disorientation and disruption of perception is a possibility.

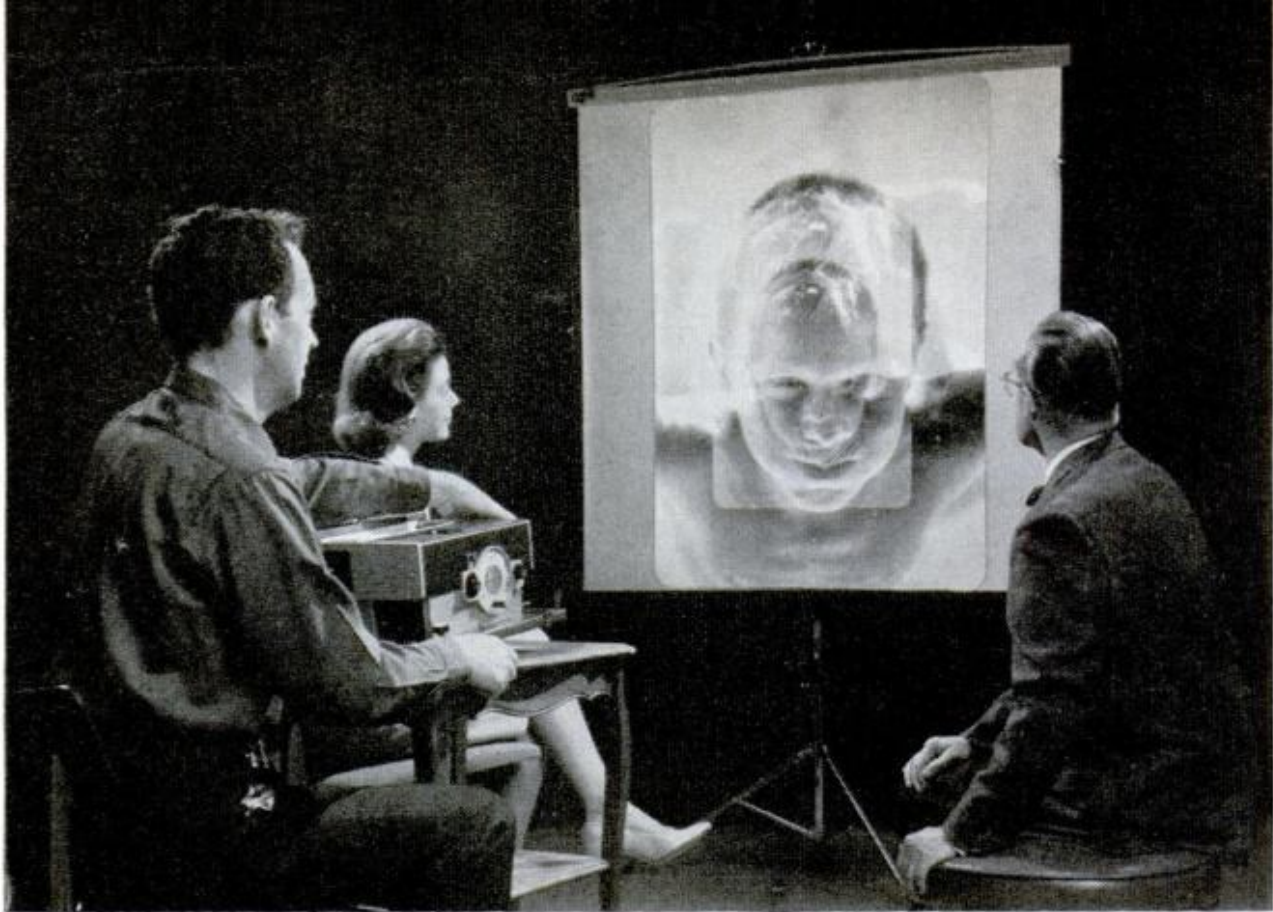
Over an extended period under zero-gravity conditions the original earth reference would probably be lost and the mind of the space traveler would quite likely become adapted to some new reference of an unknown type making the subject feel reasonably comfortable.

But what about the return to earth and the critical period of re-entry and landing?

Recovery of the original earth reference requires a definite period of time which might give rise to serious operational problems upon re-entry into the atmosphere.

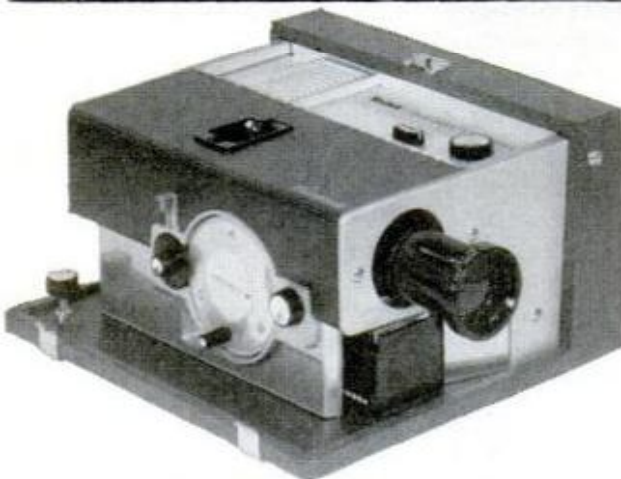
Moody Institute of Science in a technical memorandum suggested to space researchers that present human-factors space research programs be scanned to determine whether study of this time requirement for recovery of earth reference in visual, and other, perception is adequately covered.

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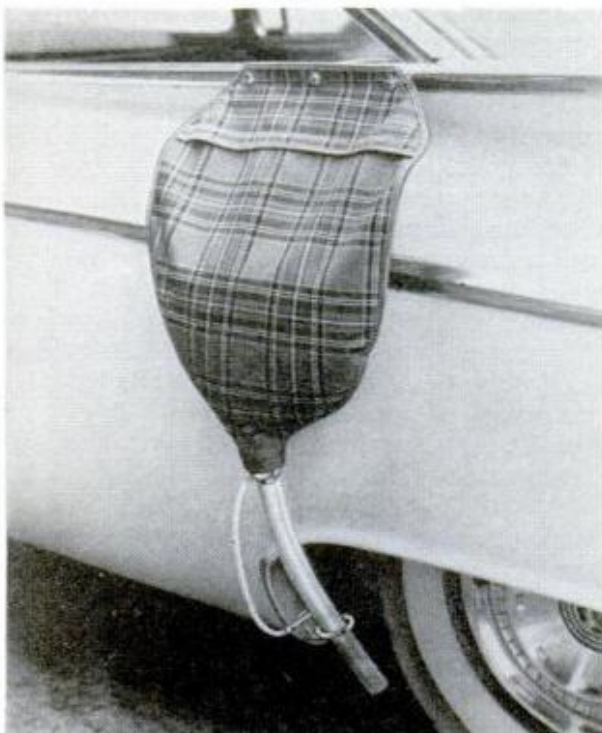
Zoom Lens for Slide Shows

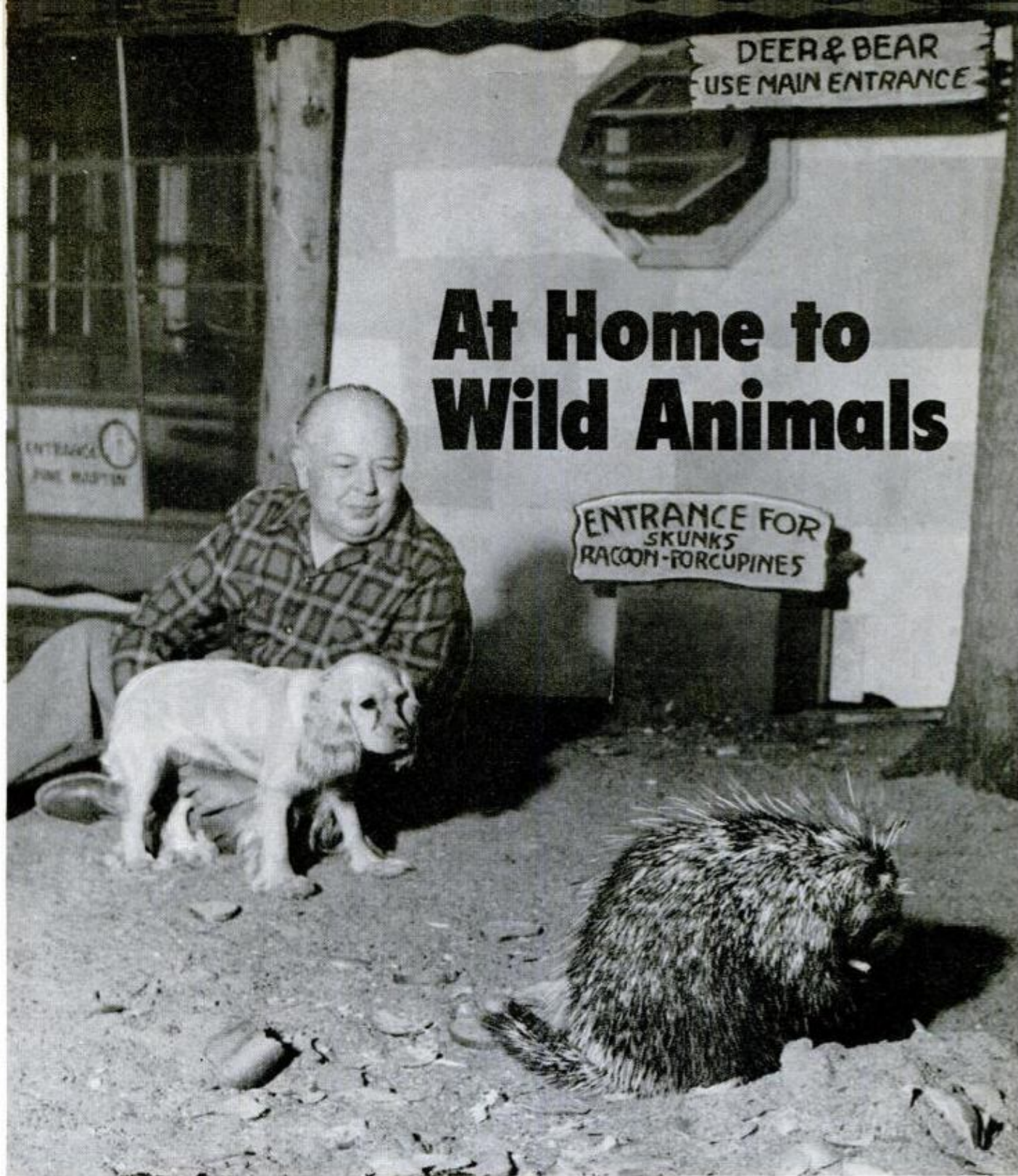
Originally introduced for movie cameras and projectors and later adapted for 35-mm. cameras, zoom lenses are now available for slide projectors. They permit the operator to adjust the picture to fill the screen from any distance, instead of adjusting his distance to fit the screen. The lenses are standard equipment on two different models, but may be purchased separately for other models. Prices range to \$160 for the projector with zoom lens, or \$40 for the zoom lens alone.



Grit Spreader Hangs on Car

Grit dispensers for rear-wheel traction are a great help—and a safety feature—in winter driving, but most installations involve built-ins with electrical wiring. A new detachable grit spreader, however, can be set in place on the few days each year that it's needed, works like the big truck models, but hides in the trunk when it isn't needed, and doesn't involve any electrical connections. Two weatherproof zippered fabric bags hang from T-frames which fit between the body and the rear door. They are equipped with a vacuum-actuated release valve, and are easily connected to the car's vacuum system with a length of tubing. When extra traction is needed, the driver simply touches a clamp-on button on the dashboard, and the grit is delivered under the rear wheels. Each bag holds 12 pounds of sand, gravel, cinders or ice-melting chemical, and is easily filled through the big outside zipper opening.





Carl Marty and Ginger watch approvingly as one of their woodland friends joins them for midnight snack

By Lela Campbell Dowell

IT WAS MIDNIGHT in the North Woods. The thermometer registered minus zero. A biting gale was blowing his thin but well-groomed hair awry as Carl O. Marty, Jr., broad-shouldered and sturdily built, bent painstakingly over feeding pans near his cabin door. The resort owner who raises and tames wild animals during his spare time was carefully arranging tidbits for all hungry creatures that might happen along.

"It's surprising how many visitors we'll

have before morning," he said. "Even though many of our animals are in hibernation, we still have the flying squirrels and porkies."

It was through his intensive study and work with wild life that my husband and I first met the owner of the fabulous North-ernaire, a plush wilderness resort at the edge of the Nicolet National Forest near Three Lakes, Wis. Since then, during our visits for the last six years, he has taught me a great deal about the taming and han-



Ginger, who grew up with wild animals, submits to antics of two baby red foxes and five-week-old otter

dling of wild animals. He has also given me access to his library of tape recordings and findings on the various kinds of wild life. In the last 12 years Marty, now an internationally known naturalist, has tamed practically every specie of animal native to the North Woods.

"Always watch their ears when taming animals," he warns. "If the ears remain in an upright position, you have nothing to

fear; but if they are drawn back close to the head, use caution."

Many times he has demonstrated how an uncaged raccoon and a badger that have been tamed will come out of the forest, or a tamed otter will emerge from nearby Deer Lake, and take food from his lips.

"All of God's creatures are full of fears," he says. "To alleviate that fear, there is no better way than with food and kindness."

Informality reigns, especially at mealtime. Raccoon enters through window to steal the very food from Marty's mouth, and at lawn picnic Bopper the Beaver foregoes table manners to eat with the hands—Marty's



Albert the Bear isn't old enough to realize what a dangerous playmate he's chosen, but quick-tempered badger, like all Marty's animals, are basically friendly and fight only when frightened



Ginger's friends are free to come and go as they please, one of Marty's cardinal rules for gaining their confidence. When they enter house, door is always left open for their easy departure



Add the help of a well-trained dog—one that has been raised with the animals—and you have his over-all formula for taming animals in minutes. However, he readily admits the younger the animal the quicker and more easily it is tamed.

"After they are old enough to have had unpleasant experiences with man, taming is more difficult," he says. "But if one spends enough time with them, it is possible to tame almost any animal. All wild creatures actually want to be friendly."

Marty does not consider an animal "tame" if it is held in captivity. His idea of "tameness" is for an animal to live a normal life in the woods or lake and associate with man or dogs because it has a desire to do so.

But the animal lover contends there is no dark secret about what he has accomplished with wild life, that he has done no

more than three out of four people could do if they would adapt themselves; that is, have a love for wild creatures, a desire to understand them and a normal amount of patience to work with them.

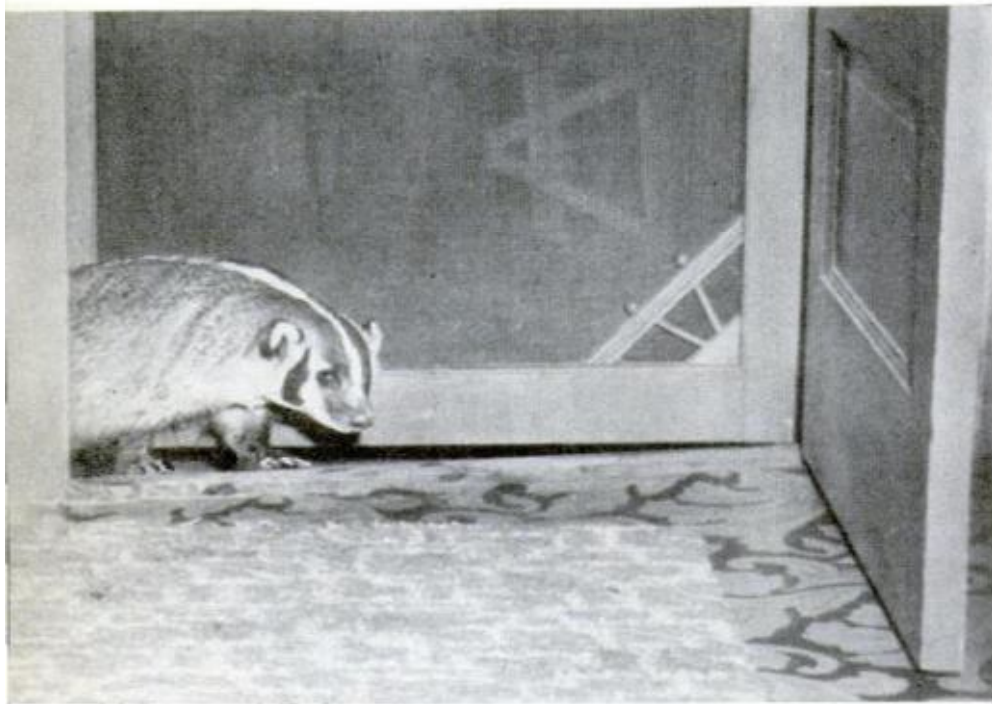
His animal interest—the phase of his life about which people talk more than any other—began during the building of the "Northernnaire" with the "mothering" of an orphaned fawn. Meanwhile hundreds of animals have felt the warming touch of his humane influence.

With the cooperation of his neighbors, he was able to get 19,000 acres surrounding his cabin and hotel closed to hunting. In that area, at least, he reasoned his animal friends would find protection. To complete his wild life haven, he constructed an animal house near his cabin and about a quarter mile from his hotel.

The animal house of story-book design



Here are two of Marty's maxims at work. Eliminate fear with food and kindness, simplify process with well-trained dog. Animal respects whom dog respects



Another rule: Don't force attention on wild animals. Get their confidence first, then they will do what badger here is doing — come out of curiosity



Marty has been sprayed only once by skunk, and it was his fault. He tried to make friends too fast. Marty's skunks, incidentally, are all . . . ah . . . intact



All Northernaire's wild visitors eventually follow their wild instincts and, sadly, are never seen again

has proved a convenient place to keep young animals during a period of protective custody or until they are ready to turn out "on their own." Invariably when the animals are released, they return and bring their wild cousins with them. Too, at the animal house, there is always a variety of food in abundance forthcoming. The four-footed friends take advantage of this generosity as they come to feed several times during a 24-hour period. Since the animals learn to respond to Marty's voice, he is not making them vulnerable to those who want to kill just for fun.

But in spite of an appropriate shelter with eating, sleeping and heating facilities, many of the orphans prefer to be nearer their benefactor. There were the two otters that arranged their sleeping quarters in Marty's innerspring box mattress. They entered it through a hole of their own making. Foxes, usually considered untamable have slept on the foot of his bed during the spring, summer and fall for five years; and a raccoon whose nimble fingers could open doors, displayed beautiful manners at the family table.

Prior to hibernation, dozens of raccoons after visiting the feeding pans lounge like house cats on the lower limbs of trees surrounding his cabin.

One night, while we were visiting with Marty, the rug suddenly developed ocean waves, the television set reeled back and

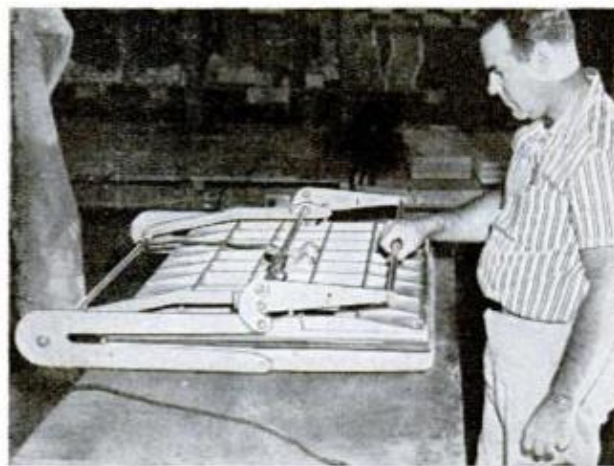
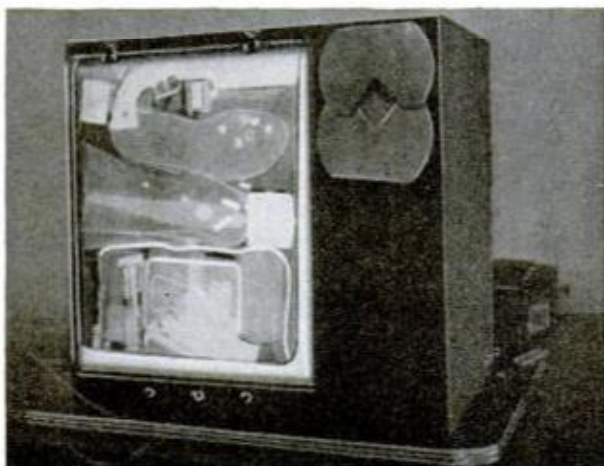
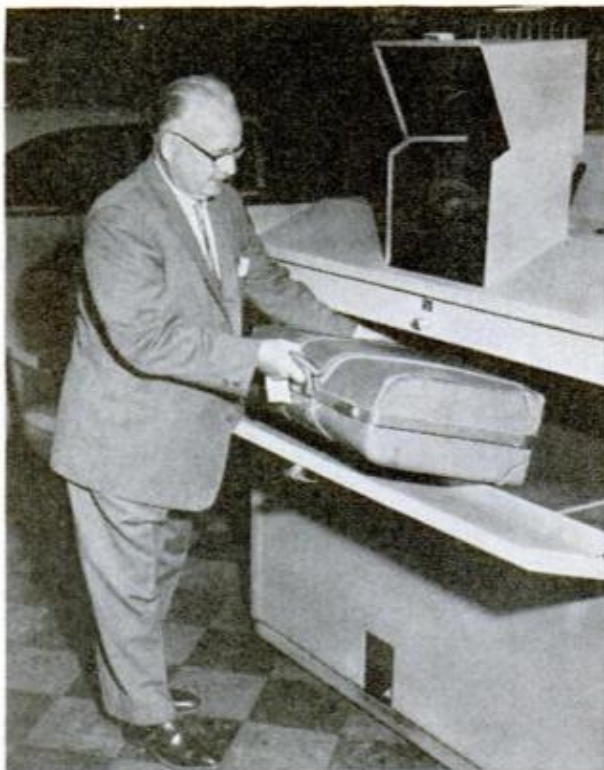
forth and a lighted Christmas tree toppled against the wall. The miscreant turned out to be "Sugie," an immense otter taking her "constitutional." Marty often spread a blanket under which she played. In lieu of the special blanket, she appropriated the rug.

Another night in late autumn, anxiety was plainly written all over the animal lover's face—Bernese the badger had failed to come in for food. Marty suggested we go into the forest and rout her from her den. Six of us started on the nocturnal trip—Marty, "Ginger" the cocker, "Little Ginger," a five-months-old honey-colored cocker puppy; "Sugie," my husband and I. Marty, as guide of this motley pedestrian safari, manipulated the only flashlight. In order for us to see as well as himself, he had to keep thrusting it to the right, then to the left, then front, strangely remindful of an inspired orchestra leader.

Besides trying to stay in a sort of path, I couldn't help keeping a watchful eye out for "Sugie" the otter. I had visions of tripping over her in the semidarkness. But my fears proved entirely unwarranted. She slithered eel-like through the brush and loped gracefully over the open spaces; and not once did she fail to keep her distance dutifully.

On arriving at the den, Little Ginger dashed into the dark hole, so far that only

(Continued to page 242)



X Ray Inspects Airline Luggage

Possible solution to the problem of inspecting airline passengers' luggage for bombs without inconveniencing both the passengers and the airline personnel, a special fluoroscopic inspection unit has been developed by Dr. W. J. Daly, of Los Angeles, Calif., a designer of industrial X-ray equipment. Built to fit into the ticket counter, the cabinet unit allows the ticket agent to place the bag under inspection (top) immediately after weighing, while the passenger is still available to identify questionable objects. The two-faced viewer (bottom) allows both to see the contents while the agent points with a directed light beam. Possible variations allow closed-circuit TV viewing from a remote location or a permanent record on film. The lead-enclosed machine is radiation-safe, and there is no hazard to anything but unexposed camera film.

"Ink Blots" for the Wall

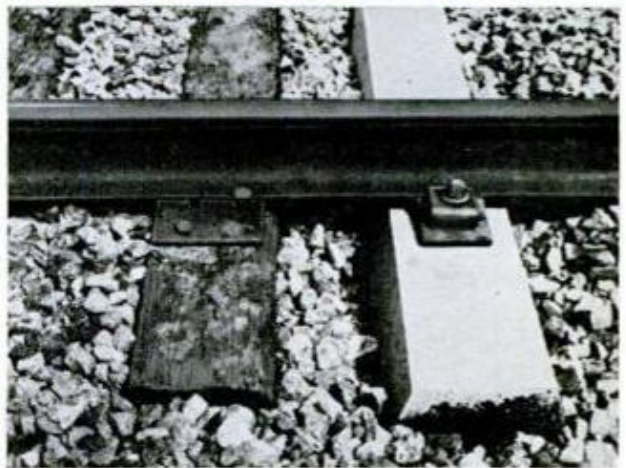
Making ink-blots, not from ink and not for Rorschach tests, but still in the familiar formless form, has turned into a business at Peter Pepper Products, Inc., of Palos Verdes, Calif., where the unusual art form produces interesting and unusual wall decorations. Production of the pattern is simple: Several dabs of colored paint are applied to a strip of ordinary wallpaper, then the paper is folded lengthwise before the paint dries. The result is a "kaleidoscroll." No two are alike, but all resemble an attractive oriental decorative scroll. After it is dry, the scroll is carefully fused to a prefinished wood or hardboard panel. After much trial-and-error experimentation, the makers learned that the best method of bonding was with a thermoplastic used in mounting photographs. Scroll backing and binder are fused (bottom) in a regular hot-laminating press.



Radar System on German Rivers

Rising on the banks of the rivers Elbe and Weser, in Germany, is a chain of radar towers that will cover the movement of ships into and away from the North Sea, and to and from such bustling inland ports as Bremerhaven and Hamburg. Some 10 towers comprise the system. The tower at Cuxhaven, which will be the center of the system guiding traffic on the Elbe, is seven stories high. It will hold six to eight radar screens which will give an unbroken picture of the entire Elbe navigation route. Main stations, such as the one at Cuxhaven, also will receive radar information from unmanned towers in the system. Main stations can be in continuous radio contact with all ships and barges on the rivers. Inbound ships first get their instructions as to navigational blocks ahead when they contact a ship stationed off Cuxhaven.

JANUARY 1961



Concrete Railway Crossties

Trainloads of phosphate that roll over a stretch of the most heavily burdened track in the U.S. are smashing their enormous weight against a new type of crosstie made of prestressed concrete. If the ties hold up, railroads are expected to use them to cut costs (\$255 million a year) of replacing wooden ties. The tie test is being conducted on one-third-mile of track laid down by Seaboard Airline Railroad Co., near Tampa, Fla. To give strength, high-tensile steel cables, given a giant stretch, are imbedded in the new tie. As the cables try to retract, they give the tie a strengthening squeeze. Billions of minute air bubbles have been entrained in the concrete to allow the tie to expand and contract in freezing and thawing weather. It takes only two of the new concrete ties to replace three made of wood.

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IS OUR ATOMIC STOCKPILE DANGEROUS?



Many planes carrying nuclear weapons have crashed in recent years, yet none caused nuclear explosion

By *Thomas E. Stimson, Jr.*

THE UNITED STATES has been building up its stocks of nuclear weapons and today it has thousands of hydrogen bombs and atom bombs on hand. Some are in storage, some are in transit on trains or cross-country trucks, still others are mounted on bombers or long-range missiles ready for use.

Our greatest weapon is the hydrogen bomb that can wipe out a major city. A 20-megaton hydrogen bomb has the same explosive force as a stack of TNT six city blocks square and more than 1400 feet tall.

At the small end of the scale are artillery shells and bazooka rounds with a power as low as one ton of TNT. Less than half a pound of TNT can blow off your head.

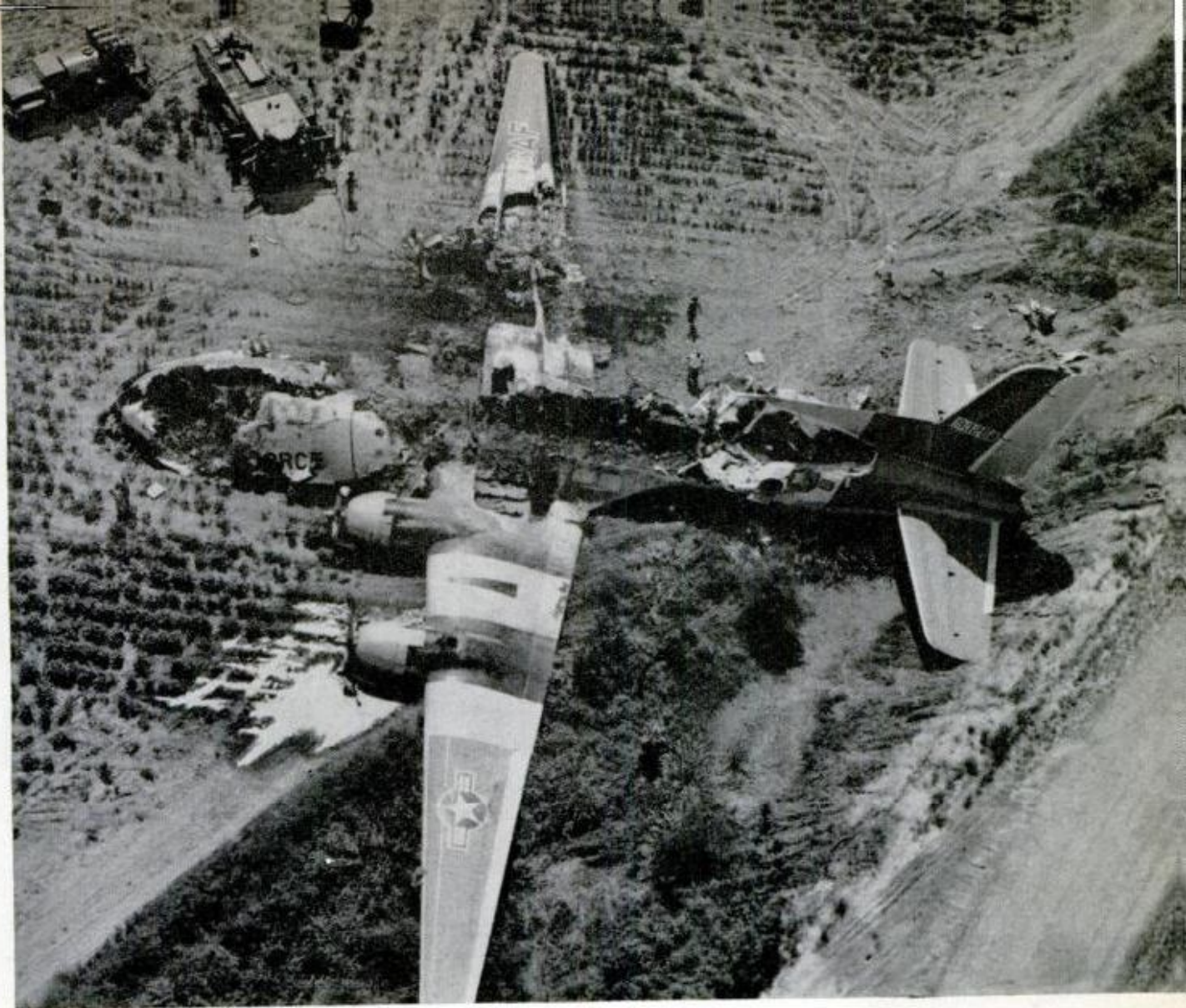
Nuclear weapons like these may be stored within a few miles of where you live or work. Possibly the military aircraft that you see overhead is carrying a hydrogen bomb or air-to-air rockets armed with nuclear warheads.

What are the chances of one of these

weapons blowing up and killing you as well as thousands of others? Many people are properly worried about this. It's true that no nuclear weapon is absolutely safe. They are designed to be dangerous.

After five months of study an Ohio State University research team says that "accidental explosion of one or more nuclear weapons in the next 10 years is not improbable."

But the Ohio State survey was concerned with Russian and possibly Red Chinese weapons as well as our own. As far as the United States is concerned, the Department of Defense and the Atomic Energy Commission both say that they are completely aware of the awful consequences of an accidental explosion and have taken extreme precautions to prevent such a catastrophe. They point to the more-than-several occasions in which a nuclear weapon burned on the ground or crashed in an airplane. In none of these cases did a nuclear explosion occur.

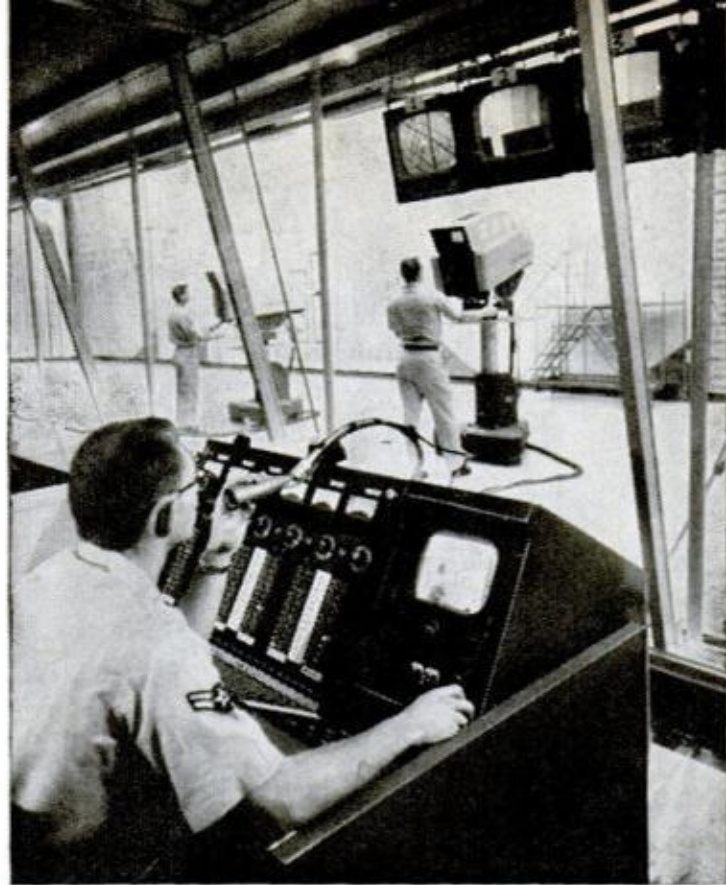
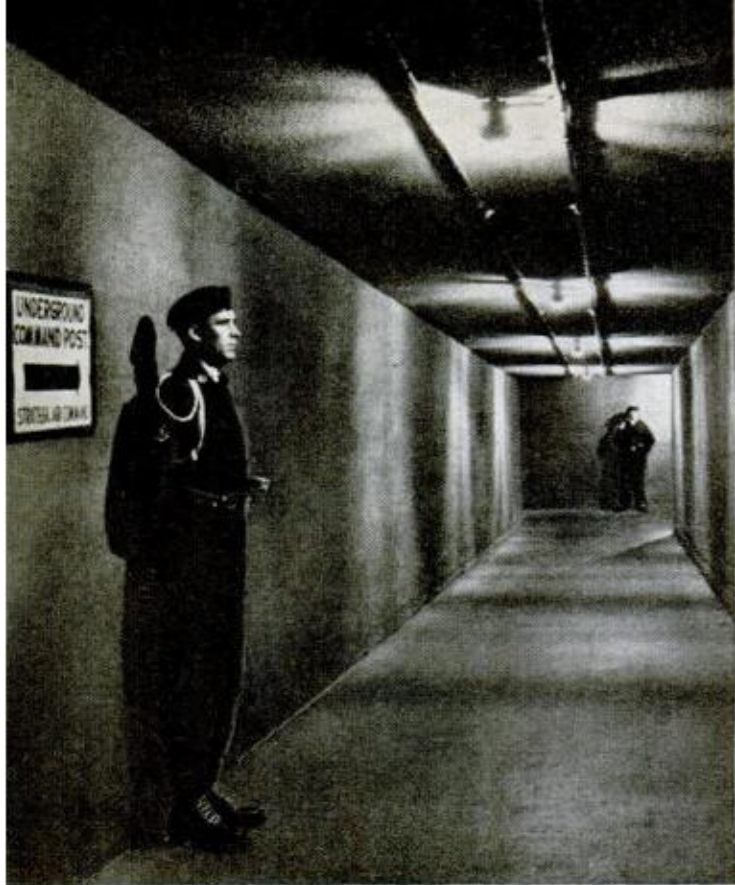


Air Force transport crashed on takeoff and entire cargo of unarmed nuclear bombs burned without mishap

DOUGLAS C-124 Globemaster shown above

Atomic shells have been fired from Army's 280-mm. artillery gun with complete safety to artillery crew





Tunnel approach to SAC's maximum-security underground headquarters which directs worldwide network of bases. Inside, TV color cameras on closed-circuit system relay information from operations room to offices

Yet there are other hazards beside accidental ones. What if a person who has access to a bomb goes crazy and explodes it on purpose? Military personnel and scientific technicians have been known suddenly to go insane.

Here's another problem. SAC is on an alert basis at this moment, loaded and fueled and ready to go. The flight crews are standing by. What if a false message sends our Strategic Air Command on its way to targets previously assigned to it?

This article will explain the extraordinary care that is being taken to prevent all such tragedies. Years of study and millions of dollars have been spent in making our nuclear weapons as safe as possible.

Some of the things you will read here may seem like military secrets. In these cases the Department of Defense says it is glad to let an enemy know exactly how the United States is holding its finger on a cocked nuclear trigger. The knowledge may deter an enemy from starting a war.

Some details about bomb safety, however, won't be discussed. The Department of Defense doesn't want to give away information that might help an enemy make his own bombs better than they may be.

In a recent briefing at the Pentagon the Defense Atomic Support Agency said that an electric battery is required to detonate most nuclear weapons and that the battery is always isolated during storage and transportation. Without this source of

power the nuclear weapon remains inert.

At the briefing it was explained that a bomb can't explode until it is armed, and that prior to arming a number of preliminary operations must be performed.

Most of these operations consist of throwing switches that energize electric circuits connected with the bomb mechanism. In a bomber, for instance, several switches must be pushed in the proper sequence by different members of the crew. Some of the switches are in series and none can be accidentally tripped. One switch may be protected by a seal that must be broken and by a pin that must be withdrawn before the switch can be moved. Another may require a special key that is carried by only one member of the crew.

The final arming takes place after the bomb is dropped. It is performed automatically by a switch that is deep inside the bomb mechanism. A saboteur couldn't reach this switch without literally tearing the bomb apart. Yet if a bomb should be jettisoned or accidentally dropped from an airplane there would be no nuclear explosion because none of the prearming operations had been performed.

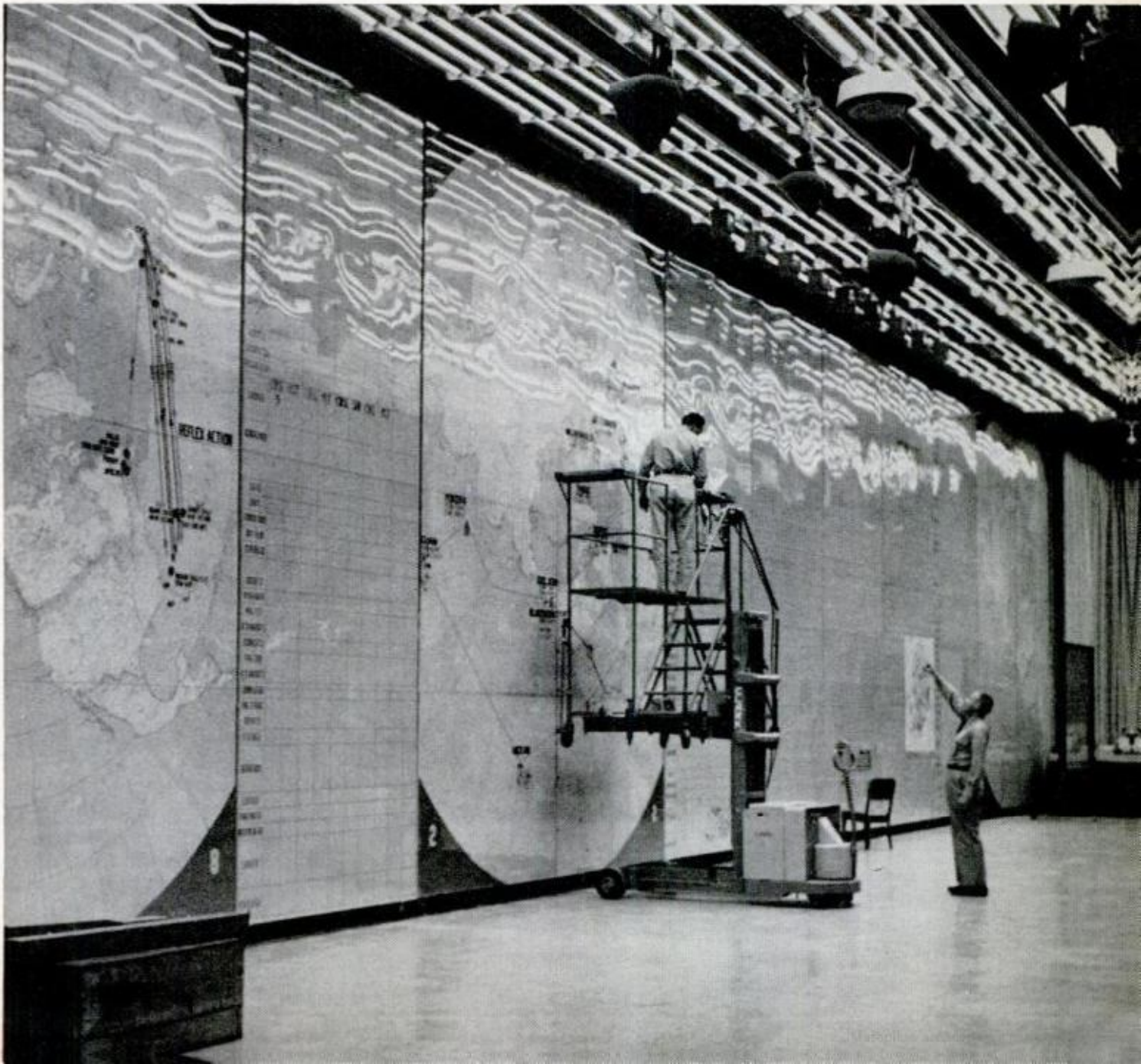
"In regard to a single piloted aircraft," one of the experts at the Pentagon briefing said, "I can only say that there are appropriate rules and physical restraints so that a lone pilot could not take off and expend a nuclear weapon during peacetime."

For missiles, "the consent and action of

Famous "red telephone" rests alongside desk of senior controller. On it, he can talk directly and instantly with every SAC command post in world

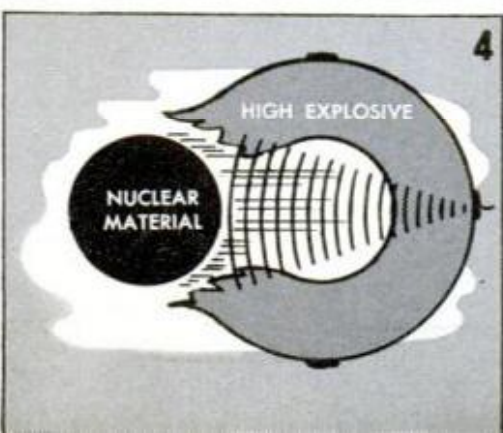
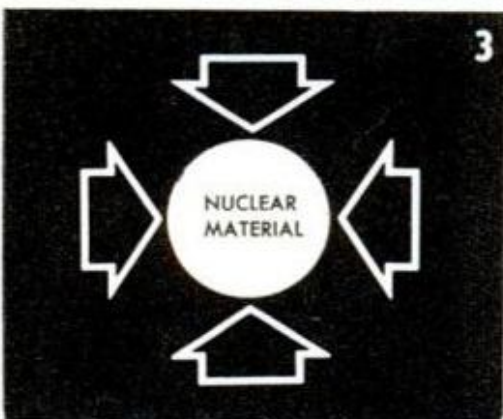
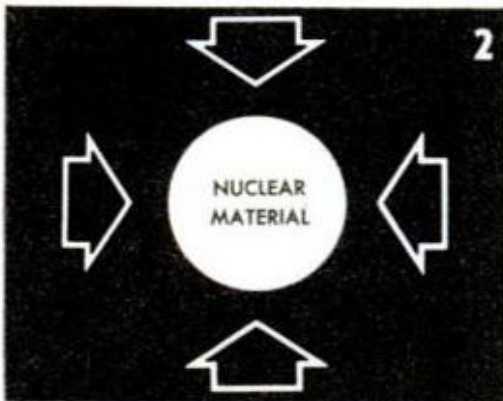
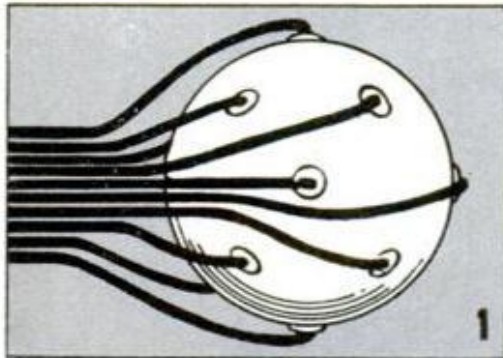
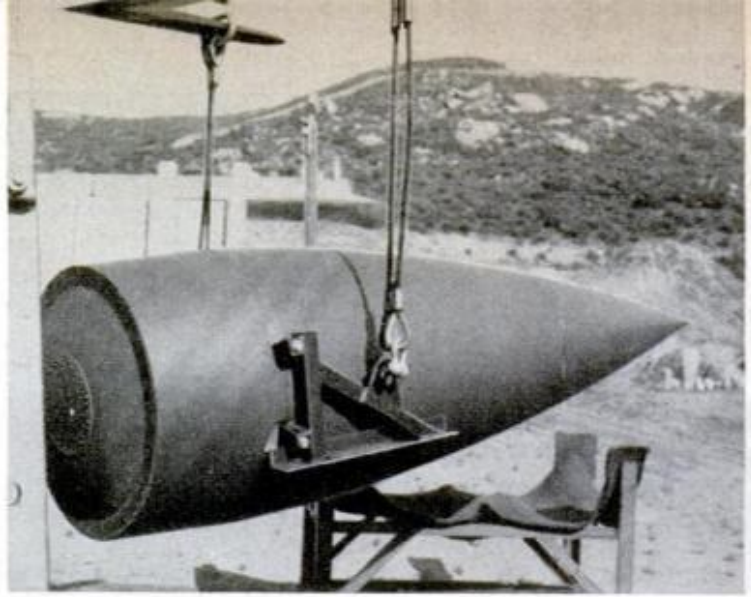


Map panels in operations room reflect status of SAC forces throughout world, keep controllers fully abreast



This is a nuclear bomb! But it's relatively harmless unless detonated properly

Sequence below shows how. Series of firing contacts leading from fusing system are attached to explosive material (1), which surrounds nuclear material. When fired, split-second simultaneous explosions crush nuclear material into critical mass (2, 3), forcing its atoms close enough together to sustain chain reaction and produce nuclear explosion. If original explosions are not simultaneous and precise, or if detonation is only at one point (4), nuclear material simply lies dormant or escapes and is scattered—a dud



several persons must be obtained before the weapon can be used. The switches are unique, reliable, well-controlled and more than one in number. The physical controls may include locking the missile to the ground.”

Every hydrogen and atomic weapon is under close guard from the time it is assembled. The men who put the bombs together are screened for basic intelligence and patriotism. They are the most reliable men who can be found. They follow exact procedures in assembling a weapon, use special one-purpose tools. The final stages of assembly are performed by at least two men of the same technical ability, as an extra precaution against carelessness, insanity or deliberate sabotage. From that time on no single person ever has access to the weapon. Any inspection or testing must be performed by a team of at least two men.

The drive for safety really begins long before a bomb is built. Each new, special-purpose weapon is automatically given a number of basic safety features at the time it is designed by the AEC. These are carefully checked by safety experts. About 18 months before the new weapon is due to be accepted a special safety conference is held by the military, the AEC and others. The safety group works without any pressure from time. Any recommendations that it makes must be adopted or the problem must be eliminated by other means. Later, six months before the weapon is to be ready, a second safety group is convened and every imaginable facet of the weapon is examined again. Final safety rules are worked out and these are carefully reviewed and discussed by each of the agencies before the new type of weapon goes to the armed forces.

Later on a review is held in which any new ideas that might improve the safety of the weapon are discussed. Finally, additional safety reviews are held at any time that special circumstances require.

Now, for the bomb itself. A typical nuclear weapon contains a number of charges of high explosive placed around its periphery. All the charges must be ignited simultaneously by the powerful electric battery in order to compact the plutonium or the U-235 into a critical mass. This is the final safety feature, for it is highly improbable that all

(Continued to page 274)



Johnson Motors photo

Outboard Ice-Making Machine Helps Canadian Loggers

North country lumbermen, working far off the highways, do their heavy trucking in the winter using frozen streams for roads. A thin spot in the ice or a mild early winter slows operations, so loggers with Price Brothers Company devised an ingenious portable pump from a 10-horsepower outboard motor. Using the motor's backwash, piped through a metal duct, they pump water out onto the surface, where it freezes, quickly making thicker, safer ice.



Measuring Spoon-Scale

Equipped with a new spoon, the housewife not only can ladle out ingredients for cakes and pies on a measure-by-measure basis, she can also ration them out ounce by ounce. The long handle of the plastic measuring spoon contains a spring balance that tells weight accurately up to eight ounces.

Effects of decompression sickness are reduced greatly by breathing pure oxygen for two hours before a flight to altitudes above 35,000 feet, according to Air Force tests.



TRUMPET ALLEY—

No Place for a Fat Man

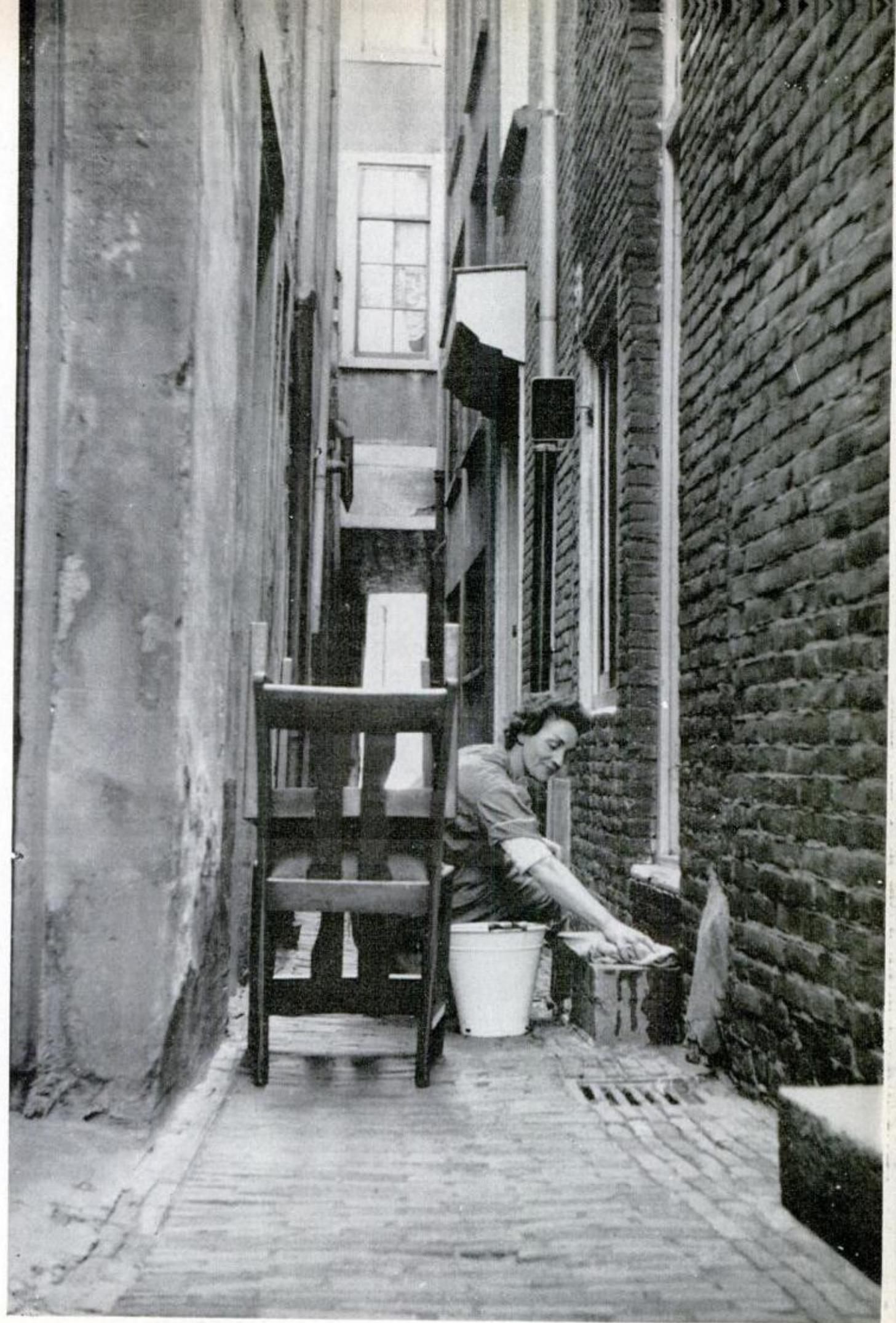


At the entrance to the street where she lives—the 31-inch-wide Trumpet Alley, in Amsterdam—a pretty Dutch girl and her beau stop to buy flowers. As pictures on these pages show, life in the narrow street goes on pretty much as it does elsewhere in the city



HOW WOULD you like to live on a street less than a yard wide? The Trompettersteeg, or Trumpet Alley, in Amsterdam, The Netherlands, is no more than 31 inches across, yet, surprisingly, it is still a busy thoroughfare. There are residences there and even business offices. People are born there and people die there, and most of the residents are long term—possibly because it's far too great an effort to move, for moving men understandably dread the thought of lugging furniture from apartments at the Trompettersteeg address.

The postman, the milkman and others who render services to the people who live and work in the Trompettersteeg tend toward thinness rather than girth. It's as much a psychological as a physical necessity. Trumpet Alley is no place for a fat man! In the Dutch tradition, street and stoops are kept spotless—but that's not very difficult, for there's not much to be kept clean, and not much to make what there is dirty. There's little privacy on this narrow street, but there is the convenience of reaching a hand out the window to borrow a cup of sugar from a neighbor, and there is the comfort of knowing that the children can run across the street in absolute safety.





Scientists on the Trail of the Lonesome Porcupine

Scampering solitarily through the forest of a University of Minnesota research center, a mother porcupine and daughter—both toting tiny radio transmitters—are being tracked by biologists with portable directional antennas. The animals can be lo-

cated within 15 minutes in the five-square-mile forest near St. Paul. Tracking them, the scientists gain information on movements, feeding habits and family relationships, and learn of the role of the porcupine in forest management.



Cuts Concrete Without a Sound

Slicing neatly—and soundlessly—through solid concrete, a new “powder lance” does the job of an air hammer, sledge, or wrecking ball at about the same speed but without the oppressive noise and vibration usually associated with demolition work. With the lance, developed by the Linde Company, a mixture of oxygen and metallic powder are mixed and forced through a pipe to the concrete surface. The mixture is ignited at the surface, where it burns with a flame so hot that it melts the concrete. The cost is only slightly higher than other methods.

As president of International Business Machines Corp., Thomas J. Watson, Jr., directs a far-flung enterprise that has introduced such socially and economically significant machines as the electronic computer to the world. Mr. Watson was an Air Force pilot during World War II and, in addition to his many civic activities, he is an avid sportsman.



My Most Exciting Moment

By *Thomas J. Watson, Jr.*

I SUSPECT that the most exciting moment of my business life occurred in 1946 shortly after I returned to the IBM Company from five years of military service. My father and the then executive vice-president of the company were walking through the home office building on a tour of inspection, and I was accompanying them.

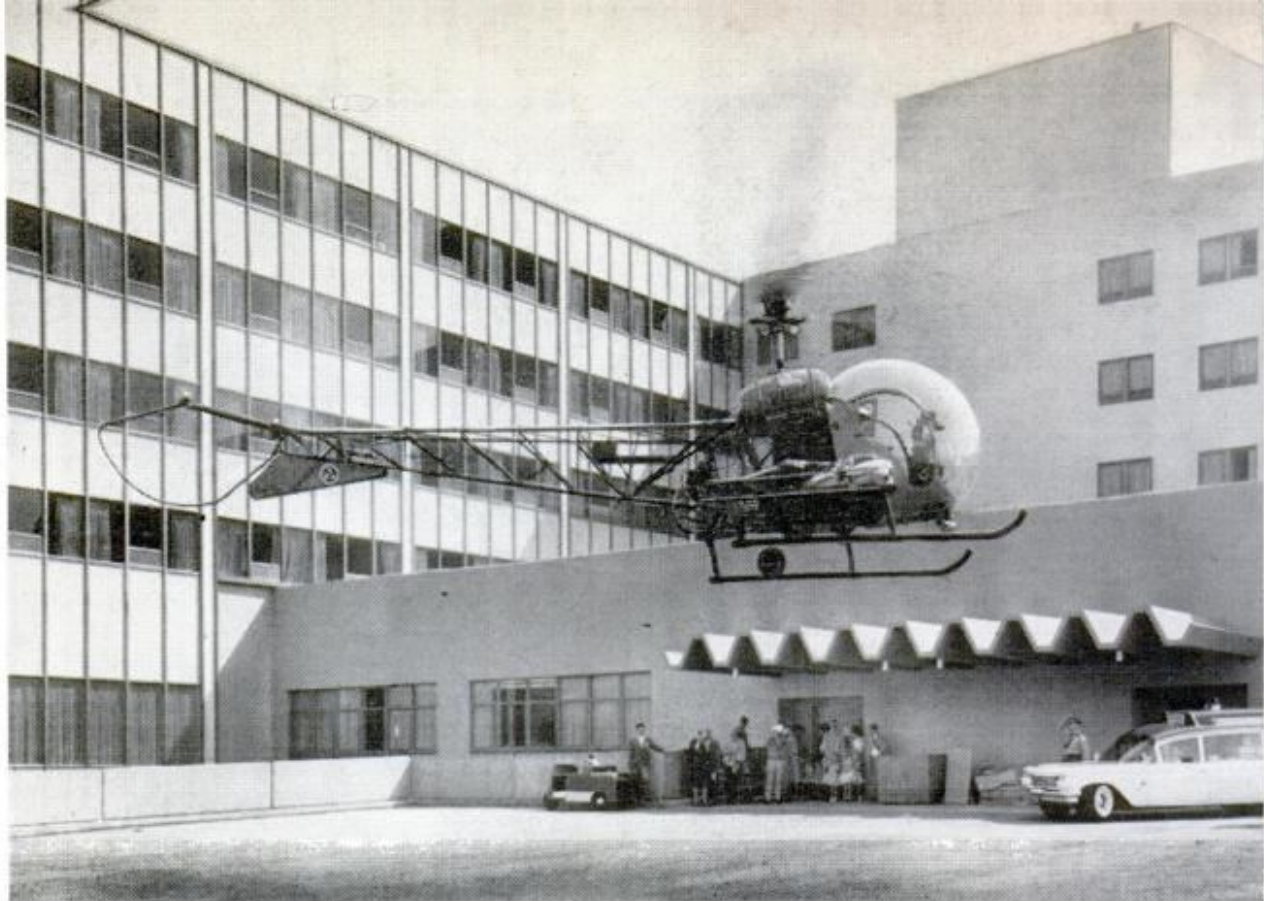
In the back corner on one of the floors which we visited was a make-shift laboratory in an area which we called Patent Development. This section normally carried on no machine work but had to do with drawings and descriptions of business machines for future products. However, in the back of this room, there was an old-fashioned electric-driven IBM summary punch connected by a rather thick cable to a black box about six by five by one foot which rested on the floor. When one looked through the perforations in the cover, it was possible to see that there were hundreds of vacuum tubes inside.

Upon inquiry, it was indicated that the pulses taking place in these tubes, which I had formerly associated only with radio, were being used to add, subtract and multiply. This seemed almost impossible to me, but one of the employees explained that the principle of the tube was to create high-frequency oscillation and that this oscillation could be used for scientific purposes. By applying this to a binary arithmetic code, which permits the use of fewer tubes than a decimal code, it was possible to achieve very rapid multiplications through additions.

The summary punch part of the machine was putting in the data and punching out the answers. Although the whole process was slowed down to the rate of the summary punch card mechanism; i.e., 100 cards per minute, the multiplication in the machine was being done in a few thousandths of a second.

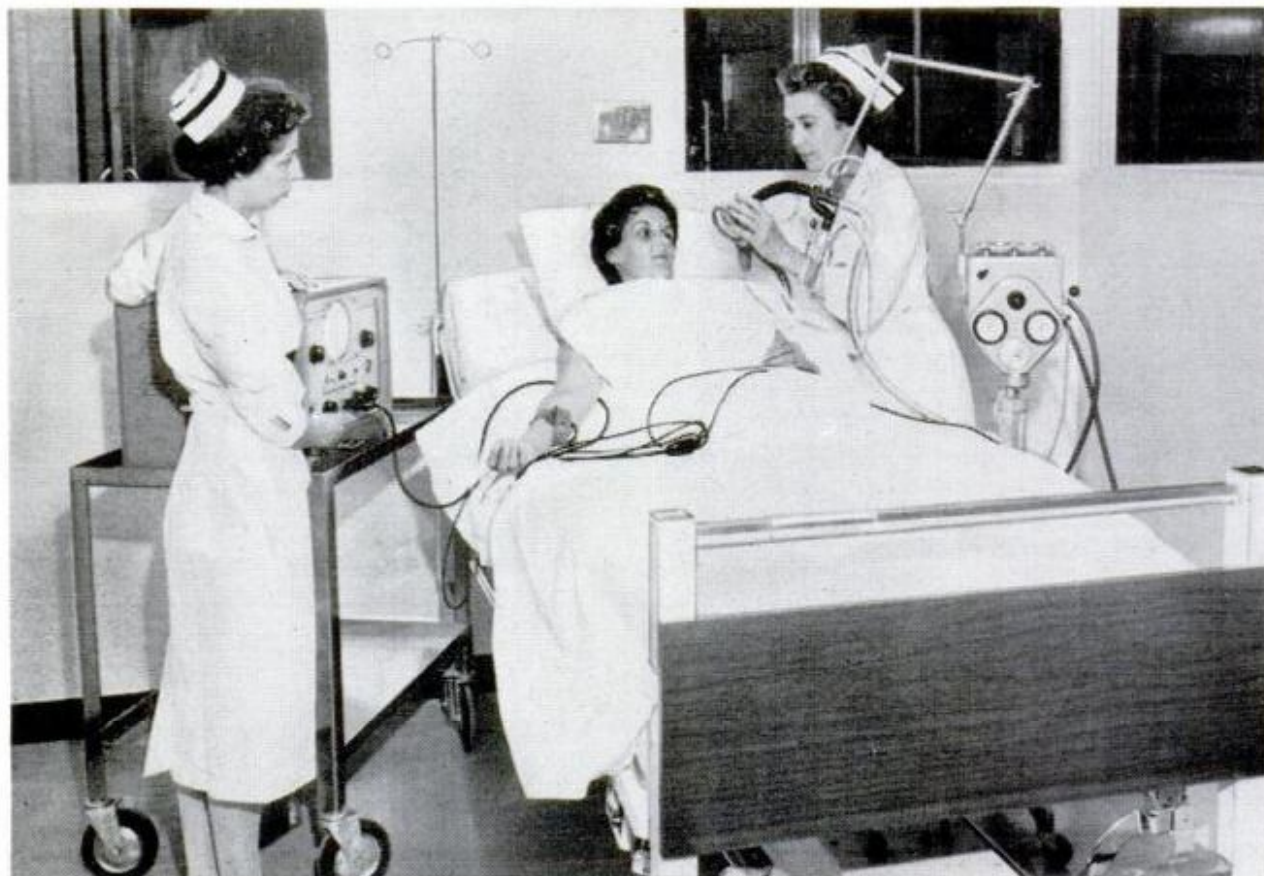
This was a tremendously exciting concept to me. It meant that in the future, computers could be upgraded to speeds tens of thousands of times faster than any previous speeds ever achieved in this type of mechanism. The engineers' development, and the subsequent application of this principle in IBM computers, has enabled us to expand our business many times and make the electronic computer a familiar element in American business.

A handwritten signature in black ink, reading "T J Watson Jr". The signature is written in a cursive, flowing style with a large, prominent "T" and "J" at the beginning.



Symbolic of the premium put on rapid handling of patients at the new Memorial Hospital in Long Beach, Calif., an injured person is flown directly to the emergency entrance in a helicopter from the Los Angeles County sheriff's department. To speed information inside the hospital, there is a network of pneumatic tubes

Electronic equipment is used throughout the hospital. This heart patient is about to receive treatment from a positive-pressure breathing machine. The progress of the treatment will be monitored by a cardio-scope which electronically and continuously displays the action of heartbeats on a televisionlike screen



Space Age Hospital

By Donald C. Carner

THE FIRST space-age hospital in the U.S.—a \$10,800,000 medical center at Long Beach, Calif.—is now in operation employing a wide assortment of electronic gear and other mechanisms as aids to diagnosis and treatment.

In the cardio-pulmonary laboratory of the 400-bed hospital, for example, highly sensitive electronic devices record minute variations in pressure within the chambers of a patient's heart. Transducers and strain gauges measure blood oxygen content as a further aid to evaluation of the person's physical condition. Guided by these findings, surgeons have saved many people otherwise doomed to die and have returned potential invalids to useful lives. Open heart surgery, now a regular practice, would be impossible without this equipment.

Patient comfort is one of Memorial Hospital's greatest considerations. Mounted at each bedside is a panel enabling the patient to adjust the head, seat or foot of his spring and mattress electrically; direct-dial telephone numbers; call the nurse on two-way intercom; control radio and television sets; plug in an electric razor; turn on a night light, and set an automatic timer on an electric clock to remind of medication and treatment times.

Labor-saving equipment and functional design help to provide improved care in the new hospital at less cost. X ray, for example, takes one-fourth the time. Film is fed into an automated developing unit and seven minutes later it emerges fully processed and ready for interpretation by the radiologist. In the kitchen, food is prepared to each patient's order, as selected from a menu. High-speed pressurized cooking units quickly change frozen vegetables into colorful, tasty dishes. Radar ranges turn out juicy steaks, lobster tails and roasts in minutes. Trays of food assembled on a conveyor belt are loaded into airliner-type heated or cooled units for delivery to patients.

