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POPULAR MECHANICS

OCT. 1964
35 CENTS

THE '65 CARS

**New Skins, New Bones,
But How Much Better?**

**You'll Soon Tape
TV Pictures
at Home**



Chevy Tries Out Test Blocks



**Ford on
Test Curve**

**I Fly With a
Rocket Belt**

9 reasons why the boot that climbed Annapurna II is the best all-around boot for you

The Oneida! A boot that can take the world's toughest terrain! A light weight boot, yet warm and comfortable in sub-zero cold! This famous boot that climbed the Annapurna II can take anything you'll encounter hunting, fishing or on the job! Here are the reasons:

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2. **Rust-proof eyelets.** Tough non-corrosive aluminum eyelets securely anchored for snug lacing.
3. **Thermo-ply insulation.** Shuts out cold, won't absorb moisture

even if snagged. This famous sealed unicellular insulation wraps entire foot in protective warmth. Lets you hunt the coldest day in comfort.

4. **Heavy net lining.** Top quality net lining wears and wears, never loosens.

5. **Cushion insole.** Full-length cushion insole absorbs shock, gives all-day walking comfort.

6. **Rigid steel plate.** Gives extra support, protection at arch for all-day walking comfort.

7. **Cleated sole and heel.** Husky sharp-edged cleats give better traction, safer footing, longer wear.

8. **Felt mid-sole.** Thick felt mid-sole insulates against frozen ground, provides maximum foot comfort, won't mat.

9. **Durable rubber compounds.** Scientifically adapted to stand up under hard wear.



Sure footing for mountain climbers



All day walking comfort for farmers



Better traction for line-men



Extra support for construction workers

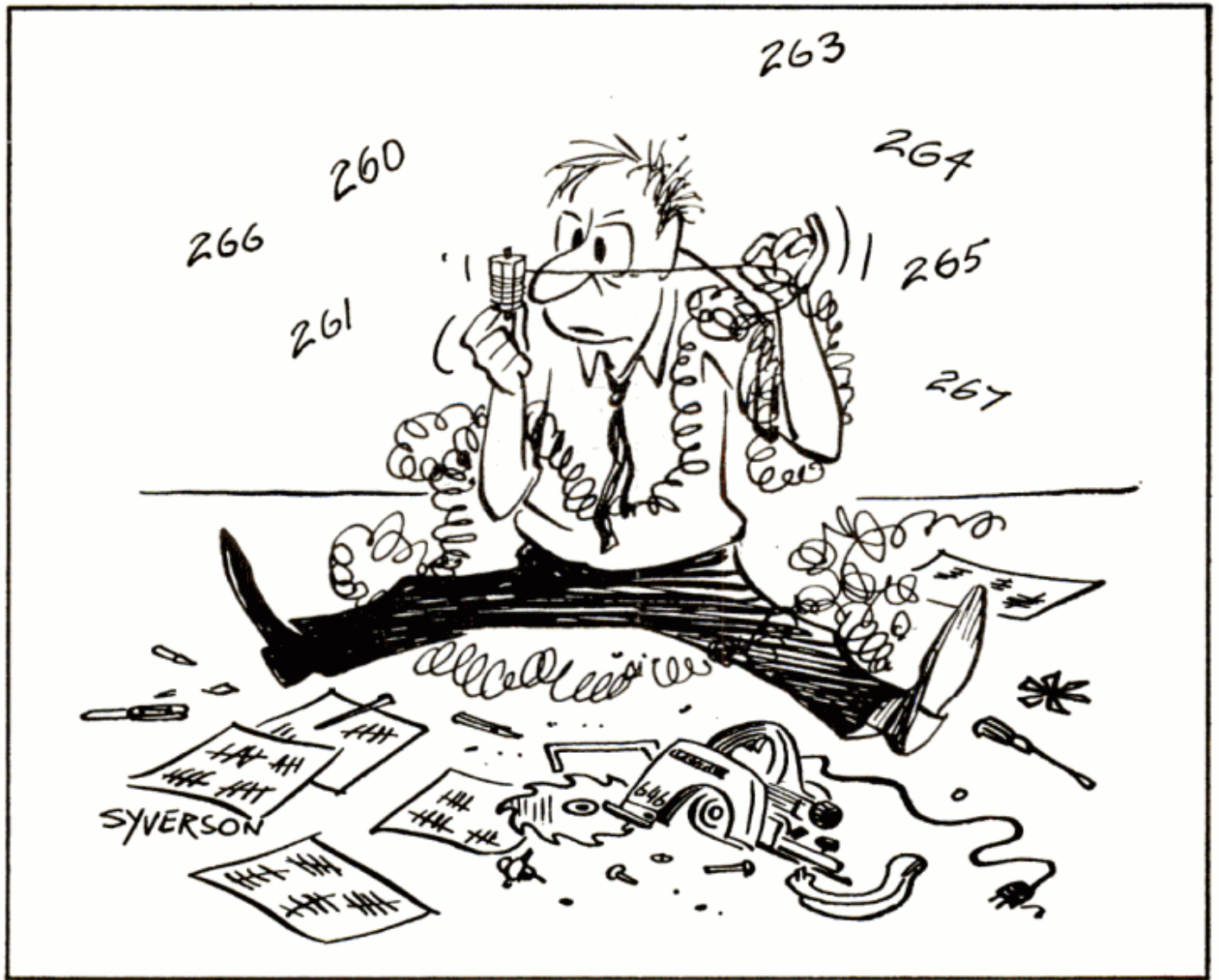


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by Ball-Band, Mishawaka, Indiana



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Millers Falls Company, Dept. PM-38, Greenfield, Mass.



Power-heavy and pound-light, No. 646 Heavy Duty, Ball-Bearing Saw is one of 2000 Millers Falls Hand and Power Tools for home and industry.



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slick, snow, breeze and bumps. Most reassuring, whether you drive for the sport or for the family (of five). Incidentally, the modest price includes all five wheels.



FOR OVERSEAS DELIVERY AND OTHER INFORMATION, WRITE: THE BRITISH MOTOR CORP./HAMBRO, INC., DEPT. J-5, 734 GRAND AVENUE, RIDGEFIELD, NEW JERSEY.

POPULAR MECHANICS®

OCTOBER 1964

VOL. 122

NO. 4

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NEW YORK, N.Y. 10022

INTERNATIONAL EDITIONS • AUSTRALIAN • SPANISH • CARIBBEAN • FRENCH • DUTCH

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Flying
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NEXT MONTH: Crazy-Looking aircraft that flew (but never got off the ground), fly again through a fascinating spread in November PM. You'll read about moon mysteries Ranger didn't solve; an electronic bed with a built-in TV, radio, maid service; some tips on spotting fake antique guns; plus a host of new craft projects

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OCTOBER 1964



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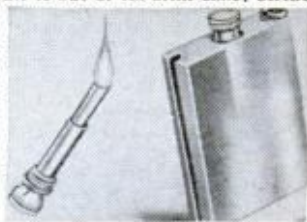


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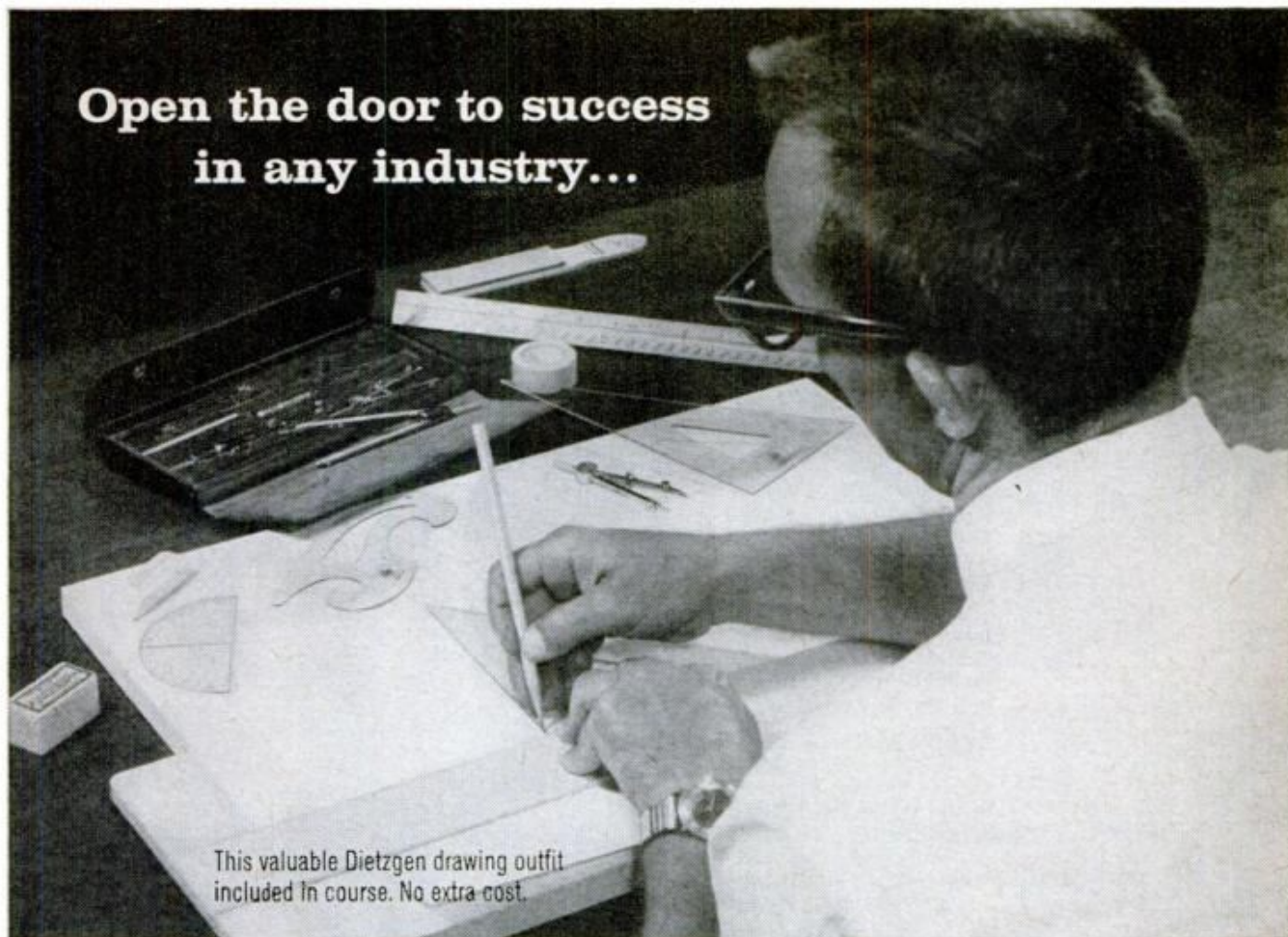
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New silicone rubber sealants stop the leaks and fix the things you couldn't fix before

because these General Electric adhesive/sealants won't crack, shrink, harden or leak



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Bathtub Seal stretches when tub settles. Pure white Bathtub Seal cannot shrink, dry out or wash away. With one application you will solve the constant problem of bathtub, sink and shower leaks. Reset loose tile, glue on towel racks and fixtures.

Clear Seal makes invisible repairs. Use transparent Clear Seal to mend tents, raincoats, leather goods, rubber boots, clothing. Seal basement cracks and aquariums. Mend plastic windows on convertibles.

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GENERAL  ELECTRIC

Over the Editor's Desk

Yard-Bird

Using your Project-a-Plan idea, my husband was able to make the *Thanksgiving Cutouts* (page 152, Nov. *PM*) life size for the yard. He also made the Santa Claus



and reindeer that appeared on the cover of your December 1962 issue.

My husband really enjoys your magazine and the wonderful ideas. There are also some very good ideas for the ladies in *PM*, too.

Penn Yan, N.Y. MRS. DONALD PADDOCK

It's No Gasser

I was about to build the *Scuba Sea-Tow* (page 141, July *PM*), but I became curious about one thing. Won't hydrogen gas generated by the battery during discharge build up inside the tank and be detonated by any short in the wiring or even in the motor itself?

Toledo, Ohio JACK PENDELTON

We had checked out that possibility with a couple of battery manufacturers. According to the Delco-Remy Division of General Motors:

"Batteries do give off a small amount of gas during discharge, but the quantity is so small that, in our opinion, there is no danger of an explosion. We do not believe that there is any hazard in using a battery in this manner."

The B. F. Goodrich Co. had this to say: "The danger of hydrogen gas from a lead-

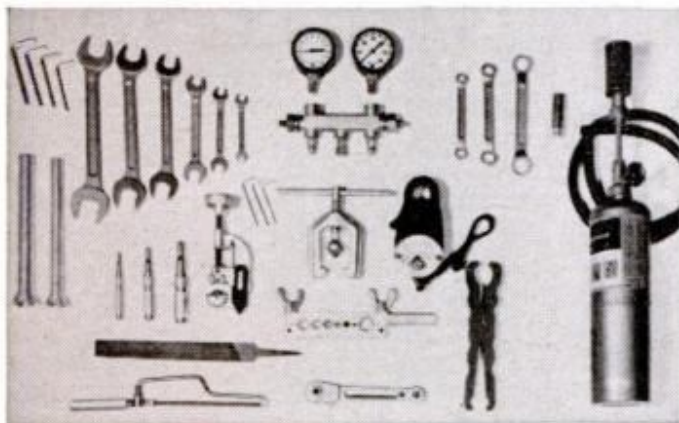
(Please turn to page 10)

POPULAR MECHANICS

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join the thousands of men who are already forging ahead in this rewarding field—and earn big money even while you learn

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"My wages have tripled since I entered this field."—James Wiest, Minn. "During the past 5½ months, I increased my income by \$1150."—George Gulvas, Pa. "On a part-time basis, I am grossing \$440 to \$600 per month."—H. K. Wolf, Wis. "Earnings have more than doubled."—Aaron York, Ind.

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DAY AS LANDSCAPE
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LARNED STATE HOSPITAL**

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No paycheck ever paid off like extra cash money and no job compares with being your own boss. And now, in a few spare hours, you can become a skilled locksmith and get in on the cash business opportunities in a field where the potential grows bigger every day. **You Start Fast ... Earn Profits From The Start!** Age, schooling or health no problem. No layoffs. Easy to make \$1500-\$2500 part time ... thousands more full time ... and without leaving home! Easy illustrated lessons complete with all tools and supplies. You actually train on real locks under expert guidance ... most complete method ever mailed. **FREE KEY MACHINE** can pay your way! Valued at \$125 but it is free from Belsaw Institute to help you make extra cash long before you complete course. No extras to buy, everything included, as a graduate you even keep valuable materials supplied for lessons.

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Over the Editor's Desk

(Continued from page 8)

acid battery is practically nil during discharge of the battery. Small quantities may be emitted from negative plates even when the cells are standing idle, but there is little or no danger from these small quantities."

One added bit of assurance: the 1/6th-horsepower motor supplied by Airborne Sales Co. (the source given in our Where-to-Find-It List) is spark-proof.

Clinic Kudos

Several months ago I wrote your *Auto Clinic* about the problem of "surging" in my 1964 Dodge Dart and was very gratified to get your reply concerning a Dodge service bulletin dealing with this situation.

As you suggested, I mentioned this to the dealer, and he was very surprised to learn that he had such a bulletin in his files. The carburetor and spark were subsequently corrected.

While the surging is not entirely gone, it is much, much better.

I have told many of my friends about the good advice and knowledge indicated by your help.

Grand Ledge, Mich.

ELMER R. WHITE

The Chevrolet service department tried the three simple methods you suggested to correct my transmission trouble. In the end, however, I had to have a complete overhaul (and you had indicated that it "might very well be in order"). One of the seals had crystallized, and that was the trouble. The car runs perfectly now.

Mundelein, Ill.

R. M. FYFE

Received a letter from you upon asking what to do about my Corvair. I took your suggestion and it proved out. I want to thank you very much.

Harmond, Ind.

HENRY J. LONGAWA

Thanks for your letter advising me that the answer to my hard starting problem in my 1960 Thunderbird might be a defective power valve in the carburetor.

Several weeks ago I replaced the carburetor with a rebuilt unit, and the starting problem was cleared up—so evidently your diagnosis was correct.

Mineola, N.Y.

RONALD CHUBER

We continue to be proud of (and amazed by) the long-distance diagnosing done by Mort Schultz, author of the *Auto Clinic*. If you're having car troubles, drop him a line. Turn to page 184 of this issue for instructions.

The Editors

POPULAR MECHANICS

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One of life's small pleasures—finding a parking space with paid-for time left on the meter—may be on the way out. A British company has developed a coin machine that issues a timed and dated ticket for the motorist to place inside his windshield, where the bobby on the beat can easily see it. No ticket, no parking.

Solid-propellant rocket engines may help prevent another tragedy like that of the *Thresher*, which sank off New England last year. That's the thinking behind the Navy's plan to equip a submarine of the same class with rocket engines to expel ballast in an emergency. Though what happened aboard the *Thresher* still isn't known, experts believe the sub's compressed air system couldn't exhaust water ballast fast enough to stop a deep dive.

A photographic film that can be developed in boiling water was recently announced in a Russian technical journal. The report described the film as having a polyvinyl backing for the photo-sensitive layer instead of the usual gelatin, and said development time was about a minute.

The item made us wonder if a similar American product might not be available. Inquiries finally led to the Kalvar Corporation, a New Orleans firm that's been making just such a thermoplastic film since the mid-1950s.

The image on the Kalvar film is formed by microscopic bubbles or vesicles instead of by silver particles. Exposure is by ultraviolet light and development is by heat alone, a process that takes seconds.

Because of its high resolution and stability, the film is widely used for micro-filming records and other copying work. It can not be used in cameras.

Heart attacks appear to be unknown among the Apache Indians. At least doctors on the Fort Apache Reservation in Arizona say that in eight years they haven't seen a single case. They can't explain why this should be so. Though the Indians generally have a low cholesterol

level, they also exhibit a marked tendency toward high blood pressure.

Eighteen lakes in southern Alaska will be used as "level bubbles" to determine the amount of tilt that occurs in the land, according to the Department of Interior's Geological Survey. Changes in distance between special markers and a lake's surface will tell geologists if structural changes, including those related to volcanic activity and earthquakes, are taking place.

Inside information on big sea creatures may become more plentiful thanks to a dolphin named Doris who lives in a tank at Berkeley, Calif. Recently, she swallowed a three-inch radio transmitter planted in a dead fish and for the next 17 hours broadcast the temperature of her alimentary canal.

Now University of California scientists plan a more elaborate capsule. It will record, not transmit, and will be buoyant. The plan is to feed it to big fish in their native seas and recover it with its record of temperatures and rate of heart beats.

Not perfume but warmth is the lure of the lady moth. The Georgia scientist who holds this theory says the female night-flying moth sends out infrared waves that a prospective boy friend a mile or two away can pick up and follow.

The flying of an atomic clock from the Naval Observatory in Washington, D.C., to an observatory in Neuchatel, Switzerland, has reduced the error in time agreement between the U.S. and Europe to less than one-millionth of a second, according to the California company that made the clock. The device is said to provide 50 times more accuracy than radio transmission, a standard method of time correlation.

One of the country's most unusual radio stations recently conducted a poll to find out who its listeners are. The station, WWV, is operated by the National Bureau of Standards and broadcasts time signals, standard radio frequencies, standard musical pitch and forecasts of radio broadcasting conditions. Though it's known that many industrial and scientific organizations tune in, the poll was made to find out exactly who listens and why.

Ever sneeze when you're suddenly exposed to strong sunlight or a bright light? If so, you're in good company. Researchers at Johns Hopkins determined that 20 percent of men and 15 percent of women exhibit the "photic sneeze reflex."

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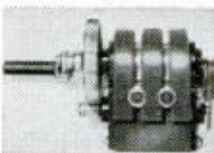
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Boat Plans

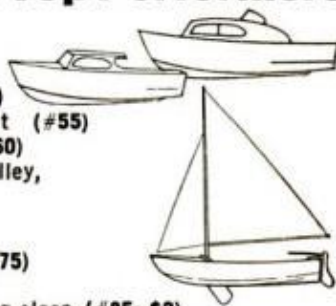
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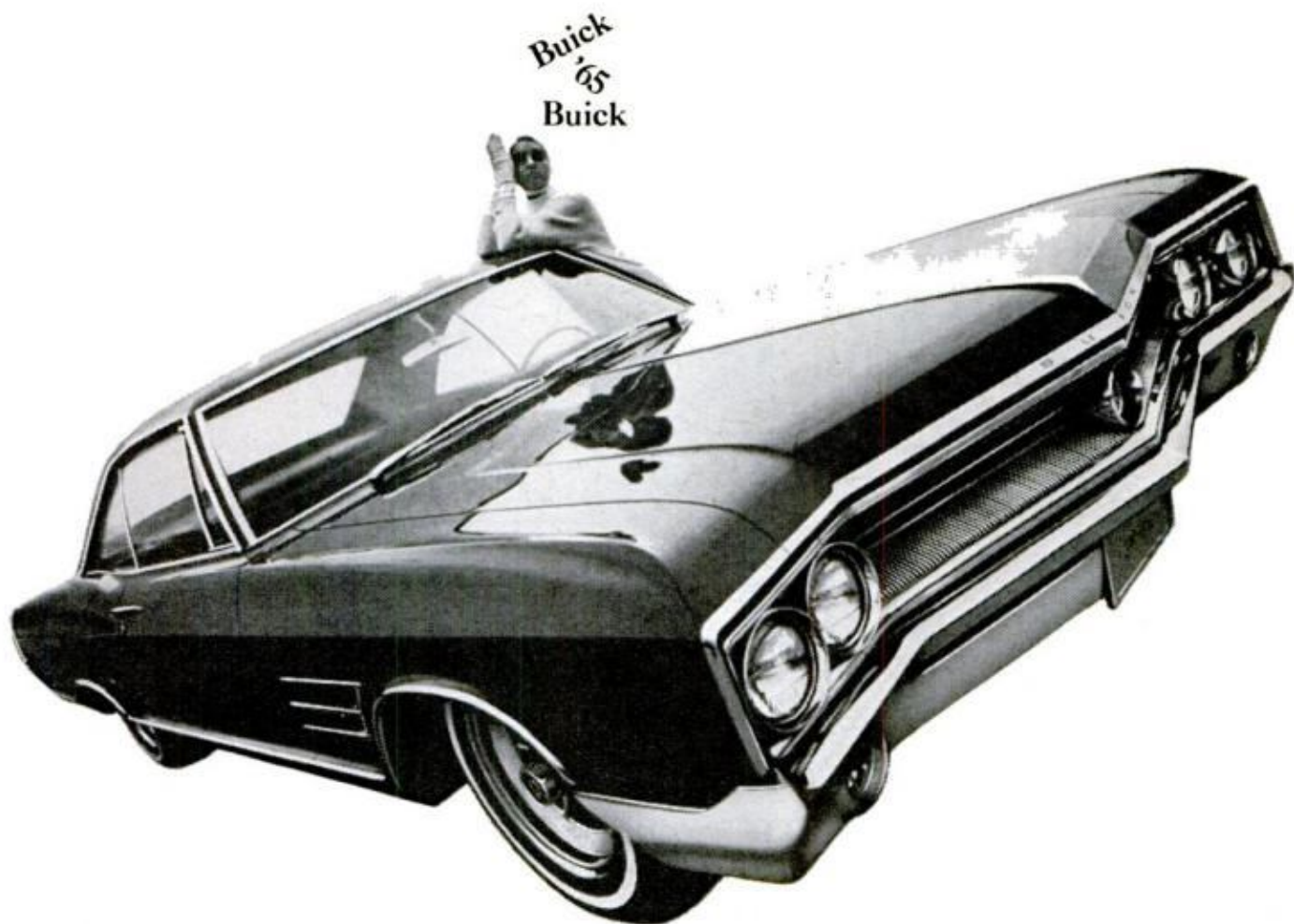
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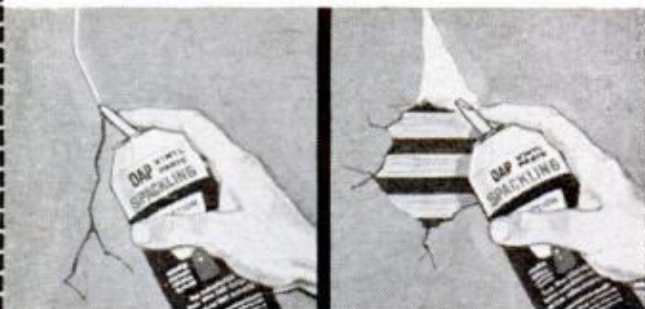
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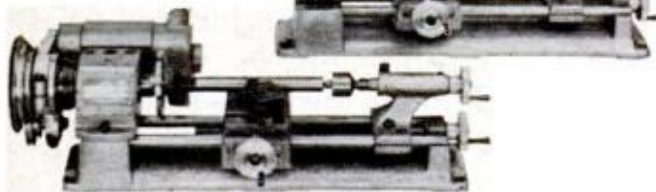
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Sidelights on

AVIATION

Experimental aircraft may have started with the Wright brothers—or even Leonardo da Vinci—but it's only in the last 10 years that they've really gotten off the ground and into the air.

Men who build their own planes in the garage or the basement or, perhaps, the living room—and send their wives to the movies, or the nut house—have always been with us. But it has only been in the last decade that any discernible organization to their madness has emerged. And it has been a perceptive madness, at that.

It's one thing to build a gimcrack in your workshop and set it on the shelf, or even a motorboat and set it afloat on the water. But there aren't too many men who have the fortitude to build an airplane (sometimes of their own unproven design) climb into it and take off into the wild blue yonder.

The occasion for all these not-too-sage observations was a recent visit to the annual "fly in" of the Experimental Aircraft Association. Several hundred homebuilts and a few score preserved vintage planes were there—flown in, in most cases, by the men who built or preserved them.

The EAA started in 1953 with just a handful of homebuilders, and it now numbers close to 22,000 members in 47 countries. That's a lot of experimenting.

But not all of it. There is also a lot of duplication—such as on Steve Wittman's *Tailwind*, the Stits *Playboy*, the Smith *Miniplane*, the Pitts *Special*, the *Baby Ace* and others. But there were a lot of originals, too, at the fly-in.

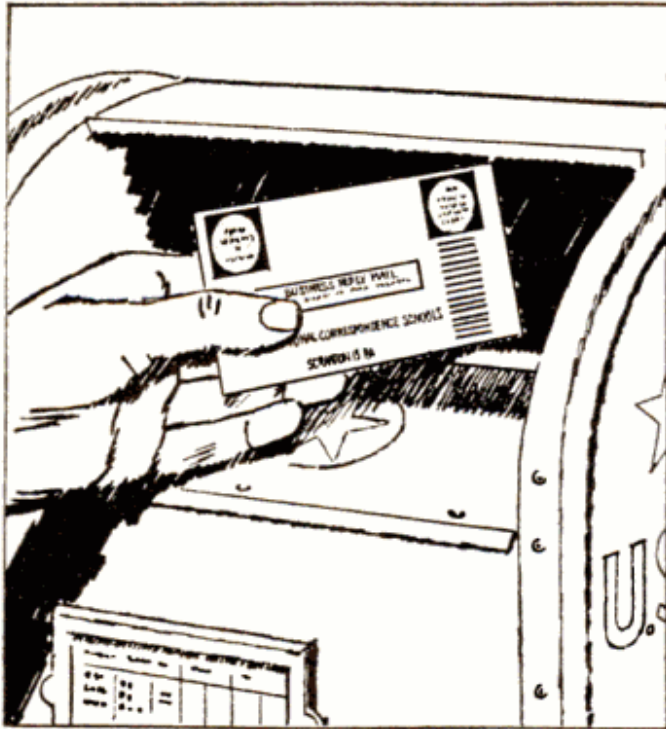
Delta wings, soaring planes with engines that could take off under their own power and glide down interminably without power, pusher props, biplanes with struts, spars and guy wires criss-crossing all over the place, wood and fabric planes, metal planes, and some with glass-fiber. The list goes on and on.

The EAA has grown so big, in fact, that it has moved out of the living room of its president, Paul Poberezny, and into a new headquarters and museum building at Hales Corners, Wis., where new members are signing up every day.

Orville and Wilbur, see what you started!

Kevin V. Brown
Aviation Editor

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New silence from SOUND engineering

Mercury engineering has developed a new silencing system that makes the new Mercs sound like they're far away. The new four- and six-cylinder Mercs are actually 50% quieter.

Anyone can silence a motor by wrapping enough fat padding around it but we didn't want to sacrifice Merc's slim, trim lines . . . or performance. Merc's silencing system required redesigning, new engineering . . . from top to bottom. Here's how we did it:



- New Mercs have a sound capsule cowling (metal, not plastic) that is elastically isolated from both the powerhead and the drive shaft housing. This fireproof cowling does not "broadcast" the sound from the engine.

- All connections for control cables and fuel hoses are *inside* the capsule and the openings are sealed with neoprene closures. The sound from the powerhead is effectively *trapped* inside the cowling.

- Mercury used a completely new principle . . . a wall of water . . . to silence the exhaust. The engine's discharged cooling water is used to surround Merc's new internal exhaust pipe and prevent exhaust noise from escaping through the drive shaft housing.

- This same wall of water, pressing against the sides of the drive shaft housing, damps out the sound resulting from mechanical vibration.

- Mercury's exclusive Jet-Prop was all-important to this new silencing system. Exhaust gases and sound are now carried directly from the powerhead, down the internal exhaust pipe and out through the Jet-Prop . . . where they are unceremoniously buried deep underwater.

- Merc's Dyna-Float, aircraft-type suspension system keeps vibration from passing through the clamp brackets to the boat.



ARE 50% QUIETER

they're far behind your boat

■ And to top it off, the new Mercs have an elastically isolated steering arm to prevent sound from traveling out through the steering mechanism to the boat.

Yes, the new Mercs are 50% quieter but it couldn't have been done with an ordinary outboard. It had to start with the engine:

- In-line 4- and 6-cylinder design with inherent smooth balance.
- Small bore and short stroke with smaller and lighter pistons, connecting rods and wrist pins for lower disturbing forces.
- *Offset* wrist pins that eliminate piston slap.
- Smaller parts with tighter fits throughout the engine.
- Power-Dome combustion chambers that "squish" the fuel-air mixture and smooth out combustion roughness.
- Flex-plate flywheels that reduce the normal working noises of the crankshaft.
- Internal reed valves . . . sealed inside the crankcase to make them quiet.
- Full-Jeweled construction throughout the engine.

More power from SOUND engineering
The silencing of the Merc is just part of the news for 1965. Mercury has a brand new 90 hp out-

board . . . the Merc 900. The fuel economy of this powerful new Merc surpasses competitors' 90's and even competitors' 75 hp outboards. In power at the prop, it is second only to the 100 hp Merc 1000. And, of course, it has Merc's new silencing system.

All of the 1965 Mercs have been restyled and the higher horsepower models have a lower profile. New engineering, such as smoother-action gearshifts, water pumps with tremendous saltwater resistance, new reed valves, and redesigned cowls, drive shaft housings and exhaust systems make the 1965 Mercs the newest in outboarding.

Sound engineering at Mercury again brings you the *highest* horsepower, the *widest selection* of power and the *greatest* fuel economy . . . in outboards that are 50% quieter. You'll get more boating fun and even more RUN for your money with the 1965 Mercs . . . 100, 90, 65, 50, 35, 20, 9.8, 6 and 3.9 horsepower.



MERCURY

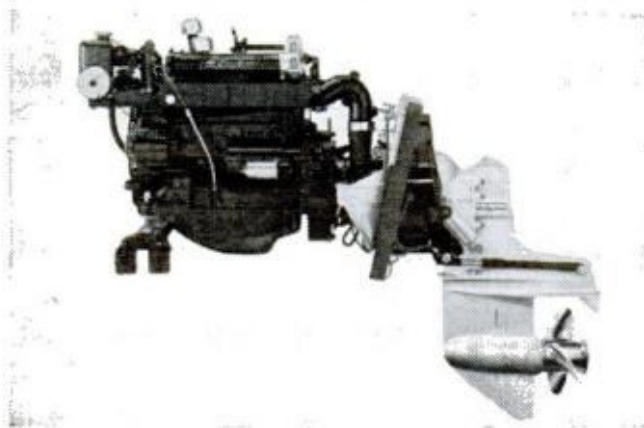
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Whoever heard of skiing all

That's about what the fuel costs will run for an average day's skiing when you have a MerCruiser I stern drive powered by a 60 hp Rover diesel. The MerCruiseRover is the first low priced diesel stern drive available for pleasure boats. The engine made its reputation in the Land Rover... now it has gone to sea.

Round-the-clock running at Lake X gave a fuel consumption figure of only 2.1 gallons per hour. A careful 70-hour fuel log on our demonstration boat, simulating ski conditions (full



MerCruiseRover: MerCruiser I with 60 hp Rover diesel.

throttle, cruising, idling) showed a fuel consumption figure of only *one* gallon per hour... about 16 cents worth.

There are two reasons for this fuel bargain... one you can see in the photo, one you can't. The first is: nothing surpasses a diesel for fuel economy... diesels are about 50% more thermally efficient than gasoline engines... and dockside, diesel fuel is only about 15-17 cents per gallon. The MerCruiseRover diesel gives you other advantages too... no carburetor to adjust... no spark plugs or points to replace (and no radio interference)... no explosion hazard... lower insurance rates... high thrust at low speeds... and there's hardly anything *more dependable* than Land Rover power. But let's not forget the second reason for that \$1.23-a-day figure... MerCruiser stern drive.

MerCruiser stern drives have no fixed shaft, strut, rudder, and skeg to damage or cause drag. The MerCruiser's drive unit is built like an outboard... with the same impact protection and propulsion efficiency. Propeller thrust is parallel to the plane of motion instead of angled downward as with conventional inboards... on the same boat, with the same hp, MerCruisers are considerably faster.



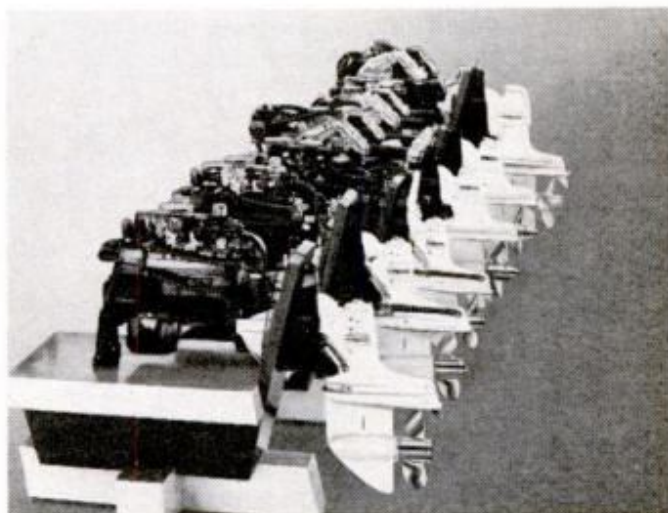
day on \$1.23 worth of fuel?

Exhaust gases are fired through the hub of MerCruiser's exclusive Jet Prop into the vacuum pocket in the center of the propeller slip-stream. Engine breathing is improved, underwater drag reduced, and noise and fumes buried far aft of the boat... (a good place for diesel fumes).

MerCruiser stern drives have a smooth, one-piece lower unit housing to assure a solid streamlined flow of water to the propeller at all speeds. A four-position tilt adjustment allows the angle of propeller thrust to be varied to achieve the best planing angle for maximum speed and riding comfort.

MerCruisers give you dual shock absorbers to absorb the kick-up energy from impact with submerged objects... a safety tilt switch to prevent engine over-revving during kick up... and, no shear pins to fail. Single-hole installation, with all controls inside the boat, is neater, stronger, and leakproof.

See one of the more than 3000 dealers selling MerCruiser. Let him show you MerCruiser power packages with either diesel or gasoline engines. And remember, whichever one you choose, your boat will get a real "kick-in-the-stern."



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than all other stern drives combined.*

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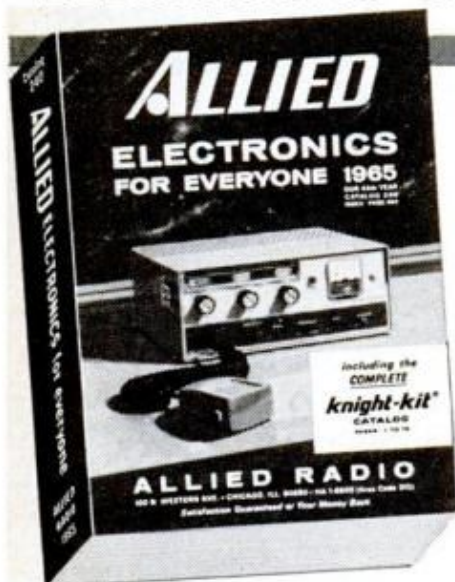
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By Ed Nelson



The Score in '64: How Did Your Favorite Car Do? Have You Hailed a Model J Yellow Cab Lately?

No matter how the hoopla has it, you and I—the car buyers and drivers—decide which cars succeed and which ones slip, which ones dictate new trends in styling or power, and which ones are limited to a small group of die-hard fans. What did we decide during the model year just ended?

We bought plenty of cars during the year—enough to give Detroit the best year in its history. The assembly lines cranked out almost eight million cars—actually 7,981,607. That was about 7½ percent better than the 1963 model year total.

There are a few thousand '64s around the country awaiting clean-up sales, so final sales figures aren't yet available. But throughout the year, production schedules are constantly revised in response to our purchases. Production, therefore, is a fair measure of a car's success. And here's how we customers altered the '64 picture, based on Ward's Automotive Reports.

We made Pontiac's Tempest the big gainer of the year, buying so many that production moved up from 131,490 in 1963 to 235,126 in this year.

Olds F-85s gained 58,807 to a total of 177,618.

Chevrolet, with 1,574,468 cars, still is on top of the heap but, with most makes gaining significantly, Chevy's total was only 2,738 ahead of 1963's. Perhaps hearty sales of the new Chevelle slowed the big Chevy's pace.

The big Ford is second with 923,232, about 9¼ percent ahead of 1963.

Studebaker's production dropped from over 76,000 to 33,150. Studebakers are coming from Canada and, properly speaking, should be considered imports.

American Motors also concluded '64 on the short end of the stick, slipping to 393,859 from 464,126. Chrysler, however, jumped from 939,526 to 1,130,020 and mammoth General Motors went from 3,-

923,928 to 4,265,734.

Ford Motor Company had a good year, but perhaps not good enough to satisfy some stockholders. While the industry was gaining about 7.5 percent, Ford products picked up 6.8 percent, moving from a total of 1,935,453 to 2,068,843. That includes Ford's "silver lining"—the Mustang introduced in mid-model year. (Technically, all Mustangs are 1965 models.)

For those of you who have the sensation that the streets are crawling with Beetles, here's how sales (not production) of the most popular import—Volkswagen—fit into the domestic U.S. picture. During the period of August, 1963 through July, 1964—roughly corresponding to the production period for domestic cars—280,410 VWs were sold in the States, including bus-type wagons, but not trucks. That's an increase of about 18.7 percent over the previous year.

The rumors that Simca wanted to go racing had a solid foundation—but they died. There was lots of interest within the Simca organization; presumably the campaign was to be based on the Simca Abarth. Even driver's names—including Walt Hansgen's—were being bandied about. But then the heavyweights at Chrysler decided "thumbs down."

Has anyone seen a cab? Specifically, a 1915-16 model J Yellow? The "J" was the first Yellow on Chicago streets and the company is looking for a specimen. The golden anniversary year is coming up and, as part of the observance, the cab company wants to recondition the skin and put modern running gear underneath it, then send a J back into service.

Yellow says that, unlike later models, the J didn't wear a battery box on the running board. They'll be happy, however, to find even a "reasonable facsimile." Let us know if you can help.

Here are the '64 cars with their production totals and the percentage of change from the '63 model run:

| | | |
|---------------------------------|-------------------------------------|----------------------------------|
| 1 Chevrolet—1,574,468 (+0.17%) | 11 Valiant—225,245 (+13.53%) | 22 Chrysler—131,129 (+10.32%) |
| 2 Ford—923,232 (+9.22%) | 12 Rambler Classic—211,551 (-34.1%) | 23 Mercury—110,342 (-8.84%) |
| 3 Pontiac—480,135 (+4.76%) | 13 Dodge—200,409 (+4.61%) | 24 Thunderbird—92,465 (+46.04%) |
| 4 Oldsmobile—368,494 (+2.94%) | 14 Corvair—200,062 (-24.9%) | 25 Buick Riviera—37,748 (+3.32%) |
| 5 Chevelle—338,286 (first year) | 15 Dart—195,263 (+26.85%) | 26 Lincoln—36,297 (+16.21%) |
| 6 Falcon—317,437 (-8.07%) | 16 Chevy II—191,691 (-48.9%) | 27 Studebaker—33,150 (-56.46%) |
| 7 Buick—288,230 (+5.69%) | 17 Comet—189,942 (+41.09%) | 28 Dodge 880—31,760 (+12.36%) |
| 8 Fairlane—277,587 (-19.29%) | 18 Buick Special—185,688 (+24.17%) | 29 Imperial—23,285 (+65.06%) |
| 9 Plymouth—274,689 (+12.39%) | 19 Olds F-85—177,618 (+49.19%) | 30 Corvette—22,229 (+3.33%) |
| 10 Tempest—235,126 (+92.5%) | 20 Cadillac—165,959 (+1.71%) | 31 Ambassador—18,647 (-50.68%) |
| | 21 American—163,661 (+55.4%) | |

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F. W. COX, Hollywood, Calif., averaged \$150 a month spare time while training, now has his own full time TV-Radio service business. ALLAN R. TOWNSEND, Topeka, Kan., is a missile officer at Atlas ICBM site, fixes radios and TV sets spare time. R. L. WOOD, Fargo, N. D., got his FCC license and is Master Control Engineer with KXIB-TV. J. J. JENKINS, San Diego, Calif., says his NRI training is priceless. He is Frequency Coordinator for the 11th Naval District.



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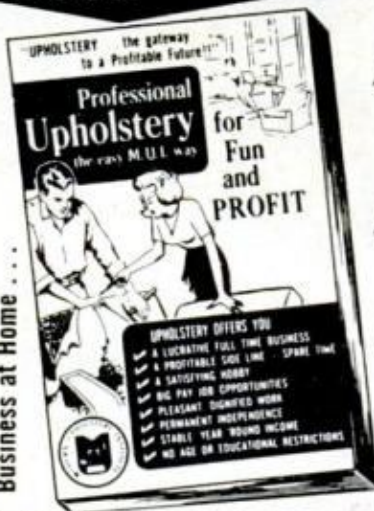
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Items from All Outdoors

Falconry buffs will welcome a new regulation adopted by the U.S. Fish and Wildlife Service of the Dept. of the Interior. It permits the taking of migratory game birds, including ducks, geese and doves, with trained falcons. In order for such hunting to be legal throughout the nation, however, permission must now be authorized by each state.

Heretofore falcon hunting has been limited to mice and other rodents. This new trend may spark new interest in falconry, a sport that was practiced in Europe in 400 B.C. Looking into the falconry gambit, we learned that during the Middle Ages the sport was governed by rules of class. An eagle, for instance, could only be used by an emperor; gyrfalcons were flown only by kings and queens. The peregrin could be flown by an earl, a goshawk was permitted to a yeoman, a priest could fly a sparrow-hawk, and a kestrel could be flown by a sportsman of the servant class.

California fishermen are voicing their indignation over an innovation of the State Dept. of Fish and Game. They now have "scuba wardens," who slip up on the fishermen and look things over from the fish point of view. They're watching for evidences of illegal chumming (dropping bait in water.) A Bakersfield fisherman aired this view: "I'm against illegal fishing, but their methods are downright sneaky!"

Introducing a youngster to fishing has long been an equipment problem. The heavy initial outlay of money for gear is a large waste if the child loses interest. As a result, most kids start with inadequate toy equipment or faulty second-hand gear. The Zebco Tackle Co. of Tulsa, Okla. now claims to have solved this problem. Their genuine close-face spin-casting reel, the 202, came on the market a year or so ago for only \$5.95. We used one last season and it does anything you might expect from the closed-face reel. This year they are introducing an open-face spinning reel for the same price. We did some dry-casting with this 707 Spin Bee, and it is smooth working and gets a lot of distance. Made of reinforced fiberglass, it will sell in a rod and reel package for \$11.90.

STUART JAMES
 Outdoors Editor
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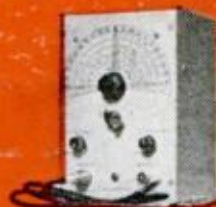
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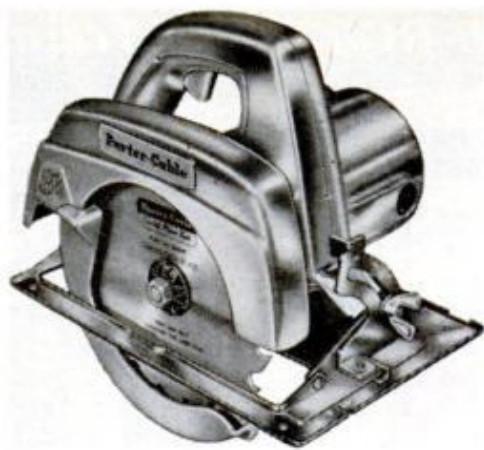
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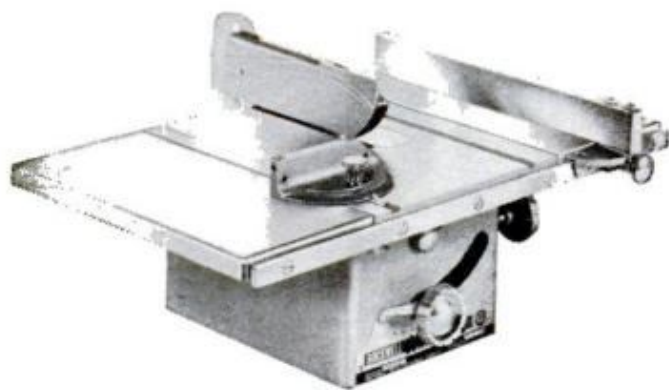


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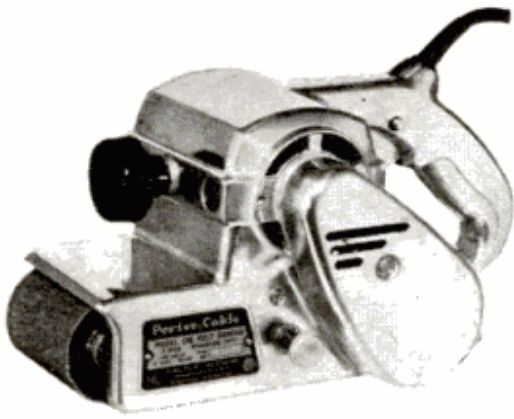
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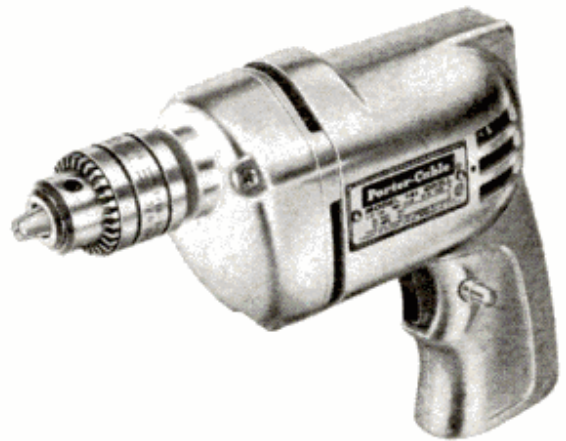
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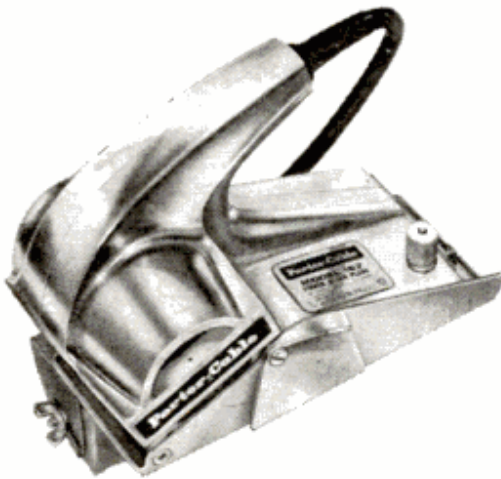
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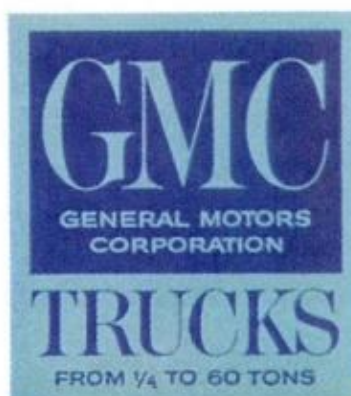
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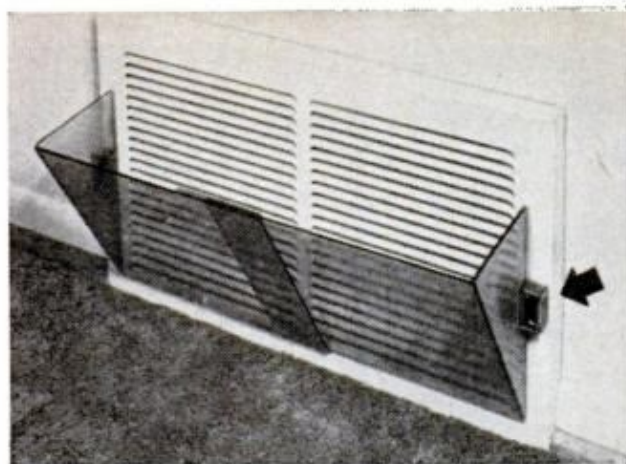
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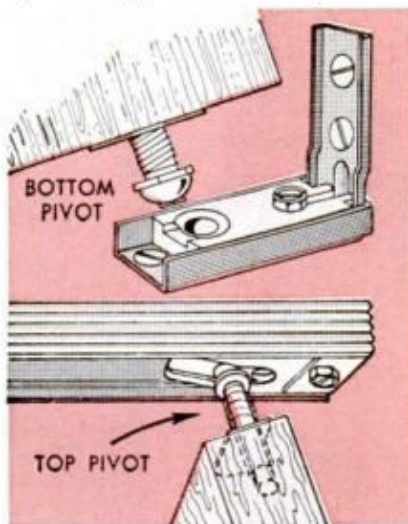
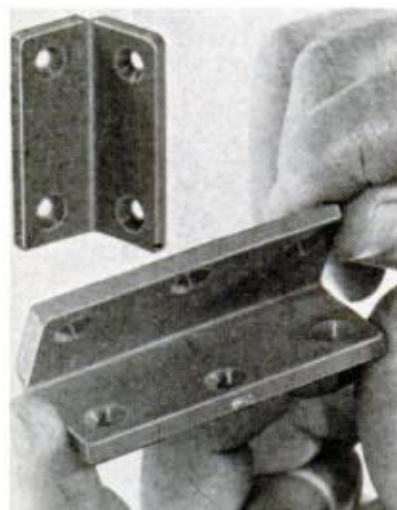
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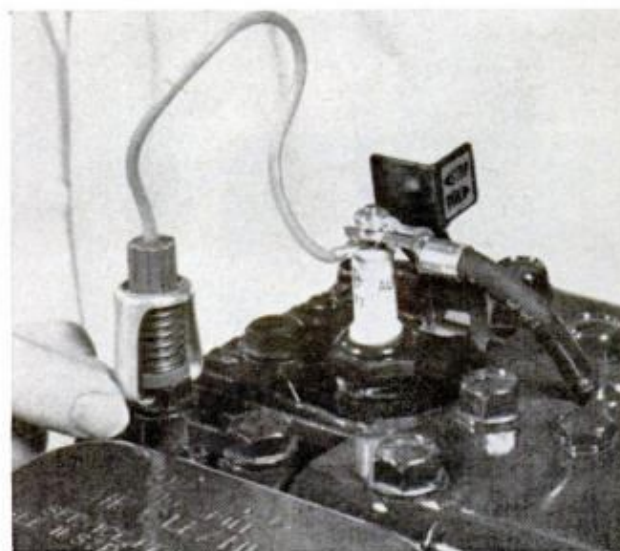
DOORS SNAP IN PLACE with improved bi-fold hardware. You just install tracks and jamb bracket, set door's bottom pivot in bracket and swing door into place. A special nylon ramp guides top pivot home. \$3.82 and up. Stanley, New Britain, Conn.