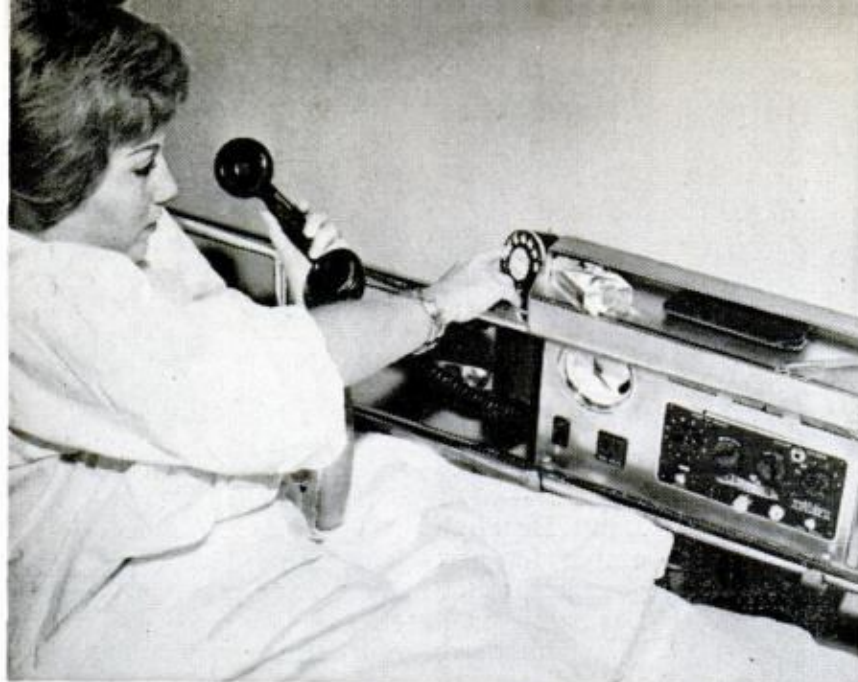
Electronic blood-scanning equipment in laboratories gives a count 10 times more accurate than the old-fashioned hand-tally method—and in a fraction of the time formerly required. Test results are sped through pneumatic tubes to physicians' floors above, doing away with the delays



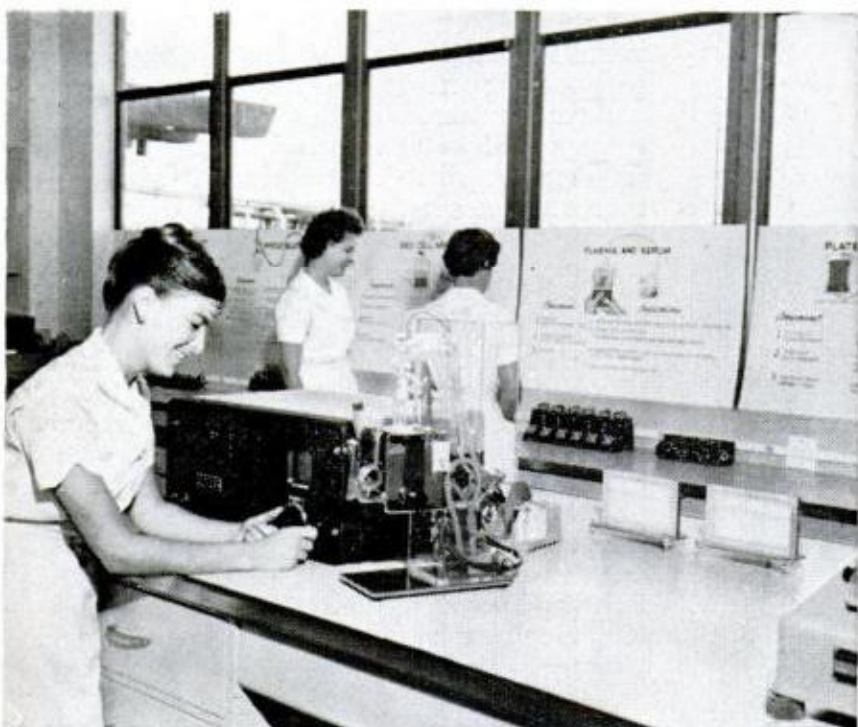
First cries of Richard Field (six pounds, thirteen ounces) energized a solenoid to open hospital doors

X-ray film is processed in seven minutes in this developer. Older method took a minimum of 30 minutes

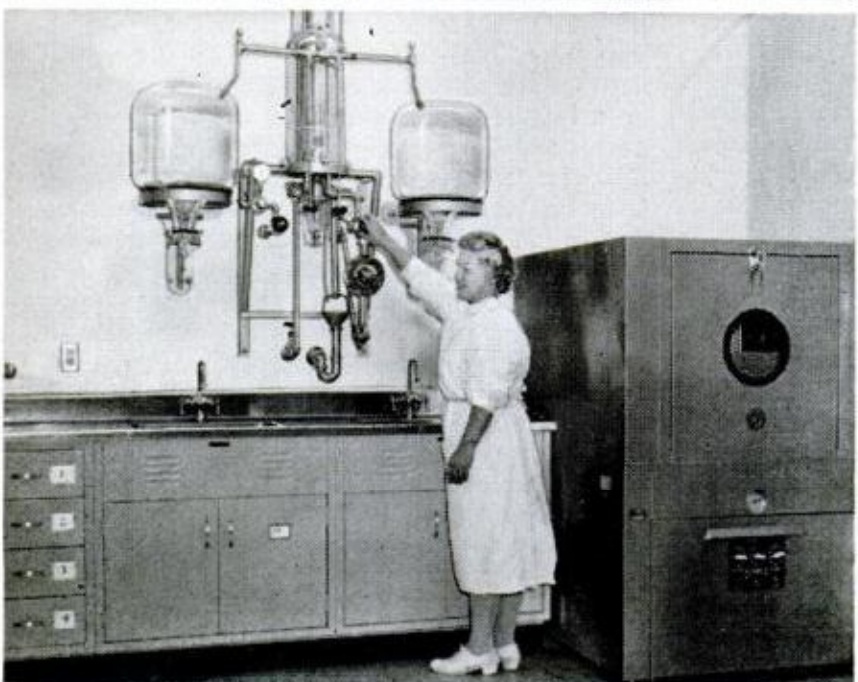




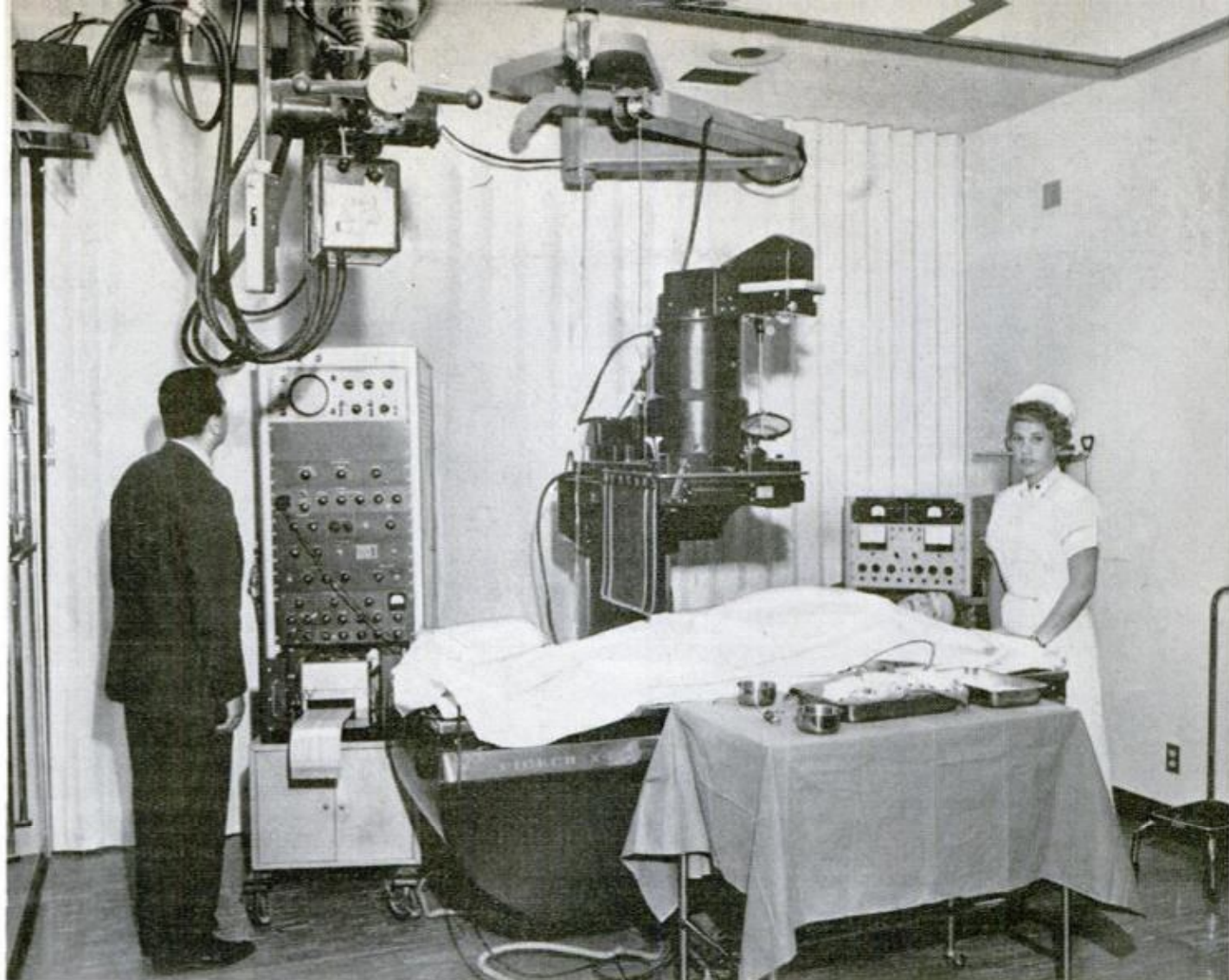
Panel for patient: From her bed she can control radio, television set; call nurse on two-way intercom; direct-dial the telephone, and set clock timer



Better blood counts are made possible with automated, electronic counting equipment. In use here, it increases accuracy 10 times over older methods



Steam-operated equipment, controlled by nurse, produces the hospital's supply of distilled water. At right is a large automatic washer for glassware



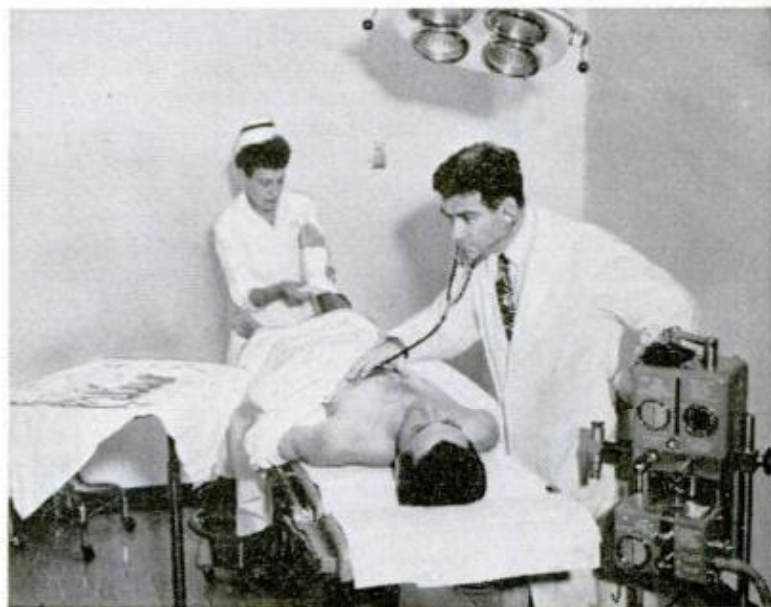
Patient being prepared for a delicate probe near heart is surrounded by electronic equipment that informs doctor of heart action, and of his progress

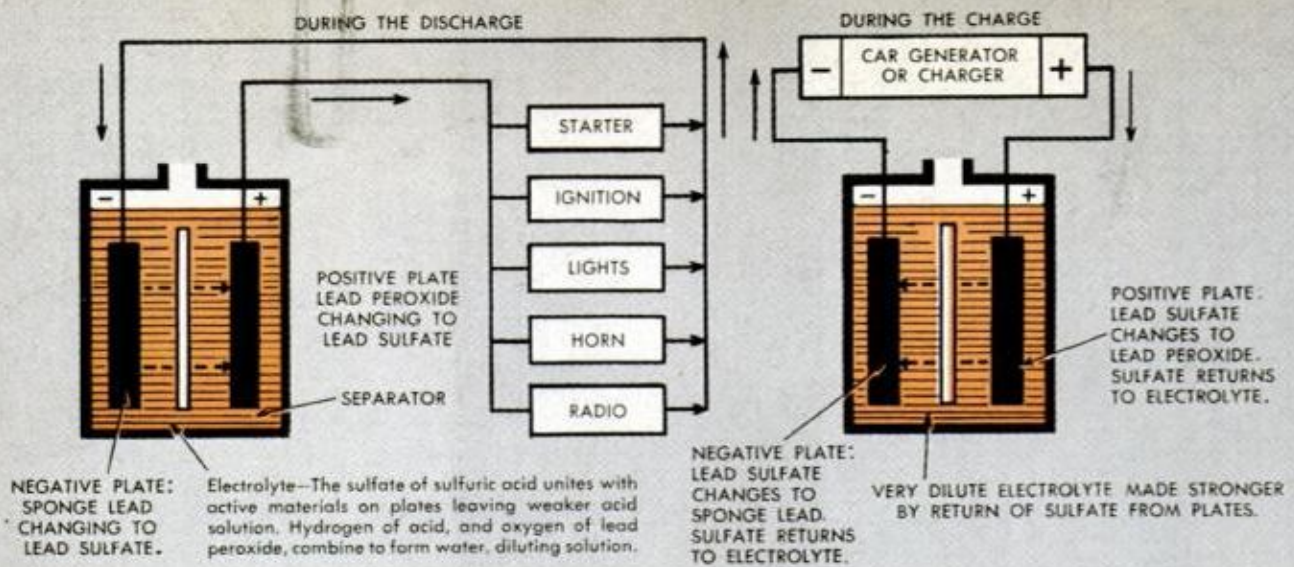
necessary when messengers made the rounds picking up requests and delivering reports. Time saved by these devices, coupled with greater accuracy in tests, enables the physician to make his diagnosis and begin treatment more rapidly. Periodic tests of blood and body chemistry keep the treatment effective, speed more complete recovery and reduce cost of hospital care.

Atomic research has opened another entire field of medical care and today many forms of radioactive material play an important role in diagnosis and therapy. For example, radioactive iodine has been of benefit to patients suffering from thyroid disease. While the boundaries of this area of medication are as yet only being charted, Memorial Hospital already has several forms of radiation therapy to treat tumors and cancers. Soon to be installed is another piece of supervoltage radiation equipment in the form of either a "cobalt bomb" or a linear accelerator.

The space-age character of the hospital—which is furnished and decorated to be warm and appealing—was established in the public mind on the day its doors were formally opened: The first cries of a newborn baby energized a solenoid which swung open the doors of the hospital to admit other patients. ★ ★ ★

Another safety device is a positive-pressure inhalation and exhalation unit, right. It is kept in the room where heart patients receive first examinations





Action of acid on lead plates produces an exchange of their basic elements, releasing electrochemical energy (discharge). Generator pours energy back into battery, redistributing elements to their original sources

What You Should Know About Your

By Ken Warner

AN OVERNIGHT DROP in temperature may find you faced with a battery which has apparently given its last. The prospect is anything but cheering and in many cases the only apparent solution is—buy a new one. However, chances are that a good, slow charge can put an old battery back into full service. This, plus a voltage-regulator adjustment and general tune-up will in many cases provide better, longer service than the expedient of buying a new battery. To see why, take a look at the principles and construction of the common storage battery.

First, a battery is little more than a plastic or hard-rubber casing filled with a sulfuric acid-water solution in which a series of lead plates is suspended. The interaction of acid on lead causes a current to be generated—though in principle the reason for

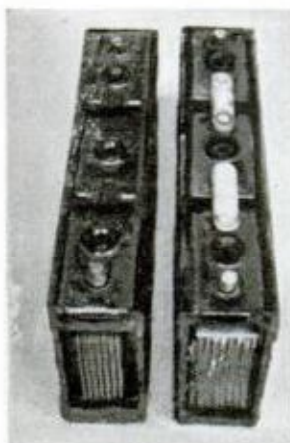
this is not thoroughly understood by science. The plates themselves are of two kinds: the *positive* plates made of a porous lead packed with lead-oxide paste; and *negative* plates made of sponge lead (lead plus lampblack). Positive and negative plates are then interleaved and separated from each other by wooden, glass-fiber or rubber separators, and a set comprised of positives and negatives is mounted in a separate compartment with its own supply of acid electrolyte, forming a *cell*.

A battery cell of this type, no matter how large, delivers approximately two volts at 80 degrees F. For this reason batteries are made up of groups of cells in a single case—three cells for a six-volt system, six for a twelve-volt system.

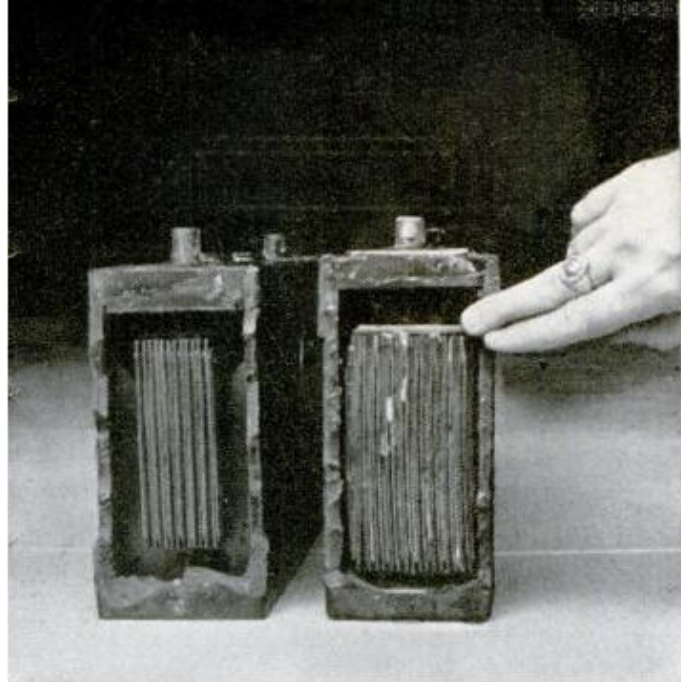
A battery, of course, remains inert until it is made part of a complete electrical circuit, at which time it delivers current. As part of the circuit, the chemical interaction of acid and lead changes the acid to a sulfate, which in time is deposited on the plates, weakening the acid-water solution and rendering it ineffective.

When the solution falls to 1.030 specific gravity, the chemical action comes to an end and the battery no longer is able to generate a current. One way to keep a close check on this is through the use of an inexpensive hydrometer. By means of a rubber squeeze bulb, acid-water solution is drawn up into the graduated cylinder of

(Text continued on page 263)

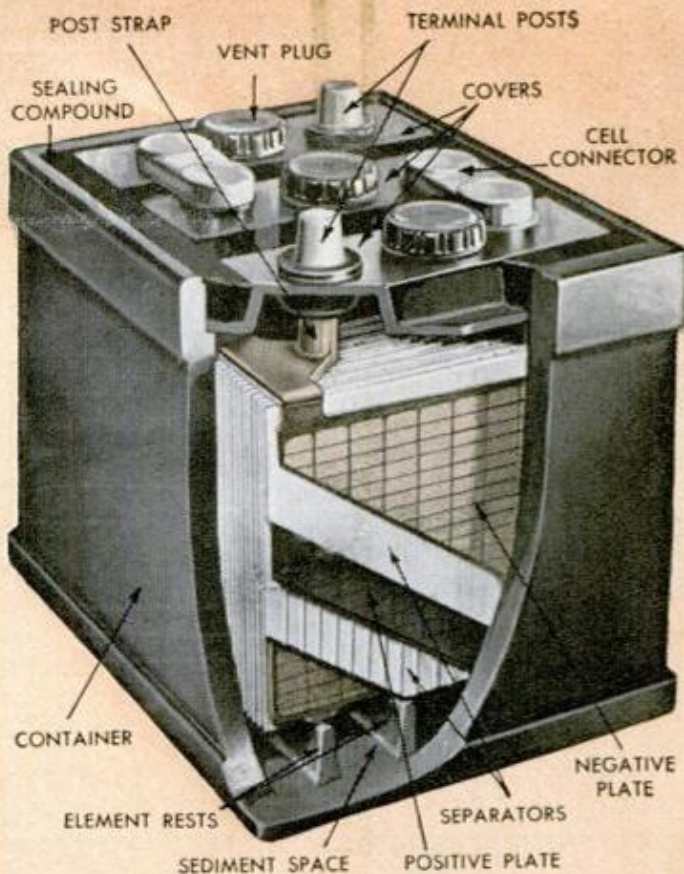


No sense advertising a battery's low quality, so some manufacturers do their best to conceal "shortcuts." Battery at the left hides its thin, inadequate connectors down in the casing. On right is a quality make with heavy connector straps plainly visible on top of the battery casing



Here's the long and short of it—"cheater plates" at left. Right, plates of full depth and weight

CAR BATTERY



THESE FACTORS DIRECTLY DAMAGE A BATTERY

Overcharging—decomposes water into gas, which overconcentrates the acid in the electrolyte. This damages separators and negative plates; creates high internal heat and this accelerates positive plate corrosion, softens case, distorts it, displaces sealing compound; can directly warp and buckle positive plates; can cause corrosion damage by forcing liquid from battery.

Undercharging—can create dense hard sulfate in plates which later cannot convert, may buckle positive plates, makes shorts; makes battery liable to freeze; may cause shorts indirectly by depositing sulfate in separators, which under later conditions may turn to lead.

Lack of water—water is one of the essentials in a battery. Plates cannot take full part unless they are completely covered; low water level indicates too-high acid concentration.

Loose hold-downs—bouncing around damages a

battery several ways besides the obvious possible crack in the case or loosened seals, which damage by turning acid loose on connectors, terminals, etc. Inside, the plates rest of their own weight on "bridges" built into the case; if they bounce they can be notched and disarranged.

Tight hold-downs—the too-tight hold-down can distort the case easily, thus allow loss of acid, particularly from end cells.

Excessive loads—using the starter to move the car should be only a genuine emergency move. Drawing this much current this quickly produces extremely high temperatures inside the battery and, of course, may also damage the starter motor.

Freezing—a $\frac{3}{4}$ -charged battery is in no danger of freezing—it is good until 62 degrees below zero. A half-charged battery however will form ice crystals at just 16 degrees below zero. A battery is $\frac{3}{4}$ charged at 1.250 specific gravity; $\frac{1}{2}$ charge is 1.200 specific gravity. (Both corrected to 80 degrees.)

THESE ELECTRICAL SYSTEM FAULTS WILL DAMAGE YOUR BATTERY

Voltage regulator set too high—battery loses water rapidly (over one to two ounces per cell per 1000 miles).

Voltage regulator set too low—battery does not regain charge, will fall to below $\frac{3}{4}$ charge, not perform satisfactorily.

Circuit shorts—short circuit anywhere, perhaps in faulty brakelight switch, will provide constant drain of current, and battery loses charge while standing still.

Damaged generator—generator is source of current

and if it doesn't put out enough, battery cannot maintain charge and will not perform.

Fan belt too loose—while fan belt is not part of electrical system, it does drive the generator, and if it is slipping, generator will not put out enough current to keep battery charged.

Corroded, dirty terminals and connections—these create high resistance, and limit available current, besides fooling the regulator into behaving as if the battery were fully charged.

WHEN YOU BUY A BATTERY, BE SURE

It is a full-size standard battery able to take the loads your car imposes. There is no penalty in over-capacity batteries.

It is full charged. If you do not know your supplier, ask for a temperature-corrected hydrometer reading, which should be 1.260 specific gravity.

That cables are long enough to reach terminals without strain.

That the installer cleans all connections bright before connecting them, that he greases the connections, that he does not drop the corrosion into your new battery.

That the hold-downs are neither too loose nor too tight.

That your radio is not turned on before connecting the battery.

That before restarting, you turn on lights to be sure ammeter light shows discharge, or the pointer shifts to the "minus" side of the scale.

That with all accessories turned off and the engine at a speed corresponding to about 30 miles per hour,

you are charging. A fully-charged battery should show a low charging rate if you have an ammeter. A rough check may be conducted on the voltage regulator now: Turn off the ignition, run the starter about 10 seconds, then start the engine and note the charging rate. It should be higher than at first, and after a little while, should settle down to the same approximate rate. With this test, you have some assurance that you will not ruin your new battery quickly, and that nothing done during the installation has affected the charging system.

Note: Voltage regulation—indeed the whole circuit—depends on conditions of use, such as temperature and amount and speed of driving. Identical machines driven differently require different settings. Identical machines driven identically in different temperatures require different settings.

All this is dependent on the individual car. If the battery is using water too fast and there are no leaks, adjustment is required. If battery doesn't use water and if it doesn't "zip" starter motor, you should adjust the voltage regulator up.



Toy Is a Man of Parts

Forty-four colorful plastic or metal parts—gears, wheels, levers and housings—form a toy called “Mr. Machine” which a child (sometimes with father’s aid) can put together or take apart using plastic nuts and wrench. When wound up and turned on, “Mr. Machine” walks on legs driven by two large wheels; his arms swing, his mouth opens and closes, emitting a squawking sound, and a bell rings. The red, blue and yellow parts that drive him along can be seen through the clear plastic housing, and the child can observe fundamental mechanical principles that make the 18-inch-tall toy work. Its path is controlled by setting a small rear wheel. Designer Marvin Glass reports girls as well as boys enjoy the toy.



Ramses' Chariot Returns

First automobile to be built in the United Arab Republic, the new Ramses makes its appearance in Cairo. Built by the Egyptian Automotive Company under the direction of European-trained engineer George Hawi, the snappy little convertible gets 55 miles to the gallon with a two-cylinder, four-cycle air-cooled engine. The pleasant but blocky design shows the influence of the massive, angular architecture of ancient Egypt, and the name is that of one of the greatest of the Pharaohs.



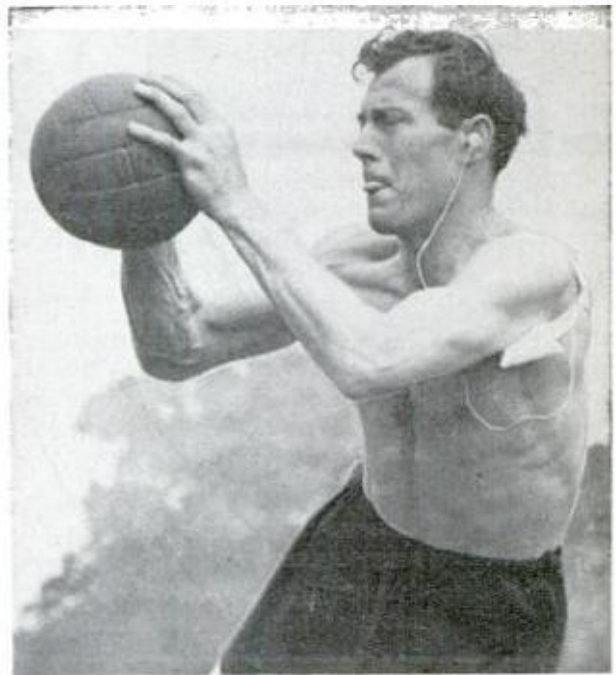
Telephone With a Memory

Capable of recording up to 850 numbers, a “memory box” can be connected to a dial telephone and, with push-button operation, automatically dial any number on the list. Each number is recorded by coded perforations on a tape; some are recorded at the factory (police, fire and other generally used numbers), but a special perforator allows new numbers to be recorded at any time. To use the box, the name of the party to be called is lined up in a viewing frame, the receiver is lifted, and, when the dial tone is heard, the starter button is pushed. The number is then dialed automatically. The system can also be used in conjunction with a “no hands,” or loud-speaker, telephone system.



Coaching by Radio

Training—and coaching—his players from the sidelines without signals or substitutes, Coach Ronnie Greenwood of the Arsenal Football Club of London (soccer to you Yanks) tests his new radio coaching system during a practice game in London. Each player wears a tiny three-ounce receiver taped to his chest under his jersey, and a lead wire runs to a little hearing-aid-type speaker in his ear as shown at right by goalkeeper Jack Kelsey. The system uses short-range short wave transmission similar to our Citizens' Band. (*Editor's note: A similar radio communication system was tried by two National Football League teams in this country several years ago, and was found very satisfactory, except that the opposing team could easily monitor the coach's instructions with their own receivers and take countermeasures. The method is now banned by NFL rules.*)

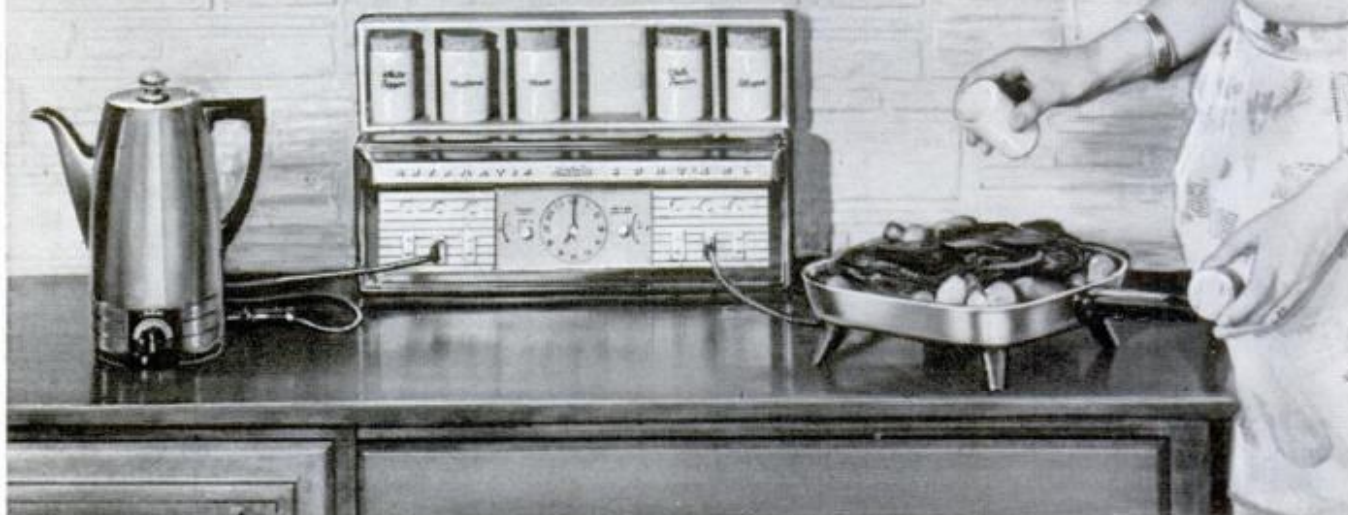


Portable Teletypewriter

Powered by a small battery, a portable teletypewriter makes possible code transmission without any knowledge of Morse. A typewriterlike keyboard has 48 letters, numbers and international code signals (SOS for "Help," etc.). The keys are wired to a bank of transistors to connect them in various combinations for producing the appropriate sequence of dots and dashes. When a key is touched, a holding relay keeps it depressed until its character is completed. Then a green light flashes.



WHAT'S NEW FOR Your Home



Sunbeam Corp., 5600 W. Roosevelt Rd., Chicago, Ill.

CONTROL PANEL for electric appliances can take cooking out of the kitchen and into any room in the house. The 220-volt power source has six outlets for skillets, broilers and coffee pot, and another that connects to a control clock for timed cooking. The panel also is used in the kitchen where it may be set into the wall

WAX APPLICATOR applies paste directly from can. When the top has been removed and the bottom taken off with an opener, can is locked into a metal plate. A guard plate is slid away and wax then feeds onto the floor surface. Twisting the handle controls the amount applied

Art Mart, P.O. Box 1524, Mansfield, Ohio



CARRIER puts baby in a canvas swing. Distributing weight over the parent's body, it takes support from one shoulder, one hip. The carrier is buckled on, comes in a variety of colors, is made of washable cotton and folds to fit into parent's pocket or purse

Papoo Seat, 3011 Las Palmas, Houston, Tex.



CALORIE COUNTER on one side has a window through which the caloric content of 300 foods is displayed. On the other side are dials that, when spun, tote up the content of any one meal, or day's intake. The plastic counter, trimmed in gold, also holds a supply of saccharin

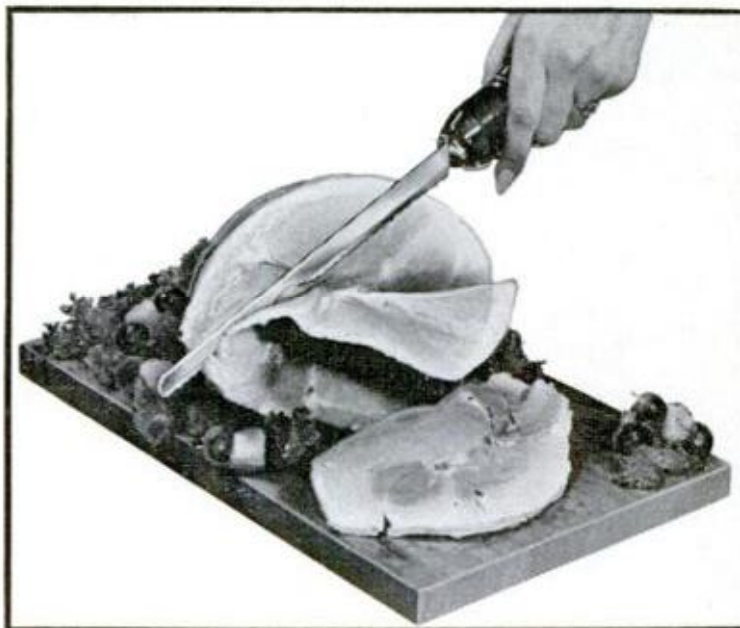
Springfield Instrument Co., 163 Clay St., Hackensack, N.J.



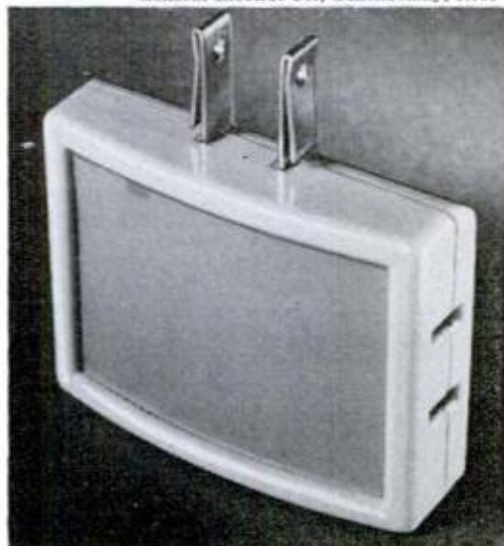
ONE-HANDLE FAUCET can be accurately regulated even if all you have free is an elbow. Raised or lowered, one lever-like handle adjusts flow; moved right or left, it adjusts precisely to right temperatures
 Standard Screw Co., 377 Woodland Ave., Elyria, Ohio



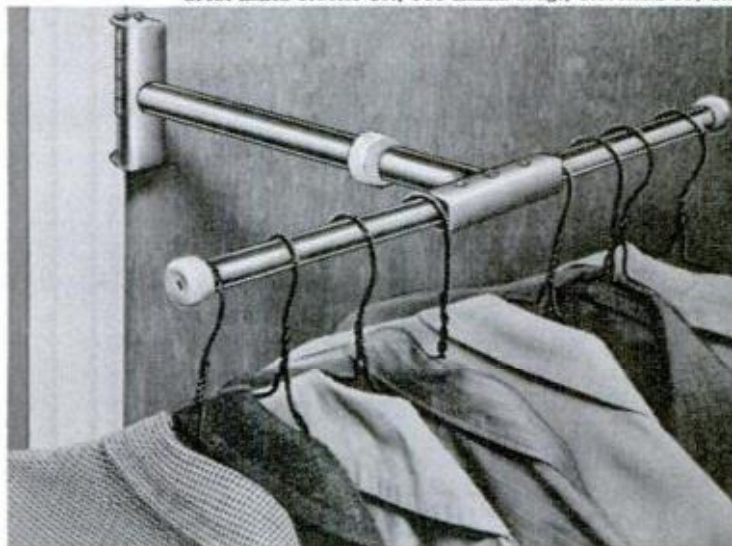
ELECTRIC CARVING KNIFE carries its power in its handle. Battery-powered, the serrated steel blade makes 7200 cutting movements a minute. Set comes with a carving board, handle, two blades, three booklets
 Burgess Vibrocrafters, Inc., Grayslake, Ill.



NIGHT LIGHT employing electroluminescent principles can be set flat against a wall, or at any angle up to 90 degrees, and can be hung at any height. It has three outlets into which equipment may be plugged
 General Electric Co., Schenectady, N.Y.



CLOTHES HANGER which attaches to hinges can make door into extra closet. It is suspended from the top hinge of door and requires no separate screws; the door pin secures the bracket. The hanger can be folded and still hold a few garments. Its chrome-plated tubing is rubber-covered at points of contact
 Great Lakes Tractor Co., 510 Hanna Bldg., Cleveland 15, Ohio

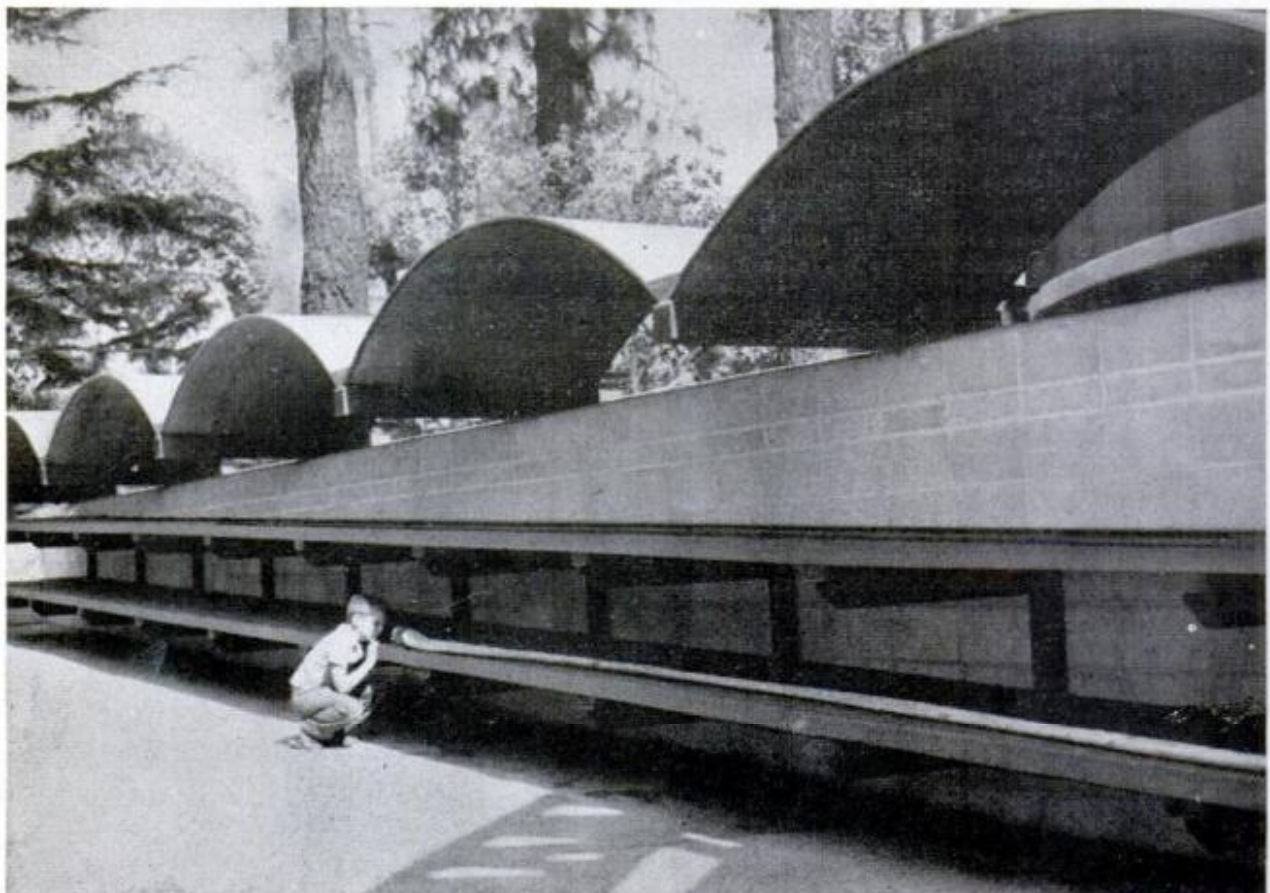




California Fire Station Is a Circular Pavillion

Set in a wooded park, a new fire station in Berkeley, Calif., is an unobtrusive circular pavillion that houses two trucks and the chief's car. The one-story station has glass walls between concrete columns, vinyl floors, beamed ceilings. Flanking the

equipment area, circular enclosures house dormitory, kitchen, day room and bath. The 50-foot lengths of hose are dried on slotted, slanted racks (below). The only firehouse feature missing—but not needed—is the familiar brass pole.



PM's NINTH ANNUAL AUTO SECTION '61

*A*S WE TURN the corner into a new year, the automobile industry stands smack in the middle of what may be its greatest period of change. It's an evolutionary era in which things are happening so fast that the results seem revolutionary when looked at from the perspective of just a couple of years ago.

In the 1960-model year, four new cars were introduced, five if you count Dart separately. For 1961 we have four more new ones, and before another 12 pages are torn off the calendar there will probably be one, possibly two more. And, like most of the compacts of the past two seasons, these new cars to come will not be built up of bits and pieces from a sister car's parts bin, but will be new designs, fresh off the drawing board.

The present period of restless turmoil in the auto market was the result of the public's expression of disenchantment with the large, powerful and uneconomical medium-priced cars which accounted for such a large slice of the market in 1955 and which have been shrinking in numbers ever since.

The cold reception to the Edsel in 1957-58 was the tip-off to top management.

So the industry gambled, and Falcon, Corvair and Valiant won out with massive sales last year, repeating the success of Rambler and Lark a year or so before.

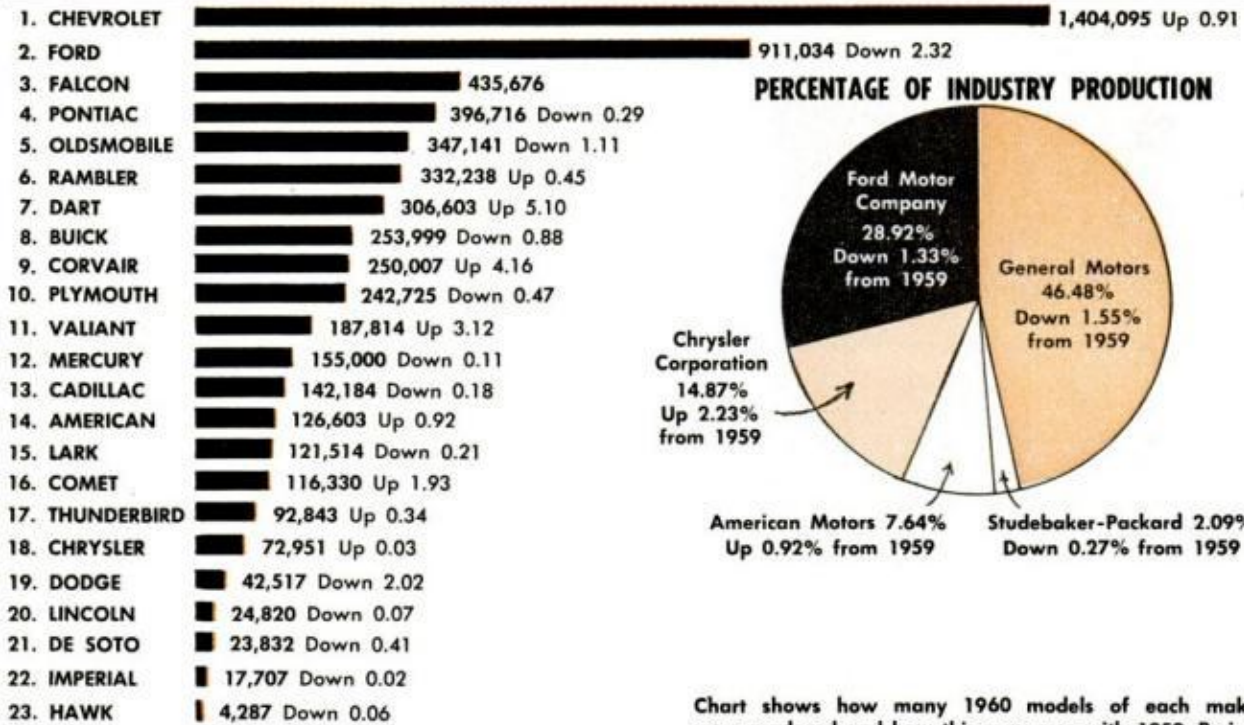
In 1960 Ford Motor Company's Comet proved that compact-car buyers could be coaxed into paying a few dollars more for a bit more comfort and luxury as long as the selling price remained within the basic economy-car price range.

Another happy fact established was that Detroit hasn't lost the knack of producing truly practical cars. Buyers of the new compacts, as well as owners of the established Rambler and Lark, rejoiced in the simplicity and efficiency of their cars and marveled at their high degree of comfort and roadability.

The light weight and efficient use of limited space, as well as the

(Continued to page 248)

PRODUCTION OF 1960 MODEL PASSENGER CARS



PERCENTAGE OF INDUSTRY PRODUCTION

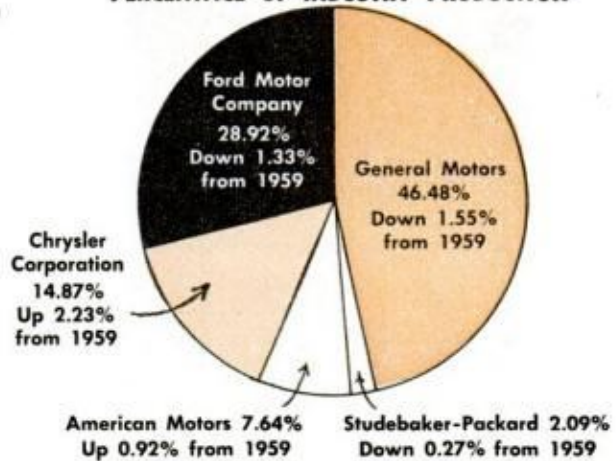
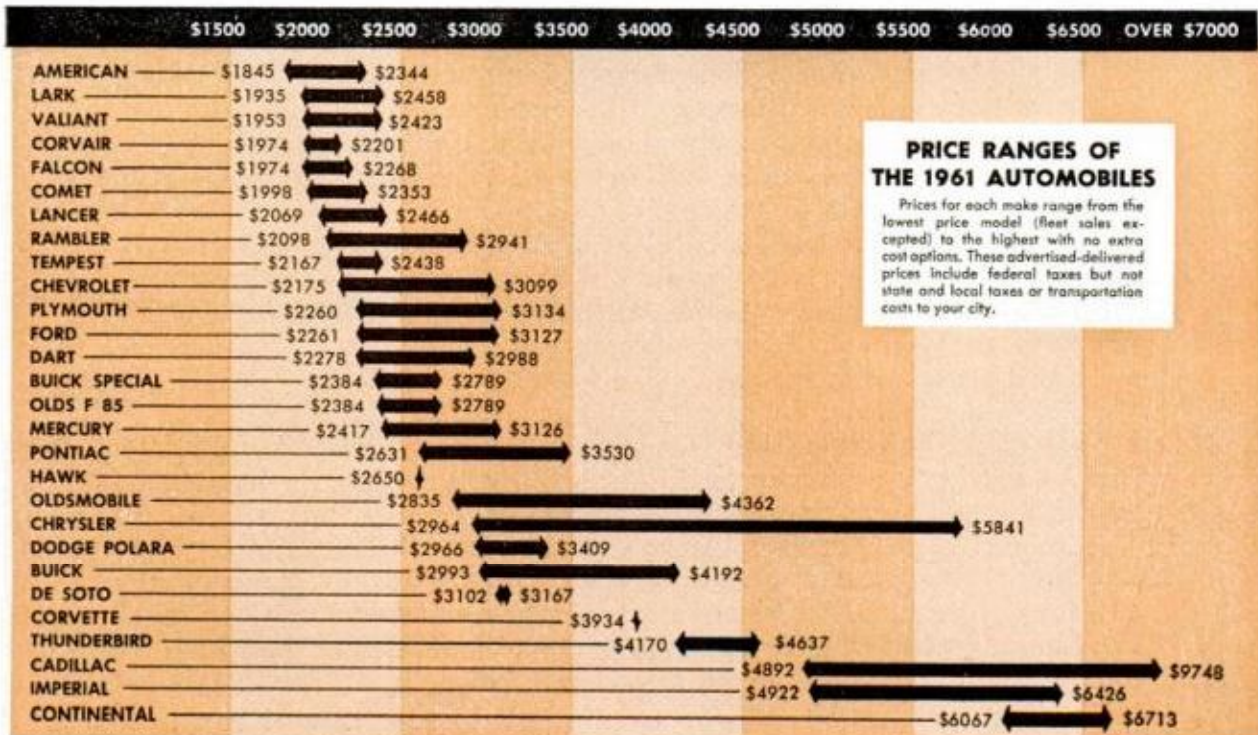


Chart shows how many 1960 models of each make were produced and how this compares with 1959. Period covered is approximately a year, beginning August 1959.

TOTAL FOR INDUSTRY—6,011,482 passenger cars—Up 7.3% from 1959

PRODUCTION FIGURES for the 1960-model year are shown above on bar graph for individual makes. Percentages, following numerical totals at ends of graph bars, indicate the rise or decline of a given make in terms of any "Up" or "Down" in its percentage of the total industry production. For example, in the case of Chevrolet, "Up 0.91" indicates a production increase of 9/10 of a percent (of the industry total) over 1959. In the case of Corvaair, Comet and Valiant, their "Up" percentages are their totals as well. Falcon's percentage (not indicated above) was 7.24 percent. Rambler's graph includes the Ambassador production

PRICE RANGES of individual makes for 1961 illustrate the close price grouping that places more than half of the makes within the \$2000 to \$3000 range. Note the wide range of Chrysler cars. You can buy one for either the price of a Dodge Dart or a low-priced Cadillac



PRICE RANGES OF THE 1961 AUTOMOBILES

Prices for each make range from the lowest price model (fleet sales excepted) to the highest with no extra cost options. These advertised-delivered prices include federal taxes but not state and local taxes or transportation costs to your city.



BUICK SPECIAL

PONTIAC TEMPEST

DODGE LANCER

OLDS F-85

Comparing the **NEW '61 COMPACTS**

By **Jim Whipple**

Photos by **Don Honick**

THE PURPOSE of this multiple-car road test was to learn as much as possible about the four new 1961 compacts, Buick Special, Pontiac Tempest, Olds F-85 and Dodge Lancer, and to compare them.

In testing these cars we drove five of them for a total of approximately 4000 miles. (Two Lancers were tested, one with a 101-horsepower engine, the second with an optional 145-horsepower version of the Dodge slant six.)

In all cases, except the Tempest, at least 500 miles of break-in driving was put on

each car before making the 168-mile economy run or taking performance figures. On the Tempest, which was tested in a short period before announcement date, mileage was over 300 when the test commenced.

In an effort to be consistent, cars were equipped with automatic transmissions. (Once again our Tempest, a stick-shift job, was the exception, being the only car available at the time.)

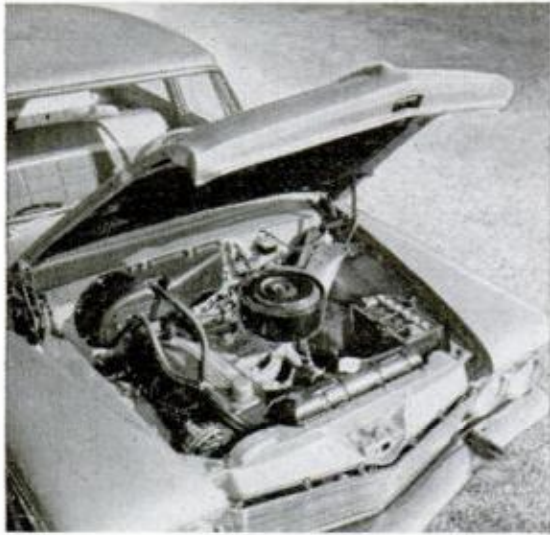
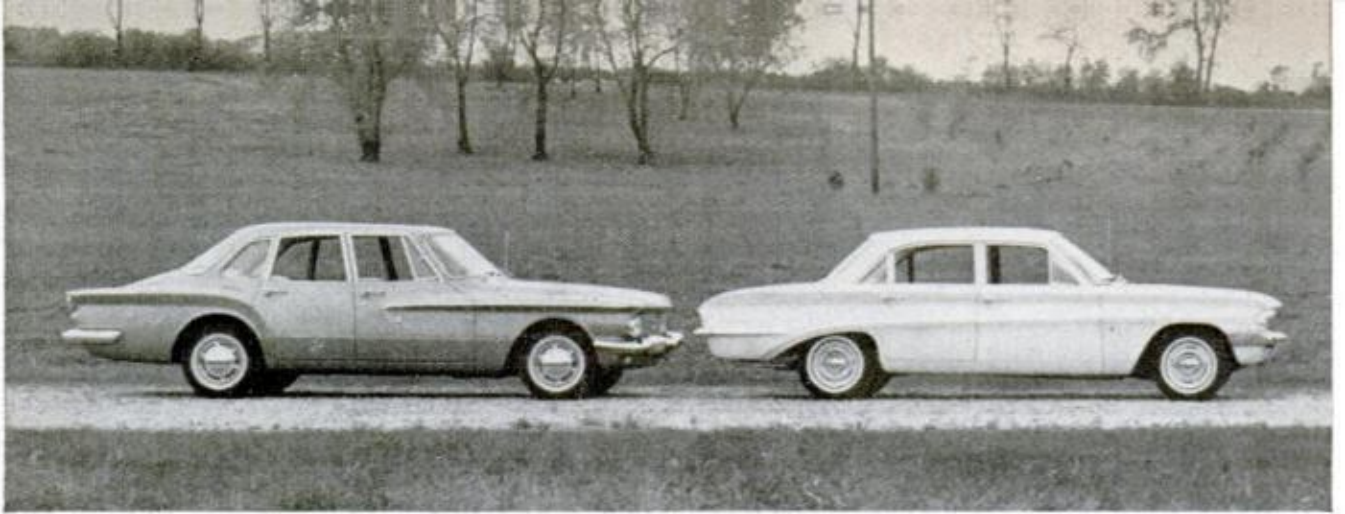
The cars were driven in dense city traffic, on winding dirt roads, on boulevards, high-speed turnpikes and country highways.

CAR:	DODGE LANCER		PONTIAC TEMPEST	OLDS F-85	BUICK SPECIAL
Model:	770	770	Standard	DeLuxe	DeLuxe
Engine:	OHV 6	OHV 6	OHV 4	OHV V-8	OHV V-8
Cubic Inches:	170	225	195	215	215
Horsepower:	101	145	110	155	155
Axle Ratio:	3.23:1	3.23:1	3.55:1	3.23:1	3.08:1
Miles Per Gallon*	20.0	17.9	16.7	17.7	17.5
Acceleration: miles per hour in secs.					
0-60	17.4	13.7	15.7	12.5	12.0
40-60	10.1	6.0	8.0	7.3	5.2
50-70	11.2	9.8	9.5	8.7	7.0
60-80	15.2	12.2	10.8	11.5	9.1

* Measured over 168-mile course; 96 miles turnpike, 34 miles country road, 38 miles city traffic. All fuel was Phillips 66 Regular from same pump.

Alike as two peas in a pod and offering equal entry and exit space, legroom, seating height and width are these two GM compact bodies, the Pontiac Tempest on the left and Olds F-85 on the right. The third member of the GM compact trio, the Buick Special, not shown, shares the same body and general interior dimensions





Lancer's lively Six and its accessories are easily reached for service. Engine is satisfactorily smooth and quiet at normal speeds



Even the compact engine compartment of the Olds F-85 seems huge as it surrounds the neatly designed, lightweight aluminum V-8

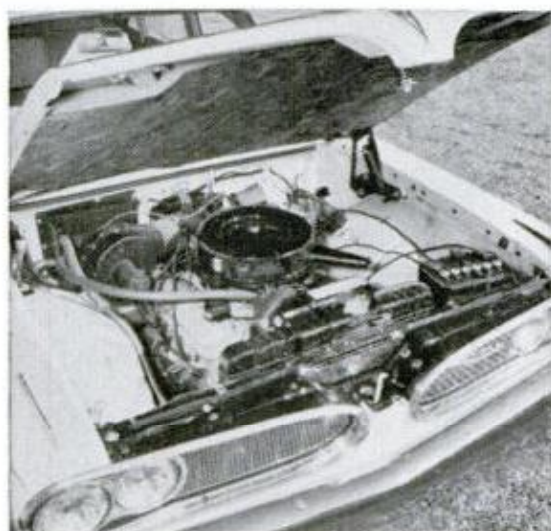
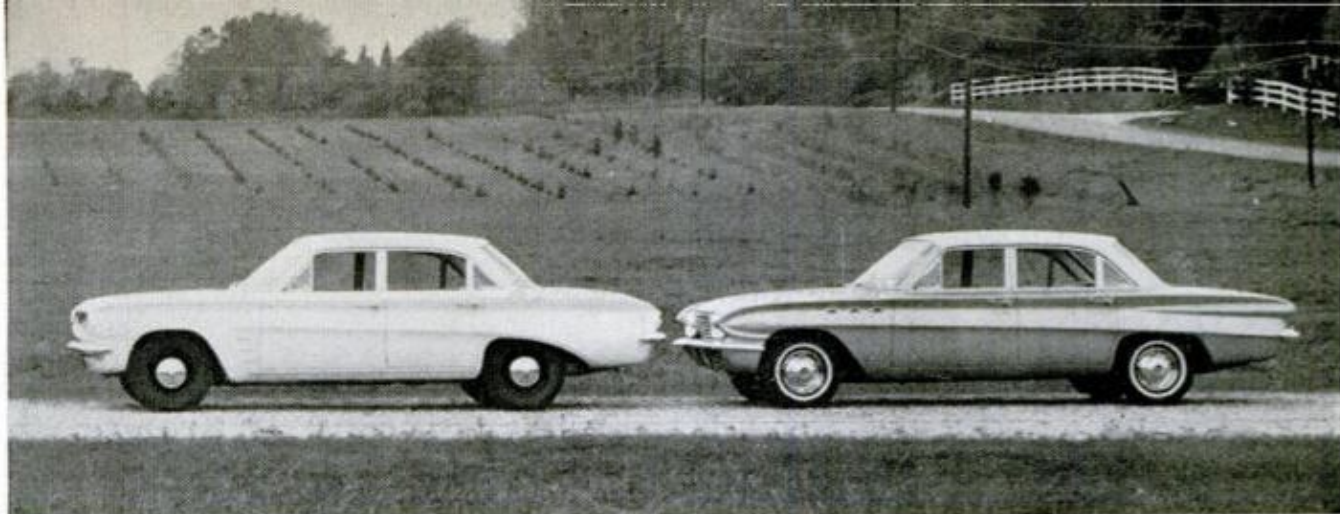
The Cars

Buick Special; four-door sedan, deluxe trim, automatic transmission, radio and heater. Base price, \$2519 (including federal excise tax, but not optional equipment). Olds F-85; four-door sedan, deluxe trim, automatic transmission, radio and heater.

Base price (as above) \$2519. Pontiac Tempest; four-cylinder four-door sedan, standard trim, manual transmission, heater, \$2167. Dodge Lancer four-door sedan, deluxe trim, automatic transmission, 170 and 225-cubic-inch displacement engines, \$2154 and \$2197 respectively.

Lancer's front door opening, left, is a full 36 inches high, as the yardstick shows, compared to 34-inches for the Special, F-85 and Tempest. Lancer's front seat is 1½ inches lower than the other three new compacts





Tempest's cast-iron Four is easy to work on, weighs about 200 pounds more than either aluminum V-8. Note thick, glass-fiber silencing pad



Plugs, carburetor, distributor and other accessories are easy to reach on the Buick Special. Generator is placed low on right side

Bodies

All four cars have unit-construction body frames composed of hundreds of stamped steel parts welded together into an integral structure. Front fenders bolt on, as do bumpers, grilles, and of course, the hinged doors, hoods and deck lids.

The Buick Special and Olds F-85 bodies are exactly the same except for shape of fenders, grilles and obvious trim items. All interior dimensions on those two cars are virtually identical.

Pontiac Tempest has more legroom in the front compartment (center and sides) due

Rear-door opening on the Lancer, left, is 1½ inches higher than the Special's and its rear-seat cushion is a full 13½ inches from the floor—one inch higher than Special's. Cars are equally easy to enter or leave





Stick-shift Tempest made 0 to 60 m.p.h. in 15.7 sec. Good passing punch logs 50-70 m.p.h. in 9.5 sec., 60-80 m.p.h. in 10 sec. Top speed, just under 90



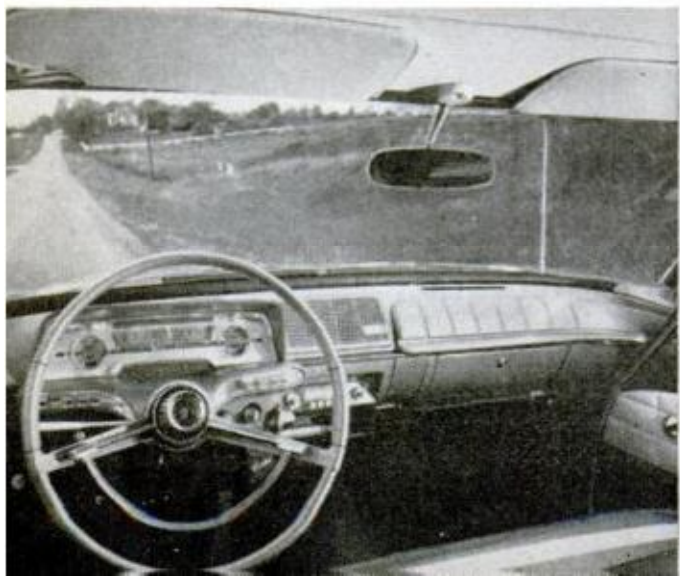
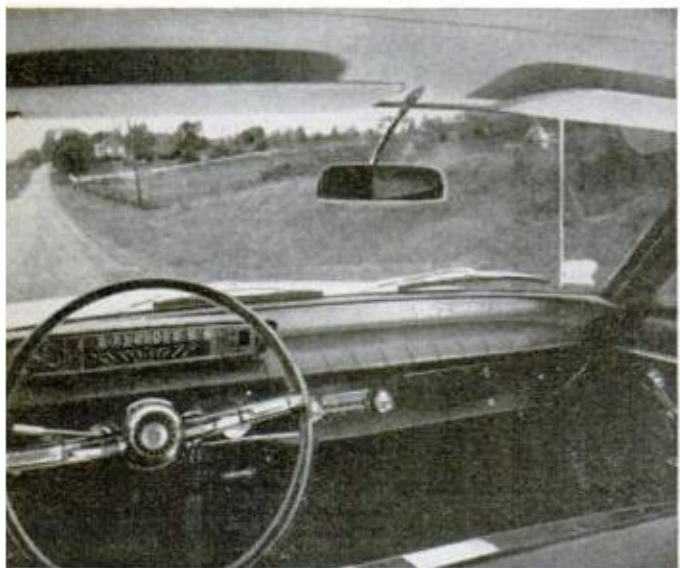
With a smaller engine, Lancer was slower than others in the group, doing 0 to 60 m.p.h. in 17.4 sec., 50 to 70 m.p.h. in 11.2 sec. and 60 to 80 m.p.h. in 15.2 sec.



Tempest handles well at normal speeds. Steering—precise, though slow. Corners hard under light load, rear swing-axles "camber"—rear end slides out



Lancer steers easily, precisely; rolls least of all four in cornering; hugs the curves nicely and stays on course better when the going starts getting rough



to rear location of transmission. Thanks to curved torsion-bar drive shaft, Tempest's tunnel creates less of a floor bulge in both front and rear compartments.

Interiors

In the other three cars tunnel bulge and transmission humps are easier to live with than most new cars. And there's not one of the four in which you "bottom" in the center of either front or rear seats.

On the three GM cars, the driver's seat is a bit higher, angled for a more erect seating position. The Lancer front seat is a bit lower and a bit softer. Lancer's front-seat design will please those who prefer a more lounge-like seating situation; one that caters to the passenger rather than the driver.

As in any other compact or small car, and some big ones too, front seat positions turn out to be compromises, best suited to the average physique, to an extent neglecting those whose size puts them on the smaller or larger-than-average ends of the curve.

A man with longer-than-average legs will find that none of the four front seats adjusts quite far enough to the rear.

(Text continued on page 260)

F-85's vision and instruments, above left, are typical of GM compacts. Windshield is deeper than Lancer's, below, but latter's sloped hood gives equal visibility



Olds has good passing punch with Hydra-Matic transmission which can be placed and held in "S" (third gear) for powerful uphill climbing or for downhill braking

Buick Special is best in passing with 40-60 m.p.h. acceleration time of 6 sec., 9.8 sec. for 50-60 m.p.h. New automatic transmission is the secret



Olds F-85 with smooth, light easy steering is a delight, though softer-acting suspension tends to produce more lean in sharp cornering than do the other three

With the least roll of all three GM compacts, and coming close to cornering ability of Lancer, was Special. All cars took same curve at 45 m.p.h.



Two big two-suiters and two over-nights outside Lancer's flat trunk

Here cases fit into Lancer's trunk with almost room enough for another set

Lancer makes trunk space with spare tire under floor

F-85's spare tire hogs space. Same cases fit with little room to spare

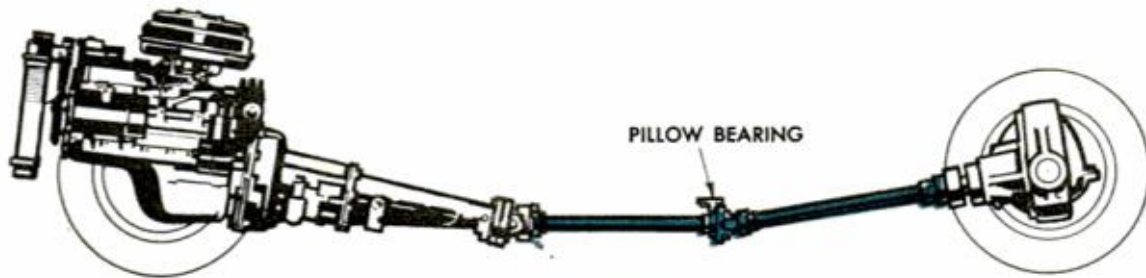
Same story with Special's trunk—housings for hinges block precious space

Spare near floor center gives Tempest the least space



An Engineer Analyzes the

By Roger Huntington, ASAE



OLD WAY

Keeping pace with the demands for improved passenger space, engineers have tackled the problem of "mid-floor hump" with a totally new idea in drive shafts. Illustrations on these two pages compare old with new. Above is old design—two shafts and three universal joints

TEN YEARS AGO the chassis on American cars were all pretty much alike—big "X" frames, coil springs and "wishbone" independent suspension in front, solid axles on coil or leaf springs in the rear and simple one-piece drive shafts. Either everybody was right or everybody was wrong in those days. Things are different today.

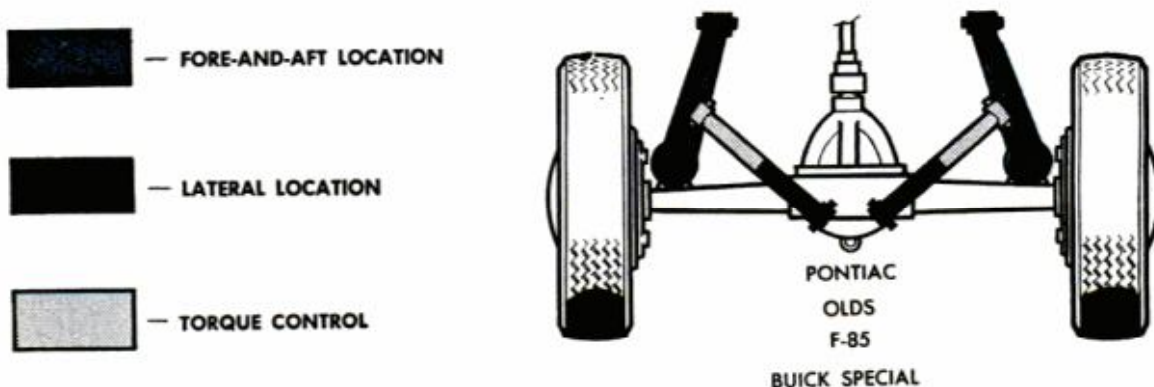
Under the 1961 cars you will find frames of all shapes, or even no frames at all; every type of spring from leaf to torsion bar; four-link rear suspensions and strut-type front suspensions; two-piece drive lines, and rear-mounted transmissions with independent rear suspension.

It seems as if everyone is trying something new and different this year, and the reason seems pretty obvious: The average buyer is becoming smarter and more particular these days. He's not buying mere size, style, horsepower and prestige as he once did; he's looking for basic value, utility, advanced engineering and economy as well. Thus, Detroit is straining to please everybody and the result is a pretty wide variety of basic mechanical designs. Let's have a closer look at the '61 chassis.

The Frame Problem

The biggest problem in frame design today is whether to use a frame at all! For many years our most progressive auto makers have been welding up their bodies in sturdy box units and attaching the running gear directly to the box without any massive subframe. We call this "unit" construction.

Shown below and on the facing page are basic rear-suspension designs employed by General Motors on some of its 1961 cars. Basic to all of them is a solid axle and coil springs





NEW WAY

A new concept in drive shafts is that employed in the Pontiac Tempest, above. In place of the bulky shaft sections is a thin, $\frac{5}{8}$ -inch torsion bar that bends and twists like a speedometer cable. It permits a lower shaft tunnel, absorbs much of the vibration and requires no universal joints

All our new compact cars feature it, and Chrysler and Lincoln-Thunderbird use the principle for their big cars. It works very well, resulting in a very stiff body, fewer rattles, lower floors and potentially lighter weight because they've eliminated the heavy frame.

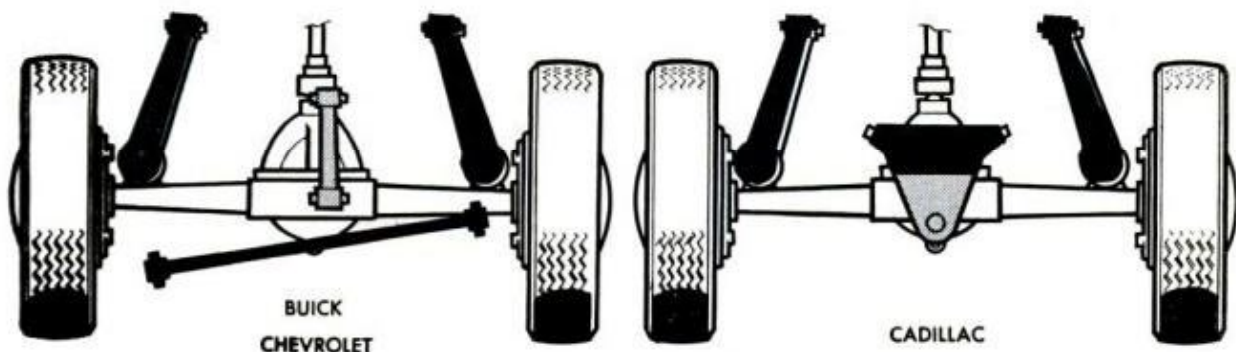
But Detroit is far from unanimously in favor of unit construction these days. GM and Ford-Mercury stick doggedly to the old frame on the big cars. They don't like the high cost of converting regional assembly plants to unit-body production, and they contend that it also costs more to make annual styling changes.

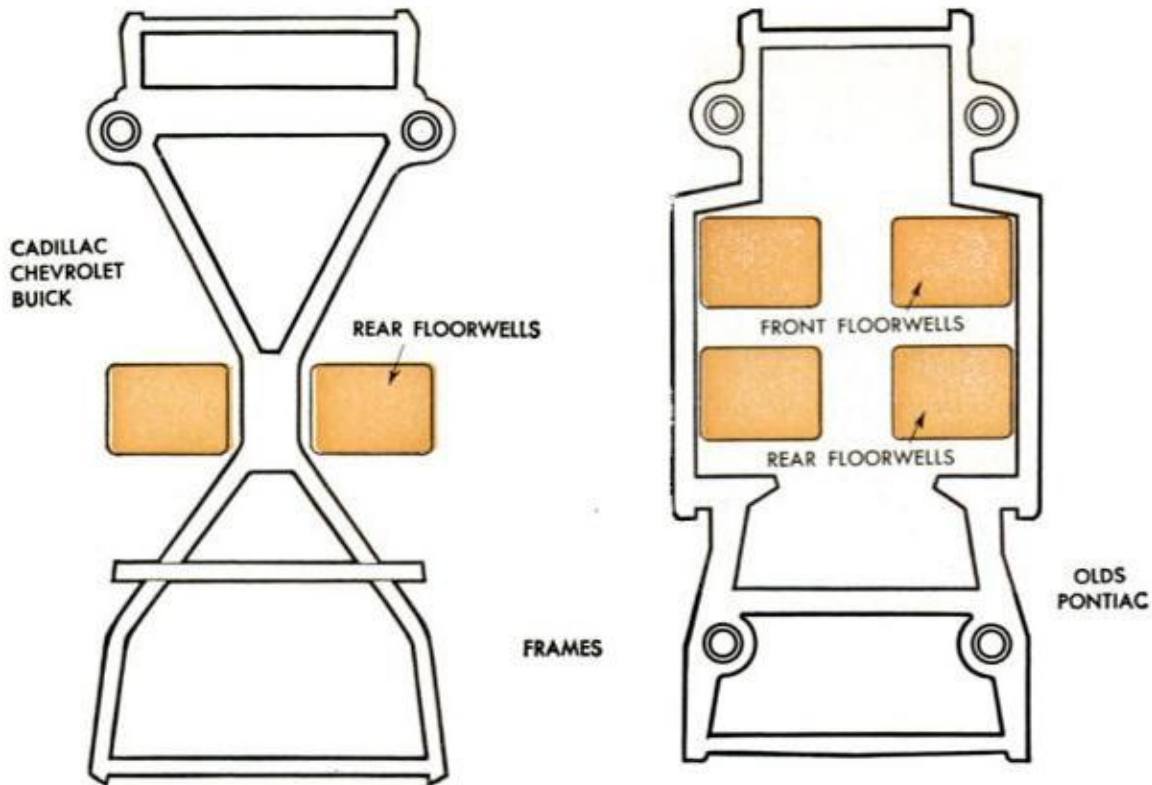
Then too, that big frame is doing more of a job than we give it credit for, especially on long-wheelbase cars. Some body designers say it acts as a heavy anvil for the springs and shock absorbers to pound against, absorbing road shocks and preventing them from being transferred to the passengers. On a unit body the boxlike body-frame may, in effect, become a huge bass drum and actually amplify road rumble.

There are still plenty of problems with both the separate frame and the unit bodies, but as of now it looks as though both will be around for some time.

It's interesting to note the differences in frame design between the various GM divisions. Cadillac, Buick and Chevrolet use a massive "X" design without side rails, with foot wells for the back seat only. Olds and Pontiac use wide-spread box frames with no central "X" member and side rails

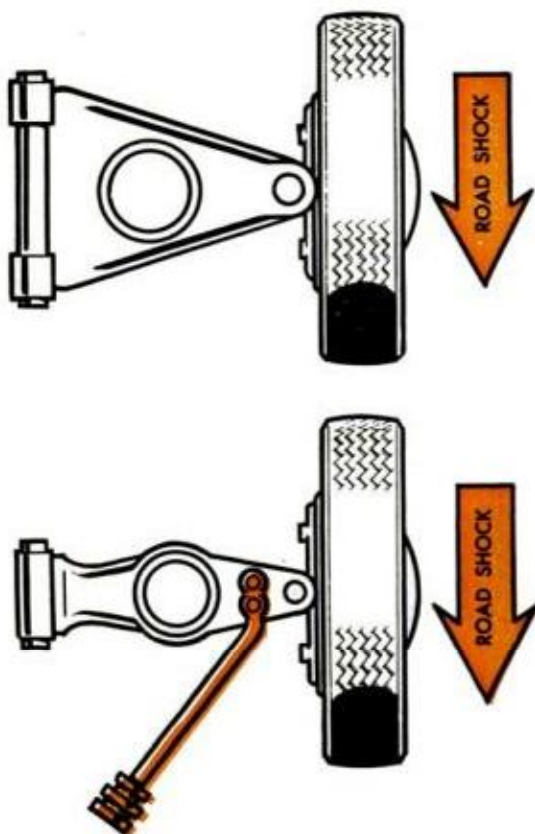
Linkages shown below control fore-and-aft location (blue), lateral location (black), torque, which tends to twist the axle, (gray), and combined torque-and-lateral control (black and gray)





Evolution in automobile-body design must begin with new ideas in the frame. Above right, General Motors' wide-spread "box" frame, used on the big Olds and Cadillac, allows deep, step-down foot wells in the front passenger compartment. Though more rigid, the "X" frame doesn't allow as low a front floor

Shown below is General Motors' newest addition to improved suspension systems. The two illustrations compare the old "wishbone" (top) with the new torque strut employed by Corvair, Pontiac Tempest, and Cadillac. The advantages of the torque strut are better anchorage and bracing against road shock



running *outside* the floor area. These have "step-down" floors in both front and back.

Which layout is best? The "X" frames are stiffer—might show fewer squeaks and rattles after years of wear—but the box frames give more foot room and chair-height seats in front. Take your choice.

The Transaxle

When Corvair came out with independent rear-wheel suspension and a rear-mounted transmission last year, nobody in the industry got very excited—simply because the car had the engine in the rear, and this layout requires the independent suspension and in-unit transmission.

But when Pontiac chose the "transaxle" for the new front-engine Tempest compact this year, Detroit sat up and took notice. Progressive auto engineers have been beating the drum for this layout for years. Not only do you approach the ideal 50-50 weight balance on front and rear wheels, but the heavy transmission mass at the rear acts in conjunction with the engine mass at the front to increase the "dumb-bell effect" of the body. This slows down the

(Continued to page 251)

ENGINES

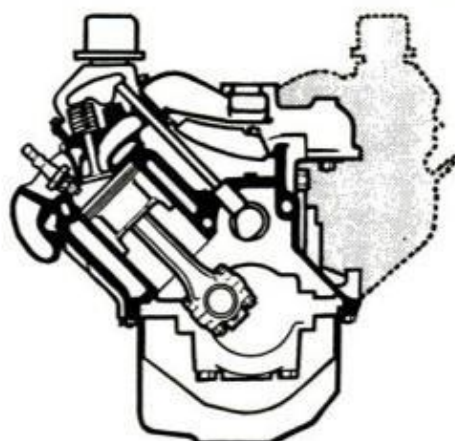
IT'S BEEN 12 years since the American auto industry has brought out a true "milestone" engine—a basic design that pointed the way for the whole industry for years after. The last time was the Olds and Cadillac introduction of the short-stroke overhead-valve V-8 layout late in 1948.

Today, we have another such design in the small, aluminum V-8 engines for the new Olds and Buick compact cars. This is a prototype of tomorrow's American passenger car engine. This type of power plant should be standard or optional equipment in almost every make of car by 1965.

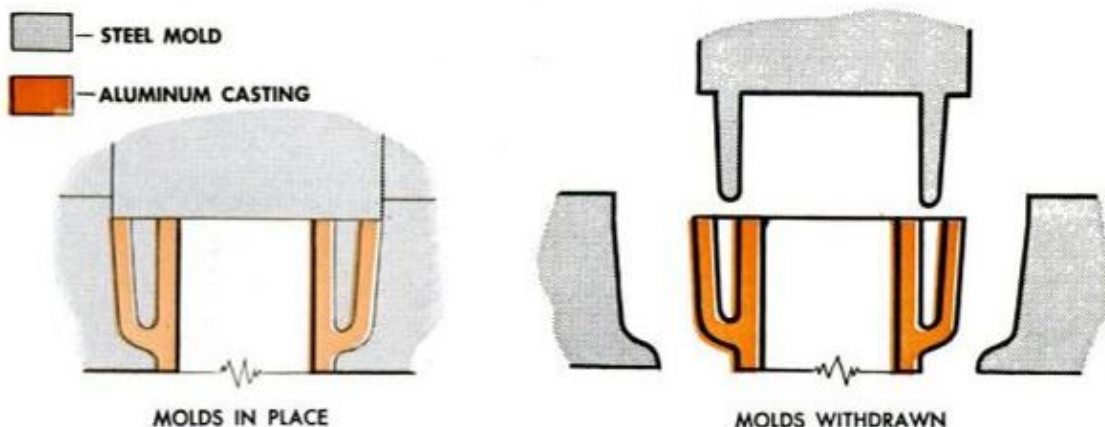
Aluminum Is Here to Stay

There are a number of reasons why aluminum is considered the "material of tomorrow" in our auto industry. A big factor, of course, is lighter weight. You can whack 200 pounds off the weight of an engine by casting it of aluminum instead of iron.

Not only is this 200 pounds saved directly, but the lighter engine allows the frame, suspension and steering components to be designed just a bit lighter too. Result: quicker

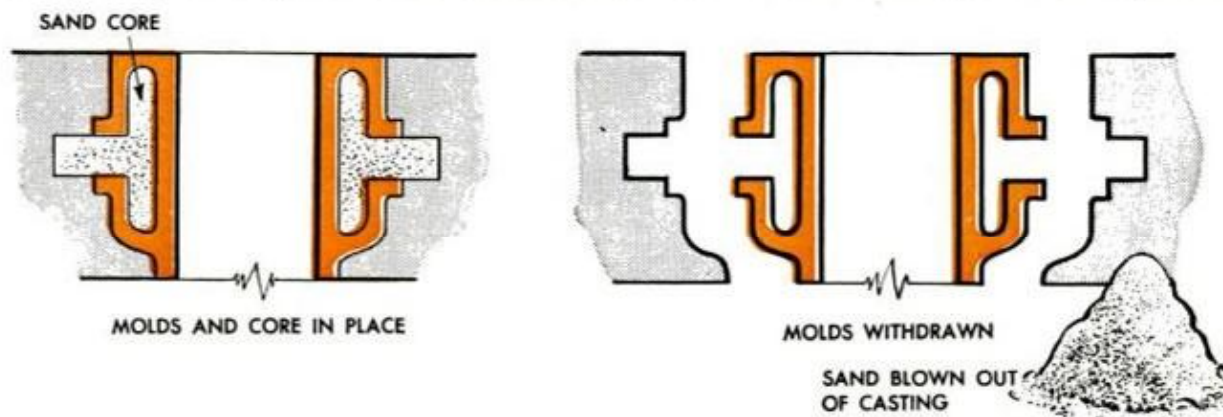


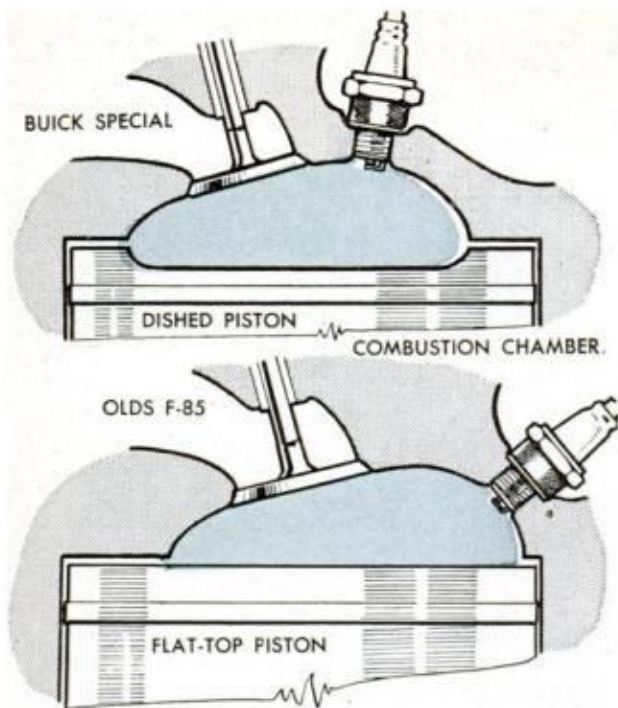
New Pontiac Tempest's slanted four-cylinder engine is, in effect, made by leaving off the left bank of the big Pontiac V-8. Machined on the same production line, it uses the same heads, pistons, rods and valves as the V-8, but weighs about 100 pounds less. To date, it is the only American "four" on the road



American Motors' aluminum engine blocks are die cast by forcing molten aluminum into steel molds and around steel cores. Resulting water passages are thus open at the top, and in the completed engine must be sealed at the top by the engine's cylinder head. Though tooling for this process has proved to be more expensive, it has the advantage of permitting high-speed production of more highly finished parts

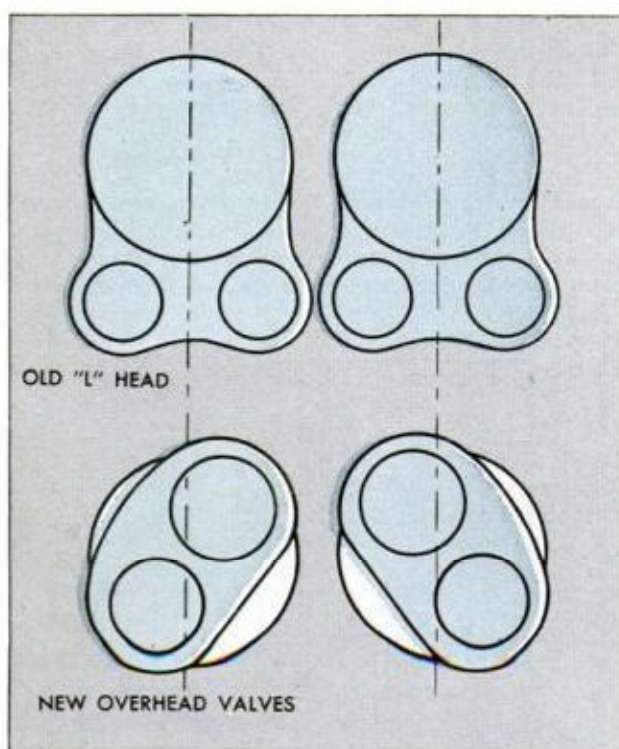
Illustration below shows the "semipermanent mold" technique used by General Motors. Here, sand cores are used in conjunction with steel molds and the molten aluminum is poured in rather than forced in under pressure. Once the molds are removed, the sand cores are blown out and the water passages have only to be sealed by core plugs in the block. This represents an older and somewhat cheaper method of production





Though the new Buick Special and the Olds F-85 use the same aluminum V-8 block, their heads and combustion chambers are different. Shown at top are Buick's oval chamber and "dished" pistons with the spark plugs placed near top center of the chamber. Olds, above, uses the conventional "wedge"-shaped chamber, flat-top piston and larger ports and valves

Not to be outdone, Studebaker-Packard has come up with a new overhead-valve cylinder head featuring staggered valves. This allows larger diameter over the original three-inch bores and narrow-bore center-to-center distance fixed by original block tooling. Intake-valve area has thus been increased 30%, exhaust 20%, and horsepower is up from 90 to 112



acceleration with a given horsepower rating, better gas mileage, and a more maneuverable, better-handling car. Cutting weight is always the best way to improve performance.

But Detroit engineers would never have switched to aluminum if its only advantage were lighter weight. Perhaps the biggest factor with them is cost—and we all know aluminum costs four or five times as much per pound as iron. The equalizing factor is that aluminum is easier to cast and machine. With its low melting point (around 1100 degrees F.), aluminum can be cast quickly and easily in steel molds. Finished castings can be shelled out of the special casting machines like popcorn. And when you die-cast there's no fussing with time-consuming sand molds and cores.

Also, casting dimensions can be held closer with steel molds, so less machining is required for the finished part. Finally, aluminum is very soft compared with iron, so it can be machined in a fraction of the time required for iron. Over-all result: even though the metal costs more than iron, the cost of a finished aluminum engine can actually be less.

This is the reason for aluminum engines. But one very significant difference should be noted in the way GM and American Motors cast their aluminum engines. GM uses the "semipermanent mold" method, where there are steel external molds, but internal passages are made with sand cores, and the molten metal is poured into the mold by gravity. American Motors uses the high-pressure die-casting technique. The casting must be specially designed to avoid internal passages and undercuts, so all-steel molds can be used, and the molten aluminum is forced into the mold under 8000 pounds pressure.

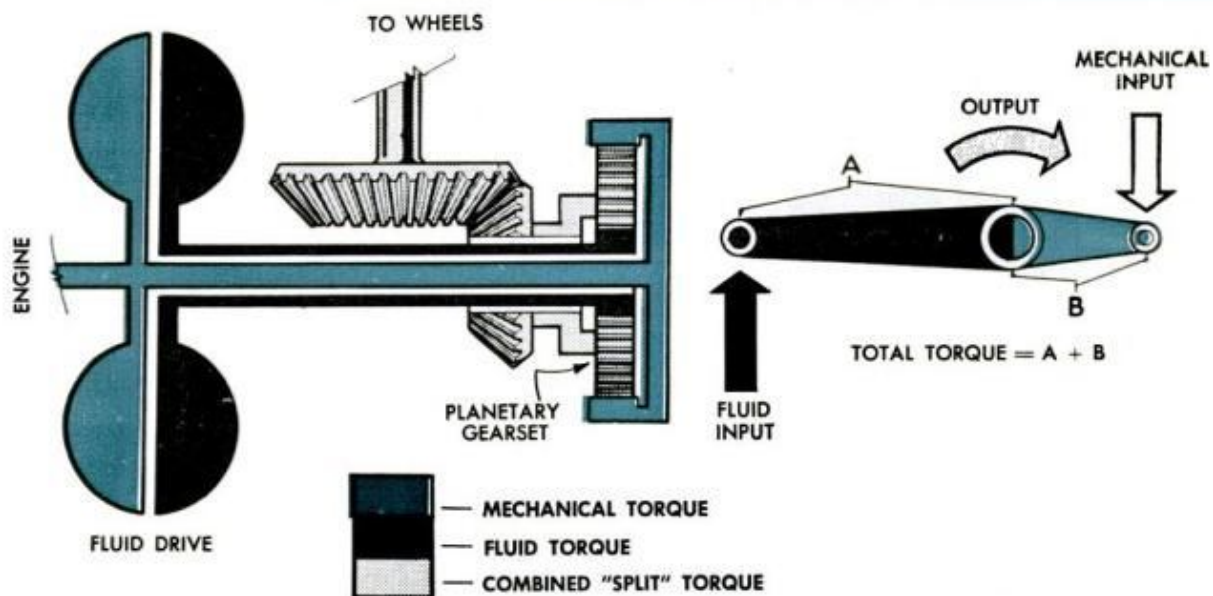
The die-casting method is quicker, requires less floor space and gives a stronger casting structure; also, thinner sections can be used for lighter weight. The big disadvantage is that the huge die-casting machines cost a lot more than permanent-mold equipment. Time will tell who's right.

The new aluminum engines have many interesting features. All use separate cast-iron cylinder sleeves to withstand friction of the moving pistons. These are placed in the mold before casting and the molten metal poured around them to lock them firmly in place.

The Buick-Olds V-8 requires cast-iron inserts for the valve seats and guides. The soft aluminum head material could never take the pounding of the valves. (They have very hard silicon-aluminum alloys that will stand the gaff, but Detroit hasn't learned how to cast and machine them eas-

(Continued to page 272)

TRANSMISSIONS



Three new automatic transmissions—Hydra-Matic, Buick Special's and Tempest's—feature "split torque" in high gear. Output direct from engine and via fluid turbine is fed to different elements of planetary gearset, above left, splitting torque load between them, above right, according to gear ratio (usually 40-60 mechanical and fluid). In effect, the transmission works like a two-handle crank employing different-length arms

IT BEGINS TO LOOK as if Detroit's recent "economy wave" may have as much effect on transmission design as it has on the shapes and sizes of cars in general. The all-new 1961 transmission designs show a complete reversal of thinking. The last new designs three years ago were just plain complicated, and expensive, too, with their triple turbines, switch-pitch stators and multiple gears.

In performance they probably came closer to the theoretical ideal than any designs we've ever had; but the fact remained that they were expensive to buy and maintain—and the public was fast getting fed up with costly family transportation.

Detroit has changed the script for '61. New designs brought out this year are simpler, lighter, cheaper and have fewer parts, gears, clutches and turbines. They get the job done, and the cost of producing and maintaining them is only a fraction of the more complex designs. The "ideal" transmission may be delayed another five years, but you'll drive for less money in the meantime.

So let's have a look at the designs that can be considered completely new for 1961.

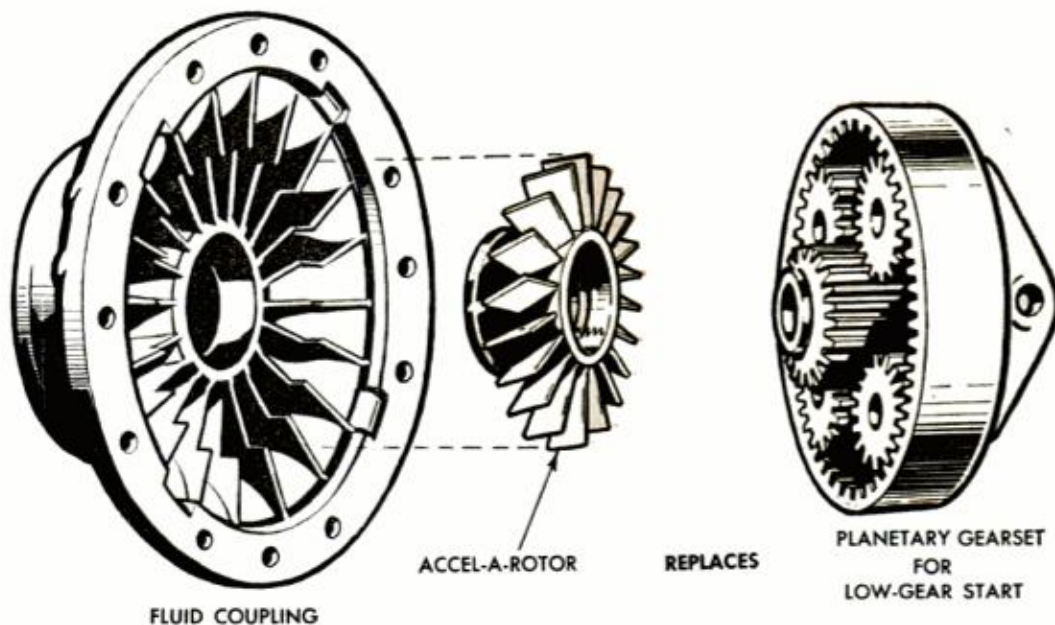
The Three-Speed Hydra-Matic

General Motors' basic four-speed Hydra-Matic transmission has been with us, with relatively minor design changes, for no less

than 22 years! In many ways it was obsolete. It was too big, too heavy, had too many parts and was too complicated. But it was also probably our quickest-accelerating transmission from a standing start with its "power" low gear. GM transmission engineers were given the job of designing a new three-speed Hydra-Matic that would have virtually as good performance—yet be a lot smaller, lighter, have fewer parts and be cheaper to produce. They have done just that.

There are two major design changes in the new Hydra-Matic. First, there's a secondary turbine (called the "Accel-A-Rotor") between the two main turbines of the fluid coupling unit, geared direct to the rear wheels. The small Accel-A-Rotor's turbine blades deflect the normal oil flow and have the effect of *multiplying* the engine's torque (turning effort) 1.3 times when the car starts up from a standstill. Then, as the car picks up speed this secondary turbine rotates with the main units, and we have a normal fluid clutch. Thus a simple bladed turbine wheel takes the place of "low gear" in the old four-speed Hydra-Matic and eliminates one complete planetary gearset!

The other innovation in the new Hydra-Matic is that its main fluid coupling unit has been reduced in diameter from 11.6 inches to 8.0 inches. Normally, just a small reduction in the diameter of any type of fluid



Secondary turbine (Accel-A-Rotor) in new three-speed Hydra-Matic multiplies torque 1.3 times at start giving the same effect as the old low gear while eliminating one complete planetary gearset from the transmission

coupling will cut the torque capacity drastically. But GM engineers had an idea. Why not boost the "charging pressure"—the pressure at which the oil is pumped into the turbine unit—to achieve the same effect as using a heavier, thicker oil? It worked. They're now running a charging pressure of 180 pounds per square inch on the new Hydra-Matic, compared with 45 pounds on the old four-speed. The problem of oil seals to resist this terrific pressure caused plenty of headaches.

The over-all result: The new three-speed Hydra-Matic is only a fraction of the size of the old four-speed, weight has been reduced from 220 to 145 pounds (120 pounds on the small model for the Olds F-85), there are 185 fewer parts, it's a lot cheaper to build and service and acceleration performance is comparable to that of the old model.

Buick Special's Torque Converter

Buick engineers have scored a real triumph when it comes to *simplifying* an automatic transmission! Their new two-speed torque converter for the Buick Special is a marvel of simplicity and efficiency in a package of minimum size and weight.

There are several important features. For one thing they get by with *one* simple planetary gearset for all gearing functions. Normally, you need two simple planetary gearsets or one compound type, for a two-speed transmission. Buick's secret is in the reversing system.

To reverse, the control lever engages a clutch that locks the fluid turbine *output* element that normally drives the rear wheels. The *stationary* reactor then becomes the output turbine, the oil circulates in the opposite direction in the fluid unit—

and the car backs up! It's so simple that nobody ever thought of it before.

The Special's transmission also features "split torque" in Drive range. In this case the output torque from the engine is split so that about 40 percent goes direct to the rear wheels through gears, and only the remaining 60 percent is subject to fluid slippage in the turbine.

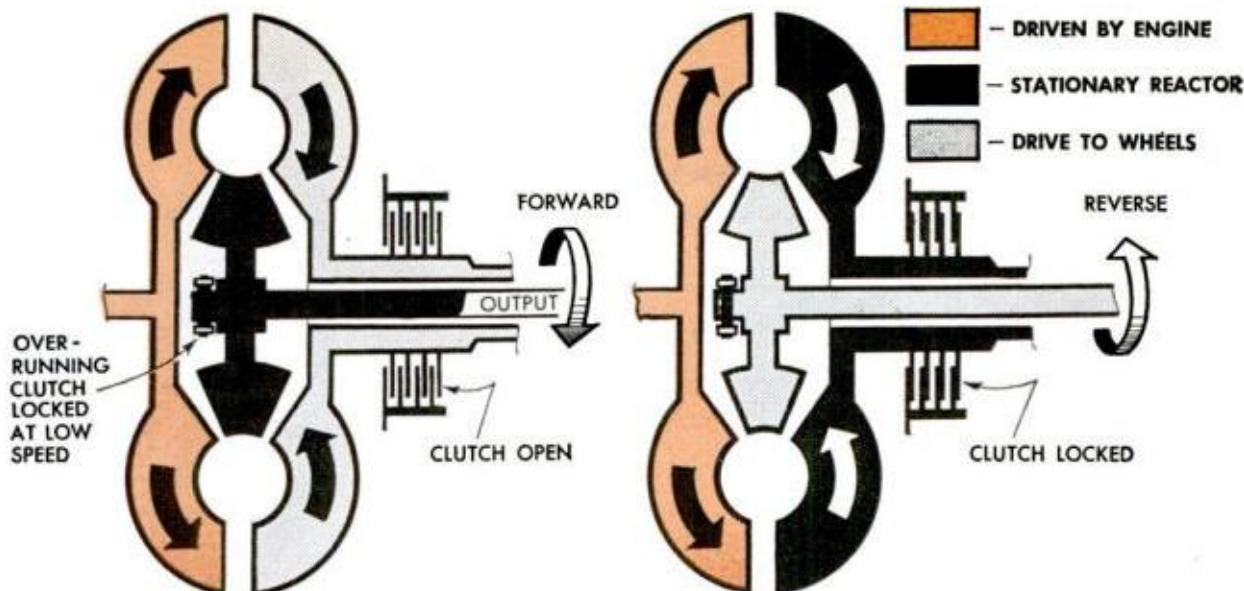
This feature is only possible with a three-element planetary gearset. Normally one of the gear elements is locked. But if you feed torque from the engine-driven turbine to one element and torque from the output turbine to another—with no element locked—you can take the *total* of the two torques off the third element to drive the wheels; result is less slippage in the fluid coupling and better gas mileage on the road. (The new Hydra-Matic and Tempest-Powerglide transmissions also have this feature.)

The Special's transmission is a midget alongside comparable designs in other cars—and weighs only 96 pounds. Beautiful engineering!

A New Stick Shift

Chrysler has tooled up for a brand-new, heavy-duty stick-shift transmission for its high-performance 1961 models. This doesn't sound too special until you realize that most of our basic manual-shift transmissions were designed and tooled more than 20 years ago, and relatively little engineering has been done on them since. With automatics taking a bigger and bigger share of the market there was no reason for changing. But now, the new economy trend in American car design has changed all that. The stick shift may be here to stay!

Chrysler's new design can take all the



Buick Special's new automatic transmission obtains reverse by switching the function of the driven members in the torque-converter unit. Temporarily, the forward-driven member becomes the stator and the stator itself functions as the reverse turbine, thus eliminating the need for an extra planetary gearset

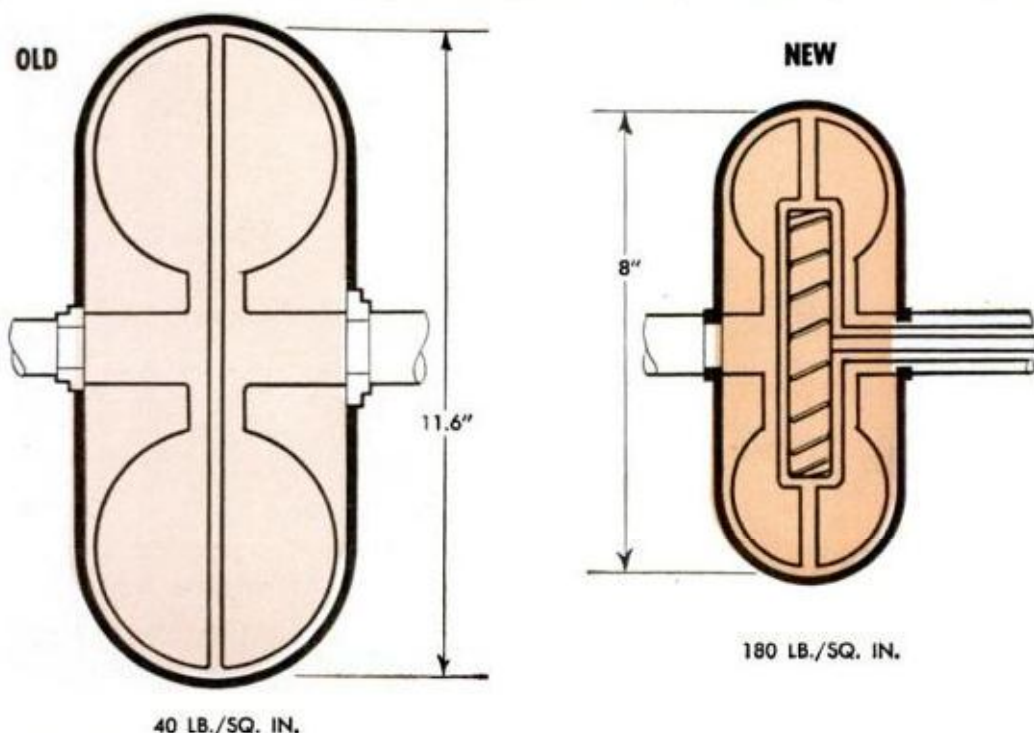
punishment you can put to it with a big, modern high-torque engine. It features a closed case for maximum strength, positive pin-type synchronizers, wider gear centers and a rear ball bearing. Chrysler may still be using this box in 1970!

Other 1961 transmission developments and trends: Ford now controls automatic shifts by a smooth vacuum "linkage" instead of the old throttle rods. More and more aluminum is being used in our transmissions, both to reduce weight and to reduce costs by taking advantage of precision die-

casting. Even the old four-speed Hydra-Matic gets a new aluminum case this year for the lower-priced GM lines. And one of the craziest trends yet is the reappearance of the four-speed floor-shift transmission. Chevrolet brought back the idea for the Corvette sports car in 1957. Now you can order an optional four-speed on Chevrolet, Pontiac, and Corvair sedans, on Studebaker Hawks, and rumor has it that Ford may have one ready by next spring!

Don't try to predict what Detroit will do next—they'll fool you every time. ★ ★ ★

To reduce the size of the Hydra-Matic fluid coupling, engineers use greater "charging pressure" of oil in a unit 3.6 inches smaller. The effect is the same as would be obtained by using heavier oil. The advantage, of course, is that the same amount of torque can be as efficiently handled by a turbine of smaller size



PM's *Eight All-Time Great* **CLASSIC CARS**

By Jim Whipple

STUTZ, MARMON, PACKARD, Pierce-Arrow, Duesenberg, Chrysler Imperial, Lincoln, Cord. These were America's great cars. If you were around at the time, there is no need to tell you that they were classics. You know it. Conceived in a time of giants, they were giants themselves. They were as much products of the Roaring Twenties as the bootlegger or the flapper, although they did not reach their peak until after the ball was over, during the gloomy depression years of 1930, '31 and '32.

Born of the unlimited optimism and soaring imaginations of the Jazz Age, the cars themselves were not jazzy. They wore no useless adornment; no fins or froth of chrome. Even the external exhaust pipes of the mighty Duesenberg SJ were functional under their shiny covers.

This refreshingly direct approach to styling was a result of a blissful, and too short-lived, union between the engineers who put together the basic ingredients of comfortable, powerful transportation and the designers who desired only to package it neatly and efficiently. For example, the "block-long" hood of the typical classic was no pretentious affectation; it was fully tenanted with the lengthy cylinder block of a big-bored straight eight or the incredible mass of a gleaming V-16.

Another reason for the tasteful elegance and legendary quality of the classics was the example of Europe. For, if there was ever anything that the shirt-sleeved moguls of the brash U.S. auto industry wanted, it was to produce motor cars equal to or better than the magnificent offerings of Rolls Royce, Bentley, Mercedes Benz or Hispano Suiza.

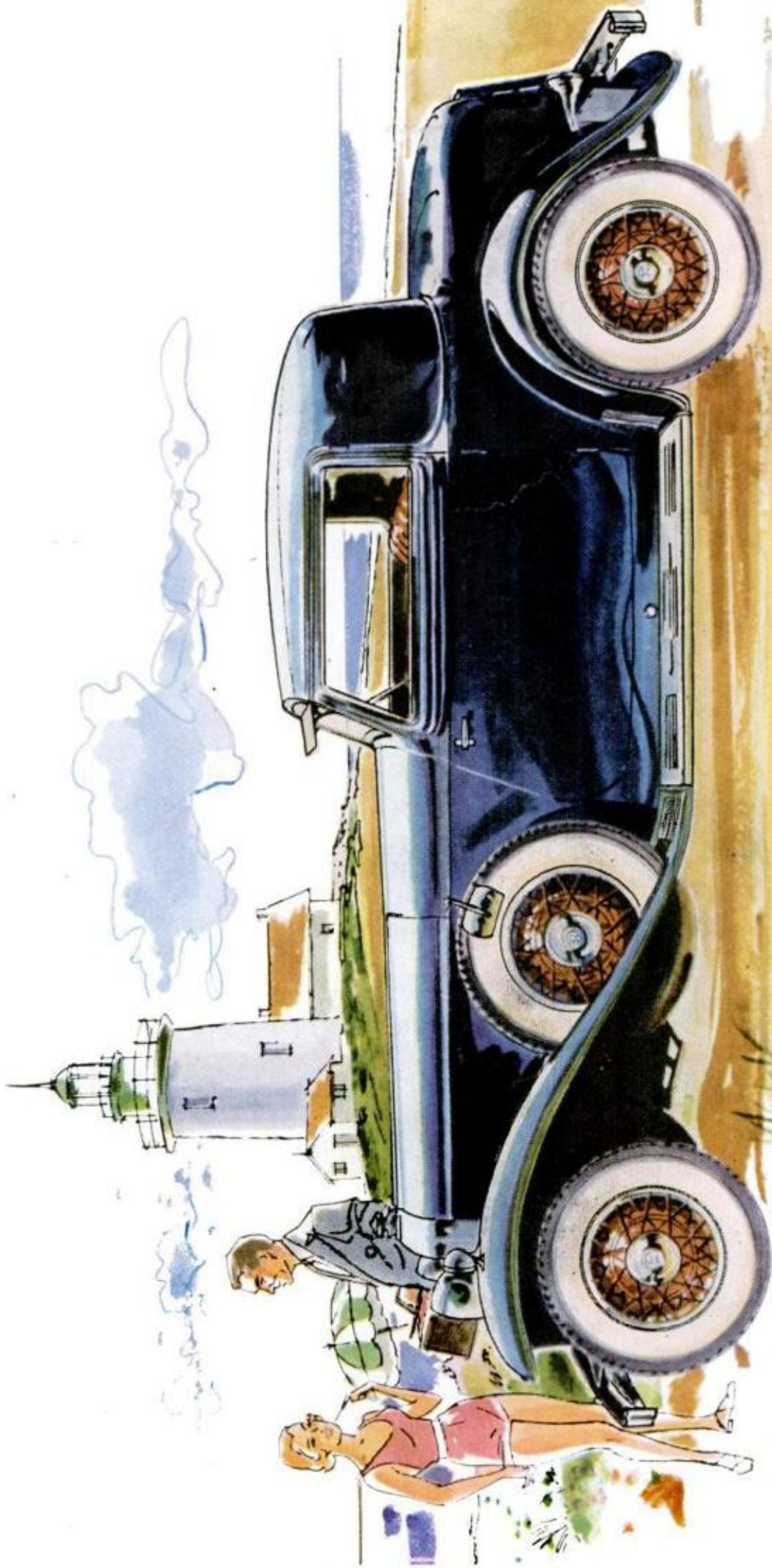
To achieve this goal, the finest metal, the thickest cushions, the softest leathers and the shiniest paints were worked with lavish care by such master coachbuilders as LeBaron, into bodies of elegant simplicity. In turn these were placed upon chassis embodying the most enduring construction and powerful performance that the engineering talents of the time could produce.

The final proof of greatness of these classics lies in the measure of their value; the few examples that have not suffered time and the wrecker's torch are worth more now than when they were new. And who can put a price on nostalgia?

Paintings by Paul Hamlin

READY-TO-FRAME FULL-COLOR REPRINTS AVAILABLE

Reprints of the complete set of eight classic cars in full color are available as long as the supply lasts. Send 25 cents to Service Bureau, Dept. 8C, Popular Mechanics, 200 E. Ontario Street, Chicago 11, Ill.



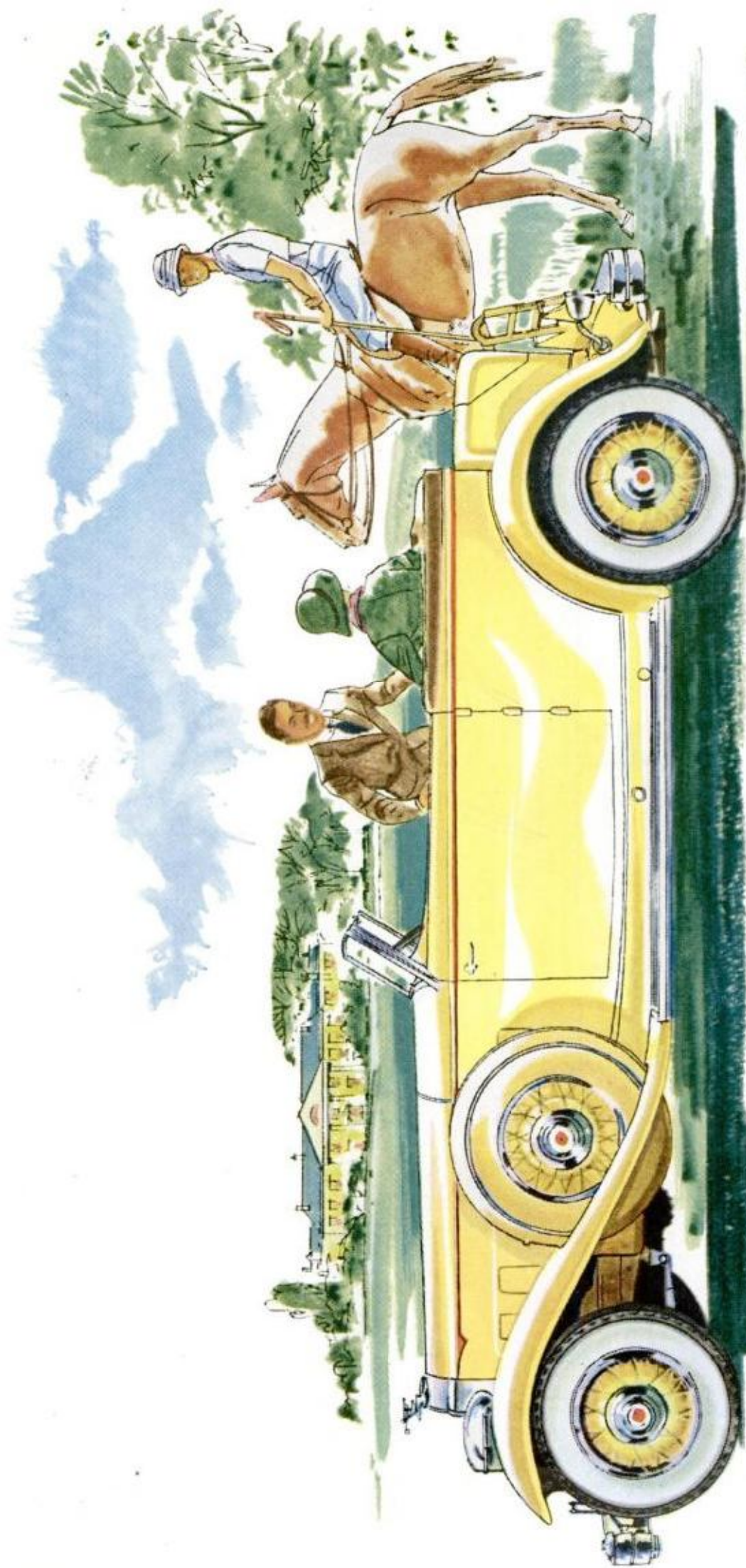
STUTZ 1932 *No suave, young bachelor's life was complete without this Stutz coupe. Custom body by Waterhouse on DV 32, 134½-inch wheelbase chassis. Engine—a 322-cubic-inch straight eight with twin overhead cams, four valves per cylinder and 161 b.h.p.*





MARMON 1932 So you think that aluminum engines are brand-new? Well, this Marmon had one, and an overhead-valve 16-cylinder 200-horsepower job at that. The car set a 24-hour speed record of 76.4 miles-per-hour that remained unbroken until 1953.





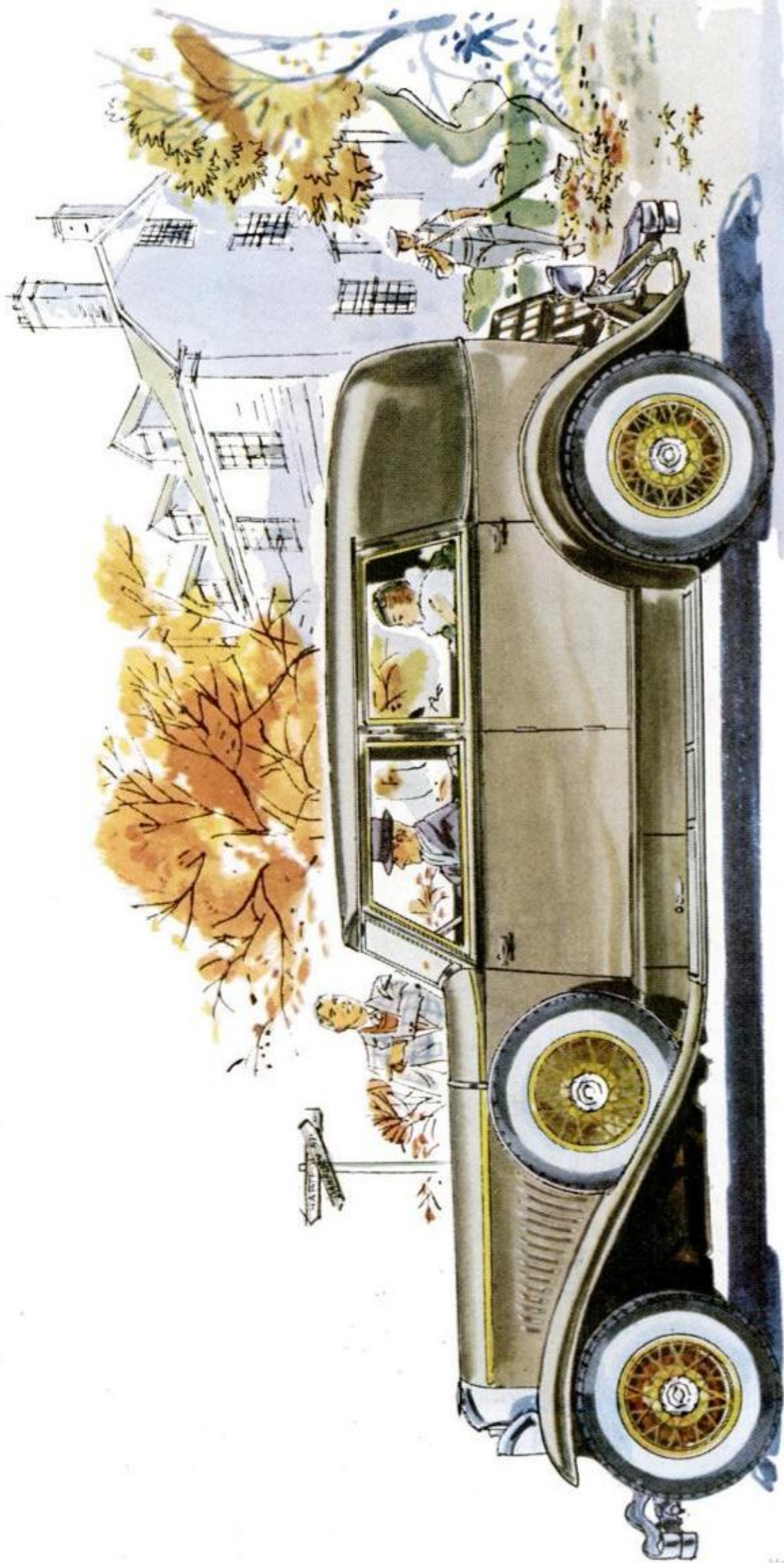
PACKARD 1932 *Smartest car at the polo field, with its rakish, sloped "Vee" windshield, was this convertible by Waterhouse. It had an "X" frame, two-piece driveshaft, and a central lubrication system. Its big L-head straight eight put out 135 b.h.p.*





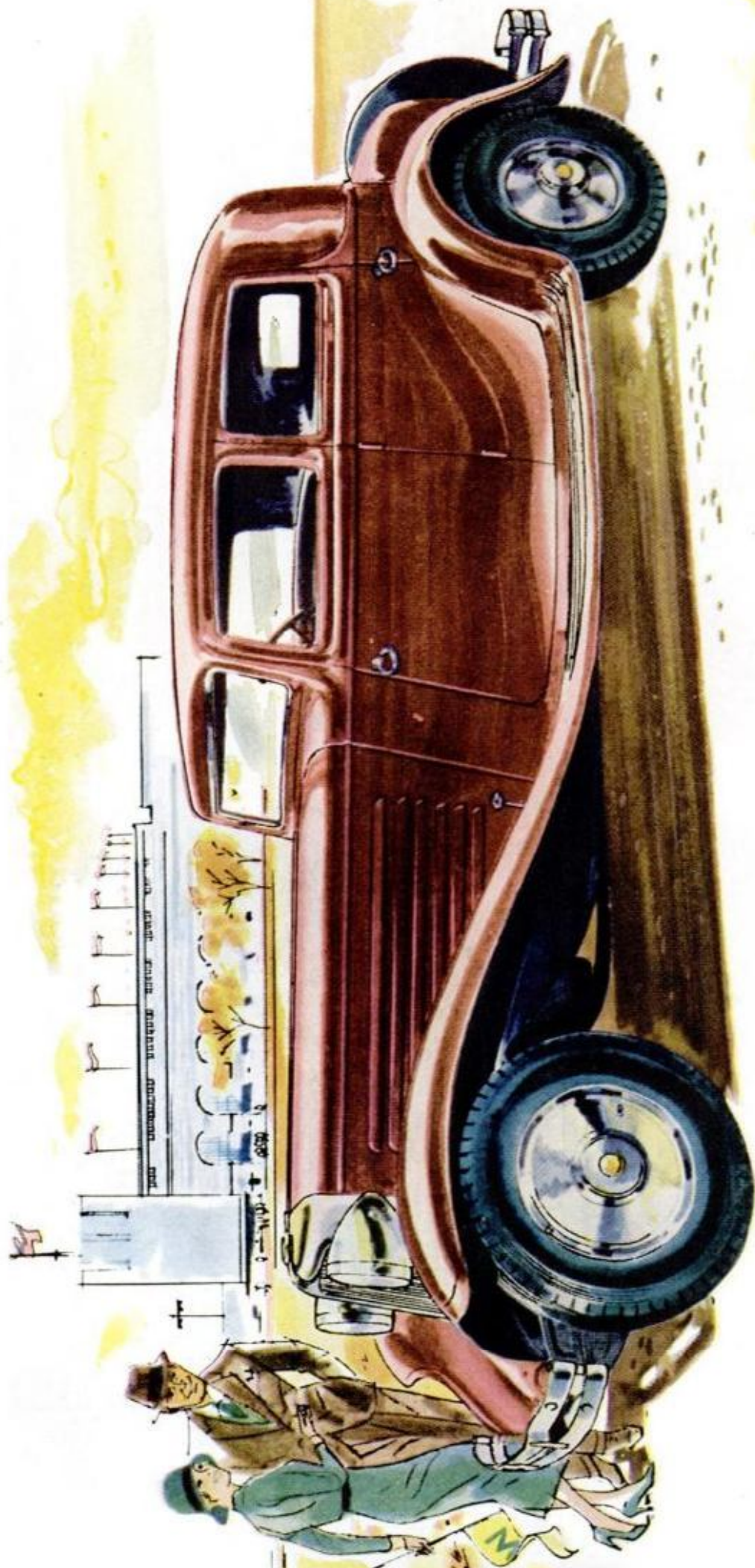
PIERCE ARROW 1931 *You'd be perfectly at home on
Fifth Avenue in this elegant
147-inch-wheelbase convertible sedan by LeBaron. Its engine was an L-head
straight eight of 385 cubic inches developing 132 horsepower.*





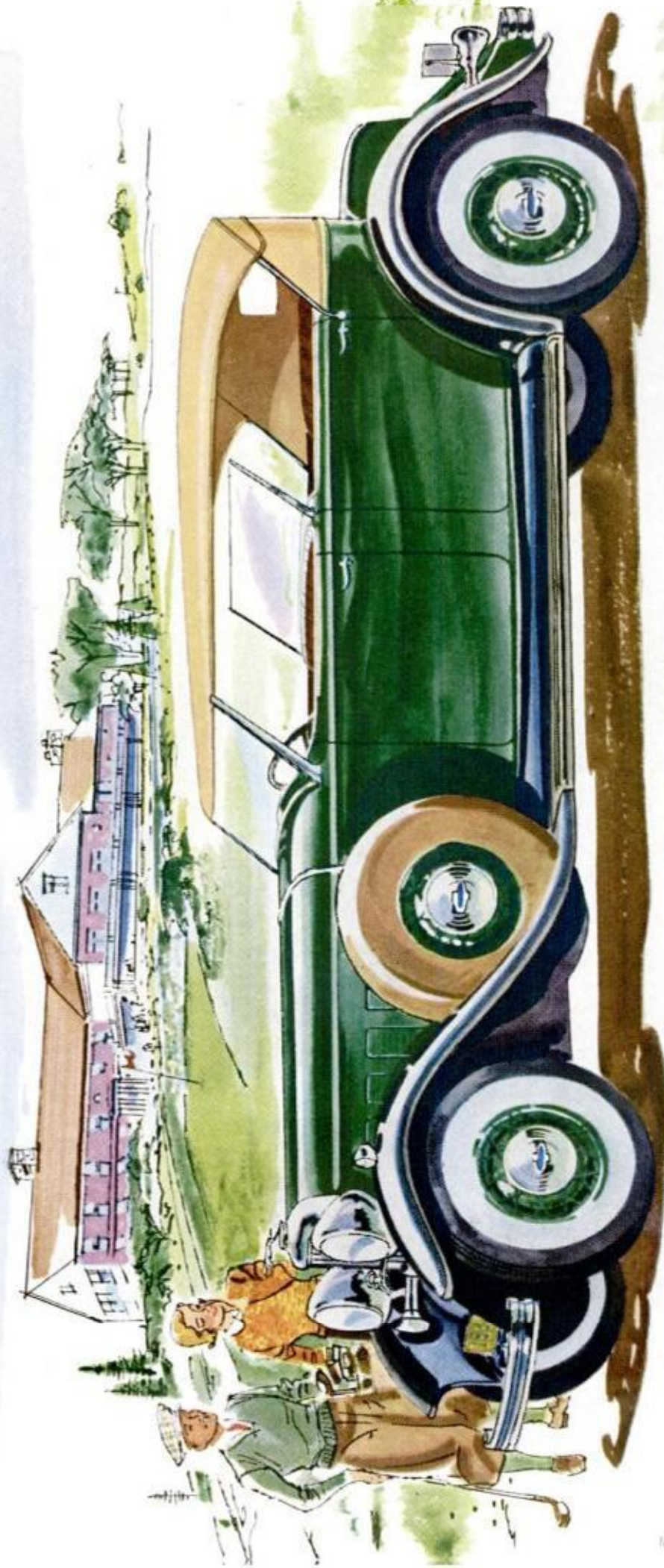
DUESENBERG 1931 *Prestige and power were wrapped up in this formal sedan built by Judkins. The "Duese" was the most powerful car in America at the time with its twin-overhead cam straight eight of 265 horsepower.*





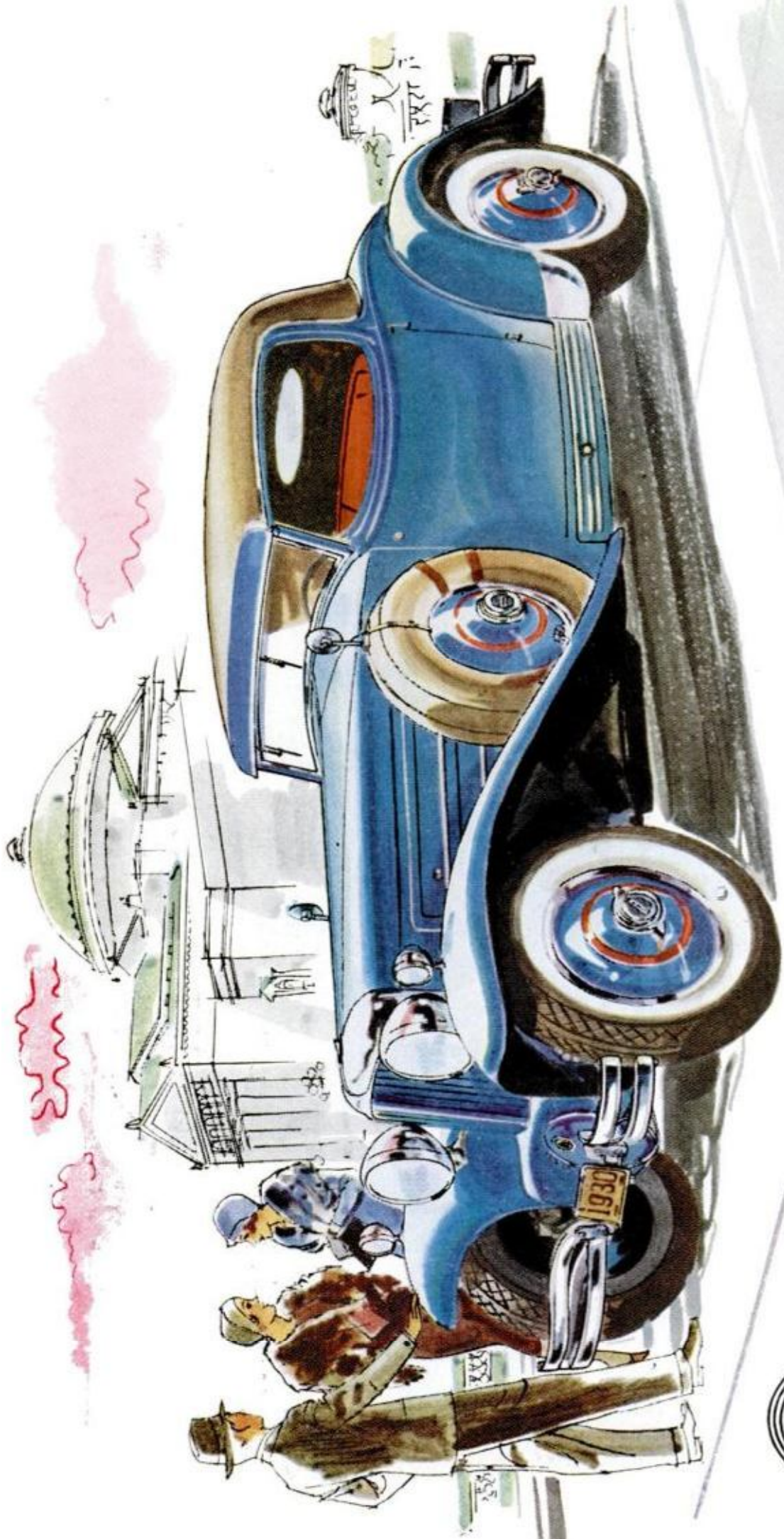
CHRYSLER 1931 *You were ahead of the crowd if you drove to the game in this low-slung Imperial Eight formal sedan by Ambi-Budd Presswerk of Berlin, German subsidiary of Edward G. Budd Co. The L-head engine developed 135 b.h.p.*





LINCOLN 1932 *Rolling up to the country club was a breeze in this graceful dual-cowl phaeton by Brunn. The Lincoln's big V-8 engine had a bore and stroke of 3½ x 5 inches, developed its 120 horsepower at a relatively slow speed of 2900 r.p.m.*





CORD 1930 *Three was a cozy crowd indeed in this Cord L-29 coupe. Its L-head Lycoming straight eight of 125 horsepower was reversed to permit forward placement of transmission and the front drive. Body was designed by Count Alexis de Sakhnoffsky.*



Automobiles of 1961

By Jim Whipple

SELDOM HAS DETROIT offered the motoring public a greater number or greater variety of cars from which to choose. The range is wide, running from Rambler's perky, stylish little American with its 100-inch wheelbase and \$1894 price tag, to the handsome, elegant Cadillac Fleetwood 75 with its 149-inch wheelbase and sleek bulk measuring over 20 feet in length selling for \$9748.

Not since the reckless and affluent 1920s has there been a total of 28 different name plates in the showrooms. In 1940, for example, there were only 17 makes at announcement time. Low tide was reached in 1950 when only 15 makes were marketed.

This year the industry has made an effort to provide cars of every size, price and equipment option. No longer are there just the low, medium and high-priced fields. Now there are economy compacts, Rambler, Lark, Falcon, Corvair and Valiant; medium-priced compacts, Comet, Lancer and Pontiac Tempest; and upper-level compacts, Buick Special, Olds F-85 and, if you care to stretch the definition, American Motors' powerful Ambassador.

The compact concept has made a pass at the luxury-priced class where, until now, better was always synonymous with bigger. This year we see the Lincoln Continental, not a true compact in itself, but costing just as much as Imperials or Cadillacs and measuring slightly smaller than last year's Ford. It surely offers the buyer a chance to spend money for luxury without bulk. Indeed, the weight-watching idea seems to be in the process of storming the auto industry.

A somewhat different trend is the developing rush of traditionally medium-price cars into the "low-priced" field. This part of the market, once the exclusive province of Ford, Chevy and Plymouth, is now crowded with Dodge Dart and Mercury as well as the trim, powerful F-85 and Special.

AMERICAN DELUXE

Price	\$1894
Wheelbase	100
Length	173.10
Width	70.0
Height	56.2
Shipping Wt.	2541
Headroom, front	35.0
rear	33.0
Hiproom, front	58.0
rear	45.25
Legroom, front	44.0
rear	37.50
Trunk Volume	23.8
Horsepower@RPM	90@3800
Displacement	195.6
Bore & Stroke	3.12 x 4.25
Torque @ RPM	160@1600
Compression	8.0:1
Axle Ratio	
Manual	3.31:1
Automatic	3.31:1



RAMBLER AMERICAN

Based on the same 100-inch-wheelbase chassis and suspension used last year, the American has an entirely new unit-construction body from roof to rocker panel. Improvements include a larger windshield, better all-around vision, and a 50 percent larger trunk that's much more accessible. Deluxe and Super models continue to use L-head six of 90 horsepower. Custom models have 125-horsepower, overhead-valve engine.



RAMBLER CLASSIC

A completely restyled grille and front end distinguish the '61 Rambler Classic which retains unit body-chassis of 108-inch wheelbase. Six-cylinder engine of 127 horsepower now has an aluminum block, is 80 pounds lighter. Optional 200-horsepower V-8 of 250-cubic-inch displacement is unchanged.

	CLASSIC SIX	CLASSIC V8
Price	\$2098	\$2397
Wheelbase	108	108
Length	189.8	189.8
Width	72.4	72.4
Height	57.3	57.3
Shipping Wt.	2915	3255
Headroom, front	36.0	36.0
rear	34.5	34.5
Hiproom, front	59.7	59.7
rear	60.0	60.0
Legroom, front	43.0	43.0
rear	40.0	40.0
Trunk Volume	27.8	27.8
Horsepower@RPM	127@4200	200@4900
Displacement	195.6	250
Bore & Stroke	3.12 x 4.25	3.5 x 3.25
Torque @ RPM	180@1600	245@2500
Compression	8.7:1	8.7:1
Axle Ratio		
Manual	3.78:1	4.10:1
Automatic	3.31:1	3.15:1



LARK

Lower and smoother looking is the '61 Lark thanks to a totally new hood and cowl structure, a body mounted lower on the frame and new rear window. Suspension has been modified for better ride, and steering improved. A new six-cylinder overhead-valve engine develops 112 b.h.p. V-8 remains at 180 b.h.p.

	LARK SIX	V8
Price	\$2005	\$2140
Wheelbase	108.5	108.5
Length	175.0	175.0
Width	71.4	71.4
Height	56.5	57.7
Shipping Wt.	2665	2941
Headroom, front	35.25	35.25
rear	34.75	34.75
Hiproom, front	59.5	59.5
rear	59.0	59.0
Legroom, front	43.5	43.5
rear	40.0	40.0
Trunk Volume	15.2	15.2
Horsepower@RPM	112@4500	180@4500
Displacement	169.6	259.2
Bore & Stroke	3.0 x 4.0	3.56 x 3.25
Torque @ RPM	154@2000	260@2800
Compression	8.5:1	8.8:1
Axle Ratio		
Manual	3.73:1	3.07:1
Automatic	3.73:1	3.07:1



CORVAIR

Two new station wagons, the six-passenger Lakewood and nine-passenger, van-type Greenbrier have been added to Corvair's '61 lineup. Relocation of air cleaners has enabled placement of Corvair spare tire in engine compartment. This in turn made possible larger gas tank and much larger trunk space up front.

	CORVAIR 500
Price	\$1974
Wheelbase	108.0
Length	180.0
Width	67.0
Height	51.5
Shipping Wt.	2355
Headroom, front	33.5
rear	33.5
Hiproom, front	58.5
rear	58.0
Legroom, front	44.0
rear	36.5
Trunk Volume	29.1
Horsepower@RPM	80@4400
Displacement	145
Bore & Stroke	3.43 x 2.60
Torque @ RPM	128@2300
Compression	8.0:1
Axle Ratio	
Manual	3.27:1
Automatic	3.27:1



FALCON

Big news for '61 on Falcon is more hustle under the hood in the form of an optional 170-cubic-inch-displacement version of the lightweight cast-iron overhead-valve six. This larger engine develops 101 horsepower to the 144-cubic-inch power plant's 85. A new convex aluminum grille changes appearance.

FALCON	
Price	\$1974
Wheelbase	109.5
Length	181.2
Width	70.6
Height	54.5
Shipping Wt.	2315
Headroom, front	38.9
rear	37.3
Hiproom, front	57.1
rear	56.5
Legroom, front	44.6
rear	40.1
Trunk Volume	23.7
Horsepower@RPM	85@4200
Displacement	144.3
Bore & Stroke	3.50 x 2.50
Torque @ RPM	138@2000
Compression	8.7:1
Axle Ratio	
Manual	3.10:1
Automatic	3.50:1



VALIANT

Valiant's successful styling has been continued with just enough change to point up the 1961 model. A new two-door sedan has been added to the V-100 line and a handsome two-door hardtop to the V-200 series. Four-door sedans and wagons come in both series.

VALIANT	
Price	\$2014
Wheelbase	106.5
Length	185.4
Width	70.4
Height	53.5
Shipping Wt.	2590
Headroom, front	37.9
rear	37.4
Hiproom, front	56.8
rear	56.9
Legroom, front	43.0
rear	39.7
Trunk Volume	24.9
Horsepower@RPM	101@4400
Displacement	170
Bore & Stroke	3.40 x 3.125
Torque @ RPM	155@2400
Compression	8.2:1
Axle Ratio	
Manual	3.55:1
Automatic	3.23:1



COMET

Comet like Falcon has been given a new grille for 1961, this one with horizontal instead of vertical bars. A welcome option is a longer stroke version of the Comet's six-cylinder engine with a displacement of 170 cubic inches. This new power plant is rated at 101 horsepower instead of the 144-cubic-inch engine's 85.

COMET 144 170		
Price	\$2053	N. A.*
Wheelbase	114.0	114.0
Length	194.8	194.8
Width	70.4	70.4
Height	54.5	54.5
Shipping Wt.	2412	2429
Headroom, front	33.8	33.8
rear	32.7	32.7
Hiproom, front	57.0	57.0
rear	57.0	57.0
Legroom, front	43.3	43.3
rear	39.4	39.4
Trunk Volume	26.6	26.6
Horsepower@RPM	85@4200	101@4400
Displacement	144.3	170.0
Bore & Stroke	3.50 x 2.50	3.50 x 2.94
Torque @ RPM	134@2000	156@2400
Compression	8.7:1	8.7:1
Axle Ratio		
Manual	3.50:1	N. A.
Automatic	3.50:1	N. A.

*Not Available



PONTIAC TEMPEST

Clearly the engineering idea car of the year, Pontiac's Tempest provides comfortable accommodation for six passengers in its unit-construction body. Its big, rugged short-stroke front-mounted four-cylinder engine delivers plenty of speed and acceleration through curved driveshaft and "transaxle" unit.