NO MIXING: Manufacturer of GC-9 polysulphide calking sealant claims it is as effective and durable as other polysulphides, but comes already mixed. Retail for \$4.93 for a 1/10-gal. cartridge, \$44.20 per gal. Pecora, Inc. 300 W. Sedgley Ave., Philadelphia, Pa.

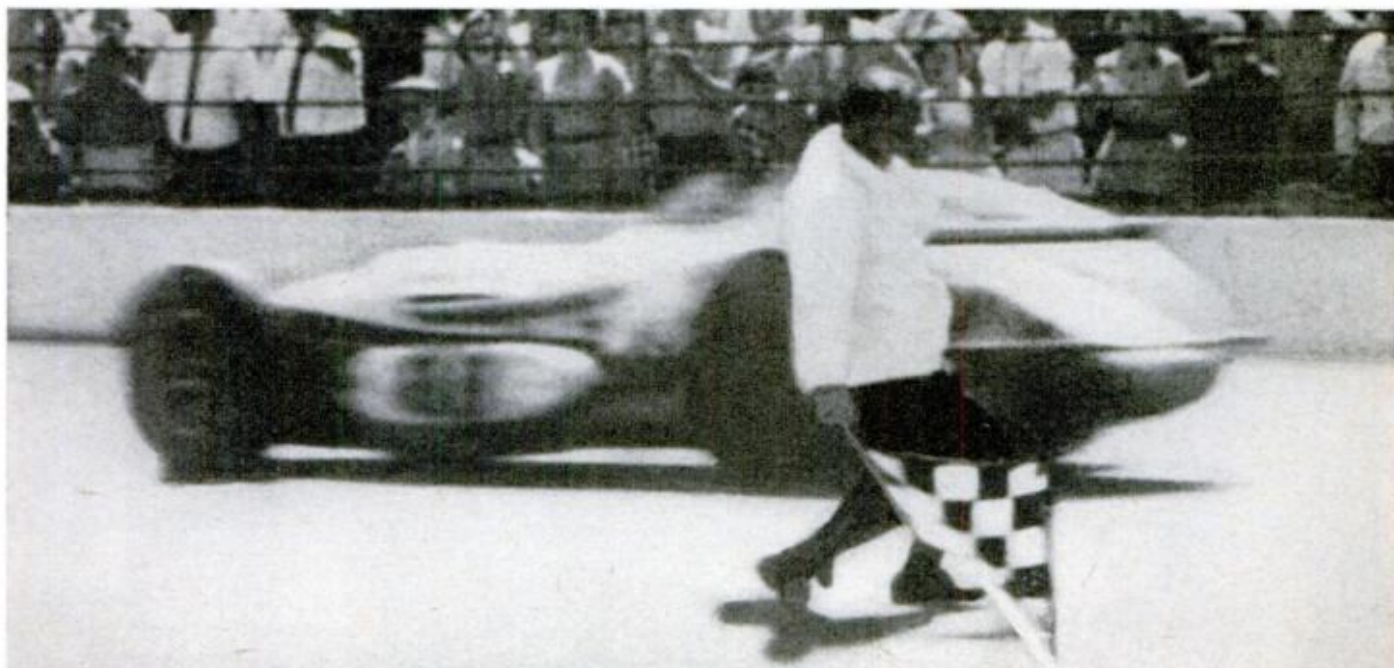


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TO PREVENT OVERHEATING of any engine, slip an Engine Guard over a headbolt, then connect the Guard to a spark plug. The device contains a temperature sensitive fuse that melts if the engine gets too hot, stopping the engine. Costs \$1.95 each. Honeywell, 2727 South 4th Ave., Minneapolis 55408



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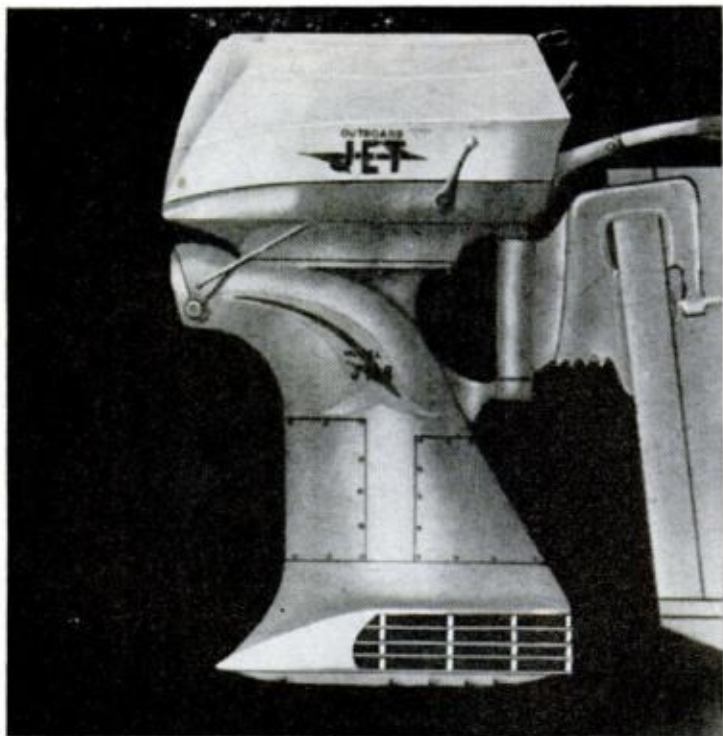
SNAPPY NEW 33 from Johnson replaces last year's 28 as the bottom motor in the big Super Sea-Horse line. Carrying most of the features available in the 40, it's being touted as an all-purpose outboard—powerful enough for fast skiing or twin installation with minimum initial cost and operating expenses. Evinrude, Johnson's twin at OMC, is also replacing its 28 with a 33

'65 Outboards High Style and Variety

Slimmed-down fishing motors, more powerful utility motors, a big new squirtgun—and Merc introduces a radical new sound silencer system

FLYWEIGHT 5 in Johnson's '65 line weighs in at only 43 pounds—14 less than last year's 5½ which it replaces. Aimed straight at the fishing market, it has 360 deg. steering with speed-control lever mounted on side of motor. The 51-pound Sea-Horse 6 is a deluxe high-compression version of 5 with full gear shift and twist-grip throttle





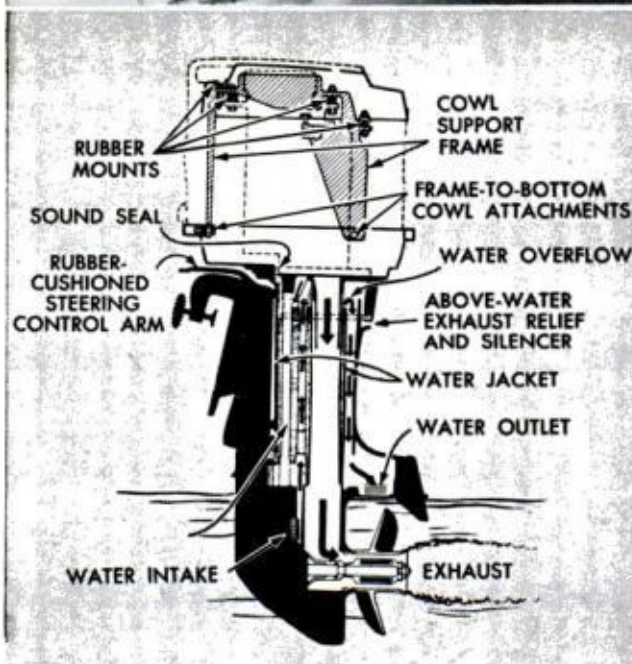
BIG JUMP in outboard jet power is the new 9.5-hp. OJ-200 from Outboard Jet., Inc. Almost twice as powerful as any existing jet outboard, it crams over 200 pounds of thrust into a neat 52-pound package. The retail price is \$369.50, f.o.b. Indianapolis, Ind.

NEW MERC FOR '65 is a 90-cu.-in. 90-hp. six. However Kiekhaefer's big news this year is a radically different silencing system for all models 50 hp. and above. According to the company, a 50-percent reduction in sound was achieved by design changes which included suspending the cowling assembly on an aluminum supporting frame attached to the engine by rubber mounts and isolating the exhaust tube inside a water jacket fed by the cooling system

SLIPPING IN below the 10-hp. restriction found on many lakes, West Bend's new 55-pound 9 is 13 pounds lighter than last year's 10, dropped from the '65 line. McCulloch will offer only nine models this year, cancelling its 3½-horsepower fishing outboard



FISHERMAN 6 introduced by Evinrude is 6 pounds lighter than its 5½-hp. predecessor, features a new combustion chamber and more compact over-all design. Angler 5, a no-frills, low-compression version of the 6, weighs 43 pounds, has 360-deg. steering



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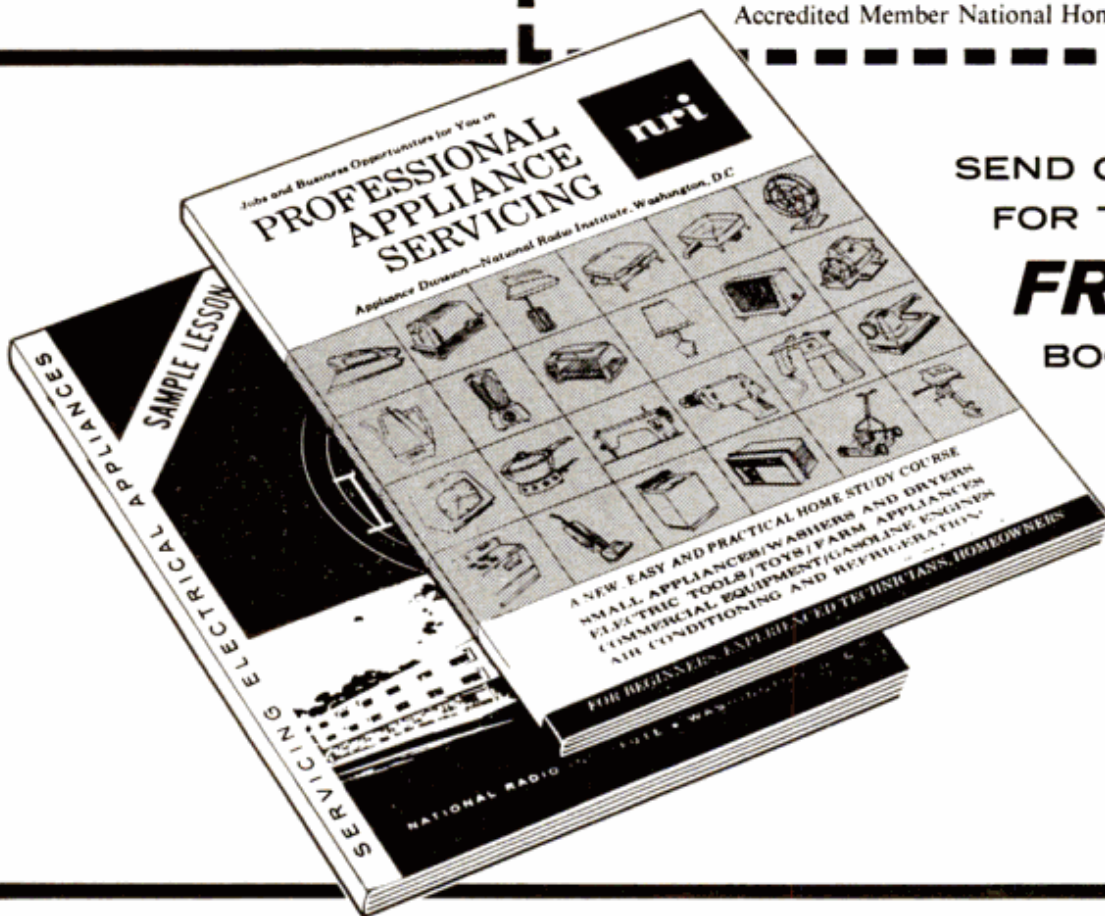
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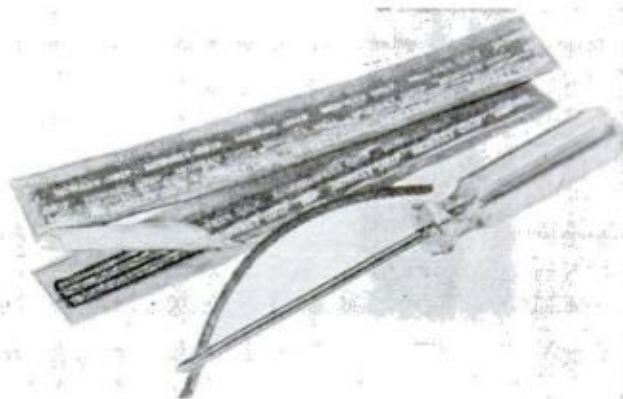
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Shopping for Tools

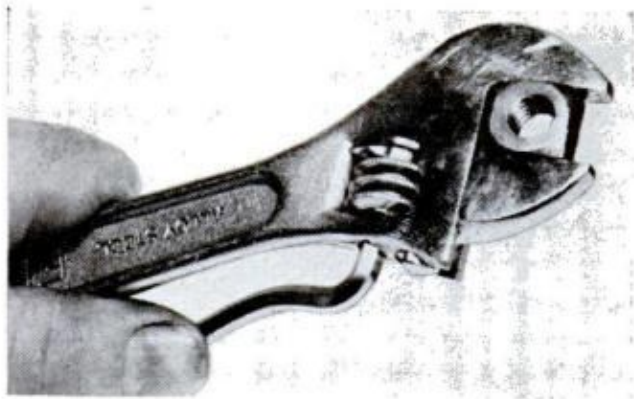
FLEXIBLE NEOPRENE PLASTERING TOOL gives a smooth job when spackling and filling curved or irregular surfaces. Also, when used on rough surfaces, its two multi-toothed edges eliminate need for sanding or sponging, according to the manufacturer. Costs \$1. Krakmaster, Inc., 1236 Marshall, St. Paul, Minn.



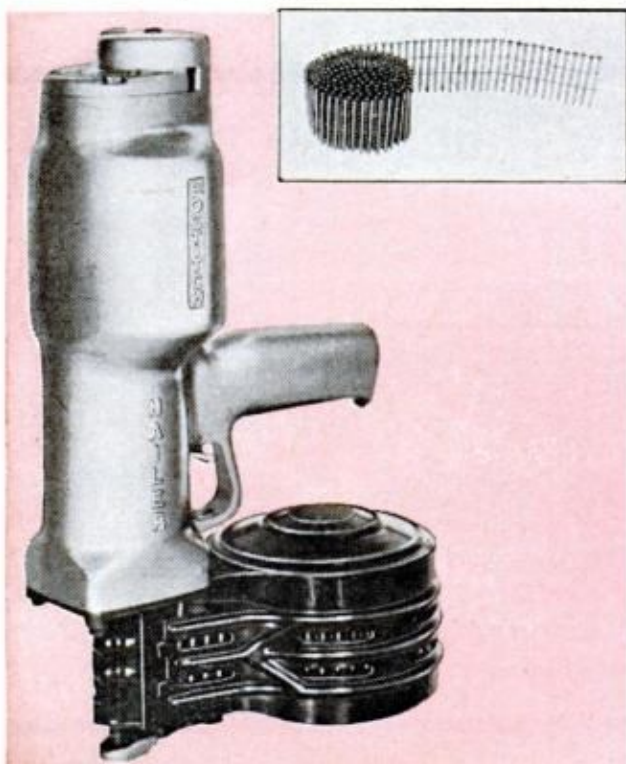
REPAIR TUBELESS TIRES on the rim, with Chem-O-Plug kits. Plugs contain cured and uncured rubber. Using a needle-like tool supplied with kit, you insert one or more plugs in puncture, where they harden. Won't prevent re-capping. \$3.58 and up. Monkey Grip, Box 6170, 5320 Harry Hines Blvd., Dallas, Tex.



REMOVE RUSTED OR ROUNDED nuts with the Finn Wrench. It's an adjustable open-end type that has a tightening lever. After wrench is tightened in usual manner, you use the lever to get additional pressure. Made in 8-, 10- and 12-in. sizes costing \$2.95, \$3.95 and \$4.95 each. Thomas & Co., Thorndike, Me.



COMMON NAILER, Model N2 drives round-head common nails pneumatically. The nails, which are accepted by F.H.A. and all local building codes, are loaded into the machine in coils (inset) of 300 6d and 250 8d nails. Machine costs \$250, nails, about 80¢ a coil. Bostitch, 2052 Briggs Drive, E. Greenwich, R. I.



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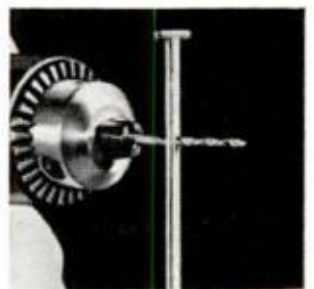
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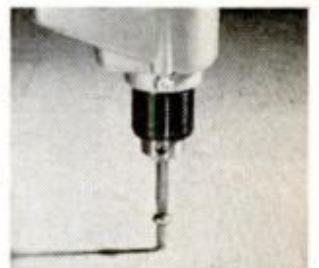
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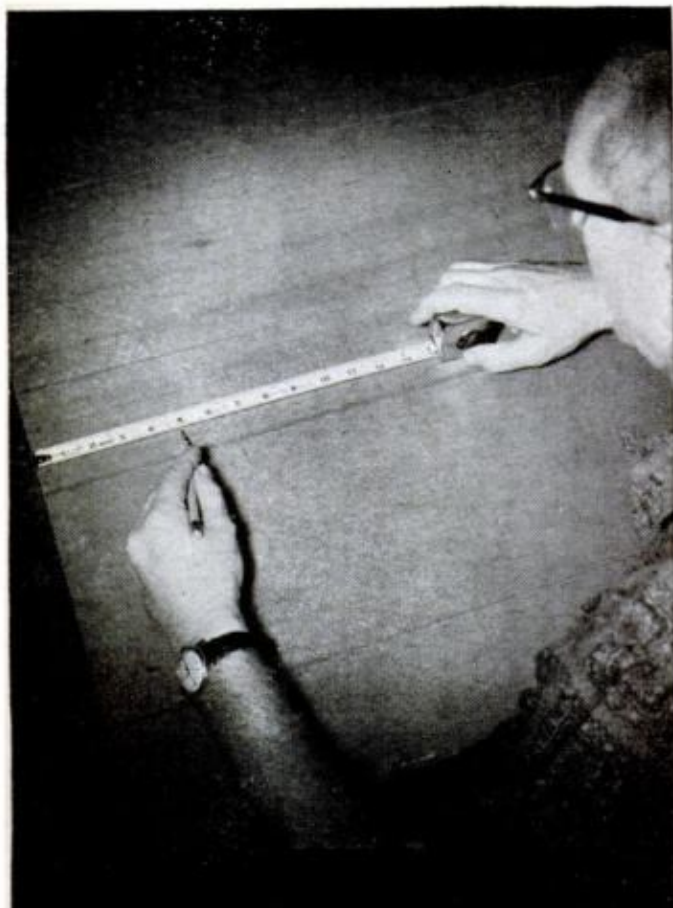
CLINIC FOR HOMEOWNERS

Q I'm puzzled why the paint on my garage door peels. I've painted it twice, but the second coat is beginning to peel as did the first. The garage is unheated so there is little variation in temperature, which I understand is one of the causes of moisture troubles. What's the cause and remedy?—J. B., Mich.

A Did you paint the back of the door, and the bottom and top edges, as well as the front? If not, then moisture is the cause. In any enclosure, such as a garage, moisture contained in the air in the enclosed area seeks drier air outside. It will pass through wood unprotected by paint or other vapor barrier. When penetrating the garage door from the inside, it is stopped by the paint film. In time it will break the bond of the paint with the wood, causing what are known as blisters. The paint film breaks and peels away from the wood. Remedy is to paint, or varnish, the back of the door. If you use a varnish, be sure to use a type specially compounded for use on exterior surfaces. Do not use an interior varnish. Coat all four edges of the door as well as the panels and framing.

Q I like to strip and refinish old pieces such as tables, chests and the like, and my problem is reproducing the colors, or tones of the originals. In some cases the stains just won't "take," and in other instances the stains available don't give the color I want. At present I'm trying to reproduce the so-called "mission" finish on an old chair, but can't quite get the right shade of color. Is there any other method, or material, I could use?—C. E., Ga.

A Three questions occur to us: Are you sure you are getting all the old finish off the wood? Are you using wiping stains or penetrating stains? And do you intermix the stains you are using? The solution to your problem is in the answer to one or more of these three questions. One of the reasons for failure of stains to take on old work is the residues of original finishes still in or on the surface. On most furniture woods, open grain woods particularly, it is essential to remove all traces of the old finish down to the bare wood. In some cases this must be done by scraping to



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remove filler and stain from the pores of the wood before sanding. By intermixing stains (of the same type and manufacture) you can get almost any shade of color desired. Wiping stains, those containing a pigment, are generally more desirable for use on old work as they are more easily controlled. Stains containing a filler are useful on some open-grained woods. Refinishers also often resort to use of artist's oil colors for staining some difficult woods. In using these colors, it generally is advisable to apply a first coat of shellac or varnish cut about 50 percent with a solvent. Then the color is wiped on as it comes from the tube, using a few drops of turpentine on the wiper when necessary to spread the color. When the desired shade is reached by wiping, allow to dry at least 72 hours before coating with any top finish.

Q We recently took our furniture out of storage where it had been for nearly three years. We notice a musty odor in the drawers of one of the chests. So far we've not found anything to eliminate the odor. Sprays don't help. Any suggestions?—W. T., Ore.

A Probably the odor would dissipate in time, but to hurry this process it might help to remove all the drawers and scrub the interiors with white vinegar. Dampen a cloth and place three to five drops of the vinegar on the cloth and go over all the drawer interiors, also the inside of the chest. Then place chest and drawers outside and expose to bright sunlight for a few hours. Be sure both the chest interior and inside of all drawers are thoroughly dry before the chest is placed in service again.

Q I have a home shop question. I have trouble keeping the blade on my small bandsaw aligned. Painstaking adjustment of the guides doesn't seem to help. Rubber tires on the wheels are still in good condition and the machine has not been damaged in any way. What could be wrong?—R. D., Nebr.

A You do not say what width of blade you ordinarily use, but one common cause of trouble in holding alignment of narrow blades is too much tension. This depresses the rubber treads on the wheels and tends to cause the blade to "climb," especially a narrow blade. Slack the tension a little and you'll likely eliminate the trouble. Some small bandsaws are fitted with scales showing correct blade tension.



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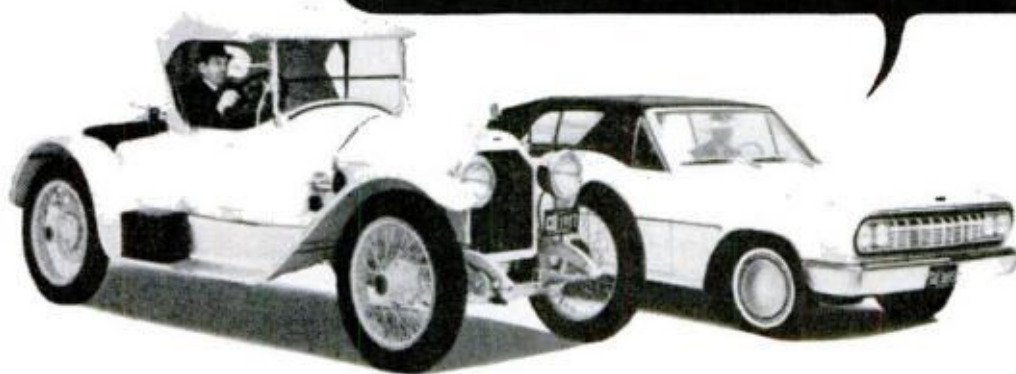
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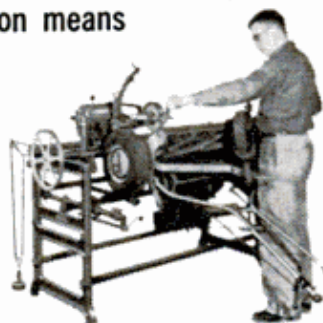
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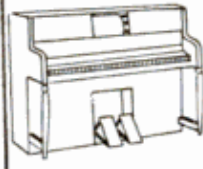
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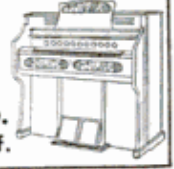
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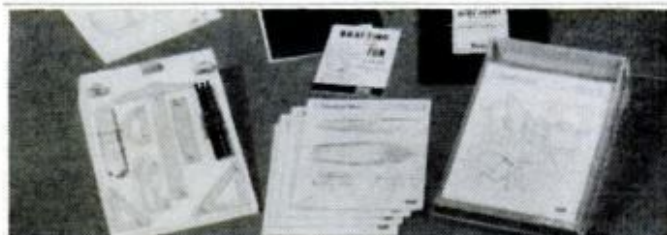
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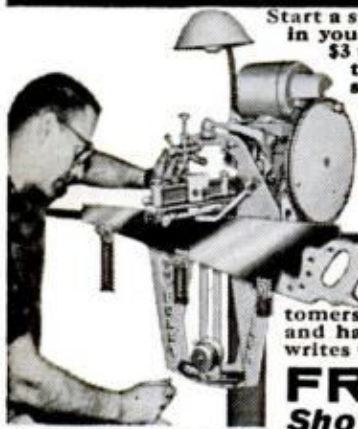
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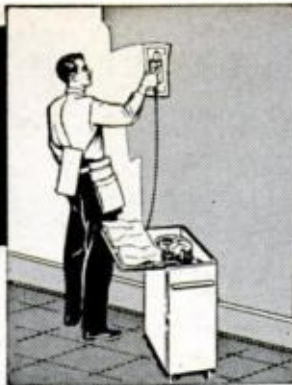
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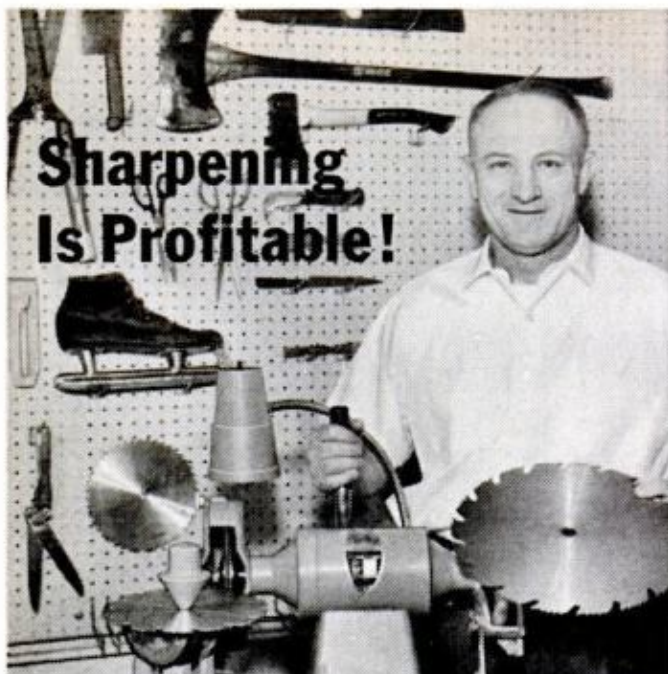
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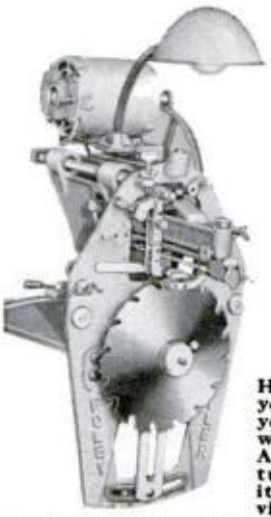
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OCTOBER 1964

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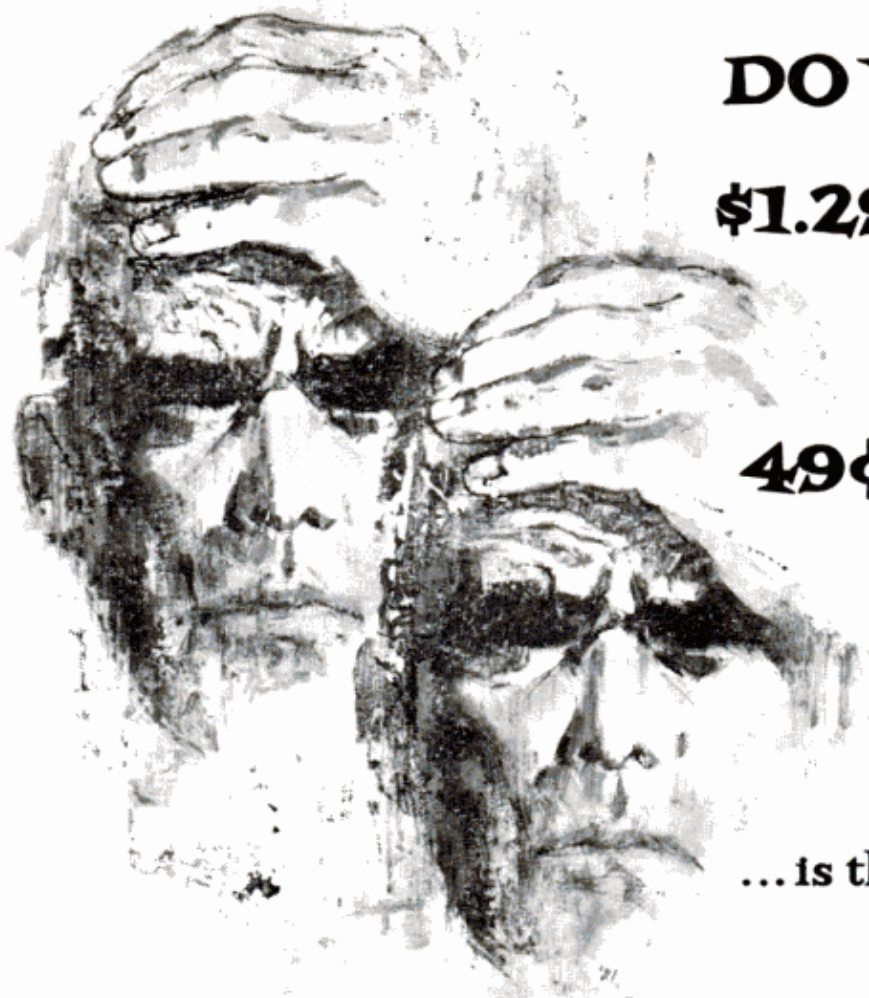
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We suggest a White Owl Tip.

It has the "feel" of a filter with its clean, white, pliable tip. Sits easy, stays neat to the last puff. And tobacco never touches your lips.

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How the 1965 Cars Compare

While stylists reshaped the skins, engineers made more important changes in the bones of the '65s.

Coke-bottle and X-type frames have yielded to limber perimeter types that soak up more road shock, add foot room in the floorwells. Suspensions are changed to match, and low-profile tires help stabilize cornering. But the big news is more whoa-power, better stopping with fade-resistant disk brakes. Seven '65 models have them.

How fade-free are these brakes? What kind of ride do the new frames give? How brawny is performance? For the answers, join PM's auto editors as they make their annual proving-ground reports.

NEW CORVAIR STYLING makes a big splash at proving ground. Rear strut rods, a la Corvette, improve handling





PLYMOUTH SPORT FURY is longer, softer-sprung, but roadability is still good. Lower trunk lip makes loading easier. But the shift pushbuttons are gone at last



MERCURY has new, limber frame that damps out road shock. With all-coil suspension, there's better ride and, surprisingly, handling



OLDS Starfire may dust off some competition with 10.2-second 0-60 time. It has 425-cu.-in. V8, variable-pitch automatic transmission



NEW STEERING arms speed big Buick's handling, and slightly wider tread improves stability. Removal of chrome was spurred by popularity of Riviera styling

DODGE MONACO is new model—plush-est of the line. Equipped with optional 426-inch mill, it literally flies. Inside are four buckets, a well-hidden tach





BIG PONTIAC'S perimeter frames now taper on the ends. Ride is softer. Brakes are wider, better cooled. Wiper blades with double-jointed pivot are optional equipment on Catalina (left)



EVEN COMET has picked up over-and-under headlights. New Cyclone (here) gets a special grille rail and, as standard equipment, 289-cu.-in., four-barrel V8—but 10% softer front springs



OVER-AND-UNDER headlights set new Ramblers apart from earlier years. Ambassador is 10 inches longer and gets an anti-sway bar in front plus 232-cu.-in. Six as standard engine



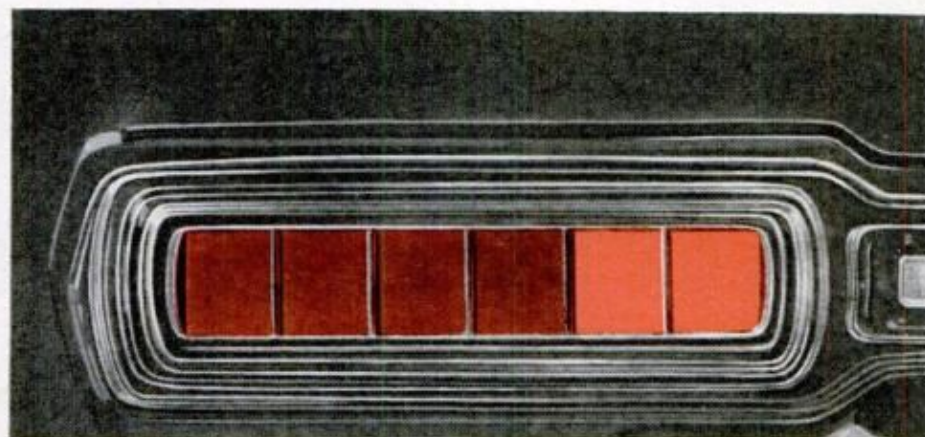
VALIANT'S ride has been somewhat softened. In performance test on the flat, we did 0-60 m.p.h. in an easy 13.1 seconds with the optional 225-cu.-in., long stroke six-cylinder engine



LIGHT TOUCHES FOR '65

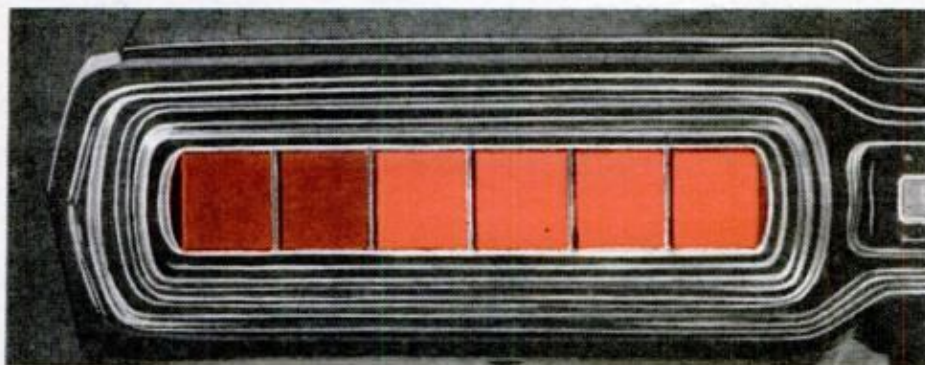
LITERATE IDIOT LIGHT ...

and gauges are standard on Imperial. Gauge glomers are happy; for those who don't care, this super idiot light "reads" the oil, temperature, and gas gauges, warns you to check them in case of trouble



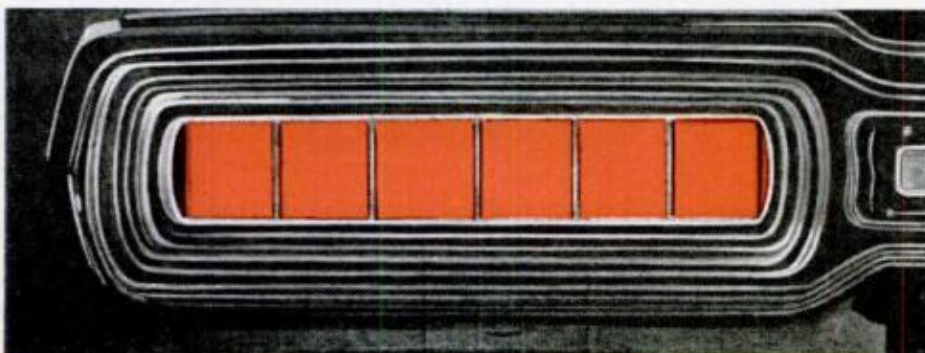
PM TURNING ...

in my shiny new T-bird. A light glows at the inboard side of lens, spreads ...



TO THE ...

center and — all within a fraction of a second — keeps on spreading outward to the ...



LEFT ...

over the full lens. Then the light goes out and the three-bulb cycle starts over

THE '65s



VOLUPTUOUS CONTINENTAL STYLING sets off Corvair (above). Turbocharged Corsa (nee Spyder) has carb, blower-vane modifications for 14 extra hp.

FULL-SIZE PONTIACS (below) are slightly longer and have sprouted more-prominent bulges on their rear quarter panels. Horsepowers have been raised



- **Mountain- and Water-Proof Brakes**
- **Softer Rides (and Some Corner Better)**
- **Cross Pollinated Styling**
- **More Thoughtful Gadgetry**

By Ed Nelson, PM's Automotive Editor

STRETCH OUT Detroit's 1965 machinery along the curves, hills and built-in bumps of the proving grounds, and you begin to wonder why all the fuss about new styling.

There's a better story in the way Corvair's new rear end takes curves with less knuckling under—the flexing without mushing of Ford's new chassis, and the absence of queasy fade in the new disk brakes. There are several versions of these disks—and a lively battle over which is best—as we'll explain later.

We hit the brakes of a popular compact, equipped with conventional drums, in successive panic stops from 60 m.p.h. We began to feel fade on the second try. On the fourth stop, the car almost felt as if it were coasting to a standstill.

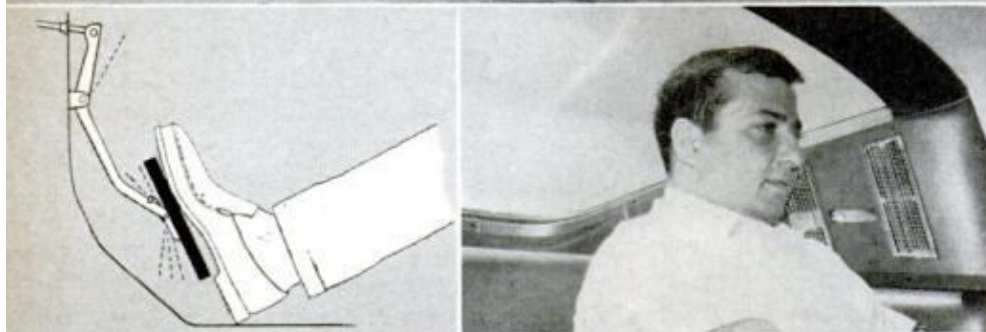
Running the same tests with a disk brake-equipped model produced no feeling of fade or grabbing. There's an even more dramatic story when you panic-stop from 90 m.p.h., or when pedal pressures are converted into life-or-death stopping distances (see page 96).

The new perimeter frames that replace 1964's cow-belly and X shapes let car makers nestle the body within the frame members and widen the footwells. Chevrolet, Ford, Cadillac and the big Buicks (except Riviera) have them for '65. Pontiac and Buick Special had them in '64.

In Ford's frame, torque boxes at each end of the side rails help sop up road shocks. With the old cow-belly (or coke bottle) frame, two-thirds of the frame-body rigidity was in the frame. Now two-thirds is in the body.

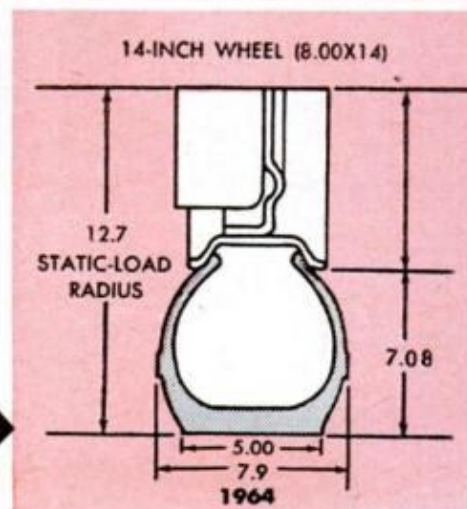
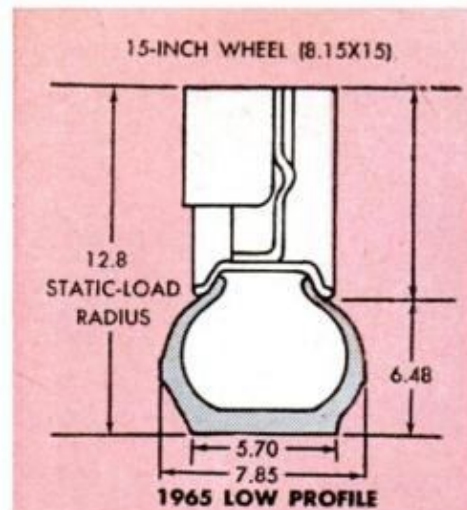
NO, IT'S NOT LAST YEAR'S PONTIAC. Those stacked headlights and slab sides belong to the Ford Galaxie. Optional for all Ford four-door sedans is a station-wagon type fold-down rear seat for increased luggage capacity





FASTBACK ROOF, A NEW MUSTANG option, looks as slippery as a goldfish. But rear seat headroom suffers. Ear-level vents extract stale air. The center pivoting gas pedal from early Mustang is added to '65 Ford and Mercurys

BIG SWITCH TO LOW-PROFILE tires isn't for show. It allows larger wheels and consequently, better brakes. During lab tests equivalent to 120 m.p.h. under 1020-pound load, squat heel low-profile tire (upper photo) developed less traction wave—or distortion—than the old style (lower photo)



Yes, the ride is smoother. And the cornering, which you might think would be sloppier, is actually firmer. It's hard to say how much of this is due to frame changes and how much to the change in suspensions and tires made at the same time.

Last year T-Bird and Lincoln engineers wanted bigger wheels without making the car sit higher from the ground. The answer was lower-profile tires, and the name of the game was Make-a-Bigger-Hole-in-the-Doughnut. Everybody's playing it for 1965, and the claims for improvement include better cornering with minimum squeal. This is hard to check because cornering ability doesn't depend on tires alone. But tire manufacturers claim that lower sidewalls on the new tires allow less tread flopping as the tire leaves the road surface (see photos, page 93).

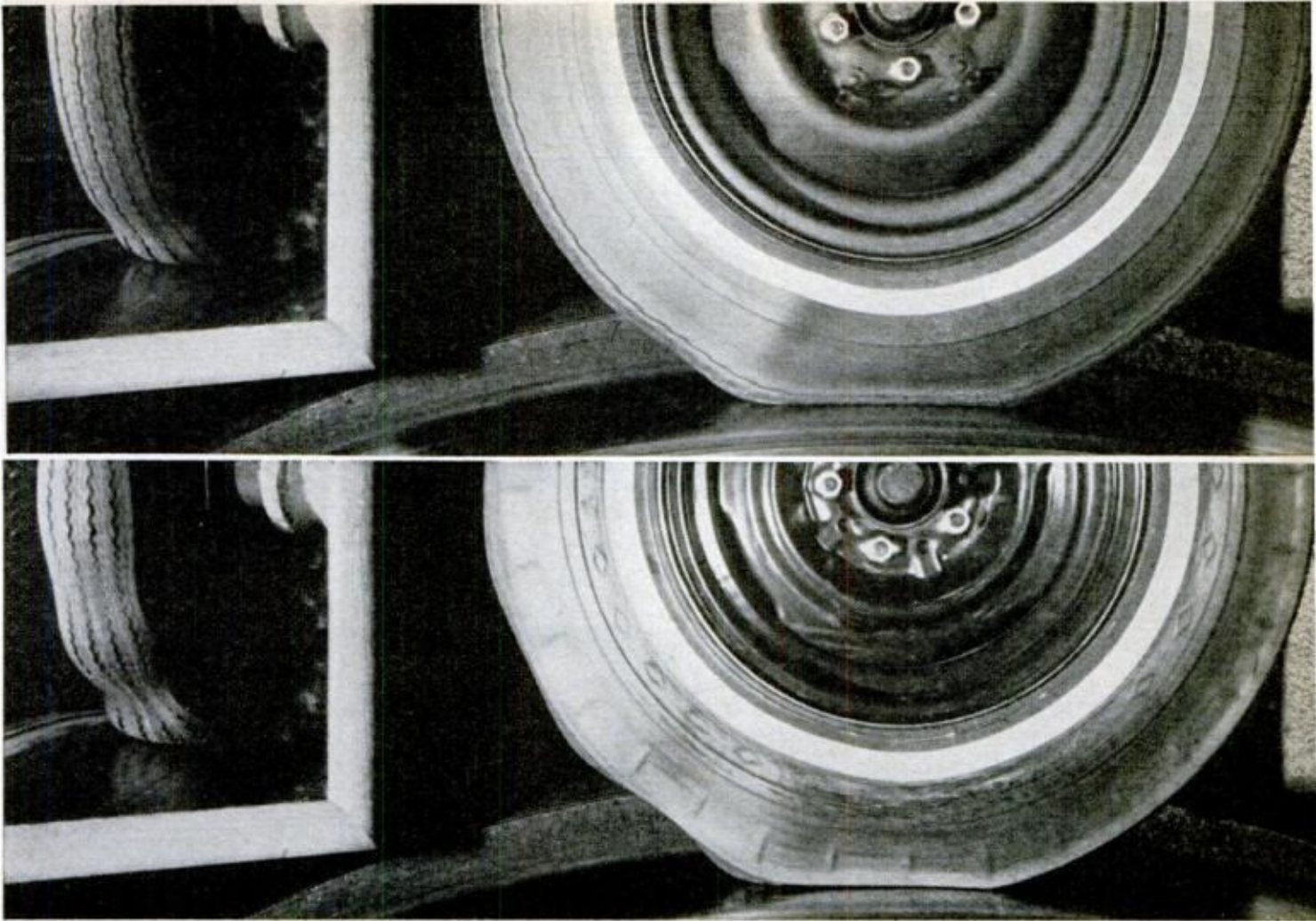
With all the unfamiliar new numbers on tire sidewalls, some tire makers plan to mark their skins this way: "7.75x14—Replaces 7.50x14."