	TEMPEST FOUR	V8
Price	\$2167	\$2383
Wheelbase	112	112
Length	189.3	189.3
Width	72.2	72.2
Height	53.5	53.5
Shipping Wt.	2870	N. A.
Headroom, front	34.0	34.0
rear	33.7	33.7
Hiproom, front	58.6	58.6
rear	58.2	58.2
Legroom, front	44.1	44.1
rear	37.8	37.8
Trunk Volume	27.5	27.5
Horsepower@RPM	110@3800	155@4600
Displacement	194.5	215
Bore & Stroke	4.06 x 3.75	3.50 x 2.80
Torque @ RPM	190@2000	220@2400
Compression	8.6:1	8.8:1
Axle Ratio		
Manual	3.55:1	3.55:1
Automatic	3.08:1	3.31:1



FORD

Although Ford shortened its thoroughly restyled body by four inches and narrowed it by two inches, passenger compartment remains roomy and trunk is much more accessible. Reliability has been improved by 30,000-mile sealed-in chassis lubrication, galvanized rocker panels, self-adjusting brakes.

	FAIRLANE SIX	FAIRLANE 500 V8
Price	\$2315	\$2430
Wheelbase	119.0	119.0
Length	209.9	209.9
Width	79.9	79.9
Height	55.0	55.0
Shipping Wt.	3683	3691
Headroom, front	38.2	38.2
rear	37.6	37.6
Hiproom, front	62.1	62.1
rear	63.5	63.5
Legroom, front	45.3	45.3
rear	43.3	43.3
Trunk Volume	29.7	29.7
Horsepower@RPM	135@4000	175@4200
Displacement	223	292
Bore & Stroke	3.62 x 3.60	3.75 x 3.30
Torque @ RPM	220@2000	279@2200
Compression	8.4:1	8.8:1
Axle Ratio		
Manual	3.56:1	3.56:1
Automatic	3.56:1	3.00:1



OLDSMOBILE F-85

Oldsmobile's sleekly styled version of the new GM compact with 112-inch wheelbase, 188-inch over-all unit-construction body, shares suspension and driveshaft with Buick. However it has its own design aluminum V-8 engine developing 155 horsepower and a compact version of redesigned Hydra-Matic transmission.

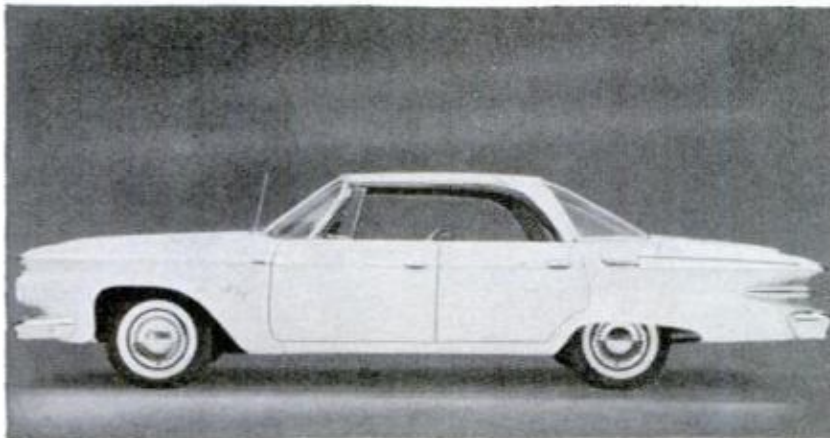
	OLDS F-85
Price	\$2384
Wheelbase	112.0
Length	188.2
Width	71.5
Height	52.6
Shipping Wt.	2566
Headroom, front	34
rear	33.6
Hiproom, front	58.6
rear	58.2
Legroom, front	44.0
rear	37.8
Trunk Volume	25.4
Horsepower@RPM	155@4800
Displacement	215.0
Bore & Stroke	3.50 x 2.80
Torque @ RPM	210@3200
Compression	8.75:1
Axle Ratio	
Manual	3.07:1
Automatic	3.23:1



CHEVROLET

An all-new series of bodies slightly shorter and narrower is the big change on the 1961 Chevys. Trunks are much larger and more accessible. Interior dimensions have been improved slightly, seats are higher and more comfortable. Transmission and driveshaft tunnel are less obtrusive.

	BISCAYNE SIX	BEL AIR V8
Price	\$2316	\$2438
Wheelbase	119.0	119.0
Length	209.3	209.3
Width	78.4	78.4
Height	55.5	55.5
Shipping Wt.	3500	3520
Headroom, front	34.5	34.5
rear	34.0	34.0
Hiproom, front	63.5	63.5
rear	63.5	63.5
Legroom, front	45.0	45.0
rear	42.0	42.0
Trunk Volume	29.7	29.7
Horsepower@RPM	135@4000	170@4200
Displacement	235.5	283.0
Bore & Stroke	3.56 x 3.94	3.87 x 3.0
Torque @ RPM	217@2000	275@2200
Compression	8.25:1	8.5:1
Axle Ratio		
Manual	3.36:1	3.36:1
Automatic	3.36:1 (PG)	3.08:1 (PG)



PLYMOUTH

All-new sheet metal at front and rear quarters of Plymouth's unit-construction body, plus a new grille has changed its looks completely. Interior and exterior body dimensions are unchanged. Suspension is by torsion bars in front and leaf springs in the rear. Battery is now charged by an alternator.

	SAVOY SIX	BELVEDERE V8
Price	\$2310	\$2558
Wheelbase	118	118
Length	209.5	209.5
Width	80.0	80.0
Height	54.6	54.6
Shipping Wt.	3310	3470
Headroom, front	37.8	37.8
rear	38.0	38.0
Hiproom, front	63.8	63.8
rear	62.9	62.9
Legroom, front	64.3	64.3 44.3
rear	42.1	42.1
Trunk Volume	N. A.	N. A.
Horsepower@RPM	145@4000	230@4400
Displacement	225	318
Bore & Stroke	3.40 x 4.12	3.91 x 3.31
Torque @ RPM	215@2800	340@2400
Compression	8.2:1	9.0:1
Axle Ratio		
Manual	3.54:1	3.58:1
Automatic	3.31 (TF)	3.31:1 (PF)



DODGE LANCER

Based on the Valiant unit-construction body and chassis, Dodge's Lancer has a considerably different appearance both inside and out. Although wheelbase is identical to Valiant, Lancer is four inches longer than its sister car. Optional 225-cubic-inch six-cylinder engine ups output from 101 to 145 horsepower.

	LANCER 170	225
Price	\$2069	\$2154
Wheelbase	106.5	106.5
Length	188.8	188.8
Width	72.3	72.3
Height	53.3	53.3
Shipping Wt.	2595	N. A.
Headroom, front	33.6	33.6
rear	33.1	33.1
Hiproom, front	56.8	56.8
rear	56.9	56.9
Legroom, front	42.8	42.8
rear	39.8	39.8
Trunk Volume	24.9	24.9
Horsepower@RPM	101@4400	145@4000
Displacement	170	225
Bore & Stroke	3.4 x 3.12	3.4 x 4.12
Torque @ RPM	155@2400	215@2800
Compression	8.2:1	8.2:1
Axle Ratio		
Manual	3.55:1	N. A.
Automatic	3.23:1	3.23:1



BUICK SPECIAL

Buick's new 112-inch-wheelbase compact has plenty of room for six passengers in both four-door sedan and station wagon models. Car rides on 13-inch wheels, has all coil-spring suspension system completely insulated from unit-construction body by rubber insulation. Aluminum V-8 develops 155 horsepower.

SPECIAL V8

Price	\$2384
Wheelbase	112
Length	188.4
Width	71.3
Height	52.5
Shipping Wt.	2610
Headroom, front	34.0
rear	33.9
Hiproom, front	58.6
rear	58.2
Legroom, front	43.5
rear	38.7
Trunk Volume	25.5
Horsepower@RPM	155@4400
Displacement	215
Bore & Stroke	3.50 x 2.80
Torque @ RPM	220@2400
Compression	8.8:1
Axle Ratio	
Manual	3.36:1
Automatic	3.08:1



DODGE DART

A complete appearance change for Dodge's Dart is the result of all new sheet metal on hood, deck and fenders. Body shell is Dodge's 118-inch wheelbase, unit-construction job with Torsion-Aire suspension. Standard engine is the 145-horsepower slant-six. Two V-8s of 230 and 265 horsepower are optional.

SENECA SIX PIONEER V8

Price	\$2330	\$2578
Wheelbase	118.0	118.0
Length	209.4	209.4
Width	78.7	78.7
Height	54.8	54.8
Shipping Wt.	3335	3510
Headroom, front	33.3	33.3
rear	33.5	33.5
Hiproom, front	63.8	63.8
rear	62.9	62.9
Legroom, front	45.1	45.1
rear	42.1	42.1
Trunk Volume	31.6	31.6
Horsepower@RPM	145@4000	230@4400
Displacement	225	318.0
Bore & Stroke	3.40 x 4.125	3.91 x 3.31
Torque @ RPM	215@2800	340@2400
Compression	8.2:1	9.0:1
Axle Ratio		
Manual	3.54:1	3.58:1
Automatic	3.31:1	3.31:1 (PF)



AMBASSADOR

American Motors top-of-the-line Ambassador billed as a "luxury compact," has had a face lift involving new hood, grille and front-end sheet metal. Wheelbase of 117 inches and over-all length of 199 inches remain unchanged. Engine is the 250-horsepower V-8 of 327-cubic-inch displacement.

AMBASSADOR CUSTOM V8

Price	\$2682
Wheelbase	117.0
Length	199
Width	73.6
Height	56.9
Shipping Wt.	3380
Headroom, front	36.0
rear	34.5
Hiproom, front	59.7
rear	60.1
Legroom, front	43.0
rear	40.0
Trunk Volume	27.8
Horsepower@RPM	250@4700
Displacement	327
Bore & Stroke	4.0 x 3.25
Torque @ RPM	340@2600
Compression	8.7:1
Axle Ratio	
Manual	3.54:1
Automatic	2.87:1



MERCURY

Mercury is really "all-new" for 1961 with very little remaining from 1960. It's a smaller car with 120-inch wheelbase and an over-all length of 214.6 inches, down six and five inches. Interior dimensions are better than last year. Car features 30,000-mile lubrication interval, unique rubber-cushioned suspension.

METEOR 600 SIX METEOR 800 V8

Price	\$2471	\$2765
Wheelbase	120	120
Length	214.6	214.6
Width	79.9	79.9
Height	55.0	55.0
Shipping Wt.	3617	3667
Headroom, front	33.5	33.5
rear	33.9	33.8
Hiproom, front	62.1	62.1
rear	63.5	63.5
Legroom, front	43.4	43.0
rear	41.6	40.7
Trunk Volume	32.2	32.2
Horsepower@RPM	135@4000	175@4200
Displacement	223	292
Bore & Stroke	3.62 x 3.60	3.75 x 3.30
Torque @ RPM	200@2000	279@2200
Compression	8.4:1	8.8:1
Axle Ratio		
Manual	3.56:1	3.56:1
Automatic	3.56:1	3.10:1



DODGE

The 122-inch-wheelbase Polara is the single large Dodge series for 1961. It shares the same grille and front-end treatment with its little sister the Dart, but has a different version of the swept-down fins and tapered rear deck. Tail lamps are "rocket tubes" faired into fenders. Engine is a 265-horsepower V-8.

POLARA V8

Price	\$2966
Wheelbase	122.0
Length	212.5
Width	78.7
Height	54.9
Shipping Wt.	3700
Headroom, front	33.3
rear	33.6
Hiproom, front	63.8
rear	62.8
Legroom, front	45.1
rear	42.4
Trunk Volume	32.8
Horsepower@RPM	265@4400
Displacement	361
Bore & Stroke	4.12 x 3.38
Torque @ RPM	380@2400
Compression	9.0:1
Axle Ratio	
Manual	3.23:1
Automatic	2.93:1

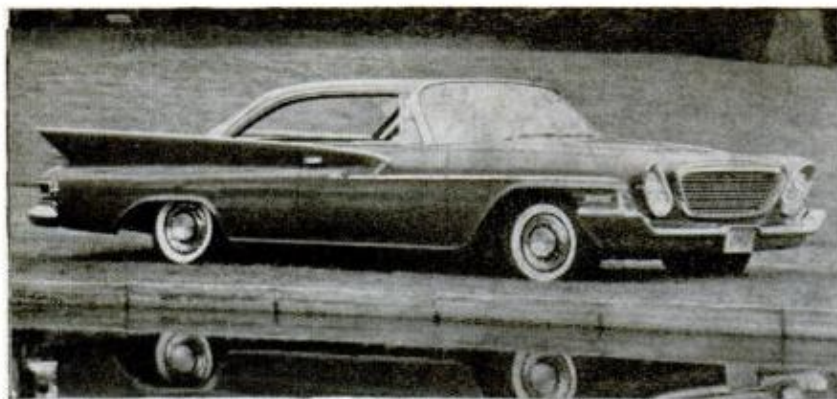


STUDEBAKER HAWK

Unchanged yet improved for 1961 is Studebaker's "touring sports" coupe, the Hawk. Modified bucket-type front seats are new as is an optional four-speed, fully synchronized floor-shift transmission. Only engine available is 289-cubic-inch V-8 rated at 210 horsepower. A power pack ups the ante to 225.

SPORT COUPE V8

Price	\$2650
Wheelbase	120.5
Length	204.0
Width	71.3
Height	55.5
Shipping Wt.	3205
Headroom, front	34.5
rear	33.7
Hiproom, front	59.5
rear	58.0
Legroom, front	44.0
rear	37.0
Trunk Volume	14.9
Horsepower@RPM	210@4500
Displacement	289
Bore & Stroke	3.56 x 3.62
Torque @ RPM	300@2800
Compression	8.8:1
Axle Ratio	
Manual	3.31:1
Automatic	3.07:1



CHRYSLER

Big news from Chrysler for 1961 is the bottom of-the-line Newport series on 122-inch-wheelbase unit-construction body-chassis. Windsor is now the middle series, also on 122-inch body. New Yorker remains top-of-the-line with 126-inch wheelbase. Engines are V-8s of 361, 383 and 413 cubic inches respectively.

	NEWPORT V8	WINDSOR V8
Price	\$2964	\$3218
Wheelbase	122.0	122.0
Length	215.6	215.6
Width	79.4	79.4
Height	54.9	54.9
Shipping Wt.	3710	3730
Headroom, front	33.3	33.3
rear	33.6	33.6
Hiproom, front	63.8	63.8
rear	62.8	62.8
Legroom, front	45.1	45.1
rear	42.4	42.4
Trunk Volume	N. A.	N.A.
Horsepower@RPM	265@4400	305@4800
Displacement	361	383
Bore & Stroke	4.12 x 3.38	4.25 x 3.38
Torque @ RPM	380@2400	395@3000
Compression	9.0:1	10.0:1
Axle Ratio		
Manual	3.23:1	3.23:1
Automatic	2.93:1	2.93:1



OLDSMOBILE

Brand-new bodies on brand-new, wider frames and a totally new styling concept make Olds a different car for '61. Interior body dimensions have been changed to give more headroom, seat height and leg room. The 98 has three inches greater wheelbase and offers more rear seat legroom than 88 or Super 88.

	DYNAMIC 88	NINETY-EIGHT
Price	\$2900	\$3887
Wheelbase	123	126
Length	212	218
Width	77.2	77.2
Height	55.8	56.6
Shipping Wt.	4024	4209
Headroom, front	34.5	35.2
rear	34.4	34.4
Hiproom, front	63.3	63.6
rear	63.3	63.2
Legroom, front	44.4	44.5
rear	41.4	44.3
Trunk Volume	29.5	30.0
Horsepower@RPM	250@4400	325@4600
Displacement	394	394
Bore & Stroke	4.12 x 3.69	4.12 x 3.69
Torque @ RPM	405@2400	435@2800
Compression	8.75:1	10:1
Axle Ratio		
Manual	3.41:1	N.A.
Automatic	2.87:1	3.23:1



DE SOTO

● For the record, there *was* a 1961 DeSoto. However, Chrysler Corporation has announced that it will discontinue production of DeSoto cars when current orders are filled. Owners of 1961 DeSotos purchased prior to the shutdown will be allowed \$300 toward the purchase of any 1961 or '62 Chrysler Corp. product.

	FIREFLITE V8
Price	\$3167
Wheelbase	122.0
Length	215.8
Width	79.4
Height	55.0
Shipping Wt.	3820
Headroom, front	37.6
rear	38.1
Hiproom, front	63.8
rear	62.8
Legroom, front	45.1
rear	42.4
Trunk Volume	N.A.
Horsepower@RPM	265@4600
Displacement	361
Bore & Stroke	4.12 x 3.38
Torque @ RPM	370@2400
Compression	9.0:1
Axle Ratio	
Manual	3.58:1
Automatic	2.93:1



PONTIAC

Shorter Pontiacs for 1961 have more room on the inside as a new, wider frame permits lower floors for better seat height and two inches greater headroom. Wheelbases are 119 for Catalina and Ventura, 123 inches for Star Chief and Bonneville. Basic engine is 389-cubic-inch V-8.

CATALINA V8 BONNEVILLE V8

Price	\$2702	\$3331
Wheelbase	119.0	123.0
Length	210.0	217.0
Width	78.2	78.2
Height	55.8	55.9
Shipping Wt.	3720	3895
Headroom, front	34.2	34.1
rear	34.4	33.8
Hiproom, front	63.2	63.0
rear	63.2	63.0
Legroom, front	45.3	44.9
rear	40.8	40.9
Trunk Volume	33.2	39.5
Horsepower@RPM	215@3600	235@3600
Displacement	389	389
Bore & Stroke	4.06 x 3.75	4.06 x 3.75
Torque @ RPM	390@2000	402@2000
Compression	8.6:1	8.6:1
Axle Ratio		
Manual	3.23:1	3.23:1
Automatic	2.69:1	2.69:1



THUNDERBIRD

An all-new T-Bird has a 390-cubic-inch engine that puts out 300 horsepower and delivers a solid 427 ft.-lbs. of torque. Car comes as convertible or hardtop. Entirely new body of unit construction is larger on inside than 1958-60 four seater. Automatic transmission is standard. Wheelbase remains at 113 inches.

THUNDERBIRD

Price	N.A.
Wheelbase	113.0
Length	205.0
Width	75.9
Height	52.5
Shipping Wt.	3887
Headroom, front	37.7
rear	37.6
Hiproom, front	59.2
rear	56.8
Legroom, front	45.4
rear	38.9
Trunk Volume	20.1
Horsepower@RPM	300@4600
Displacement	390
Bore & Stroke	4.05 x 3.78
Torque @ RPM	327@2800
Compression	9.6:1
Axle Ratio	
Manual	None
Automatic	2.91:1



BUICK

An all-new body perched on a new "hourglass" X-type frame has made Buicks decidedly different cars for 1961. A two-piece driveshaft has replaced the torque-tube and makes for lower floors. New bodies have better vision, increased headroom. LeSabre has 250-horsepower engine, other models rate 325 b.h.p.

LeSABRE V8 INVICTA V8

Price	\$3107	\$3515
Wheelbase	123	123
Length	213.2	213.2
Width	78.0	78.0
Height	56.3	56.3
Shipping Wt.	4146	4249
Headroom, front	34.5	34.5
rear	34.1	34.1
Hiproom, front	63.3	63.3
rear	63.2	63.2
Legroom, front	44.5	44.5
rear	41.4	41.4
Trunk Volume	N.A.	N.A.
Horsepower@RPM	250@4400	325@4400
Displacement	364	401
Bore & Stroke	4.12 x 3.4	4.18 x 3.64
Torque @ RPM	384@2400	445@2800
Compression	10.2:1	10.2:1
Axle Ratio		
Manual	None	None
Automatic	3.07:1	3.23:1



IMPERIAL

Imperials come in three series, Custom, Crown and LeBaron; all are powered by Chrysler's biggest V-8, a 430-cubic-inch giant rated at 350 horsepower. Imperials have separate frame and body construction with Torsion-Aire suspension. Free-standing headlamps are high spot of restyled front end.

CUSTOM V8 IMPERIAL	
Price	\$5109
Wheelbase	129.0
Length	227.1
Width	81.7
Height	56.7
Shipping Wt.	4740
Headroom, front	34.4
rear	33.8
Hiproom, front	61.0
rear	60.2
Legroom, front	46.9
rear	42.9
Trunk Volume	31.8
Horsepower@RPM	350@4600
Displacement	413
Bore & Stroke	4.18 x 3.75
Torque @ RPM	470@2800
Compression	10:1
Axle Ratio	
Manual	None
Automatic	2.93:1



LINCOLN CONTINENTAL

Not only is the Lincoln Continental a brand-new car in two models, a four-door sedan and four-door convertible, but it is the first of the "compact luxury cars." It measures just 212 inches from bumper to bumper, has a wheelbase of 123 inches and stands just 53 inches high. Engine is rated at 300 b.h.p.

CONTINENTAL V8	
Price	N.A.
Wheelbase	123.0
Length	212.4
Width	78.6
Height	53.5
Shipping Wt.	4771
Headroom, front	33.6
rear	33.4
Hiproom, front	59.7
rear	60.7
Legroom, front	44.0
rear	40.0
Trunk Volume	22.9
Horsepower@RPM	300@4100
Displacement	430
Bore & Stroke	4.30 x 3.70
Torque @ RPM	465@2000
Compression	10.0:1
Axle Ratio	
Manual	None
Automatic	2.89:1



CADILLAC

Comfort and greater convenience are the keynotes of the greatly restyled 1961 Cadillac. An entirely new group of bodies rest on the Cadillac's massive X-type frame. Rear doors are considerably wider on four-door models and leg room has been increased. Engine is 325-horsepower V-8.

SIXTY SPECIAL V8 SERIES 62 V8		
Price	\$6233	\$5080
Wheelbase	129.5	129.5
Length	222.0	222.0
Width	79.8	79.8
Height	56.6	55.8
Shipping Wt.	4936	4846
Headroom, front	34.4	34.4
rear	34.1	34.1
Hiproom, front	63.3	63.1
rear	63.1	63.1
Legroom, front	46.0	46.0
rear	44.5	44.5
Trunk Volume	N.A.	N.A.
Horsepower@RPM	325@4800	325@4800
Displacement	390	390
Bore & Stroke	4.0 x 3.8	4.0 x 3.8
Torque @ RPM	430@3100	430@3100
Compression	10.5:1	10.5:1
Axle Ratio		
Manual	None	None
Automatic	2.94:1	2.94:1

Imported Cars-1961

Here, in the approximate order of their current sales volume, are the 29 best-selling imports. Unfortunately there isn't enough room to include every make imported.

However, here are those of greatest interest to the most people. Space limits prevent

showing more than one model series or body style for each make. In almost all cases the latest or most popular model of each make is shown. The list runs from Volkswagen with 100,000 annual sales to Rolls with its 700-plus.

For Mechanical Specifications of the Imports, see page 264.

VOLKSWAGEN

Unchanged on the outside, the '61 Volkswagen embodies more changes than ever before. The engine, although not increased in displacement, is entirely new and delivers four more horsepower. A new gas tank permits a front luggage compartment that's 65 percent larger. Transmission is synchronized on all four speeds. Price is \$1565 on the East Coast.



RENAULT

Renault's Dauphine continues as next to the top in imported car sales, well above its next nearest competitor. Its water-cooled four-cylinder engine develops 32 horsepower, enough to roll its 1397 pounds along at 70 m.p.h. Suspension is by independent coil spring all around with air-filled booster springs that allow softer acting metal springs. The Dauphine sells for \$1585 East Coast P.O.E.



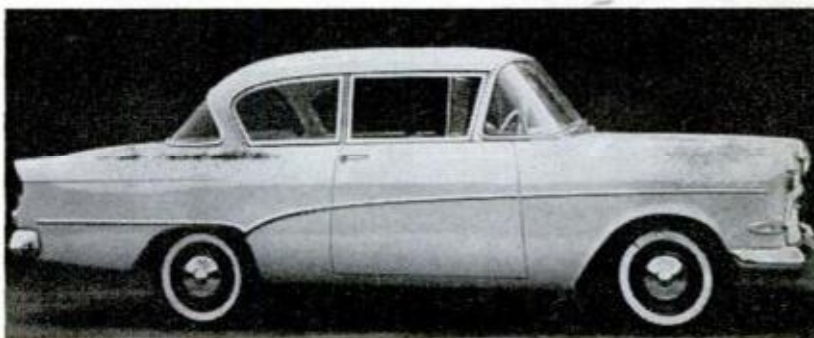
FORD ANGLIA

By far the best selling economy car from England is Ford's two-door Anglia, a sturdy little car with a modern short-stroke four-cylinder engine. This overhead-valve power plant develops 41 horsepower from just 61 cubic inches of displacement. Adding to the enjoyment of driving is a crisp-acting fully synchronized four-speed transmission. The car sells for \$1608 in New York.



OPEL

Buick dealers in selected cities throughout the U.S. will sell you an Opel sedan for \$1958 (East Coast) or a station wagon for \$2263. Opel Rekord is solidly built by Adam Opel A.G., General Motors' German subsidiary. Seats four and performs well, thanks to a 57-horsepower, four-cylinder engine.





FIAT

Fiat imports an entire line of cars from the miniature two-cylinder "500" to the smartly styled and beautifully-made "2100" sedan. Probably the best value of all Fiats is the best-selling "600" series, a well-made four-passenger four-cylinder rear-engined job, costing \$1398 in New York. It has 28.5 horsepower.



TRIUMPH

Although the TR-3 sports two-seater is the best-selling Triumph, the car shown here, the Herald, is winning many friends as an economy sedan with a comfortable ride and real sports car handling and roadability. Herald's four-cylinder engine develops 40 horsepower. It sells in New York for \$1849.



AUSTIN-HEALEY

One of America's favorite sports cars for the past six years has been the exciting Austin-Healey. Now there are two A-H sports cars; the solid little 48-horsepower Sprite two-seater and the powerful A-H 3000 with its 130-horsepower six.



SIMCA

Chrysler Corporation took the Simca under its wing a couple of years ago and its dealers have been handling the line ever since. Shown here is the Etoile (a-twal) four-door sedan powered by a sturdy four-cylinder, overhead-valve engine of 50 horsepower.



MG

Best known MG is of course the "A" series sports two-seater selling at \$2444 in New York. For a family car of 4-5 passenger capacity there's the Farina-styled MG Magnette sedan, an attractive car with leather upholstery, four doors and a 66.5-horsepower four-cylinder engine at \$2695.

PEUGEOT

A solid-value compact car in any land is the very popular French Peugeot 403, a roomy four-door sedan with 105-inch wheelbase and over-all length of 176 inches. Its 66-horsepower four-cylinder engine coupled to a four-speed transmission will cruise it at 75 m.p.h. all day and deliver mileage in the high 20s. Price, \$2250.



MERCEDES BENZ

Probably more people throughout the world would rather own a Mercedes Benz than any other car. Few cars can compare in engineering excellence, workmanship and elegance. Shown is the 220 sedan; 105 horsepower, priced at \$4283.



VOLVO

Sweden's gift to the performance-loving family man is the sturdy and lively Volvo two-door with its hot, 85-horsepower four-cylinder engine and four-speed synchromesh transmission. Beautifully finished and built to last a long time, it weighs 2140 lbs. and sells for \$2195, on the East Coast.



METROPOLITAN

Metropolitan is made by Austin of England for American Motors who intended it as their "people's car" when it was designed some years ago. It is in steady demand even though it comes only as a two seater. Its 90 cubic-inch engine develops 55 horsepower.



HILLMAN

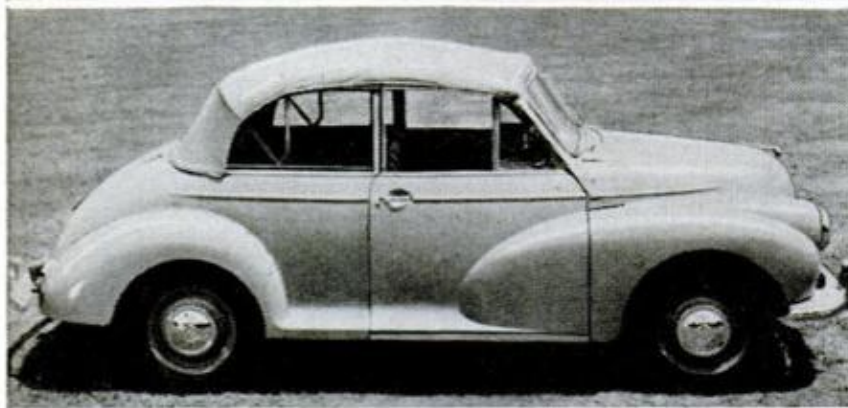
Hillman is a solidly made, attractive and purposeful car from Rootes Motors, one of England's top auto makers. The Minx four-door sedan shown is roomy (for four) and sports a 57-horsepower engine. It sells for a reasonable price of \$1735 in New York. An automatic transmission is available at \$199.





VAUXHALL

Vauxhall is produced by GM's English subsidiary and is sold in the U.S. by Pontiac dealers. It is a soft-riding, smooth-running, roomy four-passenger car that looks as if it might have been a compact Chevy of 1957. It costs \$1958 in New York, has 55 horsepower.



MORRIS 1000

Although it now looks dated, the Morris is probably England's favorite postwar car. It's incredibly sturdy, has brisk performance and shifts and handles like a sports car. Its 38-horsepower engine moves its 1600-plus pounds rapidly. At \$1495 it's a real buy for the economy-minded motorist looking for a small car that will "get up and go."



JAGUAR

Jaguar is best known for its XK150 roadster and coupe, powered by a 250-horsepower six-cylinder engine. For the family that can afford a high-priced car, there's the sedan shown here with the same 3.8-liter engine, disk brakes and sports-car handling for \$4765 delivered at New York.



SUNBEAM

Sunbeam is imported in two versions; an outright sports car, the Alpine, with a 91-cubic-inch, overhead-valve four developing 83 horsepower; and the Rapier, a four-passenger hardtop and convertible, shown here. Both cars have four-speed transmissions. Alpine sells for \$2595, Rapier for \$2499, New York.

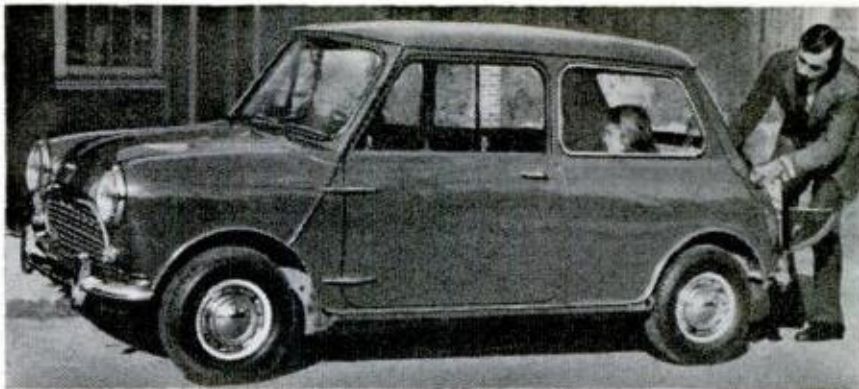


BORGWARD

Borgward's big sellers in the U.S. are the Isabella sedan and station wagon, solidly built, four-cylinder two-door models. The Borgward is approximately the size of one of our smaller compacts. Wheelbase is 104 inches and weight 2200 lb. Price is \$2495.

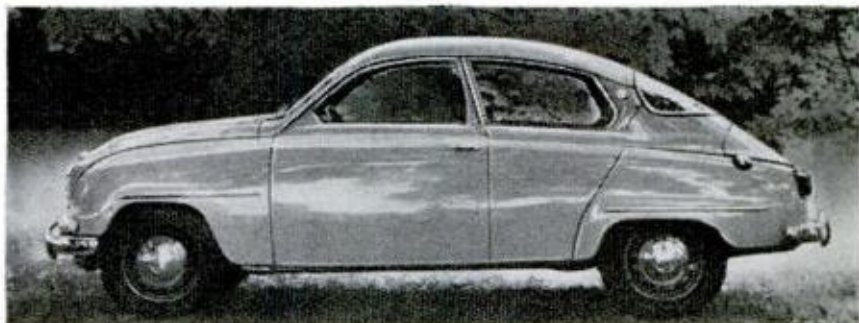
AUSTIN

Austin Division of the mammoth British Motors Corp. imports the ultracompact "Mini-Minor" four-passenger car shown. Its 37-horsepower engine moves it at brisk, U.S. traffic speeds. Other Austins are A-55 four-door sedan and A-40 two-door semiwagon. Mini-Minor sells for \$1295.



SAAB

Both a five-passenger sedan and seven-passenger wagon, both two-doors are imported by Saab from Sweden. They are powered by three-cylinder, two-cycle engines of 42 horsepower. Sedan is \$1895, wagon \$2265 at New York.



PORSCHE

Superb handling, comfortable ride and luxurious though simple accommodations for two mark the speedy, quiet and economical Porsche coupes, roadsters and convertibles ranging from \$3780 to \$4800 East Coast P.O.E. Standard four-cylinder air-cooled engine is rated at 60 horsepower.



NSU PRINZ

This solid, lightweight car for two adults and a pair of children, is the German-made NSU-Prinz which weighs only 1080 pounds. It is powered by a two-cylinder, air-cooled engine of 26 horsepower, making it a fine runabout. Suspension is independent via coil springs on all four wheels. Top speed is about 65 miles per hour. The car is priced at \$1498 East Coast P.O.E.



CITROEN

Now a convertible has been added to the four-door sedan and station wagon of the French Citroen DS19. This unique automobile has front drive, and an amazing hydraulic system that adjusts suspension height, power-brakes, steering, and shifts gears. Prices begin at \$2545.





DKW

Shown here is the DKW Junior, a sturdy and attractive four-passenger two-door sedan with a wheelbase of 85.7 inches. The engine is a three-cylinder, two-cycle job rated at 39 horsepower. The Junior has front-wheel drive and four-wheel independent torsion-bar suspension. It costs \$1665 delivered at New York.



LLOYD

Lloyd's attractive and sporty Arabella four-passenger sedan is another interesting front-drive import. It is powered by a water-cooled engine with four cylinders in horizontally opposed pairs. Wheelbase is 86.6 inches, horsepower is 45, and suspension is independent all around. Car costs \$1745 East Coast P.O.E.



ALFA ROMEO

Alfa Romeo is an old Italian firm noted for its fast sports cars with custom-made bodies. Graceful, streamlined Alfas, like the coupe shown here, are powered with high-performance, four-cylinder engines with twin overhead camshafts. Prices start at \$3250 for roadsters.



TOYOPET

Japan's Toyota Motor Co. produces and imports the attractive and sturdy Toyopet sedan which has a wheelbase of 99 inches and is roomy for four passengers and can accommodate five or six average-size people very snugly. Four-cylinder engine of 88 cubic inches displacement develops 65 horsepower. Price is \$1795, East Coast P.O.E.



ROLLS ROYCE

This is the automobile that sets the standard for most of the world in the realm of automotive craftsmanship. The Rolls is not outsize, and is designed to carry four (five at the most) passengers in exquisitely comfortable seats. Price, \$15,655.

Israeli Auto Line Makes Its Debut

Latest thing on the auto scene is the Sabra, a new line recently introduced by a Los Angeles dealer—the manufacturer, Sabra Motors of Israel. First models out are station wagons and panel trucks and soon to come is a handsome sports model. Sabras feature glass fiber bodies for light weight; heavy, all-steel chassis for strength and stability, plus a high-performance, economical, in-line four-cylinder engine. The manufacturer claims parts are available in most major cities of the U. S. Station wagons have two extra-wide doors for ease of entry and fold-away seats to accommodate a good deal of extra cargo. Light weight of the glass fiber body is said to permit larger payloads.



Putting Polish on Breaker Points as Temporary Repair

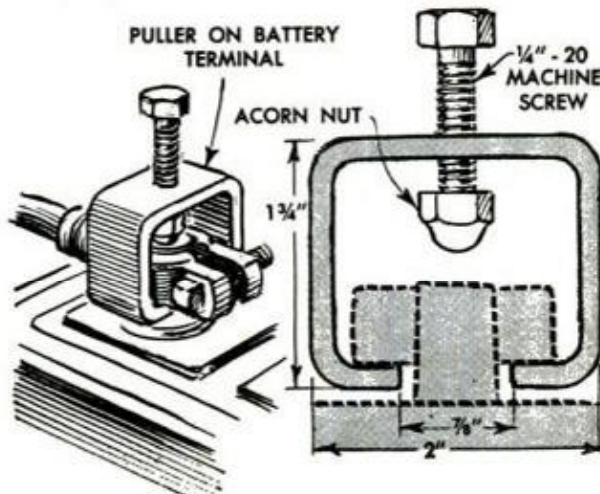
In order to get a car or truck back on the road in the shortest possible time mechanics sometimes find it necessary to clean, polish and adjust worn breaker points due to a temporary lack of replacement parts. According to the Service Dept. of Champion Spark Plug Co., you should never use sandpaper or other relatively coarse abrasives for cleaning. Rather use crocus cloth as a buffer. The extremely fine abrasive with which crocus cloth is faced will clean the points without scratching the surface or changing the contour and no abrasive par-

ticles will drop into the distributor to cause rapid wear. Next and most important step after reinstalling the points is to do a thorough job of cleaning, using for this purpose a strip of lint-free tape or cloth moistened with a suitable solvent. Pull the strip lightly back and forth across the points to remove any residue of fine abrasive and then repeat the process with a clean, dry cloth to assure that the points are perfectly clean and dry before they go back into service. New points also should be cleaned after installation to remove all traces of oil.

Battery Clamp Puller

Battery cable clamps sometimes stick stubbornly to the terminal posts due to corrosion and prying them up with a wrench jaw or by other improvised means can cause irreparable damage. It takes only a few minutes to make this clamp puller which does the trick in seconds. Bend $\frac{3}{16}$ x $\frac{3}{4}$ -in. flat steel to the shape and dimensions shown, drill and tap for a $\frac{1}{4}$ -20 hex-head screw, turn the screw into the tapped hole and tighten an acorn nut on the threaded end. Position the puller as indicated, tighten the screw and off comes the clamp.

—Enno Haan



A LESSON IN THE THREE S's SNOW, SLEET AND SLUSH



By Ben Davis

THAT BEAUTIFUL STUFF



SKIERS AND KIDS love it and poets go into raptures over the beauty of it. But to the poor motorist who has to drive through it, the first snowfall is a sign of sheer misery ahead. For snow, sleet and slush can put the unwary winter driver through a grueling test in winning the battle of the elements. Knowing how to get in and out of parking spots and how to handle a car on a sheet of ice will help in keeping up with ol' man winter.

Moving away from the curb may end up in frustration and fatigue and a car that hasn't budged an inch. It's then you wished you had been more selective in picking a parking space. Consider the location. If it is on a noticeable grade with the car due to move uphill in starting out, look out for trouble, especially if parking involves leaving one or both wheels on snow or ice. An-

WITH a good grip on the frozen wiper blade and the switch on, Harry here is a cinch to ruin the wiper motor and help himself to some expensive repairs

other good rule of thumb is to avoid parking along a curb where plows have piled up a ridge of snow. City dwellers may well scoff at this—after all, how often do you have a choice? The pressure of time and competition for the limited parking space available in most big cities is almost sure to force you to push your gas buggy into the first opening you spot, even though it means burying it up to the fenders. The only answer here is an adequate preparation for the struggle to come. Aside from snow tires and chains, a little forethought goes a long, long way. To begin with, if the curb is visible, don't tire-scrape it with a front wheel. Keep that front wheel clear. Friction of the tire against the curb may be just enough to set the rear wheels spinning. This is especially important if the space allows only a forward movement. In this case, don't tromp down on the accelerator and expect to take off. Heavy snow packed under low chassis members and surrounding the wheels has tremendous hold-back strength, so shovel out as much of this as possible, then try "rocking." When rocking becomes necessary to get out of a wheel-spinning situation, patience will pay off in the long run. Many a good standard or automatic transmission has been ruined by "rush rocking." Once the engine has warmed up, move forward in first or second gear—but slowly—just enough to determine whether or not the



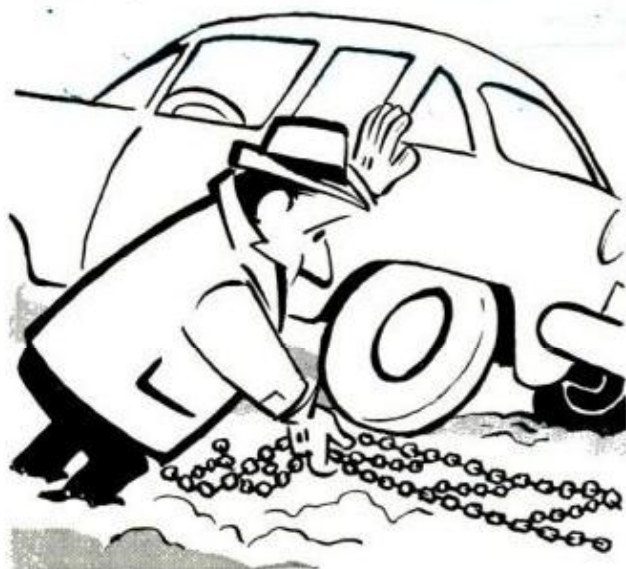
YOU CAN'T play pilot and drive "by the seat of your pants" so get out the broom and clean those windows

wheels will roll. If not, resort to the shovel and ashes or sand. As soon as the situation has been amended to where the wheels will roll freely at least to some extent, bring the car forward to the top of the "hump," or hole, impeding progress, quickly shift into reverse and repeat the performance. Quite often the roll-back will help to return the car forward, making it possible to rock by using only the forward gear. All things considered, however, such situations

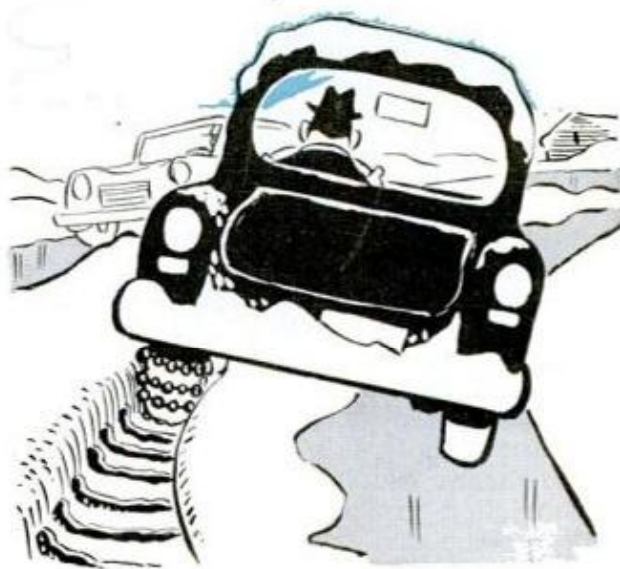
CALLED SNOW



WHEN ROAD CONDITIONS catch you stuck with chains off, lay a chain in front and in back of a wheel to provide traction when rocking car. Tying chains to bumper lets you keep going until on safe footing



ON SHORT RUNS in town or in the country put the chain on one wheel only. Drive with chained wheel in loose snow, other on bare pavement. This stunt saves wear on tires and chains and gets you there and back





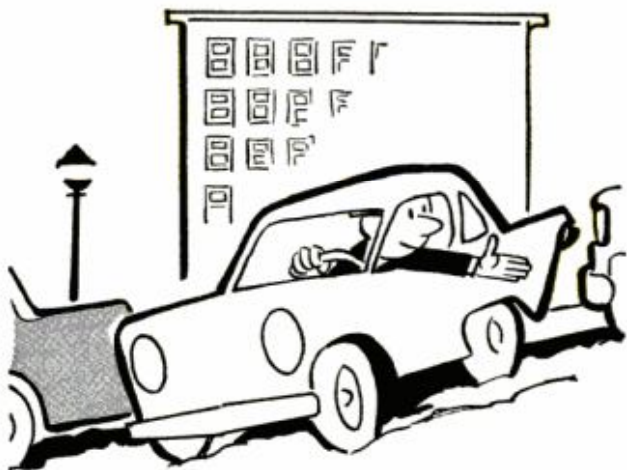
GETTING INTO a parking space may be easier than getting out again. Friend Harry knows enough to keep his front wheels straight to help reduce spinning



MANY DRIVERS find it too big a job to clean the acres of glass on their modern cars—'til time comes to back into a tight spot where seeing counts



NEVER PARK FLUSH with the curb—rear wheels have enough to do without the extra work, and the added push may be enough to spin them and dig you in



FELLOW WHO squints through a peep hole in a snow covered windshield may not see your directionals. Play it safe—signal with your hand to make sure

are greatly eased and often surmounted with no trouble through the use of tire chains. When starting to move on ice, chains offer up to 300 percent additional road grip, as opposed to the 51 percent for unaided snow tires.

Early morning snow drivers usually find plenty of parking room on arrival and are fooled by the wide open spaces. Things can change during the day. Come time to go home, two other drivers may have pulled up in front and behind and have you penned in with barely enough space left in which to pull out. This will mean a sharp turn of the front wheels and added work for the rear wheels with increased chances that the rears will spin before they ever take hold. This is the time to make use of those old standbys, the bucket of sand in the trunk, the handy shovel, or whatever other means you may think of to put grit and friction under the tires. One handy little device that has kept many a driver

on time for dinner is nothing more than a piece of 1 x 6-in. lumber to which is nailed a strip of metal lath. The lath should be longer than the wood so that it trails out a good three feet. Inserted under the rear tires two of these devices will provide enough grip to ride up the lath, onto the wood and up and over the hump. In locations where the chances of your getting penned in are slight, it is a good idea to move the car back and forth several feet along the line of entry. This will help form an exit path for your later convenience.

Once you've got her pulled out, of course, your problems are just beginning. Now you've got traffic to buck as well as snow. More important, you've got a couple of tons of moving automobile to control over surfaces for which it just wasn't designed. Worst of all, you're not the only guy on the road. The mere matter of fighting the resistance of the snow is nothing—all you have to do is to keep moving. But,

what happens when you stop? What happens if you can't stop? Add to these conditions limited vision resulting from fogged-up windshield and the picture is one of skidding along in a sealed box with disaster ready to strike at any moment.

Real trouble pops up when what was clean fresh snow has been compacted to a hard, slick cake, or worse, when this becomes covered with a fresh layer. Because you may not realize what's under the pretty, white blanket, this situation can be more dangerous than glaring ice. Handling a car under any and all of these conditions means knowing how to use the engine, the gears and the brakes to your own advantage. Skid situations, for example, are an all too common occurrence—a direct result of human reactions. In dry weather, tramping on the brake pedal can avoid an accident. In winter, however, your car is out of its element. Brakes, wheels, tires—these cannot be applied in such a fashion as to effect an immediate stop because a final and governing factor, dry road surface, has been eliminated. The safest course is—**DRIVE SLOWLY**. The less momentum gained, the less braking power required to stop. In the event of a stop on ice or snow, don't hit the brakes and expect to stop on a dime. Remember, almost all the factors which normally operate to bring your car to a halt are now operating against you. Cars equipped with standard shift transmissions have the winter-time advantage over automatic shifts in that they can be geared down, using the slowing power of the engine as an additional brake. Though this can be done with most automatic transmissions, it is not recommended as it is most likely to cause extensive damage. Once a standard transmission is geared down, the brakes should be applied gently and with a pumping action to reduce momentum and speed. Otherwise, panic-stops usually mean a slamming on of brakes, locked wheels, a helpless skid and a sickening crash. A good bet is to always keep a distance of several car lengths between yourself and the fellow in front of you.

Oddly enough, one of the greatest factors contributing to winter-time accidents is plain driver carelessness—carelessness about matters he takes to be minor. A handful of snow removed from the rear window is considered enough; rear-door windows are largely ignored; rear stop and directional lights remain covered with snow and headlights are only occasionally wiped off. Add all these visibility factors—yours and the other guy's who has to see you to avoid you—and the chances of missing a collision are considerably decreased.

★ ★ ★



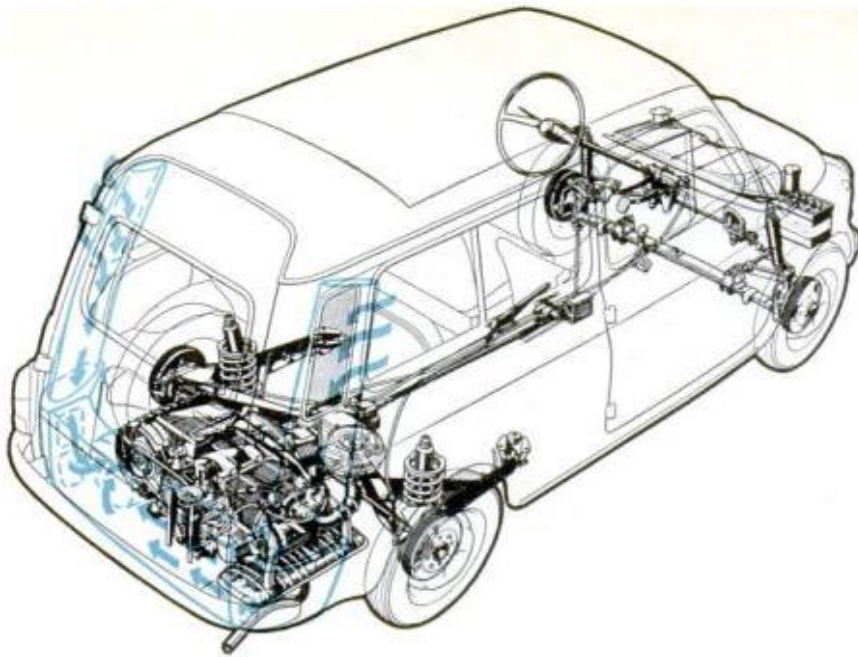
THEN there's the myth about letting air out for more traction. This creates an arch making matters worse



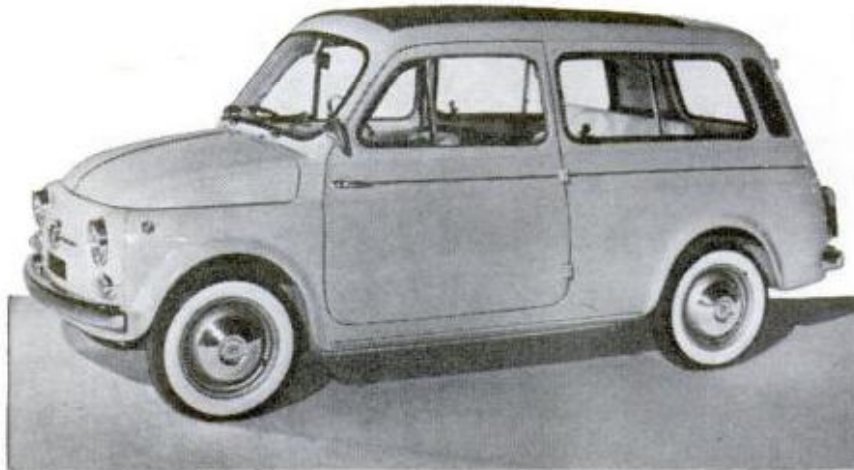
Overinflation is just as bad—pulls tread away from the outer edges and the tires "skate" along the ice. Fellow below has the right idea with just enough air pressure to leave tread flat under average loads

GOOD!





To keep road dust from the Giardiniera's air-cooled engine, air is drawn down through ducts built into the rear panels of the van



Fiat Places Engine Under Cargo Deck

Now, Fiat, maker of those little "bugs" so long familiar on the American road, has come up with the **Giardiniera**, its own version of the "town and country" station wagon. What makes this model unique among European station wagons, however, is the development of a flat, two-cylinder engine which fits **under** the rear cargo deck. With the car's rear seats removed, this arrangement permits a continuous, flat deck and a cargo capacity of some 35 cubic feet. Despite its small size (wheelbase, 6' 4"), the little utility wagon is said to seat four passengers in comfort. The hard ride for which such small cars are usually noted is softened through independent suspension of all four wheels, with transverse leaf springs in front and coil springs in the rear. In addition to great maneuverability, manufacturers claim this little wagon will do over 60 miles per hour and handle a payload of approximately 450 pounds.

Rocker-Arm Oil Leaks Can Foul Spark Plugs in Late-Model Cars

This offbeat poser can be a real fooler even for good mechanics with a lot of experience. The symptoms, say Champion spark plug engineers, are unusual oil fouling of the plugs and excessive exhaust smoke in a car that has little more than break-in mileage on it. Car mechanics should remember it especially when they service cars driven regularly in hilly areas. First, eliminate for sure all the ordinary causes of oil fouling, and these are several even in a clean car, then think of the tapped holes taking the bolts, or studs which hold the rocker-arm shaft bearings. One or more of these holes may open into the intake manifold. If this is so—and it is found occasionally in production engines—a long downhill run or any other condition that builds up prolonged high vacuum in the intake manifold may pull oil past the screw threads into the manifold and into the cylinders. Result: badly oil-fouled plugs. The

presence of an open bolt hole can be checked by removing the rocker-arm assemblies and propping open the throttle plates. Apply air pressure to the holddown bolt holes in the cylinder heads. If you hear air hissing in the carburetor throat, then at least one of the bolt holes is drilled too deep. It shouldn't be difficult to pinpoint the offender at this stage and install a replacement stud and seal. These parts are supplied especially for this purpose. Before installing be sure to blow the hole dry.

On some car models the lowest part of the heater is below the hose connections, preventing the heater from draining completely when the cooling system is drained. If a strong radiator cleaner is used during spring or fall flushing of the cooling system be sure to close the heater valve before flushing, as otherwise some cleaner may be left in the cooling system.



Custom Windscreen for Convertibles

That annoying draft on the back of your neck when you're riding in the front seat of a convertible with the top down can spoil a Sunday drive or give you a bad cold. There's no point in putting up with it when you can so easily attach two clear-plastic wind screens to the backs of the front seats to break up the eddy that causes the back draft on front-seat passenger and driver when traveling at a cruising clip with the top down. You'll need two pieces of 3/16-in.

clear plastic, each about 12 in. wide and of a length about 2 in. less than the width of the front-seat back. Finish the edges and round the corners and attach to the seat backs with friction hinges of the type used in hinging the wing windows, or ventilating vanes, in closed cars. These hinges are available from auto-accessory dealers and can be adjusted to a tension that will hold the screens in the upright position.

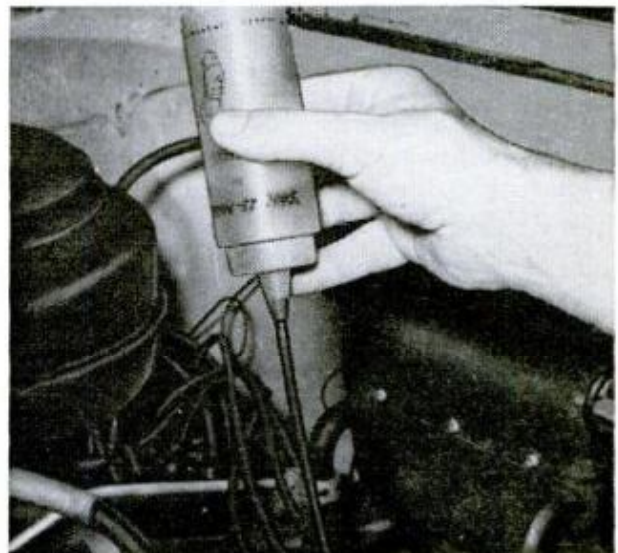
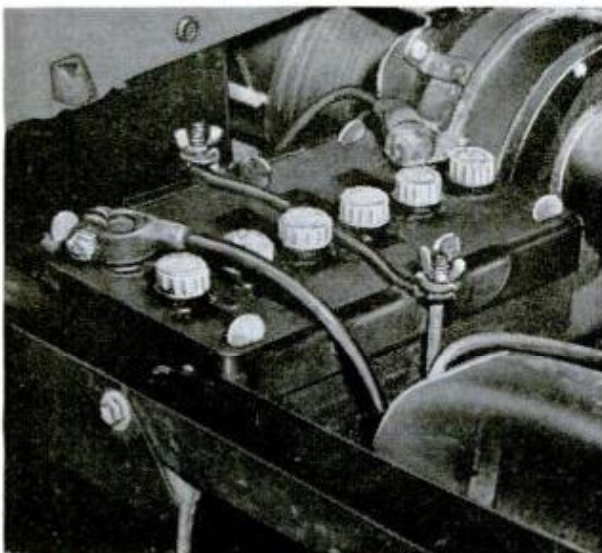
—Larry E. Hall

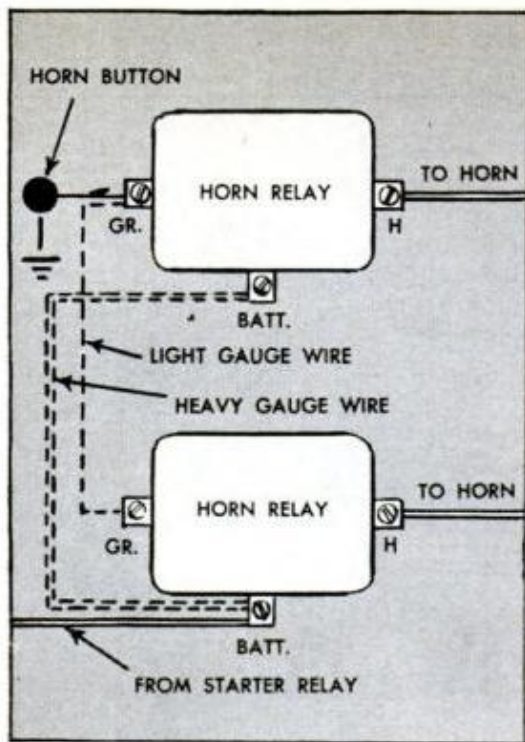
Preventing Battery Corrosion

Like your car battery always shiny new, with no white "bloom" on the terminals and holder, or cradle? Then cut several squares, or disks about the size of a penny, from sheet copper and stick these into the soft wax filling near the corners of the battery case. One in each corner as pictured will do. When corrosion builds up on the disks rather than on battery parts, remove disks, clean and replace.—Grover Brinkman

Squeeze-Bottle Filler

Brake master cylinders on some cars are difficult to reach for refilling with brake fluid, even with the regular equipment made for the purpose. An ordinary squeeze bottle of the type supplied as containers for catchup and other table sauces can make filling of the cylinders a lot quicker and easier. Fit the bottle with a length of rubber or plastic tubing that will slide snugly over the spout.—M. C. Anderson





Dual Relays Keep Auto Horns in Tune

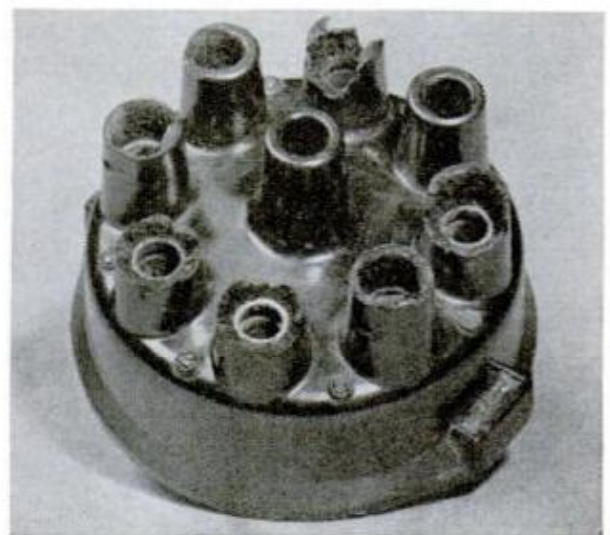
Few combinations of sounds can be more irritating than the blast of auto horns out of tune. And when the horns suddenly let go with a continuous wail everyone in a whole neighborhood wonders whose car it is and when something's going to be done about it. Of course, there's a scramble to get the hood up and the thing silenced as quickly as possible. Usually sticking relay contacts cause the horns to let go without warning and blow continuously until a battery clamp is loosened or some other break in the circuit is made. Pitted contact points usually are the cause of the raucous, jarring sound of horns out of tune. There's a way to avoid embarrassment and possibly a discharged battery (complete discharge of a battery doesn't take long with the horns full on) simply by wiring a second relay

in the horn. The wiring diagram above shows how this can be done in nearly all auto-horn circuits. Ordinarily, two jumpers with terminals are all that are required to make the installation. The additional wiring called for is shown in dotted lines on the diagram. Although not so indicated in the diagram, it's a good idea to use heavy wire from the starter relay.

If the carburetor has been finely adjusted to a warm engine, a tiny air leak in the fuel intake system can be a cause of hard starting when the engine is cold, and more especially in cold weather. Check all intake manifold flanges for air leaks during the tuneup. Also check the carburetor-bowl cover screws for tightness and windshield-wiper hose connections for leaks.

Arcing in Distributor Tower

Spark streaks inside the distributor cap, or tower, indicate arcing usually caused by the ignition lead not being pushed tightly into the tower. This results in high-resistance corrosion at the terminals and if allowed to continue, eventually destroys the insulation as pictured. Whenever there is reason to remove the tower, clean it thoroughly and don't neglect to clean the rubber boots, or caps, that fit over the terminals as these collect grease and road dirt rapidly and may hide a potential source of ignition failure. Then, when replacing the leads, see that each one is pushed tightly into its terminal and that the cap is pressed firmly into place.



SHOP NOTES AND CRAFTS



SHOW-OFF UTENSIL RACK

By Don Mathesius

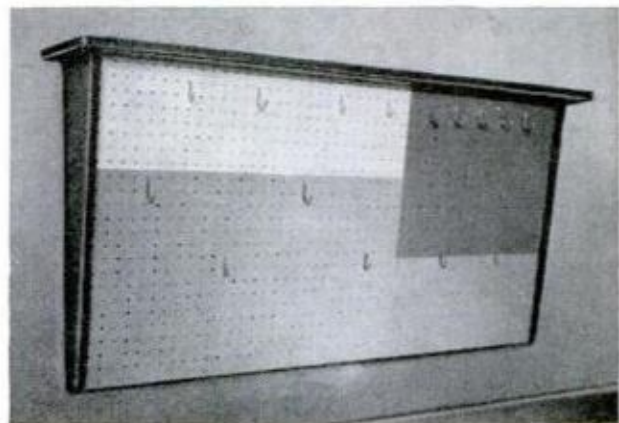
DESIGNED FOR the sole purpose of storing and displaying your gleaming copper-bottom utensils, this multi-colored wall rack itself will add a smart decorator touch to your modern kitchen. Its receding front gives a natural hang to the various items, making it easy to remove and replace them, and the roomy top shelf comes in handy for holding a canister set, radio, cookie jar, etc. Standard hooks are used in the perforated board to hang the utensils, and by using curtain-rod L-hooks to hang the rack to the wall, the affair can be later taken down as easily as a picture.

The front panel of the rack actually is a single sheet of hardboard although from the drawing it appears to consist of four separate pieces. The shaded areas merely serve to indicate how the panel can be divided up and painted different pastel colors. The original was done in salmon red, aqua blue, egg-shell white and old-gold yellow to harmonize with a framework of redwood finished natural. You may prefer to finish it differently. In either

case, the panel should be painted prior to final assembly.