Power for '65 continues to creep upward, largely by making big engines available as

options on smaller cars. There's also some boosting of horsepowers on basic V8s and even on contented Sixes, but there are no startlingly new engines. And few manufacturers are crowing about horsepower increases. For example, Pontiac won the battle with GM brass to keep the big 389-cu.-in. engine in the hot Pontiac GTO, but you have to search through the official specs carefully to find it listed.

The broad shift to perimeter frames required vast restyling of the skins. And the cross-pollination of styling ideas shows how hard the stylists are searching for a theme. Most GM cars have acquired more voluptuous curvature along the sides and fender lines a la Buick Riviera. Meanwhile, Ford has toned down its side wrinkles and come up with crisp, slab sides suggestive of yesterday's Pontiac Grand Prix (today's is full of curves).

Two themes for '65 do stand out, however. One is the obvious trend to vertical headlights. Buick Riviera's clam shell covers for its vertical pair keep its lights from being shattered by flying gravel during daytime travel.



The second trend is to those fancy fast-back roof lines. A joy to behold, perhaps, but what do they do for bald-headed rear seat passengers? Let's take a look.

MUSTANG AND BARRACUDA *Fast-backs.* Valiant's Barracuda, introduced in mid '64 and little changed for '65, boasts the biggest chunk of rear window glass in the industry. It measures 14.4 square feet, which tops the 10 square feet rear window on the new Ford Mustang fastback. Yet our six foot plus auto editor can sit in the Barracuda's rear seat without banging his skull against the rear glass. In contrast, he had to bend his head forward to fit in the rear seat of Ford's Mustang. Ford is completely honest about this, however. They call the Mustang fastback a 2+2 model, and they note that this stands for two adults in front, two children in back.

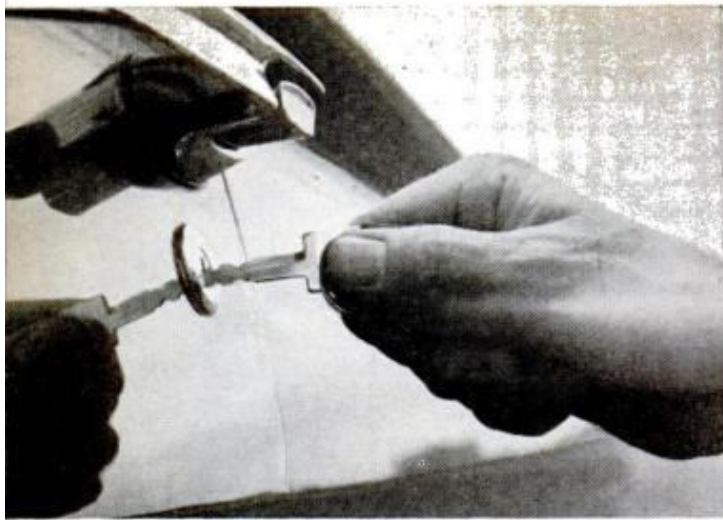
Thanks to well-tinted glass on the Barracuda we had, we weren't seriously baked. Mustangs have louvered cooling vents in place of a rear quarter window. Neither car is easy to back into a parking slot; you can't see what that rear corner is doing.

Both cars have pass-throughs back into the miniaturized rear luggage compartments. If the kids stay home, you can fold down the rear seat for extra space.

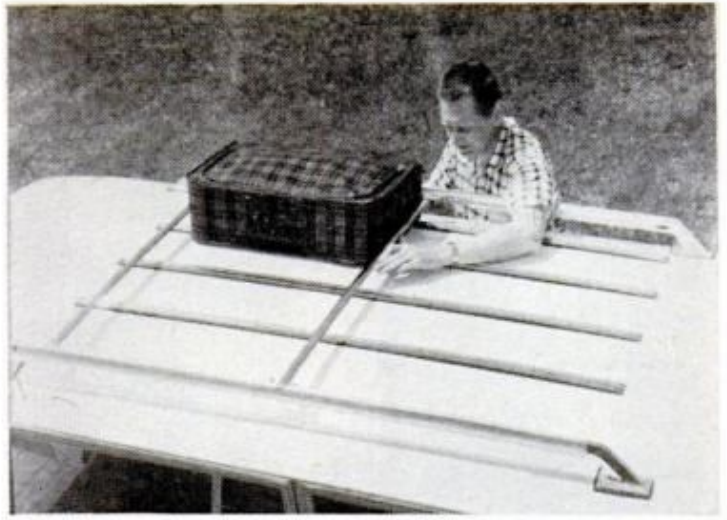
Mustang owners have complained loudly (*PM* Sept., p. 81) about a non-adjustable passenger's seat and about difficulty of handling the three-speed manual transmission (those who bought the basic engine didn't get an all-synchro box). Now both complaints have been answered by running changes. The heat-treating operation on transmission forks, which left them vulnerable to bending, has been corrected. And the passenger's seat now moves fore and aft.

Important performance options now becoming generally available on Barracuda's are front wheel disks and two levels of extra suspension stiffness for better control.

There's also a high-compression, four-barrel-carb version of last year's 273-cu.-in. V8. Without clocking it, we can say the two-barrel edition has all the power usable for any reasonable behavior on the street. And that's without the hot engine's 10.5:1 compression ratio, solid



REVERSIBLE DOOR KEY by Ford, T-Bird and Merc ends fumbling. All doors can be locked on Ford and T-Bird by pushing down the lock button on either front door



SLIDING CROSSBAR on optional Mercury wagon roof racks can be adjusted to fit luggage load, making tie-down faster and more secure. Here it's on a Comet

lifters, or high-lift, high-overlap cam. The basic Six is Chrysler's 170-incher.

Barracuda's dealer-installed disks are costly options—about \$200 a set compared to \$65-\$100 for others. But as production equipment, they qualify for competition.

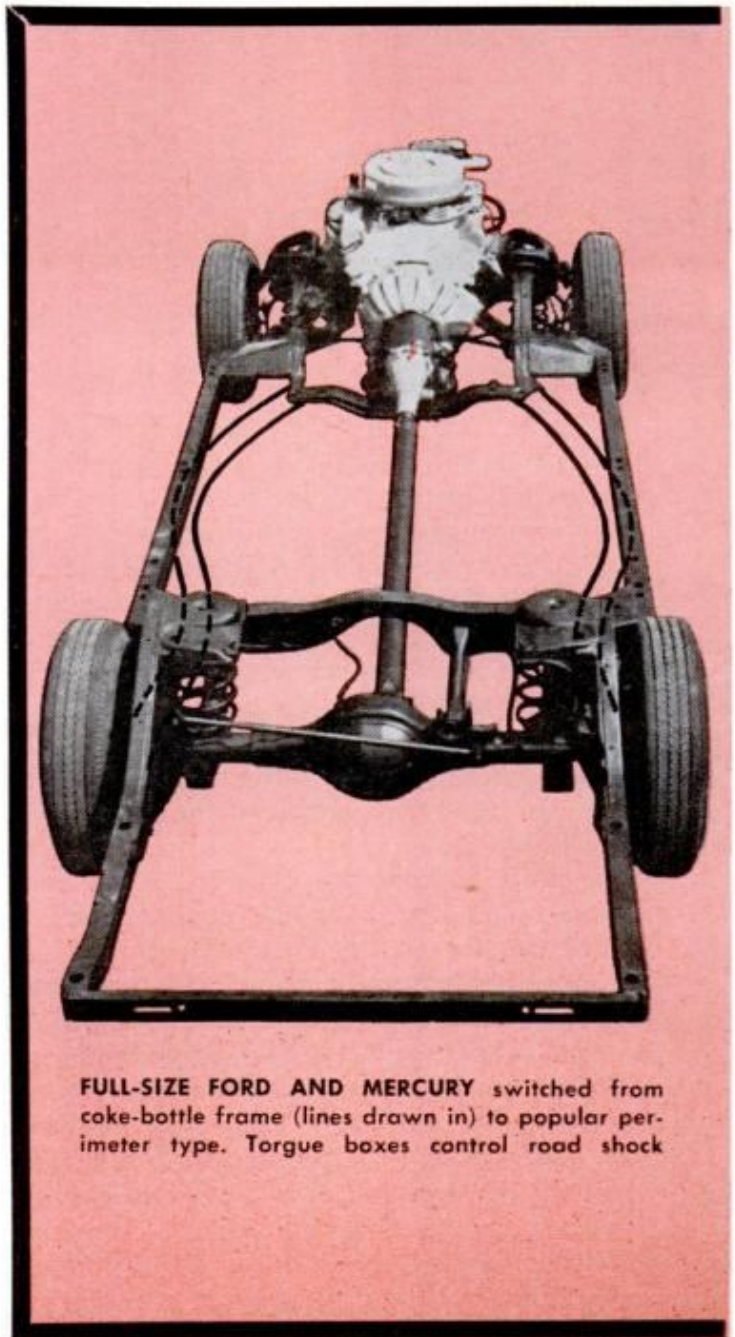
CORVAIR'S new body looks like the small offspring of a marriage between Corvette and Buick Riviera, with the straight beltline now broken by curves and kickups. B-pillars are gone and rear deck lid louvers are replaced by open work behind the back window.

A new rear suspension with strut rods a la Corvette limits independence of rear wheels and the tuck-under of the outboard wheel in cornering. Slight plowing in the front end continues to higher speeds now, but eventually the rear end does go out—rather suddenly. Handling is improved, but at the cost of harsher ride.

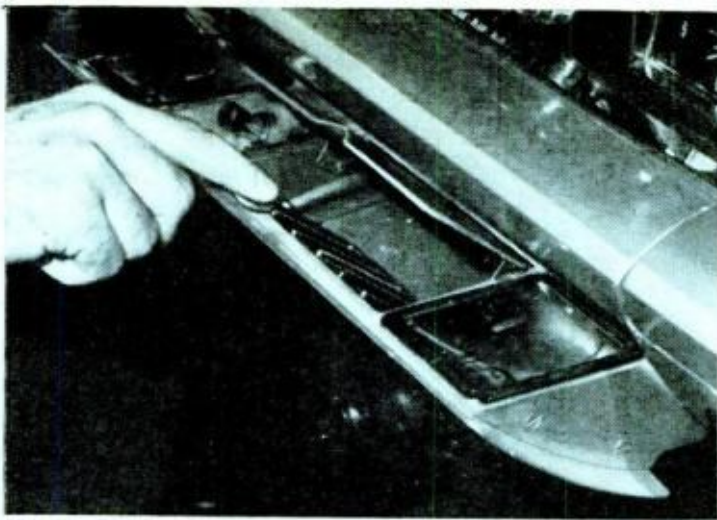
The Corvair's familiar 164-cu.-in., 95-hp. basic Six now can have four single-barrel carbs that raise horsepower to 140. This Six is called "Turbo-Air," but don't confuse it with the turbocharged version, where the charger's vanes have been modified for better flow rates. Horsepower here is up from 150 to a startling 180 which shortens 0-60 time by 10%.

Corsa replaces the Monza Spyder tag for the turbocharged Corvair. The Corsas include bucket-seated two-doors, a hard-top and a convertible. Unfortunately, the hot Corsa won't have disk brakes, though its power-to-weight ratio is close to that of Corvette.

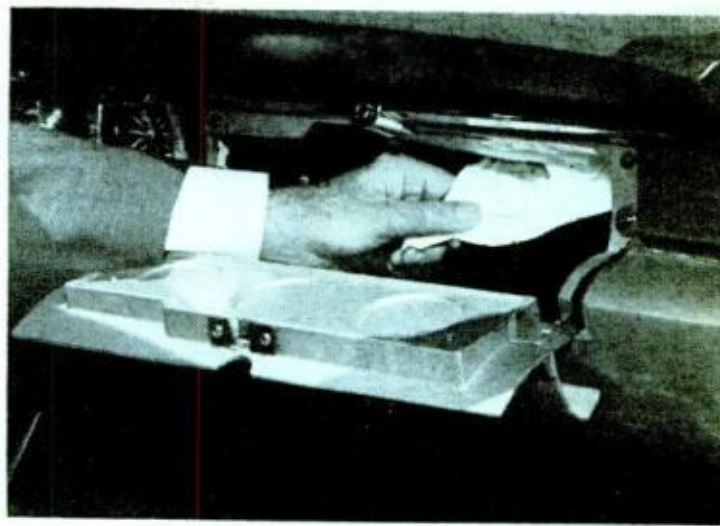
All Corvairs now have alternators. But



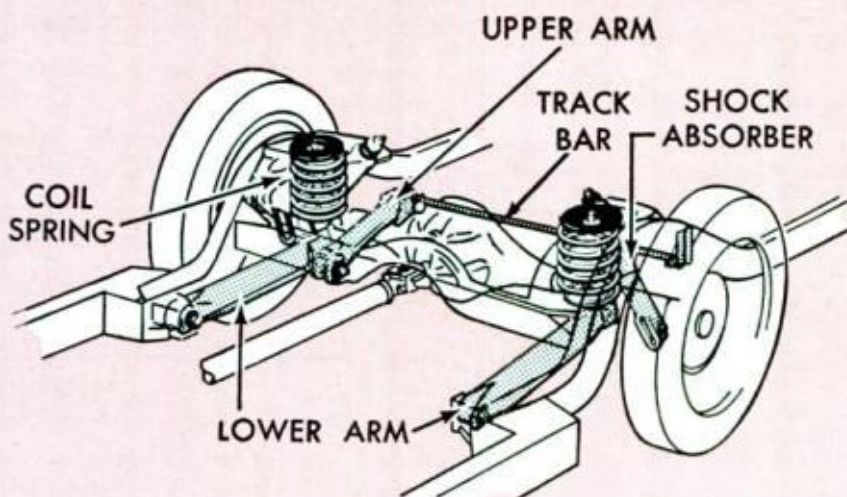
FULL-SIZE FORD AND MERCURY switched from coke-bottle frame (lines drawn in) to popular perimeter type. Torque boxes control road shock



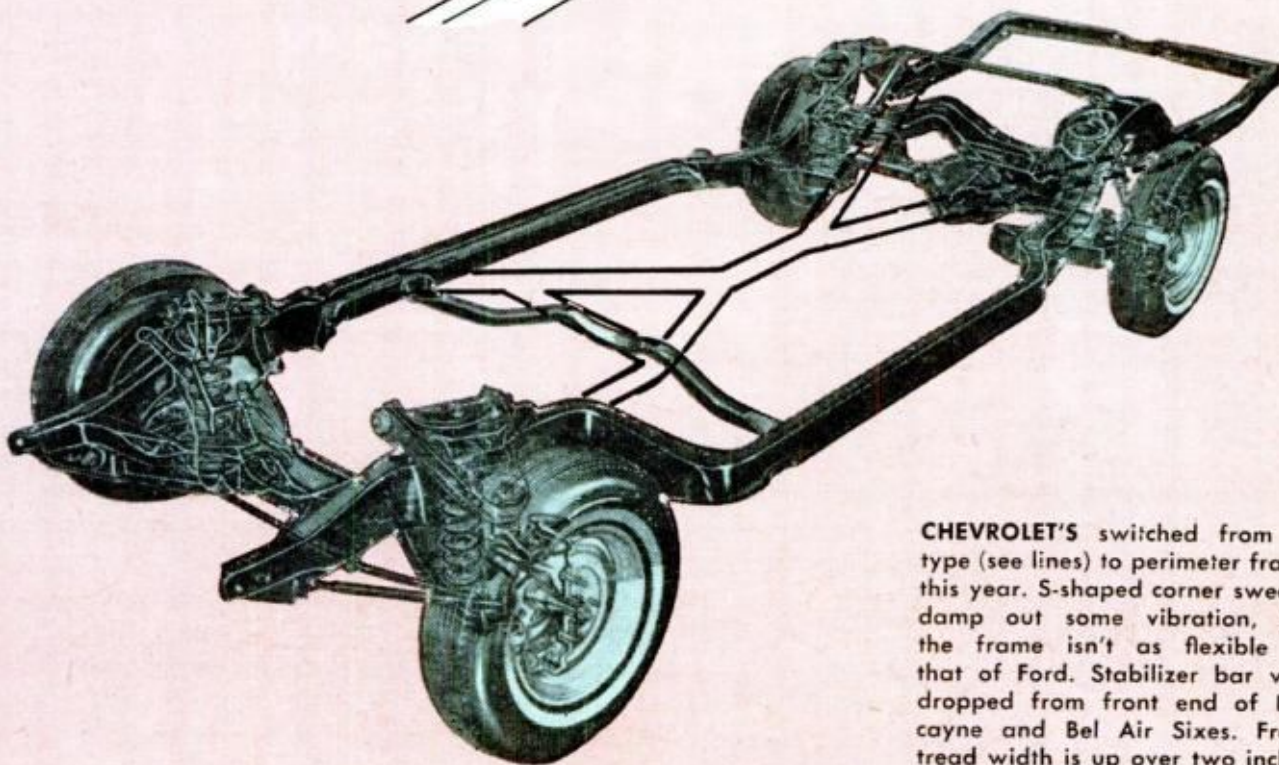
LARGE SLIDING TRAY in center of dash on all Chryslers includes a change holder for meters and toll booths, as well as two ash trays and a lighter



TISSUE DISPENSER is built into the top of the glove box in big Chryslers Handy little recesses for picnic cups and glasses are retained inside the lid

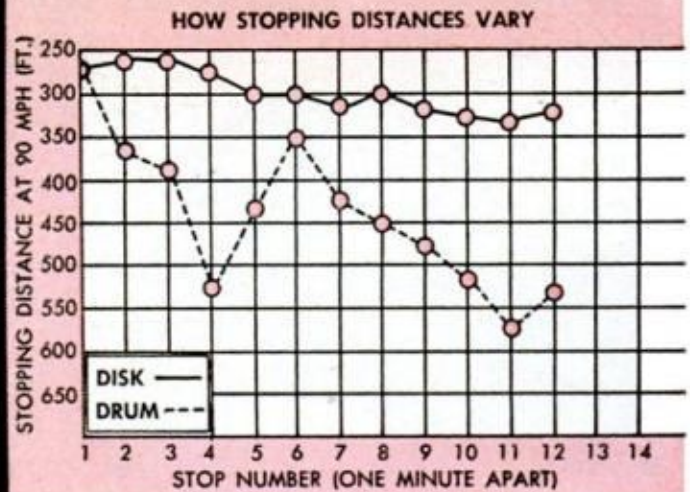


REAR-END SUSPENSION geometry in Chevrolet is changed; coil springs are spaced nearly four inches wider and the lower shock mounts are closer to the center of the car. Rear tread is more than three inches wider Thus resistance to roll is increased in the rear without making ride any harsher



CHEVROLET'S switched from X-type (see lines) to perimeter frame this year. S-shaped corner sweeps damp out some vibration, but the frame isn't as flexible as that of Ford. Stabilizer bar was dropped from front end of Biscayne and Bel Air Sixes. Front tread width is up over two inches

THE DISK VS DRUM BRAKE STORY



DISK BRAKES STOP even when immersed in water, as shown by T-Bird undergoing brake tests in water trough. Fade from heat is also lower than with drums

BRAKES THAT DON'T GRAB, pull, or show serious fade are offered on one or more '65 models from every U.S. car maker.

They are disk-caliper brakes, and they're optional on the Mustang, big Ramblers, Plymouth Barracuda and Dodge and Plymouth police cars. On T-bird, Continental and Corvette they're standard. Only the Corvette has four-wheel disks. (The problem with four-wheel disks is designing an efficient handbrake. The Corvette has a small bowl-shaped drum and mechanically actuated brake shoes built right into each rear disk.)

Basically, the disk brake consists of a cast-iron disk that turns with the wheel and a stationary caliper that pinches the disk like a vise to stop the car.

In contrast, the conventional drum brake has two brake shoes—a primary and a secondary—“floating” in a drum that turns with the wheel. Hydraulic pressure shoves the shoes outward until their lining rubs against the spinning drum, providing braking.

DURING 12TH STOP from 90, Bendix disks were 83-percent effective, drums 50 percent. Conversion to stopping distance was made with Tapley formula

There are drawbacks. Wrapped inside drums, the linings get little cooling air. And as they heat, frictional characteristics change and brakes fade. What's more, a hot drum expands away from the shoes, so pedal travel is greater. Also, the drum tends to retain water. Probably you've had the experience of driving through a deep puddle and “losing” your brakes for a time (it seems like an eternity).

Another severe drawback of today's drum brake is the inherently unstable duo-servo, or self-energizing principle. A link connects the bottom ends of the two brake shoes. When brakes are applied, the leading shoe moves against the spinning drum. Friction tends to pull the shoe around with the drum; this rotational force is passed through the link to the trailing shoe, snapping it against the drum. In effect, the momentum of the car reduces pedal pressure. But a common byproduct is sudden grabbing, swerving or locking up.

Disks use no servo assist, and so are

temperature, charge, and oil pressure are still monitored by idiot lights.

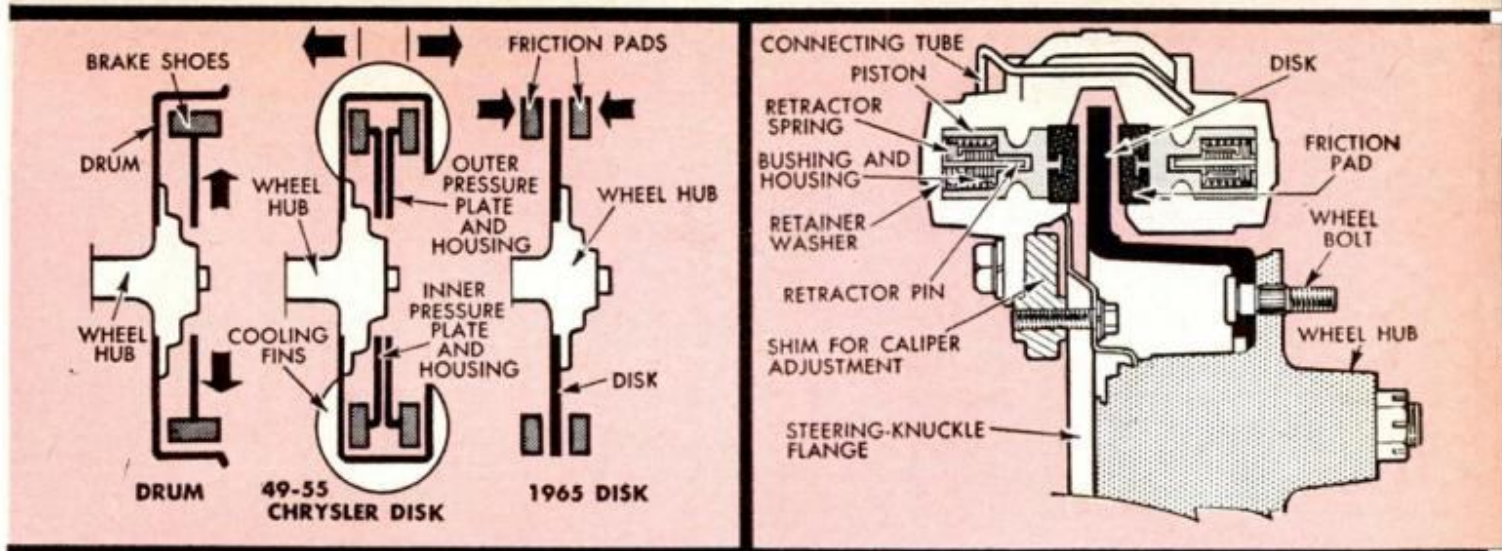
CHEVY II's wheelbase stays at a modest 110 inches, but available power isn't modest. The biggest Chevelle engine, the 300-hp., 327-inch V8, is now available.

Even the bigger Chevelle brake drums now on Chevy II may have trouble saying Whoa to this power, but perhaps new disks will be available next year.

The Chevy II still has its 90-hp. 153-inch,

four-cylinder engine in the line-up, but it's available only on low-line sedans.

CHEVELLE. The front spring rate of the Chevelle 300 is down from 245 pounds per inch of suspension deflection to 225. On V8s of this model, the rear rate is unchanged, but on Sixes it went from 130 down to 100. The ride is much softer as a result. The Malibu V8 we tried (which had a higher front rate of 250 pounds per inch) matched last year's in handling.



HOW BRAKES WORK: At left is drum, at right is modern disk. Early Chrysler disk (center) had fully enclosed clutch-type lining. It wasn't free from fade

stable. The spinning disk throws off water and dirt, and it is also open to cooling air. Disk expansion is mainly radial, so pedal travel isn't affected.

Before making disks standard on the T-bird, Ford tested a disk-equipped model against one with drums. In seven consecutive 500-foot stops from 65—a common highway speed—drum-brake pedal effort increased 50 percent, disk effort 45. But in the same number of 600-foot stops from 90, disks showed an increase of only nine percent (24 pounds). Drum effort climbed 83 percent (to 132 pounds).

In the past, engineers said disks are fine for featherweight foreign cars, but not for 4000 pounds of Detroit iron. The wheels on U.S. cars, they said, don't leave space for big enough disks.

But now they found solutions: double-size friction pads (improving effective disk radius); more-heat-resistant pad material; vented disks (which reduce temperatures by nearly a third).

Four American firms now supply car

BENDIX DISK BRAKE has piston-actuated pads that pinch the disk to stop the car. Pads are then pulled away from spinning disk by light retractor spring

manufacturers with disk brakes: Kelsey-Hayes (FoMoCo); Bendix (Rambler; Studebaker); Delco-Moraine (Corvette); and Budd (Dodge and Plymouth).

The Bendix disk isn't vented. Otherwise, all four are similar except for one point. Kelsey-Hayes and Bendix maintain a slight clearance between pad and disk with retractor mechanisms. In the other two units, the pad constantly brushes the disk lightly to wipe it clean of dirt and moisture and to reduce pedal travel.

A disadvantage of the constant contact system is higher operating temperatures, resulting in faster pad wear and wasted efficiency. One Budd engineer claimed a loss of only $\frac{1}{4}$ hp. at 60 m.p.h., but Chrysler admits that gas consumption averages two percent higher over the 20-80-m.p.h. range—more at low speeds, less at high.

But one thing's certain: The drum brake has reached the end of the road. If you don't buy a '65 with disks, chances are your next new car will have them.

—Alex Markovich

Chevelle's big drums—with 169 square inches of lining area—felt adequate.

Chevelle's smallest engine, the 194-inch Six, puts out only 120 horses, but you can go all the way up to a 300-hp., 327-inch V8 with jumbo four-barrel carb. Chevrolet has dropped the 220-hp. version of its 283-inch engine, but the 195-hp. version is still around as Chevelle's basic V8.

BUICK SPECIAL. We whipped a Skylark smartly around the tight GM handling

course and found it pleasant. For stability, Skylark has built-in understeer. Most drivers prefer scrubbing front wheels to having the rear end slide out—which happens with too much oversteer. With understeer, the front end tends to plow or scrub in a corner. The Skylark has a firm suspension—much more so than the Tempest (whose lower [softer] wheel deflection rates are 66 compared to Special's 94). Yet the Special's ride is not hard.



REAR FINS ON CADILLAC have been shrinking for years. This year's modest ones slope down from greenhouse. Crossflow radiator allows low hood line

SLEEK NEW BODY OF FULL-SIZE OLDS is longer and wider, allowing more shoulder and luggage room. Brakes are wider in front (and in back on 98s)



A small but important change is the larger exhaust valves in the Special's basic, 225-inch V6. Valve port area is up practically 10 percent. This means the '65 Special will exhale—and thus operate—more efficiently.

OLDS F-85 engineers did a first class hop-up job on the 330-cu.-in. V8 introduced last year. Still with a four-barrel carb and 10.25:1 compression, the new Cutlass is up from 260 to a claimed 315 hp. with the addition to a hotter cam. The Cutless we drove was livelier than last year's, but not startlingly so.

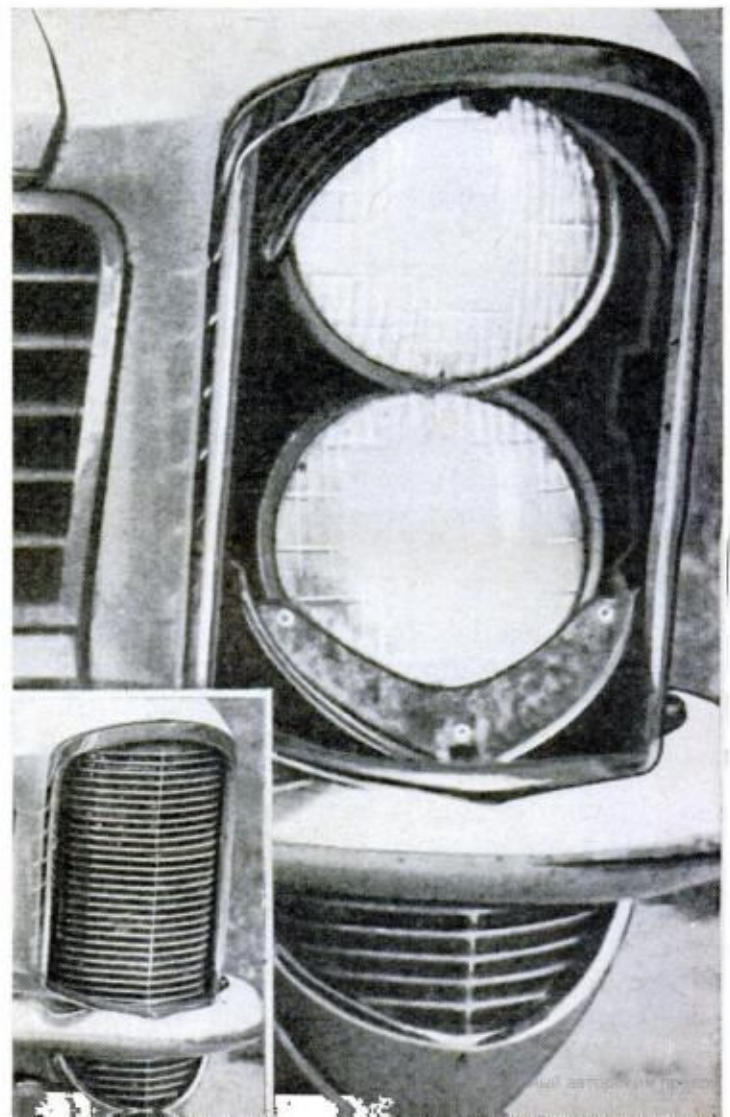
The lower-compression version of the same 330 (now 9:1 instead of 8.75:1) is rated at 250 hp.—up 40. It's standard in the Deluxe F-85. The economy V6, unchanged, still is standard in the basic F-85.

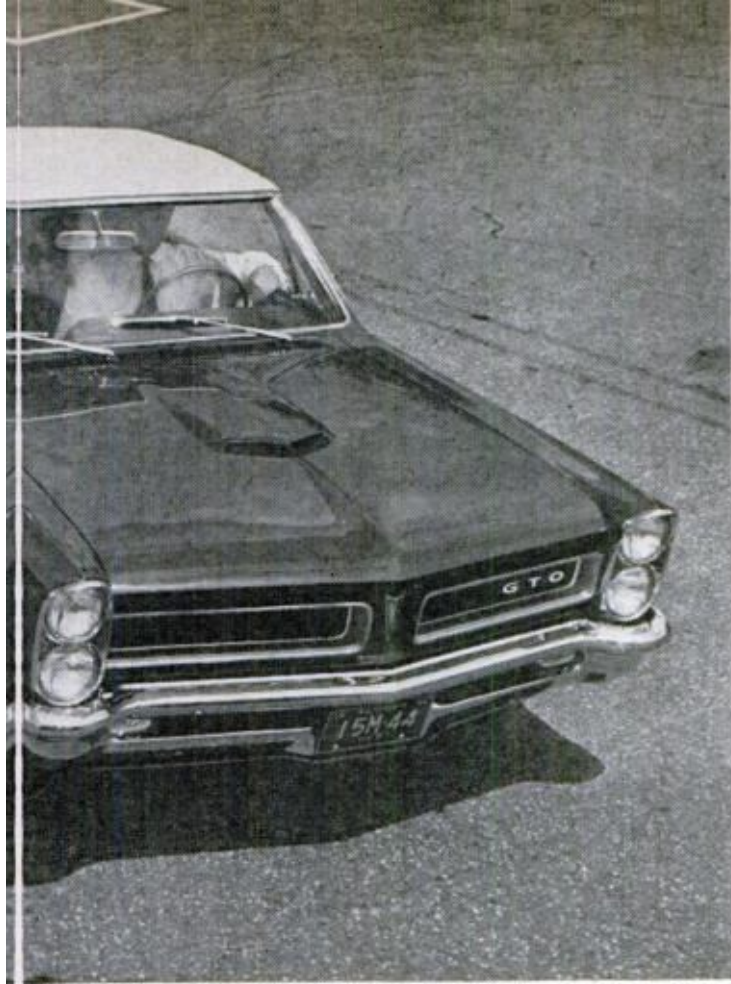
Only an inch and a half longer, the smaller Olds still has a 115-inch wheelbase, but a foot and a half wider turning circle. Trunk space is increased about three cubic feet.

PONTIAC TEMPEST not only kept its optional 389-cu.-in. V8; they've upped its rating from 348 to a snarling 360 hp. The three two-barrel carbs on this GTO model are still there, but breathing is vastly improved.

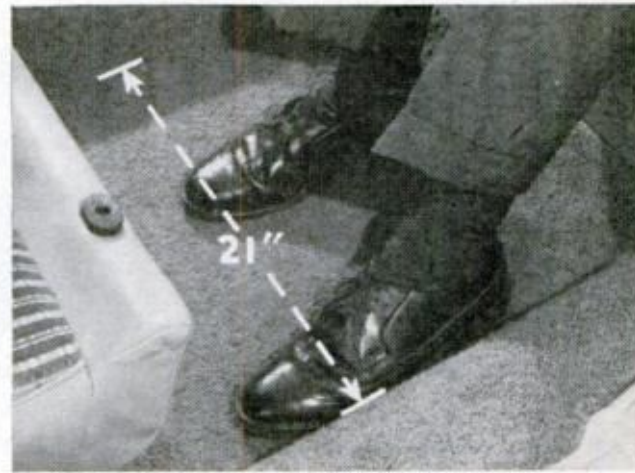
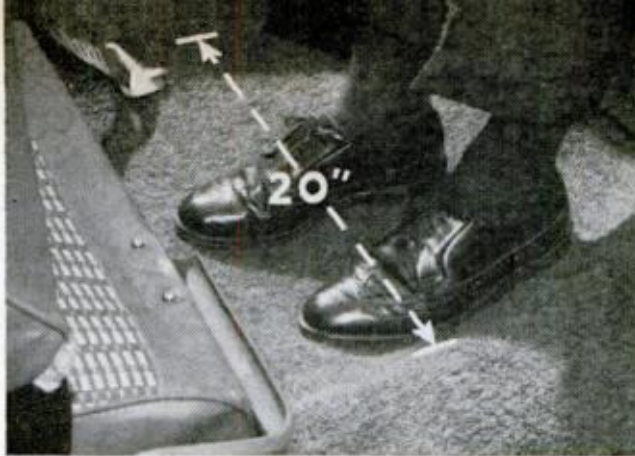
All Tempests are three inches longer for '65, most of it in front overhang. Cornering

STACKED LAMPS ON BUICK RIVIERA are protected by metal covers during day. When lights are switched on, the covers open automatically like a clamshell





ERSATZ HOOD SCOOP, a la early T-Bird, plus striping along the sides highlight Pontiac GTO styling. A 389-inch V8 with up to 360 hp. is offered



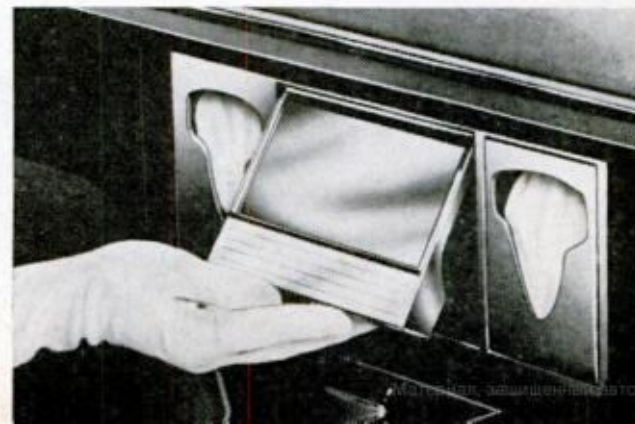
FORD GALAXIE'S new perimeter frame provides wider cabin well for more foot room, especially in front. Top photo rear in '64, lower one a new '65

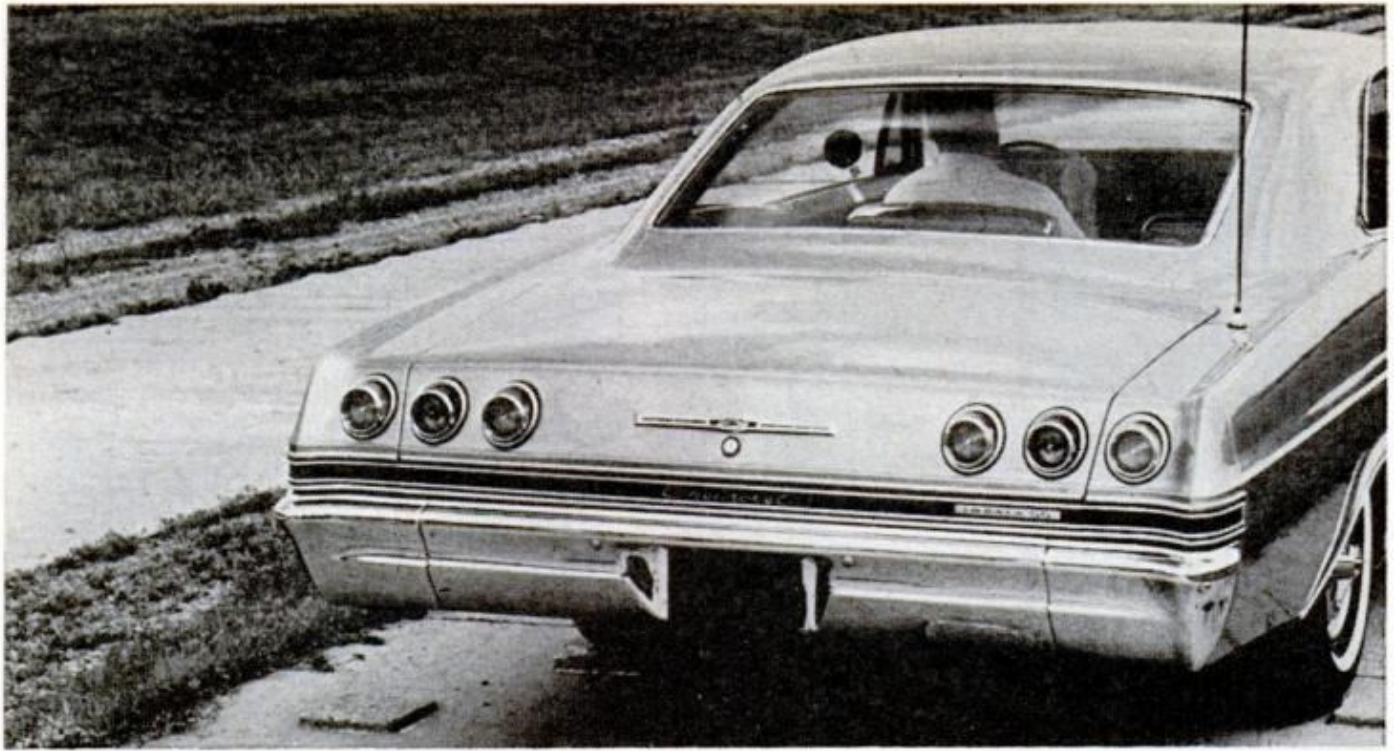


CHEVELLE STYLING HASN'T CHANGED in '65 except for minor sharpening of body trim. You can now get more power in the form of Chevy 327-cu.-in. V8

OPTIONAL TELESCOPING steering wheel in Cadillac and Corvair adjusts up to three inches with a twist of a hub ring. Separate lever controls tilt angle

FOR BACK-SEAT DRIVERS, Olds 98 has lighted vanity case with mirror and tissue dispenser in seat back. Opening the prototype version took some prying





NEAR-FASTBACK ROOF LINE and downward-sloping rear fenders are trademarks of the new Chevrolet. Softer suspension performed well on roughest test roads. Cornering isn't impressive, although the body roll is reduced

seems unchanged and the ride is still plush. The slow steering persists.

FALCONS still have as firm a ride as anything from Ford and there are no basic suspension changes. The mild 144-cu.-inch Six is gone. Basic engine is now the 170 with 105 hp., paired with a 2.83:1 economy axle. The car is almost as lively as 1964's 170-incher, and you should get economy comparable to the old 144.

There's more news, though, in the reworking of the 200-inch Six. The four main bearings have been boosted to seven. A higher lift cam and bigger valves up

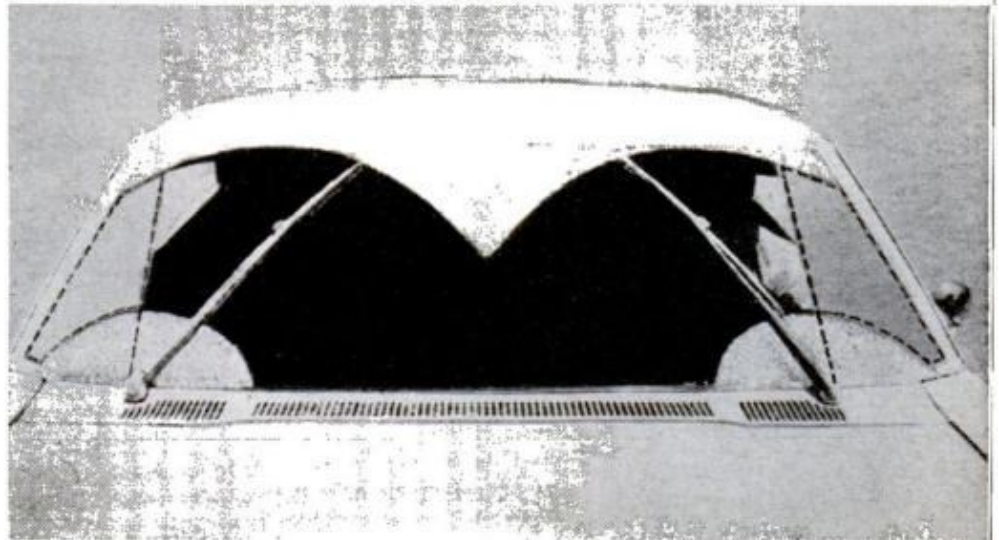
horsepower rating from 116 to 120.

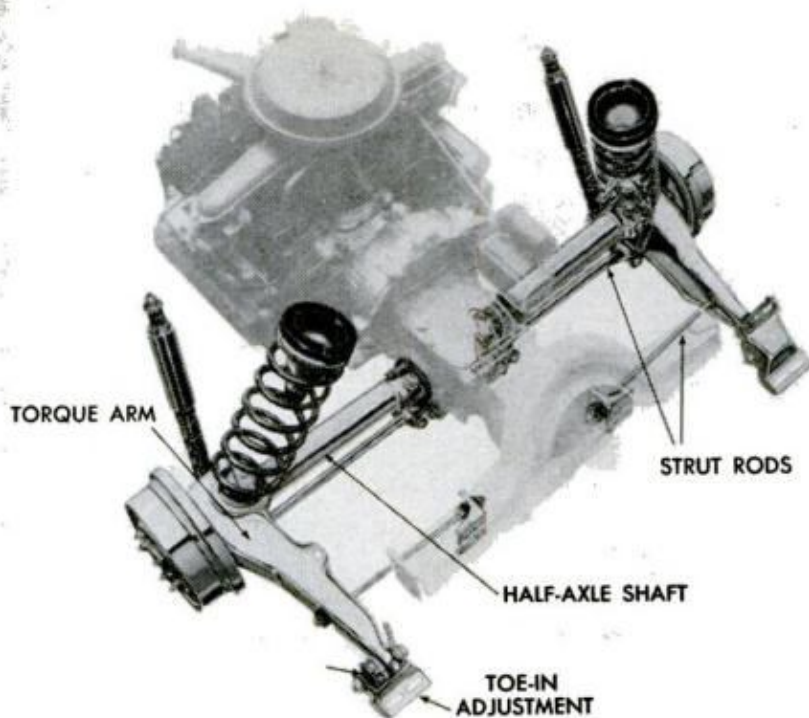
An automatic choke has been added. Though compression is raised to 9.2:1; regular fuel is still recommended. The fuse block has been moved to the kick panel for accessibility. Fuses are well labeled.

Mustang's popularity made Ford decide to drop the Falcon Sprint.

MERCURY'S COMET has over-and-under headlamps and sharper-edged fenders. Taillights wrap around, and the vestigial rear fins are gone. Imitation side port holes are a delayed tribute to an old Buick theme.

TO ELIMINATE LAST YEAR'S BLIND SPOT (shaded area), Pontiac wiper blades swivel on their arms. At the outboard end of the stroke, the blades become parallel to the A pillar. At inboard end, they're parallel with the cowl





OVERSTEER IN CORVAIR now comes in more gently and at higher speed, thanks to a redesigned rear suspension. Transverse leaf spring is gone. Strut rods now work in much the same way as those in Corvette rear suspension

Comet has dropped the 170-cu.-in. engine and uses the 200-inch, seven-main-bearing Six as its standard. We'll guess a version of the new, 240-inch Six, so far limited to Ford division, will be warming up Comets by mid-year. The 260-cu.-in. basic V8 of '64 has been replaced by a two-barrel 289 with a rated 200 hp.

Top option is the 225-hp. four-barrel 289 with 10:1 compression. It's standard for the Cyclone. Our convertible, with four aboard and without the usual high-revving start, walked through 0-60 in 13.1 seconds. The optional four-speed manual stick was smooth.

With 10 percent lower front spring rates, Comet Sixes have a soft ride. Tie rods on V8s, over two inches longer, come nearer the center of the front end and swing through a smaller angle with vertical wheel motion. Thus they limit changes in toe-in and toe-out, which should improve tire wear and rough-road handling.

Visibility is generally good, but the gloss-control paint Comet uses atop the dash is also needed around the instruments. All controls were easily accessible. Legroom in front is adequate for a six-foot-plus editor. It's skimpy in back, although headroom is fair.

There's no two-speed automatic left in either Comet or Falcon—and that's a step

forward. The smaller the engine the more it needs the flexibility of extra gears.

FAIRLANE. Manual steering is made easier by a new idler arm bushing that reduces friction 10 to 20 percent. A new set of gears and power steering pump have lowered the power steering ratio from 25:1 to 20:1, and reduced wheel turns from 4.3 to 3.5. Now if only they could reduce the manual steering ratio, which takes 4.7 turns lock-to-lock.

Blades on the front fenders make an excellent guide while you're learning the car. The front end seems vulnerable to damage. The rear end is better, though its bumper is tucked well into the sheet metal. Luggage capacity is up about a cubic foot, but the spare takes a reach.

Only the amps still are on an idiot light; oil pressure now has a gauge. The new speedometer is circular and clear. Major dimensions are unchanged.

The reworked 200-inch Six is basic. Bottom V8 is the 195-hp., 2-V 289. With a compression ratio of 9.3:1, Ford still recommends Regular gas.

VALIANT and **DODGE DART** share engines for '65, but Valiant puts them in a package that is 8 inches shorter than the Dart, on a five-inch-shorter wheelbase.

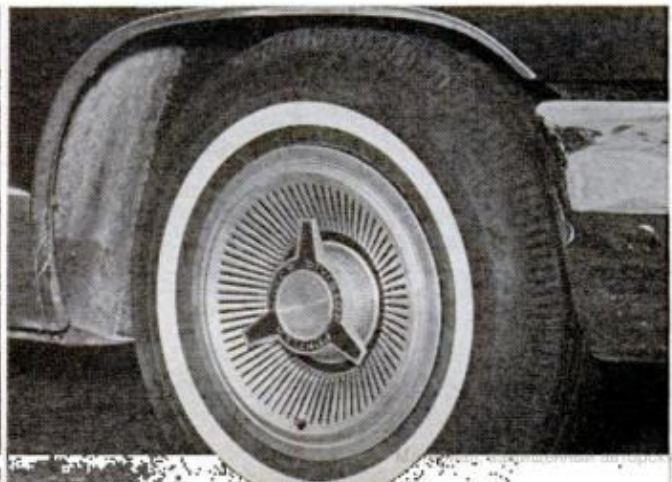
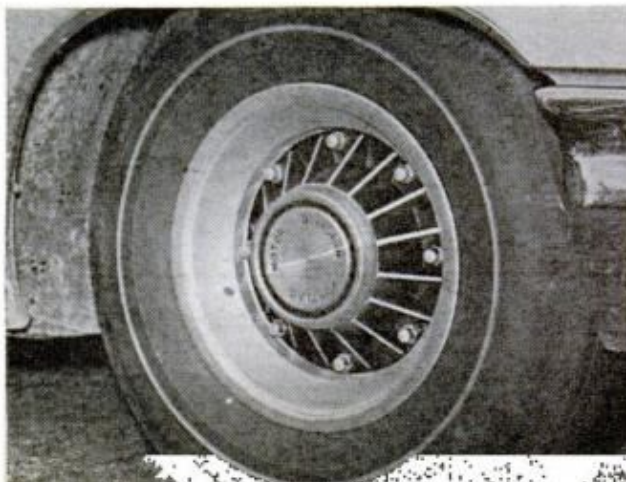
The end of Valiant's rear deck is higher, giving about 15 percent more trunk space.

How the Specifications Change for '65

| MAKE | Wheelbase 1965 Change | | Over-all Length 1965 Change | | Over-all Width 1965 Change | | Wheel Size 1965 Change | | ADVERTISED BASIC HORSEPOWER | |
|---------------------------------|--------------------------|------|--------------------------------|------|-------------------------------|-------|---------------------------|------|-----------------------------|--------------------------|
| | 1964 | 1965 | 1964 | 1965 | 1964 | 1965 | 1964 | 1965 | 1964 | 1965 |
| BUICK Special | 115 | — | 203.2 | -0.3 | 73.6 | +0.2 | 14 | — | V6 155, V8 210 | V6, 155, V8 210 |
| LeSabre | 123 | — | 216.9 | -1.9 | 80 | +2 | 15 | — | 210 | 210 |
| Wildcat | 126 | +3 | 219.9 | +1.1 | 80 | +2 | 15 | — | 325 | 325 |
| Electra | 126 | — | 222.9 | +0.1 | 80 | +2 | 15 | — | 325 | 325 |
| Riviera | 117 | — | 208 | — | 76.6 | — | 15 | — | 340 | 340 |
| CADILLAC Calais, deVille | 129.5 | — | 224 | +0.5 | 79.9 | +0.2 | 15 | — | 340 | 340 |
| Fleetwood | 133 | +3.5 | 227.5 | +4 | 79.9 | +0.2 | 15 | — | 340 | 340 |
| CHEVROLET full-size | 119 | — | 213 | +3.1 | 79.6 | +2.6 | 14 | — | Six 140, V8 195 | Six 140, V8 195 |
| Chevelle | 115 | — | 196.6 | +2.7 | 74.6 | — | 14 | — | Six 120, V8 195 | Six 120, V8 195 |
| Chevy II | 110 | — | 182.9 | — | 69.9 | -0.9 | 13 | — | Four 90, Six 120, V 195 | Four 90, Six 120, V8 195 |
| Corvair | 108 | — | 183.3 | +3.3 | 69.7 | +2.7 | 15 | — | Six 95 | Six 95 |
| Corvette | 98 | — | 175.1 | -0.2 | 69.6 | — | 14 | — | 250 | 250 |
| CHRYSLER Newport, 300 | 124 | +2 | 218.2 | +2.9 | 79.5 | -0.5 | 14 | — | 265 | 270/315 |
| New Yorker, 300L | 124 | +2 | 218.2 | +2.9 | 79.5 | -0.5 | 14 | — | 290 | 340/360 |
| DODGE Polara, Monaco | 121 | +2 | 212.3 | +2.5 | 79 | +4 | 14 | — | Six 145, V8 230 | 270/315 |
| 800 | 121 | -1 | 212.3 | -2.5 | 79 | — | 14 | — | 265 | 270 |
| Dart | 111 | — | 196.4 | +0.1 | 69.9 | +0.9 | 13 | — | Six 101, V8 180 | Six 101, V8 180 |
| Coronet | 117 | -2 | 204.3 | -5.5 | 75.6 | -0.6 | 14 | — | Six 145, V8 230 | Six 145, V8 180 |
| FORD Galaxie, Custom | 119 | — | 210 | +0.2 | 77.3 | -2.7 | 15 | +1 | Six 138, V8 164 | Six 150, V8 200 |
| Fairlane | 116 | +0.5 | 198.4 | +0.8 | 73.8 | +1.6 | 14 | +1 | Six 101, V8 164 | Six 120, V8 200 |
| Falcon | 109.5 | — | 181.8 | — | 71.6 | — | 13 | — | Six 85, V8 164 | Six 101, V8 200 |
| Thunderbird | 113.2 | — | 205.4 | — | 77.3 | +0.2 | 15 | — | 300 | 300 |
| Mustang | 108 | — | 181.6 | — | 68.2 | — | 13 | — | Six 120, V8-200 | Six 120, V8 200 |
| IMPERIAL all | 129 | — | 227.8 | — | 80 | — | 15 | — | 340 | 340 |
| LINCOLN Continental | 126 | — | 216.3 | — | 78.6 | — | 15 | — | 320 | 320 |
| MERCURY full-size | 123 | +3 | 218.4 | +2.9 | 79.4 | -0.6 | 15 | +1 | 250 | 250 |
| Comet | 114 | — | 195.3 | +0.2 | 72.9 | +1.5 | 14 | +1 | Six 101, V8 164 | Six 120, V8 200 |
| OLDSMOBILE F85 | 115 | — | 204.4 | +1.4 | 73.8 | — | 14 | — | V6 155, V8 210 | V6 155, V8 250 |
| 88 | 123 | — | 216.9 | +1.6 | 80 | +2 | 14 | — | 225 | 260/310 |
| Jetstar I, Starfire | 123 | — | 216.9 | +1.6 | 80 | +2 | 14 | — | 345 | 370 |
| 98 | 126 | — | 222.9 | +0.6 | 80 | +2 | 14 | — | 330 | 360 |
| PLYMOUTH Fury | 119 | +3 | 209.4 | +2.9 | 78 | +2.4 | 14 | — | Six 145, V8 230 | Six 145, V8 230 |
| Belvedere | 116 | — | 203.4 | -3.1 | 75.6 | — | 14 | — | Six 145, V8 230 | Six 145, V8 180 |
| Valiant | 106 | — | 188.2 | — | 70.1 | — | 13 | — | Six 101, V8 180 | Six 101, V8 180 |
| Barracuda | 106 | — | 188.2 | — | 70.1 | — | 13 | — | Six 101, V8 180 | Six 101, V8 180 |
| PONTIAC Catalina | 121 | -2 | 214.6 | +1.6 | 79.6 | +0.4 | 14 | — | 215 | 256 |
| Grand Prix | 121 | -2 | 214.6 | +1.6 | 79.6 | +0.4 | 14 | — | 308 | 333 |
| Star Chief | | | | | | | | | | |
| Bonneville | 124 | +1 | 221.7 | +1.7 | 79.6 | +0.4 | 14 | — | 235 | 256/333 |
| Tempest | 115 | — | 206.1 | +3.4 | 73.1 | -0.2 | 14 | — | Six 140, V8 250 | Six 140, V8 250 |
| RAMBLER American | 106 | — | 177.25 | — | 70.84 | +2.28 | 14 | — | Six 90 | Six 90 |
| Classic | 112 | — | 195 | +5 | 74.5 | +3.18 | 14 | — | Six 127, V8 198 | Six 128, V8 198 |
| Ambassador | 116 | +4 | 200 | +10 | 74.5 | +3.18 | 14 | — | 198 | Six 155, V8 198 |
| STUDEBAKER Lark | | | | | | | | | | |
| Daytona | 109, 113 | — | 190, 194 | — | 71.5 | — | 15 | — | Six 12, V8 180 | Six 120, V8 195 |
| Cruiser | (4-dr.) | | (4-dr.) | | | | | | | |

ARE WHEEL COVERS OBSOLETE? Pontiac integral brake drum-cum-wheel looks good and is practical. Open to the air stream, it dissipates brake heat fast

PONTIAC IS DEVOTING special attention to brake cooling; even their lowest-priced line of wheel covers has cooling louvers stamped in to carry away heat



**TRANSMISSION TYPES AVAILABLE
1965**

3-spd., 4-spd. (V8), 2-spd. auto.
 3-spd., 2-spd. auto.
 3-spd., 4-spd., 3-spd. auto.
 3-spd. auto.
 3-spd. auto.
 3-spd. auto.
 3-spd. auto.

3-spd., o. d., 4-spd. (V8), 2-spd. auto.
 3-spd., o. d., 4-spd. (V8), 2-spd. auto.
 3-spd., 4-spd. (V8), 2-spd. auto.

3-spd., 4-spd., 2-spd. auto.
 3-spd., 4-spd., 2-spd. auto.

3-spd., 4-spd. (300), 3-spd. auto.

3-spd. (300L), 4-spd. (300L), 3-spd. auto.

3-spd., 4-spd., 3-spd. auto.
 3-spd., 4-spd., 3-spd. auto.
 3-spd., 4-spd. (with optional engines), 3-spd. auto.
 3-spd., 4-spd. (V8), 3-spd. auto.

3-spd., 4-spd. (high-performance V8s), 3-spd. auto.
 3-spd., o.d. (V8), 4-spd. (V8), 3-spd. auto.
 3-spd., 4-spd. (V8), 3-spd. auto.
 3-spd. auto.
 3-spd., 4-spd., 3-spd. auto.

3-spd. auto.
 3-spd. auto.

3-spd., 4-spd., 3-spd. auto.
 3-spd., 4-spd. (V8), 3-spd. auto.

3-spd., 4-spd., 3-spd. auto.
 3-spd., 4-spd., 3-spd. auto.

3-spd., 4-spd., 3-spd. auto.
 3-spd., auto.

3-spd., 4-spd. (optional V8s), 3-spd. auto.
 3-spd., 4-spd. (high performance V8) 3-spd. auto.
 3-spd., 4-spd. (optional engines), 3-spd. auto.
 3-spd., 4-spd. (optional engines), 3-spd. auto.

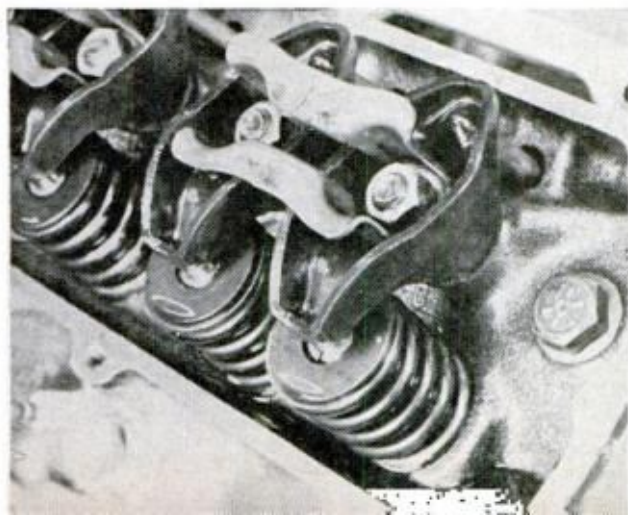
3-spd., 4-spd. (Tri-Power engines), 3-spd. auto.
 3-spd., 4-spd. (Tri-Power engines), 3-spd. auto.

3-spd., 4-spd. (Tri-Power engines), 3-spd. auto.
 3-spd., 4-spd., 2-spd. auto.

3-spd., o. d., 3-spd. auto.
 3-spd., o. d., 3-spd. auto.
 3-spd., o. d., 3-spd. auto.

3-spd., o.d. (V8), 3-spd. auto.

CYLINDRICALLY PIVOTED stamped sheet-metal rocker arms in Olds Super Rocket V8 have hollow pushrods for individual lubrication and better oil control



Both Valiant and Dart have rearranged some gauges, though both kept wiper and headlight controls cheek by jowl. Don't grab the wrong one on a rainy night.

A four-barrel version of last year's 180-hp., two barrel 273-cu.-in. engine is now available. The new edition, called the Commando 273, gets a 10.5:1 comp ratio, largely from domed pistons that squeeze the charge harder. This V8 is rated at 235 horses at 5200 r.p.m. It is also the top option for Plymouth's Barracuda.

The big Six—a 225-incher—is still to be rated at 145 hp., but Dodge says it performs better in the passing-speed range.

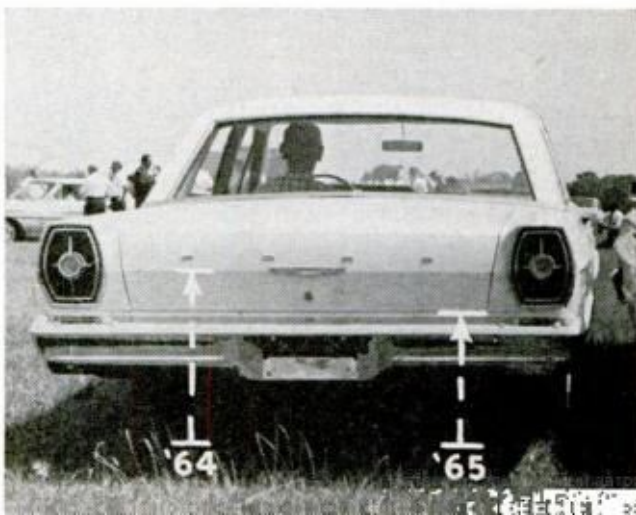
We found the Dart 270 wagon (with the basic V8) less heavy and loose feeling in the rear than expected from a wagon. It started from a dead stop on a seven percent grade with little labor.

RAMBLER AMERICAN is the only American Motors car to keep its major '64 dimensions. Both front and rear overhang are minimal. Although 14-inch wheels are standard, 15s are available.

The American still keeps its 90-hp. L-head Six with its single-barrel carb and 196.6 cubic inches of displacement, but it is standard only in the 220 and 330 series. Perhaps it is not long for the road, because breathing and service (especially valve work) with L-heads are problems.

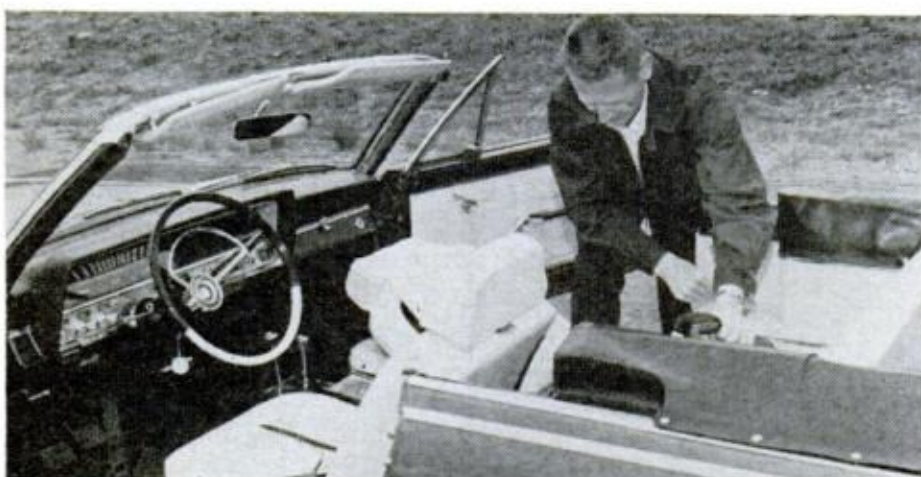
RAMBLER'S CLASSIC may have one of the finest braking combinations around for a family car. To the double master cylinder of the past you can now add Bendix disks in front. In keeping with the non-servo, hence non-grab, characteristics of the disks, the 10-inch rear drums are non-servo, too. The set-up wasn't available on the prototypes we drove, but Bendix disks on earlier cars have been

FOR EASIER LOADING, Ford trunk lower lip has been dropped 5.4 inches from '64. New perimeter frame and absence of leaf springs leave more trunk room

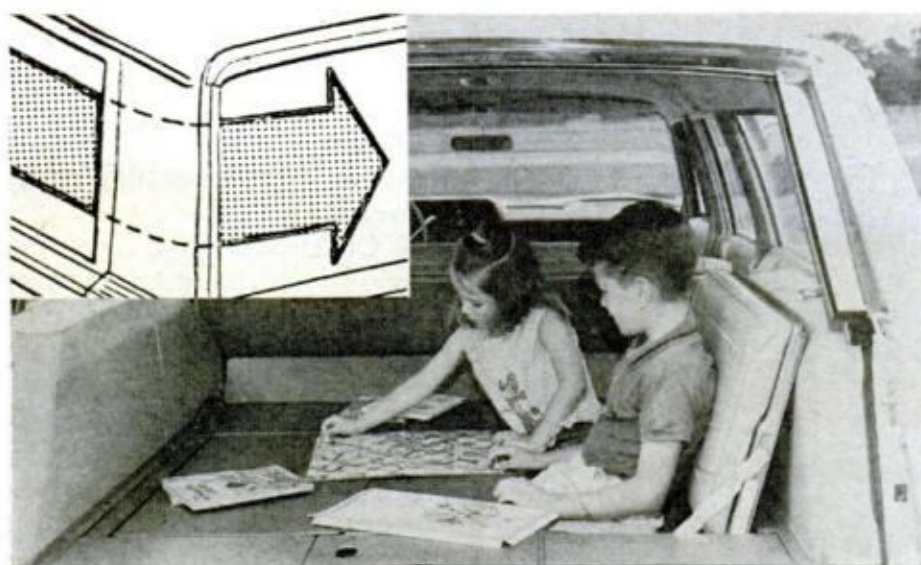




VINYL ROOF COVER, chromed window moldings jazz up the Studebaker Sport Sedan. Engines in entire line of Studebaker will come from GM; basic Six and V8 horsepowers are slightly higher than '64 Studes



OPTIONAL RECLINING seats in two-door Ramblers fold forward farther for easier entrance and loading. Number of reclining positions has been increased from five to seven. Ignition lock now is lighted for night driving



FORD WAGON with extra rear seats provides made-to-order "desk space" for youngsters when one of the seats is folded down. An optional under-seat heater keeps rear warm. Built-in rear scoops route air across rear window, keep it clean

good and these are reported better.

Your best chance to perform in a Classic comes with the 327-inch, 270-hp. V8 with four-barrel carburetor. And you can do it in a convertible this year.

Some extra ridges in sheet metal are gone from the '65 Classic, while a protruding grille has been added. Length is up five inches to 195, resulting in another 1.5 cu. ft. of trunk space. Wheelbase is still 112 inches.

CHEVROLET, like Ford, Cadillac and last year's Chevelle, has adopted perimeter frames. K-shaped diagonal frame braces stiffen the front end of Chevy's frame,

where Ford uses a straight-across brace.

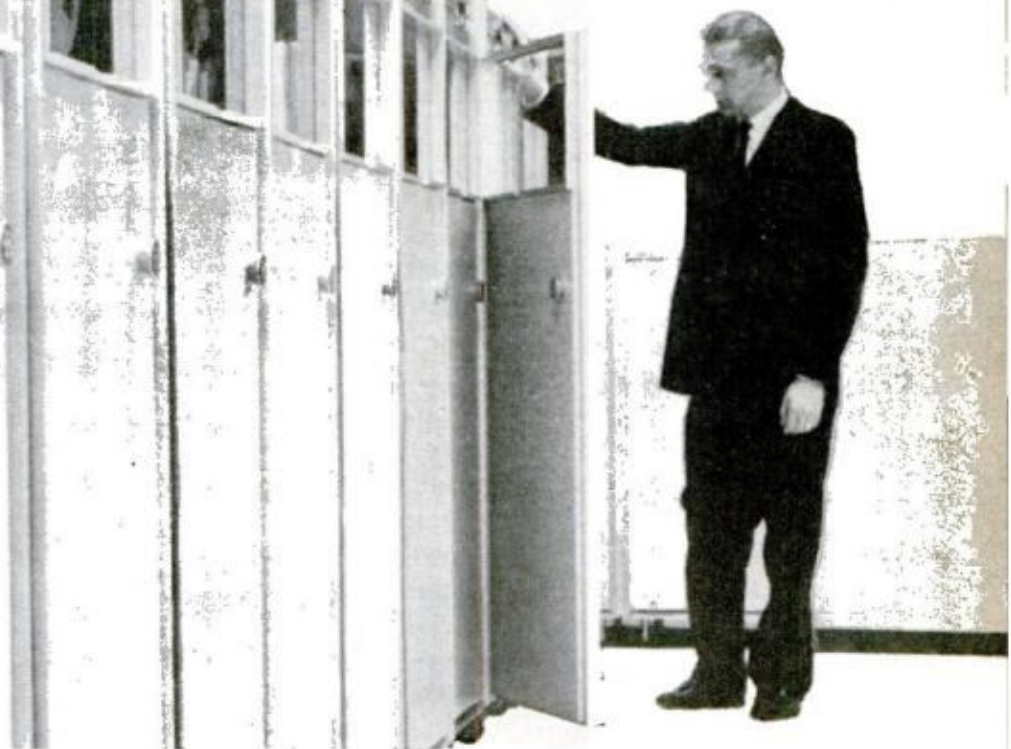
Chevy's perimeter frames replace the very rigid X-type framing. As one frame manufacturer puts it: "The idea that beefing up a frame is always good is on the wane. You don't have to be heavier to be better. Most important is that the frame and body work together dynamically."

How dynamically Chevrolet's new perimeter frame works with the body is difficult to pinpoint, because its front spring rates are dramatically reduced while rear coils are stiffer. The Impala we tried still had a lush, lullaby ride and control felt

(Please turn to page 228)

They'll Tell You How You'll Vote

Before the polls close, electronic computers, having calculated voting history, probed swingometric precincts, damped out party bias, will announce the next U.S. President. Here's how it works



By Clifford B. Hicks

ON THE EVENING of the first Tuesday after the first Monday of November, computers will proclaim the next President of the United States.

Long before millions of voters in California, Hawaii and Alaska have even gone to the polls, you'll know the name of the winner and his approximate margin of victory.

Although pollsters frequently have been wrong, the thinking machines have run up an incredible record of speed and accuracy in projecting the winners of recent elections.

In the photofinish California primary, an ABC computer declared Goldwater the winner just 22 minutes after the first precinct closed its doors, but network officials cautiously held off more than two

BIG BRAIN for ABC network on election night will be the B5000 computer (shown). It can store 250,000 bits of information and run 20-odd programs simultaneously

hours before they had enough confidence in their own machine to put its projection on the air. CBS had the courage to put its Goldwater prediction on the air 23 minutes after the polls closed, and the computer projected the winner's percentage with eerie accuracy. NBC, even more timid than ABC, waited more than four hours before announcing its computer's projection, which had been accurate all along. While he waited, NBC's David Brinkley wryly remarked about the CBS projection, "All we can do now is hope they're wrong, which I suspect they're not."

They weren't. All the computers accurately called Goldwater the winner within minutes, even though 15 hours later the vote count showed Rockefeller in the lead. As inexorably as though the computers were writing the rules, Goldwater slipped ahead and won the primary.

Back in 1960, during the closest Presidential election in the nation's history, the NBC computer named Kennedy the winner at 8:20 P.M., EST, even though Nixon was considerably ahead at that moment. This close election almost—but not quite—fooled some computers. Working on incomplete returns, the ABC and CBS computers at first tabbed Nixon the winner, but later changed to project the correct winner, the popular vote and the electoral vote with hairsplitting accuracy before the vote was in.

In the startling New Hampshire primary, swept by dark horse Henry Cabot Lodge this year, the CBS electronic brain gave Lodge the victory at 7:18 P.M., EST. Actually, the computer had told the network 30 minutes earlier that Lodge would be the winner—but the network played it cozy. In the Maryland primary, the CBS computer indicated that Governor Wallace would wrap up 40 to 45 percent of the votes, which he promptly proceeded to do as though on signal.

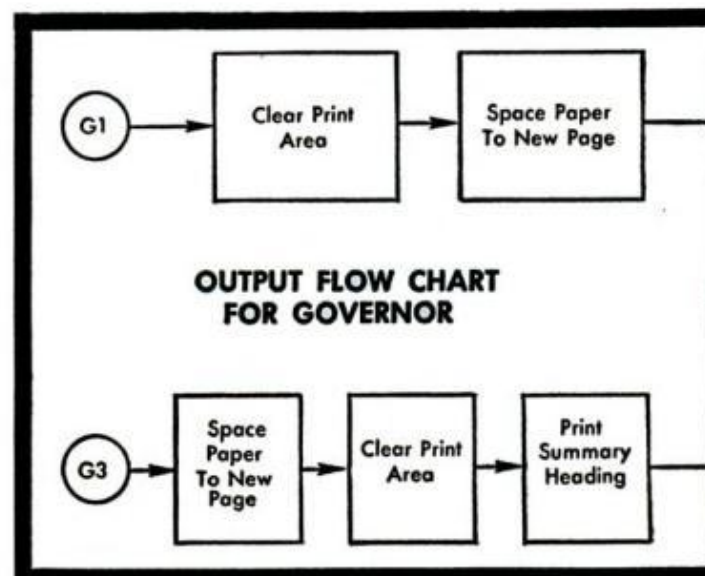
In another upset, the ABC computer predicted Rockefeller's Oregon primary victory just 12 minutes after the polls closed.

The computers apparently have been too efficient. Voters are beginning to resent the apparent mental telepathic ability of those big boxes of humming electronic gear. There is an uneasy feeling that they are *determining* voter behavior.

What's the secret of the computer's election-guessing success?



THE MAN behind the brain, Dr. Jack Moshman, begins intricate job of working out the "mathematical model" that will indicate types of information needed



The key, of course, is the human brain behind the electronic brain. Programming election computers is a young business. One of the old pros in this field is Dr. Jack Moshman, who supervised the programming of the NBC computer that was first on the air with its projection of the 1960 Kennedy victory, and also the ABC computer that predicted Rockefeller's upset victory in the Oregon primary.

Dr. Moshman, a genial young mathematician whose precise mind stores more electoral lore than most practicing politicians, is vice president of C-E-I-R (formerly the Corporation for Economic and Industrial Research). The firm's basic business is programming computers for corporations.

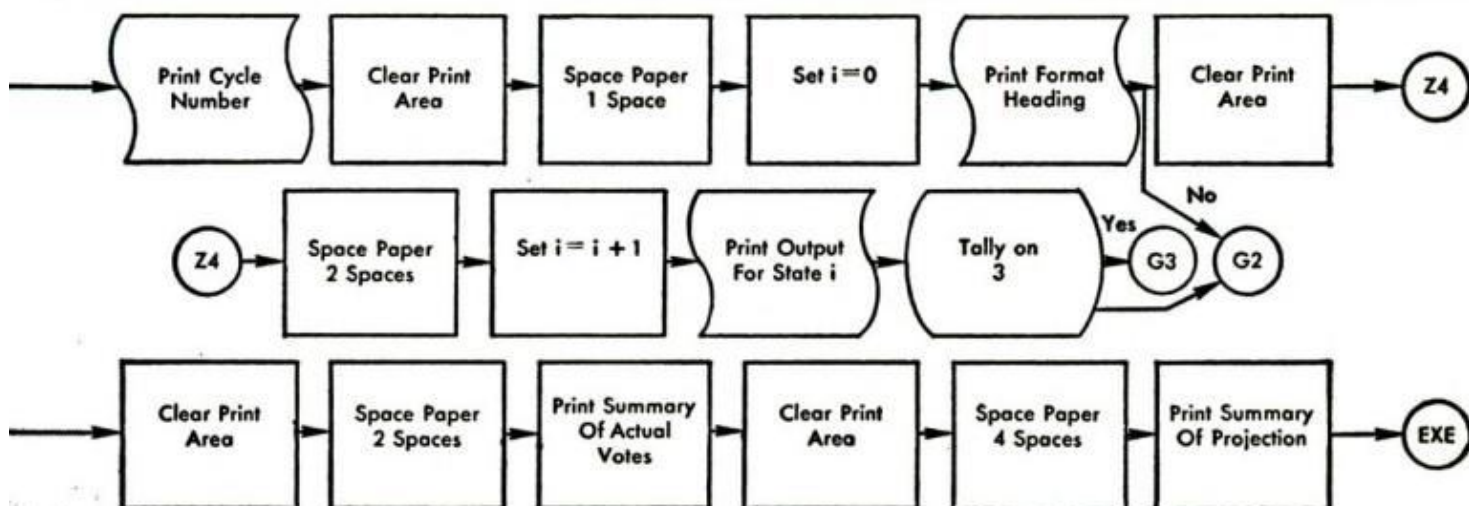
"RCA officials approached us in January of 1960," recalls Dr. Moshman. "NBC



KEY PRECINCTS are chosen, then researcher gathers data used to determine their past voting behavior—information that's stored in the computer's memory



TAPED DATA are stored on reels for quick selection by computer itself. Reproduced below is section of actual flow chart showing typical one-step commands



was planning to use one of their computers in the forthcoming Presidential election. We were asked to program it. If you reduce the problem to its basics, it's similar to many industrial problems. The principal difference is that time is a critical factor. In an election, the measure of success is to be first on the air with the name of the winner.

"That year we made an early projection of a hairline Kennedy victory. As a result we were asked to program the NBC computer for the 1962 mid-term elections, and again had considerable success. This year RCA is programming its own computer for NBC, and we are handling the computer for ABC."

Despite all the electronic showmanship of election night, a computer does *not*, of course, determine an election, it does *not*

simply total votes, nor does it *guess* at the outcome. Basically it does two things: It *compares* the tallies from early-voting precincts with a tremendous wad of information from previous election history stored in its memory system; it then *projects* the outcome based on the balloting behavior of early voters.

Thus if the computer is to hit on target, its programmers must:

1. Store it full of accurate information of the correct type.
2. Select early-voting precincts which are in some way representative of the nation as a whole.

The tremendous effort to feed information into the computer's blank mind starts months before names of the candidates are even known.

First, a small group of experts work



BEDLAM REIGNS in computer room on election night. As soon as key-precinct tally is phoned in, one of girls (left) punches a card for the computer to "read"



ABC NEWSCASTERS, Howard K. Smith (left) and Edward P. Morgan, confer with political analyst Oliver Quayle (center) during coverage of Oregon primary

out the "mathematical model" which must take into account all the major and minor peculiarities of the convulsion that shakes American democracy every four years—from the oddities of the electoral college system to the inordinately strong Republican leanings of the earliest-reporting precincts in Maine. The completed model consists of thousands of algebraic equations indicating what types of information—including political information—must be stored in the computer. In order to obtain the political information required, C-E-I-R leans heavily upon a group of outside experts with political savvy, men who have made an intensive study of the vagaries of local politics for years. They know (or can quickly find out), the precise closing time of a precinct anywhere in the country; whether the local election official will release results promptly; whether there is a strong local issue that might affect the Presidential vote; whether a new superhighway or apartment complex has chopped up a particular precinct.

Meanwhile still another group of skilled researchers is sifting and evaluating other data. Dividing the country into small areas, they analyze information from diverse sources on race, age, sex, marital status, occupations, bank deposits, agricultural income, retail and wholesale trade, mineral industries, taxable property and a hundred other factors that could affect an individual as he puts his X on the ballot.

After all this relevant political and demographic information has been stored

magnetically in the computer, the programmers take over. Using the mathematical model as a guide, they write detailed instructions in the form of one-step commands to the computer. A series of such steps (in English rather than computer language) might be:

"Pick up latest returns from key precincts in Kentucky, Indiana and Illinois; from your memory, retrieve the traditional Democratic bias in Illinois at this moment and in past elections; make the necessary adjustments; check the result for accuracy; add these new state figures to your totals; check result for validity; project this figure as a total national popular vote; determine how these additional figures will affect the electoral vote; project the new total vote for each of the three states; and determine how this will affect the Senate and House races in each of the states."

It's enough to produce an electronic headache.

The correct programming of the computer thus is one of the two keys to accuracy on election night. The other is the selection of precisely the right "bellwether" precincts.

The philosophy behind *all* election-computer programs is the selection of a relatively few key precincts, the early determination of how they are voting, and the projection of these into national figures. Bellwether precincts must, in one way or another, be an accurate reflection of the entire country. But computer groups differ in the way they select their key precincts.

"There are three philosophies," says Dr. Moshman. "Some choose precincts which they feel are each representative of the country as a whole. They try only to find precincts that have mirrored the national vote in past elections. They depend upon early returns to be accurate.

"A second philosophy is to select each precinct as representative of some group particularly sensitive to one of the campaign issues. Racial, ethnic and economic considerations are fed into the data mix. These programmers put together a massive jigsaw puzzle. Each precinct is weighted according to factors it is believed to represent. When each piece of the puzzle is in place, you hope you have a picture of the entire country.

"We have a third philosophy somewhere between the other two. We select precincts that are either representative of the country as a whole, or of some significant factor in the election. Using this technique, we feel, we don't need the large numbers of early returns required by the first philosophy, nor are we completely strung up by the second philosophy if a key precinct—a part of the jigsaw puzzle—fails to report."

Dr. Moshman indicates to his political advisors the criteria he demands in his key precincts, then leaves the final decision to them. In order to pass the exhaustive test

as a bellwether:

1. The precinct must be "swingometric," which means that in two or more elections, its percentage of popular vote for each party must have mirrored the national "swing."

2. The precinct must report early. Obviously, to be first on the air you must have a group of early-reporting precincts. Kentucky is always the first state to report, so it is a favorite with most programmers. Also, it contains Louisville, a sizeable city in a border state, with precincts that can be selected to represent almost any issue. After Kentucky, Connecticut is an early reporter (Bridgeport precincts are favorites), as are Ohio, Pennsylvania and New Jersey.

3. The precinct boundaries must have been unaltered since the last election.

4. The precinct's population must be relatively stable. People-movement has affected many precincts that otherwise were swingometric. Racial blocs are on the move. The average American family now moves once every five years. Finding stable precincts is a problem.

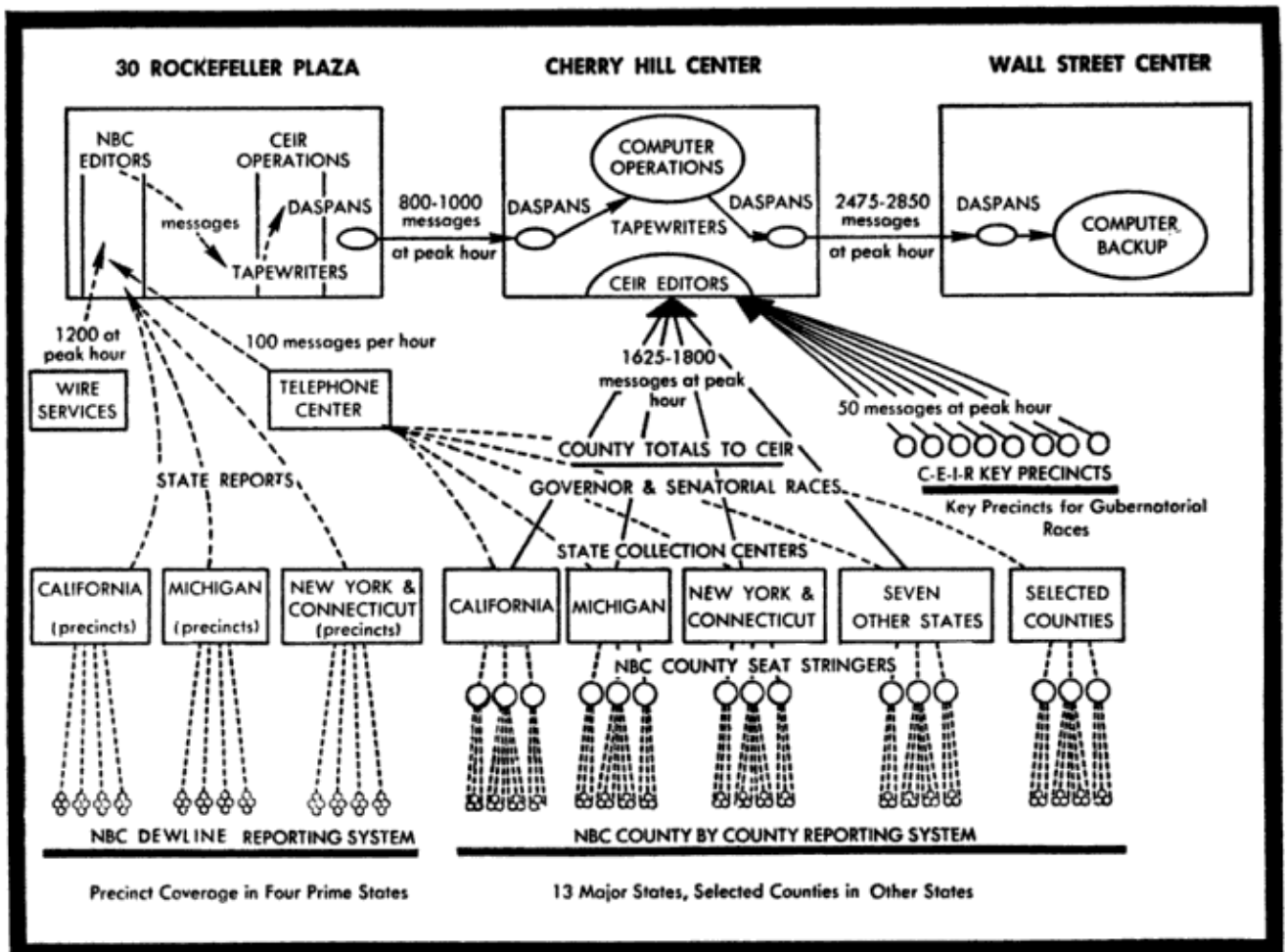
5. The precinct must contain no sizeable minority group or voting bloc that will make it exceptional, *unless it is selected for this very reason.*

After the key precincts have been

COMPUTER PRINTOUT produced in the California primary race is in computer language. It takes a computer man to translate it into intelligible English

Partial Computer Printout from California Primary

| | | | | | |
|--|------------|--------|--------|--------|---------------|
| Relative importance of "jth" California Congressional District..... | EQUALS.... | 10.26, | 9.57 | | |
| Proportion of key precincts in "jth" District reporting..... | EQUALS.... | 100.00 | | | |
| Overall fraction of "jth" District precincts reporting..... | EQUALS.... | 63.93 | | | |
| <u>DISTRICT NO. 4</u> | | | | | |
| Combined projection | 40.87 | 59.14 | 5.81 | 48.27 | 6.14 39.77 |
| Baseline projection, including poll results | 28.20 | 71.80 | 5.20 | 64.20 | 3.40 27.20 |
| Key precinct results | 43.76 | 56.24 | 9.24 | 45.80 | 5.24 43.70 |
| Preliminary projection based on baseline, including poll and key precincts | 40.45 | 59.55 | 5.23 | 49.48 | 4.87 40.40 |
| Standard deviation of key precinct returns | .01126 | .01126 | .00565 | .05136 | .01732 .05089 |
| Vote | 41.27 | 58.73 | 6.96 | 45.86 | 5.47 39.50 |
| Relative importance of "jth" California Congressional District..... | EQUALS.... | 9.52, | 11.71 | | |
| Proportion of key precincts in "jth" District reporting..... | EQUALS.... | 100.00 | | | |
| Overall fraction of "jth" District precincts reporting..... | EQUALS.... | 62.65 | | | |
| <u>DISTRICT NO. 5</u> | | | | | |
| Combined projection | | | | | |
| Baseline projection | | | | | |



DATA FLOW chart for 1962 election. Though most returns go to election headquarters (upper left), data from key precincts go directly to computer center

chosen, the voting records of the states in which they fall are studied in order to feed instructions into the computer regarding "party bias." For example, when five percent of Maine's *total* precincts have reported, the state generally shows 15 percent more Republican votes than it eventually will show, simply because predominantly Republican precincts report earlier than the rest of the state. In Florida an early Democratic bias gives way to a Republican bias which eventually is dampened to zero.

The computer must make corrections for such biases in its calculations at any given point. It must, in effect, watch the clock, and damp these biases to zero from beginning to end of the long moment of truth that is election night.

In Dr. Moshman's office are three large maroon-bound books that represent C-E-I-R's own detailed evaluation of its work in past elections. When I asked Dr. Moshman if I could borrow them for study, he was reluctant to agree, for the books contain his company's top-secret information in the election-computer business. When I asked what types of information

were trade secrets, he mentioned the biases of past elections, and how the computers were instructed to damp them out. He needn't have worried. About half the pages of each book were covered with the hen-scratches of a foreign language—long and complex algebraic equations. I didn't have the slightest idea which sections were trade secrets.

This year Dr. Moshman is working with 1½ million dollars worth of electronic gear—the Burroughs B5000 computer. In February its vast memory system stood empty, ready to soak up data. Without any attachments the computer can memorize 250,000 bits of information. For this election, two residual memory drums have been coupled to the computer, each capable of storing 250,000 additional bits. Still more information will be stored on 16 magnetic tape units.

Dr. Moshman feels that the B5000 has one major advantage over election computers he has programmed in the past. It is not only capable of carrying forward 20-odd programs simultaneously, but it *tries* to do this. In most computers, when

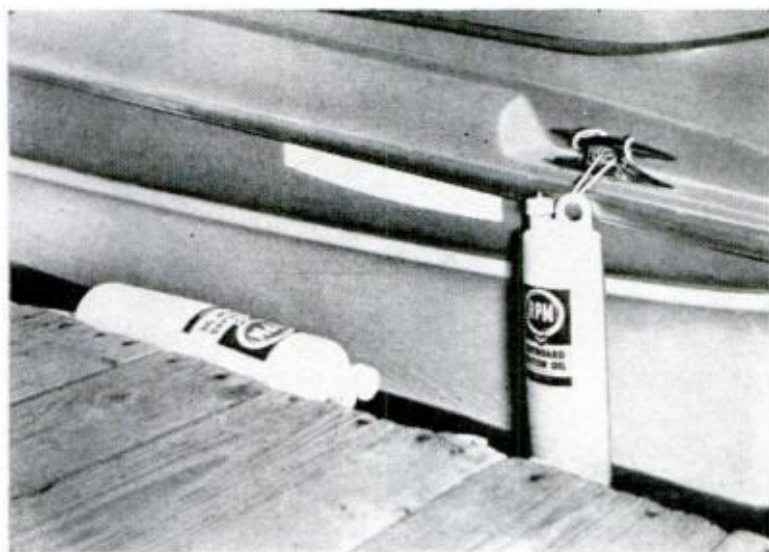
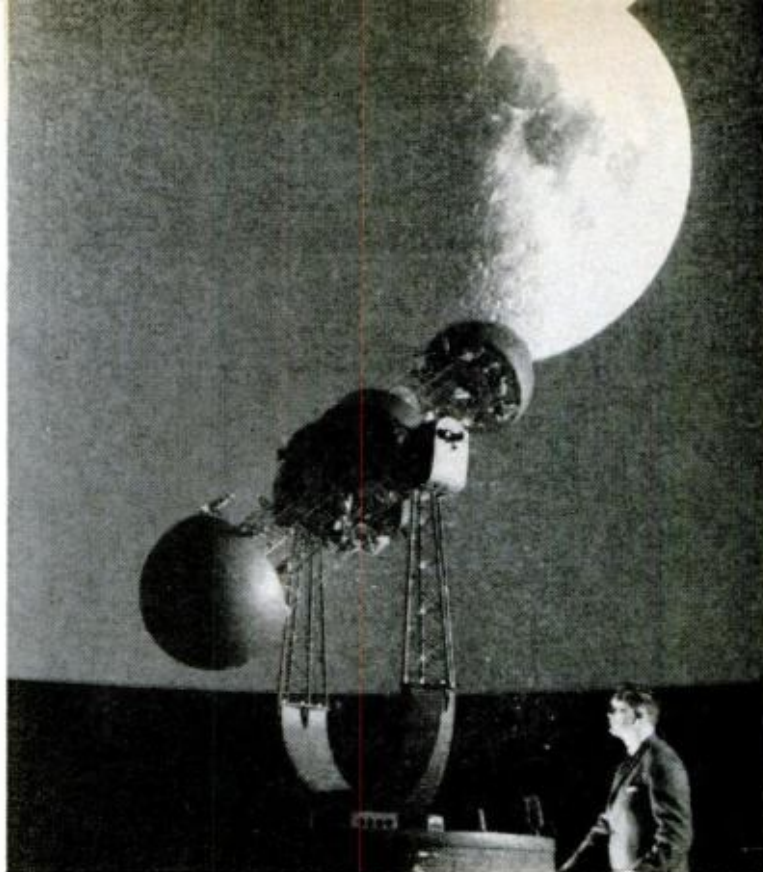
[\(Please turn to page 222\)](#)

Projects Astronaut's View

A space traveler's view of the sky can be shown on the star projector at Michigan State University's new planetarium.

The projector has three axes of rotation instead of the usual two, enabling it to show the heavens not only as they appear from any place on earth, but also as they would appear to an astronaut on the moon or traveling in space.

Subminiaturization of component parts has kept weight of projector below 1000 pounds—compared with the several tons of most older instruments—and enhanced mobility. Called the Spitz Intermediate Space Transit Planetarium, the projector was manufactured by Spitz Laboratories of Yorklyn, Del.



Free Fenders

Boaters can now buy outboard oil in two-quart plastic bottles designed for reuse as boat fenders. The containers, 12½ inches long and 3½ inches in diameter, feature molded-in grommets at both ends for securing lines.

Currently marketed in the East by California Oil Co., they have just been introduced in the West by Standard and Chevron dealers. California Oil Co. is now developing one, two and five-gallon bottles of similar design.

Airplane Lean-To

Adapting a tent often used as an automobile lean-to, a pilot took a flying vacation, sleeping in the tent rigged to his plane.

He attached the awning to the wing instead of using poles, and secured only the rear guy ropes to the ground. The tent, made by the H. Wenzel Tent & Duck Co. of St. Louis, Mo., has a base of 7 by 7 feet and is 6 feet high at front. It also features a screened front with zipper opening and rear screened window.