From a study of the pull-apart drawing you will see that the perforated front panel is housed in grooves cut in the shelf and end pieces. These are little more than saw-cut width and are run $\frac{1}{4}$ in. deep. You'll note in the case of the shelf that the groove is blind, that is, it is stopped short of the

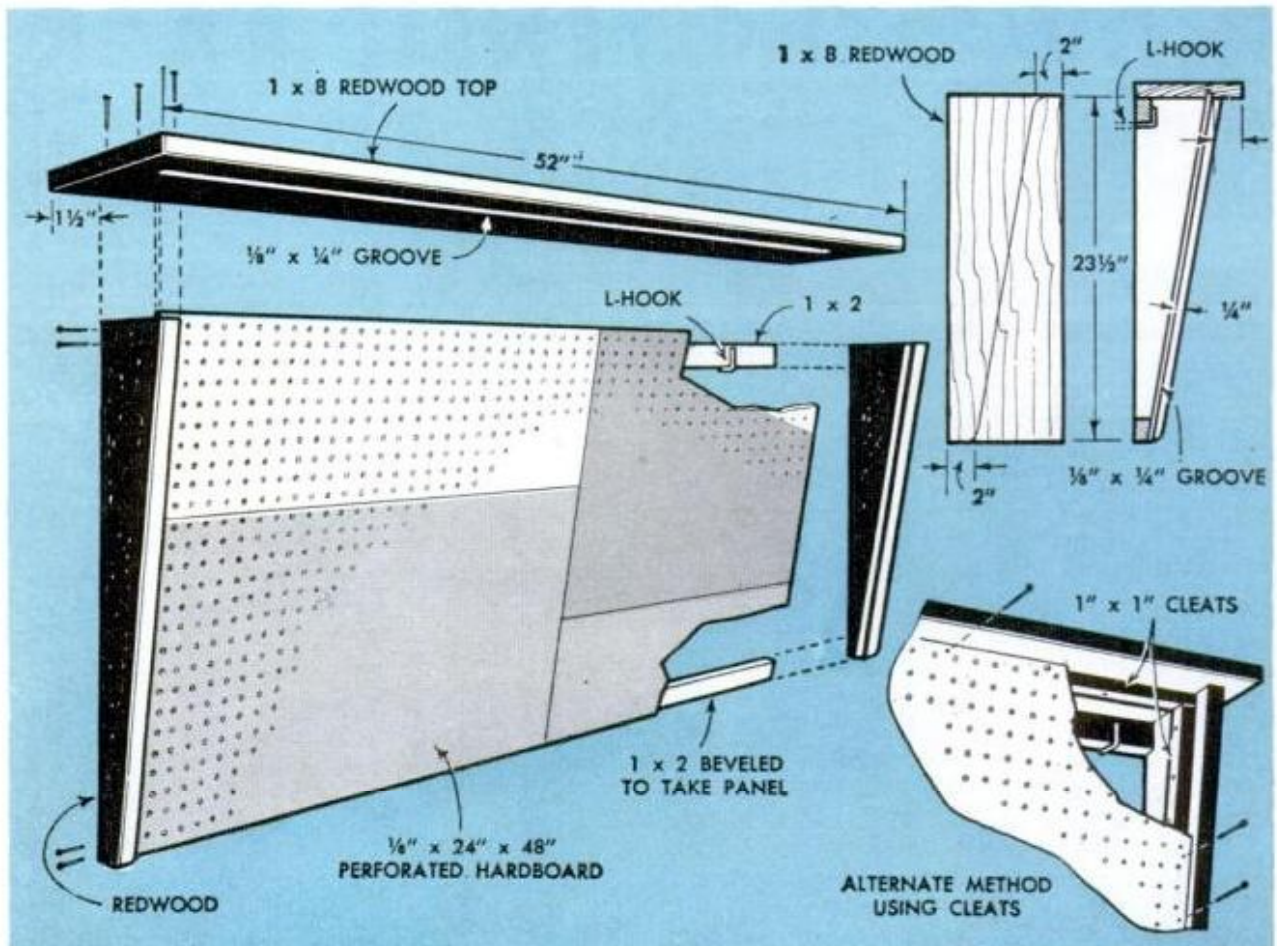
A TOOL PANEL for the kitchen, the perforated front is fitted with standard fixture hangers to suit utensils

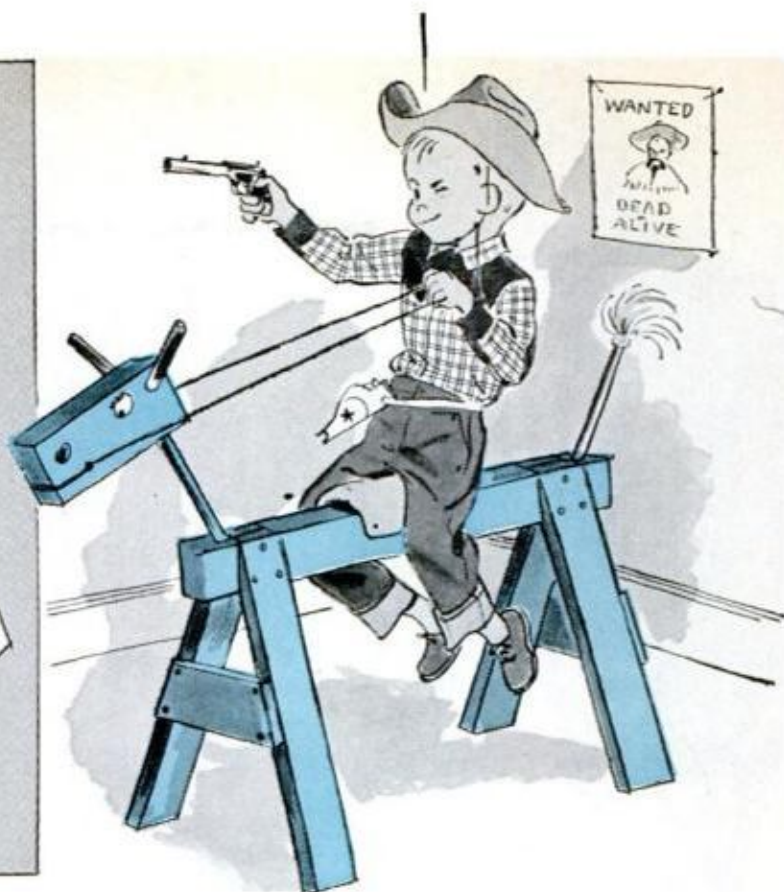
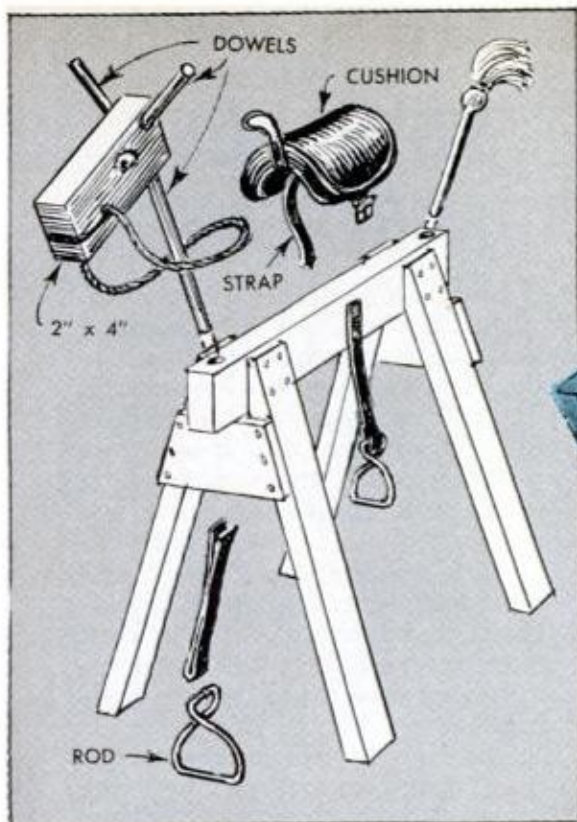




GROUPING THE PANS beforehand on the perforated panel and ruling off areas for different colors that will contrast best with the particular utensils is the best way to determine how the front should be divided. Masking tape makes the neatest job when painting

ends and later squared up with a narrow chisel. If you prefer to skip the grooving, you can resort to an alternate method of adding 1-in. cleats to the top and ends and gluing and nailing the perforated panel to the cleats. The advantage in grooving the pieces is that there are no nail heads showing. It is possible, of course, to conceal the nails with putty if the heads are set below the surface. To do this when working with tempered hardboard the holes for the nails must be counterbored slightly to accept the nail head. Remember in running the groove in the underside of the shelf that the saw blade must be set at an angle to match the slant of the front panel. Here the groove is made $2\frac{1}{2}$ in. in from the edge, whereas it is only $\frac{1}{4}$ in. in the case of the ends. Both end pieces are cut from a 1 x 8 board, which measures actually $7\frac{1}{2}$ in. The top shelf likewise measures only $7\frac{1}{2}$ in. wide. The lower edge of the hardboard is reinforced with a beveled 1 x 2 glued to the back side. Another 1 x 2 fitted between the ends at the back serves as a hanging cleat which hooks over L-hooks turned into the wall. Use three L-hooks and locate them in wall studs when possible. Studs can be located by tapping the wall with a hammer. ★ ★ ★





Let That Sawhorse Ride the Range

Say Dad, you can't get much done in your home workshop with youngsters prancing around and getting in your hair. If locking them out creates a riot, the best you can do is to keep them amused. Here's one suggestion—convert your sawhorse into a temporary hobbyhorse. Insert a section of 1-in. dowel into a scrap of 2 x 4 painted to represent a horse's head. The

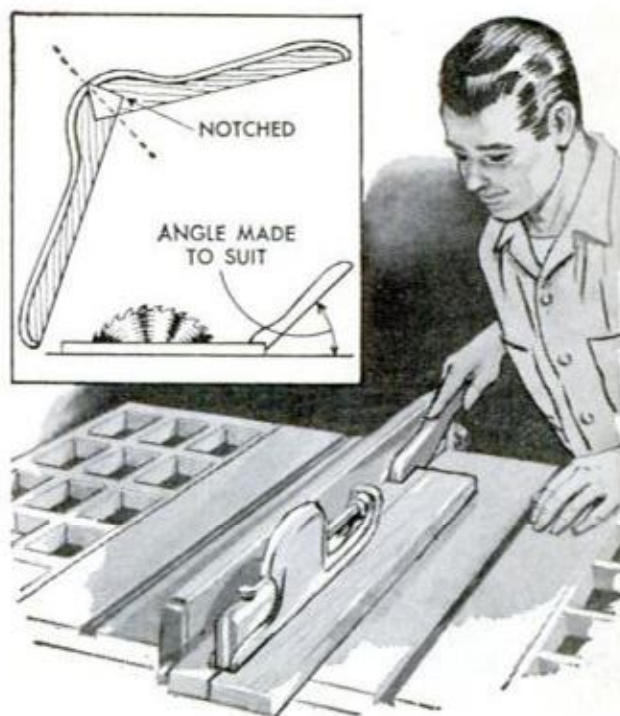
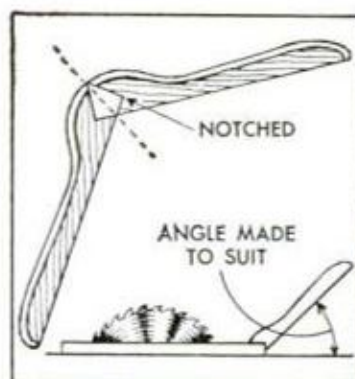
dowel should slip fit a hole drilled into one end of the sawhorse to make it removable when the horseplay must cease and the work continue. An old dish mop similarly fitted makes a dandy tail. With a "cinch" strap stitched to an old pillow and a pair of stirrups made as shown, your young cowboys will ride tall in the saddle, leaving you free to work in peace.—Carl Pelander

Clothes Hangers Put to Work As Circular-Saw Push Sticks

Here's a familiar household item put to new use in the workshop—the wooden clothes-hanger makes its bow as a pair of push sticks for use with your circular saw. The outer ends of the hanger are of a shape which fits the hand nicely and require no attention. The only necessary change after separating the two pieces, is to cut right angle notches at the front or juncture ends. If desired, one arm may be given a notch large enough to engage stock of 1 in. thickness or larger, and the other a shallower notch for stock of $\frac{1}{4}$ in. and smaller.

—W. C. Wilhite

Strips of veneer or molding will do an adequate job of concealing the raw edges of a piece of plywood furniture and will enhance the appearance of the finished project.





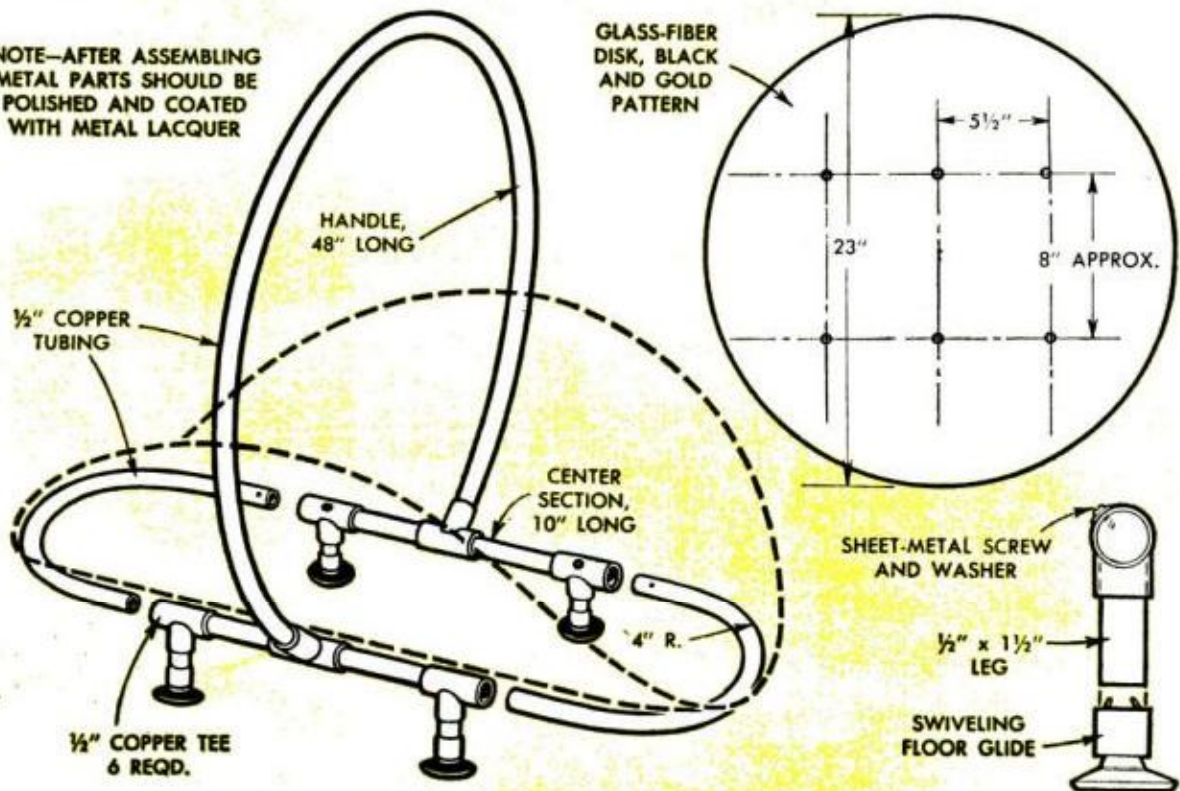
IT GOES WITH YOUR FIREPLACE

Laying a fire takes only a minute or so when you keep kindling and logs handy in this attractive basket. The basket proper is made from a disk of glass fiber in a decorative black-and-gold pattern and the supporting frame, legs and bow-type handle are assembled from copper tubing and solder-type fittings. After assembling, the metal is polished and lacquered to prevent it from tarnishing. The short tubular legs are fitted with swiveling floor glides.

The copper tubing used is the type and weight specified for home plumbing and can be bent with a plumber's or electrician's bender, or you can bend it by hand if you are careful to make the bend in easy stages so that the tubing does not kink or flatten. The fittings can be joined to the tubing with sheet-metal screws and washers as indicated in the detail or can be sweat-soldered if desired.

—James A. Lockhart

NOTE—AFTER ASSEMBLING METAL PARTS SHOULD BE POLISHED AND COATED WITH METAL LACQUER



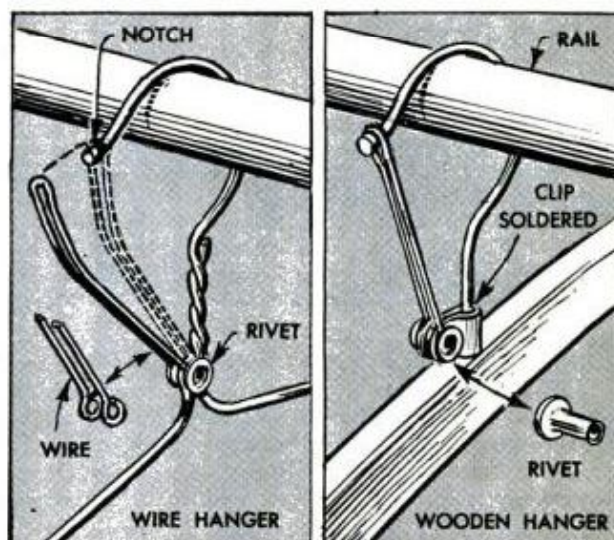
Keep Your Windshield Clear With This Plastic Cover

Tired of scraping sleet and wet snow from the windshield every time you park your car outside in stormy winter weather? Then you can use this plastic cover. To make it cut a strip from sheet plastic equal in width to the full height of the windshield and at least 2 in. longer than the full width of the windshield. Hem a coat hanger into each end of the plastic strip to provide hooks for attaching the ends of the strip to the frames of the vent windows on each side of the car. You'll have to do a little careful measuring to make sure that you get the hangers located with the hooks in just the right position so that by bending each one only slightly you will get a snug fit of the plastic sheet over the windshield. Usually the rear window of the car can be protected in a similar manner.—Joseph Skiscim



Wire Tongue Holds Hanger On Closet Clothes Pole

Clothes hangers won't become entangled with others on a closet clothes pole when they are fitted with these wire tongues, or locks, and neither can individual hangers slip off the pole when other garments are removed. Simply bend a length of wire around the tip of the hanger hook and back on itself to form an eye. Then bend an eye in each end of the wire tongue thus formed. Form a clip from sheet metal, solder to the hook and then rivet the tongue in place as detailed. On hanger hooks that do not have upset, or ball-shaped, ends file a round-bottom notch near the end so the tongue will snap into place.—Lee C. Walker

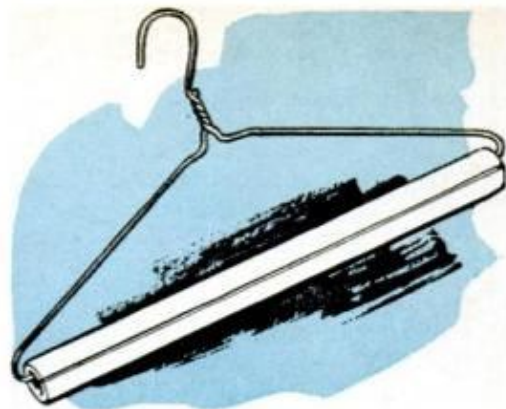


Sheet-Plastic "Lock Washer" Prevents Loosening of Nut

Lacking a conventional lock washer, one sure way of locking a nut on a bolt is to place a layer or two of polyethylene plastic over the threaded end of the bolt before turning on the nut. The plastic film runs into the threads as the nut is drawn tight, locking it very nearly as effectively as a regular lock washer. If necessary, the nut can be removed quite easily with a wrench, but it won't loosen under vibration or even severe shake. If the nut fits rather loosely, then, of course, several thicknesses of plastic film must be used.—R. Hanscom

Old or outgrown mittens make good bean bags that the kids will enjoy playing with. Just fill the mittens with beans and stitch them at the cuffs.





HOW MANY TIMES have you had a wire hanger put a crease in a freshly pressed pair of trousers? There's no need for this to happen. Simply slit a length of mailing tube and slip it over the bottom of the hanger

WHERE'S A SAFE TEMPORARY PLACE to hide cash or valuables around the house? Chances are the petty thief wouldn't think of looking at the back of a drawer. An envelope tacked to outside forms pocket

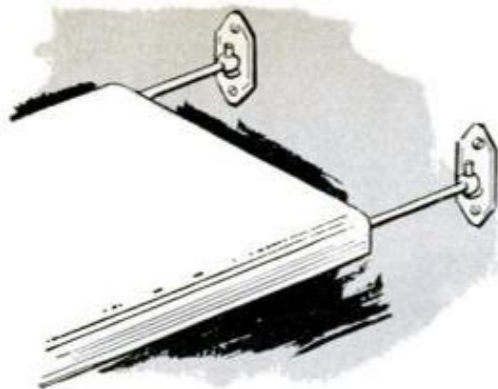
SOLVING HOME PROBLEMS

ARTIFICIAL "PERENNIALS" offer no end of possibilities for flower arrangements, as witness the "potted" specimens below. At left, flowers climb a trellis of dowels set in a wooden block—all set off with a handsome porcelain pot. The wreath, right, is similarly potted but mounted on a wire ring



LOOKING FOR a simple rack for your wife's shoes? You won't find an easier or more practical one to make than a panel with holes spaced to accommodate the heels of the shoes. Mount the panel out far enough from a closet wall to provide enough clearance for hooking the heels of the shoes





SHELVES FOR LIGHT OBJECTS can be added to your closet using curtain rods and brackets. Mount the brackets, adjust the rods to the right length and place a piece of plywood on the rods to make the shelf

LAST YEAR'S BONNET may have developed a droopy, tired-looking veil, but it does not take much to revitalize it. Spray it with hair set, press it with a hot iron and pressing cloth and it will look like new



TO RAKE PAINT from a roller prior to cleaning it, bend a length of coat-hanger wire to the proper contour, draw it along the length of the roller and with a few strokes you will have removed excess paint from the sleeve with little or no mess

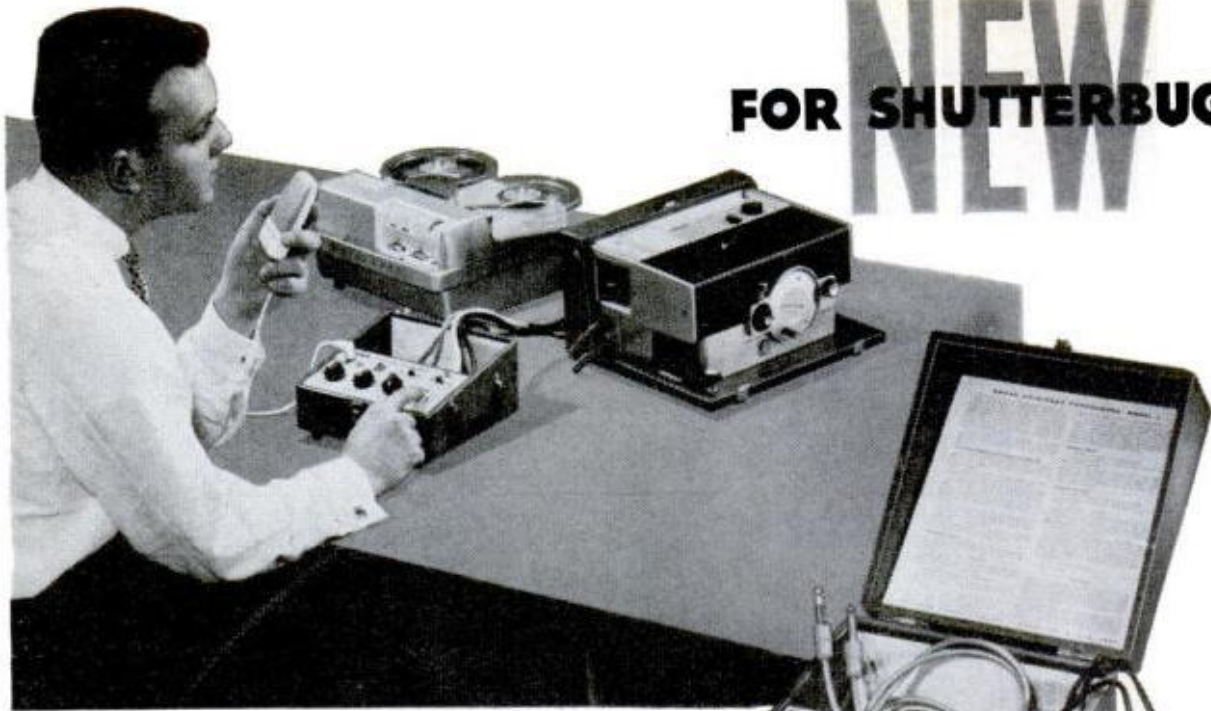
THAT HIP POCKET IS A HANDY PLACE to keep a screwdriver but you risk a hole in the pocket, possibly an injured hand when you reach for the tool. Don't take the chance. Try "muzzling" the screwdriver by slipping the case of a pocket comb over the blade



FASTENED SECURELY to the wall above your work-counter and close to an outlet, a paper-towel dispenser makes a neat storage cabinet for a portable electric mixer. Lower compartment of dispenser is roomy enough to house both mixer and its beaters



NEW FOR SHUTTERBUGS



AUDIO PROGRAMMER synchronizes most magnetic tape recorders with standard 2x2 slides in the Cavalcade projectors for sound-slide shows. The programmer permits recording narration along with musical background and inaudible trip signals which, during playback, automatically change the slides in the projector. When coupled to a recorder and projector, the programmer is the central control unit. With a repeating projector and continuous loop tape, a slide sequence and an audio program may be rerun continuously without even having the operator present

Eastman Kodak Co., Rochester 4, N. Y.



PORTABLE DARKROOM DEVELOPING KIT allows you to carry a darkroom with you and process film anywhere within just 10 minutes. After 6 minutes, processing stops automatically. A single-solution formula combines the actions of developer, short-stop and fixer. Included in the Unikit is a rapid drying solution to dry films in 2 minutes. The developing tank screws to the bottle of processing solution

Cormac Chemical Corp.,
80 Fifth Ave., New York 11, N. Y.

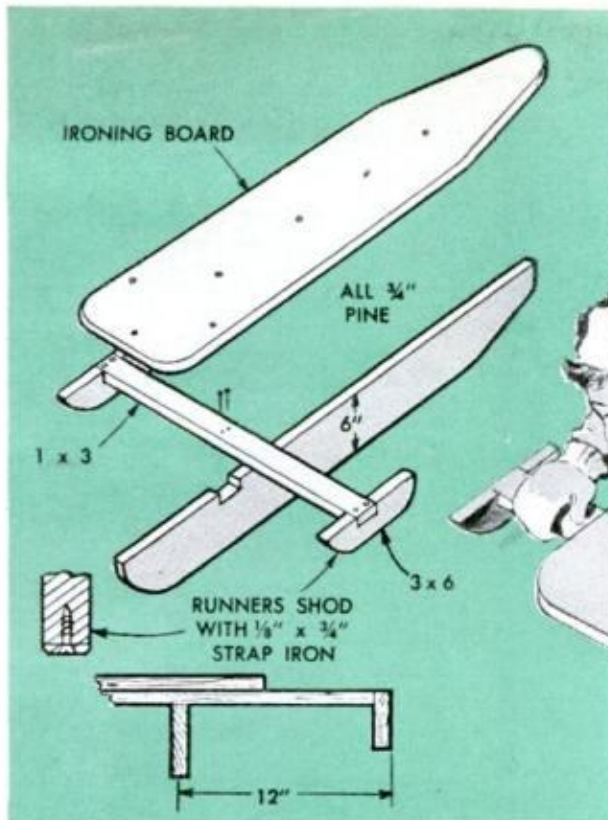


ELECTRIC EYE MOVIE CAMERA is a fully automatic 8mm camera. It has a compact handle with trigger film release that is easy to hold steady. Aperture settings are seen in viewfinder as they change, plus light indicator to signal when too much or too little light is available

Camera Specialty Co., Inc.,
705 Bronx River Road, Bronxville, N. Y.



POPULAR MECHANICS



SNOW OUTRIGGER IS BUILT FOR SPEED

Fit an old wooden ironing board with a steel-shod center runner and outrigger runners for stability and steering and you've got yourself a sled that'll leave the field far behind on any hill. There's nothing plushy or comfortable about it. It's plain sled, built solely to get maximum speed from a single runner on smooth snow. Take it either way you like, belly down or sitting, nothing will get you to the bottom of a hill faster. And it's so simple to make that you can start building it from scratch during a snowstorm and be out sliding long before the last flake comes down.

Any wooden ironing board will do for the body, or platform, so long as it's not

split or otherwise damaged. The center runner is cut from a straight-grained 1 x 6, which is about 5½ in. wide. The rear end is cut at an angle, the forward end is rounded to a smooth curve and the top edge notched to take the crosspiece carrying the outrigger runners in a flush lap joint, glued and screw-fastened. Attach the outriggers to the crosspiece in the same manner, then attach the strap-iron shoe to the center runner with screws in countersunk holes spaced about 6 in. apart. Polish the metal shoe with abrasive. Mark a center line on the ironing board, drill holes for screws and attach to the runner with screws and glue.—Hi Sibley

Potter's Kick Wheel

Here's a pro-type potter's kick wheel that can be fitted easily into the project schedule of the school welding shop or can be assembled by individual practicing ceramists who like to make their own equipment. It's made almost entirely by weld-fabricating ordinary pipe and steel plate. The vertical mandrel carrying the throwing head is mounted on a thrust ball bearing, permitting the weighted wheel to spin at a uniform speed for long intervals between kicks. The wheel is a steel plate flame-cut to a disk and weighted with curved weights flame-cut from 1½-in. steel plate stock. Seat is adjustable for height.



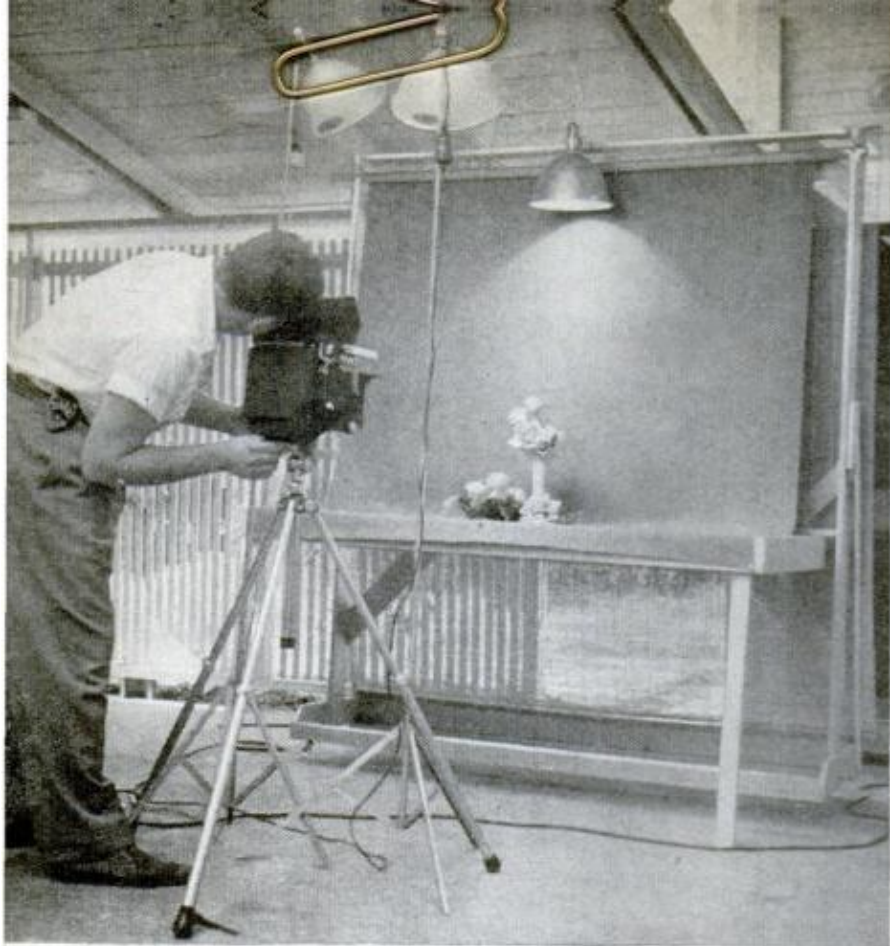


PHOTO at the left pictures a typical table-top setup with the table in raised position. Above you see the resulting print, perfectly lighted, shadowless, with no background line. Compare with photo on opposite page and you'll appreciate the versatility of this unit



PORTABLE

By Charles Scott

PORTRAIT OR TABLE TOP—this double-duty photo backdrop will handle both assignments in one compact unit which makes it ideal for the cramped quarters of the amateur home studio. In addition to supporting a variety of backdrops that can be interchanged and pulled down like a window shade, the unit features a folding built-in table for table-top shots. Casters permit it to be wheeled about indoors and out. The backdrops are rolled up on wooden poles, cardboard tubes or aluminum tubing. When buying back-drop material, choose the widest size available. If cloth backdrops are fastened to poles, it will be easier to roll them up and down. To accommodate larger backdrops you may wish to make the stand 9 ft. wide instead of 6 ft. so that it will accept commercial display-paper back-grounds available in different colors.

The portable stand is basically a simple wooden frame assembled from 1 x 2 and 1 x 4 material. As part of the compact unit, the table swings up to provide a desk-high surface for closeup setups. The base of the frame is cut out and nailed together first. Then the lower upright section is added. Be sure to brace the frame properly, especially if planning to use it outdoors where it may be subjected to twisting stresses.

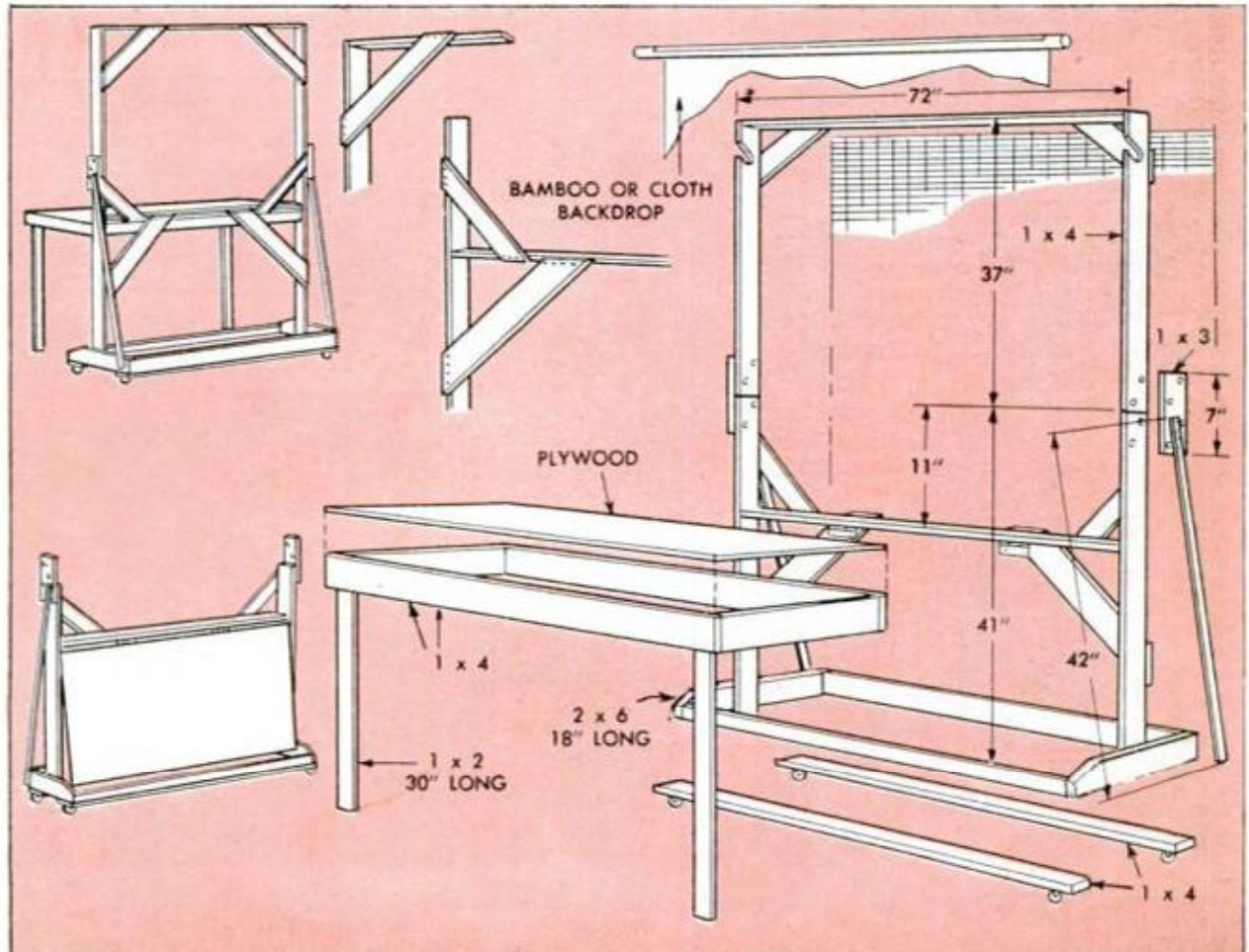
Slots are sawed at an angle in the sides of the upper section, and these hold the backdrop poles in place. Cleats are used to attach the upper to the lower section. Nail the cleats to the lower section

and bolt them to the upper one. Using wing nuts makes it easy to disassemble the stand when you may wish to transport it by car for on-location assignments.

The table is simply a hinged shelf that drops down and out of the way when a table-top setup is finished. Two or three large hinges are used to attach the top to the frame, and special folding brackets may be used to attach the legs to the table so that they fold out of the way when the table is dropped. Flat plate casters screw to the base and make it easy to roll the unit from place to place. The frame may be used to hold clamp-on floods and spots to backlight subjects, and also the light arrangements necessary for portrait lighting. For table-top setups, the backdrop should always curve at the back of the table to eliminate a distracting line, which will appear on the print and may spoil the composition of what would otherwise be a shot of professional quality. ★ ★ ★



PHOTO BACKDROP

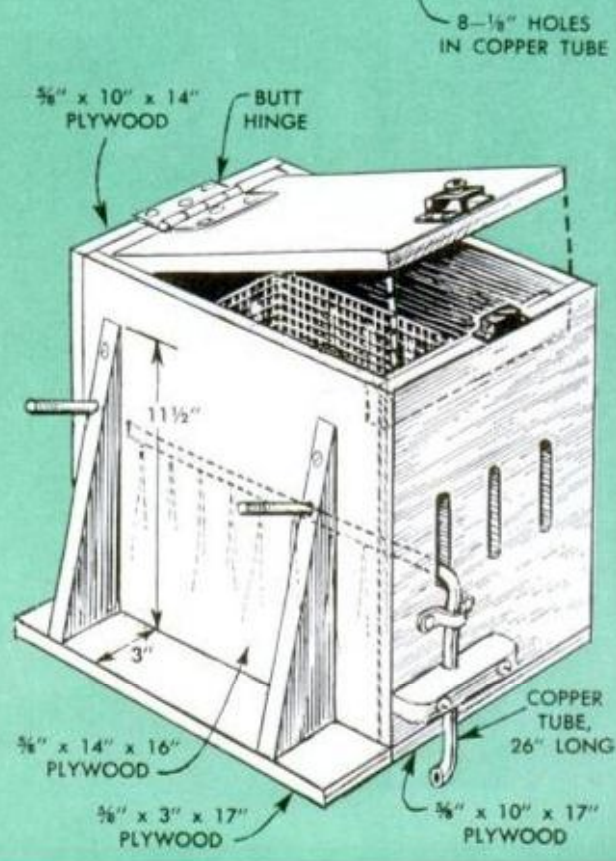
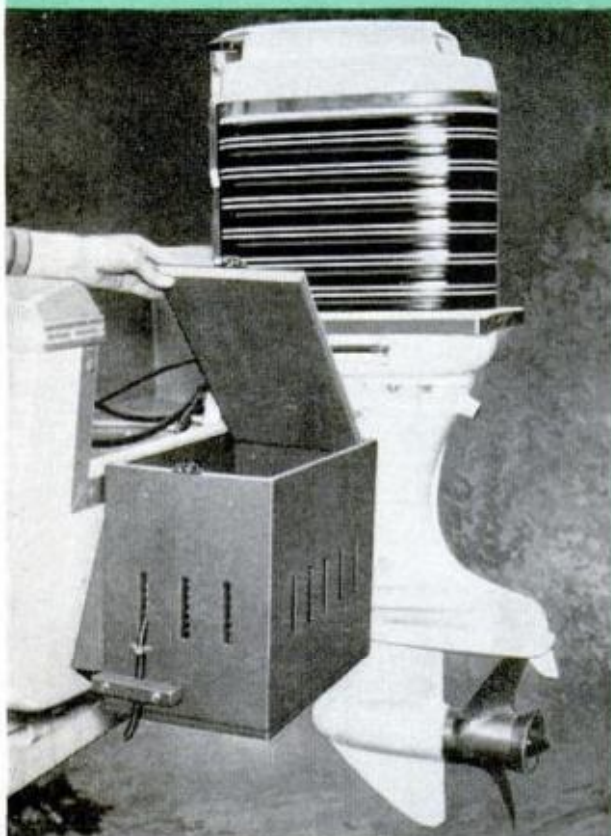
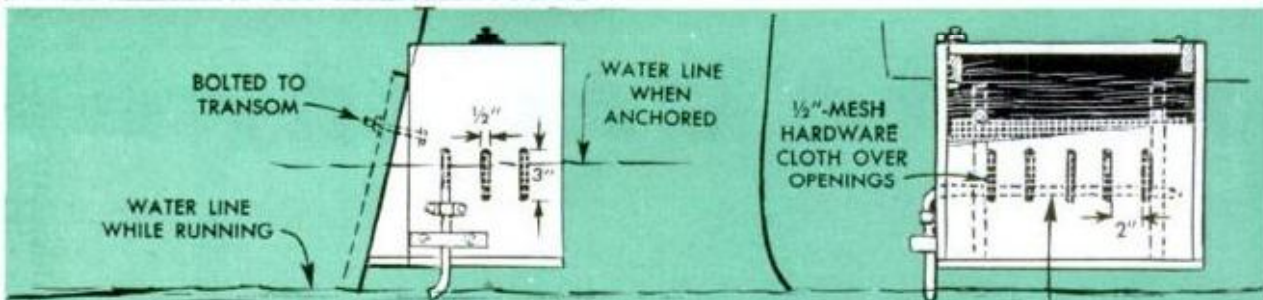


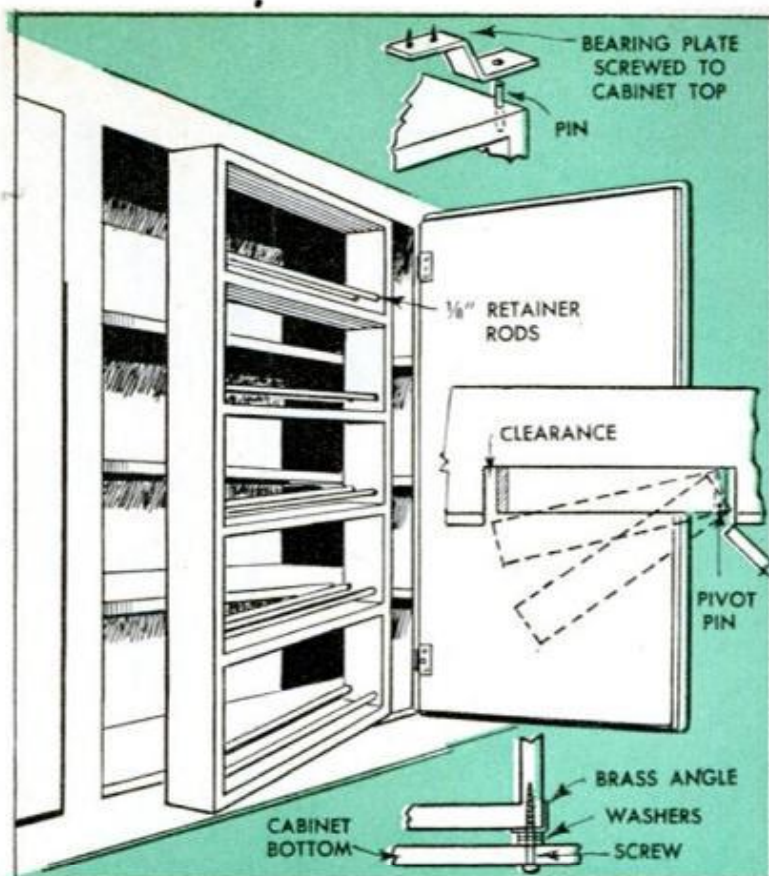
KEEP LIVE BAITS LIVELY



ONLY ACTIVE live baits catch fish. The hungriest bass is not likely to strike a minnow in a coma from too long exposure to the air. Here's a way for you outboarders who buzz off to far fishing grounds to keep live baits always palatable, for days if necessary. It's a special box, or tank, attached to the transom alongside the motor. The sides of the tank are slotted and the bottom half is always submerged when you're anchored or docked. When you're buzzing along at a smart clip or trolling with little more than a ripple in your wake, a pickup tube pulls water into the box, aerates it thoroughly and keeps the minnows happy. The details show how to make the tank of waterproof plywood and how to attach it to the transom.

—Jack McEarchern





Swinging Spice Shelf for Your Spouse

This swinging shelf unit has an advantage over condiment racks attached to cabinet doors—it isn't necessary to rearrange stored items frequently to provide clearance for closing doors. The cabinet shelves are a separate unit pivoted to swing out and give quick access to the items in back.

The recessed cabinet is made of 1x4 lumber, and may have a back of 1/8-in. hardboard if desired. Open shelves of the separate shelf unit are dadoed to the sides and all parts are screwed and glued together to make a rigid, non-sagging assembly. Retainer rods are simply set in blind holes in the sides before gluing. Pivot holes at top and bottom of the front corners

must be in perfect alignment. The top pivot is a nail and fits into a bearing plate screwed to the top. The weight is carried on a brass angle that rests on washers to provide clearance at the bottom. The lower pivot is a wood screw that slips through the hole in the cabinet bottom.

In repairing electric razors and other small appliances which are subject to vibration, I had trouble with the small case screws vibrating loose until I hit upon the idea of dipping the screws in rubber cement. Now the screws stay put and yet they can be easily withdrawn if need be.

—Jack Steele

Typewriter Ribbon Boxes Perfect for Storing Tape

The next time you change your typewriter ribbon save the box. Such containers are ideal for storing friction tape. The tight fitting cover won't let the tape dry out and also protects the sticky roll from dust and chips when carried in a tool kit or left in a workbench drawer.—H. Hanscom

To keep patent-leather shoes and handbags from cracking when put away, coat them with petroleum jelly and then wrap them so the coating doesn't rub off.

—D. Fenn





TO LOAD THE MITT, dip the palm in the paint, then squeeze the hand to remove the excess. To use, wrap the mitt around the work and slide along. Mitt alone also is useful for polishing car and dusting furniture

SHAKE HANDS WITH A

By M. Robert Beasley

WHAT'S NEW in paint applicators? Meet the paint mitt—the latest innovation to the painting industry. Developed for use wherever it is impractical or time consuming to apply paint with a brush, roller or spray, the paint mitt lets you literally put it on by hand, unbelievably fast.

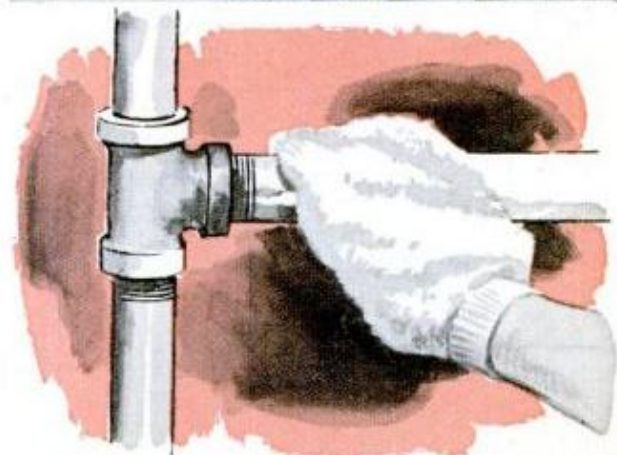
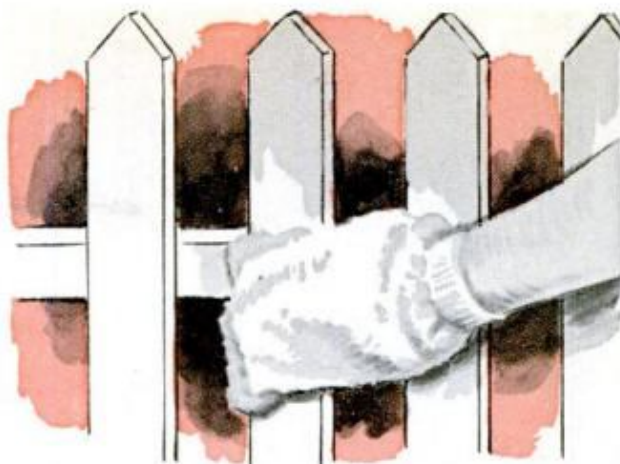
For example, whole sections of I-beam can be effectively covered with paint with one stroke of the mitt where it formerly took hours with a brush or produced “blow back” when sprayed. For pipes, especially those near a wall, you have only to dip the mitt, squeeze out the excess, close the mitt over the pipe and with only a few strokes the job is finished, in a matter of minutes.

Available with or without thumbs and in short or long nap, the lambskin mitts are finding a thousand and one other uses in and around the home. To paint a picket fence, a job that once took hours of tedious work, just dip the mitt, close your mitted hand a trifle and spread paint over the face and edges, in one pass. Do a repeat performance on the other side and there you are. Intricate jobs, like ornamental iron work and porch railings, are painted in minutes and all without the dripping and splatter problems that are a regular part of painting when using brushes and spray guns. Another advantage of the mitt is the fact that it allows you to work in small cramped

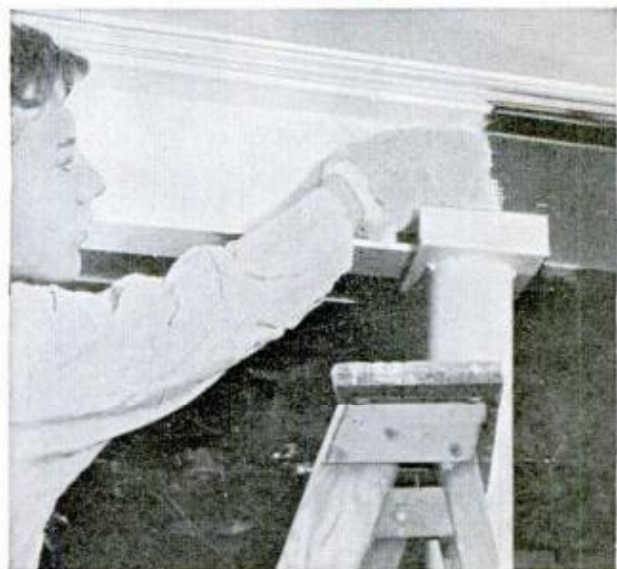
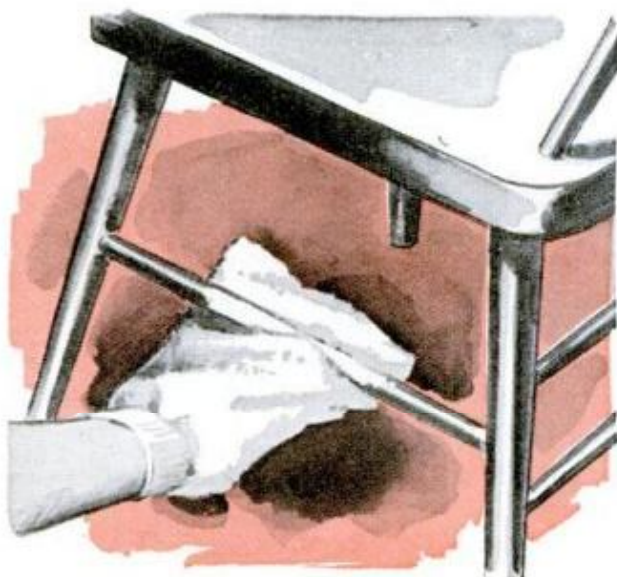
spaces, eliminating the time consuming task of masking—the mitt gives you complete control over paint distribution at all times. Use of the short-napped mitt has proven best for painting furniture, like chairs, chair rungs, ladder backs and seats. In place of twenty or thirty brush strokes, one sliding stroke of the mitt covers the same area and without leaving any streaks or brush marks.

The lady of the house also will find the mitt a blessing, for in addition to its use with paint, it may be dipped in a solution of warm water and soap and used to clean venetian blinds, radiators, hard-to-reach spots behind furniture and appliances and to dust and clean with a minimum of effort. Used dry, the mitt makes an ideal polishing cloth for waxed surfaces and dad will find it about the best thing yet for washing and polishing the car.

Paint mitts are available in different sizes with leather or plastic lining to protect the hands from paint stains and are manufactured on the same principle as rollers with the same basic procedures applying—a short nap for smooth surfaces and a longer nap for rough. Also, like rollers, a new mitt should be washed in warm sudsy water and rinsed in clear water before use. When the job is finished, the mitt should be washed out thoroughly. For oil based or latex paints, of course, use the recommended solvent. After washing allow the mitt to dry thoroughly before storing in a dry place of moderate temperature. After washing, it's a good idea to wrap the mitt in sheet plastic to prevent it from collecting dust. ★ ★ ★



PAIN T MITT



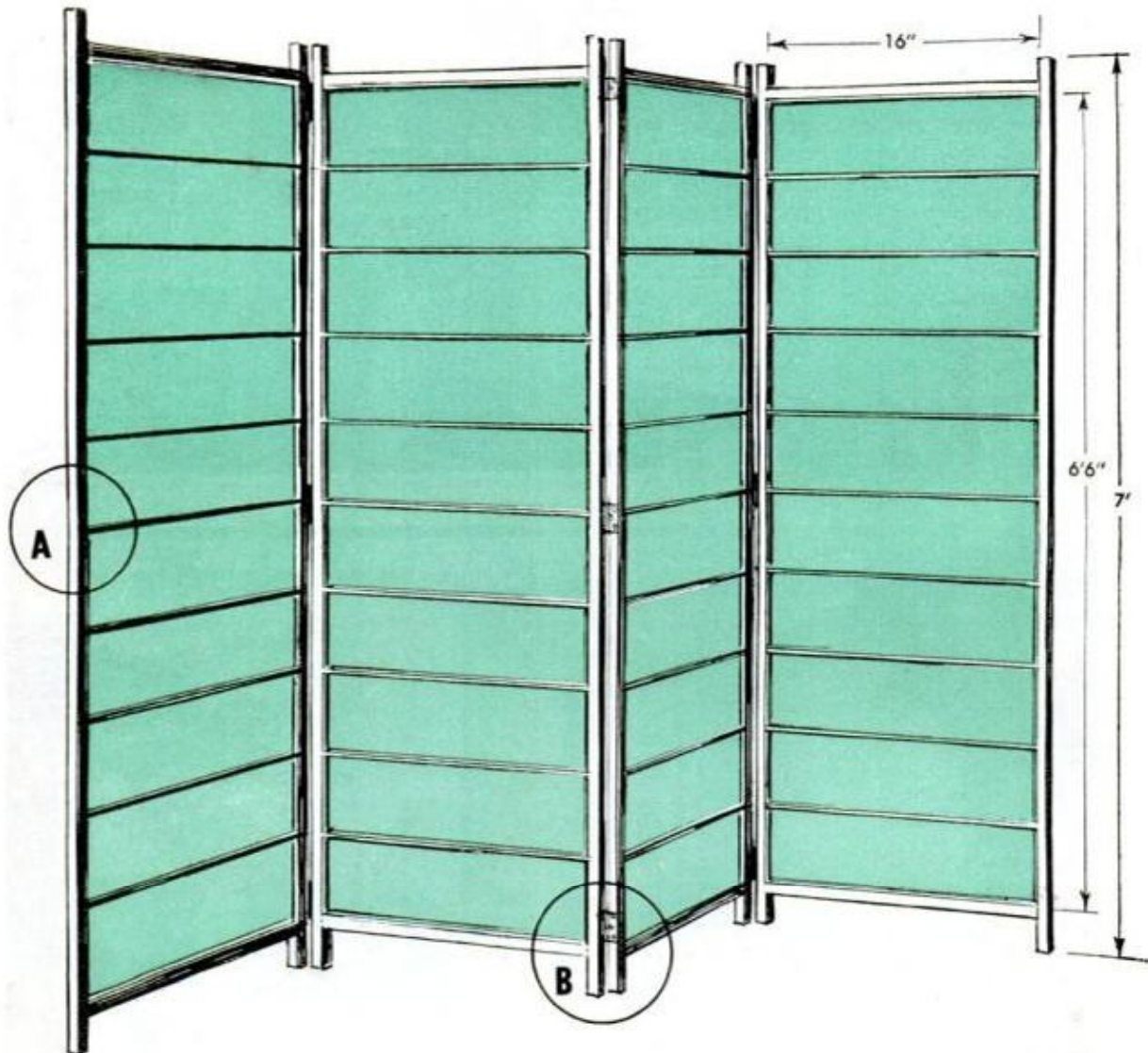


FROM EAST

BRING A decorator touch of the Orient into your home with an easy-to-build shoji screen. It has a way of belonging with either conservative traditional or ultra-modern furnishings and in open-plan homes and apartments the shoji can serve a two-fold functional and decorative purpose. The screen illustrated and detailed can be made in several designs, but basically all are simply frames of wood paneled with translucent glass fiber, which is regularly supplied in panels 1/32 in. in thickness and 30 x 72 in. in size. The translucent white glass fiber simulates rice paper and has greater resistance to tearing.

Redwood is recommended for the frame members and the crossbars, because this wood gives the screen durability and dimensional stability. It takes and holds glue, nails and paints or stains well.

Details A and B tell the whole story of construction and assembly of the redwood screen frames. Note in the details that the

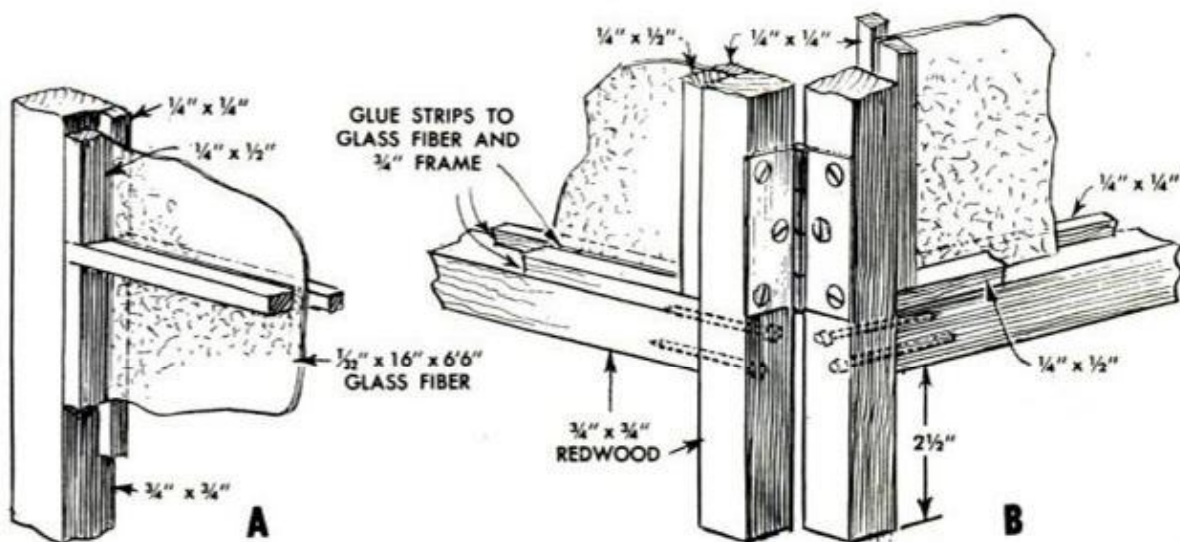
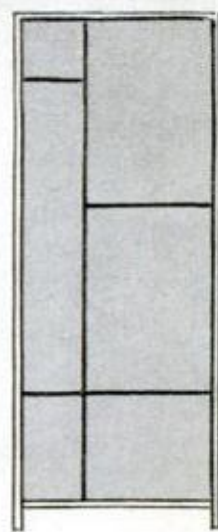
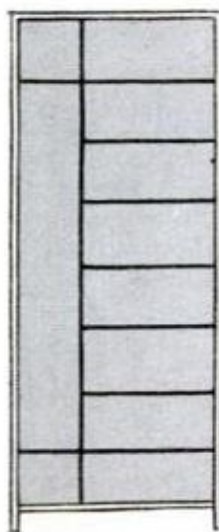
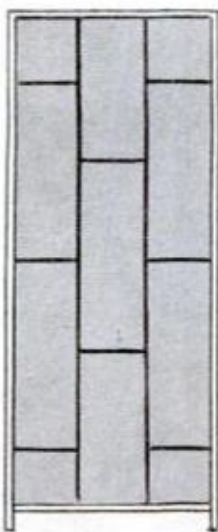
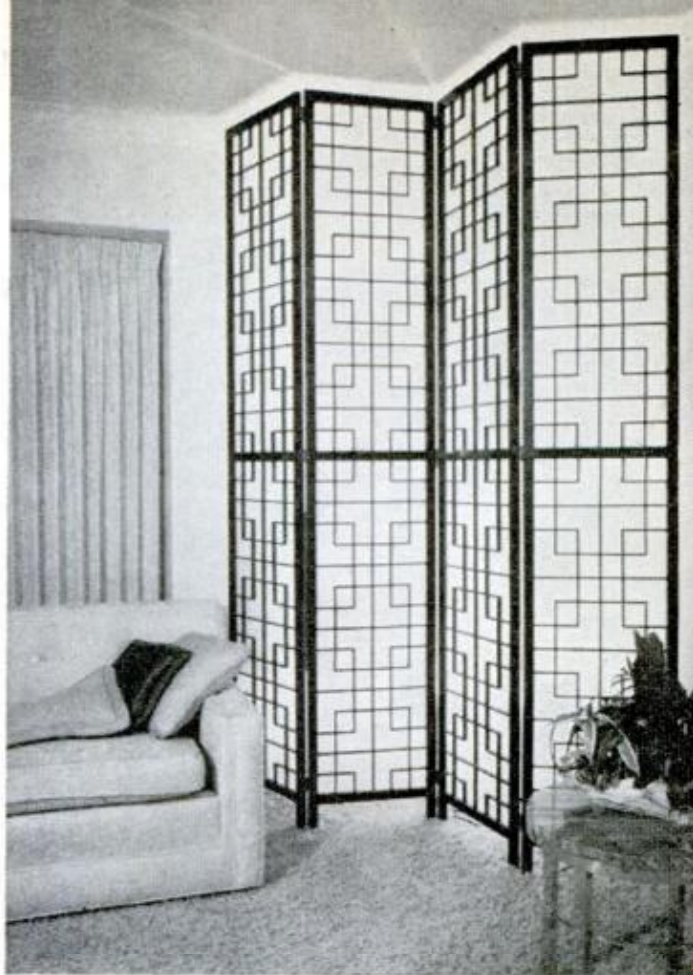


TO WEST

vertical and horizontal frame members are $\frac{3}{4}$ x $\frac{3}{4}$ -in. squares and that $\frac{1}{4}$ x $\frac{1}{4}$ and $\frac{1}{4}$ x $\frac{1}{2}$ -in. strips are used to hold the glass-fiber panels in place at the top and bottom. All joining parts are fastened with finishing nails and glue, the heads of the nails being set below the surface and the holes filled with a colored wood putty.

In detail B a single-acting butt hinge is shown, but if desired a double-acting hinge of the type permitting the members of the screen to swing in either direction, can be used. Finish the frames before assembling in the natural color with a semigloss finishing material applied over a sealer. If you wish a finish closely simulating the original used on shoji screens, apply a semigloss black lacquer over a lacquer sealer. Rub down with fine steel wool. ★ ★ ★

EACH ONE of the panel designs shown below are built around 30 x 72-in. sheets of glass fiber. Stock 1 x 2s assembled flatwise and half-lapped at the upper corners form the frames, while $\frac{1}{4}$ x $\frac{3}{8}$ -in. window parting stock is used for the overlay strips





WEAR SAVERS FOR PAD SANDERS

Dust drawn into a pad-sander motor can clog up ventilating openings, foul the brushes and may even work into sealed bearings. The result is overheating, greatly accelerated wear and possible breakdown of the motor. Especially do these motors need extra protection when working for prolonged periods under extremely dusty conditions, such as sanding the taped joints on plasterboard walls and ceilings. It takes only a minute to make an effective filter by folding an open-mesh cloth—first-aid gauze is excellent—and taping it tightly over the air intake openings as in the left-hand photo to above. When placing the tape, be sure that it does not reduce the normal free area of the intake openings as otherwise the flow of air drawn into the motor will be re-

stricted and overheating will result. Keep the power cord out of the way by looping it as in the right-hand photo and then taping to the handle. This not only saves a lot of wear on the cord, but keeps it trailing always to the right when you are sanding either on a horizontal or vertical surface. Also, there is less tendency for the cord to kink and bend sharply at a point near the handle which results in eventual damage.

A light film of rust on handsaws and other hand tools can be removed with a paste made by mixing fine pumice with lubricating oil. Apply the paste with a cloth pad, rubbing vigorously. The pumice will remove the rust and the oil picks up the residue. Wipe off and apply a light oil.

COMING UP NEXT . . .

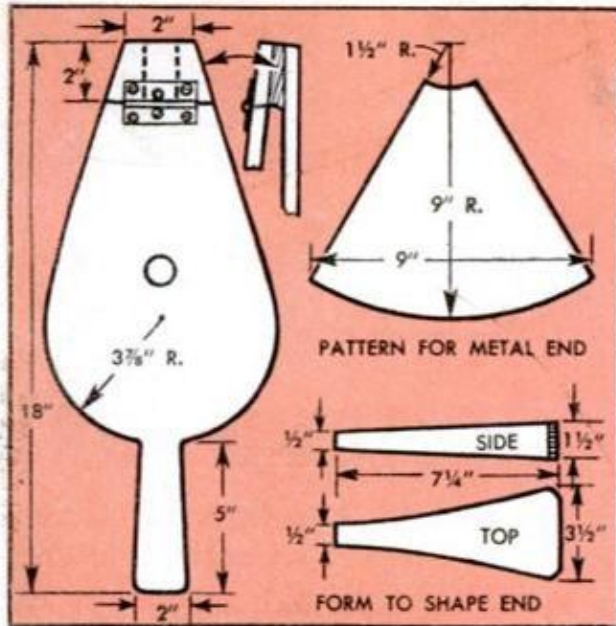
ELECTRIC SIDEWALK CAR. Up and coming dragsters from tyke-size on can wheel this little racer safely without scaring the daylight out of the neighbors or running people off the walks. Can't go too fast because it's battery powered and is driven by a war-surplus motor driving through a gear-reduction.

WHICH ELECTRIC PUMP? Nowadays you just can't live happily in the country without a pressure water system and a deep-well pump. Or maybe you only need a shallow well pump. One should know the difference between these two types and how they work, so watch for this February feature.

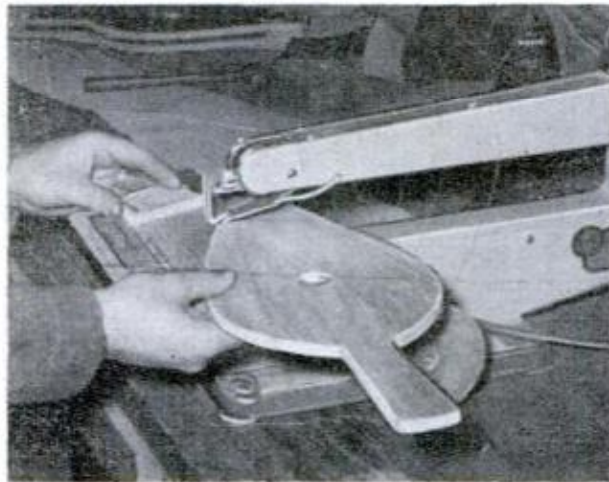
MOVIE-CAMERA SWITCHES. With these panhead and shoulderpod switch handles cinematographers—and that's what you are if you take movies—can control pan and tilt, and operate the variable shutter or Zoomer lens and the camera all at the same time with just two hands!

HOW TO INSTALL HUMIDISPRAY. Enjoy all the benefits of controlled humidifying of the air in your home with no furnace-performance losses and no complicated installation problems. Humidifier operates on new principle of controlled spray. Fits any forced-air furnace. How-to article gives all details.

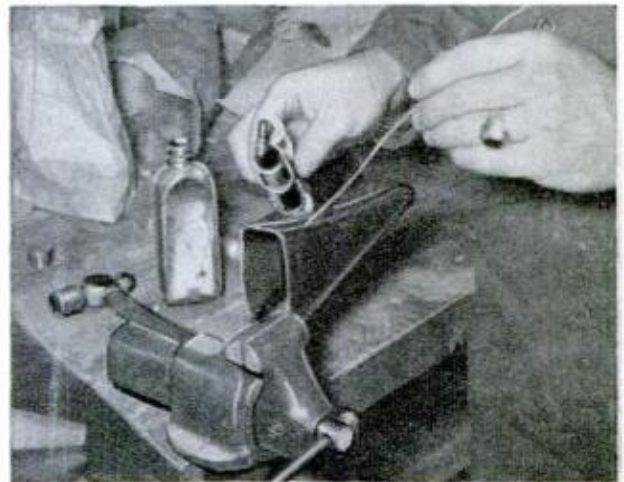
FIRE BELLOWS



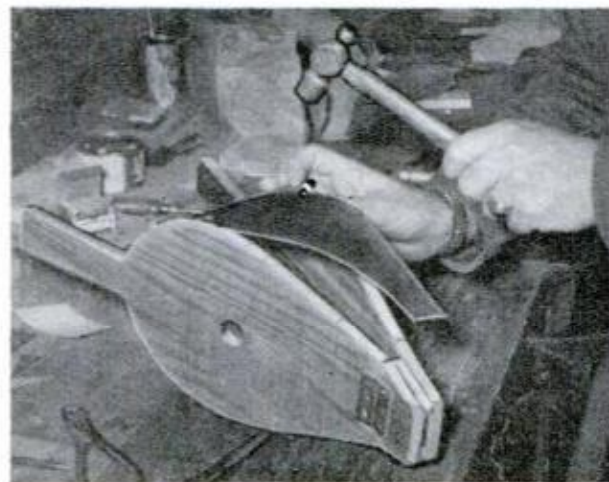
By John Corey

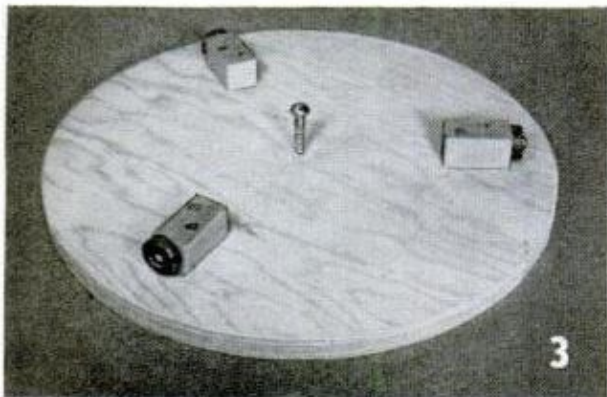


JIGSAW WOODEN SIDES from 1/2-in. solid stock or plywood. Bore air-intake hole in one and cut 2-in. section from nozzle end. Hinge section back on, then join members at throat, sandwiching blocks between to form discharge opening. Below, apply leather covering to edges of wooden sides, gluing and tacking with rows of upholstery nails to make air tight

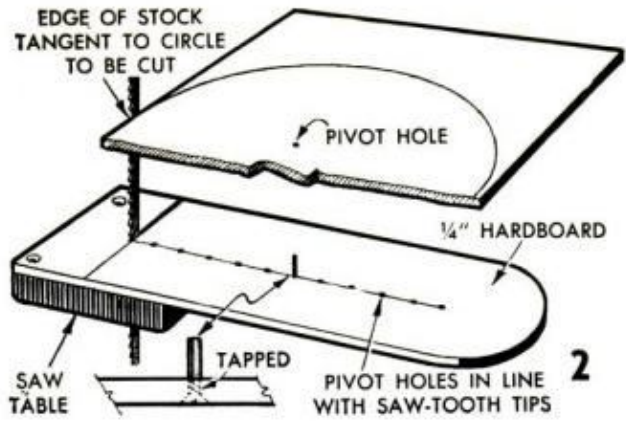


TRACE NOZZLE PATTERN on sheet copper, cut out and form over wooden block shaped as detailed. Solder seam, above, then slip nozzle over throat of bellows and fasten with fancy upholstery nails, below. Copper nozzle may be given hammered finish while on form and wooden faces of bellows can be decorated after finishing with hammered metal overlays





ABOVE, FAUCET WASHERS provide ready-made rollers to support rotating top. Below, 16 glass marbles are held between grooved hardboard race by pivot



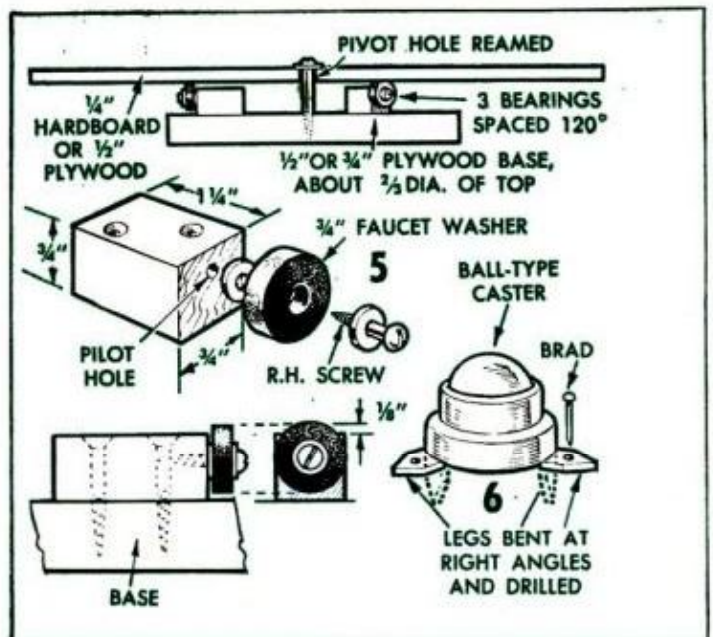
ONE GOOD TURN

Five clever bearings for Lazy Suzans assure smooth rotation

By E. R. Haan

FROM SUCH common everyday items as glass marbles, faucet washers, can covers, skate wheels and casters you can make your own free-turning bearing for that Lazy Susan. Simplest of all is one that utilizes faucet washers attached to small blocks as shown in Fig. 3 and 5. The blocks are glued and screwed to the base of the Lazy Susan and centered over radial lines spaced 120 degrees. Three ball-type casters like those shown in Fig. 6 mounted equidistantly around a central pivot make another simple bearing for a Lazy Susan.