Ready for Your Daily

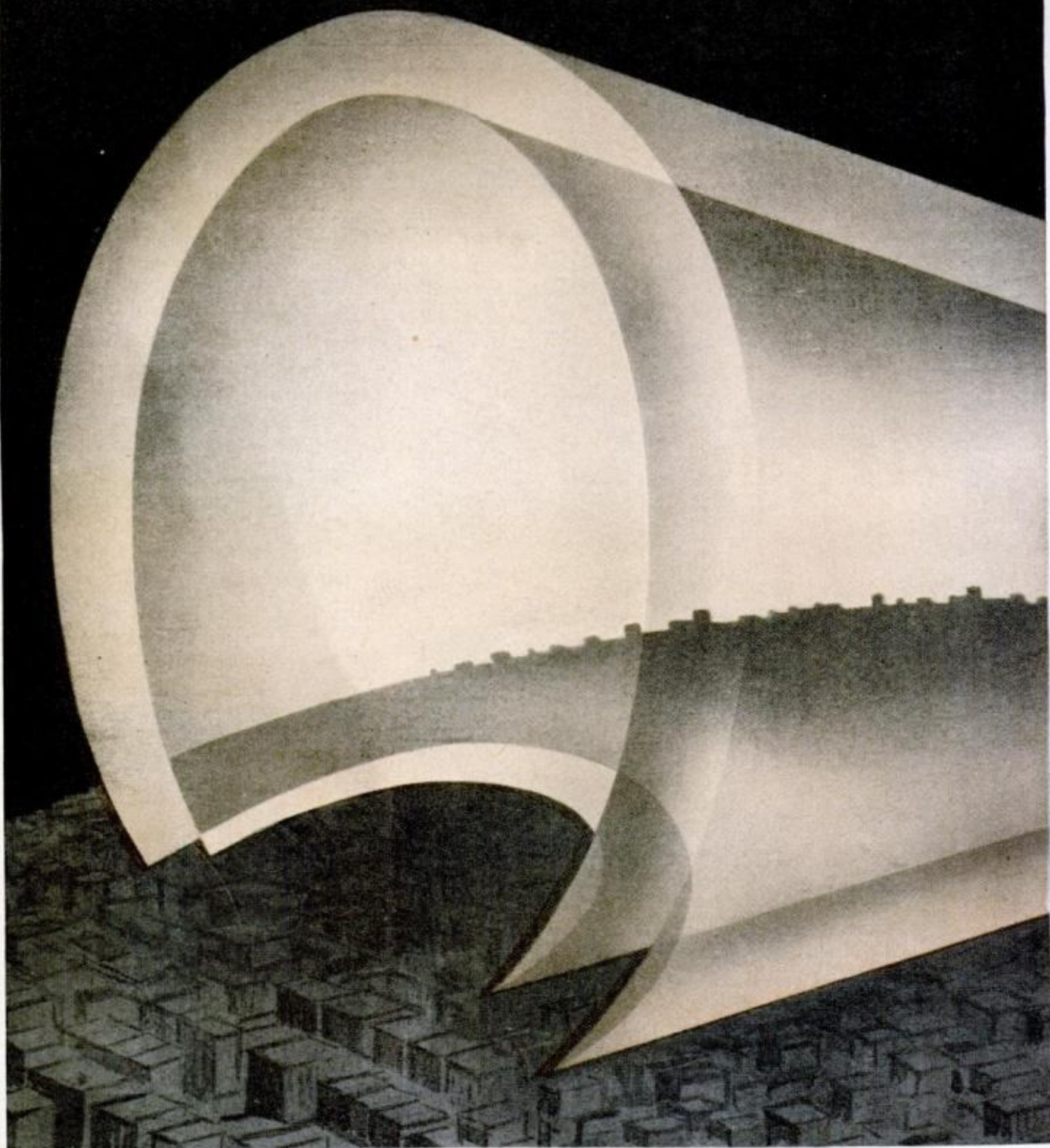
Supersonic flights will make sonic booms, shocks and noises our constant companions. New tests show whether we can learn to live with these sounds in comfort

By Kevin V. Brown

Aviation Editor

MY TRAVELING ALARM woke me dutifully at 6:55 one morning last summer. Hurriedly I rubbed the sleep out of my eyes, and remembered that I was lodged in a motel near Oklahoma City, Oklahoma. I had to be wide awake by 7 o'clock.

I was brushing my teeth when the first one came over. There was a loud crack; the bathroom window rattled,



Sonic Booms?

and it seemed the floor and walls shook. Or did they? I stood there momentarily, trying to analyze my reactions. I couldn't have been scared, because I was expecting it, but it was still a little startling.

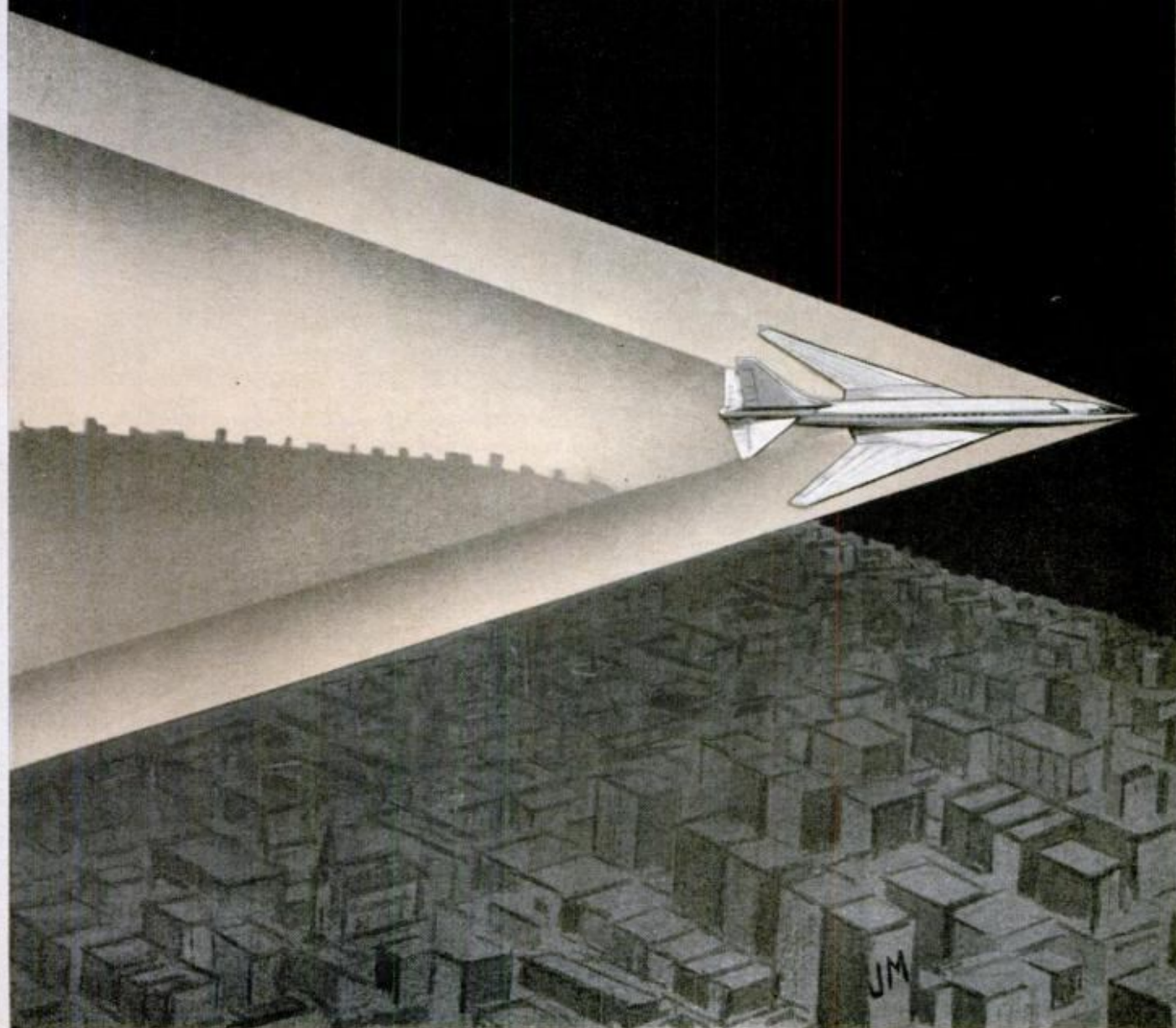
Twenty minutes later, while eating breakfast in the motel restaurant, it happened again. The noise shook the huge plate-glass window and, again,

almost imperceptibly, it seemed the room moved. Or was it me?

I looked around for confirmation. The waitress was busy pouring coffee, and her customers were busy with their eggs. The man next to me didn't even look up from his newspaper.

Essentially, that's the story of the sonic boom. If you're used to it, you can almost ignore it. I wasn't and

SONIC BOOMS trail from nose and tail of supersonic transport as horizontal cones. When bottom of cones reach ground, noise and pressure will jolt residents and, if severe enough, crack plaster and break glass windows



I didn't. But, there's more to the story than that.

It's too complicated and too controversial a story to brush off so easily, and some of the facts still aren't in. The Oklahoma City tests, during which Air Force planes under the direction of the Federal Aviation Agency boomed the city eight times daily, lasted only 26 weeks. No one really knows what the long-range effects will be.

And time is running out. This month the FAA was to announce its conclusions from the Oklahoma City tests, and next month the winner may be chosen in the design competition to build our first SST.

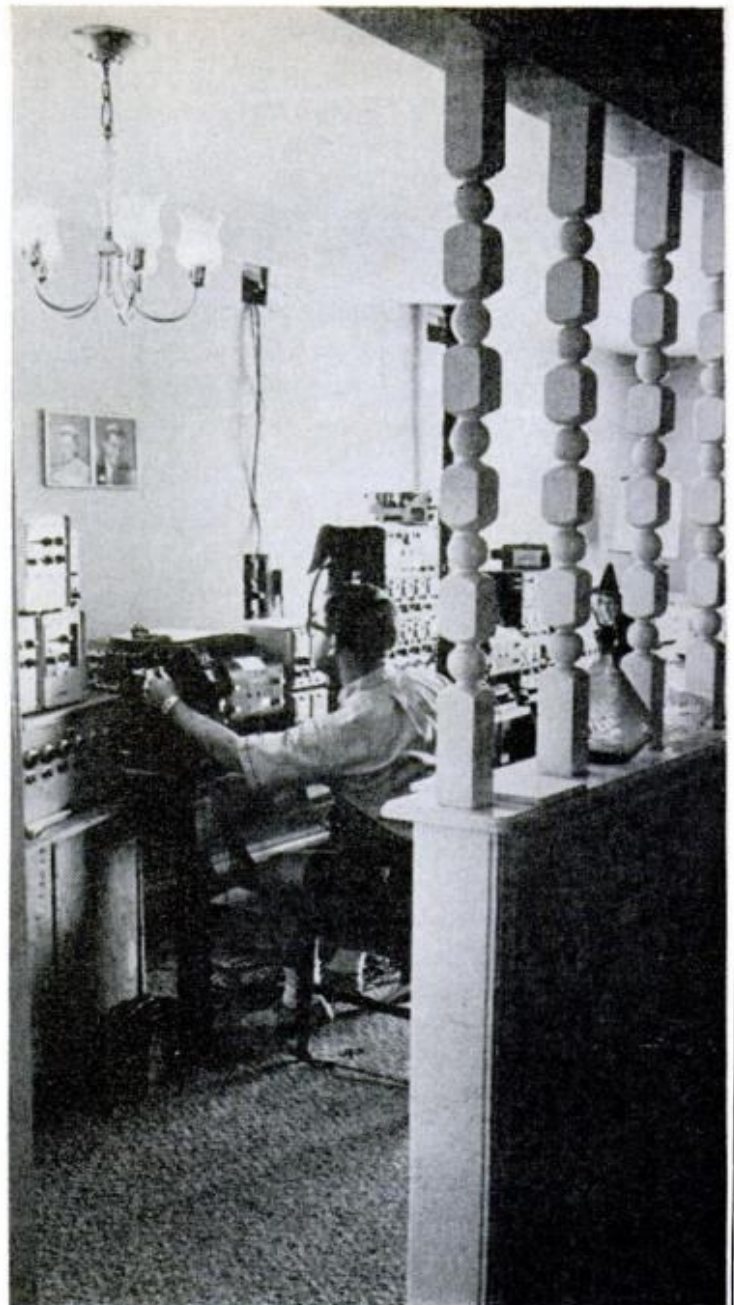
So, as the walrus said, the time has come to talk of many things, but especially of sonic booms. Because, ready or not, here they come!

Just what is a sonic boom, and how will it affect the average citizen?

Technically, sonic booms have always been with us. Any time an object flies through the air faster than the speed of sound, it creates a sonic boom. The "crack" of a bullwhip is a miniature sonic boom; at the instant the tip flips around it is traveling faster than sound. But the boom we're talking about began in October, 1947, when Capt. Charles Yaeger pushed the X-1 through the sound barrier.

Following that, military planes were

FAA TESTS in Oklahoma City rigged typical home with instruments and deployed mobile units to record shock of sonic booms



BOOM ROOM inside home was loaded with \$100,000 worth of recording equipment, as well as usual bric-a-brac, chandeliers, pictures and middle-class furniture



built to fly at supersonic speed but, with some lapses, they did—and still do—most of their supersonic flying in restricted areas away from populated zones. The supersonic transport, however, will fly commercial routes daily, bringing the sonic boom, almost literally, into every home.

Can we take it? What we'll be expected to take is "a pressure wave of air created by an aircraft moving at or above the speed of sound." That's the FAA's definition of the boom. More colloquial definitions go back to Charlie Yeager's time.

If an aircraft is flying slower than the speed of sound, its sound, naturally, travels away in all directions faster than the plane. The sound moving ahead of the craft, warns the air molecules in front to move out of the way. However, when the aircraft reaches the speed of sound (760 m.p.h. at sea level) and moves ahead of it, the air, naturally, has had no warning, so it hasn't moved out of the way. It's still there, all along the flight path. The nose and all leading edges of the aircraft push against this wall of air, piling up the sound waves and adding all their small energies together to create a wave of highly compressed molecules—a pressure or "shock" wave. The plane sheds this shock wave in a three-dimensional pattern, like an ice cream cone lying on its side. But that's

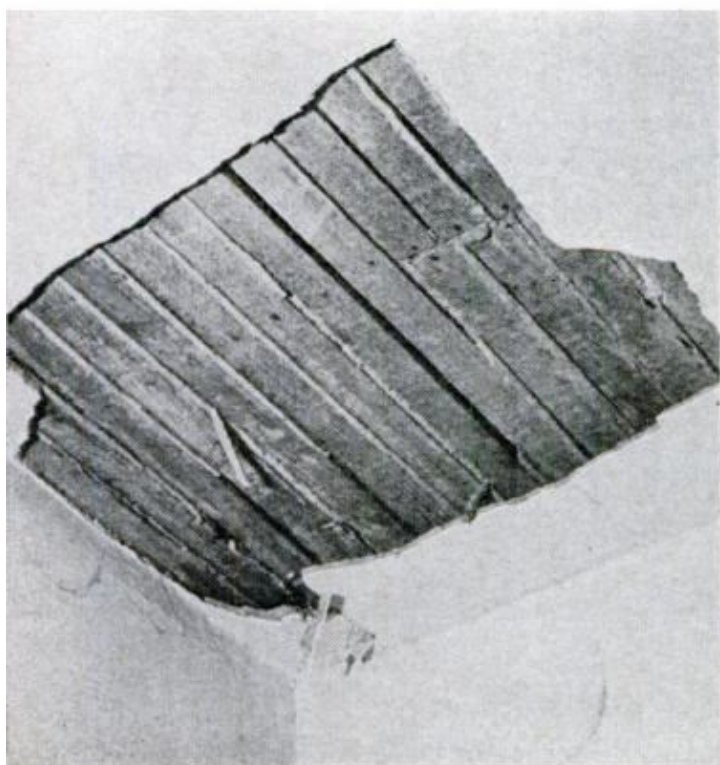
not quite all. Combined shock waves from all of the crafts' leading edges meld into two basic cones, one at the bow and an almost-identical trailing wave of lower pressure at the tail. So the shock wave pattern is actually like two ice cream cones nested—one inside the other. At ground level these are sometimes, but not always, heard—and felt—as a distinct boom-boom. For simplification, however, we'll speak of the two cones as one.

The sonic waves, remember, are three-dimensional: they go in all directions. Planes flying above or at the side of a supersonic plane will hear and feel the sonic waves as well as people on the ground. This is one more problem.

However, it's the part of the wave that reaches the ground that causes the most concern to the greatest number of people. And, when it reaches the ground, it is measured in "overpressure"—pounds per square foot over normal atmospheric pressure (2116.8 pounds per square foot at sea level). As of now, the FAA feels that 2-p.s.f. overpressure is the maximum allowable, and 1.5 p.s.f. or lower is more desirable. Above two, the boom can break windows and crack plaster and sound like distant thunder or nearby artillery, depending on the overpressure.

The amount of overpressure is impor-

WET PLASTER, along with plate glass, is most vulnerable to shock of sonic boom. Oklahoma City resident claimed boom tore this hole in his ceiling



TEST EQUIPMENT in FAA home included strain gauges attached to structural member to record amount of displacement from boom. Microphones recorded sound





TELEPHONE CALLS received during Oklahoma City tests peaked during second week, then fell drastically after residents got used to hearing daily booms

tant, because in some ways it can be controlled. The design of the airplane is one way. The length of the plane affects the volume of air that will be disturbed, and so does the area distribution. A supersonic plane shaped like a boiler would certainly create a greater sonic wave than one with a pointed nose and smooth, slim airfoils. Also, the distribution of the lifting surfaces and the plane's gross weight can affect the size of the wave, especially when the plane changes its angle of attack, as in turns, climbs, dives or acceleration.

The second controllable factor is the flight itself. The higher the altitude, the smaller the boom, because it dissipates with distance. Speed changes the angle of

FEDERAL AVIATION AGENCY
SONIC BOOM REPORT

NAME (Last, First, Middle Initial)

| | | | | | | | | | | | | | | |
|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|

Interior Damage

1. Plaster, paint, cracks, or breaks

2. Glass - Regular (less than 1/4")

3. Glass - Plate (more than 1/4")

Exterior Damage

1. Foundation, exterior walls cracked

2. Roof damage

4. Other

Living Objects

1. Animal injury

2. Human injury

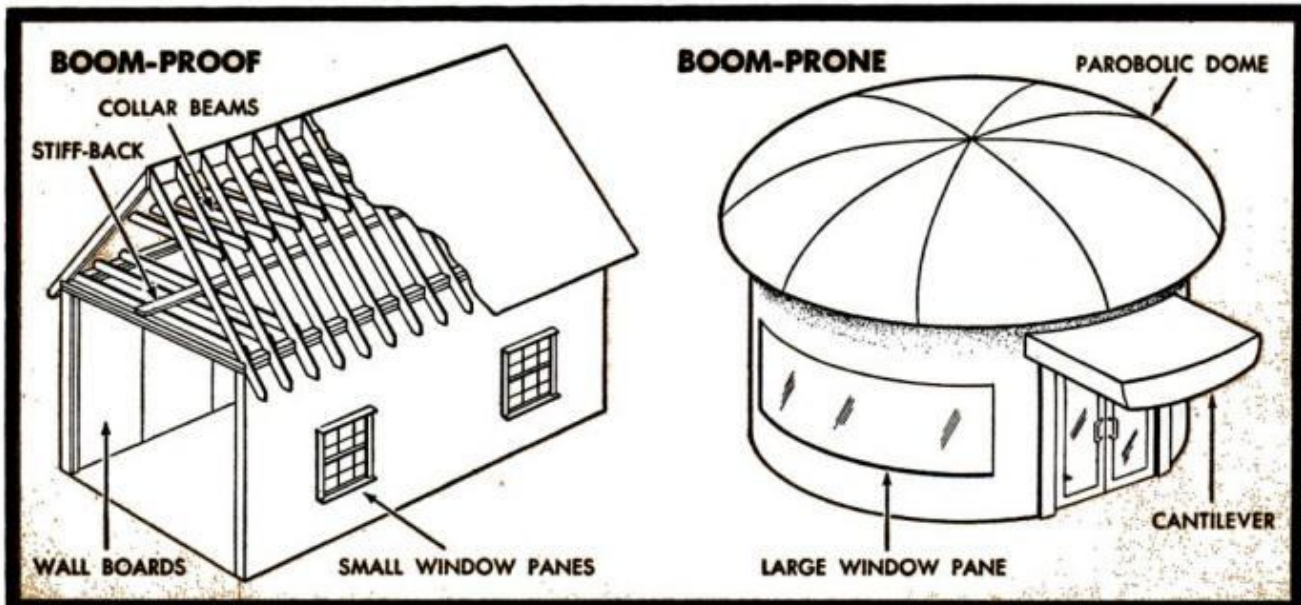
COMPLAINT FORM covered such areas as interior and exterior damage to home and injury or annoyance to persons. FAA rejected 80 percent of claims

the shock wave. At Mach 1.5 the cone is about 45 degrees to the ground; at Mach 20 it would be almost parallel to the line of flight. So, ironically, the faster the flight, the less problem from the sonic wave.

Uncontrollable factors are weather and terrain. As temperature rises so do the overpressures, and heat can bend the cone the same way water refracts light. Wind also can blow the cone to one side or another, and clouds and/or precipitation can cut down overpressures. Humidity works opposite to temperature; as it goes up, overpressures go down. So, perhaps, hot, dry days are the most vulnerable for large

[\(Please turn to page 226\)](#)

BOOM-PROOF HOME may go back to old-fashioned, even Early American, designs. Small window panes and reinforced structures are recommended. Thin-shell designs, dome roofs and cantilevers are vulnerable to boom



New Low-Cost System Lets You Tape TV Pictures at Home

Revolution in home entertainment—the home recorder puts TV pictures and sound on tape

By Hans Fantel

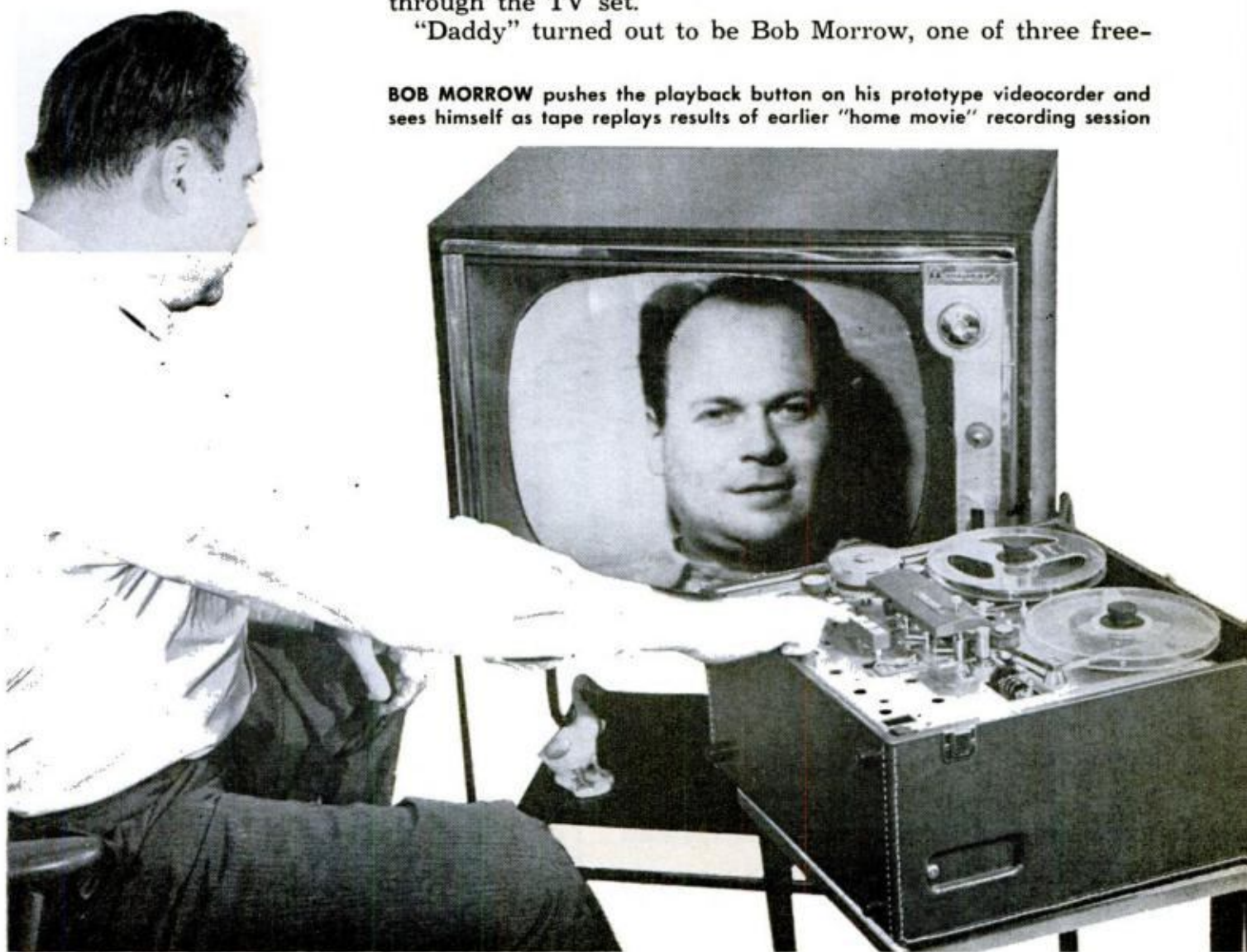
I HAD EXPECTED the usual kind of laboratory setup, complete with wire fence and uniformed watchmen. But the Baltimore address turned out to be a tree-shaded family house with a six-year-old redhead waiting at the door.

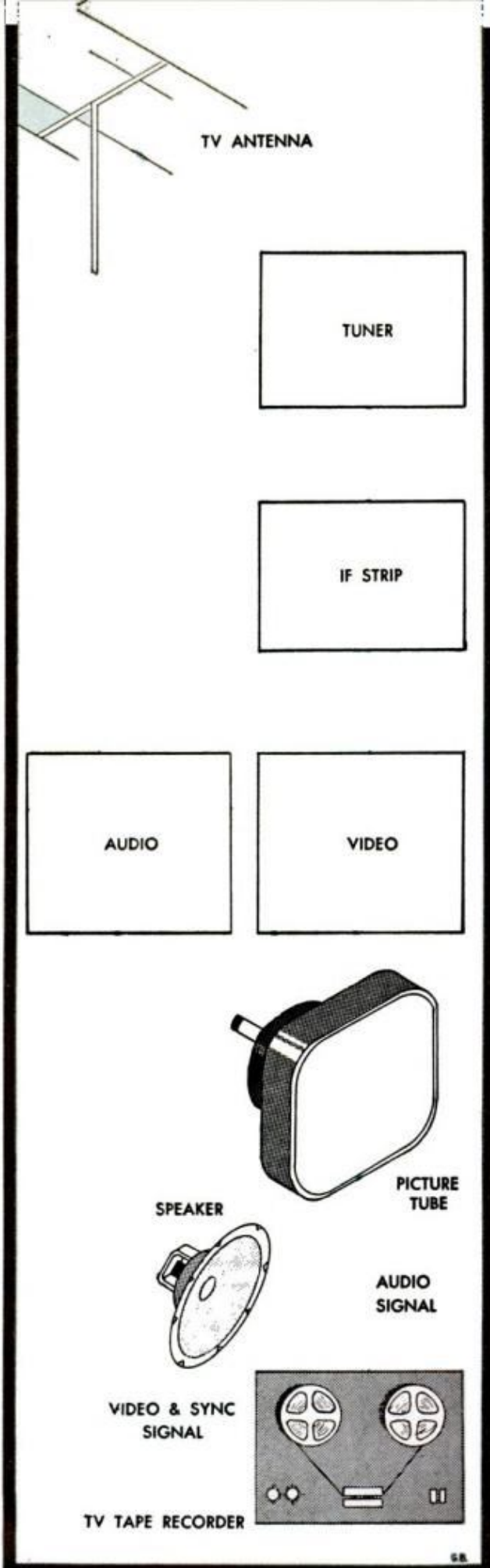
"I know who you are," she announced after I had pulled into the driveway. "You've come to see Daddy's invention."

Daddy's invention was down in the basement in a closet-size room stacked to the ceiling with electronic test gear. I was soon watching a television show from the night before. For Daddy's invention is a TV tape recorder for home use. Attached to an ordinary TV set, the recorder captures a telecast—picture, sound and all. The tapes are then played back through the TV set.

"Daddy" turned out to be Bob Morrow, one of three free-

BOB MORROW pushes the playback button on his prototype videocorder and sees himself as tape replays results of earlier "home movie" recording session





TWO CONNECTIONS are made from the videocorder to the TV receiver. One takes off picture information, the other sound. On playback, the recorder feeds the same signals back to the same parts of the TV set

lance inventors banded together on this project. Morrow is so excited about his machine that he simply can't sit still. Half-way through yesterday's "Cheyenne" he flipped a switch and turned a small TV camera on me. Moments later I was watching myself on the screen as Morrow played back the tape.

"Home movies on tape!" he almost shouted with enthusiasm. "Instant playback. Like having Polaroid movies, only better. You've got sound too. And if the picture doesn't pan out, you know it right away. Just erase the tape and do it over. Nothing wasted, nothing lost."

His eagerness almost made me forget that this was merely a lab demonstration. It would yet take a year to get the unit on the market. But if the demonstration I saw is any indication, they've come closer than anyone else to solving the problems of a practical, low-cost TV recorder.

Industry bigwigs are now beating a path to the Baltimore basement to see the better mousetrap and dicker for manufacturing rights. Barring unforeseen snags, the first units should be in the shops next summer. Price tag: about \$400.

Electronics men are not the only ones sniffing a bonanza in that basement. Theatrical producers already talk of an entirely new branch of home entertainment: pre-recorded tapes to be played through TV sets. Shows fresh from Broadway might be mailed to you on tape. Or you could sample the London theatre season just as easily.

STU HEGEMAN takes Bob Morrow's picture. Playback results are shown on the previous page. You can judge the recording quality with your own eyes



School administrators are also eager for the new machines. Taping educational TV programs off the air, teachers could schedule shows to fit class lectures.

Golfers, bowlers, and other athletes like the idea of instant playback. With a small camera (costing about \$150) attached to the recorder, they could monitor their own form and correct defects.

So far it seems that the Baltimore trio holds the most promising key to all these possibilities. Other home videocorders have been demonstrated, but this one gets almost twice as much picture detail on half as much tape as its closest rival.

Recording TV signals has been an engineering challenge since the beginnings of commercial TV. The hitch was that TV signals pulsate at the rate of 4 million cycles per second—200 times faster than sound signals. A TV recorder must, therefore, cram 200 times as many impulses on tape as a sound recorder.

Professional TV recorders sidestep this difficulty by using a 2-inch wide tape and recording crosswise on it with several rotating heads. Such recorders carry price tags from \$11,000 to \$65,000—definitely not for the average home.

A different approach was needed. Going to a pencil and paper analogy, you can write more information on a given strip of paper if you use a sharply pointed pencil to make a very thin line. In the same manner if you narrow the magnetic gap on the recording head, it's like sharpening a magnetic pencil. It writes thinner lines on tape,

squeezing more information into every inch, requiring much less tape.

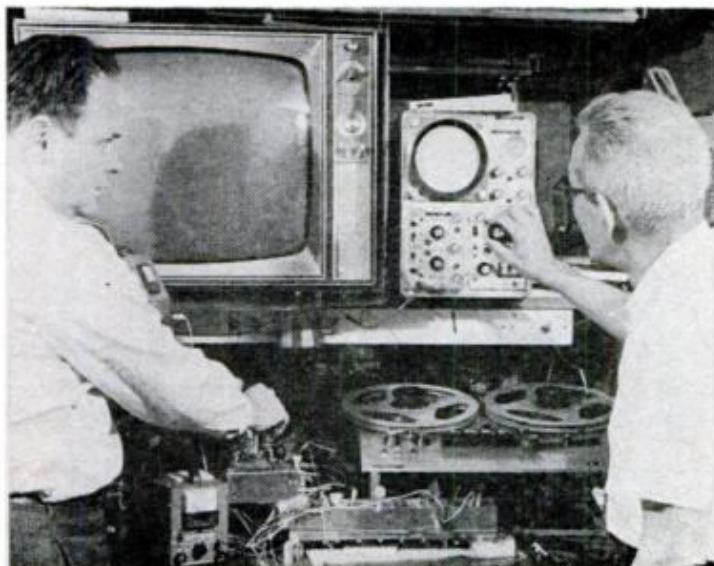
The Baltimore inventors, Bob Morrow, Steward Hegeman, and Paul Gavzey, came up with a new approach. To quote Morrow who keeps mum about details: "We make the magnetic circuit so that the gap width of the head is less important than in conventional recording methods. Ideally, we might yet be able to make the head perform as if its gap width were almost zero."

Last July, the first prototype was ready. Running at 60 inches per second (i.p.s.)—half the 120 i.p.s. speed of its competitors—it produced a picture almost as clear as that of a top-grade live telecast. And for a tight tape budget, the speed can be cut to 30 i.p.s. with reduced quality.

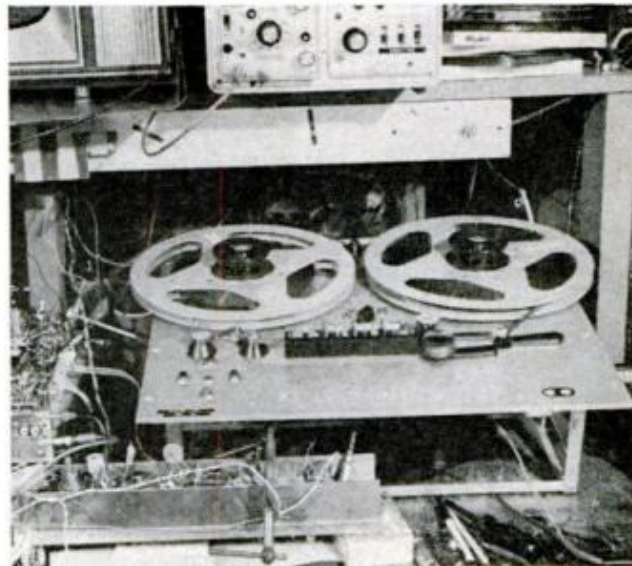
Slower speed also means smaller reels. An hour program at 30 i.p.s. fits onto a 7-inch, 4800-foot reel of Mylar audio tape. Only one brief interruption is needed for flipping the reels after 30 minutes.

Not all problems are solved as yet. Trouble is that if reception is poor the picture gets wiggly because the machine can't stay in step with the line sync pulses. Hegeman is struggling with that one now. His confidence that he can lick this problem is shared by a major manufacturer planning to put the recorder into production early next year. Before leaving to make his report to headquarters, the company's delegate turned back at the basement door. "Keep the flies off the jam, boys!" For a cool businessman, that's an expression of high hope. ★ ★ ★

IN THE LAB the inventors make final adjustments before a trial run. They're waiting to see the effect of a recent circuit change on the picture



CLOSE-UP of the first prototype recorder. The maze of wiring to the left of the tape deck is the electronic circuitry that enables the recorder to work



I Fly the **Man Rockets**

A man who has logged more than 250 flights with only a rocket strapped to his back, tells what it is like to fly like the birds

By Robert F. Courter, Jr.
as told to James Joseph

WHAT'S IT LIKE to fly with a rocket strapped to your back? I can tell you. It's like something straight out of Buck Rogers.

Fitted to my back is a "rocket belt"—a kind of glass fiber corset that backpacks a flameless propulsion system and enough hydrogen peroxide fuel to give me about 21 seconds of flight. My right hand works the rocket's thrust throttle; my left, the thrust-directing "jetavator" rudder control.

Helmeted, flight-booted and looking like something from space, I'm harnessed in, checked out and set to go.

"Blast off!" a ground crewman signals.

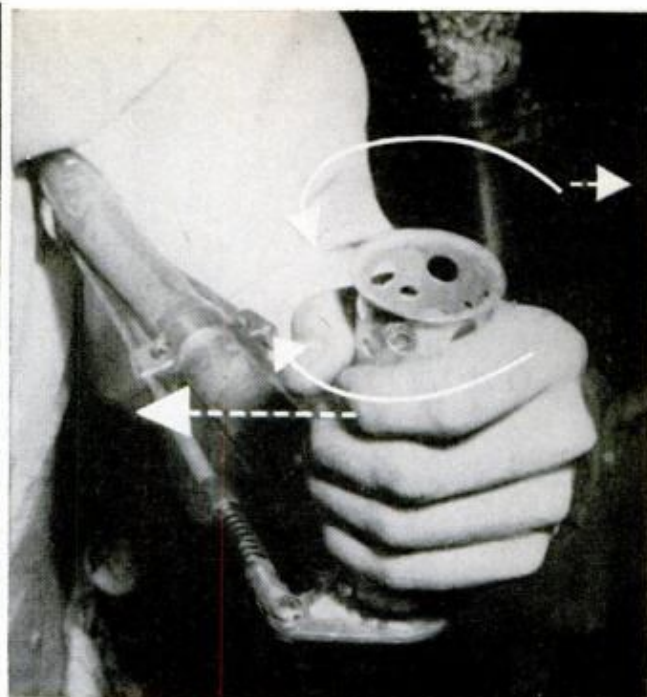
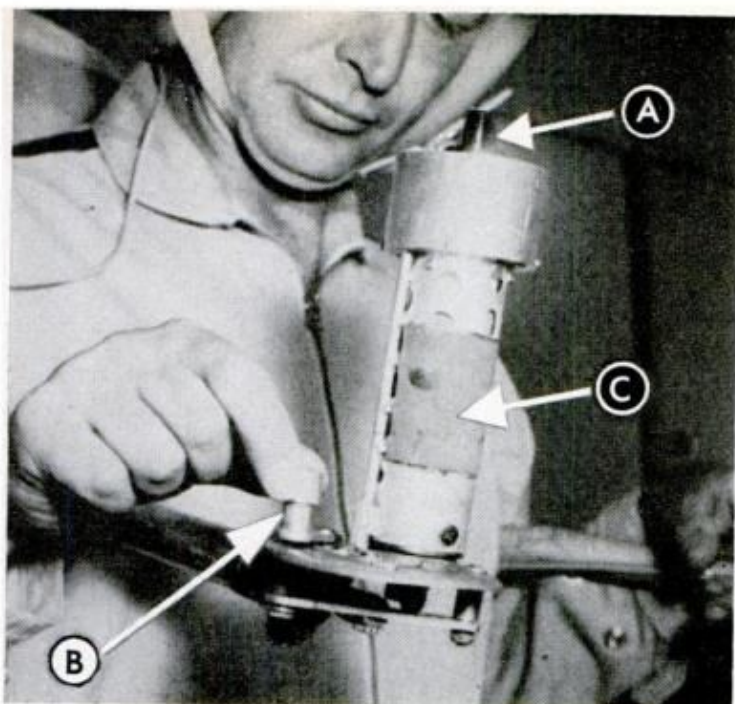
I throttle the power on full, for nearly 300 pounds of thrust from pressurized fuel tanks. The roar is deafening as the twin rocket nozzles, spewing an invisible hurricane of steam, thunder to life. Dust billows around me—kicked up by the thrust-stream. Its blast is more powerful than a fire hose. The harness strains, gives a tug and I feel myself lifting. In that split-second of take off, it's as though some giant had put a hand beneath my arms and another where I sit, jerking me off my feet.

In an instant, I'm airborne. Next, I'm flying like the birds.

Rocket powered and soaring six stories high, I'm too busy to do much philosophizing. Had I the time, and if my voice could punch through the rocket's thunder, I'd tell anyone who listened: "In 10 years, maybe less, some of you will be up here flying with me."

ROBERT COURTER soars 60 ft. in air on typical 21-second flight. Limited fuel supply restricts the altitude and duration of all man-rocket operations





ROCKET CONTROLS include timer (A, left photo) which warns rocketeer when flight time is nearly up; timer lock (B) which prevents accidental tripping of timer; and thrust throttle (C) which controls power. Jetavator (right photo) is twisted left or right to control movement in left or right direction. Moving both arms up or down controls forward and backward flight



JET BLAST is usually invisible, but is powerful enough to kick up dust when rocketeer takes off or lands. Courter performed at New York World's Fair



WELL-DRESSED ROCKETEER, besides flight suit, helmet and boots, wears 115-lb. rocket gear (including fuel). Jet vanes jut out in rear, away from body

The man rocket was developed by Bell Aerosystems, a division of the Textron Corp. I work for Bell and I can make another prediction. Man-rockets—and their high-rocketing wearers—will be as common as helicopters in the decade to come. And, if anything, even more versatile.

Man-rockets will provide firefighters with seven league boots—whisk them, in seconds, to within reach of a skyscraper's loftiest holocaust. Outfitted with back-packed rockets, surveyors and construction men will find no hill too high to climb, and no river too wide to cross. No longer will military patrols need to pick and probe through mine fields—they'll simply rocket over them.

For sportsmen, rocket power will open inaccessible back country, fly anglers to the hottest fishing spots and nimrods into the world's roadless big-game haunts. They may even fly commuters over the bumper-to-bumper traffic.

I base these predictions on a breakthrough, revealed here for the first time:

A new, more efficient fuel promises to give Bell's man-hefting rockets 50 times their present range, up to perhaps 10 miles of free flight at 60 m.p.h. or better.

Technically, the new fuel catapults man-rockets from the realm of a limited-range prototype to workaday reality.

Historically, it's also a milestone. In little more than three years since man's first back-packed free flight, man-rockets may



FOR TAKEOFF, Courter turns on power until thrust overcomes weight of his body and gear. For landing, he eases off power, and weight overcomes thrust

fulfill man's dream to fly like a bird.

The new fuel (its chemical makeup is still classified) should give the rocket wearer 10 minutes of flight. By contrast, the 48 pounds of liquid hydrogen peroxide fuel which my teammates and I have carried aloft on some 800 test hops since 1961, limit us to 21 seconds aloft, and to a range of little more than one sixth of a mile.

Our best altitude has been about 60 feet; our best speed, a bit over 60 m.p.h. Any of us could smash the altitude record any day. We could climb to 500 feet or higher. But with fuel enough for only 21 seconds aloft, going higher is dangerous. If we ran out of fuel in a meaningless reach for altitude, we'd drop like a rock.

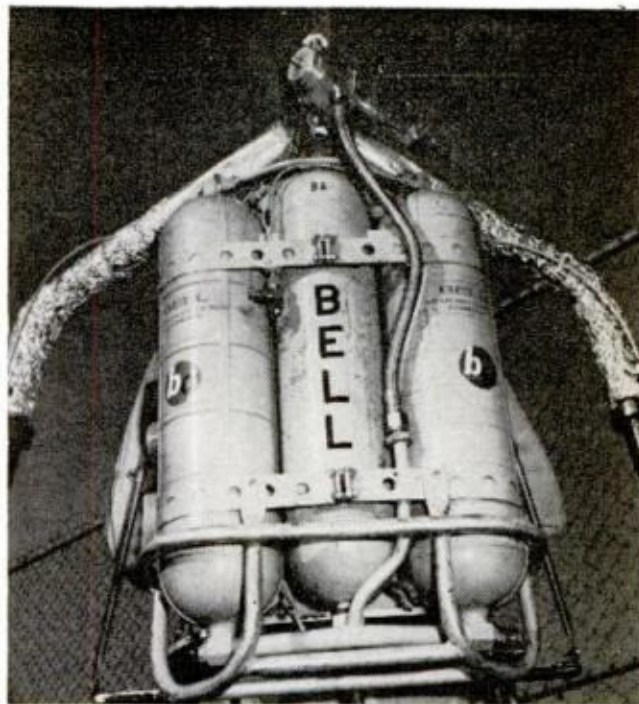
But given enough fuel, the man-rockets conceivably can fly for hours, propelling the rocketeer at fantastic speeds. To do it takes a lot of fuel. In the case of hydrogen peroxide, about 2¼ pounds are burnt every second. Since 48 pounds is about all a man can carry comfortably, he's scarcely up before he's picking his landing spot.

Those 21 seconds explain, too, why only five of us—all Bell employees—have flown the man-rockets. With flight time so critically short, there's scarcely a second's margin for error. When that warning 15-second buzzer sounds in your helmet, you've got six seconds to get your feet on the ground. There's no time to think what controls to use. You've got to know instantly, by instinct.

The few lumps we've taken have been mostly the kind that a little liniment quickly soothes. Last March, in Sidney, Australia, one of our rocket men dropped to one knee as he landed, thrown off-balance by the weight of his gear. "Rocket Flier Crashes," the newspapers headlined. Actually, he merely grass-stained his flight suit. Our one "casualty" was caused by a rope, not by our rockets. A tether broke and dropped Wendell Moore, the man-rocket's inventor, to a concrete hanger floor. He fractured his kneecap and was permanently grounded. The accident occurred in 1960, months before the first man-rocketeer soloed in free flight.

How soon can *you* expect to strap rockets on your back—and soar aloft? That's one prediction I'd rather not make. But one thing is sure: The day is closer than you may think.

Man-powering rockets, of course, won't be for everybody—for several reasons:



REAR VIEW of back pack shows two hydrogen-peroxide fuel tanks and, between them, pressurizing tank of nitrogen which maintains 500-lbs. pressure

Your weight is a limiting factor to man-rocket flight. Right now, for example, we consider 170 pounds the maximum practical weight for a rocketeer. A little addition explains why. The propulsion system and its fuel (at takeoff) weigh about 115 pounds. Add to that a 170 pound flyer, and the total comes to 285 pounds. The rocket must exceed this weight in thrust if the man and his gear are to get off the ground. With our present 330 pounds maximum thrust, there's not much leeway.

There's a practical minimum weight, too, for future rocketeers—about 140 pounds. If a man weighs much less, he hasn't the heft to back-pack the 115 pounds of gear and fuel he's saddled with at takeoff. Once airborne, of course, the thrust lifts all that weight from his shoulders (the special corset is designed to distribute his burden; 60 percent on hips and buttocks, the rest on shoulders and back).

The price tag of rocket power won't meet everybody's budget. Even a decade from now, man-powering rockets are apt to be Cadillac-priced.

Rocket fuel isn't cut-rate either. The hydrogen peroxide that fuels our present rockets costs about \$25 per flight. That's a fair tab for 21 seconds aloft.

You needn't be a pilot or carry flight credentials to fly rocket-powered, however. The FAA requires no rocket-pilot's license. Only two of Bell's five rocketeers

[\(Please turn to page 212\)](#)



Custom Case Takes Any Shape

A new aluminum carrying case may be customized by the purchaser to carry electrical meters, cameras and other delicate objects.

Inside each Protect-O-Case are three pads of foamed polyester plastic. You cut pockets out of the center pad to fit the objects to be carried (top photo). Cases run 5x9x12 (\$11) to 8x19x33 (\$37).

A product of HD Electric Co., Box 633, 760 Osterman Ave., Deerfield, Ill.



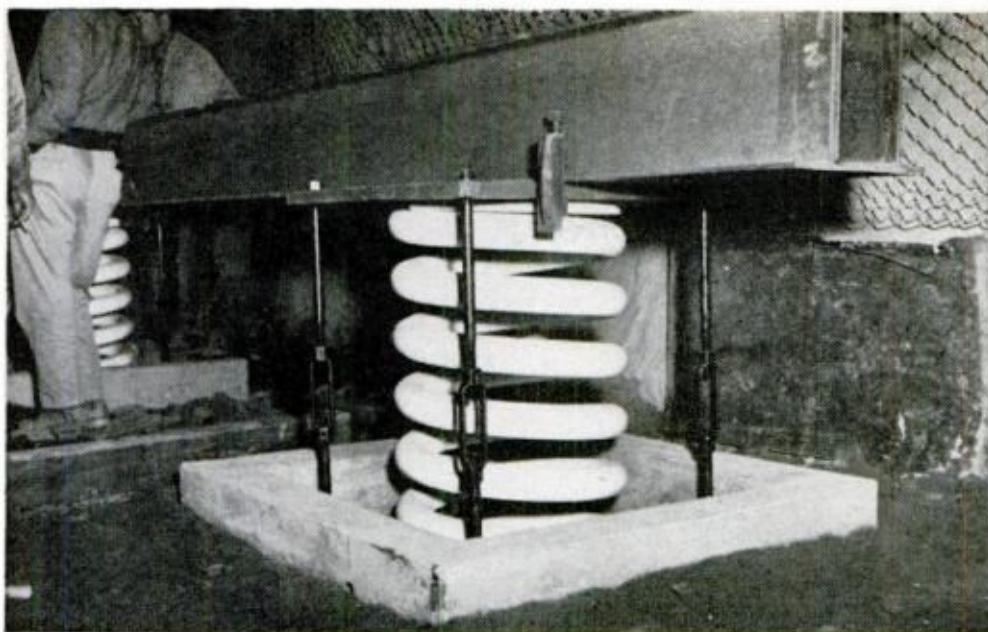
Ultra Low-Level Missile ▲

Made from an old Crosley auto and a salvaged Q2C drone missile, the *Dover Demon* performs "low level" public-relations missions for the Air Force. It was created by members of the 95th Fighter Interceptor Squadron at Dover (Del.) Air Force Base.

Poncho-Tent for Tommies

British soldiers will not be caught sleeping with this newest addition to their field equipment, a poncho-bivouac-cape that doubles as a one-man tent. In the event of a surprise attack, the napping Tommy can stand up, pull the tent stakes and retreat or advance as necessary. ▼





Giant Springs Will Keep the Joint from Jumping

Still under construction beneath a mountain near Colorado Springs, Colo., the combat operations center of the North American Air Defense Command will include 10 buildings built on springs.

Each houses sensitive electronic equipment that could not stand the shock of

bomb hits, even though buried underground. The springs, each four feet high and 22 inches in diameter, can absorb the shock without disturbance to the building.

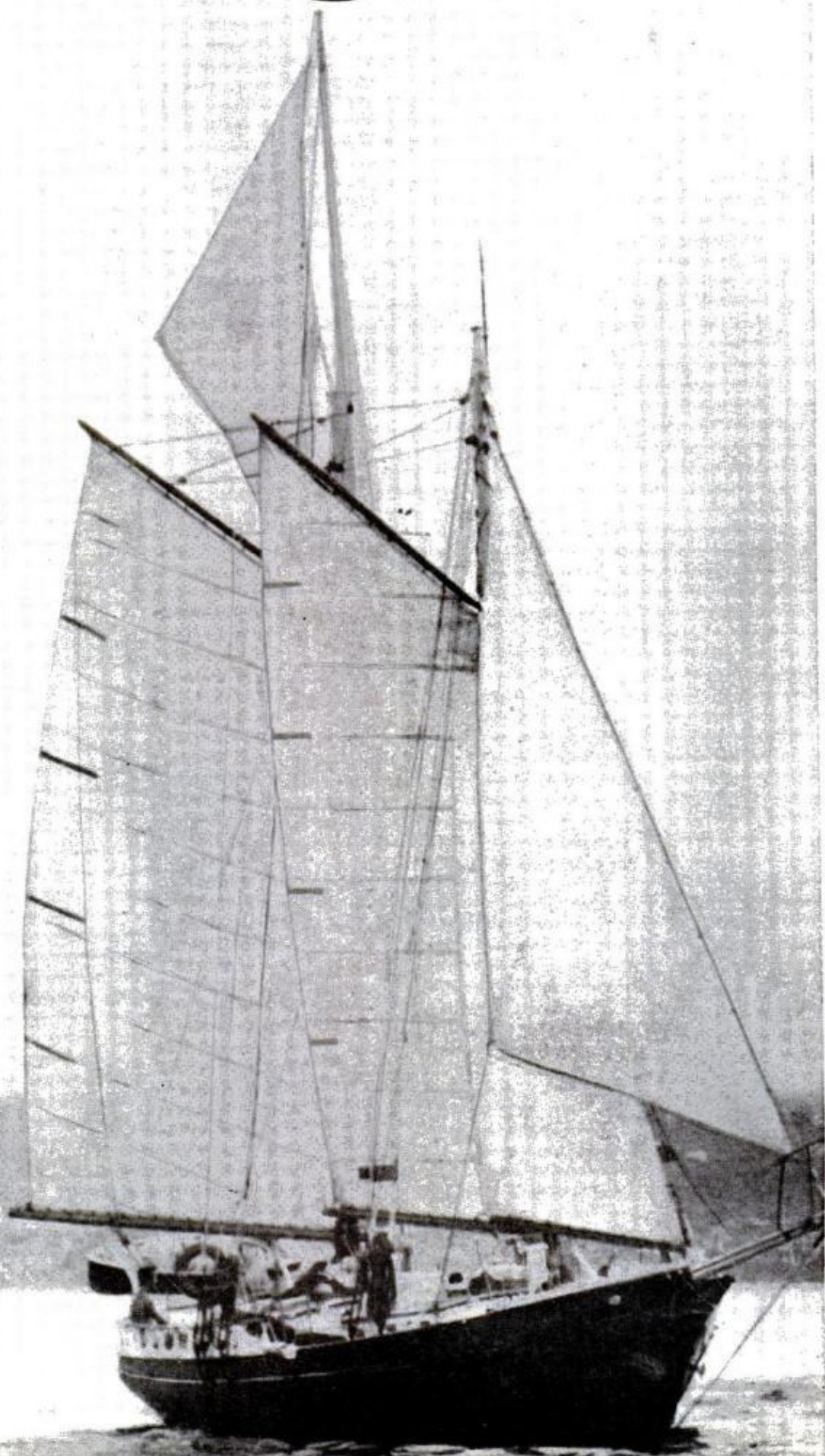
NORAD controls the defense of the North American continent, including Canada and Alaska. —John M. Norvell

Stretched VW

The elves of the Black Forest would never recognize this VW panel truck. It was cut in two and lengthened five feet. Then a second VW roof was welded on for headroom. Interior boasts dinette, six-foot bunks. Bodywork cost Mr. and Mrs. August Baumann \$1350, equipment \$1500.



New Regatta in



Salty Old Hulls

Nostalgic boats of yesterday are sailing again — with new wrinkles and a burgeoning crew of fans

By Thomas E. Stimson

A LOT OF MODERN SAILORS are going down to the sea in old-fashioned ships, and these not-so-ancient mariners are having the times of their lives.

Some of the craft are true classic powerboats, like the Gar Wood "Commuter" of the early '30s. Some are small replicas of ocean-going tugs powered by miniature steam engines, their hulls glistening with gaudy colors.

Others are century-old sailing craft that have been restored to original condition. Still others are scaled-down, modern versions of old sailing ships, complete to wooden taffrails and creaking spars.

And some of the old sail is giving the lie to modern naval architecture.

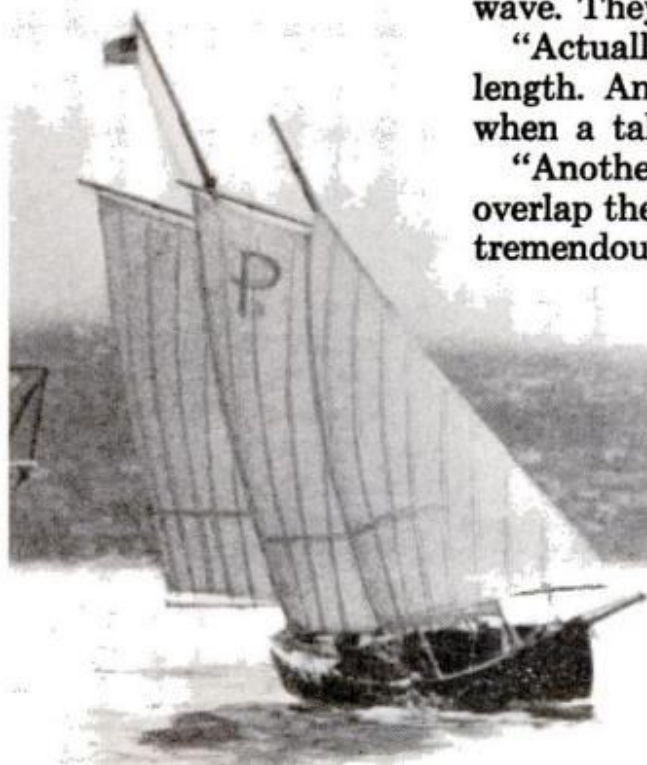
"Stands to reason an old design can't compete with a modern boat," says the owner of one miniature "traditional" schooner. "The old hulls were too tubby, too deep and heavy. And the gaff-headed sails didn't reach high enough to collect much wind.

"So how come I can outfoot a great many of the modern boats I meet?

"It's because the modern boats are so light, so extremely tender. They lose way every time they hit a wave. They don't have the drive of a heavier hull.

"Actually, I carry more sail than they do, length for length. And I can carry all my canvas in a good wind when a tall, modern design has to reef down.

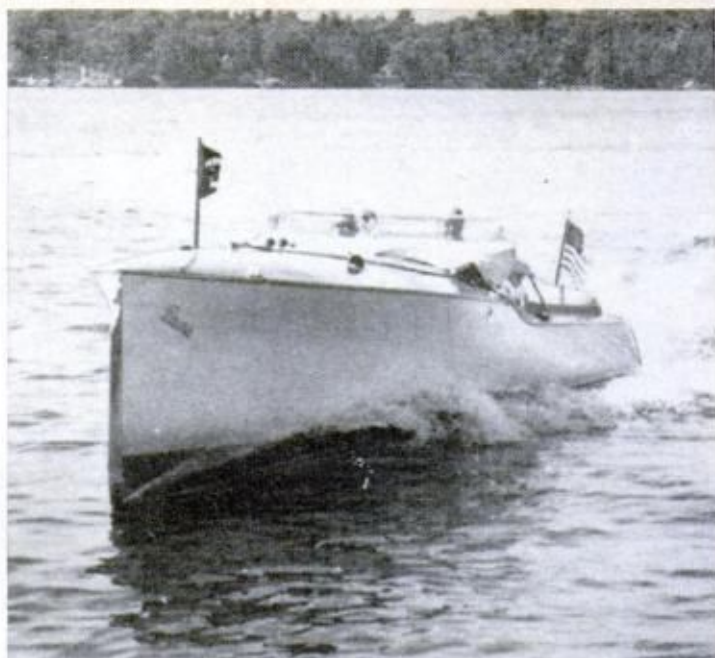
"Another thing, our old-style jibs are loose-footed and overlap the sail behind. This creates a slot that generates tremendous drive. Modern designers only recently re-



THESE TWO BEAUTIES may look the same age, but the little 18-footer is brand new, while the old Pacific coasting schooner dates back a good many years



TRADITIONAL LINES of this standard Angelman, ketch are perfect for off-shore cruising, according to her proud owner. She's beamy, stable and roomy



40-YEAR-OLD LAKER can slice through water that sends a modern flat-bottomed boat bouncing and hammering. The 33-ft. splinter has a beam of 6 ft. 4 in.

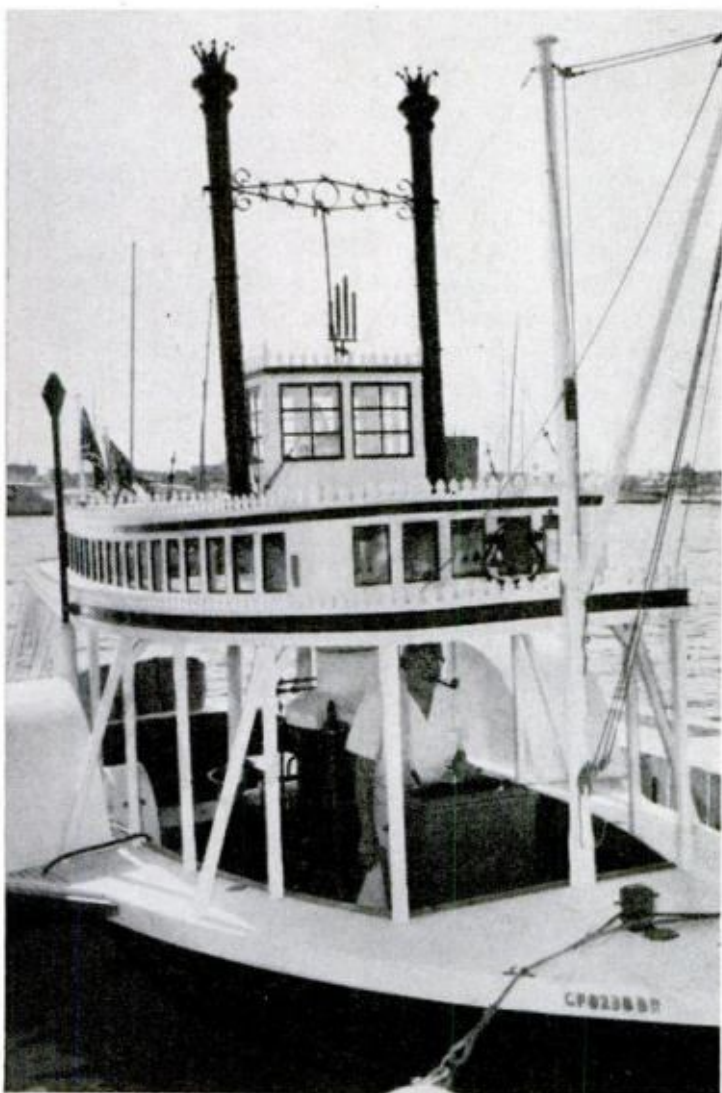
FAT STACK and polished brass boiler fittings of David Rose's "Copenhagen" are pure beauty to any true steam enthusiast. Running on Diesel fuel, she has a working pressure of 150 lbs. pr. sq. in. and puffs along at a steady 7½ m.p.h.





FRIENDSHIP SLOOP over half a century old was originally a work boat, but faithful restoration has turned her into an excellent family pleasure craft

EXCEPT FOR HER SIZE, Mark Twain would have felt right at home on this 20-ft. Mississippi side-wheeler. Paddlewheels are turned by a small 10-hp. engine



On both coasts and in inland waters there's a treasure hunt underway for old classics in sail or power. Old sailing hulls are hard to come by, for many of them were left to rot apart on the mudflats. But there's many an early powerboat resting on blocks in a barn or shed.

One aficionado of early power is Larry Grover who operates a summer resort on Lake Winnepesaukee at Wolfeboro, N. H.

His pride is a pair of "lakers" that are 33 feet long and only 6 feet 4 inches wide. These 40-year-old mahogany splinters were designed for the steep, short seas that build up on inland lakes. They drive straight ahead with no pitch or roll in weather so bad that modern, flat-bottom boats are best kept safely tied to their piers.

Another unit of Grover's "classic" fleet is an 18-foot open launch, built in 1912, whose planking consists of mahogany strips half an inch wide and an inch and a half thick. Grover got the boat for a song, then spent \$2000 for restoration, including new power in place of the original two-cylinder naphtha engine.

Grover also owns, and operates almost daily, one of the sleek "commuters" that were built in the '30s for home-to-office transportation between Long Island estates and New York City. This rough-water class is 26 feet long with 10 feet of beam, and Grover's boat has been clocked at 47 m.p.h. under the drive of a 280 hp. Chevrolet truck engine.

The biggest resurgence in old powerboats is the re-birth of steam, and today there are several hundred old, and new, steamboats in use. The trend is international, in fact, and both England and Europe have clubs whose membership is limited to owners of steam vessels. One typical "steam squadron" is at Newport Harbor in California, where the unofficial commodore is David Rose, well-known musician and orchestra leader.

Four years ago Rose installed a small steam engine and a coal-fired boiler in an open whale boat, then found he was becoming a problem to the local fire department. The fire chief was getting too many after-dark phone calls: "There's a boat out in the harbor, on fire!"

Today Rose skippers the 30-foot lapstrake "Copenhagen" that he bought in Denmark. The boat was originally powered by an internal combustion engine which he immediately yanked out and re-

EXTREME EXAMPLE of how Monterey fishermen can be modernized even has a flying bridge. Cabin was added to provide cruising accommodations



placed with a small 1918 Navy compound steam engine and a custom-built Dixon boiler, fueled with diesel oil. It has a working pressure of 150 lbs. per square inch, enough to push the "Copenhagen" along at a sedate 7½ miles per hour at 250 turns per minute (which is equal to 150 hp. at 2500 r.p.m. in a gasoline power-plant). His Corinthian chief engineer, J. D. Hillyard, owns a different kind of "character" boat, a Monterey fisherman.

Next-to-the-smallest steamer at Newport (Rose has the smallest, a 12-foot tender powered by a one-cylinder Babcock) is an 18-foot miniature tug built by Ed Puryear of Redondo and now owned by I. G. Greer of Corona Del Mar. The gaudy green-red-and-white tug has a 4½-hp. steam plant that drives it at 8 knots.

Still another vessel in the steam squadron is W. A. Thompson's 20-foot side-wheeler "Southern Bay" that is patterned after an 1830 Mississippi river steamer. There's no electricity on board because boats of that period had none, yet it was necessary to depart from tradition in one

respect: the boiler that feeds the two-cylinder 10-hp. engine is fired with diesel oil instead of wood. There isn't room on the small craft to carry enough cordwood.

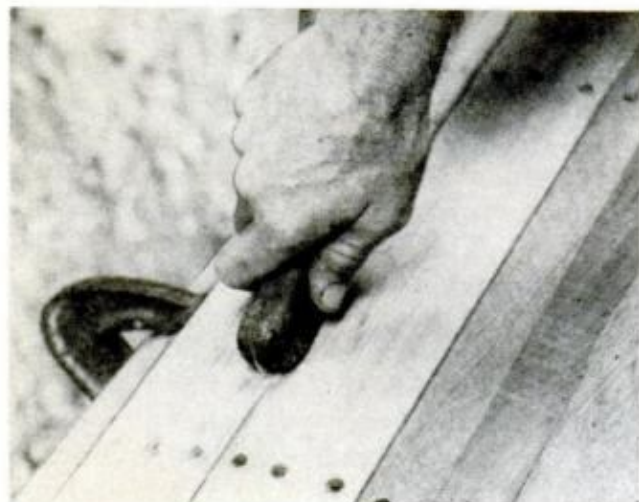
The fact is that Newport Harbor's 7000 pleasure craft include a variety of "character" boats aside from the steamers. There are scaled-down Chinese junks (PM, Sept., '63), converted tug boats up to 90 feet long, Scandinavian trawlers rebuilt into comfortable cruising boats and more than a dozen Monterey fishermen.

The Monteys, distinctive double-enders with clipper bows, have been the favorite of Italian market fishermen of San Francisco and Monterey for the last hundred years. They were developed from the earlier lateen-rigged fishing craft of Corsica. Today they are being phased out in favor of larger, faster fishing vessels.

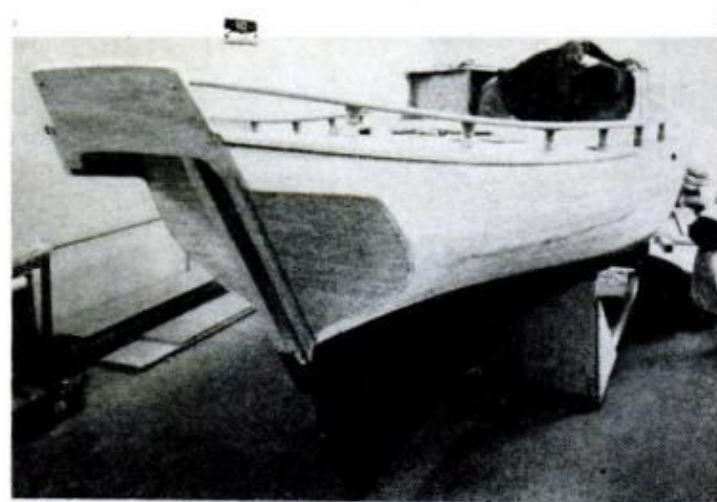
No two Monteys are exactly alike, for each hull was "eyeballed" by the builder instead of being built from plans. Hull planking was fitted so precisely that no calking was required. From 24 to 36 feet

[\(Please turn to page 220\)](#)

HANDLE OF CAULKING WHEEL used in Bahamian shipyard has been worn smooth by the hands of craftsmen whose skills go back hundreds of years



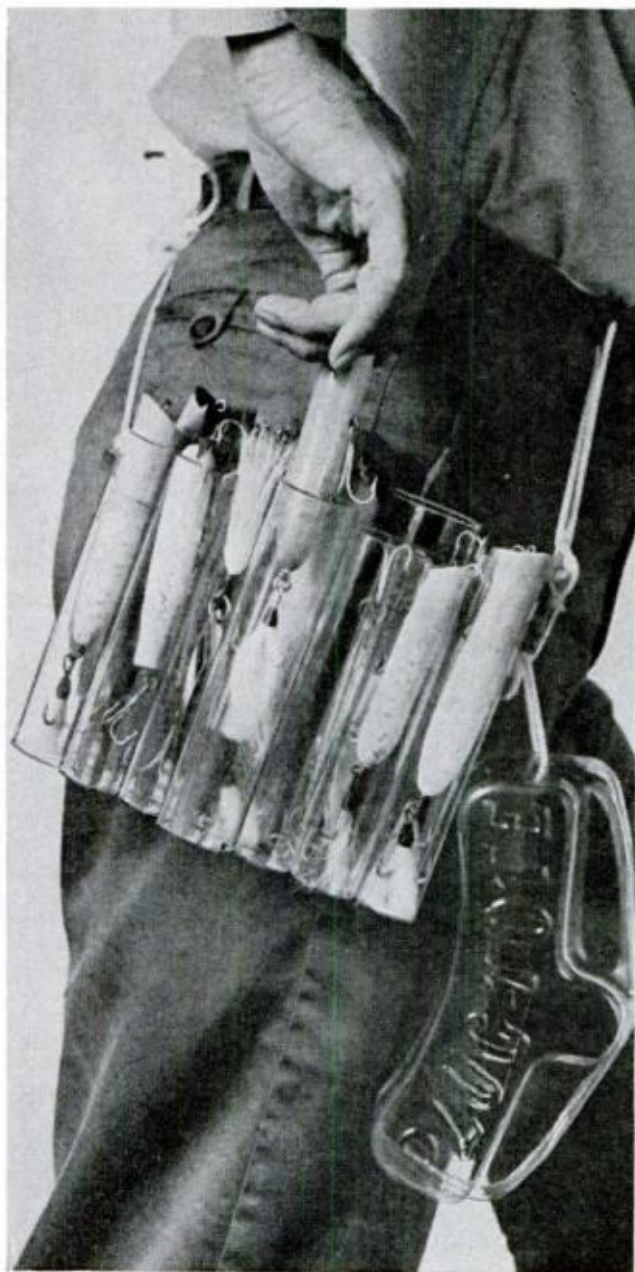
AUTHENTIC in appearance, even to her tiny quarter deck, this 18-ft. pilot schooner incorporates many modern materials, such as tough polyurethane finish





Quick Help at Home

A single phone call in Ealing, England, can summon almost any emergency service from killing spiders and unclogging drains to delivering groceries. Photo above shows emergency repair van that travels to the site of the crisis. At right, a boy is rescued after locking himself in bathroom.



◀ Carrying Case for Fish Plugs

No need to trudge back to the tackle box for a change of fishing plugs with Plug-Tote, a plastic carrying case with compartments for 12 plugs. Holes in bottom facilitate washing of plugs. \$9.95; Plug-Tote, 29 Jefferson St., Glen Cove, N. Y.

Sharp Look


A five-power magnifier permits young naturalists to see details of grass, leaves and seeds in sharp focus. A slide (arrow) holds object for viewing in place. The viewer is priced at \$2.49 from Renwal Products, Inc., Mineola, N.Y.





Hunting Pheasant





Stalking pheasants calls for a real skill—but tin cans, predator calls and chicken wire help

By Pete Czura

WITH A GOOD GUN DOG, pheasant hunting is largely a matter of following behind the animal, letting him do the hunting until a bird is pointed, then getting your shot away when the dog flushes the bird on command.

But, hunting the wily ringnecks *without* a dog becomes a far more demanding sport requiring finely honed hunting instincts and techniques and—most of all—ingenuity. The bird has far more latitude for using his whole bag of defensive tricks, and the challenge to the hunter is not just interesting. It quickly separates the men from the boys.

Without a Dog

When a pheasant senses trouble, its first instinct is to hide, relying on its natural camouflage for protection. If it hears trouble advancing, it will often run, seeking a better

hiding place. And it is only when the bird feels that its hiding place has been discovered that it will fly. It takes a smart hunter to use the bird's instinct to his advantage.

Hunting a densely covered soil bank field near Sargeant, Nebraska, seemed like a waste of time without a dog. We knew that as soon as we entered the field the birds would be running and hiding, but we had an ace in the hole that we were going to try.

As we advanced into the field we made as much noise as possible. As expected, two birds broke cover and started to run. That's when I took out a hawk call and cut loose with a couple of low, piercing shrieks. The two roosters stopped in mid-stride and dived for cover. Our noise became insignificant to them, compared to the more important hazard of being a running target for a circling turkey hawk. Now we knew where the birds were hiding. It was then a matter of walking toward them until the birds heard us again and flushed for a going-away shot.

The predator call usually is an effective "coaxer" for tight-sitting birds. The pheasant that has survived a number of seasons seems to know that he can melt into his cover, blending so perfectly that the human hunter won't spot him from three feet away. This can be frustrating when you've spotted a bird in a light weed patch, then find your quarry has seemingly disappeared when you comb the area.

Allan Eckert of Dayton, Ohio, solves this problem by "squeaking" them up.

"I figure that while a pheasant might scorn a human's hunting abilities, he has no such notions about predatory animals," Eckert says. "When I see a bird flush ahead of me and then beat it into cover, I give him time to settle down. Then I haul out a fox call and stalk as quietly as possible to within 30 yards or so of his hiding place. With my gun ready, I use the fox call. Hearing a fox in the neighborhood is all that the bird needs to make him nervous enough to get out of there. When he comes up I can usually count on an inter-

esting shot, and sometimes a surprise double."

Some hunters use a pheasant call to lure birds within gun range.

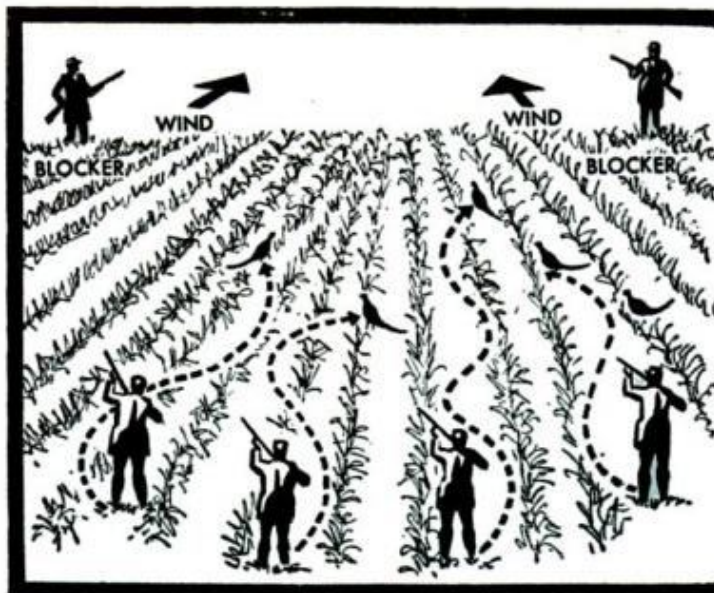
To locate your pheasant, once you are in the field, sound the call four or five times, very rapidly decreasing in volume, and repeat the call every three or four minutes. Pheasant often answer the call and sometimes approach toward it. The best times for this call are in early morning and evening.

A cock pheasant has great fighting instinct, and because of his ill-tempered nature, the pheasant call excites him into thinking another rooster is invading his domain. When you get him to respond, keep answering him back. This way you can stalk him and get away your shot before he knows what made the sudden noise in the brush that kicked him out on the wing.

Road hunters can take a tip from Larry Rupert of Lincoln, Neb., who uses binoculars to an advantage in this form of hunting. Driving along the backroads, Rupert scans likely pheasant hiding spots with his glasses.

When he does spot a bird, he begins his stalk from an area which will ultimately force the bird toward an open field. When the pheasant reaches the end of his cover, he usually flushes and that's when Rupert gets off a load of No. 6's.

There is no question that going afield without a dog after pheasants puts the hunter at a disadvantage, but he can trim the odds if he learns something about the



DRIVING PHEASANT requires six hunters, two blockers at the end of the field and two outside drivers advancing ahead of center men who bring up the rear

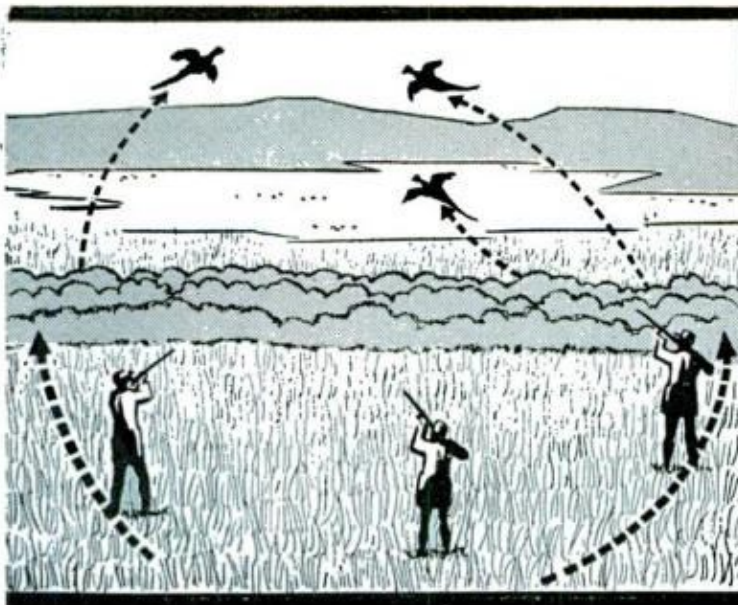
bird's habits and the type of habitat it frequents.

For example, I've found out that if I hit the feeding areas in the morning and late afternoon, I'll surprise a fair share of birds. Best feeding spots are corn and milo fields, and the dirtier they are (weedy and filled with cockleburrs), the better your chances of shooting opportunities. In early morning and evening you'll find the birds at their roosting areas: in orchards, stubble fields or near abandoned farm buildings.

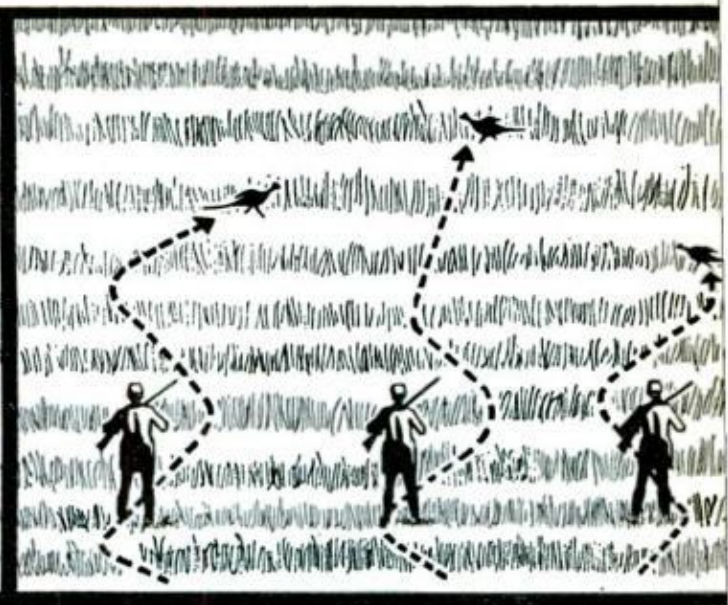
Swampy areas are a pheasant mecca. Water holes, drainage ditches, brooks, pot-holes and farm ponds (especially those with dense cover nearby) will offer plenty of action.

CHICKEN WIRE is cut into two-foot-high strips and is erected at one end of a field. The hunters, usually two, advance from the opposite end, and when the running birds hit the fence they will flush for a good wing shot





WHENEVER open water is available, the best tactic is to work nearby thickets, driving toward the water, where the pheasant will invariably take flight



EXPERT HUNTERS always work a field of wheat stubble in zig-zag patterns, examining every clump of cover where the perfectly camouflaged birds might hide

On windy days they'll wander out of the cornfields to elude hunters. Cornstalks clatter and rattle so much that the noise of an approaching hunter's footsteps are drowned out. The clever bird knows this. So on windy days, look for him in slough bottoms and weedy swales.

In the early afternoon pheasants head for their loafing areas—swales, hedge rows, plum thickets, meadow edges and deserted farmyards.

A successful pheasant hunting technique is the "rabbit hunting system." Nebraska bird hunters have adopted and worked this one to perfection, and it is especially good when you go afield without a dog.

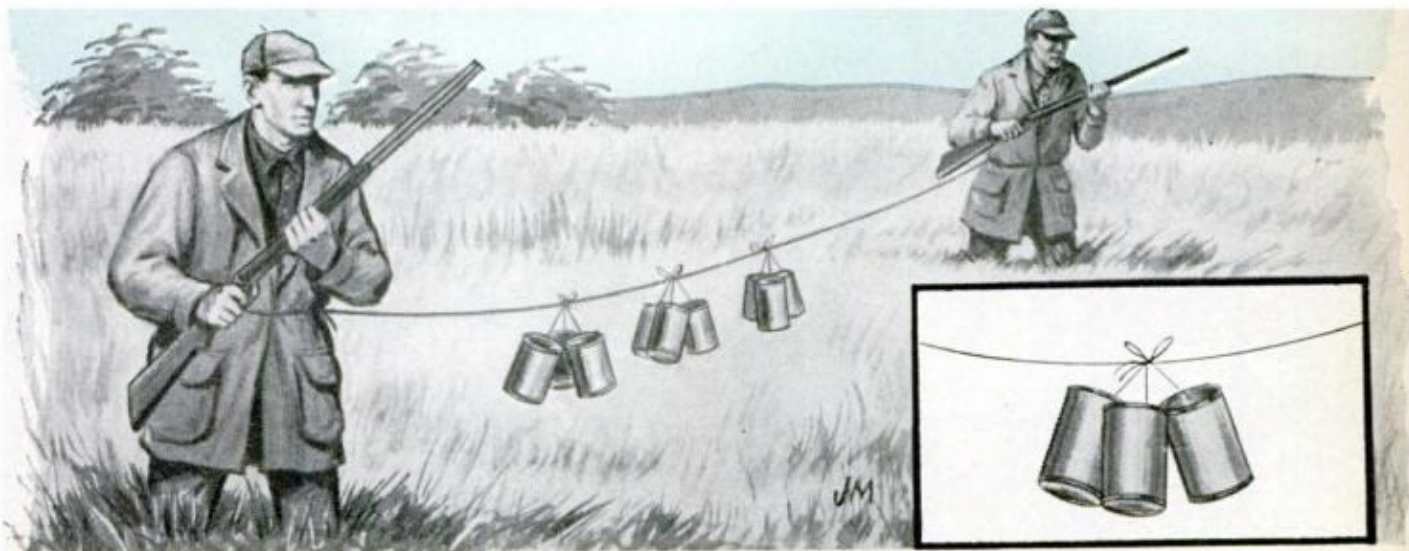
By nature, the pheasant is a nervous

bird. He stays in cover because he feels hidden. And he will not break cover until the moment he is sure he's been found. Here's where bird psychology pays off.

Take four or five steps, moving very slowly, and then stop. Make the stop last a minute or two. The moment the pheasant doesn't hear you moving he begins to worry. It boils down to a war of nerves and after a couple of minutes, if you're lucky, he'll blow his safety valve and take off. The halting between moves really is what works on him—so he flushes, and if you are fast with the gun, you've got him! But watch it. He'll likely come up right under your feet and you'll be flailing

[\(Please turn to page 207\)](#)

PHEASANTS are nervous birds, and one useful method of scaring them up is to stretch about 200 feet of cord between two hunters, attach dangling tin cans to the cord, and then advance—rattling and clattering—across the field





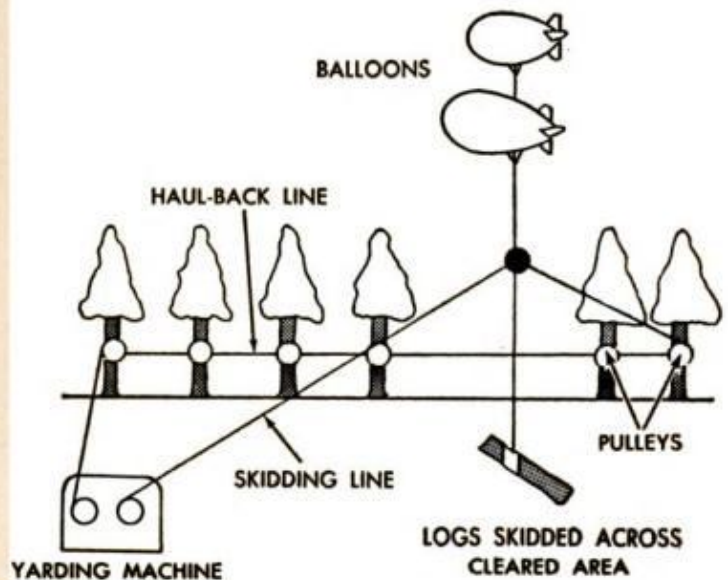
Plane with Ribless Wings

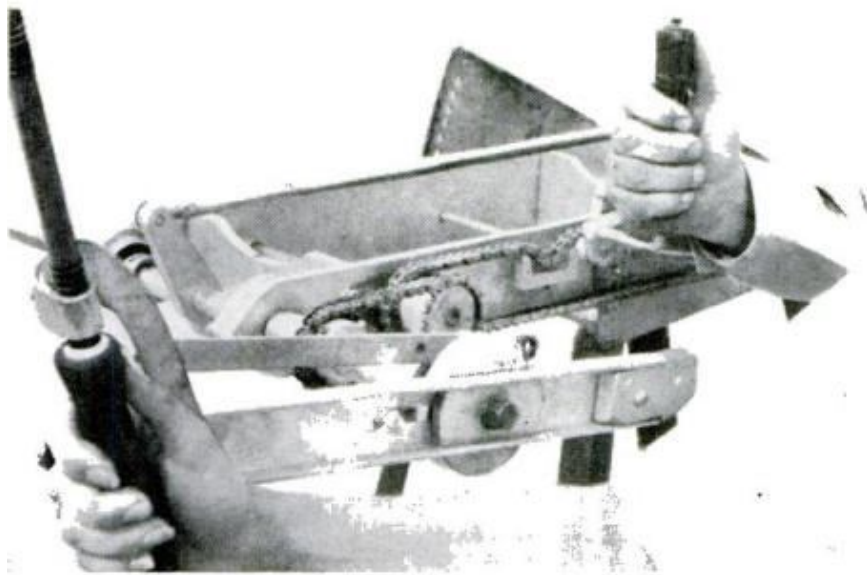
Designed more than 20 years ago, John Thorp's "Sky Scooter" is finally going into production. One of the first tricycle-gear private planes, it also features unique ribless wing construction. Extruded metal panels are corrugated for strength. \$6795 from Tubular Aircraft Products Co., 225 N. Madison Av., Los Angeles, Calif.

Logging Gets a Lift

Surplus World War II barrage balloons, used to hold logs aloft while they are skidded down mountainsides, are expected to revolutionize the logging industry.

Eliminating the need for costly access roads, and capable of skidding logs over half a mile, the two-balloon "yarding" method is the invention of Chester Matheson of British Columbia.





Teaching Machine for Fly Casters

Fly casting is made simple by a machine that teaches the fundamentals to a novice in less than 10 minutes.

The student simply holds the handle of a standard fly rod that is firmly attached to a metal arm, which is connected to a handle at the rear of the machine by a series of chain drives. The linkages are

adjusted to correspond to the student's physical dimensions.

Standing behind the machine and the student, the instructor operates the machine with the handle, guiding the rod and the student's arm through the movements of a perfect cast, complete with the important pause at the top of the backcast.

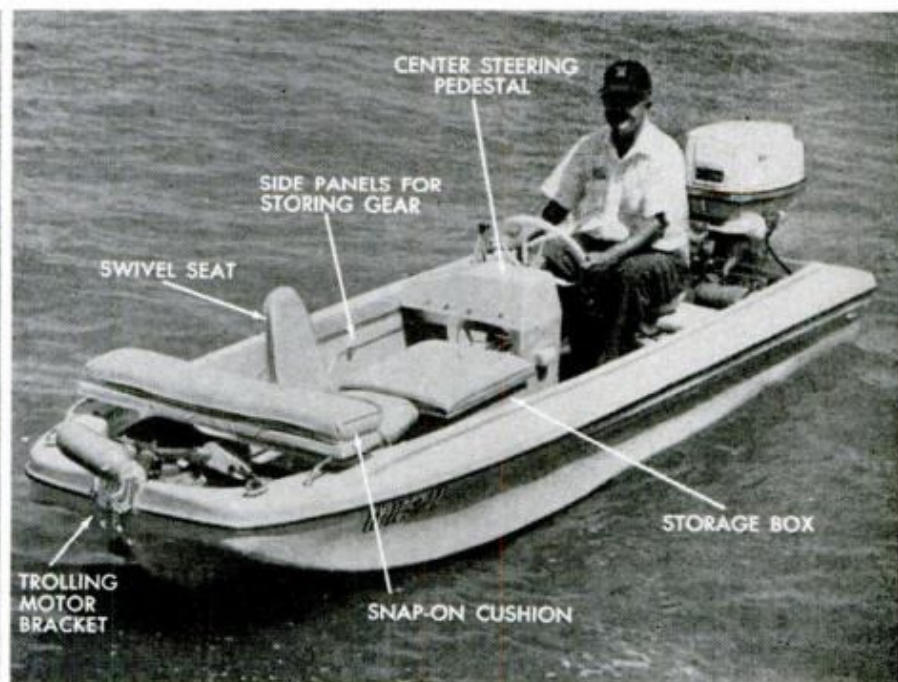
New Boat Can Be Customized with Drill and Screwdriver

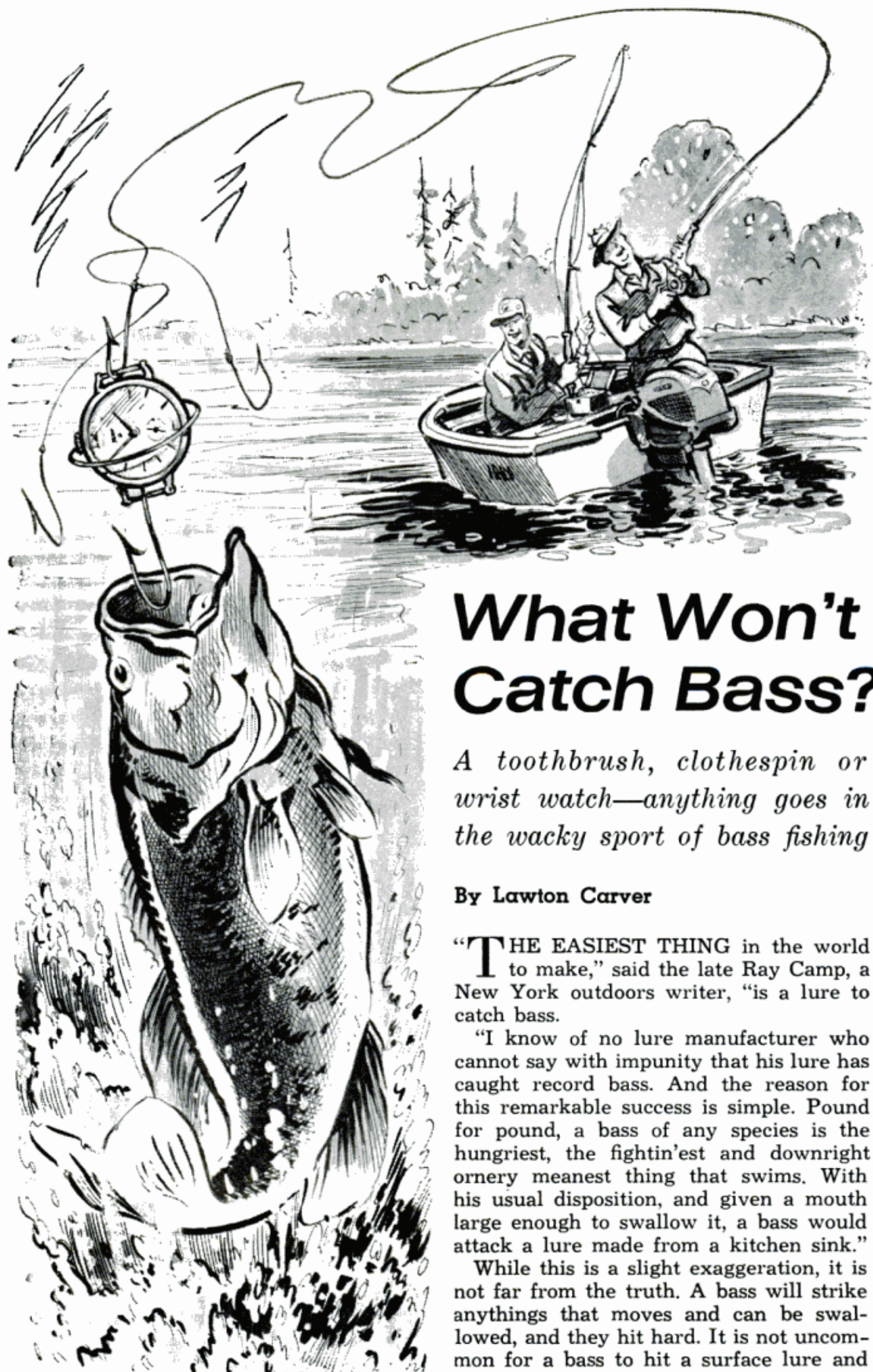
Featuring an extensive line of optional equipment which can be installed with only an electric drill and a screwdriver, a new 14-foot 9-inch open fiberglass run-about can easily be customized to suit your individual taste.

Flotation is provided by balsa wood sandwiched between the fiberglass floor and bottom. An adjustable casting seat

located in the bow is included as standard equipment. Designed for use with an outboard of 40 hp. or less, the boat has a 57-inch beam and weighs 280 pounds.

The Model 15 Terry Bass Boat is priced at \$429.50 f.o.b. Terry Plastics, 3733 E. Belknap, Ft. Worth, Tex. Two other sizes are also available—a 13½-foot model for \$319.50 and a 12-foot model for \$279.50.





What Won't Catch Bass?

A toothbrush, clothespin or wrist watch—anything goes in the wacky sport of bass fishing

By Lawton Carver

THE EASIEST THING in the world to make," said the late Ray Camp, a New York outdoors writer, "is a lure to catch bass.

"I know of no lure manufacturer who cannot say with impunity that his lure has caught record bass. And the reason for this remarkable success is simple. Pound for pound, a bass of any species is the hungriest, the fightin'est and downright ornery meanest thing that swims. With his usual disposition, and given a mouth large enough to swallow it, a bass would attack a lure made from a kitchen sink."

While this is a slight exaggeration, it is not far from the truth. A bass will strike anythings that moves and can be swallowed, and they hit hard. It is not uncommon for a bass to hit a surface lure and

BASS have strange tastes, as one fisherman illustrated when he used a red toothbrush as a lure, tying the line to the handle and running the hook just beyond the bristles



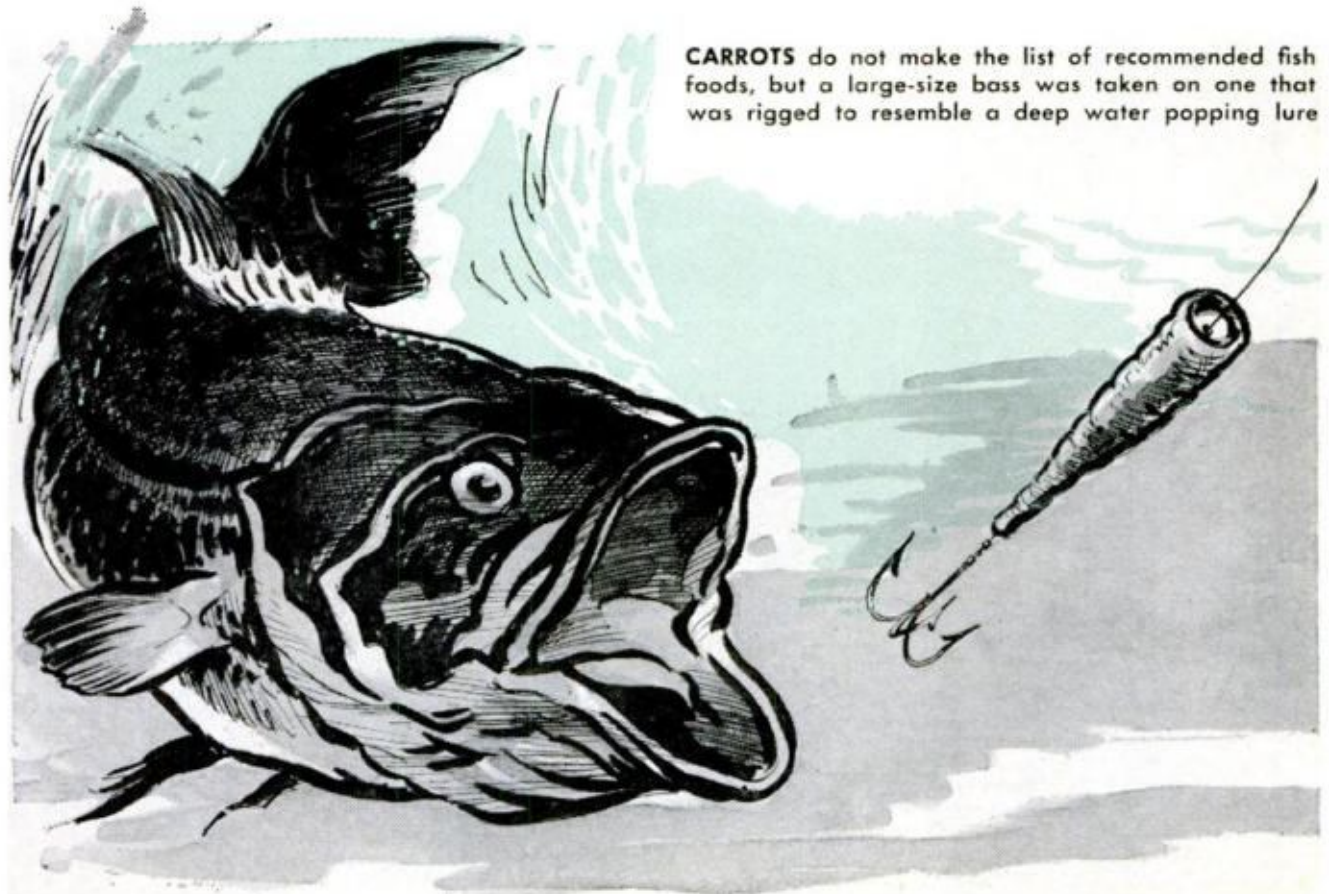
carry it six feet into the air. When stuffed with food, a bass will strike just out of pugnacious anger at any movement that seems to irritate him.