A bearing using glass marbles is shown in Figs. 4 and 7. Here the race consists of two disks of tempered hardboard having concentric grooves to hold the marbles. The lower one is screwed to the base of the Lazy Susan and the upper one is glued to





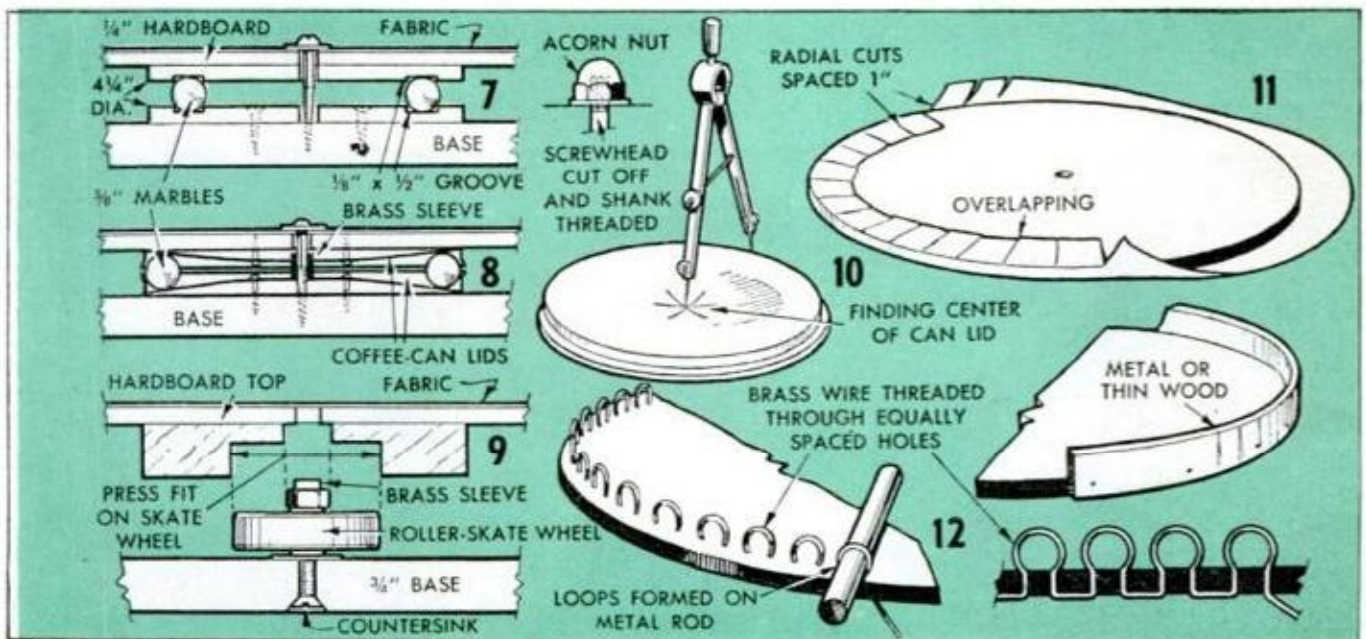
the top. A round-headed wood screw and washer pivots the Lazy Susan to the base. As a final touch of refinement an acorn nut can be used as a finial by cutting off the head of the screw and threading the shank.

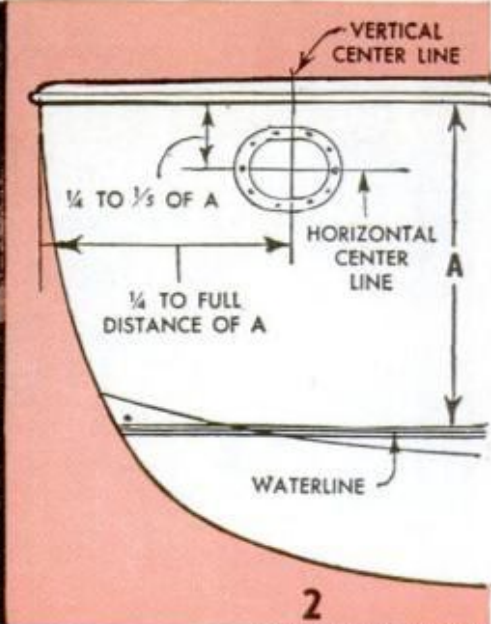
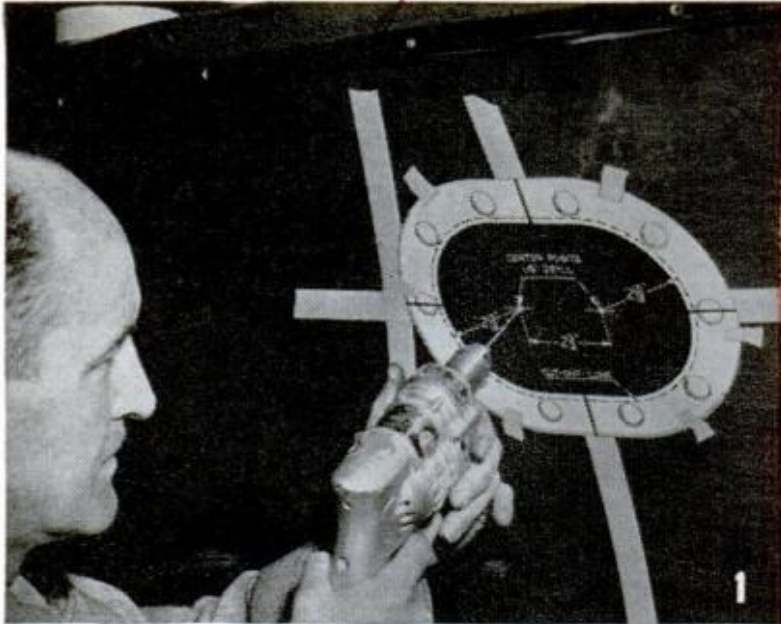
If you have no facilities for turning the grooves in the disks, coffee-can lids can be substituted for the latter as shown in Fig. 8. Here a sleeve is used on the pivot screw to prevent the upper lid from catching in the threads. Spotting the pivot holes in the lids is done as in Fig. 10.

Still another Lazy-Susan bearing can be improvised from a skate wheel, Fig. 9. In this case, the machine screw passing

through the wheel must fit without play, and the counterbored block under the top must be turned to a press fit on the wheel.

Figs. 1 and 2 detail a circle-cutting jig that can be made for sawing the base and top for a Lazy Susan. While you can simply paint the sawed-out top, plastic fabric gives a nonskid surface that wipes clean. After cementing the fabric to the surface, the overhang is brought around the edge and slit at 1-in. intervals for cementing to the underside as in Fig. 11. If you want to add a gallery for appearance, you can thread brass wire through holes around the perimeter, forming loops, as in Fig. 12. ★ ★ ★





AFTER BOW-LIGHT TEMPLATE is positioned according to location directions given in Fig. 2, pivot points for end radii are drilled, Fig. 1, as means of checking light housing clearances between frames inside of boat

Morse Instrument photos

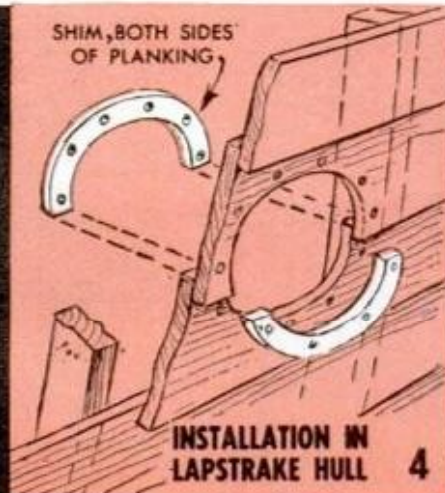
DOCKING LIGHTS Mean Safer Boating

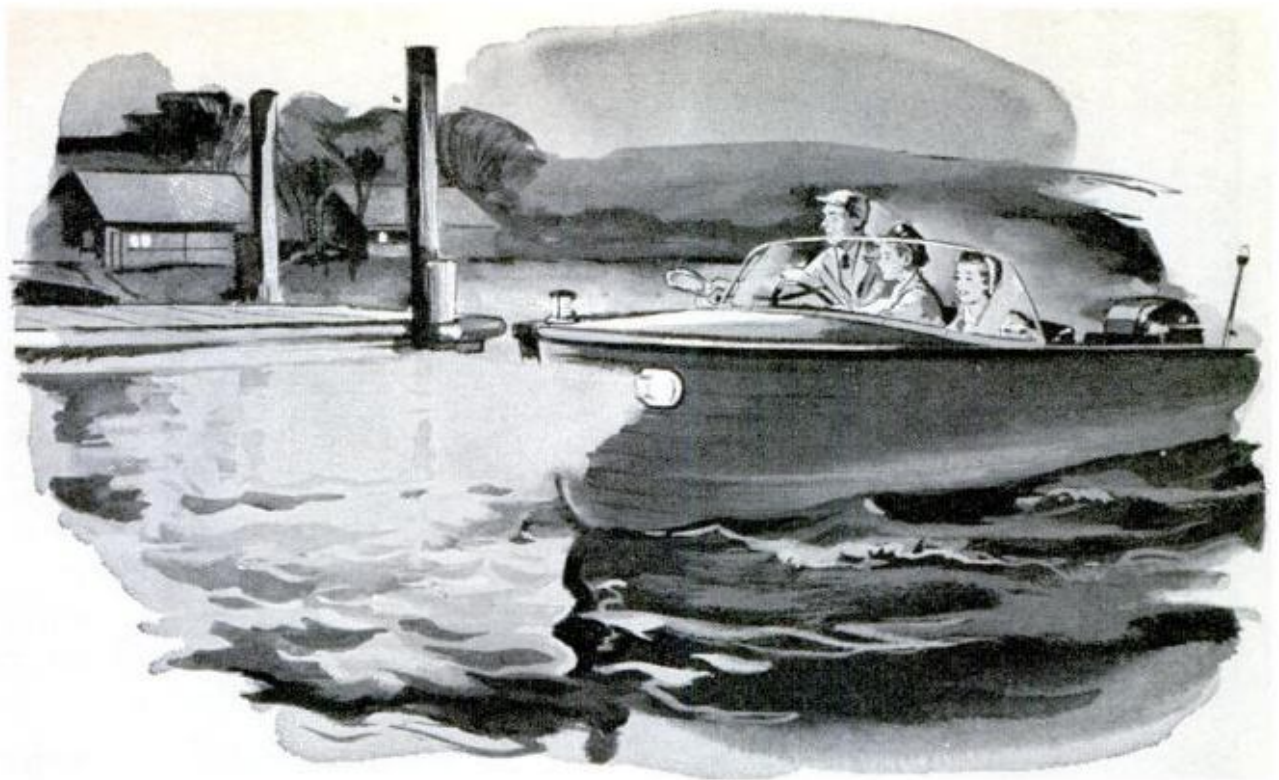
By Earl Wobeck

NIGHT-TIME LANDINGS at poorly lighted docks can be less of a hazard to boat and crew when your craft is fitted with marine docking lights. Such lights can be installed on any boat regardless of size, design or construction. Mounted on both sides of the bow, docking lights provide unobstructed illumination where it is wanted, enabling the skipper to avoid projections on the dock that may damage the boat or cause injury. Whether at dockside or under way, docking lights also are needed in order to steer clear of floating debris, avoid swimmers, small boats tied up to dock pilings and other dangers or aids to navigation that are unlighted.

Although a searchlight is fine for illuminating objects at far distances, its location up on deck makes it impossible to beam the light on objects close to the boat. Further, the concentrated beam of such a light covers a relatively small area, requiring constant focusing by the skipper, who usually has both hands busy tending the wheel, throttle and shift controls, especially when docking, or sailing in close quarters. Although docking lights produce low-angle illumination that is usually more diffused than that of a searchlight, they are quite brilliant and must not be turned on when in the vicinity of other vessels that are under way. This rule is according to

LIGHT INSTALLATION is same for lapstrake hull, except that shims are used to provide flush mounting surface





Coast Guard regulations, and common sense consideration for other boaters.

Regardless of what make of marine docking lights you install in your outboard or inboard cruiser, sports utility or runabout, the procedure is about the same for all. Lights must be flush-mounted in the bow sides so as to illuminate a broad area of the water directly in front of the boat. They also must be watertight (the unit itself and the installation), be installed so as not to weaken the hull and be located so as to enhance the boat's appearance.

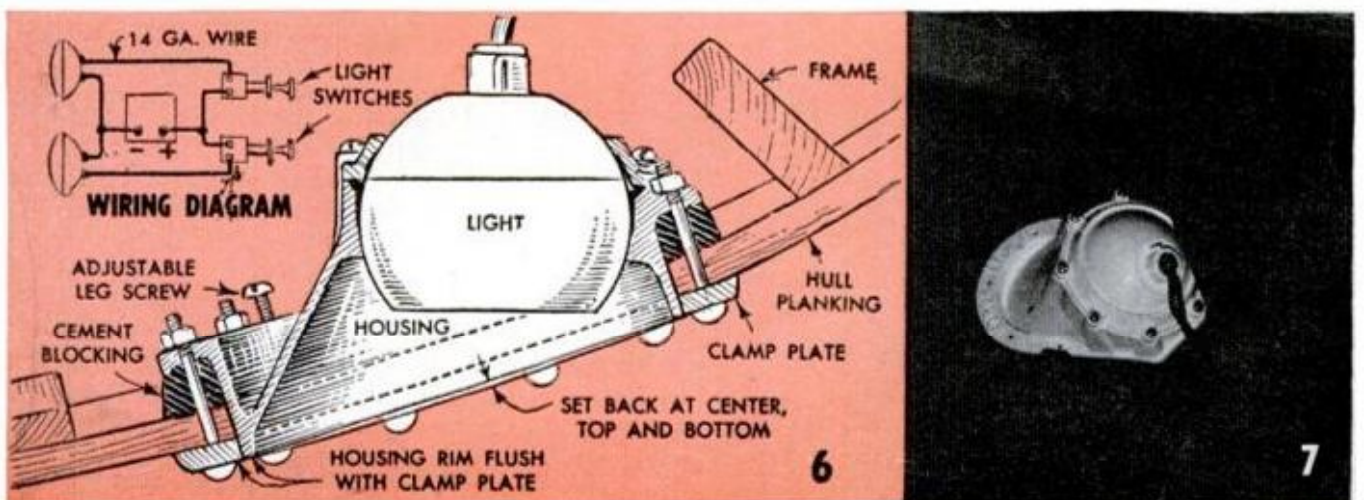
Of primary importance in any docking light installation, is the determination of the exact location of the lights since a hole must be cut through the hull on each side of the bow. Once the lights are installed, the beams may be adjusted for best illumination, but the units are a part of the boat

and can't be moved. Although the procedure illustrated in this story covers the installation of Morse docking lights in an outboard cruiser, it can be used as a guide for fitting the same lights or other makes in other craft.

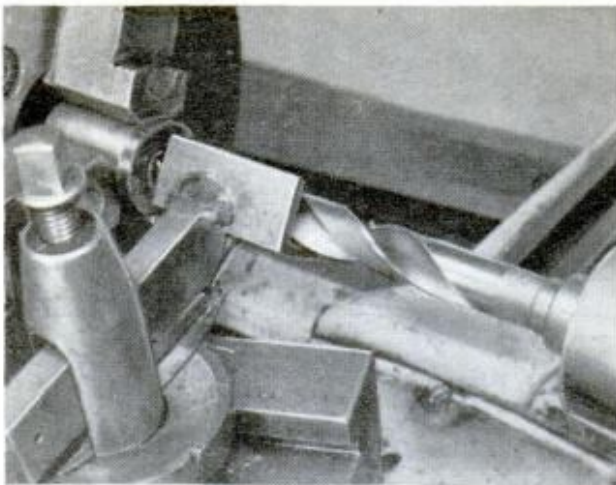
The first step is to determine the best location of the lights for your boat, the procedure for which is given in Fig. 2. You will note that the range of locations along a vertical line is quite limited, whereas placement of the lights on the horizontal plane allows considerable choice. The latter is necessary simply to avoid cutting into a frame or other important structural member since the light housing must have an unobstructed mounting surface inside the hull. The lights must be kept fairly high on the bow for good illumination, to keep them

(Continued to page 250)

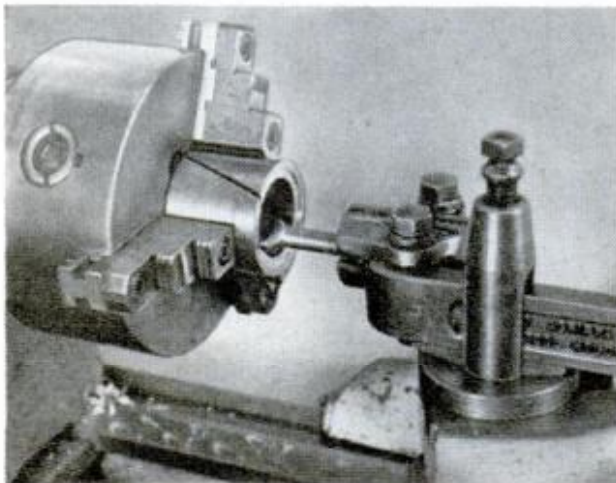
ALTHOUGH A BATTEN may be cut to accommodate a light as in Fig. 7, to sever a frame would weaken hull



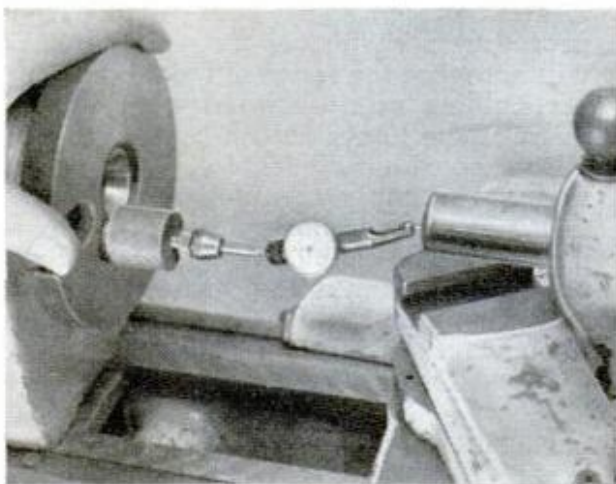
LATHE TIPS



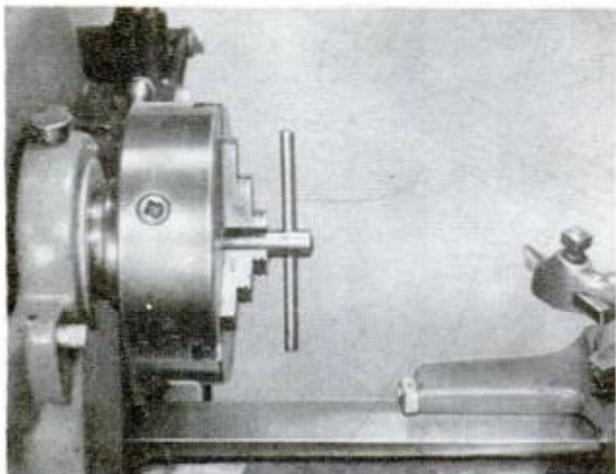
TWIST DRILL BITS often tend to run out when held in the tailstock chuck, even though they may have been correctly sharpened for the job to be done. End-cutting reamers also may give this trouble. In each case the result is an oversize or out-of-round hole. Control of the bit is made certain with the back-up bar pictured in the top left-hand photo. It's made by welding a short length of steel angle to a steel shank of rectangular sectional size that will fit the tool post.



THIN WASHERS can be held securely for facing or boring operations in a split sleeve, or collet, gripped in a 3-jaw chuck. The sleeve can be made from a bronze bushing or a short length of seamless steel tubing with a relatively thick wall. Slot the sleeve diagonally as pictured. Then run in a counterbore of a depth equal to or slightly less than the thickness of the washer and having a diameter slightly greater than that of the washer. Several sleeves can be made to accommodate work of different diameters.

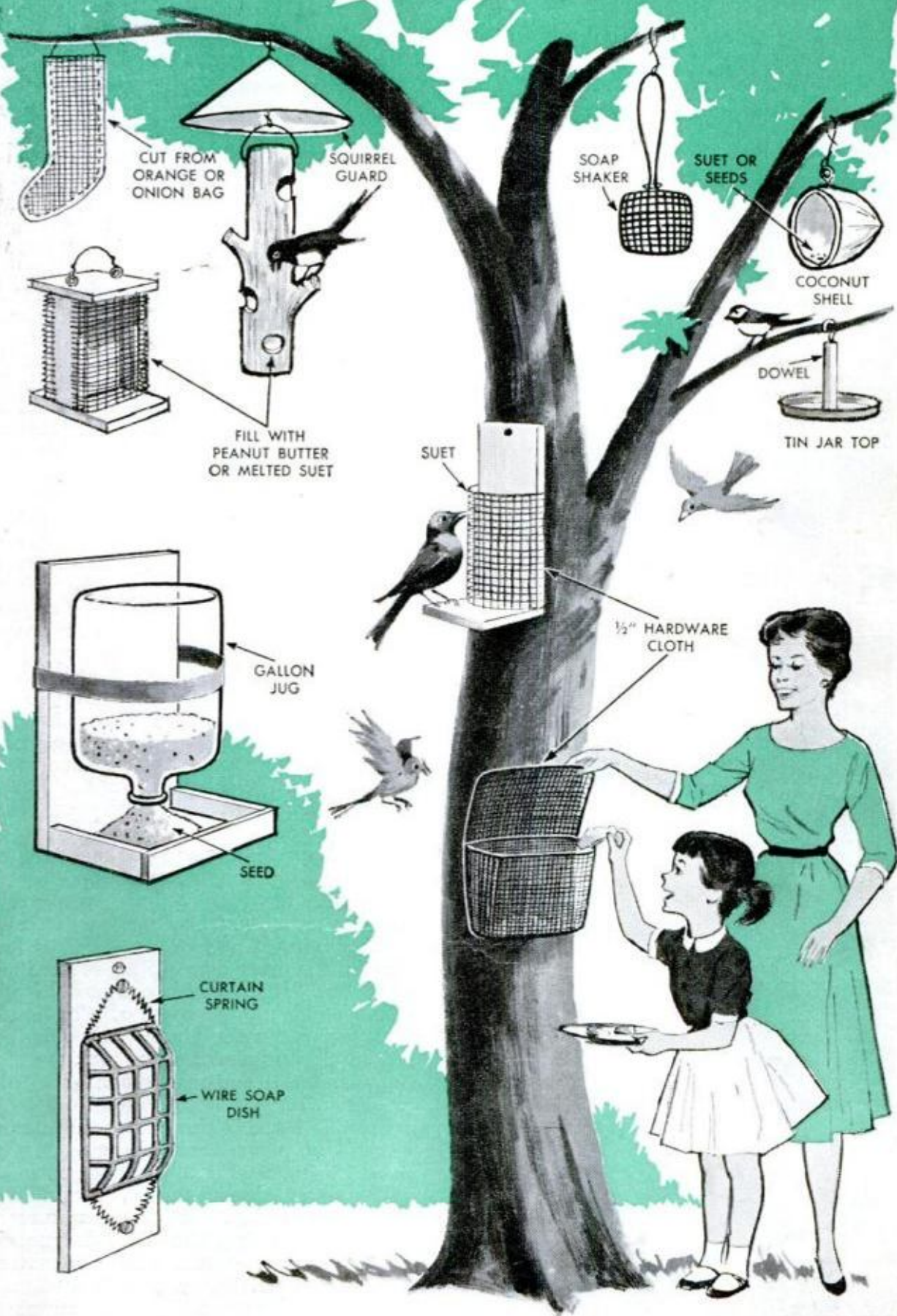


TAILSTOCK ALIGNMENT is tested accurately by mounting a dial indicator on a button-type magnet seated on the lathe faceplate. After positioning the indicator its probe is adjusted to contact the internal taper of the tailstock sleeve. With the setup made, hand rotation of the headstock spindle will indicate the extent and direction of any mis-alignment. Correction is made by adjusting the tailstock offset screw until a zero reading is obtained through one complete revolution of the spindle.



KEEPING TRACK of the chuck wrench is a problem that never quite reaches the ideal solution in many small shops. Usually the wrench can be found somewhere on the lathe bed ways, or perhaps in the chip pan and sometimes it cannot be found at all when it's needed most. But one machinist has come very near the final solution to the chuck-wrench storage problem. When he finishes using the lathe he simply closes the chuck jaws so that the body of the wrench will slide into place in the jaws as pictured.

EASY PICKIN'S



Shop Projects 1961

SHOP USES For Rigid Plastic

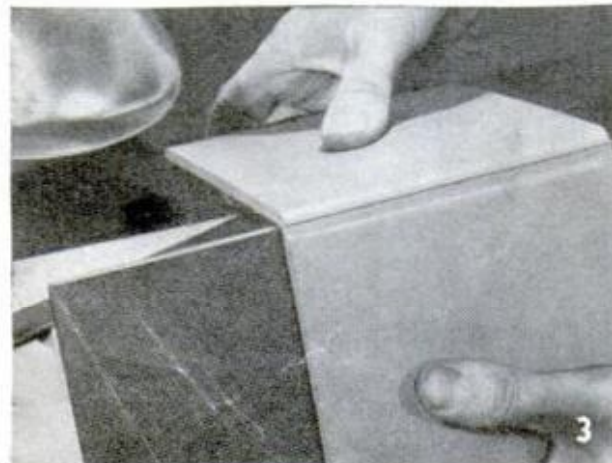
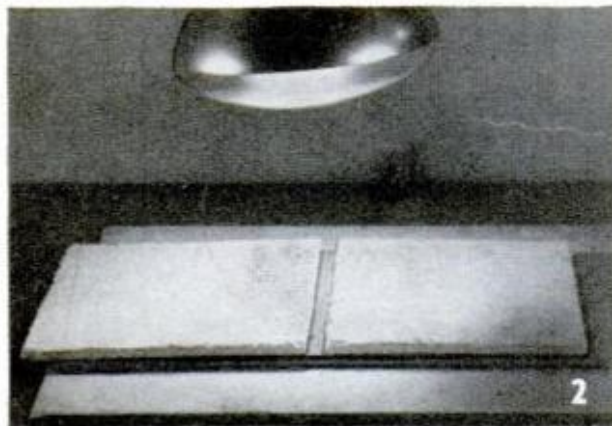
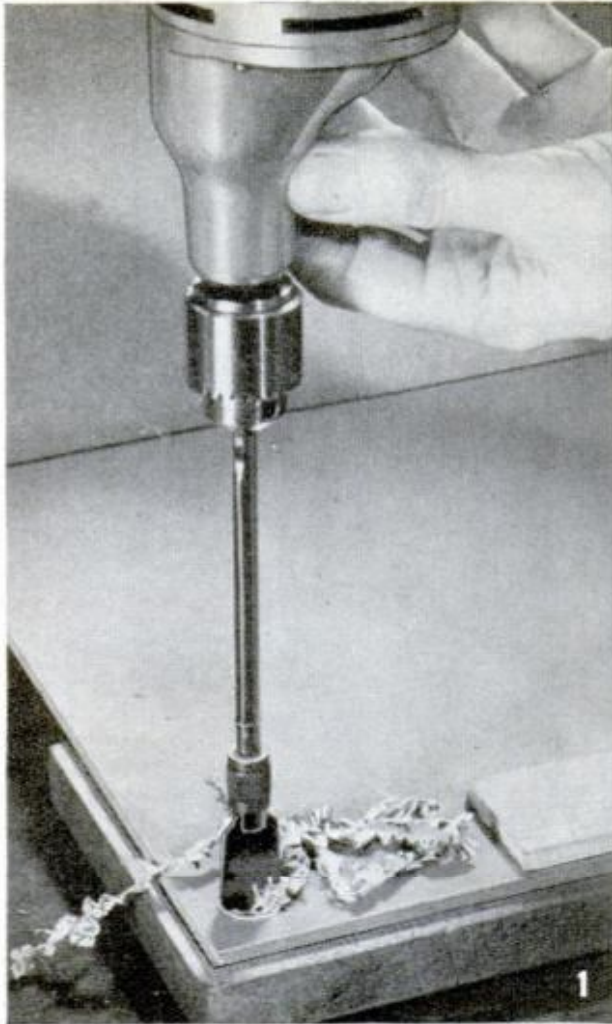
This new material, dubbed PVC (polyvinyl chloride) is available in the form of pipe, fittings, sheets and extrusions which are rigid rather than flexible. Here's what you can do with it

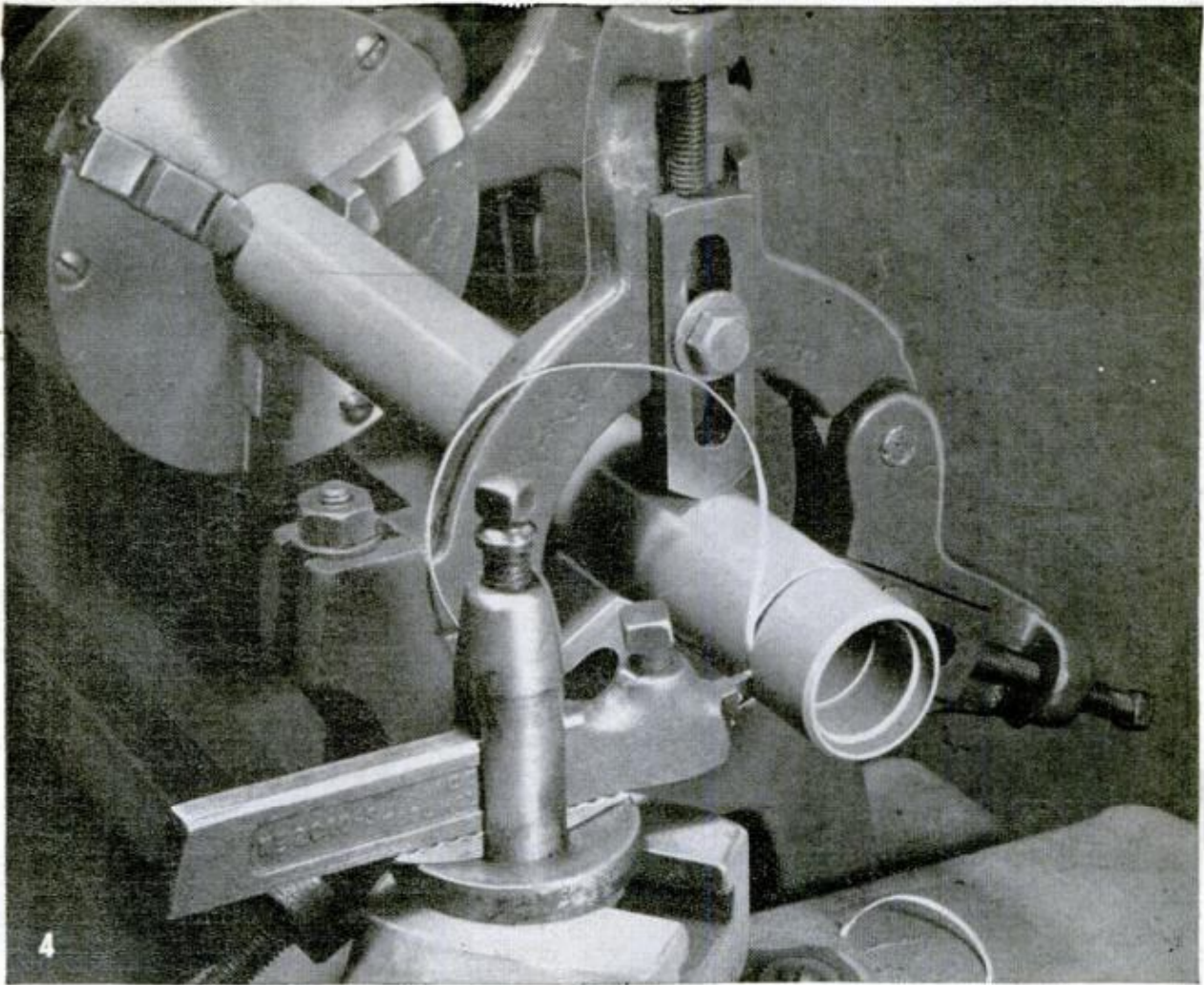
By Walter E. Burton

COMES NOW another modern material that's beginning to work wonders in all manner of applications from the atomic plant to the kitchen sink. It differs from the flexible plastic sheets, upholstery materials and other flexible plastic products that you already know in that it is rigid with working characteristics more like that of hard woods and soft metals. It is resistant to most acids and alkalis, greases and oils and many other chemicals. It takes hot sun and weathering without any protective coating. Placed underground it does not corrode or collapse and is not subject to electrolytic action or damage by bacteria or fungus growths. It does not contaminate liquids it carries or holds and imparts no taste or odor. Few materials will stick to it. It can be cut, machined, filed, threaded, sanded or otherwise worked with ordinary tools used for wood and metal working. It is thermoplastic, that is, it can be softened and bent by application of heat. This means that the material in the sheet form can be heated and bent to almost any radius desired. It also can be stretched while heated, or the regular shapes can be distorted to suit some special requirement.

Figs. 2 and 3 show how the sheet material is bent by shielding the areas on either side of the point at which the bend is to be made, using asbestos sheets as heat shields, Fig. 2, and applying heat from an infrared lamp. The bend is made over a piece of hardboard as in Fig. 3. Two bends convert the sheet into the sides and bottom of a developing tank for use in the photo darkroom, Figs. 10 and 11. End pieces of the tank are of the same material and are cemented in place as in Fig. 10.

Figs. 1, 4 and 5 show how the material works with power tools. Using a wing-type wood-boring bit, Fig. 1, you get a clean hole with a sharp edge all the way around without any chipping. Notice the nature and length of the chips. The bit holds true; does not drift off-center and bore an oversize or elongated hole. When boring medium to large holes through thin sheets, chipping at

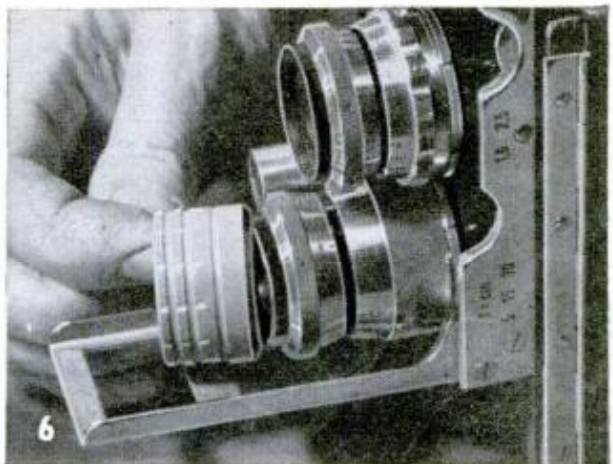
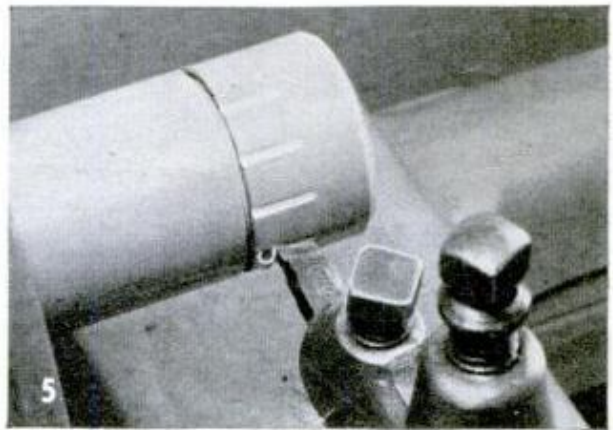


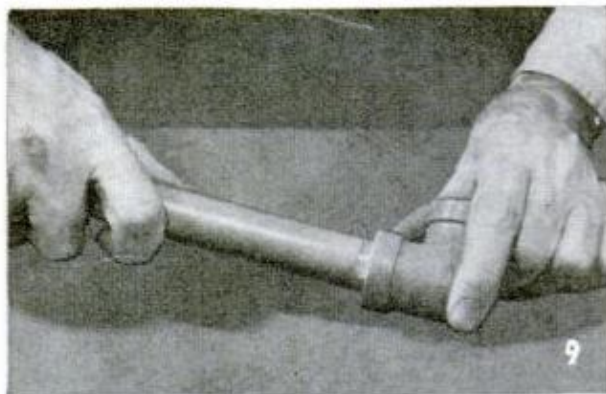
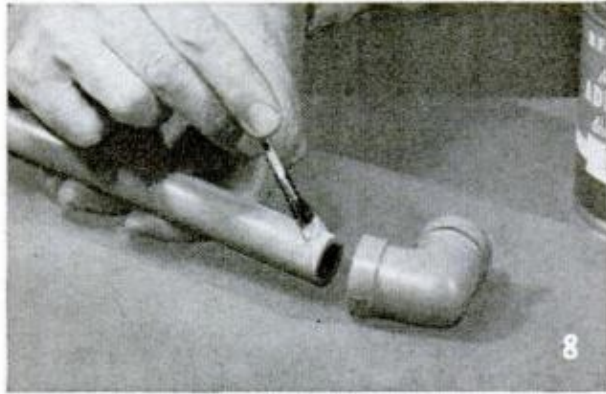
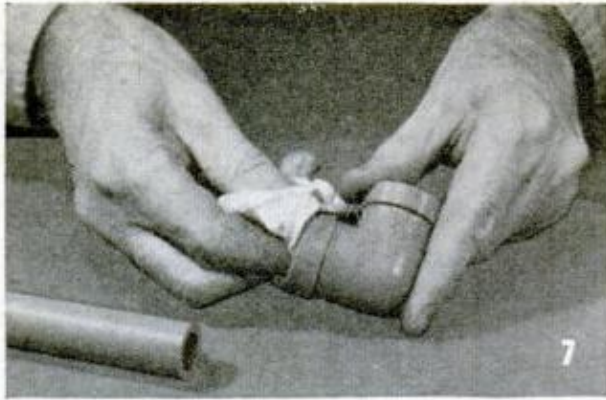


the edge of the hole as the bit breaks through is prevented by placing the sheet on a piece of hardwood as in Fig. 1.

Rigid plastic pipe turns beautifully. The chip comes away clean without tearing or scoring the machined surface and without any tendency to build on the cutting point of the tool. What you see being made in Figs. 4 and 5 is the lens shade for a movie camera, Fig. 6. Note in Fig. 4 that the end of the pipe has been faced, the corner broken (chamfered) in accordance with good machining practice, and that the inside diameter has been bored out to a snug, slip fit over the lens barrel. Before the part is cut entirely off, Fig. 4, the operation is interrupted to cut the round-bottom grooves as in Fig. 5, using the lathe carriage and cutting tool as a shaper. These grooves are not only ornamental; they serve the same purpose as knurling.

Layout marks are made on the surface of rigid plastic with a medium to soft lead pencil. Ordinarily, the materials should not be scored with a scribe due to the difficulty of removing the scores on exposed areas. Normally the surfaces of rigid plastic are very smooth and exposed pencil marks are easily erased. Any tool that will cut wood or metal will cut rigid plastic in any form.



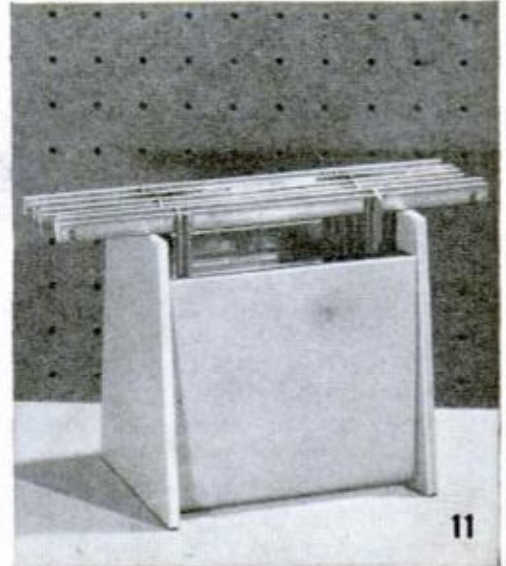
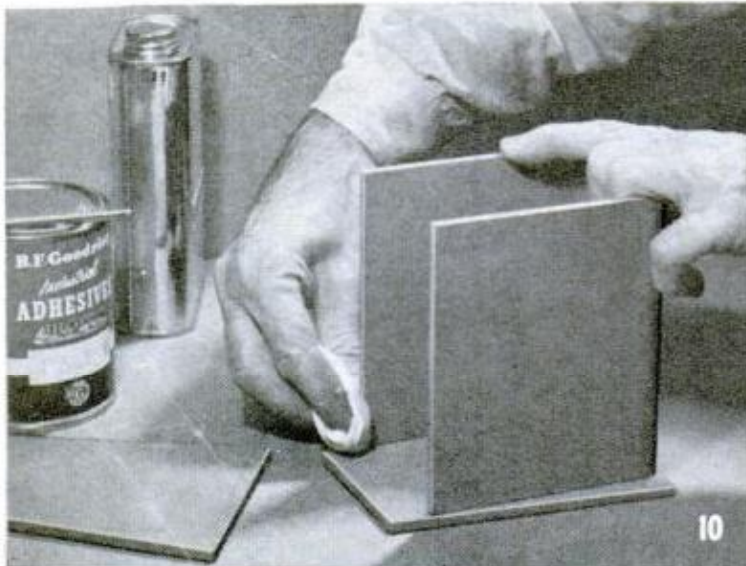


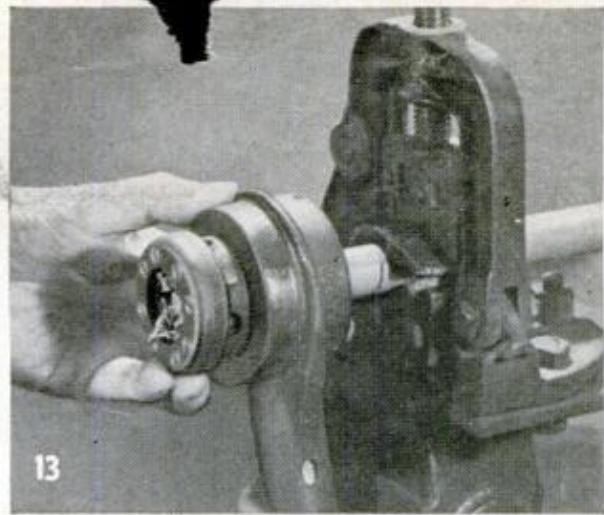
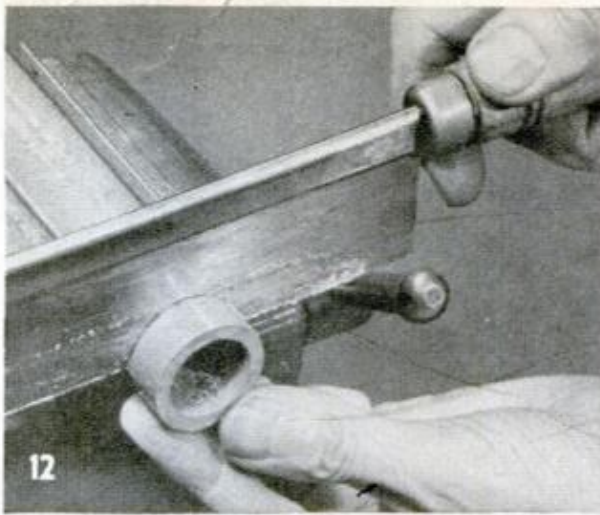
PIPE AND FITTINGS are joined either by tapping and threading or by a 3-step process pictured above and known as solvent-welding. When the welding process is employed threadless, socket-type fittings are used

For sawing by hand use a fine-toothed blade. A dovetail saw, Fig. 12, is just the thing for cutting pipe and other small pieces to required sizes. If you cut the material on a power saw, use a circular hollow-ground blade. If the work must be planed, set the plane iron to take a very light cut. In machining operations such as milling or shaping, use a slow feed to prevent heating the material. In ordinary cutting and machining operations the material is cut dry, without a lubricant, although in some operations involving deep cuts use of a soluble-oil solution may prove helpful.

One precaution must always be taken where the work is held in a vise or is clamped when fabricating, Figs. 12 and 13. The clamp or vise jaws should always be padded with a soft material. Crosshatched or alligator jaw faces will imprint the material, even though light pressure is used. Also, the irregularities on the faces of clamp pads will imprint the pattern into the surface of rigid plastic. In this respect the material is the same as softwood and when it is clamped or held in a vise the same precautions must be taken. Also, when the material is heated care must be taken to see that the softened plastic is not imprinted, dented or otherwise defaced on an exposed surface. At normal temperature, that is, unheated, rigid plastic forms will withstand ordinary clamping and bending pressures without crushing, and, in the case of pipe, without flattening. The material also will withstand impact without marring or denting. It is available in normal-impact and high-impact grades, the latter for uses where it is subjected to rough usage.

External threads are cut on plastic pipe with ordinary dies, Fig. 13, in a lathe, or with a threading machine. No lubricant is necessary. Internal threading can be done in the lathe or with conventional taps. In some instances, especially where consider-





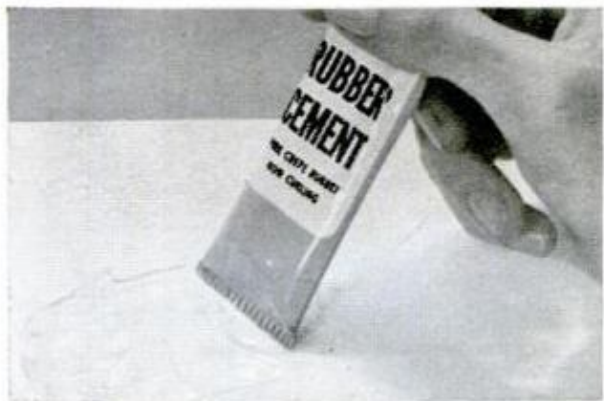
able threading or tapping is done, using dies for threading, it is recommended that the cutting teeth of dies and taps be ground to a slightly negative front-rake angle of about 5 degrees. Larger sizes of pipe should be plugged with wooden plugs before threading. Plastic pipe with thin walls should not be threaded, but rather joined to fittings with a solvent-type cement.

Pipe fittings are joined to pipe either by threading and tapping or by a process known as solvent-welding, a method of joining especially recommended for plastic pipe in the lighter wall thicknesses. Threadless, socket-type pipe fittings are used for

the solvent-welded joints which are said to be stronger than those joined by threading the parts. The welding procedure is pictured in Figs. 7, 8 and 9. First the surfaces to be joined are cleaned with a common solvent such as acetone or lacquer reducer, Fig. 7. Then the special cement is spread on both contacting surfaces, Fig. 8, and the parts are joined immediately as in Fig. 9 and held in place, if necessary to prevent shifting, for 30 minutes or so. In this time the set of the cement will be sufficient to hold, permitting succeeding joints in an assembly to be made. Maximum strength develops in about 48 hours. ★ ★ ★

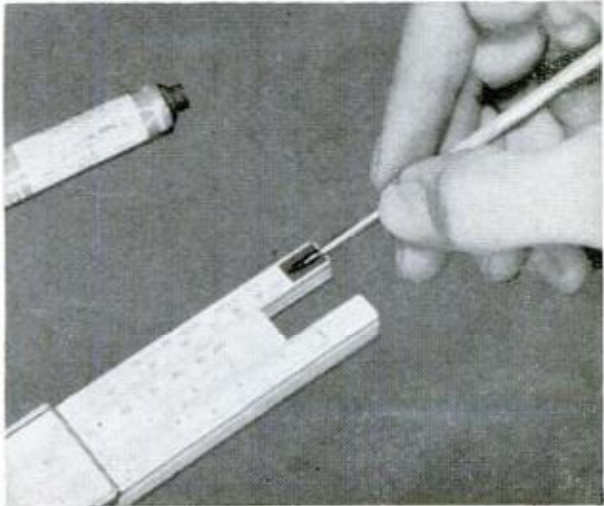
Tube End Is Cement Spreader

Various types of paste and rubber cement should be spread to a uniform thickness after application as otherwise adhesion of the joining sheets or parts will not be complete. One way to save the time one is likely to spend searching for a suitable spreader is to use the bottom end of the tube as a spreader. It works perfectly if you take the time to straighten it before using, as it has a crimped edge that spreads the cement in a uniform film.

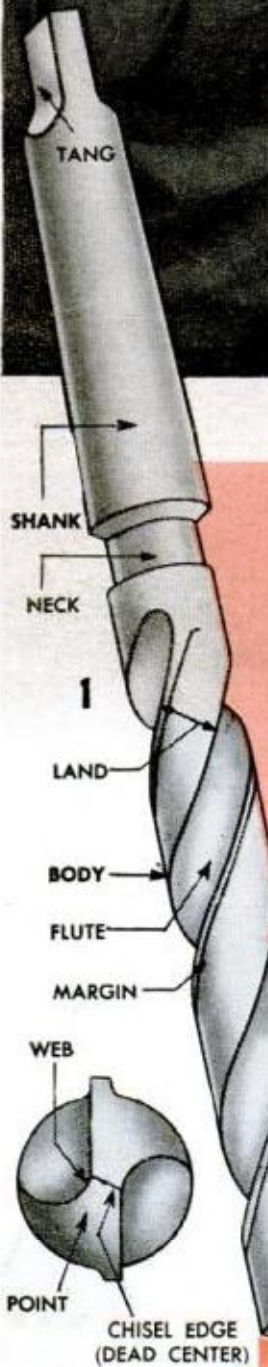


Mark Indicates Position For Slide-Rule Use

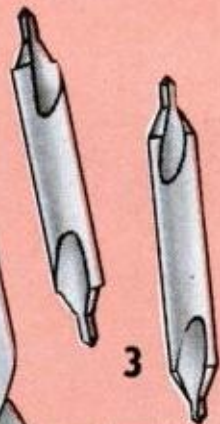
With this rectangular mark on your slide rule you can determine at a glance the correct position for using it. There's no need to check the scale positions and then perhaps invert the rule before making a calculation. A small rectangular piece of colored adhesive tape will serve as a marker on some slide rules, but on others the tape may interfere with movement of the cursor. If this should be the case, apply a rectangular patch of paint with an artist's brush, taking care that the paint is neatly applied in a uniform film.—H. Hanscom



HOW-TO WITH



2
DRILL-GRINDING
JIG



3
COMBINED
DRILL AND
COUNTERSINK



4
CENTER
DRILL



2-FLUTE



STEP



5
BIT
STOCK



4-FLUTE



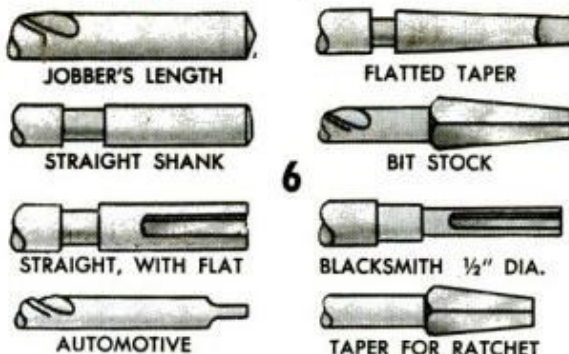
**STRAIGHT
FLUTE**

TWIST DRILLS

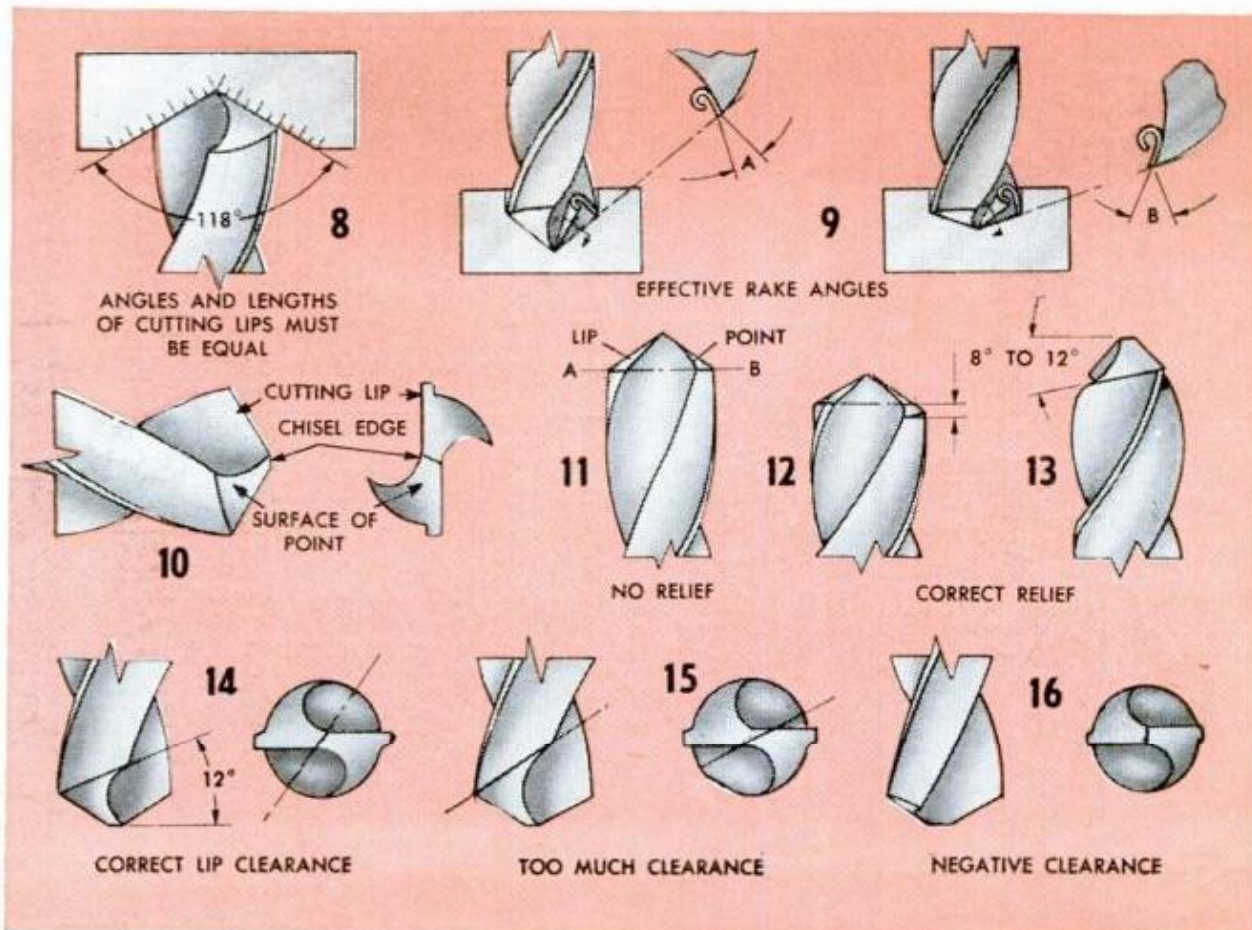
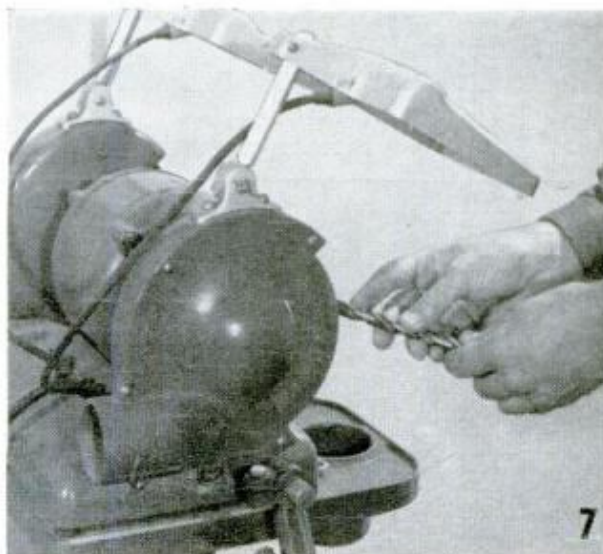
By C. W. Woodson

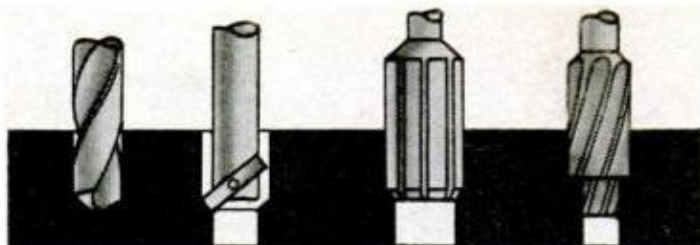
Size, depth and accuracy of a hole drilled in metal are determined by correct sharpening and the proper speed and feed of the twist drill selected to do the job. Twist drills are made in a variety of sizes and in a number of different forms. Several of the forms are shown in Figs. 1, 3, 4 and 5. The two-flute drill, having either a tapered shank or a straight shank, is perhaps the most commonly used, Fig. 1. For reference it is divided into three parts, the shank, the body and the point, the latter including the entire cone-shaped end of the drill. Most of its basic features are found in all forms of twist drills. The point, Fig. 1, has its tip, or chisel edge, in the exact center of the axis and the cutting lips must be ground to equal length and both to the same angle with the axis. The margin, Fig. 1, is a narrow raised rib with a cutting edge. It is the margin that finished the hole to size and also reduces friction by its cutting action. The outer diameter of a twist drill is greatest at the cutting point. From the point the body tapers slightly to the shank.

Twist drills have four classifications. Fractional drills rise in size from $\frac{1}{64}$ by 64ths. The number drills rise in size from



TYPES OF DRILL SHANKS





17 IN PRECISION WORK HOLES ARE DRILLED AND THEN REAMED TO SIZE



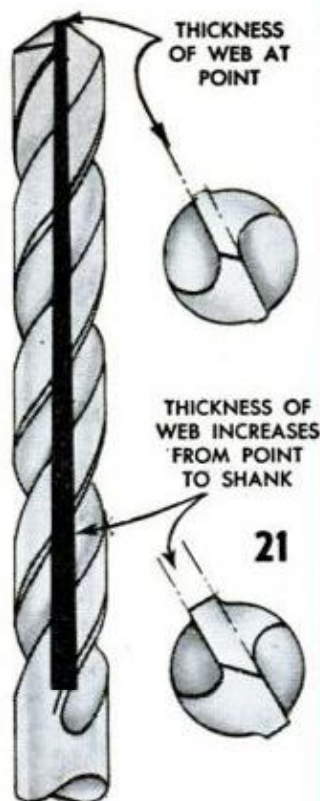
18 DRILL WITH LIPS OF DIFFERENT LENGTHS WILL PRODUCE OVERSIZE HOLES



19 COUNTERSINKS PRODUCED WITH VARIOUS TYPES OF STEP DRILLS



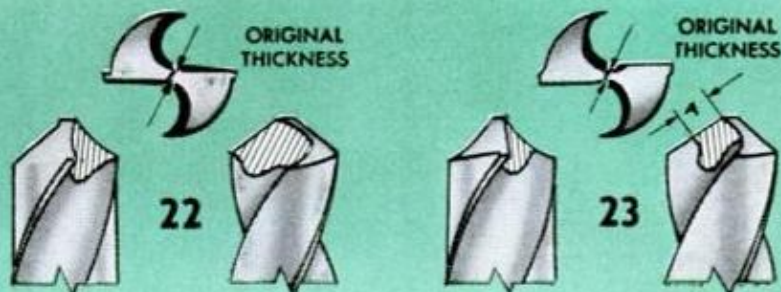
20 THREE TYPES OF THE COMBINED DRILL AND COUNTERSINK



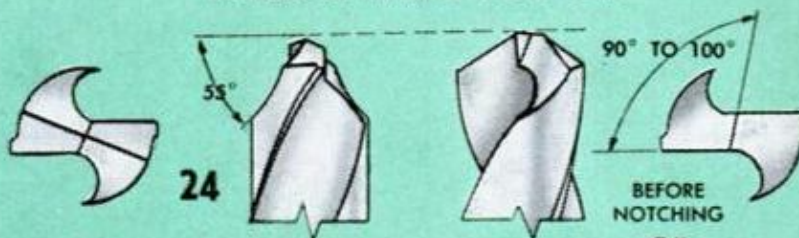
THICKNESS OF WEB AT POINT

THICKNESS OF WEB INCREASES FROM POINT TO SHANK

21



METHODS OF THINNING WEB AT POINT



METHOD OF THINNING BY NOTCHING



CORRECTING NORMAL WEAR

No. 80 to No. 1, with diameters measuring from .0135 to .228. Letter drills range in size from A to Z, with diameters from .234 to .413. Metric drills are listed from 5 mm. to 10 mm. and those larger than 10 mm., by .5 mm. The various types of shanks supplied are detailed in Figs. 1 and 6. The straight shank drills (jobber's length, Fig. 6) and the tapered shank with a flattened tang, Fig. 1, are the types most commonly used. The tapered shanks are supplied only on the larger sizes of drills and are for use in drill presses having tapered driving sleeves rather than geared chucks. Twist drills, in the fractional, letter and number sizes are supplied with plain, straight shanks.

As the drill becomes dulled by use the rake angle, relief angle and the clearance angle must be corrected by grinding freehand as in Fig. 7, or with a drill-grinding jig, Fig. 2, which is designed to be attached to small grinders of the type shown in Fig. 7. Figs. 9 through 16 show in somewhat exaggerated detail, the right and wrong of drill-point grinding. First, for average work in metals, the point usually is ground to an included angle of 118 degrees, measured across the cutting lips, or edges, as in Fig. 8. This is varied, of course, for work

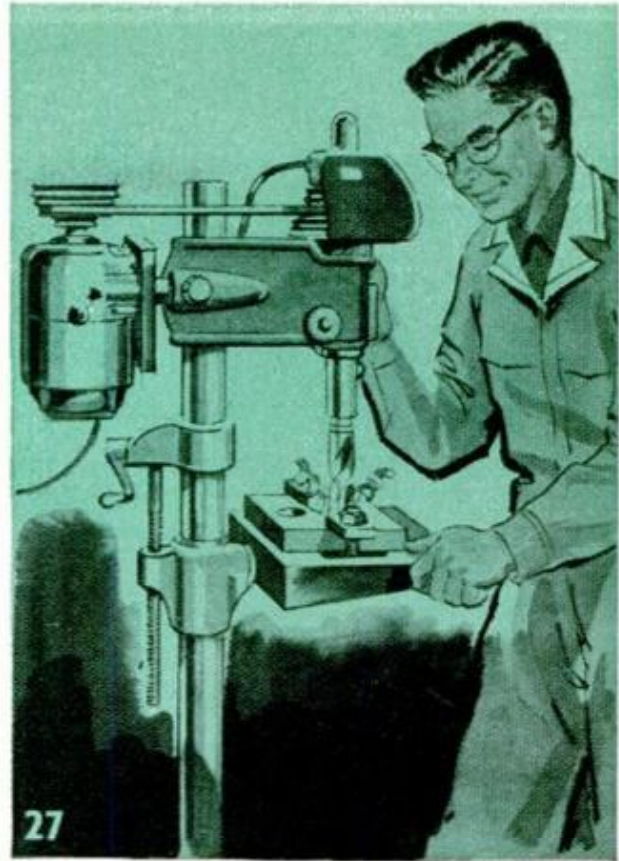
in hard and soft metals and for special drilling jobs. The rake, relief and clearance angles must be maintained when grinding as otherwise inaccurate work and possibly a broken drill will result. For example, if the length of the cutting edges, or lips, Fig. 8, are unequal, you will end up with a hole larger than the diameter of the drill, Fig. 18. If there is no relief, Fig. 11, the drill point will not enter the work.

For precision work the twist drill is not relied on to produce a very accurate, smoothly finished hole. In work where extreme accuracy is specified, the hole is twist-drilled just under the finished size. The drill is followed with a boring tool to correct any eccentricity and then is brought to exact diameter with a straight reamer as in Fig. 17. Counterboring and countersinking, in whatever form required, follows the reaming of the hole, Fig. 19. In some types of work a counterbore can be made with a step drill, Fig. 5, but this is not always permissible on work calling for a high degree of accuracy.

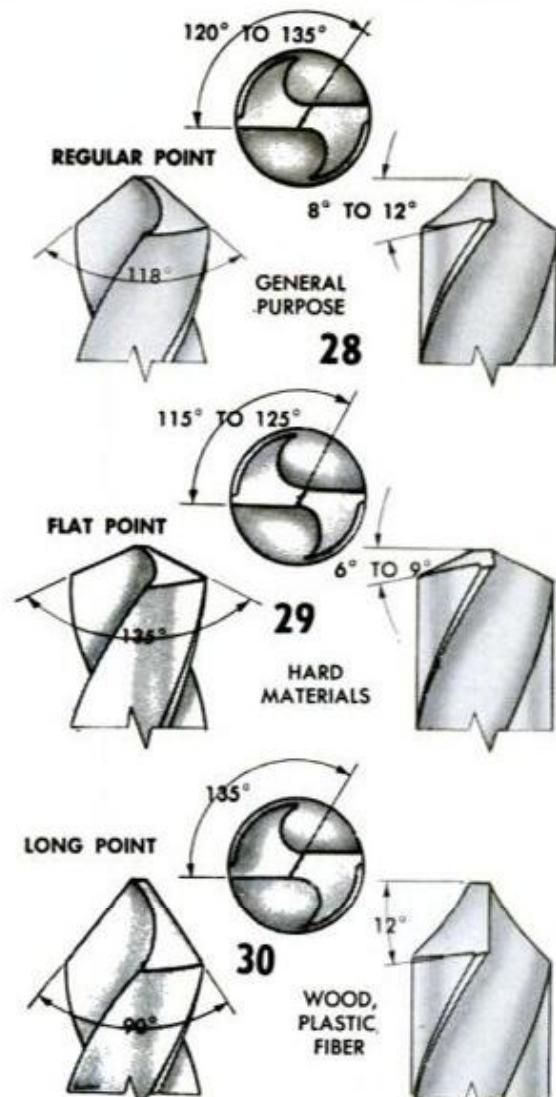
There are three common types of the combined drill and countersink, Figs. 3 and 20. These short combination tools are used for center-drilling the ends of work to be mounted between centers in the lathe. The regular type, Fig. 3, produces center holes with a countersink like that shown in Fig. 20, the left-hand detail. Where the center holes are to be used repeatedly, as those in the ends of a lathe mandrel, a bell-type drill and countersink combination tool is used. Two examples of the holes produced by these drills are shown in the center and right-hand details in Fig. 20.

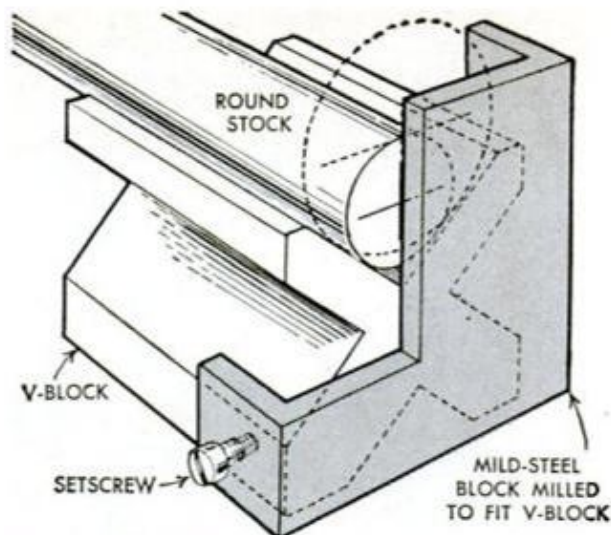
The web of a twist drill, Fig. 1, gradually increases in thickness from the point to the shank, Fig. 21, and as the drill is shortened by repeated grinding the chisel edge, Fig. 1, lengthens as the web becomes larger. In reconditioning worn drills the web must be reduced either by grinding or by notching as in Figs. 22 through 25. Of course, these procedures are of interest only to industrial plants, school shops and others who make a practice of reconditioning large numbers of drills of various sizes. Of interest to smaller shops are the methods of correcting normal wear, Fig. 26. This shows first at the points A in Fig. 26, can progress to the stage shown at B and finally increase to the stage shown at C, in which the margins are worn away, resulting in a negative back taper which causes a wedging action and possible fracture of the drill. To restore a drill in this condition to its original efficiency it is necessary to grind back the point until the taper is removed and the margin restored. Frequent grinding and normal use usually prevent the condition

(Continued to page 246)



27





Center Square Fitted on V-Block

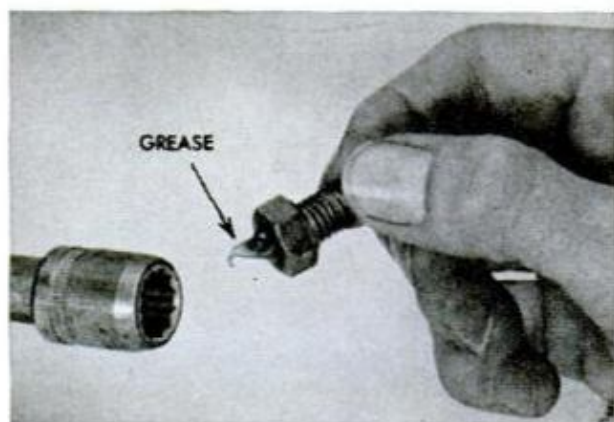
I needed a quick, accurate method of scribing centers on both ends of a large number of short rounds of steel. I milled a block of mild steel to a U-shape, the width inside the webs just permitting it to slide over the end of a V-block. Then I milled a shoulder, the vertical edge of which was precisely on the center line of the Vee. Finally I drilled and tapped a hole for a setscrew to hold the square on the V-block. To use, I place the part to be center-scribed in the V-block, scribe a vertical line, turn the work 90 degrees and scribe an intersecting line.—Federico Strasser



Improvised Welder's Angle Clamp

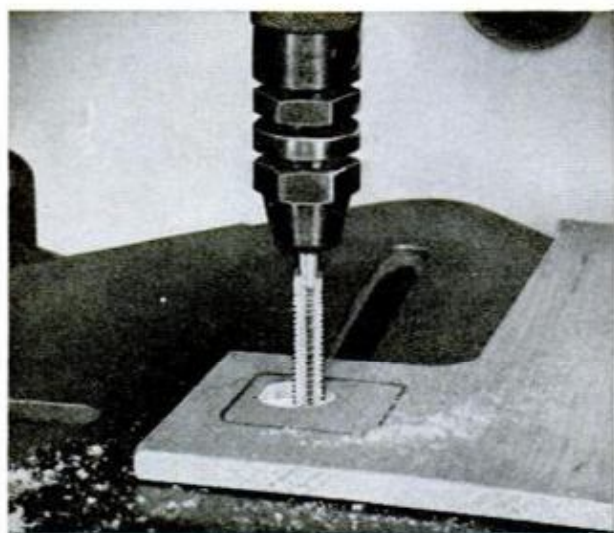
Two short lengths of steel angle welded to the pads of a C-clamp convert it into a handy welder's clamp for squaring up small parts to be welded at right angles. Note in the illustrations the position of the angle jaws on the pads. The important thing is to weld the angles to the pads so that when closed, or nested, they fit perfectly. Care also must be taken when welding the angle to the swiveling pad to prevent weld spatters from reaching the swivel joint.

—H. J. Gerber



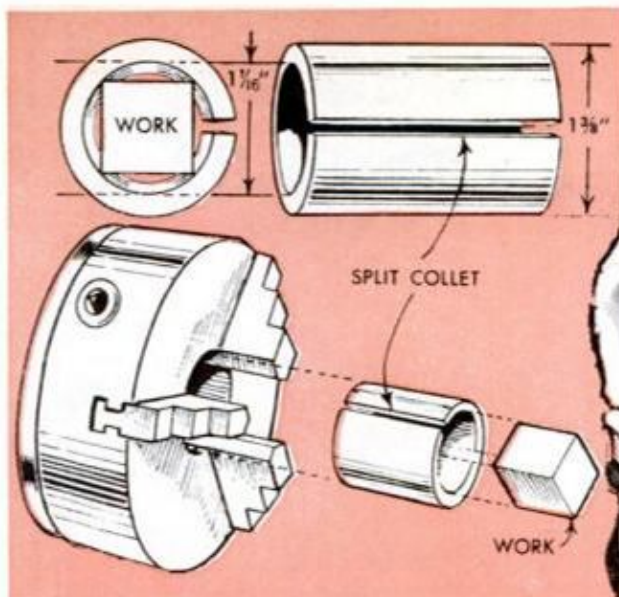
Grease Holds Capscrew in Socket

Ever try to start a capscrew with a socket wrench in a place you can't reach with your hand? It's a neat trick if you can bring it off after a few tries. Usually the screw persists in dropping out of the socket just before you have it placed and ready to turn into the thread. Then you begin casting about for some means of holding it in the socket for those few critical seconds it takes for the threads to catch. A dab of heavy grease on the head of the screw will do the trick nicely.



Tap Makes Emergency Router Bit

Just in case you haven't thought of it, an ordinary bottom tap, or a broken tap ground off square, makes an excellent router bit. You'd be surprised at how fast and clean it cuts in both hard and soft wood when you drive it at the right speed. The speed is not critical but for best results should exceed 3000 r.p.m., especially in the softer woods. If you use a tap with the tip broken off, grind the broken end at an angle of about 5 degrees with the axis. You can grind the tip square but the tap will cut a bit faster and the bottom of the cut will be smoother if the tip is ground at a slight angle.



SPLIT COLLET HOLDS SQUARE STOCK

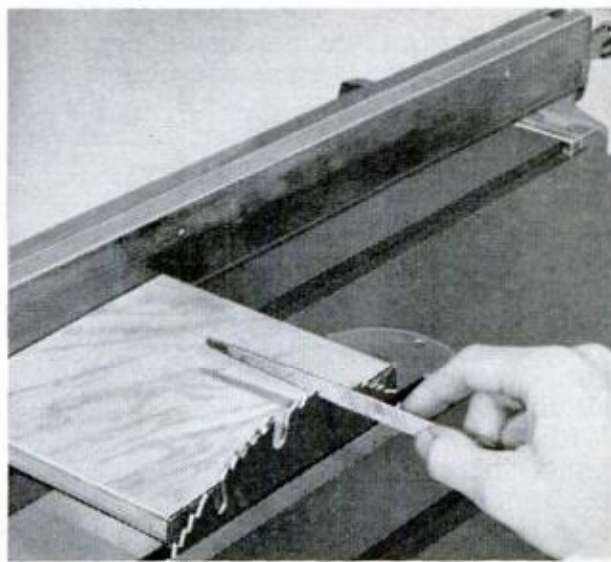
Machine shops often get contract work that taxes the ingenuity of the machinist in devising a means of getting the job finished to acceptable standards of accuracy and in a reasonable time. Often such shops do not have available a complete kit of accessories for each machine and it is necessary to make do with what is at hand. Holding short pieces of square stock for shouldering or facing is an example of the type of work that may come into the shop on short notice. Such pieces cannot be centered accurately in a three-jaw chuck and removing and replacing duplicate square workpieces in a four-jaw chuck wastes too much time on each operation. So, to speed up the repeat operations and at the same time assure accuracy, one machinist made a

simple split collet, or pinch-type collet, from a short length of tubing which enabled him to handle the duplicate square workpieces with a three-jaw chuck. A piece of heavy wall seamless steel tubing will serve for all jobs where accuracy requirements are nominal. Slit the wall of the tubing along the length and, if necessary, widen the slot with a file so that the collet made in this way will grip the work securely when the chuck jaws are closed. Notice in the end view above that the work must be positioned with the slot midway between the corners so that when the jaws close the collet will not be distorted. Only medium pressure of the chuck jaws is necessary to hold the workpiece.

—Anthony Caputo

Touch Up Saw Blade Without Removing From Arbor

Time can be saved by touching up the teeth of a circular blade without removing it from the arbor, but the problem here is adequate support of the blade while filing. Unsupported the blade tends to spring under the file on the cutting stroke, making it difficult to sharpen the teeth properly. One way to prevent this trouble is to cut a 5 x 6-in. piece from 1/2-in. plywood and cement a strip of rubber cut from an inner tube to one edge. Then place the piece on the saw table between the ripping fence and the blade with the rubber facing next to the blade. Slide the ripping fence over until the rubber faced edge of the block contacts the blade. Then exert light pressure against the blade with the fence and tighten it in position.—R. Hanscom



Reducing Noise in Your Car Radio

By Len Buckwalter



ARMED WITH a couple of capacitors, some suppressors and a taste for criminal investigation, you can detect and eliminate most of the interference in your car radio. From the assortment of static crashes and buzz-saw noises there emerges a definite pattern of clues. Track them down and you'll probably discover a couple of stations buried under the "hash." If you're planning to install one of the new Citizen's Band two-way radios or shortwave converters, you'll find them virtually useless without several of the techniques detailed on these pages.

One of the simple rules for noise suppression that's often overlooked is the fact that the radio itself is one of the most effective interference suppressors. As the stations grow stronger, the set becomes increasingly more immune to noise. Before buying any devices, try beefing up the set's sensitivity with each of these simple steps.

Every car radio has a hidden adjustment known as the "antenna trimmer." In fact it is so secluded that it may never have been trimmed properly for your particular car. When improperly tuned, the set's sensitivity suffers and up comes the noise. With your head under the instrument panel, shine a flashlight at the underside of the radio chassis and look for a small access hole. Most likely there's a paper tab

next to the hole with printed instructions for tuning the trimmer. If not, warm up the radio for several minutes, set the tuning pointer to a weak station around 1400 kc. and insert a small screwdriver into the hole. Tune for the best volume. This shouldn't require more than a half-turn of the screw in either direction. Occasionally the trimmer is not behind an access hole but appears as a tiny knob located close to where the antenna lead enters the radio.

Another simple tune-up should be performed on each of the pushbuttons, if the radio is so equipped. These buttons often vibrate slightly out of adjustment and rob the set of sensitivity. Resetting them is done in a matter of minutes. Grasp the button, exert gentle pressure to the left or right, and pull. The button will pop out toward you. Carefully adjust the manual tuning knob until the station is tuned in perfectly—then punch in the button. This procedure is standard for most sets but works somewhat differently for the expensive jobs; here the push-buttons don't shift the dial pointer each time a station is selected. In this case pull out the button as before, and tune the knob (or slot) which will be exposed.

Another noise source in auto sets is the volume control. After a period of time, a wiper arm inside the control loses tension

RADIO TV HI-FI

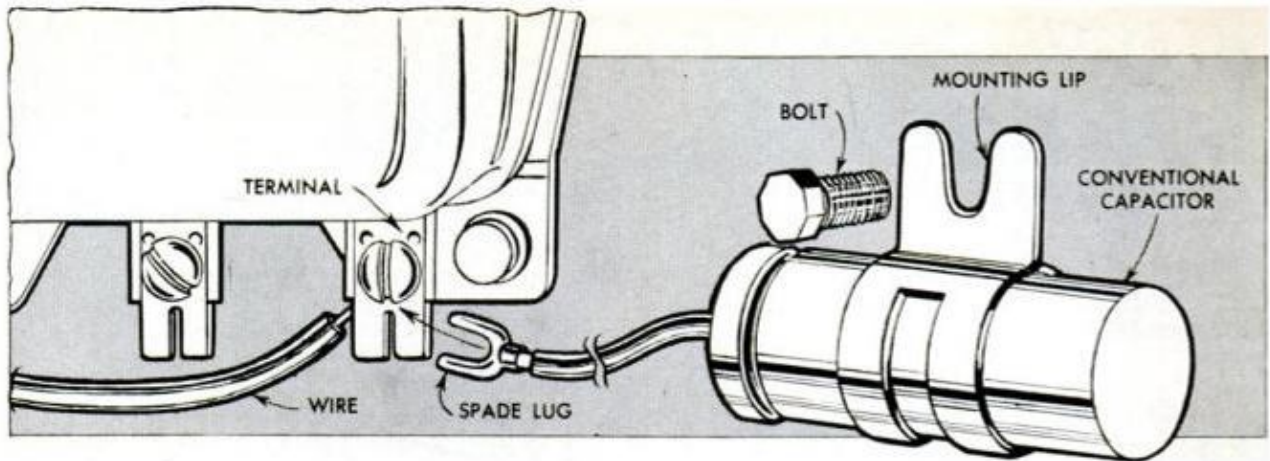
ELECTRONICS



TROUBLESHOOTER'S CHART

TO PERFORM TESTS: Start car engine, switch radio on and tune to a weak station.

TEST	LISTEN FOR:	NOISE SOURCE	CURE
Depress gas pedal momentarily.	Steady "popping" noise. Becomes faster as engine revs up.	Spark plugs, Distributor.	Spark plug suppressors, Distributor suppressor.
Drive 20 mph, switch off ignition, stop car.	Howl or whining sound which lowers in tone as car slows down.	Sparking at Generator brushes.	Connect capacitor at Generator terminal marked "A"
Race engine intermittently.	Crackling noise, might vary with engine speed.	Sparking at Voltage Regulator contacts.	Connect capacitor at Voltage Regulator terminals marked "A" and "B."
Drive at various speeds over smooth, dry road.	Irregular static, cuts out at low speed or at standstill.	Front-wheel axles.	Install static collector springs.
Drive at varying speed.	Same as above.	Inner tube and tire.	Inject anti-static powder.
Drive over bumpy road.	Intermittent noise.	Poor grounds	Use braided wire to bond following to car frame: muffler, tail pipe, motor block, firewall, control rods.



Conventional capacitor is installed by placing wire spade lug beneath terminal to be filtered. Leave other wire to terminal undisturbed. Find convenient bolt, ground mounting lip by attaching to bolt

and begins to bounce, especially when the car is in motion. This can cause loud static crashes, even on the strongest stations. To check it, set the control to normal listening level and tap on the knob with your finger. If reception is affected, replace it.

If the car radio, antenna and lead-in cable are in good condition, other noise-suppression measures deal with interference which originates outside the set itself. The auto ignition system, aside from producing high voltage for the spark plugs, is an excellent radio-frequency generator. It's an indiscriminate one, too, which sets up sharp pulses of interference from the lowest frequencies in the broadcast band to the upper channels used for shortwave and communications. The voltage regulator and generator are also spark producers which can create noisy reception. Wheels and tires contribute to the mayhem by building up static charges that sporadically discharge in a splash of radio noise.

Since the amount and type of noise will vary from one car to the next, we've made a step-by-step chart to pinpoint each source of noise and its cure. With this information,

the amateur sleuth can purchase and install those specific items which will treat his particular problem.

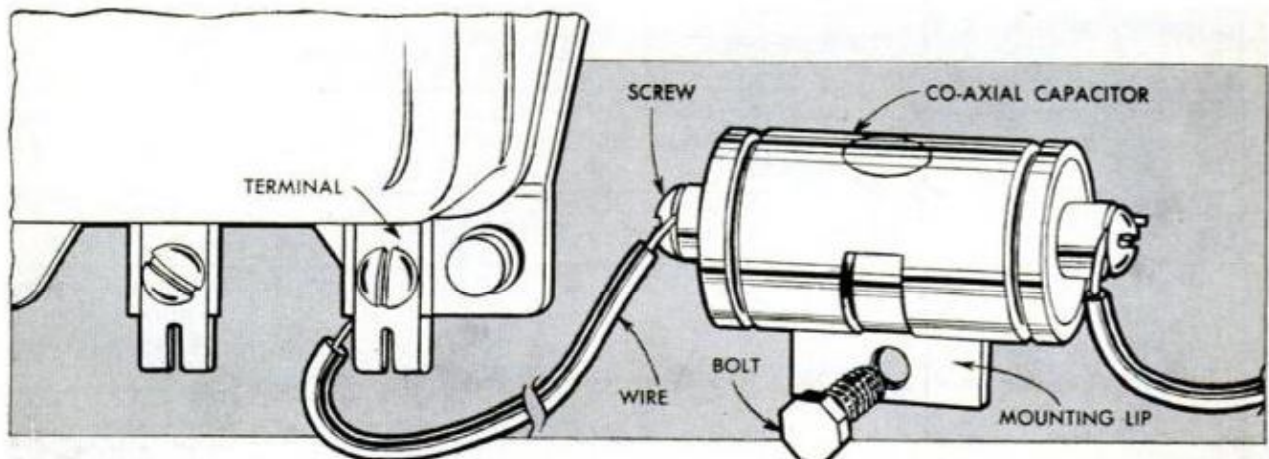
Auto manufacturers are beginning to make certain noise-suppression devices standard equipment, so it's a good idea to check your car for them. Some of the newer cars are being delivered with resistor spark plugs or spark-plug cables marked "radio resistance." This, of course, eliminates the need for plug suppressors. However, the capacitors used in these cars are to reduce interference in the broadcast band only. If you intend to use any shortwave equipment (over two megacycles) the superior coaxial capacitor is almost mandatory.

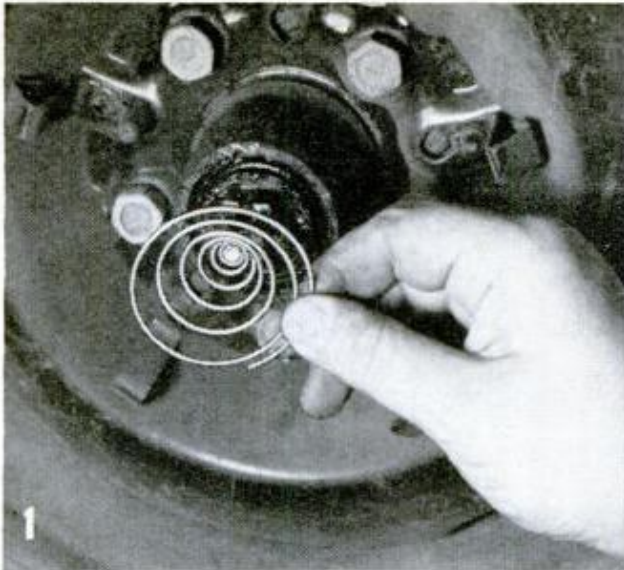
For clearing up the broadcast band, most of the necessary parts are available at local auto-supply stores—suppressors, capacitors and heavy wire. Static collector springs are not so common. Ours were secured through one of the electronic mail-order houses.

Installation tips: Follow the "Troubleshooter's Chart" in the order given. The chart leads off with the most common noise

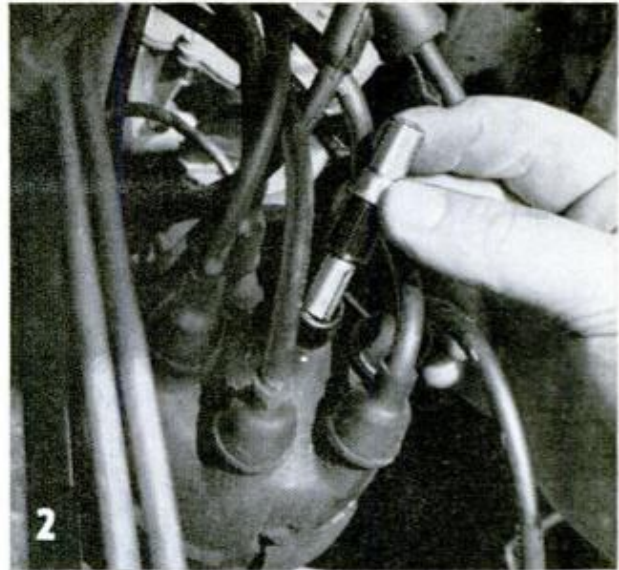
(Text continued on page 254)

Coaxial-type capacitor mounts in series with line. Cut and strip terminal wire, attach stripped ends to capacitor screws. Find convenient chassis bolt and ground capacitor by mounting lip to the bolt





1. PLOPPING SOUND in car radio while in motion is attributed to tire static. Eliminate by use of a static collector spring. Install by removing hub cap and axle dust cover. Mount spring, large end out, and replace axle dust cover and tire hub caps



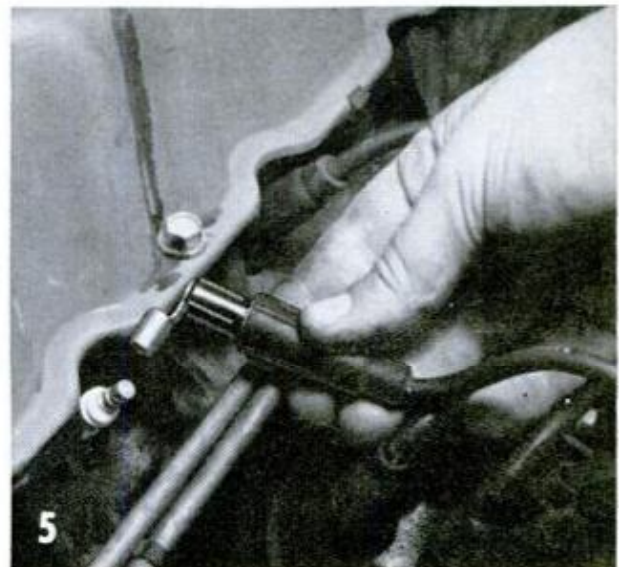
2. NOISE FROM DISTRIBUTOR is often eliminated by using distributor suppressor. Remove center lead from distributor, plug suppressor into distributor socket. Replace lead wire which originally went to distributor by plugging into top of the suppressor



3. TYPICAL MOUNTING for coaxial capacitor. First attach mounting lip to convenient body bolt. The wire to armature terminal of voltage regulator is attached to top of capacitor. Hand holds shorter length of wire which connects capacitor to terminal

4. TOOL USED for injection of antistatic powder into inner tube of tire. Cap is removed and powder is poured in from premeasured packets. After cap is replaced, tire is reinflated blowing powder into tube. When operation is complete, remove tool

5. INSTALLATION OF spark-plug suppressors begins with removal of spark-plug wire. Snap spark suppressor over plug then spark-plug wire into end of the suppressor. Both ends should fit tightly to insure a positive contact. Repeat for all plugs

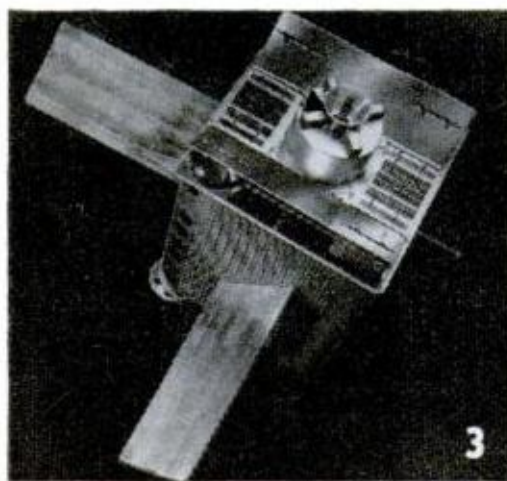




1



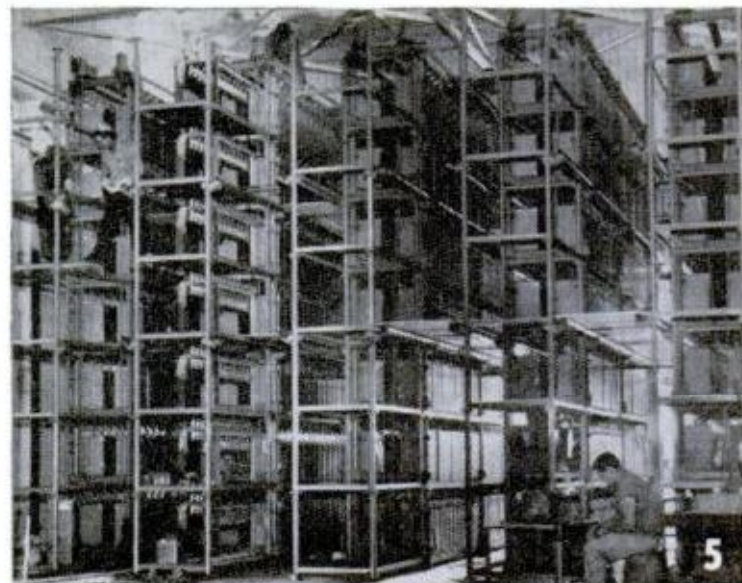
2



3



4



5

1. ELECTRONIC STRING BASS boasts light weight, small size. The Framus bass is manufactured in Germany, tone rivals the larger acoustic types. The instrument can either be bowed or slapped with equal facility. Foot pedal attaches to the amplifier to regulate volume. Instrument is priced under \$200

2. NEW STEREO SOUND in recorded music makes engineer into musician. Each critical instrument can be switched either to left or right channel. Result is amazing stereo separation. Technique has been pioneered by Command Records and Kapp Records. Records also serve to balance or test system

3. WITHIN NEXT FEW YEARS, recoverable interplanetary space probe may soar round-trip to Mars. Model of 340-pound device is shown. Probe is designed to carry camera to within 5000 miles of Mars for high-resolution photograph. Unit utilizes complex electronic navigation and control devices

4. STRAIGHT DIAL TELEPHONE granted patent in West Germany may replace round dials. Strong, flexible loop of plastic tape is moved vertically by a finger, selecting numbers

5. ZEUS CAPACITOR BANK at Los Alamos will be used in controlled thermonuclear research. For first cycle (15 to 20 millionths of a second) Zeus will produce electricity equal to more than entire output of U. S. Size comparison can be obtained by observing technician in lower right of photo

More
happy ideas
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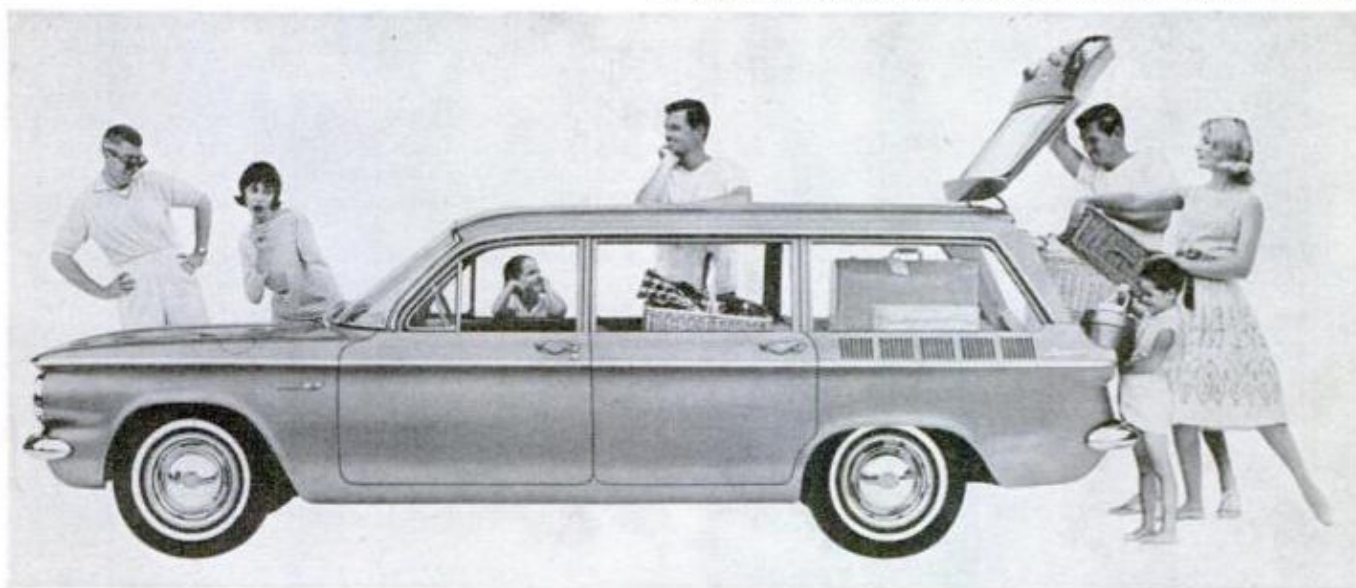
This Corvair 700 4-Door Sedan has provisions for heating ducts built right into its Body by Fisher.

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'61 CHEVY CORVAIR!

Wasn't easy, but we managed to make Corvair even more desirable in '61: we boosted the displacement of that air-cooled rear engine to 145 cubic inches. Made Corvair even thriftier to run: Coupes and Sedans carry lower prices, and quicker cold-start warmup gets you saving fast. (There's a new heater* that distributes heat more evenly, and a longer range fuel tank.) Added space inside for you, up front for your luggage. (Sedans and Coupes give you nearly 12% more space under the hood.) You'll like Corvair's smarter styling, too, the minute you see it. But that's not the half of Corvair's good news for '61. Now Corvair has family-lovin' wagons for you! Interested? Read on!

Chevrolet Division of General Motors, Detroit 2, Michigan/ *optional at extra cost.



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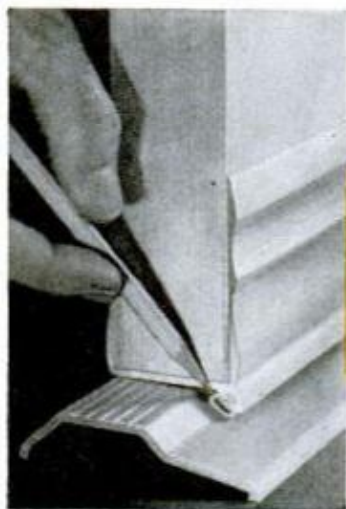
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Pratt & Lambert, Inc., Tonawanda St., Buffalo, N.Y.

ALUMINUM THRESHOLD, scuff plate, and weatherstrip, left center, are combined in these two attractive units. One is attached to bottom of door and carries flexible plastic weatherstrip as is being pointed out. Other extruded member serves as threshold. Available in anodized finishes to match door hardware

Skuff Guard, Inc., 3232 N.W. 38th St., Miami 42, Fla.



SPATTER PAINT for old floors, right center, creates those new, dirt-and-scratch-disguising "confetti" floor finishes that you've admired. A 15-oz. container of this brand-new finish can change the whole look of your kitchen or other problem room in less than an hour's time. Available in decorator colors

Mer-Mar Products Co., 1451 Merchandise Mart, Chicago 54, Ill.

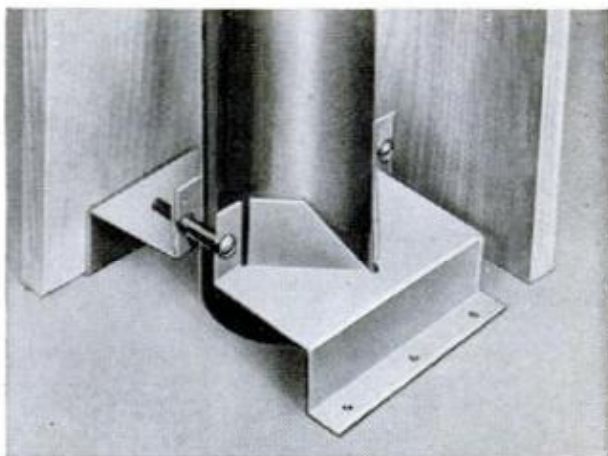
INSULATING SHEATING, below left, is made extra strong, is intended for use without corner bracing. Direct nailing of siding and asbestos shingles is said to be permissible, using annular-ring nails of specified size. Comes in 1/2-in. thickness and in 4 x 8 and 4 x 9 sheets for convenient application

Simpson Logging Co., 2041 Washington Bldg., Seattle 1, Wash.



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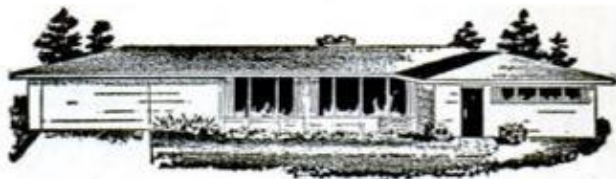


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Snow Mold

Q—Last spring after the snow melted, a number of scattered patches showed on my lawn, the blades of grass turned a grayish white and were covered with an odd appearing, cottony mold-like substance. The grass did not make any growth in these patches and I had to dig up the areas and reseed. Now I'm wondering what about this coming spring—will I have the same experience? If it is likely, what can I do to prevent damage to the lawn? I've been told that this condition is caused by the snow, but this hardly seems likely.—B.T., Mich.



A—You were correctly informed; the condition is caused by the snow, indirectly, and is commonly known as snow mold. Snow which covers the lawn for long periods—throughout the winter in colder localities—provides the conditions for the development of the fungus which damages the grass. In the colder climates the disease is especially favored by late, heavy feedings which greatly stimulate growth only a short time before freezing temperatures prevail and growth ceases. Snow conditions, the time the grass is covered by snow, temperatures, and other factors also contribute to the development of the disease. Usually in a cold

(Continued to page 238)

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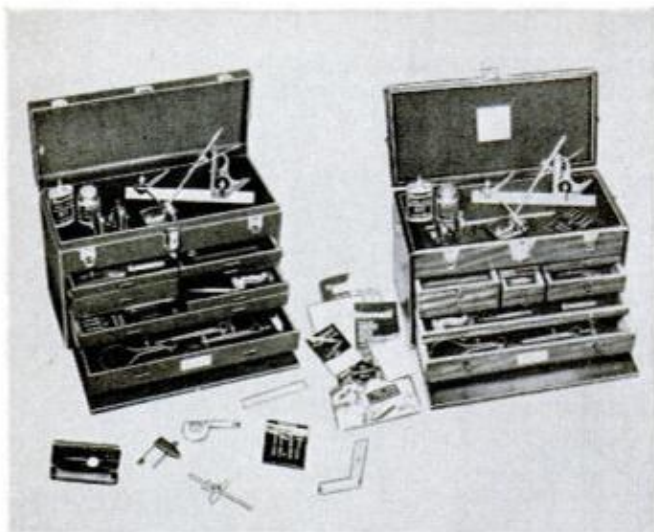
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climate where there is the possibility of deep snow coming early in the winter season and remaining as ground cover until spring, it is best to keep the grass mowed until low temperatures stop growth. Of course, you always risk an "open" winter causing some minor damage to closely cropped grass, but usually this risk is less than the chance of snow mold causing widespread damage on the lawn. Late mowing is generally a fairly reliable preventive measure. The disease, fortunately, reoccurs only rarely. Rake any leaves in spring as soon as snow melts.

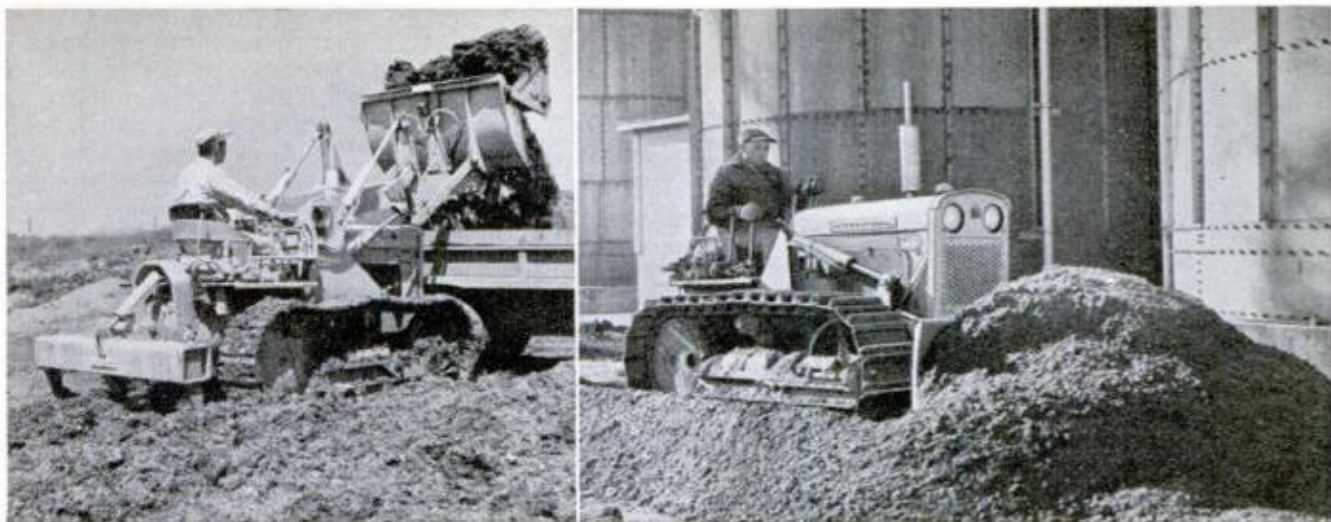
Removing Paint From Moldings

Q—I want to remove the paint from several inside doors which are paneled, each door having five panels separated by crosspieces having molded edges. Paint remover takes the paint off the panels and the other surfaces quite easily. But how does one get the paint off the molded edges? The remover takes off most of it, but there is a residue it apparently won't touch at all.—N.L., Ga.



A—Getting the residue of paint off a molded edge is the bane of all those who use paint removers. The reason is that the shaper cutter which was used to form the molding, or shape it if you prefer, changes the "lay" of the wood fibers and creates a surface especially receptive to paint pigment which actually enters the wood and defies all ordinary efforts at removal. One reason is that users of paint removers do not give the chemical sufficient time in which to work. Thus only the paint on the surface is softened. Often you can get the last vestiges of paint from a molding simply by giving the remover twice the normal working time allowed and using a wire brush to loosen the pigment which has penetrated below the surface. Another way is to purchase a cabinetmaker's scraper and grind one edge to the contour of the molding. With this you can remove wood, and of course the paint residue, without changing the contours of the molded edges of the molded rails and stiles of the door frame. But try giving the remover more time first, before you buy a scraper and alter it just for this purpose.

(Continued to page 240)



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4 Sizes — 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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Ice on Porch Roof

Q—My new home has a very low-pitched roof over a porch with two roof valleys leading onto the porch roof from gables at each end of the house. Last winter snow collected on the roof and before I became aware of what was happening, water from snow melting on the higher levels of the house roof ran down onto the porch roof, worked back under the shingles and leaked through onto the plywood ceiling. This caused so much damage that I had to have several pieces of the plywood replaced. So far this winter I've had no repeat of the trouble, but I have no assurance that it will not happen again. Do you have any suggestions?—H.N., N.Y.



A—Of course, the water runs to the lower level and freezes on the porch roof because this area is much colder than that over the main part of the house which is heated. You have two alternatives, either scrape or shovel the snow off the roof, or melt it with a heating cable made specially for the purpose. Shoveling or scraping the fresh snow from the roof is not at all difficult if the roof height permits you to work from a short ladder or a step-ladder. A pull-type scraper is easily made by attaching a board about 6 in wide and 24 to 30 in long to a wooden clothespole, a rug pole or anything similar that will serve as a handle. Or you can remove the white stuff with a shovel or a push-type scraper. Of course, care must be taken not to damage the roof in either of these procedures. A low-heat electric cable can be laid over the affected portion of the roof in a zigzag pattern and plugged in to a convenient outlet whenever snow falls to any appreciable depth. The heating cable is, of course, the most convenient way of solving the problem. You mention a plywood ceiling and we gather from your letter that this was damaged and that you have replaced the damaged parts. If you have not already done so, we might offer the suggestion that you also provide ventilation for the enclosed area above the ceiling. This could be done by cutting a row of small openings near the front edge of the ceiling. Cover these openings with fine screen and then install at least two roof ventilators near the high side of the sloping roof over the porch.

Muscle Rustle

When human muscles are tuned in by a sensitive amplifier, it is possible to pick up the rustling sound of electrical signals. Dr. Walter K. Volkens of the Millivac Instruments Division of Cohu Electronics, Schenectady, N.Y., said this discovery was made when he was examining the chest of an electronics technician with a new low-noise amplifier and frequency scanner. The technician Richard Bittner, started "sending" when two electrodes were pressed against the area over his heart and the amplifier was turned up.

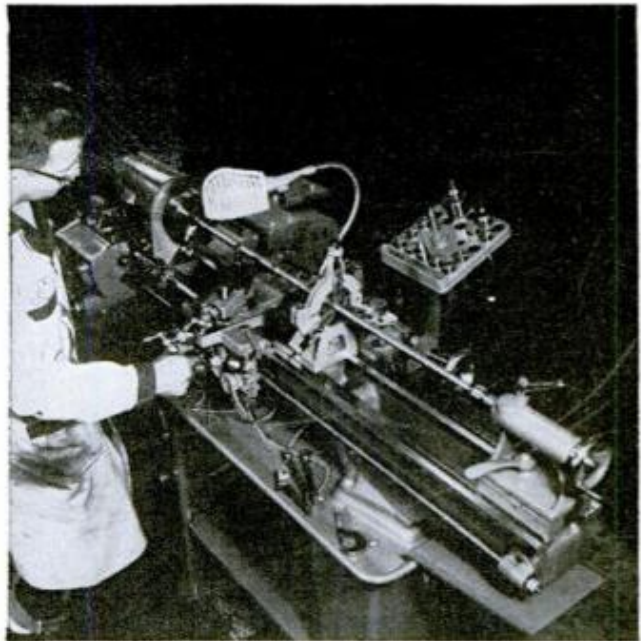
"First we heard the blimp-blimp-blimp-blimp of his heart as expected," said Dr. Volkens. "It came through very clearly. Then we heard a kind of rustling noise." If Bittner inhaled and held his breath, the rustling was sustained, leading Volkens to conclude the electrodes were picking up electrical signals, since there was no microphone in the circuit to pick up sound.

Examination of other muscles—in Bittner's jaw, wrist, calf and shoulder—again produced the rustling sound. Volkens said these high-frequency signals had not been detected before because they were so weak—about one one-hundredth of a millionth of a volt.

The finding leads to speculation as to whether the human body is capable of transmitting these signals and whether another person can pick them up. If this should be true, mental telepathy, for example, might be viewed with less skepticism than it is today. Perhaps of most importance was the discovery that diseased muscles generated signals different than normal muscles, and this might provide clues in the diagnosis of muscle disorders.

Shielded Cubicle in Space Ship

Space travelers may have to retreat to small, heavily shielded compartments when their ships rocket through Earth's radiation belts and the space storms of solar protons. That is the prediction of engineers J. W. Keller and N. M. Schaeffer, of Convair Division of General Dynamics Corp., who have studied the shielding problem. They say the compartment would eliminate need for heavy shielding over the larger area where astronauts would be able to live once they are past the radiation belts, provided solar protons are not present in large numbers, as they are about 10 times a year.



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At Home to Wild Animals

(Continued from page 121)

the tip of her blond tail was visible; and at each sniff the little tip wriggled like an animated bull's-eye on an archery target. Soon with an air of surprise, she backed out of the den. It was empty!

On our return, we found the badger—most gorgeous of all wild creatures—waiting for us in front of the animal house. The unrehearsed show that followed between Bernese, Sugie and the dogs would have put the best circus animal act to shame. Bernese, unaggressive yet unafraid, played with the animals like an over-sized roly poly kitten and was just as gentle.

Working with animals ceased to be a pleasurable pastime one day when Bernese disappeared. Marty's greatest fear that his four-footed friends might get trapped, may have been justified. But the chance that perhaps she had set up housekeeping elsewhere was always a comforting thought; and with a faraway look in his eyes he spoke the words that belied his feeling, "Well, that's as it should be."

Taming wild animals that are dependent is perhaps the least difficult of all. Through the years, the game wardens have continued to bring orphaned animals to the haven, some of them so young their eyes have not yet opened. Besides the actual raising and taming of tiny animals, there have been casualties to care for—broken bones, faces bristling with porcupine quills and at least one Caesarian birth. The aptly called "Wizard with Animals" accepts it all in his stride, even to taking them to the hospital for possible X rays.

There was a little beaver, so tiny that Marty took it to bed with him and placed it in the crook of his arm to prevent it becoming chilled. When it was half-grown, it would come in from the lake and after its evening meal, become restless, chew on wood and cry like a baby for Marty to hold it. In less than a minute it would be sound asleep, after which he could put it in its bed, where it would sleep all night.

Late one evening, the game warden brought in a three-day-old fawn with a broken leg. Marty prevailed upon a local doctor to have a look at the animal, before making a long trip to the veterinarian. The doctor, somewhat disgusted, declared his work was "doctoring people, not animals." During the examination the little fawn licked the doctor's hand. It instantaneously won its own case. The doctor not only rummaged around for splints and immobilized the tiny leg, but he never missed a day calling to ascertain the prog-

(Continued to page 244)

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ress of his appreciative patient. Marty, alerted by the hotel, every four hours night and day for six weeks took over the full-time job of nurse for the animal. At the age of five months, it was quite tame and one could not tell which leg was injured.

Probably one of the greatest challenges in Marty's animal-taming career came when a vicious muskrat was brought to him. It had already bitten a boy, possibly from fright or from an inherent instinct of self-preservation. He had had no more experience with muskrats than the average person. He knew they were nocturnal travelers and that they were hunted and preyed upon day and night. He also knew they were fighters.

"A muskrat, ounce for ounce, is a tough little guy. First I put him in the bathtub which without seeming to have restrictions made a perfect cage. About every hour, I went in quietly and sat with him. He became calm. After about four hours, I was able to pet him."

About 10 days later, Marty received a call that another muskrat, in going cross-country, had been treed by dogs. A man was sent to live-trap him. The animal was caught, but not before it had bitten the man severely and buried its teeth in the rubber heel of his boot. It also was put in the bathtub.

"I started extending my hand toward it. When it would get ready to move, I would draw my hand back. Then I took a comb and did the same thing. I was soon able to stroke it with the back of the comb. Ten minutes by the clock from the time it was brought to me, and 20 minutes from the time it was caught, I was able to stroke it with my hand."

Each time after the muskrats became calm, Marty fixed a box with blankets and fed them. Twice a day, he filled the tub with water and they had a good swim. After the swim, they would groom themselves for perhaps 15 minutes. They became so tame they would walk on his hand, up his arm and jump out in the bathroom and play. When he put them back in the tub, he always picked them up by their tails. They never tried to bite him. Later, he put them in the animal house with the beaver. Soon the beaver and muskrats were great friends.

Marty is careful never to deceive his animals. Even in play, two older animals are not allowed to tackle a younger, un-aggressive one. When animals come in for food, they are not disappointed. Many are hand-fed. Much of his pleasure is derived from the trust he is able to inspire in them. Unlike the trapper who betrays them with food, Marty gains their confidence.

During his extensive work with animals, he has never been bitten. Bears, deer, otters, wolves, foxes, badgers and skunks, as well as smaller animals, have gone in and out of his house at will. But with his ever-changing animal family including the vicious muskrats, wounded and usually considered untamable animals, one wonders if, at times, it is not a real challenge.

A broader knowledge of wild life and its quick reaction of trust and affection has obviously stimulated in the animal lover a greater interest in and a desire to protect all animals; hence he has developed a keen concern for conservation. Studying the animals' habits and needs has helped him determine their niche in life—their relationship to each other and to human beings. He has discovered that his woods friends—besides making wonderfully entertaining pets—constitute a phase of his natural heritage on which he is dependent; that either directly or indirectly, they are essential to his well-being.

To anyone living in a rural district, near a woods or lake, he recommends animal taming as a most enjoyable recreation. However, the would-be tamer must realize that taming animals is a seven-days-a-week job and that he must be punctual as animals are quick to follow a routine.

In summarizing, here are a few basic rules he has gleaned from this unique sort of work:

(1) Eliminate fear, and there is no better way than with food and kindness.

(2) All movements in the approach to wild life should be slow and deliberate. Voice should be modulated.

(3) Do not force your attention on a wild animal. Let it first learn that you will not harm it. Allow it to come to you out of curiosity.

(4) A well-trained dog—one raised with animals—simplifies the process. The animal respects whom the dog respects.

(5) Do not restrain an animal. Let it feel that it has its freedom at all times. When it starts coming into the house, the door should be left open so it can leave.

To those who are fearful of wild animals, it is Marty's opinion that the safest place to bed down for the night is in the center of the forest; that no wild life will ever harm you; that it is in the city of man you have need for self-defense.

To those who are skeptical about the pleasure gained from taming wild animals, Marty says:

"It is the gratification experienced in the animal's ready response in every instance to human kindness. I have yet to be double-crossed by an animal." ★ ★ ★

Booster for Space Rocket Will Travel by River Barge

To get the space age underway, the National Aeronautics and Space Administration first must build a river barge. This is the only way to solve the problem of transporting the Saturn booster—the first stage of a multistage space vehicle being developed by the Army Ballistic Missile Agency—2200 miles to the launching site at Cape Canaveral, Fla. The booster is 75 feet long, 22 feet in diameter and is just too large to be moved by air transport or on highways or railroads.

It will take the faster-than-sound booster 18 to 25 days to complete the trip from

Redstone Arsenal at Huntsville, Ala. The barge will ply three rivers and some 750 miles of coastal waters. Especially designed for its job, the barge will be 180 feet long and 38 feet wide. It will support an enclosed compartment fitted with breathing devices to control the atmosphere around the booster. Other facilities include an instrument room, kitchen and sleeping accommodations for 10 people. The personnel will be responsible for keeping proper humidity control and making instrument recordings of the shock and vibrations to which the booster is subjected.



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How-To With Twist Drills

(Continued from page 225)

developing to the stage shown in detail C, but the point of the drill should be examined closely each time before grinding and sufficient metal removed in grinding to keep the margins at full cutting efficiency.

Note the variation in the drill-point angles in Figs. 28, 29 and 30. The regular point, or general-purpose point, has the cutting lips ground to an included angle of 118 degrees with a lip clearance varying from 8 to 12 degrees. Such a drill point is suitable for drilling holes in any of the common steels and some of the softer metals such as hard brass. But for the harder, tougher alloys, the drill-point angle is flattened to 135 degrees and the clearance angle reduced to 6 to 9 degrees, Fig. 29. In the long-point drill, Fig. 30, the included angle at the point is reduced to about 90 degrees and the clearance angle increased to 12 degrees, making this drill suitable for drilling in both hard and soft woods, plastic and fiber, also some laminates. The angle of the cutting lips gives, in effect, more nearly a shearing action which severs the fibers of these softer materials without any tendency to tearing or chipping at the edges of the hole. Speeds and feeds for this drill point are not critical, but as a rule a drill point sharpened to this angle operates best at the higher speeds.

It will be noted from tables of cutting speeds for drills (these are available from manufacturers of twist drills) that as the diameter of the drill increases the recommended speeds decrease proportionally, also that as the rate of feed is increased the recommended speeds increase more or less proportionally. Speeds and feeds are important in industrial applications demanding maximum hole-drilling efficiency with maximum drill life, but to the small shop and to the individual user of twist drills the recommendations are of less importance. Often specifications cannot be followed in all details with the equipment at hand. By fitting a small drill press with a motor-driven speed reducer as in Fig. 27 comparatively large twist drills can be used due to the reduced spindle speeds. A small drill press so equipped can be utilized for drilling large diameter holes in steel, cast iron and other metals which require slow drilling speeds for maximum efficiency.

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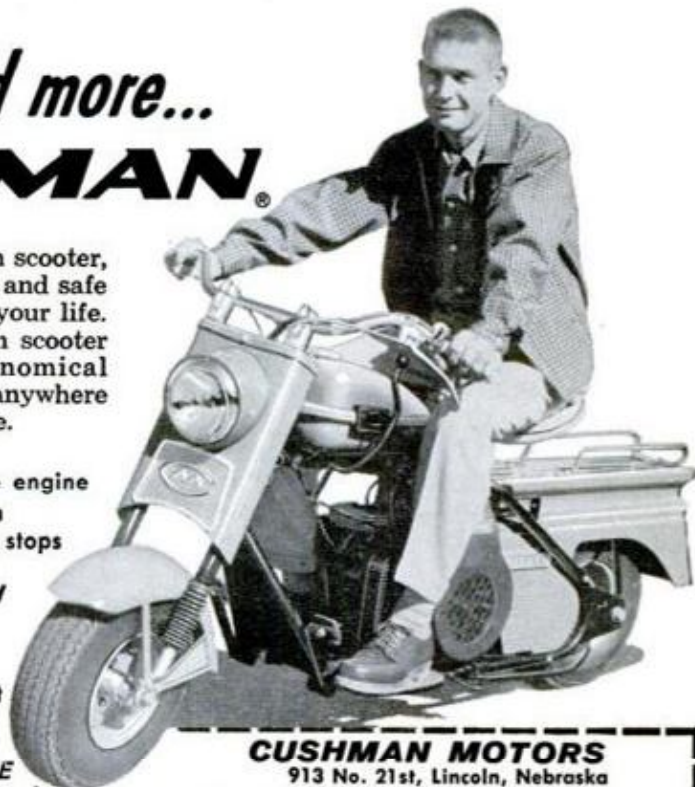
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Auto Section—'61

(Continued from page 145)

excellent riding and handling qualities of the compacts gave proof that the industry's engineering staffs were capable of succeeding at any high-priority task that management put before them asking only that they be given enough lead time to translate the prototype into foolproof production.

For the most part, quality standards rose during the 1960-model run. There were some early production problems and design kinks on the new models, but these were straightened out.

But perhaps the most salient fact to emerge from a year of shifting trends was this: more people were interested in paying less for their cars.

A look at the charts on page 146 will show that out of the 6,011,000 cars produced, over 4,400,000 came from the combined ranks of the familiar low-priced three, plus the new Dart and the six compacts.

As a result of this shift to the low and lowest priced fields something has had to give, and there's ample evidence of slipping, sliding and crumbling: Every one of the traditional medium-priced cars, with the exception of Chrysler, showed a decline in sales from 1959.

With this as the background the industry swings into the '61 model year with Buick's Special, Old's F-85, Pontiac's Tempest and Dodge's Lancer added to the lineup of makes. In addition, Mercury has eased down into the traditional "low-priced field" to compete with Ford, Chevy, Plymouth and Dart in two out of three series.

With its new economy model, Newport, Chrysler swoops down close to the "low-priced-three-plus-two."

All GM's traditional big cars, from Chevy to Cadillac, are physically smaller, although still a long way from compact. Ford and Mercury are smaller too. Chrysler's "full-size" line remains unchanged in dimension while the Lark and the Rambler are, of course, compact.

The trend to shrinkage has even reached into the ranks of the high-priced three, where Lincoln Continental introduces a totally new luxury package that's smaller than last year's Ford—no lighter though!

Perhaps the boldest marketing move of the new year is being made by GM's Buick and Oldsmobile Divisions in bringing out cars smaller than Ford, Chevy or Plymouth, yet costing more than the lowest-priced V-8s of those traditional makes.

This is frankly a gamble that will prove whether or not the U.S. motorist considers a smaller car desirable in its own right as a more acceptable form of private transpor-

tation or whether the compacts are thought of as merely a necessary sacrifice to be made in order to get low first cost and low operating expense.

The Lincoln Continental is a similar attempt, at the top level, to disallow the traditional ratio of size, cost and value, expressed as follows, "If it's bigger it must be better and therefore worth more money!"

It will be interesting to see how the medium compact F-85 and Special are received because they embody big-car performance and comfort with small-car economy and maneuverability.

Looking at the big picture, we see that the auto industry is being forced into competition with other industries for the car buyer's dollar. The trend toward paying proportionately less for new cars seems to be growing stronger as desire for other durable goods such as new homes, appliances and recreational products grows.

However, the industry is launching a strong counteroffensive in the shape of an awesome parade of technical improvements. In 1961, just a single year, there are three entirely new lightweight automatic transmissions, two new series of basic body shells, the GM compact unit body and the much improved bodies of the GM big cars.

Then, there are the new engines; the two wholly new aluminum V-8s on Olds F-85 and Buick Special, the sturdy, smooth-running Pontiac Tempest four, and the two aluminum engine blocks, the first big U.S. die castings for the Rambler and Dodge-Plymouth Sixes. And, of course, we have the long list of chassis improvements, from Ford's 30,000-mile, sealed-in lubrication to Pontiac's flexible driveshaft.

As a result of all this 1961 could be called "The Year of the Engineer"; a time when technical considerations resumed their rightful role in determining the nature of the American automobile, shaping it into a satisfying, efficient and pleasing instrument of practical transportation. To the industry this New Year's 1961 we say, "Congratulations on a job that had to be done—and a job that was well done." ★ ★ ★

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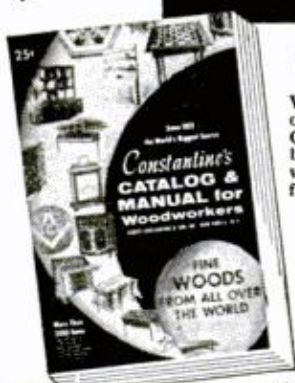
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Docking Lights

(Continued from page 215)

out of spray from the bow and to restrict them to an area that is less vulnerable in the event of collision. Installing lights in a lapstrake hull is the same as for a smooth-planked hull, except that shims or filler blocks must be cut and fitted on the inside and outside of the hull as shown in Fig. 4. These may be cut from marine plywood of the same thickness as planking strakes so that a flush mounting surface is provided for the housing and clamp plate.

Most docking lights come with two templates, one for the port light, the other for the starb'd one. The templates have the same outline and general appearance of the lights as seen from the outside of the boat as shown in Fig. 1. With them you can locate the lights for best appearance and illumination, and avoid internal obstructions. The latter is done by first applying strips of masking tape to the outside of the hull so as to mark the locations of frames or ribs in the general area determined for the position of the lights as in Fig. 2. Position the template between the frames as indicated by the tape (one side at a time) so that sufficient clearance is allowed on the inside for the lamp flange. View the template from the side for appearance. Then, have someone hold the lamp over the template and view it from the front of the bow to make sure the light beam will point directly ahead but overlap the one on the other side of the bow. When the exact location has been determined, mark the horizontal and vertical center lines of the lamp with tape or pencil. Do the same for the other side of the hull. Next, drill a 1/8-in. hole through the hull at each of the pivot points for the end radii (round ends) as marked on the template. If these points are lacking on your template, they can be located easily with a pair of dividers or pencil compass. Templates too, when not provided, can be made by outlining the clamp plate (Fig. 6) on cardboard.

Next, set your compass so that one leg is in the 1/8-in. hole and the other touches the outer edge of the template. Go to the inside of the boat and mark circles of the same radius on the planking, connecting the tops and bottoms of them with tangent lines so as to duplicate the template outlines. If a frame or other member is intersected by the circles, move the templates as necessary and repeat this procedure. Battens and other obstructions that are not important structurally, may be cut away to provide mounting clearances. Remove screws or any other metal fastenings loca-

(Continued to page 252)

1961 Chassis

(Continued from page 154)

pitching motion on the road and gives a beautiful gliding ride. Furthermore you don't have the heavy rear axle bouncing up and down over bumps, telegraphing shock to the body.

The Tempest has probably the ideal chassis layout for an American passenger car. Look for more cars to copy it in '62 and '63.

One brilliant feature is the fantastic bowed torsion-bar drive shaft. The engine drives through a $\frac{5}{8}$ -inch bar, 87 inches long, that's bowed down about 1.9 inches in the center and retained by two ball bearings spaced along its length. There are no universal joints!

With this new design we get rid of the two expensive U-joints; the twisting and flexing of the long bar absorbs drive-line vibration, and the bar's hat-shaped housing provides a solid support for the rear of the engine so that it can be balanced on only two mounts at the front of the car. This helps absorb the rocking vibration that is the plague of every four-cylinder engine.

Suspensions

For many years Detroit has tried to improve ride and reduce road shock by using softer and softer springs and shocks and by reducing friction in the various suspension joints and pivots. All this helped a lot—but there's a limit to how far you can go.

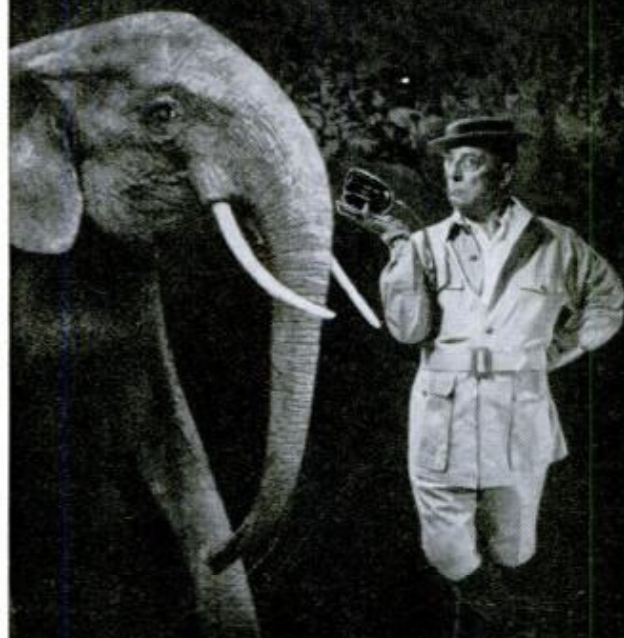
So today we see a new tack: The engineers are now working to *isolate* the suspension system from the body through rubber cushioning—and at the same time attaching the suspension to the body at *more points*, so road shock forces will be spread over a larger area and will not be concentrated at just two points.

For example, both Olds F-85 and the Buick Special have their front suspensions mounted on a massive, separate cross member which is insulated from the body shell by thick rubber cushions at the three points of attachment. This not only gives the suspension system an "anvil" to work against, but permits the insulation cushions to be a lot softer than could be used at the suspension pivots (which would cause the car to wander). The Corvair and Tempest also use this setup on the rear suspension. Works like a charm.

Then, there's the problem of spreading the load. The strut-type front suspension is an important feature. Here, the usual

(Continued to page 257)

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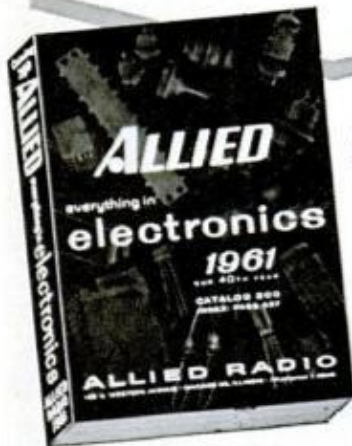
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ted on the cutout line and make the cutout, using a keyhole or saber saw. Cut along the inside of the line, being careful not to cross it. When fitting the lamp housing in the hole, rasp or file enough material away to give a snug fit. Then, place the housing in the hole and drill the bolt holes in the hull, using the ones in the housing flange as a guide. Drill one hole at each end first and install bolts in them temporarily to assure proper alignment of remaining holes to be drilled. Be sure to hold the drill perpendicular to the flange when doing this, so that the holes in the hull line up with the opposing ones in the clamp plate.

From this point on installation procedure will vary somewhat, depending upon the design of the unit selected. All units will require a caulking of seam compound under the clamp plate and between the housing and planking edge of the cutout hole. To continue with the installation of the model illustrated, four adjustable leg screws are screwed into the housing flange, which then is inserted in the cutout as in Fig. 3. While holding the housing in place with one hand, the screws are adjusted so as to permit the rim of the housing to extend beyond the hull a maximum of $\frac{3}{8}$ in. (the thickness of the clamp frame) at the highest point, Fig. 6. Because most hulls have a compound curve in this area, the frame will not extend evenly at all points, but this will be compensated for later. With the housing still held tightly in place, seam compound is forced into the crack between the rim and the hull, after which the clamp plate (and mounting area on the hull) is coated with compound and bolted in place, Fig. 5. Take up the nuts finger-tight, but tighten front-center and rear-center bolts until the clamp plate is drawn down to within $\frac{1}{16}$ in. of the hull. Being flexible, the clamp plate will curve itself to the hull contours. Readjust the leg screws if the frame appears tilted.

At this point there will be a gap of uneven width remaining between the housing flange and inside of the hull, the amount of which will depend upon the thickness of the hull planking, plating or shell. An aluminum hull naturally would have a considerable gap, a wooden one very little. This gap then is filled with a cement blocking. When the latter becomes hard, the adjustable leg screws are removed and clamp screws are drawn up tight. These must be tightened evenly and in rotation, until the clamp plate is pulled snugly against the outside of the hull. Remove excess seam compound that has oozed on the outside of the hull and make certain that compound is packed around all bolt heads, clamp plate and frame rim to prevent leakage. Seam

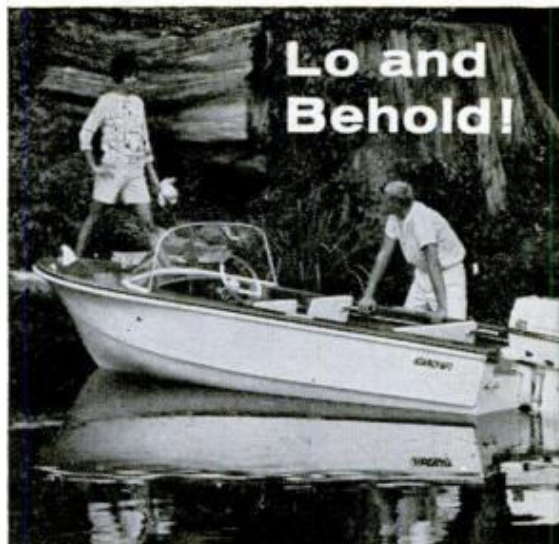
compound should be an elastic, nonhardening type. The cement blocking used is of a hard-curing type, usually included with the lamp units. Hydro-Cal or Plastic Mastic, available at most building-supply stores are good substitutes. The completed installation as seen from the inside of the boat is shown in Fig. 7. Note that a batten was cut to accommodate the light, which is located just forward of a frame.

The wiring diagram for the lights is shown in Fig. 6. No. 14 Packard cable or its equivalent should be used for wiring. Use squeeze-on lugs at connections and insulated saddle tacks to hold the wire in place against the hull and frames. Dual switches should be installed convenient to the helmsman so that only the light on the side of the boat on which illumination is needed may be turned on, saving on batteries. When replacing sealed-beam lamps, be sure to specify the correct voltage.

Adjusting the beam pattern of the lights is accomplished by clamping screws at the back of the assembly. This should be done on a dark night on still water. Clamping screws are loosened so that the light assembly may be turned fairly easily. Each light should be positioned to cover dead ahead to 30 deg. on each side, with the main body of the beam striking the water 50 to 75 ft. ahead of the bow. After adjustment is completed, clamp screws are tightened. The docking lights are now yours to enjoy safe boating after daylight hours. When using them to pick up channel markers and other navigational aids, make sure there is no oncoming vessel within range of your light beams. The courtesy will save a boating friend and maybe a fine. ★ ★ ★

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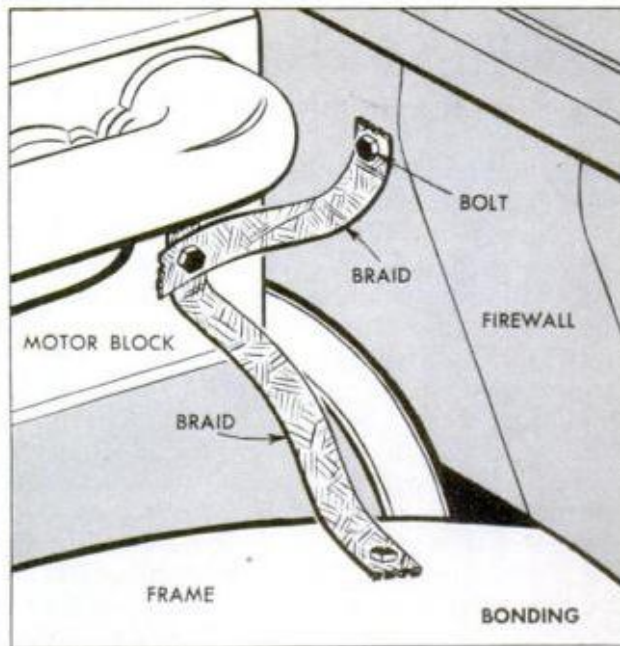
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Reducing Noise in Your Car Radio

(Continued from page 230)



Bonding provides good electrical contact between parts. Use short lengths of braid under car bolts

sources and continues to the rarer cases. But results are unpredictable. It may take one or a combination of several measures to reduce noise to an acceptable level. Keep the capacitors close to the terminals they connect to. The mounting lip of these units is actually one electrical lead of the capacitor, so it must make good contact with metal. It's handy to use a piece of steel wool or sandpaper to clean off corrosion and provide a good ground. The suppressors, as shown in the photos, simply snap into place. Bonding, a method of grounding various parts to the car frame (the electrical ground) should be done with heavy flexible wire or copper braid. ★ ★ ★

Push-Buttons in Planes Will Send Distress Signals

Pilots will be able to flash messages to ground stations in seconds when their air-planes are equipped with a push-button system being built for the U. S. Air Force. With the system, a pilot could, for example, signal the plane was on fire or in distress in five seconds. The system sends a simple code signal to a receiver which may be located in a plane or on the ground. The receiver's magnetic memory converts the signal to a previously recorded message which is spelled out on a device that looks like the mileage dial on an automobile. Letters, however, replace the numbers and form words.



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A Crash Need Not Be Fatal

(Continued from page 100)

been installed in the plane. Then a glance down the two columns of aisle seats solved the mystery. There was a visible dent at exactly the same place on the top of each seat. The overhead luggage rack had collapsed at the instant of impact. A heavy steel tube which was the main longitudinal support for the luggage rack had whacked the aisle passengers on their heads and killed them.

That sort of thing is less liable to happen now. Airliner interiors have been modified in many cases to provide for overhead rack supports made, not of lethal steel tubing, but of a lighter and more ductile or yieldable material. It, rather than the passenger's skull, likely will bend if they happen to bang together.