On the Pascagoula River in Mississippi I caught a bass that had some other angler's plug still hanging by a gang hook from its mouth. On that same trip we took a bass with a cigar butt in its stomach.

It was Ray Camp who took a largemouth on a carrot rigged with a single hook, merely to prove it could be done. The hook was tied to the end of the leader pro-

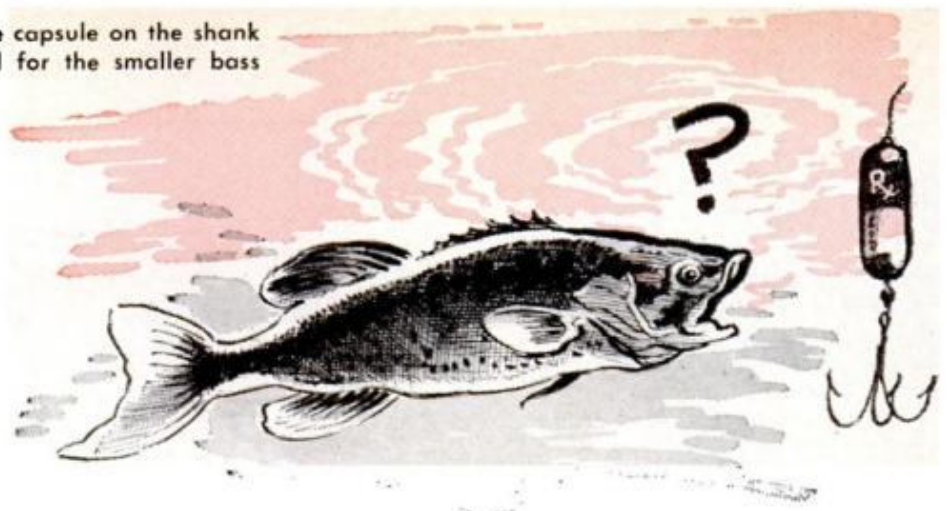
truding from a lengthwise hole at the small end of the carrot. The leader was made secure at the large end, which was scraped convex to provide something like a popping bug's gurgle when yanked sharply underwater. The carrot was cast and allowed to sink, and then retrieved in jerks. It didn't take long for a bass to decide it was something to eat.

A wrist watch rigged into a frog harness with a piece of pork rind on the bend of the hook will work about as well as anything—when they are hitting. The wrist



CARROTS do not make the list of recommended fish foods, but a large-size bass was taken on one that was rigged to resemble a deep water popping lure

DOCTOR'S SPECIAL, a medicine capsule on the shank of a hook, has special appeal for the smaller bass



watch lure, improvised out of curiosity, took a bass in New York's Ashokan Reservoir in the fall of the year. But this can be costly fishing. A second bass made off with the watch.

After three unsuccessful days of fishing Forked Lake in the Adirondack Mountains, where we tried every lure imaginable, a big dry fly designed for salmon was offered and accepted with a smash on the first cast. It wasn't the fly. They simply began—for reasons known only to a bass—to hit at everything.

In bass country a man's toilet case can double as a tackle box. I saw a bass taken on a razor blade. A flat-shanked hook trailing a piece of pork rind was tied to

the center split of the blade with monofilament in such a way as to produce an oblique dart on a fast retrieve with quick yanks.

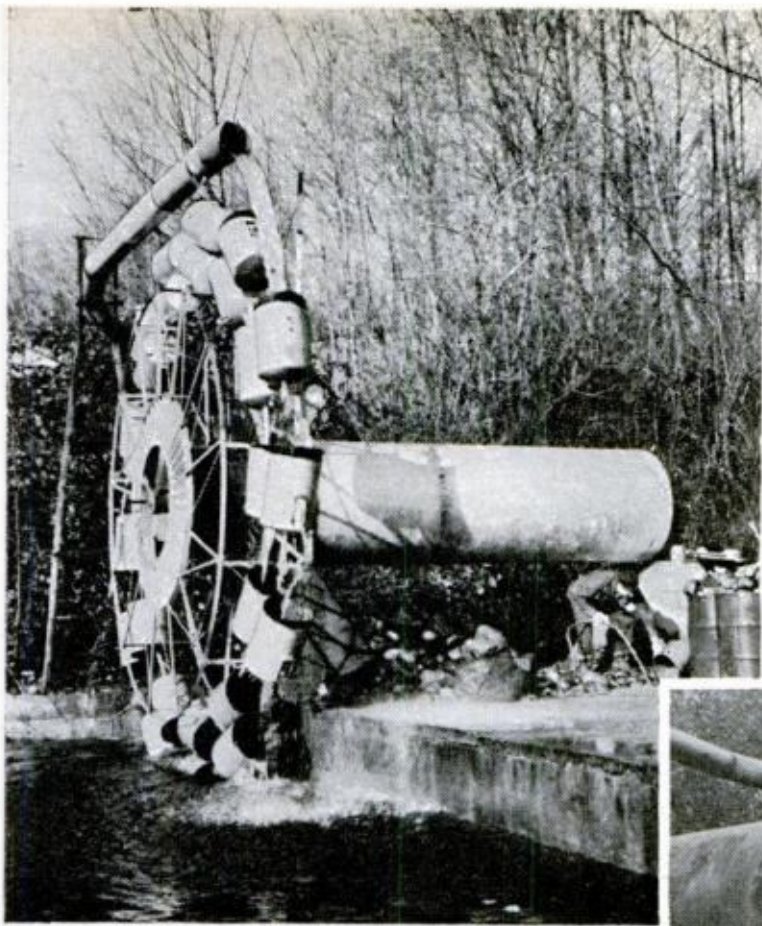
Another time, just for the fun of it, I fished a transparent red toothbrush, fastening the leader to the hole in the handle and trailing the hook slightly behind and beneath the bristles. On the third cast and retrieve a bass followed it almost to the boat, as though trying to figure out what it was. And just as we were about to conclude that even a bass can't brush after every meal, he lunged and took it.

Largemouths are regularly caught in the south weighing up to 20 pounds, and the

[\(Please turn to page 201\)](#)

PLAYING TAG with a bass, a lizard approaches the water, then scurries for safety when the bass leaps

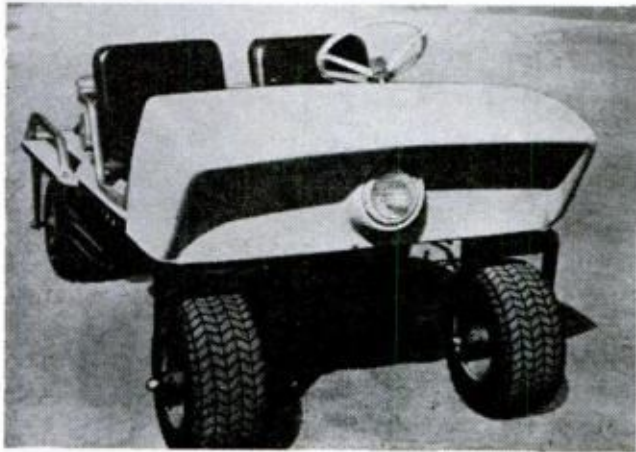




Boulder Bouncer

Smoothing semiprecious stones in eight-ton batches, a giant rock tumbler built by Walter Thompson, Gold Bar, Wash., is probably the largest—and noisiest one—going.

Thompson built the water-powered machine from salvaged materials. The tumbler is a paper-dryer roller, and the water-wheel buckets are old hot-water tanks cut in two. Thompson even built a dam to create the flow of water. Thompson cuts the finished rocks into slabs for table tops, counter tops and such uses.



Off-Trail Swiveler

Swivel-hipped and equipped with wide-tread tires, the Invader is a new go-anywhere vehicle.

Front and rear halves are joined by a single "backbone" clamped in a rubber bushing, allowing any wheel to raise or drop 16 inches. The wide, low-pressure tires grip on almost any surface and do away with the need for springs. The body is formed of fiberglass. Engine choices are $7\frac{1}{2}$ and 9 horsepower.

Base price of the Invader is \$895. It's made by My-On Products, 1435 So. LaCienega Blvd., Los Angeles 35, Calif.



New for Your Home

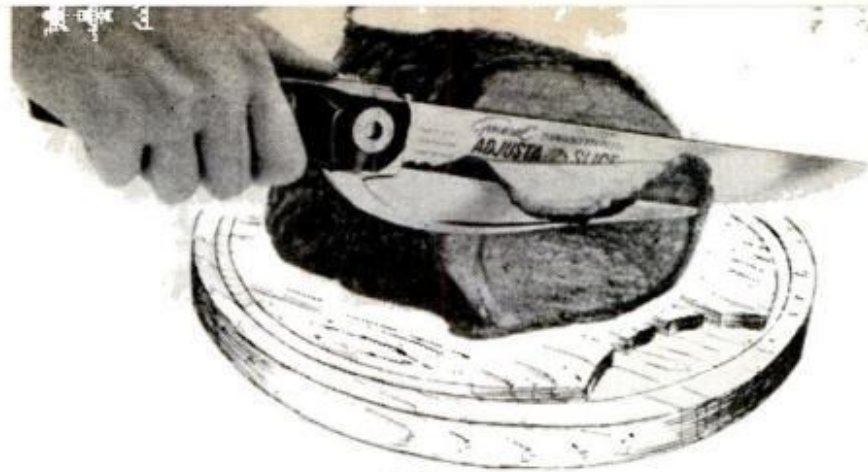
FLOOR MARK REMOVER takes off scuffs in seconds, applies coat of wax to cleaned area. Half the pad contains "beads" of cleaner and polish, half serves as buffer. Twelve pads cost 59 cents; Armstrong Cork Co., Lancaster, Pa.



SOFT-DRINK DISPENSER operates in home, auto or boat with self-contained absorption-type cooler, motorless carbonator. Four syrup holders vend drinks (2½ cents each). \$300 from Bernzomatic, 740 Driving Pk., Rochester, N.Y.



ROOM DIVIDER KIT frames hardboard grillework with hardwood mouldings; installs with screwdriver. Kits start at \$12, adjust to height of 99 in., width of 26 in. By Panelboard Manufacturing Co., 222 Pacific St., Newark, N.J.



ADJUSTABLE KNIFE is set to slice from paper-thin to $\frac{3}{8}$ of an in. with a flick of a finger. Stainless-steel blade, plastic grip, aluminum regulator weigh 13 ounces—slice food from hot meats to cheese. Price is \$6.95; made by General Slicing Machine Co., Walden N.Y.

APPLE CORER of tubular aluminum with a hardwood dowel ejects cores quickly and simply. Seven-inch long unit prepares apples for immediate slicing or canning, and is easy to clean. Price per corer: \$1.49. Available from Mail-A-Way, Dept. Q1, Box 253, Provo, Utah



COFFEE DISPENSER replaces tin cap on five or six-ounce jars. To operate, tip jar upside-down, move handle; one teaspoon goes in cup. Unit then acts as cap to keep coffee fresh. Cost: \$1. Mayvons, 900 E. Gordon Terr., Chicago, Ill.

PULL-UP TABLE slides under chair or sofa, fits any guest. Welded steel legs act as cantilevers for steadiness. With tops in laminated glass or wood, tables are \$9.95 each. Furniture Div., AGM, 8711 Grinnell Ave., Detroit, Mich.



Emergency Hot Squad Tames

A dangerously "hot" factory, the radioactive belongings of a dead man, a boat's lead ballast—they all spell work for this unusual team

By Charles Remsberg

ONE DAY IN AUGUST, 1963, a Pittsburgh man came home with a suitcase he'd bought at a second-hand shop. Examining his \$1 bargain, he was surprised to find a label pasted inside. "CAUTION!" it read. "RADIOACTIVE MATERIAL!"

Though the bag looked innocent enough otherwise, the warning hit home. The man's simple act of lifting a lid had dropped a serious problem in his lap. And he did what many people with problems do—he went to the police.

They, in turn, called in the Pennsylvania Health Department. A quick examination disclosed that the warning sticker couldn't have been more to the point: The suitcase was "hot" with the radioactive dust of radium.

The bag was traced to its previous owner, a radiochemist who had recently died. He had maintained a makeshift lab in his suburban home and had worked with radium. Unwittingly, he had spread radioactive contamination throughout the house.

Empty and up for sale, the dwelling was a serious health hazard. Authorities also feared that the furnishings, now being put into circulation by the second-hand store, would spread the danger into many corners of the city and set the stage for a public panic.

But the prompt action of the health department and the work of a unique crew of private radiation experts kept the problem from getting out of hand. These specialists are members of the "Hot Squad," more properly known as Applied Health Physics, Inc., a company dealing in radiation safety services. Head man is Robert Gallagher, who represents a new breed of scientist, a health physicist. He cut his teeth in radiation safety by working for the Federal government at a large num-

ber of its massive nuclear installations.

When called in on an accident, Gallagher and his men have two immediate objectives: to decontaminate "hot" objects and to halt the spread of radioactivity before it seriously damages property and injures human beings.

In the Pittsburgh crisis, the health department tracked down and safely disposed of the dead chemist's belongings and tested the persons who had bought them. Gallagher's crew confirmed that none of the items was contaminated enough to have caused injury during the short span of public exposure. They then turned their attention to the house itself.

That was a different story. Several rooms—especially the basement laboratory—were dangerously "hot." Radioactivity had penetrated deeply into the walls and floors. And in a drawer in the basement, the investigators found a dozen capsules of radium that could have delivered a potent dose of radiation if opened by some curious future occupant.

Despite the heavy contamination and the fact that radium loses its radioactivity at the slow rate of 50 percent every 1620 years, the Hot Squad made the house perfectly safe within 10 days.

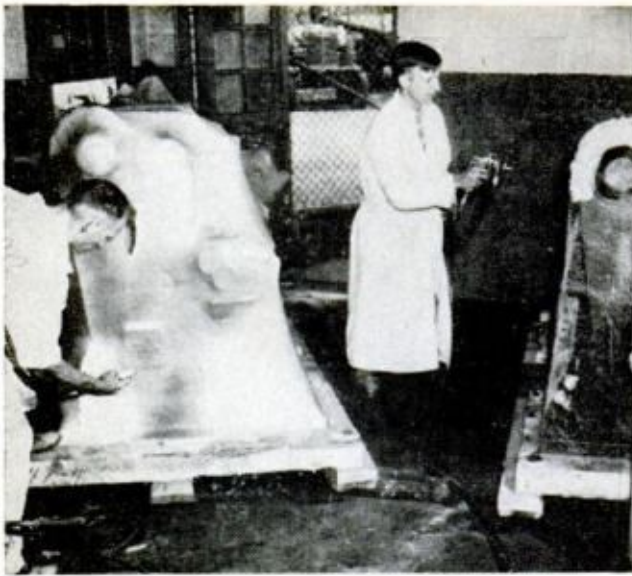
Protected by bizarre *anti-C* (anticon-tamination) clothing, they scrubbed the place with detergents; coated walls with a plastic that absorbs radioactivity and carries it away when peeled off; froze off contaminated tile flooring with dry ice, and used a special paint to tie down radioactivity on desks and chairs while they were being taken apart and packed in concrete-lined steel drums for burial.

When the Hot Squad's work was finished, there remained only background radiation, which comes from naturally

Radiation

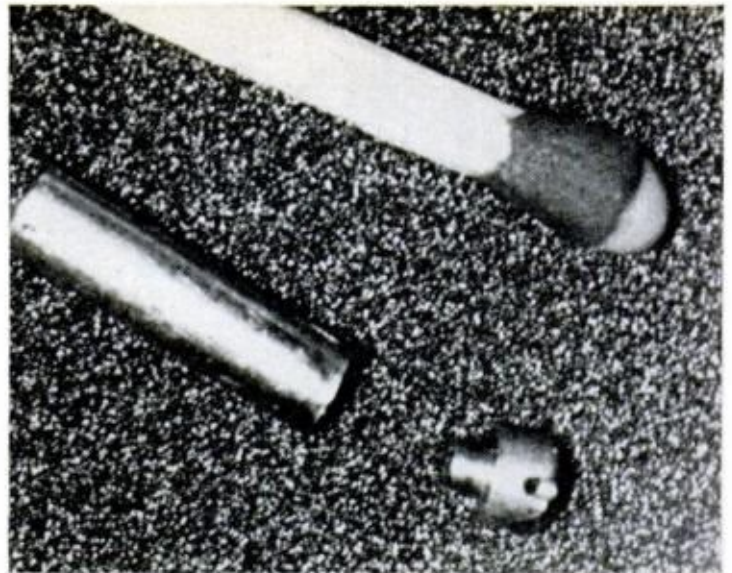
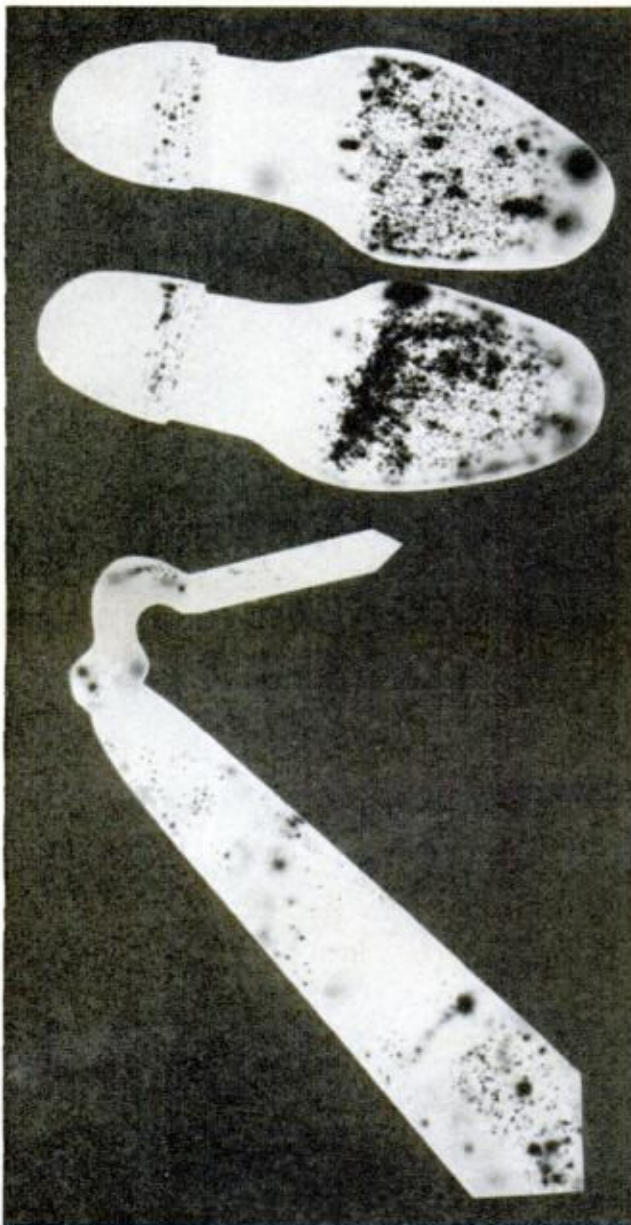
HOW SQUAD recovers radioactive source: One man uses pick-up tool while partner checks radiation level





GOVERNMENT MEN spray machinery with cocoon material so that it can be shipped to decontamination center, a standard way of handling some items

THE MANAGER unwittingly tracked radium throughout extensive area in factory. "Hot" material shows up as dark specks on radiographs of his tie and shoes



THOUGH SMALLER than kitchen match, this capsule of radium caused damage of \$250,000 in a Midwest plant when accident was mishandled by personnel

radioactive elements in the earth and is found everywhere. The house once again was safe to live in.

This case, like many others the Squad has handled, backs up Gallagher's contention that a radiation accident need not have disastrous results. Last March, for example, Gallagher and his men were called to decontaminate part of a Pittsburgh hospital after a doctor had discovered that a box in the basement contained a broken vial of radium. The de-con crew got rid of the radium, cleaned the basement and checked to make sure that no radioactive dust had spread into other areas through the building's ventilation system.

Radiated Keel?

Individuals, too, call in the firm. A woman in Philadelphia recently hired the Squad to decontaminate an antique table willed to her by a radiochemist, and a sportsman in New Orleans flashed an S.O.S. when he discovered that the lead ballast in his sailboat had previously been used to shield radioisotopes at a medical center.

"There are times when we handle three emergencies a week," Gallagher recently told me. "Yet, we experience less personal radiation in a year than many dentists, working with their X-ray machines, do in a month. Our work is an art."

It's an art that's bound to grow in demand. Some years ago, radioactive materials didn't play much of a role in industry. Today, there are over 5000 industrial users

and some 500,000 workers who are required to handle "hot stuff." Many of these workers are not properly trained. One authority estimates that there are as many as 20 radiation mishaps a month, many of which are never made public.

"In many cases, plant personnel try to handle emergencies themselves," says Gallagher. "Unless they're experienced and highly trained—and I mean *highly*—it's like someone practicing amateur brain surgery."

Gallagher is a trained professional. After graduating with the first class of health physicists (scientists concerned with radiation protection) trained at Oak Ridge National Laboratory in Tennessee, he worked as a radiation specialist for the U.S. Public Health Service and for one of the nation's largest insurance companies. His work made him keenly aware of the costly bungling of radiation problems within industry.

Typical of such bungling is what happened in one Midwestern plant. A vial of radium broke, spraying radioactive dust in the immediate area. The damage could easily have been confined to a single room, but the plant manager and a supervisor turned on 24-inch fans to blow away the radon (the gas resulting from the decay of radium). In their panic, they spread radioactivity through 25,000 square feet of the factory and endangered the health of almost 300 workers.

Through ignorance, the two men turned what should have been a minor clean-up job into a major operation requiring a shutdown of the plant for three months and costing \$250,000. In addition, the plant manager still carries a dangerous quantity of radium in his bone marrow.

Such mishaps convinced Gallagher that private companies needed the same kind of radiation safety guidance that government installations provide for themselves. In October, 1962, he formed Applied Health Physics, Inc., which he believes to be the first U.S. firm devoted solely to radiation safety services. He selected Pittsburgh as his operational base because it is the geographic center of peaceful atomic energy. Within a 500-mile radius are more than half the companies and medical centers licensed by the Atomic Energy Commission to use radioisotopes, as well as 75 percent of all Canadian users.

APH, now located in a suburban plant



PROTECTIVE clothing and equipment used by AEC inspector (above) are same as the Hot Squad's gear. Man is shown taking reading with a fish-pole meter

after outgrowing Gallagher's basement, helps clients with the whole spectrum of radiation safety needs, such as monitoring, leak testing, processing of the film badges worn by workers to indicate exposure, employee training, record keeping and instrument calibration.

The firm's main function, according to its founder, is to prevent radiation accidents and aid in the productive use of radioactivity by establishing proper safety practices. But the Hot Squad, said to be the nation's only private decontamination crew that includes certified health physicists, is undoubtedly its most dramatic service.

To cope with potential disasters, Gallagher maintains a staff of 24 full- and part-time de-con experts. In addition, there are stationed in 10 major cities across the country part-time consultants who can take over at the scene of an accident while the Squad is on its way.

The crew's smooth, professional approach was demonstrated in the way they handled a recent emergency in one large plant. A capsule of radioactive cesium had broken as the result of corrosion, threatening to contaminate \$75,000 worth of machinery in an adjacent section and to spread radioactivity through air ducts and endanger the workers.

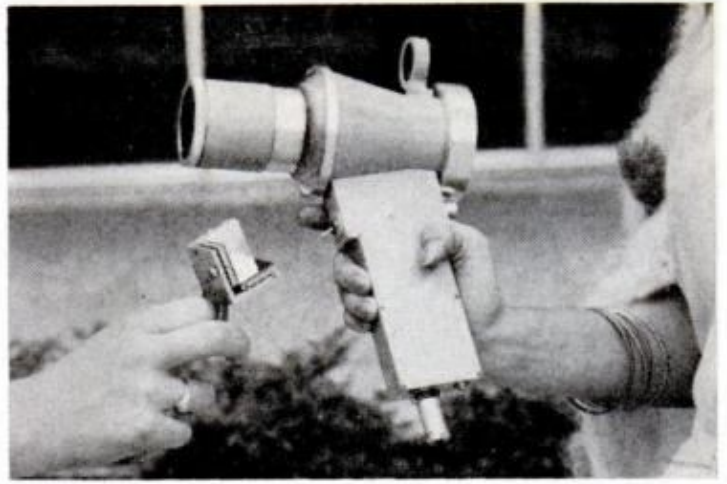
By phone, Gallagher told plant officials how to seal off the room where the mishap occurred, monitor and clean workers involved in the accident, and how to limit the spread of radioactivity. Then the Hot

[\(Please turn to page 210\)](#)

Talking on the Beam

Only the power of the sender's voice is required to activate the transmitter in a new light-beam communications system.

A large, gunlike Retrometer unit, powered by batteries, sends a beam of light to the person who will speak. That person talks into a "corner reflector," and his voice activates a flexible, reflective diaphragm that modulates the beam. The reflected beam returns to the source/receiver unit where it is converted into sound. System was developed by NASA.

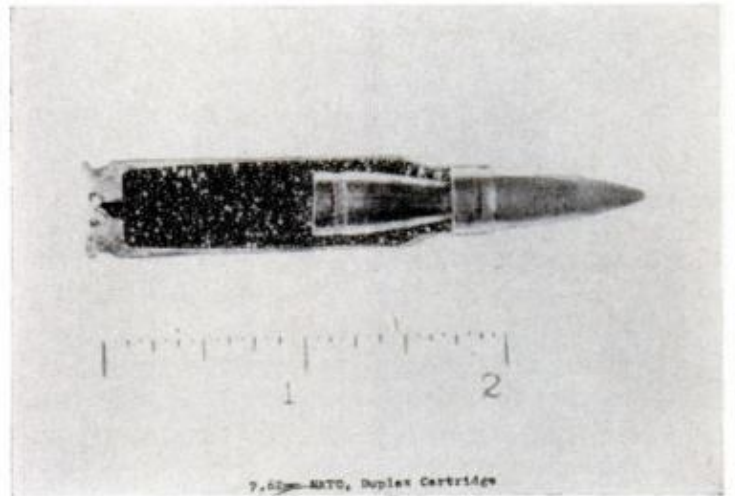


Two-Headed Cartridge

A new duplex cartridge adopted by the Army is reported to increase the effectiveness of short-range combat rifle fire.

The 7.62-mm. round resembles a conventional rifle cartridge, but has two bullets instead of one (photo, left). The base of the second bullet is slanted 4.5 degrees.

When fired (right), the first bullet follows the line of aim, while the second, due to its slanted base, veers slightly and follows a divergent path. In Army tests, duplex cartridges increased the hits scored at ranges up to 150 meters.



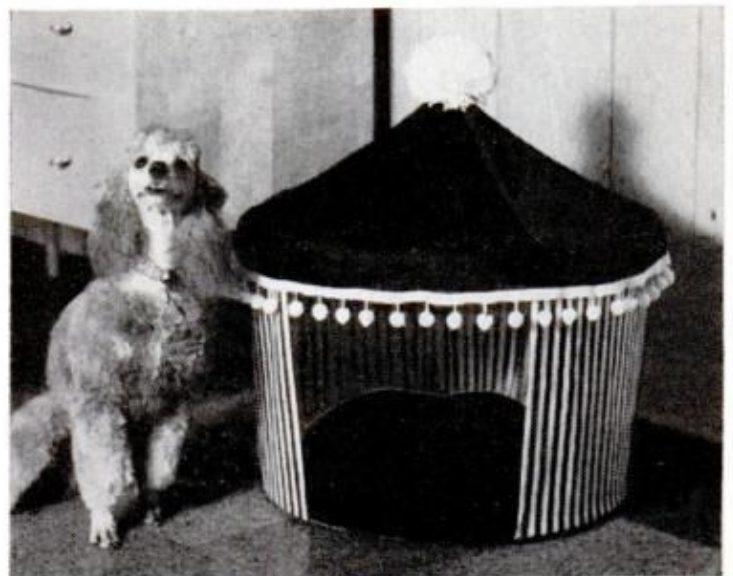
Personal TV on Jets

Passengers on American Airlines jets can watch take-offs and landings—as well as in-flight movies—on individual closed-circuit television screens. The sound comes through individual earphone headsets, which also bring stereophonic music programs to the passengers.



Pup Tents for Pups

For the pet owner who really wants to put on the dog, there is now an indoor "pup tent" for Fido, designed to protect him from cold drafts. Standing 19 inches and furnished with a foam cushion, the tent is priced at \$14.95 from Pup Tents Co., Box 10, Elmwood Station, Omaha, Neb.



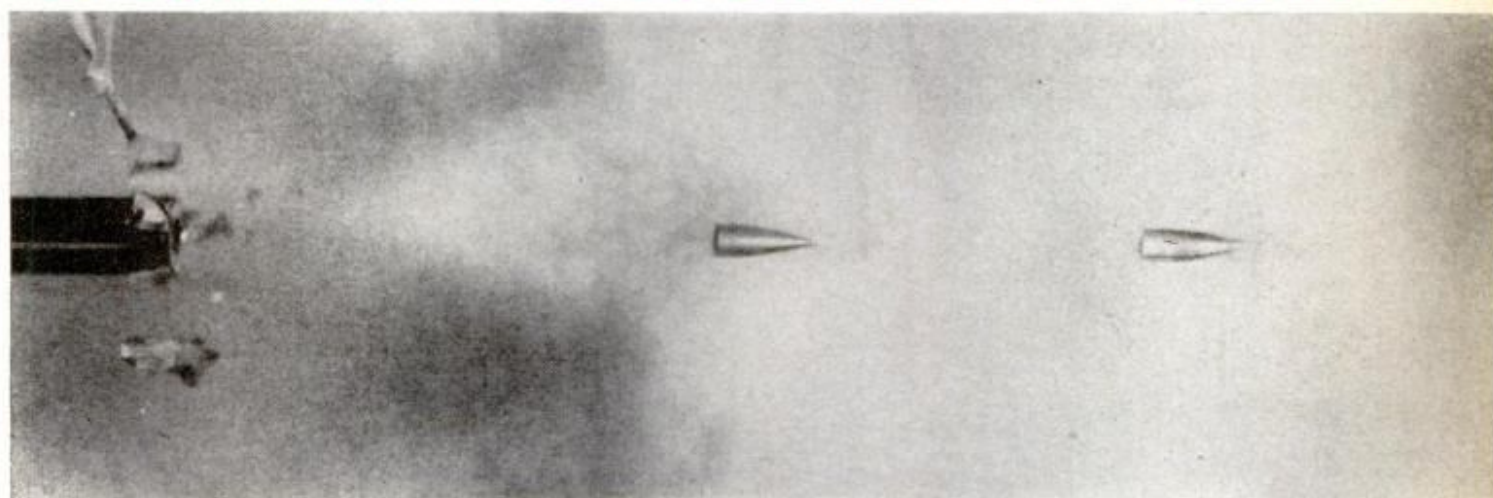
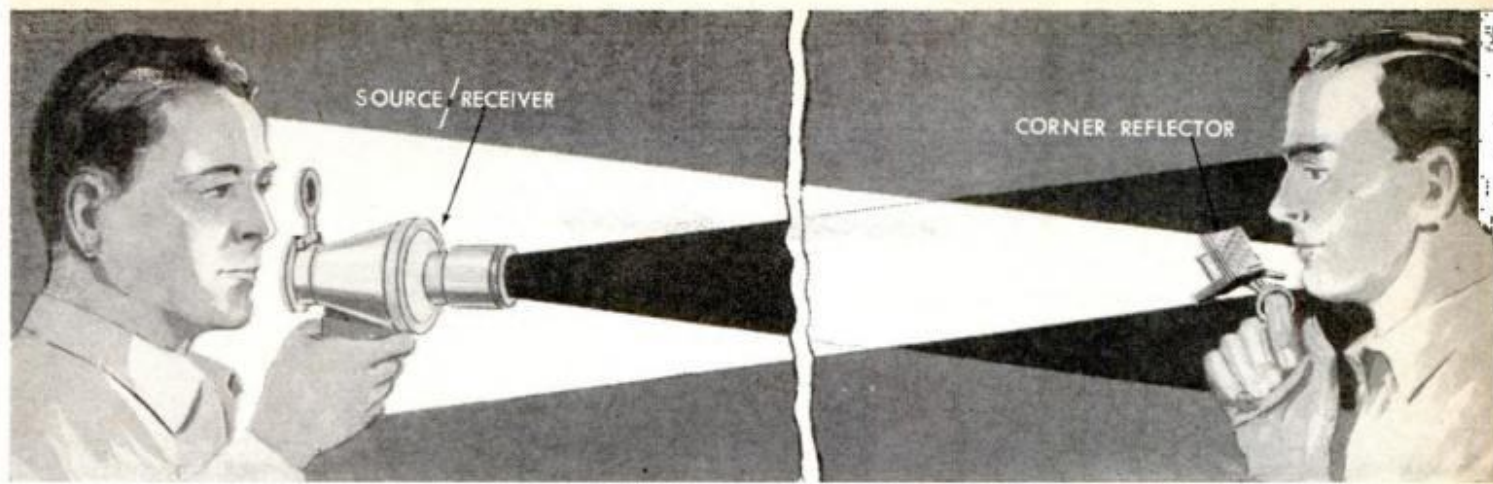
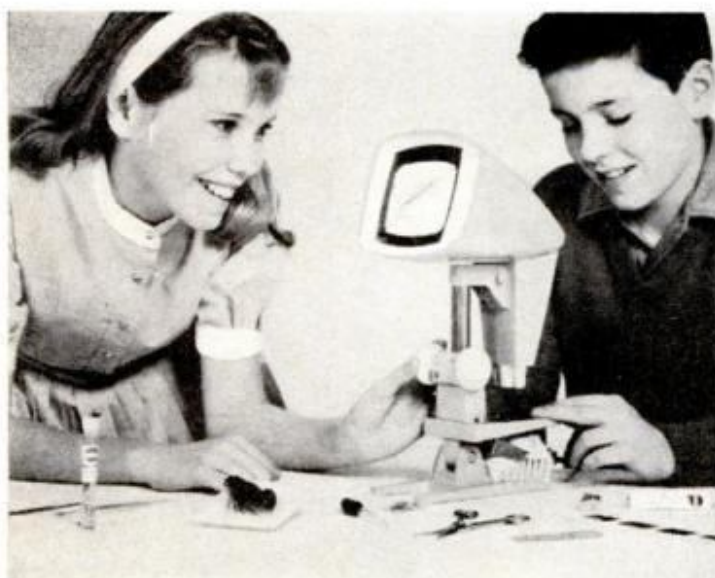


Image-Projecting Microscope

An image enlarged 5, 20 or 60 times appears on Micro-Projector's frosted screen, where it can be viewed or traced. The instrument accepts both opaque objects (biology specimens, coins, etc.) and slides. Made by the A. C. Gilbert Co., New Haven, Conn., the science toy costs \$19.98.



Featherweight Dock

Weighing only 25 pounds per section, a new dock unit uses expanded polystyrene for flotation and will support 500 pounds. Each hardboard-decked "Add-A-Dock" section is priced at \$39.95 f.o.b. from P. & R. Products Corp., Box 12031, Oklahoma City, Okla.





Powerful king-size horseshoe magnet mounted in portable swivel stand holds tenaciously to metal parts, freeing your hands for work

By Manly Banister

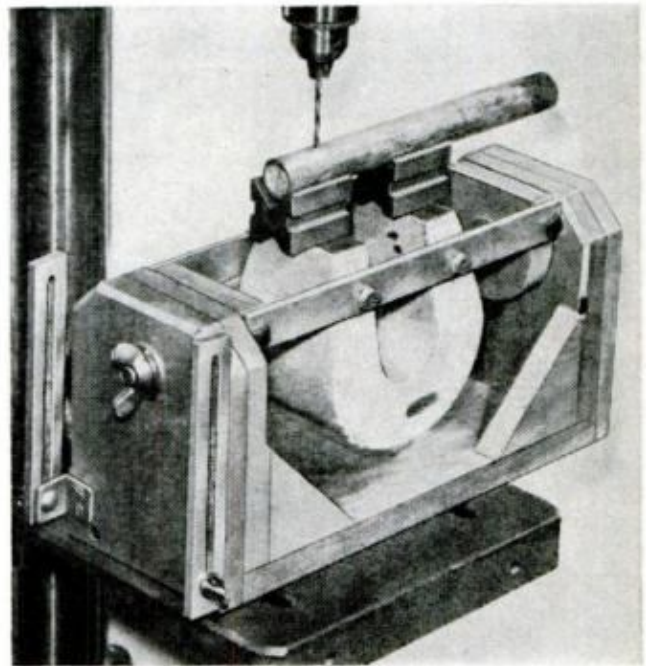
HOW MANY TIMES have you wished for a third hand to hold a job while you worked on it. Well, here's a strong third hand for use with metal-working projects which has a powerful 250-lb. grip—a 15¾-lb. permanent magnet mounted in an adjustable holder.

The swivel bolts make it possible to set the magnet at any point on its longitudinal axis, and the entire assembly can be tilted to whatever angle is desired by raising or lowering the two aluminum legs. By setting one leg higher than the other, the holder can be tilted to still other planes. You'll find complete plans for this holder on the following page.

It's especially important that nonmagnetic materials be used in constructing the holder. If you use iron or steel bars to hold the magnet, they will "short" the magnetic lines of force. Thus, aluminum is recommended. It's also a good idea to use brass or aluminum mounting bolts. If the swivel bolts are made of brass, so much the better.

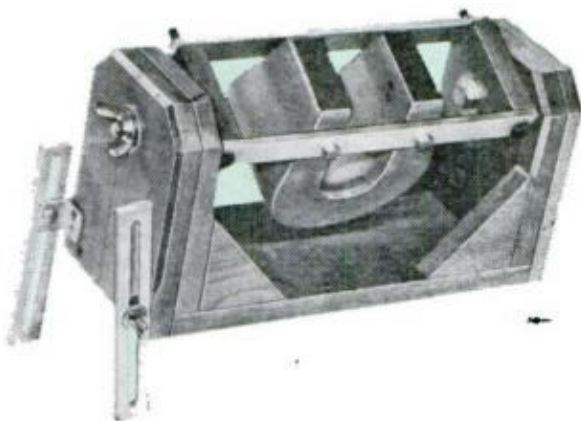
The number of uses for this third hand is almost limitless. It can hold sheet metal during wire-brushing, grinding and drilling operations with portable tools. Even the smallest parts will be gripped firmly

UNIVERSAL HOLDER for the magnet is made of hardwood with the magnet secured to two aluminum bars by means of capscrews. Various adjustments provide a spherical radius of operation for holding any work

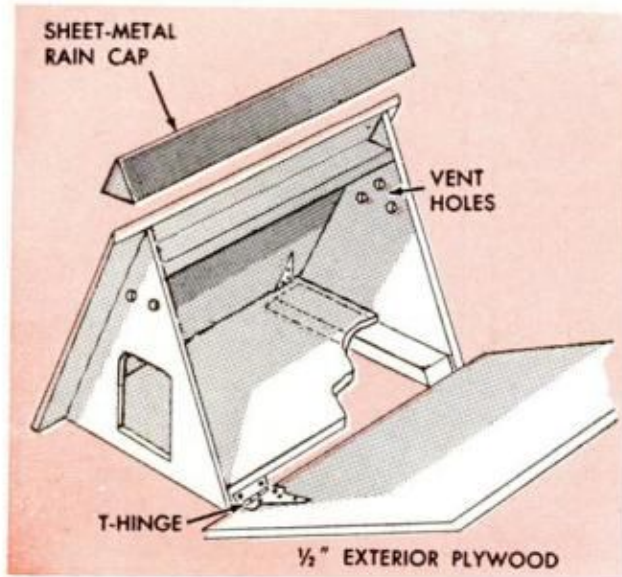


USE V-BLOCKS with the magnet-holder assembly to hold rods or pipes for drilling. This set-up is particularly well-suited to extremely short lengths of pipe, since it grips with bulldog strength yet leaves the whole length of the pipe free for drilling

DIFFICULT WELDING set-ups are a breeze with this "third hand." The plate, above, is supported vertically on the magnet so that the lines of force enter the free end of the rod and hold it firmly in place



A-Frame Simplicity Ideal for Dog House



The roof-wall A-frame construction that makes vacation cabins so quick and easy to erect gives an extra bonus when applied to a home for your pooch: it makes cleaning a cinch. You just drop the hinged sides flat for a quick hosing and airing.

No dimensions are shown on the plans because the design is readily adaptable to any size dog. For an average house pet, an 11-in.-square opening in a 32-in. equilateral triangle is ample. You'll then be able

to cut both ends and both sides from a single 4x8-ft. sheet of $\frac{1}{2}$ -in. exterior grade plywood. You'll need an extra piece, $30\frac{3}{4}$ x 36-in., for the floor, plus 1x4s for the base cleats and cross brace. Materials should run you around \$10.

All panels should be painted inside and out. No hooks are needed to hold the sides up—the snug-fitting rain cap (which could also be of wood) secures them, and seals the ridge slit against rain.—*E. J. Holgate*

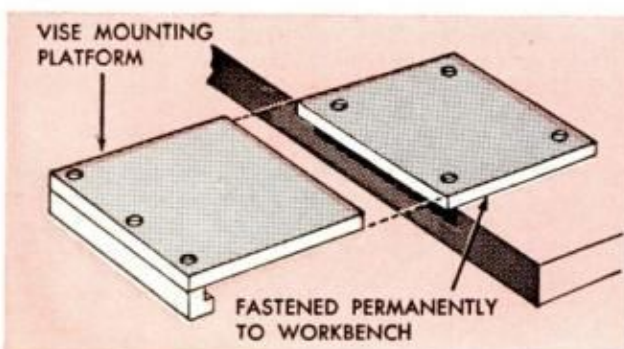
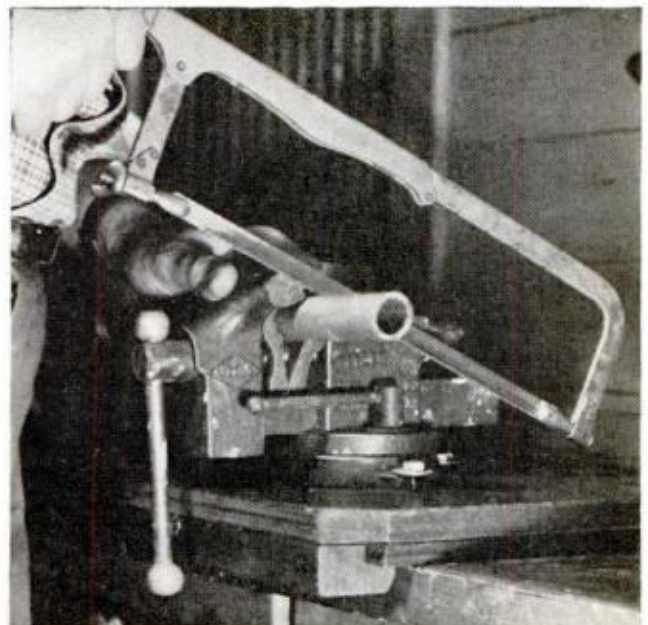
Copper Sulphate Cakes Add Color to Your Hearth Fire

You'll enjoy watching colorful flames in your fireplace if you burn copper sulphate cakes. This chemical is obtainable at feed supply houses, drug stores and grain elevators. To prepare the cakes, mix two parts of copper sulphate with one part of

crushed salt. Then place paper baking cups in muffin tins and put two tablespoons of the mixture into each cup. After that, melt paraffin in a double boiler, fill the cups and allow to harden. Throw the cakes onto a bed of coals beneath the logs.

Vise Hook Lets You Clear Your Workbench for Action

Your bench-top vise won't be a nuisance while not in use if you mount it on a detachable panel, as shown, countersinking the bolt heads. A rabbeted block, screwed to the underside, forms a hook to engage a slightly protruding second panel fastened to the bench top, or a cleat screwed to the edge of the bench.—*Thomas J. Laughlin*





WHAT YOU CAN DO ABOUT

Don't just sit there—even extreme cases will respond to treatment. And you may be able to effect the cure without costly professional aid

By Steven J. Howard



FOUNDATION CRACKS must be chiseled out to form a wedge-shaped groove that will key the repair patch into the wall. Groove—at least 1 in. deep and wider at bottom—is cut with cold chisel and hammer

LOOSE PARTICLES must be swept out of crack with a narrow wire brush like that shown, near right. When sides of crack are clean and firm, mix patching mortar; soak crack with clear water before filling it

HYDRAULIC CEMENT (far right) is best patch to use if crack is leaking at time of repair. Mix it with water to thick paste and pack it into groove. Another patching paste: mix 1 part cement, 3 parts sand

HOW MUCH of a moisture problem can a basement have before it's beyond the skill of a do-it-yourselfer? That is, at what point would a homeowner be well advised to search the yellow pages under "Waterproofing Contractors"? Since a professional estimate will probably run several hundred dollars, it's important to recognize which *causes* of basement dampness you can combat on your own.

There are only four major causes:

1. Cracks in the foundation walls are letting water *leak* in.

2. Your area has a high water table, and hydrostatic pressure is pushing against the walls and floor, as shown in the sketch at the right, forcing water through poor mortar joints, wall-to-floor joints, or any cracks or punctures in the concrete.

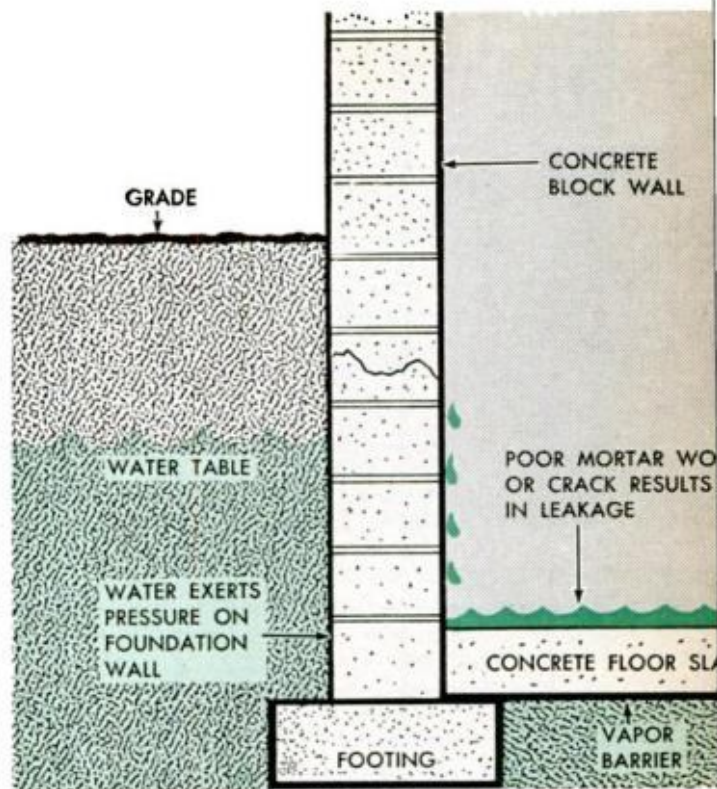
3. Your home is old, and the foundation wall (whether poured concrete or block) has become porous enough to permit *seepage*. This condition can even be found in a few newer homes where the concrete used in a poured foundation had too much sand in the mix; when the concrete breaks down with age, water seeps through it.

4. You have a condensation build-up. This has nothing to do with water entering from the outside; the problem is too much moisture in the *interior* air.

No one method of attack will solve *all* of these problems. You must determine which cause is responsible for your wet basement and select the cure to fit. Then you can decide whether it's a cure *you* can handle, or if it requires a pro.

The yellow pages for your area will probably list several different companies—all offering "sure cures." We investigated those in a typical phone book and found that the guarantees they offer range from five years to life; that the prices they charge range from \$200 to \$2000; and that the companies that charge the most don't necessarily provide the longest guarantees!

Almost every company touted an exclusive method. But the *product* used in each



HYDROSTATIC PRESSURE in the soil around a foundation—caused by a high water table or underground stream—will force water through joints of badly-laid block wall, or cracks in poured concrete wall

case was much the same: all methods involved a waterproofing agent. However, the *methods* fall into two general categories—solving the problem from inside the basement, or attacking it from the outside. Few advocate coming at the problem from *both* sides.

It's always worthwhile to try a few cures on your own, before picking up the phone. Unlike other household troubles, such as plumbing woes, you can't make a wet basement *worse* before you resort to the pro. You'll always have time to spend hundreds of dollars later, should the solution prove beyond you.

As a rule of thumb: if your problem lies mainly in the basement *walls*, chances are you can fix it yourself—if not permanently,





ANOTHER FILLER for cracks or big chips is a putty-like compound. It's tricky to use because it dries in 3 to 5 minutes after you mix it with water. Roll it into a ball, slap it into crack and trowel smooth



EXTERIOR CRACK often extends far below grade. You must uncover and patch the full length; it does no good to patch the upper visible section if water will continue to leak through the underground part

at least well enough to last a good long time. But if the problem is affecting the concrete floor—perhaps causing it to wave, buckle, and crack—you'll most likely need professional services, unless you're handy with a jack hammer and know how to install a sump pump.