Another change in airliner design (and AvCIR helped bring this about, too) is the use of yieldable materials instead of rigid steel in seat backs. Thus, if there is a crash and the passenger smacks his head against the seat in front of him, he'll have a somewhat greater chance of survival. And to reduce his chances of even striking the seat ahead of him, seats in many planes are being made with backs that pivot forward under crash force. That way the belted passenger behind won't hit the seat in front if his head and torso snap forward.

The whole idea, then, is to eliminate, insofar as it is humanly possible, the things which—in addition to crash force itself—actually do the damage to people in plane crashes.

"There have been cases," says AvCIR's resident manager, Victor E. Rothe, "where planes have bounced and rolled and gouged their way across the ground, and yet the people inside would have walked away except for one little piece of lethal structure. Maybe it was an arm rest, or part of a seat. After investigating many such cases, we have concluded that survival can be based on engineering design. If those lethal things can be designed out ahead of time, people need not die."

It was this concept of "safety-engineering" that was put to the ultimate test in the crash of the Texas-built crop-duster, the AG-1. A minute investigation of the crack-up showed how well the concept worked.

One of the precautionary features built into the plane was a cockpit structure specially designed to provide the pilot with an "island of safety" in case of a crash. It was strengthened to resist a crash force of up to 40 G's and remain intact at an impact speed of 75 miles per hour, which was the

(Continued to page 258)

(Continued from page 251)

lower wishbone or A-frame is replaced by a single-pivot arm, which, in turn is braced with a diagonal strut that runs either forward or backward to the frame. This spreads out the suspension's shock loads and gives added leverage to resist road and brake twist. Chrysler first used this idea on its Torsion-Aire suspension in 1957—and now Cadillac, Corvair and Tempest are using forward running struts on their '61 front ends.

Much the same effect can be achieved at the rear end by carrying the axle on long trailing arms with load-bearing coil springs at their outer ends. The movement of the axle is controlled by two more arms running diagonally from each side of the lateral frame to the differential housing.

This really spreads the driving, braking and road-shock loads. Olds, Pontiac, Olds F-85 and the Buick Special use this layout. Cadillac uses a three-point link from differential to frame cross member to get the same effect. Chevrolet and the big Buick use transverse, frame-to-axle "track bars" to control sidewise movement of the axle.

All the GM cars now use coil springs at the rear end. It's a far cry from the day when your rear suspension met the frame at four points—at each end of two long leaf springs.

But Ford Motor Co. and Chrysler still use this layout—and are doing right well with it. In fact they've got a new idea for '61 that's probably as effective in isolating road shock at the rear suspension as any of GM's tricks. Normally, a rear leaf spring is pinned at the front and shackled at the rear. Road rumble can be readily transferred to the frame through the pin joints. The '61 Mercury is using a kind of shackle arrangement at the front of the spring also, with shackle movement restrained by a thick rubber cushion. In effect, the wheel can move backward about $\frac{3}{8}$ of an inch as it moves upward over bumps!

The same principle is applied on the lower wishbone of the front suspension; this is strut-mounted on rubber to allow fore-and-aft movement on bumps.

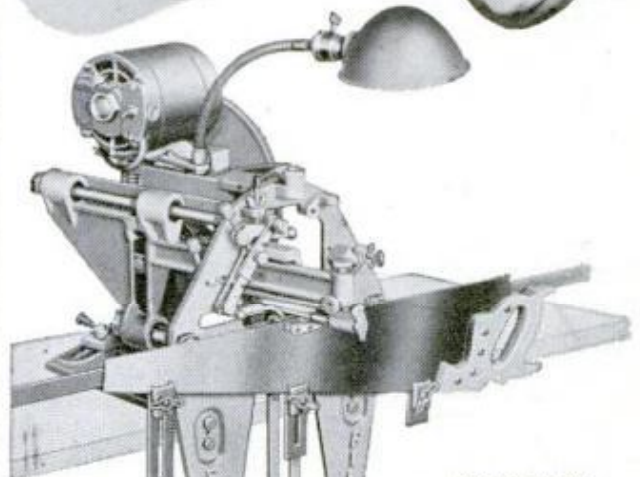
Chassis lubrication may be a thing of the past soon. Ford is using a new molybdenum-disulfide grease in well-sealed fittings that should be adequate for 30,000 miles of normal driving, and Cadillac is using special rubber fittings at all chassis wear points that won't ever require lubrication.

So, 1961 goes down in history as one of Detroit's really big engineering years. Let's hope we have more of 'em! ★ ★ ★

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comes from as far
as 55 miles away."
—Joe H. Walker.

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BUYS OUR GROCERIES**
"I have filed about 500 saws
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the Foley Filer is a good
investment because it earns
enough extra cash to buy our
groceries." — R. J. Kreuser.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays from \$3 to \$6 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. J. C. Delbert wrote us: "Since I got my Foley Filer five years ago, I have averaged 4 1/4 saws each day over all this time." Howard Kuhns says: "We operate 2 Foley Filers, and our business averages about 500 saws per month. The count last year was 5,798 saws."

The new model 200 Foley Saw Filer (shown above) is the first and only machine that automatically sharpens combination (rip and cross cut) circular saws—also all hand saws, band saws and crosscut circular saws. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. Exclusive jointing action evens up irregular teeth — old saws cut like new!

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cruising speed of the AG-1. And the cockpit structure did just that.

The duster had other features which came in mighty handy when the chips were down. One was a heavily-reinforced head rest structure, higher than the pilot's head, designed to protect him in case the plane flipped over on its back, which, of course, is what happened. Additional protection came from heavy tubular-steel guard rails extending lengthwise over the open cockpit. These rails were intended both as nose-over protection and to deflect wires and branches past the pilot's head when he made his low dusting sweeps.

Finally there was a special military safety belt and shoulder harness made to lock automatically under a crash force of 3 G's or more.

"It appears highly improbable," the pilot wrote in his report of the crash, "that any other plane used for agricultural work could have been crashed as this one was without killing the pilot."

The AG-1 wasn't rebuilt, but many of its ideas have been incorporated in the design of at least one commercial duster, the Piper Pawnee. The Pawnee even bears a noticeable resemblance to the AG-1.

The idea of "safety-engineering" likewise was put to the test in a new helicopter recently. While it was still in the designing stage, AvCIR was asked to evaluate it from a safety standpoint. AvCIR's men studied a wooden mockup of the new chopper and came up with a rather peculiar recommendation. It was that the transmission engine assembly atop the cabin be rigged so as to "break away" in case of a crash landing instead of crushing down into the cabin. The safety engineers also suggested that the landing skids and steel tubing beneath the chopper be beefed up to absorb the energies loosed in a crash landing.

Both improvements were duly made, and sometime afterward the 'copter did, in fact, make a crash landing. As it hit the ground, its transmission engine assembly broke away just as it was meant to. And the landing gear withstood the tremendous impact. Neither of the two men in the 'copter was killed, and only one was injured.

AvCIR's research has helped influence other refinements to make airplanes "crash-worthy" as well as airworthy. There's the "break-away" instrument panel, for one. It's mounted on shear pins designed to fail under the G-load encountered in a crash. At the moment of impact the instrument panel breaks away and the pilot's head doesn't wham into it. Also increasing numbers of private planes are being designed with reinforced cabins and long nose sections which serve as absorbers of crash en-

ergy—cushions, in a sense. "The principle of the thing," says Rothe, "is to have as much of the crash force as possible absorbed by the progressive collapse of various structures."

So far, in order to get its vital "crash-worthiness" data, AvCIR has had to rely on actual crashes, as and when they occurred. "Million-dollar unscheduled experiments," AvCIR calls some of them. But this kind of research has its drawbacks. Explains Rothe: "We have to guess what is taking place inside the plane during a sequence of crash incidents. We can't be sure exactly what is happening to materials and human bodies which are going through a series of impacts."

Now, however, AvCIR is embarking on a new phase of research. It is going to crash its own planes. Some will be dropped from high cranes. Others will be drones flown deliberately and carefully into the ground, at certain speeds and certain angles, simulating actual mishaps which AvCIR has investigated. Specially-constructed dummies will be riding in some of them. The dummies will be extensively instrumented so that investigators can measure the effect on them of crash forces and gauge what those forces would do to humans sitting in the same seats.

AvCIR is well aware that, no matter how efficiently it does its work, airplanes can never be completely safety-proofed. And there still will be crashes so devastating (as, for example, the famous airliner collision over the Grand Canyon) that even with extensive safety-engineering, nobody will survive.

But, AvCIR holds, people can survive some crackups that otherwise would be the death of them if certain things happen: If the cabin floor is strong enough to remain reasonably intact; if the seat is anchored firmly; if the person remains in his seat (that is, if he is belted or harnessed so as not to be thrown out); if the cabin structure doesn't crush him, and if no loose object flies through the air like an unguided missile to clop him on the head. The idea, in other words, is to package the passenger inside the airplane like a fragile vase packed in excelsior inside a sturdy box.

Modern planes—airliners, private planes and military aircraft—are being designed more and more to meet these safety-engineering requirements. Nowadays, when you read that somebody has walked away from the crash of a small plane, or half the passengers aboard an airliner survived a crackup, it well may be that AvCIR's indefatigable experts had a hand in it. Conceivably you might even owe your own life to them some day. ★ ★ ★

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Comparing the New Compacts

(Continued from page 150)

What these cars, and others too, need is a foolproof mechanical system for six-way seat adjustment that's really reasonable in cost.

Vision is good on all four cars. The three GM compacts have more glass in windshield (top to bottom measure) and have short hoods, easy to see over. Lancer doesn't give quite as much overhead vision and cowl comes up higher, but hood's downslope lets you see the road at the same short distance in front of the car.

Special, F-85 and Tempest have parallel windshield wipers that overlap, cleaning center as well as the area in front of the driver and right-hand passenger. Lancer's wipers cut conventional arcs leaving uncleaned "dead" spot in the middle. However, Lancer's wipers are two-speed. GM compacts have single-speed electrics that are too slow for heavy rains, too fast for mist.

Instrument groupings on the Special, F-85 and Tempest are different in detail, but all three have big, readable speedometers, easy to see day or night. All of them are free from nighttime feedback of light into the windshield, all three are relatively chrome-free, give no daytime dazzle. However, they have only one gauge (for gasoline capacity) other than the speedometer.

Everything else—temperature, oil pressure, generator charge—is delegated to "warning" lights that tell you when you're in trouble but don't show it creeping up on you. Lancer has everything but an oil-pressure gauge, but its instruments are clustered in a panel of silvery plastic that does glitter and reflect.

Considering their compact size and lowness it is very easy to get in or out of these cars; few persons of average size will have complaints.

Rear seating is comfortable in all cars, especially so in the soft-cushioned Lancer which has its cushion further from the floor.

All four bodies are free from squeaks and rattles, but the three GM bodies seem as solid as concrete, less inclined to quiver on really rough roads than Lancer's.

Quality of upholstery and interior trim seemed a bit better on the Buick Special, but was good on all cars, even the non-deluxe Tempest which was finished very neatly.

Luggage Space

Lancer takes this category in a walkaway with its wide trunk with spare tire buried beneath its floor. Lancer's trunk's rear edge

is lower too, for easier loading. Special and F-85 have the same trunk. About 60 percent of the usable capacity of Lancer's due principally to tire stowed flat on the right-hand floor taking up "prime" space.

Also, all three GM trunks have hinges that intrude on useful space above the axle "shelf" at forward end. Tempest's trunk has least capacity with tire bolted spang in the middle of the floor and an additional bulge, for the transmission, taking space from the rear "stand up" load area.

Engines

Oldsmobile F-85 and Buick Special have similar engines, different in detail. Both are aluminum V-8s displacing 225 cubic inches and weighing approximately 325 pounds minus clutches. They have 3.5 inch bores (cast-iron cylinder liners) and unusually short strokes of 2.8 inches. Compression ratios are 8.75 to 1 for Olds and 8.8 to 1 for Buick. Both performed satisfactorily on regular gasoline. These engines are very well-balanced and run very smoothly and quietly.

Pontiac's big, horsey cast-iron four is about 200 pounds heavier than the aluminum V-8s of its sister cars. It has a bore of 4.06 inches and a longish stroke of 3.75. Displacement is 194.5 cubic inches and compression ratio 8.6 to 1. In test (with manual transmission) it pinged on regular fuel when accelerated hard from 25 to 35 miles per hour in high gear.

It is without doubt the smoothest, most vibration-free four-cylinder engine ever seen in a U.S. production car. At cruising speeds it is next to impossible to tell that it isn't a six. With standard transmission axle ratio of 3.55 to 1 Tempest's longer stroke engine will wear faster due to greater piston travel. Although not objectionable, Tempest's engine makes more noise than the V-8s.

Lancer has two versions of Chrysler Corporation's new "lean to the right" six. Both have bores of 3.4 inches, but the larger one is longer "stroked" from 3.125 to 4.125 inches. This extra inch ups displacement from 170 to 225 cubic inches. Horsepower is increased from 101 to 145 (torque raises from 155 pounds feet at 2400 r.p.m. to 215 at 2800 r.p.m.).

The big engine is yours for an additional \$43, which is surely the power buy of the year. Both engines have 8.2 to 1 compression ratios and perform smoothly and quietly on all regular fuels.

A number of the 225-cubic-inch engines are coming through with aluminum cylinder blocks (iron-sleeved cylinder bores) for a saving of some 80 pounds in over-all engine weight. These are not experimental;

Dodge would make them all aluminum if production facilities were large enough. Our test "225" was aluminum blocked.

Fuel Economy and Performance

The Lancer, with 170-cubic-inch engine, led our 168-mile economy run with a flat 20.0 miles per gallon, best for the group. Its performance was slowest; 0 to 60 m.p.h. in 17.4 seconds, 50 to 70 passing at full throttle took 11.2 seconds.

Best combination of power and economy was the Olds F-85 with 17.9 miles per gallon and 0-60 time of 12.5 seconds, 8.7 seconds for 50 to 70.

Performance champ was the Special with a flat 12 seconds for 0 to 60, and a sizzling seven-second run from 50 to 70. The Special logged 17.7 miles per gallon.

The Lancer 225 dropped behind the two V-8s in both economy and performance with 17.5 miles per gallon, 13.7 seconds for the 0 to 60 run and 9.8 for the 50 to 70 dash.

Tempest, the only stick-shift car in the group, lagged with a 16.7 mile-per-gallon average. Its performance was brisk with 15.7 seconds required to reach 60 m.p.h. The 50 to 70 burst (made in high gear) took 9.5 seconds, just .8 of a second slower than the V-8 Olds F-85. This good performance, and the disappointing gas mileage, are results of

the high numerical rear-axle ratio (3.55 to 1) requiring the engine to turn faster and "breathe in" more fuel mixture at high cruising speeds and providing more torque at lower speeds for acceleration. All other axle ratios were 3.23 to 1 with the exception of the Special's 3.08 to 1.

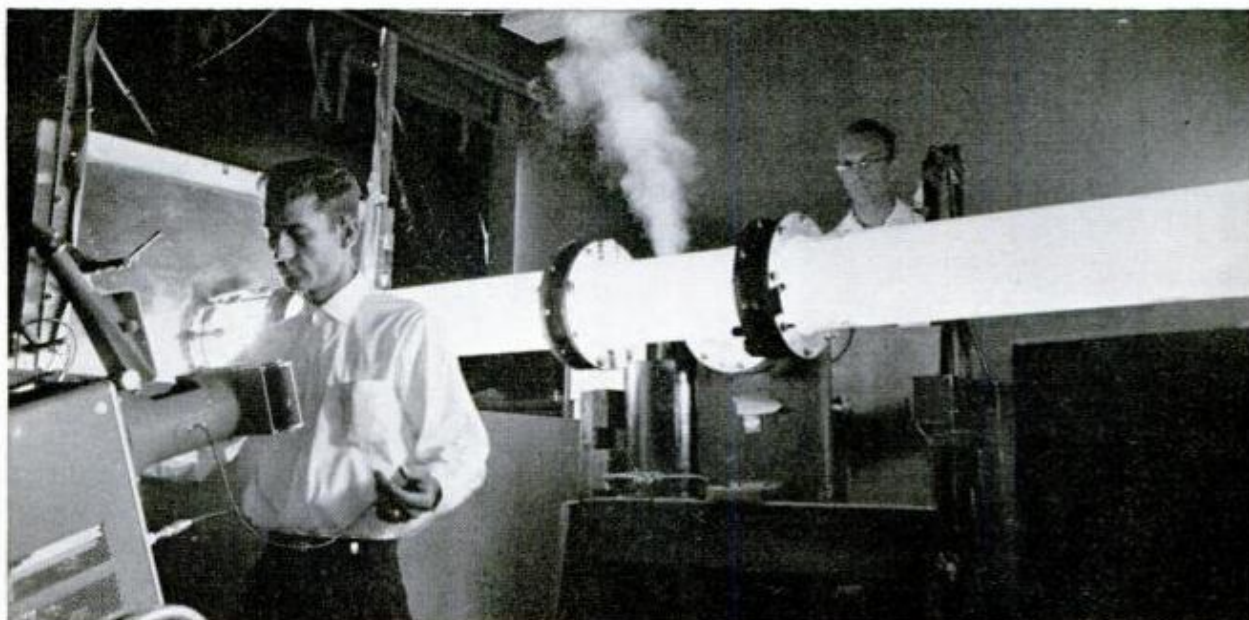
Of the total 168-mile course over which the cars were checked for economy, 96 miles were on turnpikes at 65 to 70 m.p.h., 34 miles on country roads at 50 to 60 m.p.h. and 38 miles was in city traffic with speeds ranging from 20 to 40 m.p.h. Speedometer readings are corrected.

Transmissions

Lancer's automatic transmission is a three-speed-plus torque converter controlled by push buttons giving solid, even acceleration and quiet cruising. Lancer's manual transmission is a three-speed floor shift with the shift lever on the floor to the left of the transmission bulge.

Olds F-85's automatic is a new, lightweight Hydra-Matic with essentially four forward speeds and control by steering column lever. Acceleration is steady, but all three shifts are definitely felt, especially at full throttle. Manual is a conventional three-speed column shift.

(Continued to page 262)



Boeing Airplane Co., Seattle, Wash.

Shock Waves Collide at 160 Times the Speed of Sound

With both traveling 80 times faster than sound at the moment of impact, two shock waves recently collided in a hydromagnetic shock tube. The experiment, part of a study of high-temperature gases that may lead to ion and plasma propulsion systems, consumed electrical power equal to the output of four Grand Coulee Dams to drive the shock waves on their collision course. The

electrical energy is stored in two 30-capacitor banks rated at 20,000 volts with peak power near 5,000,000 kilowatts. Once triggered, the shocks last only a few microseconds, but create a gas temperature within the tube of one million degrees. The picture was taken in total darkness with only the flash from the tube to expose the film. The eye sees only a wink of light.

Buick's transmission is an efficient, two-speed torque converter with "split-torque" feature giving 40 percent direct engine-to-wheels connection in high ratio. Control is by steering column lever. This automatic is smooth, steady and powerful, shift point is barely perceptible. Manual is three-speed column shift.

Tempest was equipped with three-speed manual, controlled by floor stick set to left of drive shaft tunnel. Clutch is in conventional location forward, transmission is incorporated with differential. Second gear is noticeably noisy, but it gives really powerful acceleration from 25 to 55 m.p.h.

Handling

All four cars are exactly the same length over-all, 188 inches (see photos pages 148-149). The three GM cars have 112-inch wheelbases, the Lancer 106½ inches. Buick and Olds F-85 can be parked just as handily as the shorter wheelbase Lancer as they have same curb-to-curb turning circle of 37 feet. Tempest needs more room with a 41-foot turning circle. All cars are available with power steering, but none of them really needs it.

On Lancer, Special and F-85, power steering cuts down on the number of turns of the steering wheel from approximately 4.5 to 3.5 for full left to right swing. Some drivers may feel that Lancer needs power steering for parking. All test cars had manual steering. Of the group, Lancer and F-85 seemed the lightest and easiest to turn at traffic speeds. All were judged satisfactory for city traffic. Some vibration of rough surface roads can be felt through Special's steering.

Roadability

Lancer and Buick Special are ahead in directional stability—the business of going where steered in opposition to cross wind, road surface and contour. Special has some tendency to slew around when cornered fast on rough gravel, washboard roads, but it can be put back on course quickly.

Lancer is the best in cornering on any surface; it leans less, has no tire squeal and will stay on the road and on course at a higher speed. Olds F-85 does almost as well as Special, but its softer ride (less shock-absorber control) permits more lean in cornering, provokes more weight transfer which, in turn, makes for more swerve when cutting from one lane to the next in a hurry.

Pontiac Tempest handles well in cross wind, has stable, go-where-you-point-it directional stability under average conditions. When cornered hard under severe

conditions such as slippery surfaces, loose gravel, etc., and when carrying only the driver, the rear end of the car tends to slide out, away from the curve, where Lancer, Buick and Olds would remain on course.

Ride

Olds F-85 and Lancer both have soft, comfortable rides; Lancer's is well-controlled at all times, F-85 sways and leans a bit more than you'd like on curves.

Special has firmer suspension control, sways little, if any, more than Lancer, but sacrifices softness, has instead a firm (yet not harsh) ride reminiscent of European luxury cars.

One flaw in Lancer's ride occurs only on really rough surfaces where body tends to shudder more than the other three.

Tempest's ride is generally comfortable, although more prone to transmit harshness of rough surfaces through front end. Tempest's ride is on the firm side, but quite free from sway and bounce.

Miscellaneous

All cars have good heaters; controls on Special, F-85 and Tempest heaters are better than Lancer's as they offer blending between "Defrost" and "Heating," have three-speed blowers for either defrosting or floor heating.

Gas filler pipe on Lancer is horizontal, spits back when tank gets full on automatic gas filler hoses.

Lancer has excellent alternator which charges battery even when engine is idling.

Parking brakes on the GM cars are conventional pull-out "T" handles while Lancer has easy-to-operate foot pedal at left with trigger release knob.

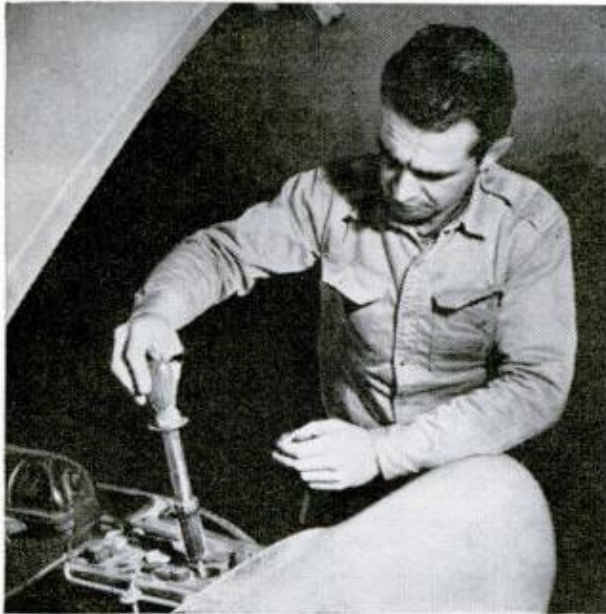
Service brakes are good on all cars, powerful and quiet. Lancer alone offers power brakes, and for some drivers Lancer should be so equipped.

Summary

All these cars are fun to drive. All of them offer advantages of maneuverability and varying degrees of fuel economy over conventional, full-sized cars. The unique size, attractive yet conservative styling and some other special advantages, such as handling ease, freedom from rattles and shake of conventional (separate body-frame) cars, or prestige, must weigh in the balance with Special and F-85. For these two cost just as much as middle-of-the-line Ford, Chevy and Plymouth V-8s. And the latter will give you almost as good gas mileage.

Tempest and Lancer offer solid virtues at prices competitive to the "stripped" sixes of the low-priced three. ★ ★ ★

Your Car Battery
(Continued from page 138)



Hydrometer gives check of the electrolyte strength

the hydrometer and the weighted float in the cylinder indicates its specific gravity.

The process by which electrical energy is discharged may also be reversed and the life of the battery restored. This is done by passing an electrical current through the battery in the opposite direction to its normal flow, replacing the sulfate in solution and restoring the "charge."

Mounted as part of the ignition system of a car, a battery's chemical reversibility is used like this: The battery provides current to run the starter motor which spins the engine to life; the engine then turns the generator, providing current for ignition, lights and other power requirements. Current also runs back into the battery to replace the huge load used in starting the engine. With the proper care and attention, the battery will cycle through discharges and charges until the chemicals and plates are exhausted, whereupon the battery will have literally consumed itself.

Though the charge-discharge process should not seriously impair the battery's efficiency for about two years, advance symptoms of trouble will be obvious, especially to a driver whose car is equipped with an ammeter. An excessive charge indication—20 amperes or over—is a sure sign that the electrolyte has thinned to the point where it is absorbing as much "juice" as the generator can grind out.

At this point headlights brighten as the engine is revved up and dim as it slows down; next, of course, starting begins to become a problem.

For cars equipped with flashing-red

(Continued to page 265)

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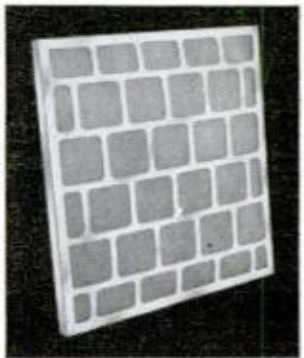
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IMPORTED - CARS SPECIFICATIONS

	Engine Type	Transmission	Bore & Stroke	HP.	Displacement	Compression Ratio	Torque	Wheelbase	Length	Width	Height	Curb Wt.
Volkswagen	Flat 4 OHV Air-cooled rear	4 spds fwd. Synchronesh	3.03 x 2.52	40	72.74	7.0:1	64 @ 2400	94.5	168.0	60.6	59.0	1631
Renault Dauphine	Inline 4 OHV* Mounted rear	3 spds fwd. Top 2 Synchro.	2.28 x 3.15	32	51.54	7.8:1	50 @ 2000	89.0	155.0	60.0	57.0	1397
Anglia	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	3.19 x 1.90	41	61	8.9:1	53 @ 2700	90.5	153.5	57.34	54.93	1625
Opel Rekord	Inline 4 OHV Mounted front	3 spds fwd. Synchronesh	3.15 x 2.91	57	90.8	7.8:1	84 @ 2200	100.0	174.0	63.6	59.0	2250
Fiat 600	Inline 4 OHV Mounted front	4 spds fwd. Top 3 Synchro.	2.36 x 2.21	28.5	38.6	7.5:1	30 @ 2700	78.8	130.0	54.5	55.3	1334
Triumph Herald	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	2.48 x 2.99	38.5	57.82	8.0:1	51 @ 2750	91.5	153.0	60.0	52.5	1764
Austin Healey 3000	Inline 6 OHV Mounted front	4 spds fwd. Synchronesh	3.28 x 3.50	130	177.7	9.0:1	167 @ 2700	92.0	157.5	60.5	50.0	2465
Simca Etoile	Inline 4 OHV Mounted front	4 spds fwd. Top 3 Synchro.	2.91 x 2.95	52	79.0	7.5:1	N.A.	96.0	165.0	61.0	56.0	2072
MG Magnette	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	2.87 x 3.50	66.5	90.8	8.3:1	82 @ 2500	99.2	178.0	63.5	59.7	2507
Peugeot 403	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	3.15 x 2.87	65	89.5	7.0:1	74 @ 2500	105.0	176.0	66.0	59.8	2380
Mercedes 220	Inline 6 OH cam Mounted front	4 spds fwd. Synchronesh	3.16 x 2.87	105	133.9	8.7:1	133.2 @ 3300	108.3	192.2	70.6	59.45	2890
Volvo PV544	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	3.13 x 3.15	85	96.5	8.2:1	87 @ 3500	102.5	177.0	62.5	60.3	2140
Metropolitan	Inline 4 OHV Mounted front	3 spds fwd. Top 2 Synchro.	2.87 x 3.50	55	90.8	8.3:1	81 @ 2000	85.0	149.5	61.5	54.8	1850
Hillman Minx Deluxe	Inline 4 OHV Mounted front	4 spds fwd. Top 3 Synchro.	3.11 x 3.00	57	91.2	8.5:1	83 @ 2000	96.0	162.0	60.8	59.5	2220
Vauxhall Victor	Inline 4 OHV Mounted front	3 spds fwd. Synchronesh	3.13 x 3.00	55	92.0	7.8:1	85 @ 2400	98.0	167.7	63.5	58.0	2200
Morris 1000	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	2.47 x 2.69	40	58.0	8.3:1	50 @ 2500	86.0	148.0	61.0	60.0	1662
Jaguar 3.8 Sedan	Inline 6 Twin OH cams Mounted front	4 spds fwd. Plus OD	3.24 x 4.17	220	230.6	8.0:1	240 @ 3000	107.5	180.8	66.8	57.5	3262
Sunbeam Rapier	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	3.11 x 3.00	78	91.2	9.2:1	83 @ 3500	96.0	162.5	61.0	58.5	2300
Borgward Isabella	Inline 4 OHV Mounted front	4 spds fwd. Synchronesh	2.95 x 3.33	66	91.1	7.0:1	80 @ 2400	102.5	175.0	68.0	58.0	2240
Austin Seven	Inline 4 OHV Front transverse Front drive	4 spds fwd. Top 3 Synchro.	2.48 x 2.69	37	51.7	8.3:1	44 @ 2900	80.0	120.0	55.5	53.0	1331
Saab	3 cylinder Two-cycle Front drive	3 spds fwd. Top 2 Synchro.	2.75 x 2.87	42	51.3	7.3:1	59.3 @ 3000	98.3	158.0	61.5	57.5	1800
Porsche 1600	Flat 4 OHV Air-cooled Rear	4 spds fwd. Synchronesh	3.20 x 2.88	70	96.5	7.5:1	82.2 @ 2800	83.0	156.0	65.0	51.0	1920
NSU Prinz	Inline 2 OH cam Air-cooled rear	4 spds fwd. Synchronesh	2.95 x 2.60	20	35.6	7.2:1	30 @ 2300	78.3	123.7	55.7	53.7	1113
Citroen DS 19	Inline 4 OHV Front drive	4 spds fwd. Top 3 Synchro.	3.07 x 3.94	75	116.5	7.5:1	101 @ 3000	123.0	189.0	70.5	59.0	2632
DKW Junior	Inline 3 Two stroke Front drive	4 spds fwd. Synchronesh	2.67 x 2.67	39	45.2	8.0:1	47 @ 2500	85.0	155.0	62.0	55.0	1496
Lloyd Arabella	Flat 4 OHV Front drive	4 spds fwd. Synchronesh	2.72 x 2.36	42	54.7	7.5:1	45 @ 2500	86.6	150.0	60.0	55.0	1532
Alfa Romeo Giulietta Coupe	Inline 4 Twin OH cams Mounted front	5 spds fwd. Synchronesh	2.91 x 2.95	53	78.6	7.0:1	69 @ 3000	93.0	157.5	61.2	55.5	1960
Toyopet	Inline 4 OHV Mounted front	3 spds fwd. Top 2 Synchro.	3.03 x 3.07	65	88.6	8.0:1	84 @ 3000	99.6	172.0	66.8	60.2	2627
Rolls Royce Silver Cloud	Aluminum V8 OHV Mounted front	Automatic 4 psds fwd.	4.09 x 3.60	N.A.	380	8.0:1	N.A.	123.0	211.8	74.8	64.0	4648

*All makes water cooled unless indicated otherwise.



Overcharged battery—internal heat forces acid out

warning lights instead of the meter, the wisest buy is an easily wired-in ammeter available at almost any auto-supply store.

Remember, an engine full of 20-weight oil requires $2\frac{1}{2}$ times as much power to turn over at zero degrees F. than it does at 80 degrees, and at zero the battery delivers only 40 percent of its power. Thus, a battery able to turn an engine at all in cold weather is probably in fair shape.

More often than not, a driver's first reaction to a "low" battery is to ask for a good running push or for a "hotshot" assist from the corner service station. These field expedients, however, are permanently effective only if the car is driven long enough to allow the generator to do the major portion of the recharging. Even so, the charge may not "hold."

The fact of the matter is that a proper charge is a slow process, requiring anywhere from 12 to 15 hours, depending on the vintage of the battery. This process cannot be hurried but must be allowed to trickle in, the current paced to the chemical changes taking place in the battery.

The "fast-charge" setting on battery chargers is designed primarily to give new "dry-charge" batteries an initial boost, for test purposes and for emergencies.

So much for the battery which proves to have been good. But what happens when a motorist must buy a new battery—what is he liable to find? The fact of the matter is that there is no way to make sure of the quality of a new battery, and this holds true regardless of the price. Because of the price war waged for several years between battery manufacturers and the fact that there are no industry-wide standards governing the quality of the product, the result has been a drastic reduction in the only components on which cost can be shaved—the lead plates. The method of cutting the cost of plates is simple; thinner plates and fewer of them.

(Continued to page 267)

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We Discover a Phantom Coast

(Continued from page 111)

along the Eights Coast, and possibly even the George Bryan Coast.

Operations rolled into high gear. High on each ship's mast, revolving antennas caused blips of bright light to appear on scopes in darkened rooms below, allowing operators to tell at a glance the distance and bearings to objects which reflected radar pulsations. This mechanism was being used to chart the irregularities of the unknown coastline through scope photographs.

On the flight decks, red aerological balloons rose in the air at intervals and climbed rapidly in the sky until they faded entirely from sight, their small transmitting units radioing back weather data of the upper air.

On the main decks, deep sea winches lowered yellow Nansen bottles into the sea to obtain samples of the ocean at predetermined depths. Other secrets of the sea were learned through bottom hauls, corings and plankton samples.

The *Glacier's* large helicopter planted a "grasshopper" weather station on Cape Palmer. Thereafter it automatically transmitted weather data every six hours to the icebreakers.

Scoured by glaciers of past centuries, the sea floor was rocky and marked by many submerged peaks. One series of traces revealed the existence of a clearly defined fault in the earth's surface.

A group of shoals, barely awash, were observed in the nick of time, causing the commanding officer of the *Glacier*, Comdr. Philip Porter, to back his vessel down full. Afterward, these hazards were referred to as Porter's pinnacles.

With the temperature a few degrees above zero Fahrenheit, wind from WSW at 15 knots, and a wide lane of open water next to the shoreline in which to operate freely, the icebreakers were encountering little difficulty in flying scientific parties to exposed rock areas ashore. But Antarctic weather and ice conditions can be unpredictable, changing suddenly from a flat calm to fierce winds which close the pack so that the very strongest ships sometimes cannot escape. If we should become beset in the ice pack, we knew that our only recourse would be to wait patiently for better ice conditions.

Besetment in the ice pack, under modern conditions, is certainly much different from that once experienced. Outside, the icebreakers pit their strength against weather, time and distance. Inside, within their ample, protected hulls, they provide

luxuries of community living to their more than 200 inhabitants. Their food ranks with the best anywhere in the world—oven-fresh bread, rolls, pies and cakes from the bakeries; steak, roasts, poultry, ham, sea food from the galleys, hot coffee and soup available at all hours. Once a day, twice on Saturdays, Sundays and holidays, all off-watch personnel are treated to Hollywood movies, either in the wardrooms, chiefs' quarters, or mess halls.

Outside, the power from diesel-driven generators in the engine rooms drives the ships ahead, smashing through frozen barriers, whereas inside the same engineering plants furnish hot water for showers and shaving, heat for maintaining 70-degree temperature, electricity for diffused lighting, and power for radios and luxury electrical appliances.

Volunteer crew members, acting as ham operators, work with radio amateurs in the States to allow crew and passengers to talk with home and family. Hobbycraft, lectures, books, organized competitions, games and amusements prevent boredom.

After logging 120 miles by the morning of the third day of our eastward advance, the ships were confronted with worsening ice conditions. Ice floes became more formidable, larger and more hummocked. The coastal channel of ice-free water vanished altogether. Did this mean we had reached the end of our eastern progress?

The two *Glacier*-based helicopters could provide the answer in a short time, so orders were given for their launching. I went along in one.

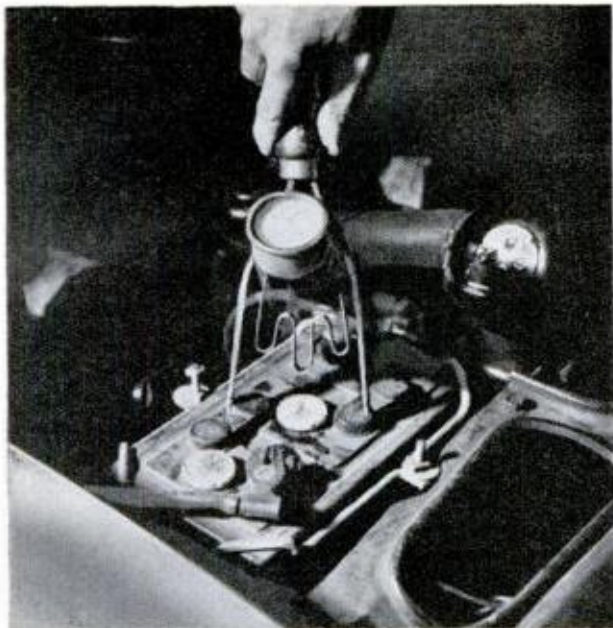
Gaining altitude above a large block-shaped iceberg, the small helicopter gave a breathtaking view of the new coastline. Into the fantastic ice-world of the interior we could see the ice shelf's rising trend. In some places elevation increased rather abruptly, in others more gradually, proof indeed that the thick, white mantle of ice flowed over submerged rock.

Fairyland blue grottos, outlines of snow-covered crevasses, intestine-like undulations—all showed how the ice was encountering the obstacles of rough terrain in its stubborn march to the sea. Occasional peaks with dark, angular rock outcroppings thrust upward through the ice and lent contrast and perspective.

Winging over glistening snow fields, our craft skirted the eastern capes of Thurston Peninsula. Below we could see a hodgepodge of jumbled ice masses, some 500-foot-thick blocks, freshly calved additions to the sea-ice formations.

A mittened finger pointed southward to indicate where an ice bank flowed out from

(Continued to page 268)



Voltmeter gives check on battery "charge" capacity

The "17-plate battery," long considered standard, has in many cases been reduced to 15 plates. The high-quality, six-volt, "Group 1," 100-ampere-hour battery which at one time contained about 20 pounds of lead now, in some cases, contains less than 10 pounds.

Another method to catch the unwary buyer is the use of "cheater plates"—shorter plates placed in a standard-size box. Through the battery's filler hole, the difference in plate size is not apparent and, though the price may (or may not) be lower, the life of the battery is shortened.

As a recompense for all these short cuts, pro-rated warranties are offered. That is, the manufacturer asserts that the battery will last a certain number of years. Should the battery fail before the specified time is up, he will replace it for the price of a new one, minus so much for each month left of the warranty period. No matter how good the "deal" sounds, the buyer is still paying so much per month for service.

One way to assure yourself a good buy is to buy on the recommendation of someone in the battery business—the owner of a big garage, for example, who has a big inventory and handles several brands—or to find out what batteries are used by a passenger car or cab fleet in your town.

Buying the same batteries that they do, from the same source, should give reasonable assurance the product will be good.

A general idea of what a battery can be expected to do, especially in cold weather; an eye to symptoms of trouble and a bit of common sense in nursing an ailing battery back to health—these things, plus discretion in buying a new battery can save you a good deal of frustration and money. ★★

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an embayment behind a rise of land. In a short time we could see an ice-covered strait. Here was evidence to support aerial trimetregon photos taken by one of two VX-6 planes a month previously. Thurston Peninsula might really be no peninsula at all, but an island!

Massive hummocked floes, each many miles across, glared up at us in sullen mood. Jammed together by forces sufficient to cause high pressure ridges, hiding any vestige of water, they comprised a virtual white desert where every surface reflected sunlight with terrible intensity. We were convinced that no ship, even the most powerful icebreaker constructed, could ever expect to breach such defenses. We had definitely reached the limit of ship travel eastward.

We saw the snow-shrouded outlines of an island five miles in length. Beyond, we caught the glint of another island, and into the interior, far to the south, an unknown mountain range reared a cascade of peaks into the cold, sterile Antarctic air.

Touching the rubber floats down briefly on the nearby island, our pilot decided that the soft snow surface was unsuitable for landing the other aircraft, which had wheels. He then chose to land on the only smooth ice floe in sight, aided by a streaming red flare dropped by the other helicop-

ter to indicate wind direction and force. Shortly afterward the larger helicopter settled nearby and refueling was accomplished from a rubber-tire fuel drum.

Back aboard ship, we sipped hot steaming coffee and conferred about future plans. Our decision was to backtrack to the west, first to the vicinity of Cape Flying Fish and then on to the Amundsen Sea Coast, but not before we had completed scientific observations in our present vicinity.

Although the weather had been favoring us with cold southerly winds and clear visibility, it suddenly turned on us. An intruding low-pressure area from the west brought a stiff northerly wind which immediately began to close the open water channel between the pack and the shelf. Temperatures climbed to slightly above freezing, and snow started driving down to cut visibility to nil.

In the afternoon large ice floes rapidly closed against the sides of both ships so that progress came to a standstill. Then, in addition to this disturbing situation, the commanding officer of the *Glacier* confronted us with still more disquieting news. "I think we have a bent shaft," he said. "We'll know definitely, though, after we get a new bearing installed."

Clouds of white smoke had been seen emerging from the port shaft alley. A siz-

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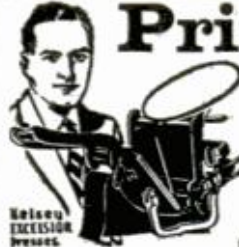
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zling hot journal and bits of chewed metal showed that a main bearing on the 23-inch shaft had been badly wiped and would require renewing.

As the bearing cooled, a team of engineers went to work around the clock to install a new 1200-pound bearing. It was no easy task. The job first entailed burning a hole through the bulkhead so the new journal could be put into position.

Was a bent shaft responsible for the damage? If so, *Glacier's* remaining starboard shaft would tend to force her to port and also reduce available power by one-half.

On the following day the pack tightened even more, groaning and creaking with pressure. Rows of ice blocks, marking the edges where floes had come together with tremendous force, rose steadily.

Meanwhile, the shaft was being readied for installation of the new journal. The team worked without stopping, fighting fatigue and sleep with numerous cups of coffee. Finally, after 48 hours, the last bolt was tightened.

When all was ready, the shaft was turned over at slow speed. Temperatures remained normal. Speed was then built up to full power, and we could see that our worries about a bent shaft were ended. The *Glacier* was again ready for business.

This was not the end of our good luck.

In a few hours, a favorable shift of wind began easing ice pressure. Already we could see areas of water between floes. The two ships experienced little trouble now in proceeding along the coast to the westward.

Both ships retraced their tracks to the west, paralleling the ice shelves as before. Cape Flying Fish was actually in sight and ships' boats were out investigating shoals and small inlets when an urgent message was received. The Argentine icebreaker, *SS San Martin*, had been caught in the ice pack off Marguerite Bay, Palmer Peninsula (1000 miles to the east) and, squeezed between two ice fields by 100-knot winds, had been badly damaged. The resulting pressure crushed 30 frames along her starboard side and broke off a propeller blade. Later we learned that her crew had been forced to jettison 500 tons of cargo in order to lighten ship and bring her back to a more even keel. At the time the damage occurred she had been attempting to reach an Argentine base 40 miles distant where seven men were short of supplies and two required medical treatment. Now her situation was desperate and our help was urgently requested.

This was a serious blow to our planned Amundsen Sea Coast operations and meant the finish of scientific plans which had in-

(Continued to page 270)

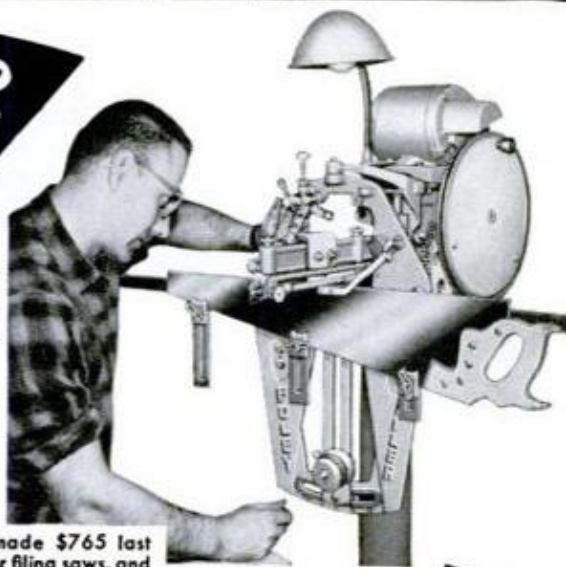
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cluded erecting a small station on the coastline. However, the law of the sea demands that aid be given whenever a fellow seaman is in distress. The year before Deep Freeze icebreakers had given assistance to the Belgian vessel SS *Polarhav* in the Weddell Sea and the British Falkland Islands Dependencies Survey ship SS *John Briscoe* in Palmer Peninsula waters.

While the *Burton Island* transferred fuel to the *Glacier*, three helicopters set out to study and photograph the Cape Flying Fish area. On landing, a ship-constructed flagpole was unslashed from one of the small helicopter floats, and planted with the National Ensign in a low swale fronting the prominence of Cape Flying Fish.

As we departed, we watched with mixed emotions the bright colors of the flag ripple briskly in the strong winds. How long would the winds and driving snows of the Antarctic permit it to maintain its vigil?

In 10 days' time the *Glacier* was to come upon the *San Martin*, and then to proceed to the assistance of the Danish ship SS *Kista Dan*, 47 miles to the southwest. Aboard the latter would be a British expedition led by Sir Vivian Fuchs, head of the successful British Commonwealth Trans-Arctic Crossing Expedition three years before. It would take four days of hard struggle with the ice to free the smaller vessel and to lead her into less ice-choked waters.

Meanwhile, we wondered a little about the new mountains, bays and features we had missed seeing by not going to the Amundsen Sea Coast. Among them might be a Shangri-La, a volcanic region or a source of valuable riches. Man can never be certain until he sees things with his own eyes. Future plans, however, did give us a ray of hope. This year, if we are lucky with our two-ship expedition, we shall see the Amundsen Coast for sure. ★ ★ ★

Do You Know This Old-Timer?

(Answer to quiz, page 18)



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• Beautiful walnut finish cabinet. Latest design, finest equipment. Govt. cost \$450. SALE.....**\$97.50 FOB**
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ELECTRIC CAR MOTOR
• Item #576. Powerful gear motor. Hi torque. Build boy's car, golf cart, winch, elevators, etc. Runs on 6 or 12-v battery. Reversible. Gear ratio 33 to 1. Shaft 3/4" diam. Size 1 1/2" x 5 1/4". Wt. 30 lbs. Govt. cost \$295. SALE.....**\$15.79 FOB**
Reversing switch for above motor—**\$3.50 FOB**

6 or 12-V STORAGE BATTERY WINCH

• Item #311. Powerful fully reversible ball-bearing gear reduction winch, 1000-3000 lb. pull. Use on 6 or 12-v battery. Holds 40' of 1/4" cable. For trucks, docks, boats. Govt. cost \$280. SALE.....**\$46.71 FOB**



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• Item #1526. New high current 60-cycle step down. Use with war surplus DC series motors or our #311 winch. Adj. taps give range of 7 to 19 volts at current range high as 75 amps. Hundreds of uses with surplus motors, laboratory, etc. Note—different case from picture. Govt. cost \$29.95. Wt. 21 lbs. SALE.....**\$15.91 FOB**



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• Item #280. New Govt. unit. High capacity. Fine for basement, ideal bilge (boat), contractor use, etc. Capy. 12-40 gpm. 1 1/4 (o.d.) inlet and outlet. Wt. 51 lbs. Kit of spare parts free. Govt. cost \$69.50. **\$22.90 FOB**



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- 52.50 Cathode Ray Tube (905)... **4.91 PPD**
- 300.00 Welding Generator P1... **16.95 FOB**
- 30.00 Hand Winch 1500 lb. cap... **15.95 FOB**
- 98.00 Centrifugal Pump 275 gpm... **49.50 FOB**
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• Item #1019. A marvelous special—one of the best items we have ever offered. Represents a manufacturer's overstock of brand new leading make Electric—massaging motor units. Type used on expensive contour health chairs.
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• Item #738. Amazing electric switch—same used in dial telephone offices. Select any of the 99 circuits with dial. Use for private system—remote telemetering—experimental—etc. Fascinating unit. Furnished with dial and data. Regular sale price this item \$16.95. Cost over \$125.00. Wt. 16 lbs. SALE..... **\$9.91 FOB**



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WATCH FOR THEM IN THE MONTHS TO COME

1961 Engines

(Continued from page 156)

ily yet.) The Rambler aluminum-block engine will use the earlier, cast-iron cylinder head, so there is no problem here.

It might be mentioned here that Chrysler Corporation is die-casting about 20,000 aluminum six-cylinder blocks for experimental installation in some 1961 Plymouth, Valiant and Lancer models. These will also use the present cast-iron head. It is interesting to note that both GM and Rambler aluminum engines are using iron main bearing caps. The different heat expansion rates between the steel crankshaft and aluminum bearing support would cause excessive bearing click with aluminum caps.

The new Buick-Olds V-8 has many special features other than aluminum construction. Crankshafts are cast instead of forged. Casting is much cheaper, and apparently produces a strong enough shaft. The Buick version of the engine has a unique oval combustion chamber with a dished-out piston and spark plug near the center for fast, efficient combustion.

Intake manifolds are aluminum, and are heated (to vaporize the fuel) by hot water from the heads instead of the old exhaust "hot spot." This system works much more efficiently and evenly. The shaft which drives the distributor and oil pump is set diagonally at the front of the engine, ahead of the timing chain, so these parts are right out in the open and easy to get at. The bottom oil pump cover also serves as a mounting base for the oil filter.

All this is in an engine weighing less than 350 pounds (with accessories). You get a substantial 215 cubic inches, 155 horsepower—and gas mileage ranging from 15 to 25 miles per gallon under all conditions. This is tomorrow's engine today!

New Engines From Old Parts

It costs approximately \$70 million to tool up for a new engine these days. Detroit companies don't want to do it unless the market absolutely demands it. This year we see several cases where "new" engines (at least new in performance) were created by making relatively minor changes on earlier basic designs. Not much new tooling is needed, so the over-all cost is only a fraction of the all-new design.

Take the four-cylinder Pontiac Tempest engine, for example. This is nothing more than the right bank of the big Pontiac V-8 that's been in production on the same basic tooling since 1955.

The new Four uses many standard V-8 parts—cylinder heads, pistons, rods, valve gear, etc.—and the blocks, with cylinders

slanted 45 degrees to the right, run down the same production line with the V-8 blocks! Pontiac has put a truly new engine on the market for an unbelievably low cost.

And, just as remarkable, Pontiac hasn't compromised performance in doing it. With 195 cubic inches and the big valves and ports of the V-8, the new Four should perform right alongside the 215-inch Buick-Olds V-8. And the new job is probably the *smoothest* 4-cylinder engine ever developed. Much of this is due to the unique mounting. With the solid-mounted differential at the back of the chassis, and the flexible drive shaft anchored by bearings along its length, the engine requires only two mounting points, one on each side of the block. This means that fore-and-aft rocking vibrations (the big problem with a four-cylinder engine) are damped out by the whipping action of the drive shaft housing and are not transferred directly to the passengers.

Studebaker-Packard has done a neat job of modernizing the six-cylinder Lark engine—which was originally designed and tooled for the Studebaker Champion 22 years ago. The original flat cylinder head, with valves in the block alongside the cylinders, didn't give adequate "breathing" for high power and torque outputs and the poor combustion chamber shape limited the compression ratio on regular gas, which hurt the fuel economy.

For 1961 they have designed a new overhead-valve cylinder head to mount on the original block, using the original rods, crankshaft, pistons, etc. Crowding in two decent-size valves over the small three-inch bore diameter was neatly done by staggering the location of the valves along the length of the head so their diameters overlap. In this way valve and port sizes were greatly increased and horsepower raised from 90 to 112, without adding cubic inches that would use more gas. This new Lark Six may prove to be the most economical engine of the year.

Detroit engine designers continue to be torn between the apparent sweeping trend toward operating economy and the very real buyer demand for better acceleration. It's almost impossible to give more of both in the same engine. But they try.

Chrysler uses the miles-per-dollar approach. They have reduced compression ratios on all their standard engines permitting them to burn regular-grade gas. This might reduce the miles per gallon a shade—but the gas costs enough less per gallon that you end up going more miles on a dollar. Confusing? In some cases they have also used bigger valves to maintain horsepower with the lower compression.

Ford engineers take a different tack. They reduce the rear axle gear ratio to slow the engine down—which is a very effective way to cut fuel consumption—then they increase the cubic inches of the engine to maintain acceleration potential. This is why they boosted from 352 to 390 cubic inches on the big V-8 and from 144 to 170 inches on the Falcon-Comet Six.

Some engineers say you end up right where you started, that the increased size eats up all the gas you save by running the engine slower. People who think all American cars are the same should hear these engineers argue sometime!

For the buyer who wants really outstanding performance—and is willing to sacrifice considerable economy, smoothness, quietness and flexibility to get it—a number of companies continue to supply their optional “maximum-performance” engines.

The 1961 crop of “factory hot rods” is the wildest ever. These engines are generally standard V-8s with three, two-throat carburetors or one huge four-barrel, high compression ratios, special high-lift camshafts, usually with solid lifters, special ignition distributors, and streamlined, “header” type exhaust manifolds.

It looks as if the job to beat this year will be the big competition Pontiac. This develops nearly 400 horsepower at 6000 revolutions per minute at the flywheel on the road, and will accelerate a heavy Pontiac car from a standing start to over 100 mph in a quarter-mile—or about three city blocks!

This is Detroit’s answer for the performance enthusiast. Five years ago they were trying to build all cars like this; today they try to satisfy Aunt Jane with the standard low-compression economy engine, and the young kid around the corner with the hot-rod engine. ★ ★ ★

Chemical Process Remakes Leather

Leather is being made in any size, shape or thickness by chemists of Armour & Co. In their laboratory, using a process developed jointly with the United Shoe Machinery Co., they are converting collagen, which constitutes 85 percent of the hide protein solids, to a solution. They then produce a continuous leather sheet to their specifications from the solution and hide fibers. Commercial production of the new type of leather is planned. The process would allow the entire animal hide to be used, while in conventional tanning processes, trimming of irregularly shaped hides is necessary. The new process also is said to produce leather faster than ordinary tanning procedures.

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Is Our Atomic Stockpile Dangerous?

(Continued from page 128)

the charges could explode at the same instant unless ignited by the battery. Instantaneous ignition of all the charges has never occurred in an accidental fire or in experimental tests of accident conditions. When one of the charges ignites and then sets off the others the nuclear material is blown apart instead of being compacted together into a smaller, critical mass.

When a Bomarc, Nike, IRBM or ICBM accidentally catches fire or when an aircraft carrying a nuclear weapon crashes there is a real danger that the TNT in the weapon will explode. Some of the larger nuclear weapons carry as much as 300 pounds of TNT. The chances may be a trillion to one that there will be no nuclear explosion, but the chances are possibly 50-50 that the TNT will explode. The best advice is to get far away, fast, from any such accident.

Nine accidents involving U. S. nuclear warheads or bombs are known to have happened in the last few years. In 1958 an atom bomb was accidentally dropped by a B-47 over South Carolina. The TNT charges exploded, wrecking a home and injuring the occupants, but there was no nuclear explosion. In 1959 a B-52 crashed while refueling over Kentucky. Its hydrogen bombs did not explode and were recovered intact. Most of the other crashes occurred during takeoffs from Air Force bases. This past spring an electrical fire destroyed a Bomarc anti-aircraft missile in New Jersey. Its nuclear warhead was partly consumed by the fire and again there was no nuclear explosion.

In any accident involving a nuclear weapon the fissionable material is apt to be scattered around the area or even carried up into the air. Some but not all weapons are loaded with plutonium metal that breaks up into tiny alpha-emitting particles in a fire or explosion. The alpha particles cannot penetrate the skin but they are a real health hazard if breathed or ingested. They can have long-range effects similar to strontium 90. U-235, the fissionable material in other weapons, is not considered hazardous to health.

Probably the biggest hazard when plutonium is involved is that it may burn and be carried up in the smoke. A person inhaling the smoke could absorb serious amounts of the radioactive material.

Fire and police departments in all parts of the country have been told to keep spectators at least 1500 feet away from any accident in which a nuclear weapon might

(Continued to page 276)

WAR SURPLUS AND OTHER **BAIGAINS** **SAVE UP TO 90%**

DC JET GENERATOR ARC WELDING KIT Complete with GE Type CM-77 Generator (30 volts D.C., 400 Amp., 3000 RPM up; ampere rating is for continuous duty, intermittent amperage is 500 to 600 amps.), also 2 rheostats, 1 voltage regulator, 1 voltmeter, 1 electrode holder, 2 ea. 25 ft. lengths No. 0 welding cable, 1 welder's mask, 1 toggle switch, 10 lb. vacuum packed 1/8 in. welding rods, pair welder's gloves & spline coupling. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOVT. COST \$700. All items, now only **\$64.50**.

*G.E. Generator noted above can be purchased separately. Makes deluxe heavy-duty welder comparable to the finest commercial welders available. Wt. 90 lbs. Approximate GOVT. COST \$400. Gen. alone—**\$49.50**.



COMPLETE 2-WAY TELEPHONE SYSTEM For that extra phone in the home, shop, farm, school, etc. Excellent intercom with 2-way buzzer system. Mfd. by Western Electric. Can carry clear conversation for miles. Net a toy. Wt. 11 lbs. Complete with battery & 50' weather-proof wire—ready for use. All this for only **\$13.95**.

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ELECTRIC STORAGE BATTERY WINCH—Powerful reduction gear, fully reversible, ball bearing, safety locking device. Handles from a 1000 to more than 2000 lbs. pull. Use on 6, 8, 12, 24, 32 V. battery. Holds 50' of 1/4" cable. For tractors, boats, tow trucks, etc. Complete with bracket for mounting in any position. Heavy-duty equipment. Approximate GOVERNMENT COST \$400. NEW with improved reversing switch, **\$49.50**.

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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**.

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HEAVY-DUTY CABLE—Size No. 0. Four layers insulation. Fiberglass jacket. Use as positive and negative electrode cables for arc welder. High amperage. Late government spec. Approximate GOVERNMENT COST \$40. 50' lengths—**\$14.50**.

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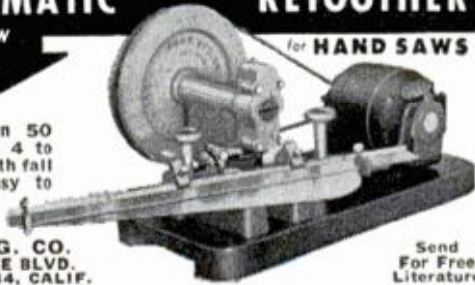
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possibly be involved. The big reason is that the TNT charges might explode. And, for their own safety, firefighters and rescue squads are advised to stay out of any smoke cloud and to fight the fire from upwind. Doors and windows of any buildings downwind should be closed and any air-conditioning apparatus should be turned off.

Within an hour or so, sometimes within minutes, an emergency decontamination team will reach the scene. More than 400 of the teams are on call. They are distributed over all parts of the United States. They use the fastest transportation available. They wear special protective clothing, use breathing apparatus and carry sensitive alpha-particle meters. If fissionable material has been scattered by the accident they comb the area inch by inch and gather up every bit of material they can find. Decontamination may take days or even more than a week if some of the material has scattered downwind.

The same Ohio State report that foresees the possibility of an accidental nuclear explosion says there is a significant chance of an "accidental" nuclear war in the 1960s. A misunderstood message or a spurious radar signal might be the cause.

Here again, as far as the United States is concerned, the chance of starting a war by accident is extremely remote. The military services are operating under "positive control" rules that are designed to prevent premature action.

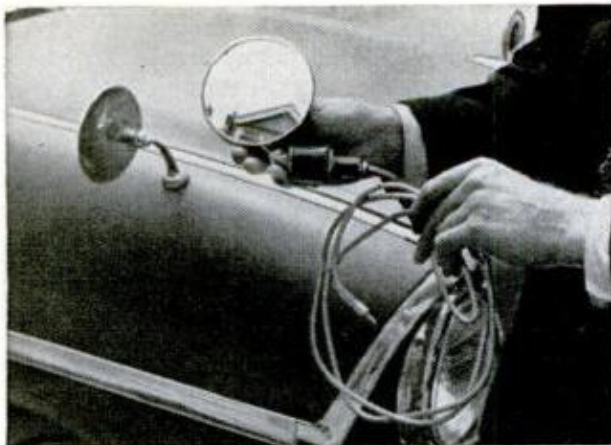
Most publicized are the methods devised by the Air Force's Strategic Air Command. This aerospace force literally has a ring of bases all around the northern hemisphere in addition to its domestic installations.

Armed bombardment aircraft and ballistic missiles, with their crews, are on "ground alert" status. Targets have already been assigned. Flight crews know their targets intimately. Members of the crews have spent hours in studying the targets, working with aerial maps and other information. They know the distance and bearing of their assigned targets from such geographical reference points as lakes and mountain peaks. They know where to refuel enroute, they know the secret "go code" that would come to them by radio after they are airborne.

Each of SAC's bases around the world can be reached by a worldwide single side-band radio network direct from SAC's "hardened" headquarters at Offutt Air Force base near Omaha, Neb.

This underground headquarters has its own power plant and water supply. It can be sealed off against blast and radiation

(Continued to page 278)



Engine Imports Inc., 1140 North Harbor Drive, San Diego 1, Calif.

Mirror Is Radio Antenna

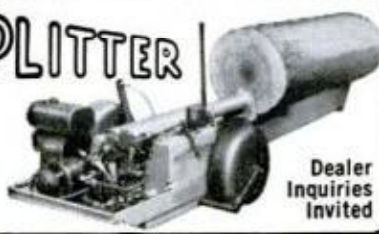
Determined to reduce clutter on automobiles, an English manufacturer has marketed a radio antenna and outside mirror that are combined in one unit. The mirror is mounted on an insulating base; a coaxial cable under the fender connects to the car radio.

Scientists on the Brink of Hell

A special feature
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closeup of volcanoes in
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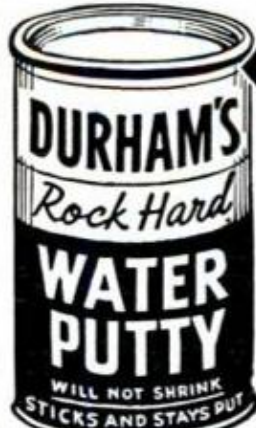
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and is stocked with enough food for a month. It is manned every hour of the year. In it are located a radio headquarters, teletype central, worldwide weather station, computer room, central intelligence and the war rooms in which missions are planned.

One enormous room, 140 feet long, has one wall covered with panels that contain all the information needed for conducting a nuclear air war. One panel shows the location of all SAC aircraft and whether or not they are on ground alert. Another shows the status of forward bases, some of which would be used for reflex strikes, some for recovery of aircraft and repair of damages, some for post-strike operations. Other panels show the current weather over the whole northern hemisphere, the locations and status of refueling tankers and the latest information on defenses in the target areas.

On a balcony overlooking this operations control room are desks for General Thomas S. Power, SAC commander, and his staff. At hand is the "gold phone" that connects General Power direct with Washington, nearby is the "red phone" over which launch orders can be sent all around the world.

Normally the command staff occupies other offices at Offutt and uses closed-circuit color television to keep in touch with the information on the control room panels. Only in case of a real alert would the staff take its place in the balcony.

One way that an alert might come is via a television receiver in the control room that is hooked to the Colorado Springs headquarters of the North American Air Defense Command. On this TV screen appears a picture of NORAD's combat plotting board that shows minute by minute the locations of any objects of interest. These objects might be "Siberian tracks" that represent training flights over Siberia by Russian aircraft or, after new long-range radar facilities go into operation, the objects might represent the tracks of missiles fired from locations deep inside Russia.

If something appears on this screen that suggests that a sneak attack has started, such as a number of missiles headed toward North America, General Power is authorized to launch his SAC bombers at once. The bombers will head straight toward their targets and meanwhile General Power would use his gold phone to talk to the White House, advising the President of what he has done and why.

Within minutes additional information will have been received at the White House

that would allow the President to decide whether the alarm is a false one or whether an attack actually has begun.

If the attack is real the President authorizes General Power to flash the "go" message to all SAC bases and on to the aircraft in the air. At once the crews begin the preliminary arming of their weapons. If the alarm is false, no message of any kind is transmitted. Not having received additional instructions within a given time, the aircraft automatically turn around and return to their bases.

This system is called positive control. It gets the aircraft off the ground and well on their way to their targets, yet gives the President extra time for making his decision. No long-range missiles are launched at this time, for a missile can't be recalled once it has left its pad.

SAC has several alternate headquarters aside from the one at Offutt, including an airborne operations center. Any of these can assume control of the whole force if necessary. SAC is dispersing some of its bombers at civilian airports to prevent their destruction in case of sneak attacks aimed at military bases. For the same reason, some of the new Minuteman missiles when operational will operate from railroad rolling stock, changing their locations at frequent intervals.

With its terrible new weapons the United States has taken every precaution imaginable against nuclear accidents and at the same time is prepared to use its weapons instantly if it must. ★ ★ ★

Coming Soon—Colored Highways

It looks as though the days of dull gray and black highways may be fast coming to an end as developments in the field of thermoplastics hold out the prospect of colored roads. Paved in different colors, highways should be easier to follow, turn-offs more easily identified, and highly visible colored curbing should lessen the danger of running off the road. Tests recently conducted indicated that the thermoplastics, which can be produced in any desired color, have only to be mixed with a suitable aggregate and laid down over existing pavement to make the colored surface an integral part of the roadway. In addition to their use on highways, colored thermoplastics hold great promise in aviation to produce color-coded landing strips. Private pilots would also find the colored highways easier to follow when using them as landmarks.



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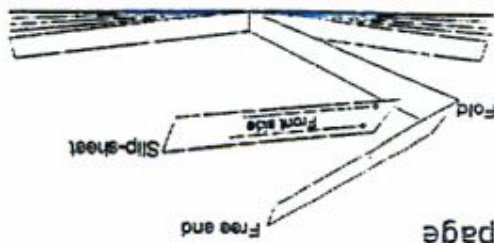
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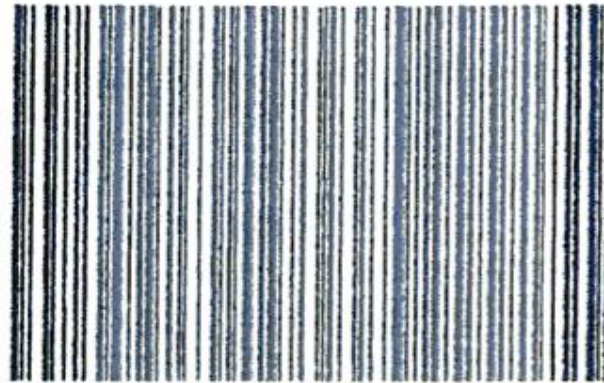
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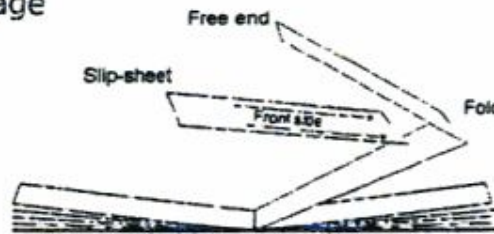
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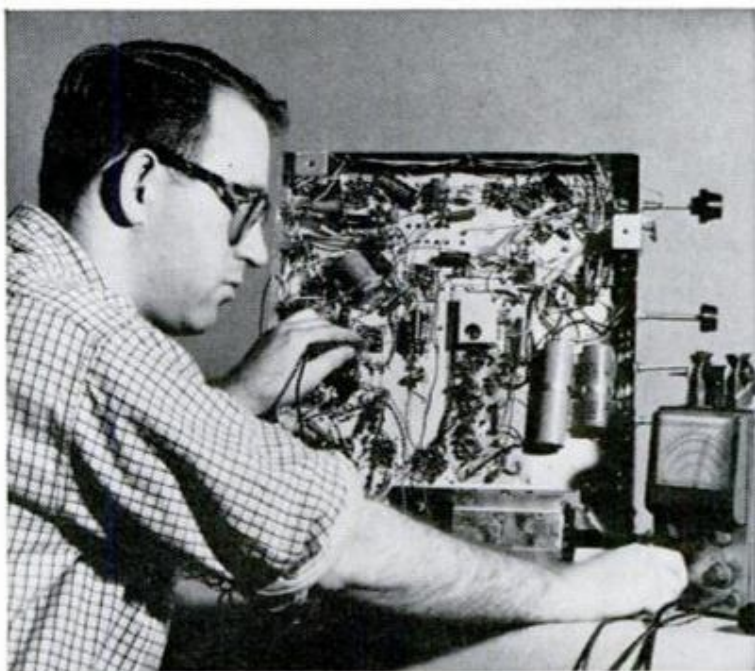
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