This article, then, concerns itself mainly with causes and cures you *can* handle, and with problems that are *constant*, not the rare emergency, such as backflow from overtaxed city drains. (Actually, you can usually take care of *this* emergency, too, if you keep a 3 or 4-ft. standpipe handy for screwing into the threaded floor drain when heavy rainfall threatens, or when you leave home for extended periods.)

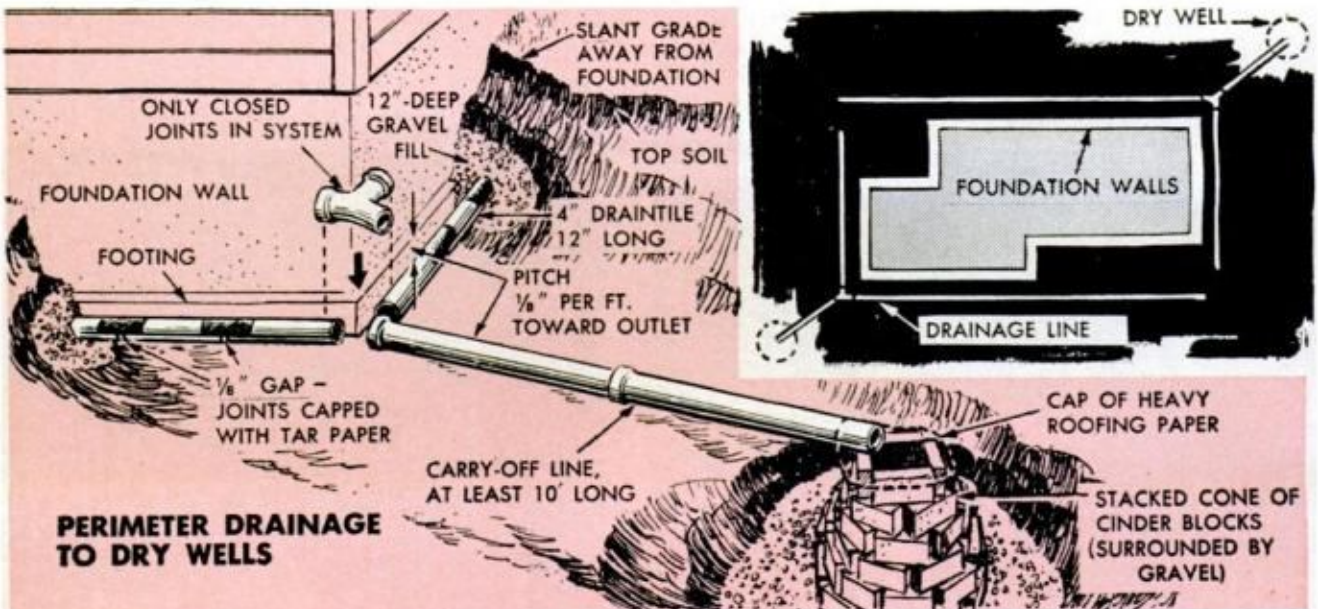
Cracks in foundation walls are easy enough to spot. No matter how narrow a crack may look, it should be attended to. Small cracks can widen and eventually cause serious leakage problems. But even

the narrowest crack could provide an entryway for water, since water can work its way through it by capillary action.

Inspect particularly around windows, doors and pipes. These are a foundation's weakest points, because there's an interruption in the foundation material. The result as a house settles and shifts is often a long, deep crack. But be aware that a foundation can crack in other spots—even where the material is solid.

Many "experts" advocate repairing a crack from the inside. Many others say it's best repaired from the outside. I can offer some solid reasons why it should be repaired from *both* sides.

Suppose you repair a crack from the inside only. If water is leaking into the cellar through that crack, it must be coming from the outside. Thus, there must be a crack on the outside of the foundation that coincides with the crack on the inside.



If you plug up the crack from the inside only, water is still getting through the outside crack and will eventually gather enough force behind it to weaken the patch, cause it to pop loose, and start the leak all over again. True—it could take anywhere from several months to several years for this to happen, but sooner or later the patch is going to give way.

Suppose you just patch a crack on the outside of a block wall which, admittedly, is better than the internal method. There is still water left inside that wall. Naturally, after the outside patch is in place no more will enter, but the water remaining in the wall will still have an entry into the cellar through the inside crack, and only that wall knows how much it has stored up.

A block wall, in fact, can serve as a reservoir. If the cores are full of water in the winter, a sudden freeze could result in serious damage. At any rate, water-filled blocks are bound to cause a seepage problem, and it's a good idea to drill "weep holes" in the bottom row, to drain the cores. You can do this quickly with a carbide bit in an electric drill.

There's another use for weep holes—in both poured and block walls. Drill one at the bottom of each large crack before you attempt to fill them. It quickly relieves water pressure around the crack and gives the patch a chance to take hold. You then plug the hole itself with a carrot-shaped plug, held in place until it starts to set.

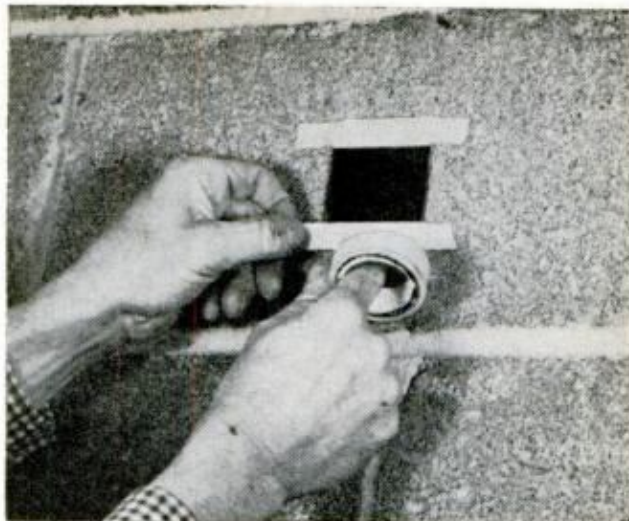
There's nothing difficult about plugging cracks—certainly nothing that requires an expenditure for professional services. But you follow a few rules:

Tackle all inside cracks first—at least you'll stop the water flow until you get around to outside repairs. The best product to use for these is hydraulic cement, because it can be used to plug up cracks even while water is leaking through them. You can, however, use a mixture of one part of regular cement to three parts of sand. If you do, wet the filled crack down every 24 hours for a week, to keep the patch from drying too quickly.

The photos on pages 154 and 155 show how to prepare a crack for patching. Note, however, that we have patched only one section of the crack, for the purpose of demonstration. In actual practice, the full length of the crack must be chiseled out and filled.

Once you've patched the *inside* crack, orient yourself so you can go outside to the same general spot. If the crack is below grade, dig down along the foundation to find if there's an outside crack which coincides with the one inside.

To repair outside foundation cracks, use



POCKET MIRROR or shiny scrap of tin serves as test gauge to find whether basement dampness is caused by condensation or seepage. Leave it taped to wall overnight; if mirror fogs up, condensation's to blame

either hydraulic cement or a mortar mix consisting of one part of regular cement to three parts of sand mixed with water to form a thick consistency. Again, chisel out the crack, dampen the area and trowel in the cement. As before, if you use regular cement, wet the patched area down every day for at least a week.

It's important that you chisel a crack wide and deep enough for the patching material to get a firm grip. If you simply lay cement on top of a crack, it won't



DOWNSPOUT SPILL, if not carried away from the foundation, may seep through basement walls. Plastic extension, below, carries rain water far from house, distributes it over lawn through sprinkler holes



TO PREPARE INTERIOR surface for waterproofing, roughen concrete by means of random jabs with pick axe or cold chisel. Then sweep all loose particles from surface with a wire brush for an unbroken seal



WATERPROOFING COMPOUND, such as Anti-Hydro, is added to a mortar mix to create trowel-on seal coat for interior wall. Proportions called for on label must be followed; keep wall wet during application

adhere properly; as it dries, it will crumble and pull away, leaving you with the problem all over again. And *interior* patches have the added problem of resisting water pressures from behind; they must be keyed into wedge-shaped grooves or they'll be pushed right out of the wall.

With cracks eliminated, if your basement remains wet you must determine whether this is being caused by water seepage through the foundation or by condensation in the cellar. This is not readily apparent without making a test such as that shown on page 157.

If, upon examination, after it's been taped face-in to the wall overnight, the mirror is covered with fog or moisture, then condensation is the problem. If, however, the surface of the mirror remains clear and dry, while the wall around and beneath it is damp, moisture is definitely coming through the wall from the outside.

Whether this seepage is being caused by porous foundation materials or by hydrostatic pressure is something you can't tell for sure. However, you can draw a pretty definite conclusion by calling the municipal engineer in your town or city to ask if your area has a high water table.

If he says "no," then you can conclude that porous building materials are probably at the root of the problem. If he says "yes," you're back where you started.

You can take a chance and tackle the problem from the standpoint of porous concrete. All this costs you is some time, energy and a small expenditure for materials. Or you can call a professional immediately. He'll relieve the water pressure on the foundation, install a sump pump, or use some other means.

In any event, you should try to elimi-

nate as much water as possible that might be accumulating around the foundation. If the problem is *porous materials*, keeping excess water away from the foundation might solve all your problems at once.

Some 60 percent of all water seepage problems through a porous foundation can be resolved by carrying roof water away from the foundation. Ideally, downspouts should carry water 8 to 10 feet away.

Make sure gutters and downspouts aren't clogged, which would cause water to spill over the gutters and waterfall down around the foundation. To check the operation of a gutter and its respective downspouts, pour a bucket of water into the center of the gutter and make sure it flows quickly and easily to the downspouts, down the spouts and out through them. You may have to repitch the gutter to permit water to flow more quickly or you may have to clear the system of clogging debris.

Many "experts" suggest that underground tile (if not already installed) should be laid around the outside of the foundation footing to carry away excess water that permeates the soil and sinks to the bottom of the cellar walls. These drain tiles are short lengths of 4-inch pipe that are made of clay or plastic.

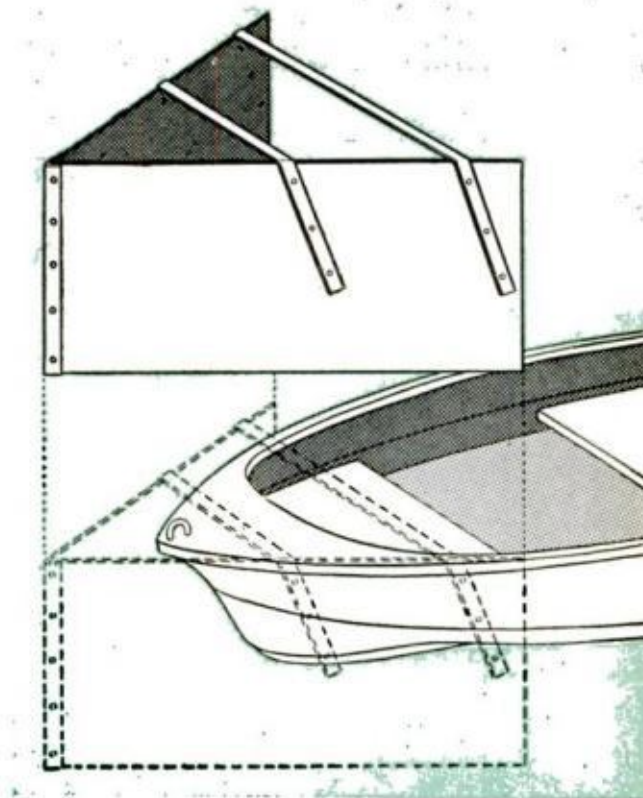
Installing them is a big job, as the sketch on page 156 indicates. The tile are not effective unless pitched downward along the foundation and then away from the house. The earth has to be excavated to the bottom of the foundation. Discharge lines have to be placed at opposite corners, pitched and connected to a storm sewer or a dry well. The tile then has to be covered with crushed stone or gravel that's

(Please turn to page 214)

Icebreaker Prow

Fishermen who use their boats in late fall and early spring often have to smash through patches of skim ice which may scratch or even gouge the hull. Such ice forms early on calm water and presents a real problem for the frostbite boater. If you're faced with this problem of protecting the hull from jagged edges of ice, here's an inexpensive accessory which can turn any small fishing boat into an icebreaker.

Made from two 2 x 4-ft. panels of $\frac{1}{4}$ -in. hardboard, such as Masonite, this protective prow is assembled with three pieces of aluminum—a 1-in. angle at the joint and two 1-in. straps forming the support braces. Attach the angle and straps with short bolts or screws. When not in use, the prow can easily be removed and hung on the wall of the boathouse. During the off-season, the prow can be dismantled and stored flat.

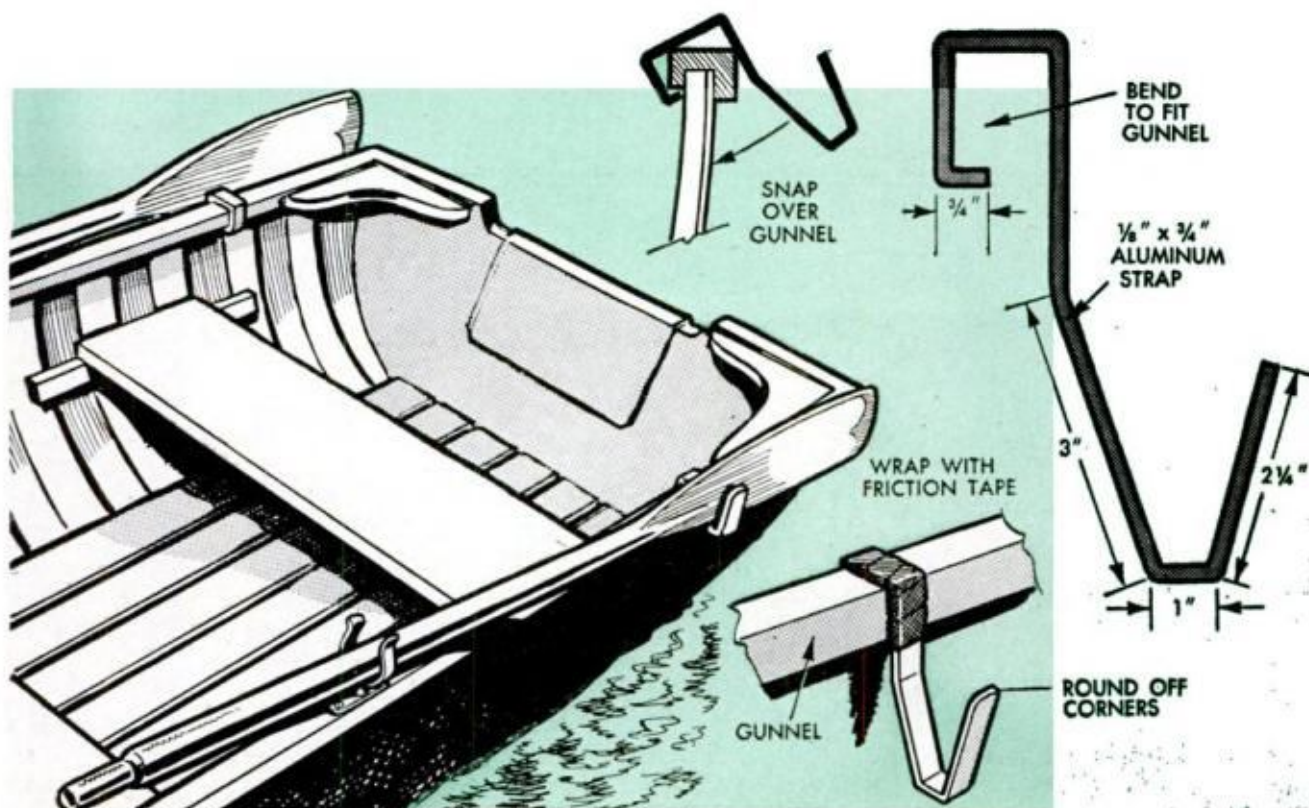


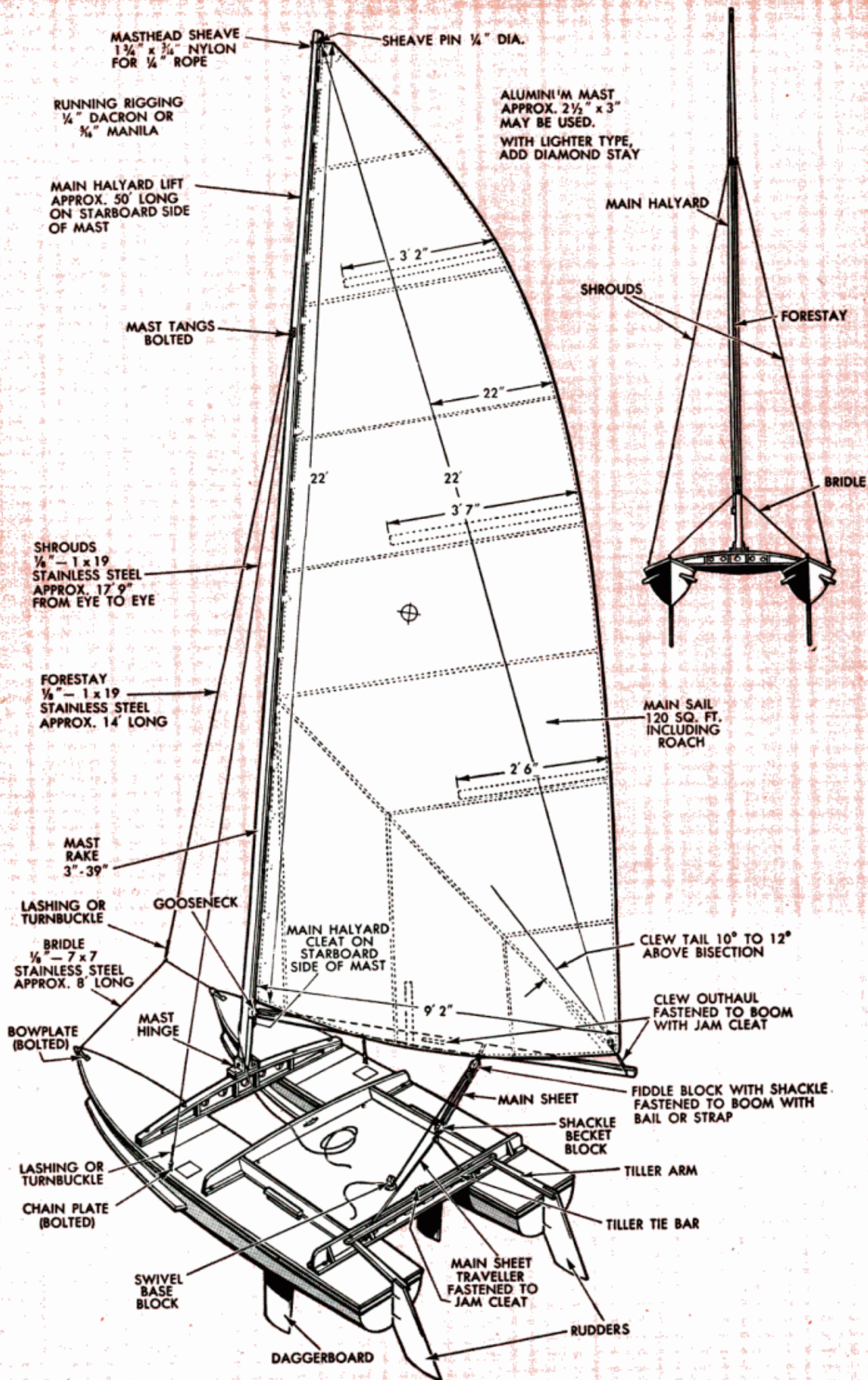
Gunnel-Mounted Oar Rests Stow Oars Outside

Any fisherman worth his salt carries enough gear to create a stowage problem in a small fishing boat. Landing net, tackle box, rods and bait containers always seem to snag the oars when getting them into the water. You can remedy part of this clutter problem by adding a pair of inexpensive aluminum oar rests which clip over the gunnels of your boat. With these rests, your

oars need never be lifted into the boat.

Construction of the oar rests is detailed below. Shape the oar-rest portion first, bending it out about 80 deg. Then bend the gunnel-clip end to fit over the gunnels of your boat. Finally, wrap the clip with friction tape to prevent damaging the finish on the gunnel and snap the rests into position.—Don Mathesius





EL GATO

Part II

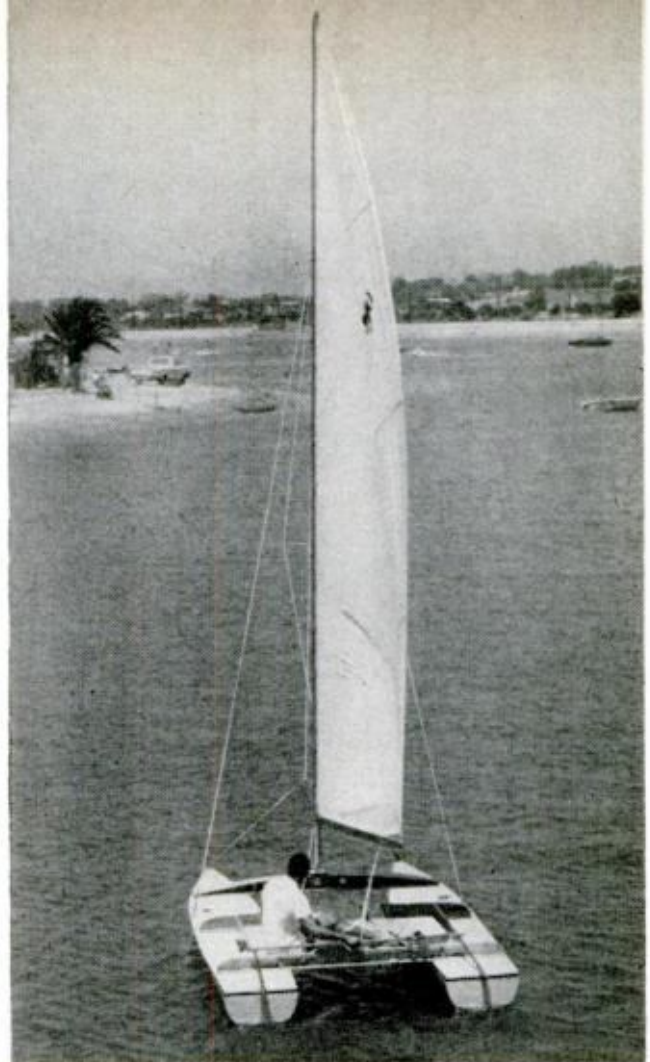
Once you've completed the hulls, the rest is easy. Here are the final steps in building El Gato

WITH the planked undecked hulls resting right side up, fit the chain-plate blocking in place below the sheer 24 in. aft of bulkhead C. The chain plates can be mounted either inside or outside the hulls, but must be through-bolted in either case. However, don't install these until the hulls have been decked.

One 4 x 8-ft. panel of 1/4-in. plywood is sufficient to deck each hull, using a butt joint reinforced by the forward deck beam. After fairing the deck framing, rough cut the panels and temporarily tack them in place for final trimming. Then remove the decking and coat the inside of the hull with an anti-rot preservative (Cuprinol, Penta, or similar). The spray rails must be hand-fitted to the contour of the hull and fastened from the inside.

The mast support beam, detailed on the next page, is a simple construction which should present no problems. After you have assembled it, lay the beam aside before drilling the bolt holes and complete the cockpit tray. The construction diagram of the tray is self-explanatory. The only feature which doesn't show is a 1-in. reinforcing block 3 in. square which should be installed on the underside to serve as backing for the main-sheet swivel block.

When you have completed both the tray and the beam, align the hulls in an upright position the proper distance apart and place these two components on top of them so that the locations for the assembly bolt holes can be marked. After marking, remove the beam and tray for drilling. To assure making these holes perfectly verti-



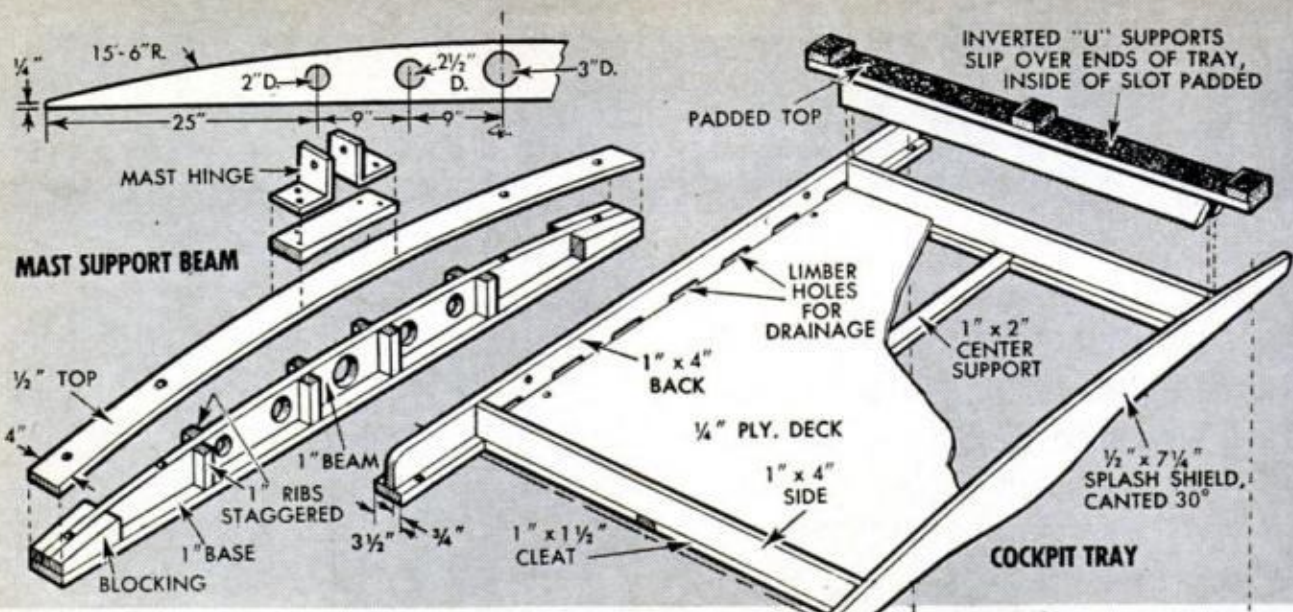
cal, either use a drill press or have a friend help guide the drill by sighting. When you have drilled all twelve holes, replace the beam and drill mating holes in the deck.

Locate the mast support beam over bulkhead C and drill down through the top cleat, using the holes in the beam as a drilling guide. Do the same thing with the cockpit tray, positioning it so that the holes will pass through the top cleats of bulkheads A and B. After all holes have been drilled, remove the beam and tray and take off the deck planking so that the steel bulkhead plates can be installed on the underside of the cleats. The cleat should be mortised slightly to hold the plate in position so that the bolt will pass through the hole and contact the threads.

Now you can secure the decking permanently to the hull. Coat all mating surfaces with glue and fasten the plywood in place by nailing around the edge with 1-in. nails

PM PLANS. If you are planning to build *El Gato* and would prefer to work from larger plans than those appearing in the magazine, enlargements of the plans included in parts I and II of this article will be available after Oct. 1. Printed on four 22" x 28" sheets, these will also include details for making a car-top carrier and a single-piece spruce mast. Just send \$4 to Popular Mechanics Boat Plans, Bureau of Information, 575 Lexington Ave., N.Y., N.Y.

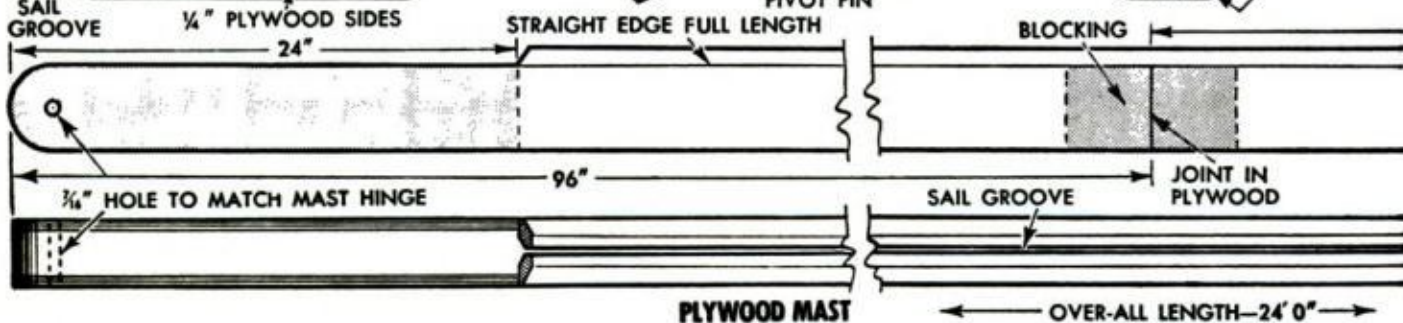
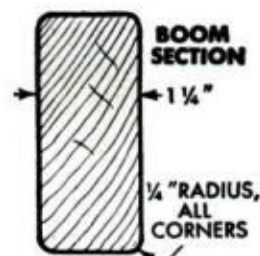
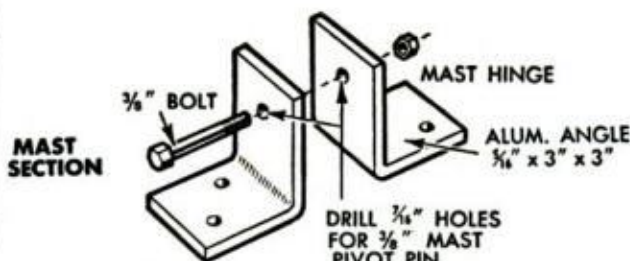
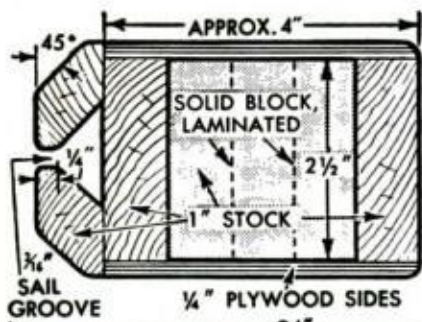
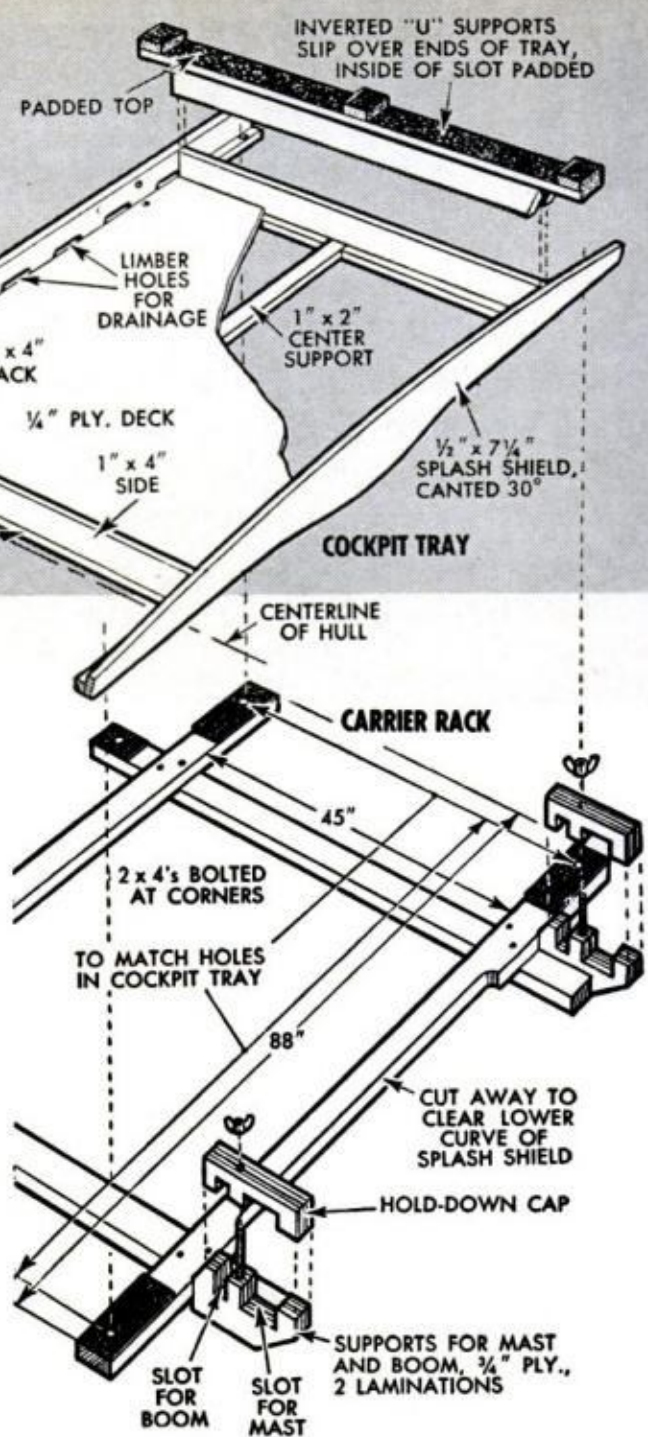
PATTERNS. You may obtain full-size cutting patterns for the stem, daggerboard, daggerboard trunk, rudder, tiller arms, cockpit back, cockpit sides, cockpit splash shield, mast support beam and half sections of the bulkheads by sending \$10 to Glen-L Marine Designs, 9152 E. Rosecrans, Bellflower, Calif. 90707. The complete naval architect's plans plus the patterns described above are priced at \$20, and pre-cut Frame Kits are also available from the same address.



spaced about 2 in. apart. Either cut an access hatch in the indicated location or use a metal deck plate for ventilation.

The two daggerboards, detailed in part I, should be generously bevelled fore and aft with a somewhat steeper bevel on the bottom edge. The rabbeted block at the top will prevent warping, while the wedges serve to center each board in the slot and hold it securely. If the fit of the daggerboard slot is firm enough, you won't need any hold-down. However, if the fit is slightly loose, a shock cord may be necessary to hold it in the down position.

Construction of the two rudders is somewhat similar to that of the daggerboards. These are cut from 1/2-in. exterior plywood and tapered fore and aft. Use standard pintle and gudgeon fittings to assemble the rudders to the hulls. After bolting tiller arms to each rudder, locating them about 5 deg. off center, as shown in part I, connect the arms with a 5/8 in. x 1 1/2 in. bar. Use a 1/4-in. carriage bolt and washer at each arm to serve as a pivot.



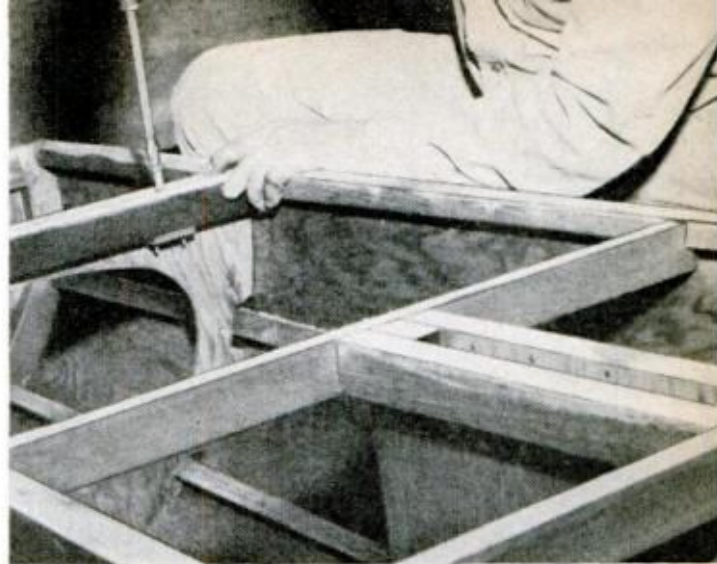
While the mast shown below is made of plywood reinforced with solid blocking at stress points, you might prefer to purchase one of the extruded aluminum type. Anything from 2½ in. to 3 in. or more will be adequate, though a diamond stay may be required with the lighter type. You might prefer a solid wood mast (spruce, white pine or fir), and if this is the case, you'll find plans for templates included in the enlarged *PM* plans. Naturally, a sail track may be substituted for the mast grooves.

The boom should be of Sitka spruce, if possible, with the top edge straight and the bottom edge in a symmetrical curve. The locations of the main sheet blocks may be varied to suit individual tastes.

Drill two ⅜-in. holes in the aft end for the clew outhaul, generously rounding the edges to avoid unnecessary wear. The outhaul threads through these holes and is secured to a jam cleat located on the boom. (Again, the exact location is a matter of personal preference.) If you wish, a ¼-in. wide groove ½-in. deep may be cut in the aft end of the boom for the clew outhaul, in which case the holes can be eliminated.

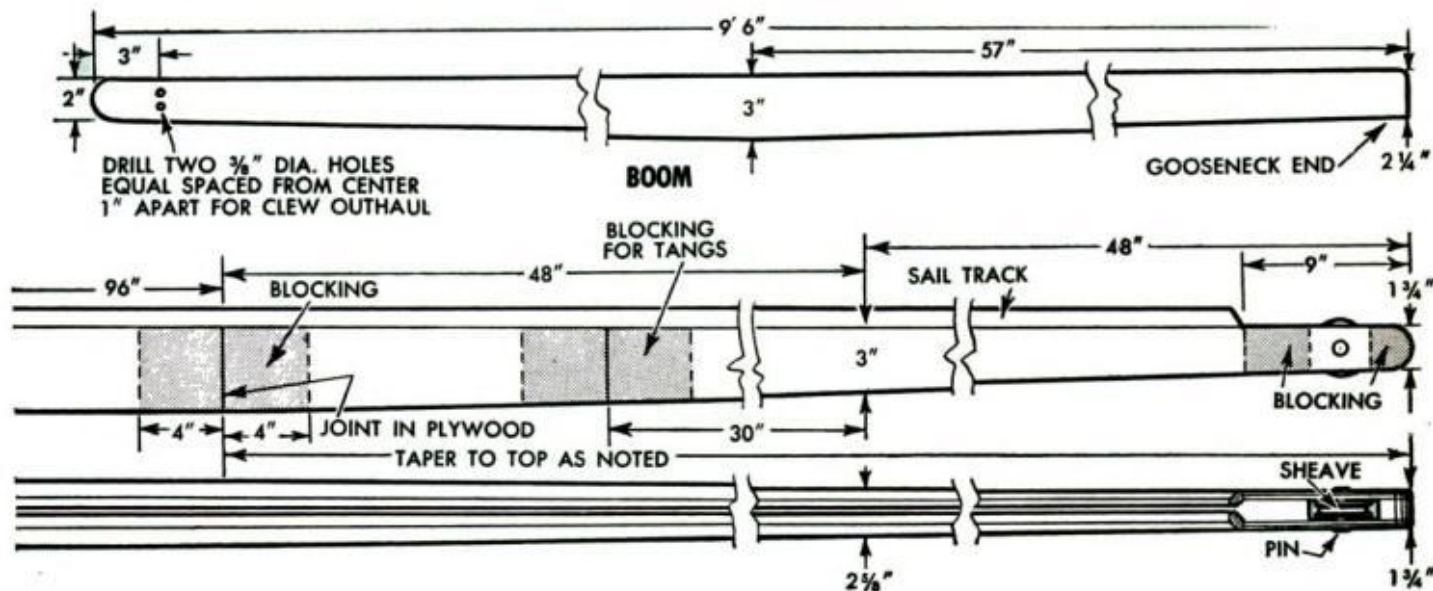
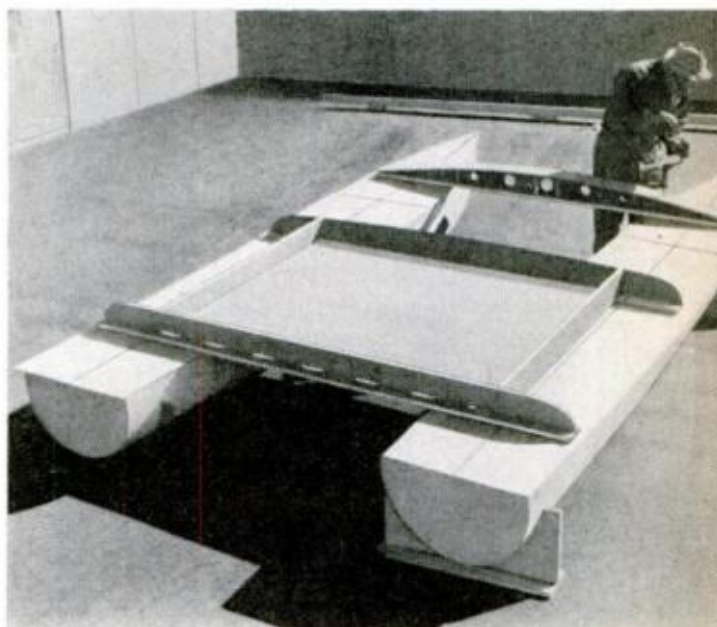
Any reputable sailmaker will be able to fabricate the sail from the dimensions given in the drawing on P. 160. Don't mount the gooseneck in the mast until you have obtained the sail, since it may be necessary to compensate for the exact length.

Fiberglassing is optional, though it is recommended that you at least glass the seams. Give all areas which haven't been glassed a coat of plywood sealer followed by a flat primer sanded smooth and at least two coats of marine enamel. All natural wood surfaces should be given at least three (and preferably five) coats of varnish. Once you've either glassed or painted the boat, it's ready for the water. ★★ ★



BEFORE DECKING hulls, run mounting bolts through the holes in the cleats to make sure that tapped steel bulkhead plates are in perfect alignment

CHECK HULL alignment by measuring from centerline at transom to centerline at bulkhead C on opposite hull. If hulls are parallel, distances will be equal

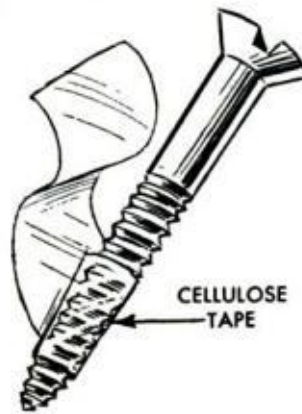




THE WASTE SPACE under a basement stairs can be put to good use as a pen for Fido. Plywood closes in the sides, and one side from a discarded child's playpen makes a gate when installed with hooks and eyes

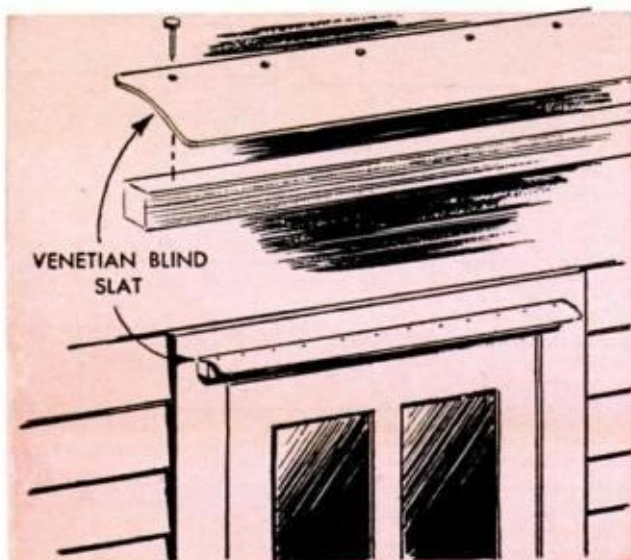


A SCRAP of insulation board slipped into your shirt pocket and used as a pincushion is especially handy when you're up on a ladder using brads and tacks. Saves digging for them in pocket or box and protects fingers

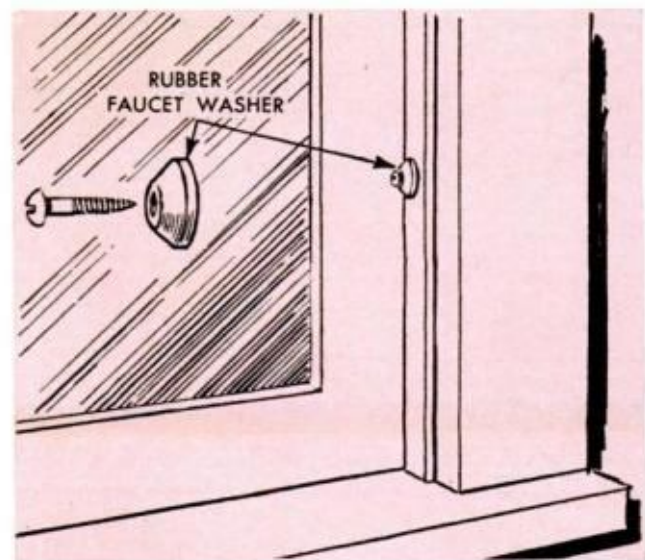


LOOSE SCREWS in a door hinge may be tightened by wrapping them with several layers of cellulose tape. When the screw is reinserted, the tape will be pressed into the threads, adhering sufficiently to hold while the screw is driven

IF YOU FIND that water still enters the space at the top of a screen door despite the regular drip cap, a section of venetian-blind slat mounted over the door will provide a rain canopy to prevent door swelling



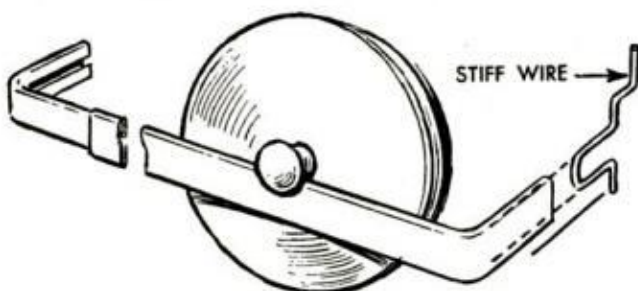
A RUBBER FAUCET WASHER attached with a screw to the inside of the window casing so that it presses lightly against the sash will prevent wind-rattle but won't interfere when the sash is raised or lowered



Solving

HOME PROBLEMS

A **CONVENIENT HOLDER** for two or three pot covers can be made from a flat curtain rod. The potholder may be hooked to a panel of perforated hardboard if desired, by bending a piece of wire as indicated



IT'S **EASY** to remove a tight fitting cap from a large diameter jar if you wrap a damp towel around the jar and twist the ends of the towel together to form a sort of handle you'll be able to grip the jar securely as you unscrew the cap



BAKING A CAKE? A small funnel makes a fine substitute for an egg separator. Break the egg into the funnel; the white will flow through the spout, leaving the yolk to be emptied into a separate container



OCTOBER 1964

FROM CANDY TIN...

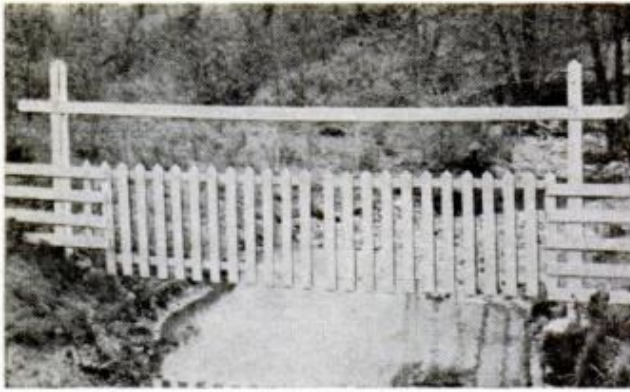


A **COMBINATION** extension cord and work light is handsome enough to store in plain sight when you make it from a fancy candy tin. Fit a socket in a hole in the bottom and attach a 25-ft. lamp cord. Three-way socket permits plugging-in a portable tool. Bulb, cord and loose socket all store inside can

...TO EXTENSION LIGHT



165



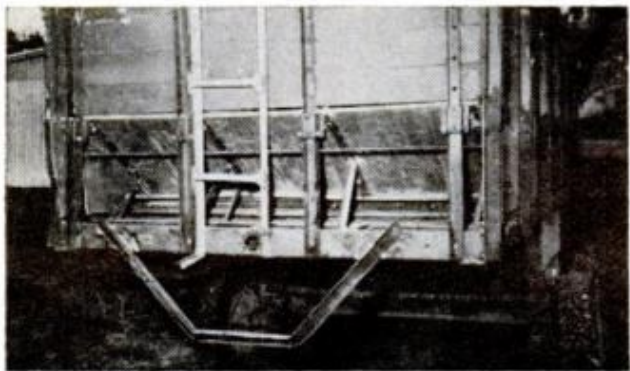
Real Swinging Gate

Double picket gates are suspended on chains from an overhead beam so that they may swing freely under the pressure of floating debris. The 4 x 4 support posts on each side of the stream are set in concrete. The pickets and rails are 1 x 4s.



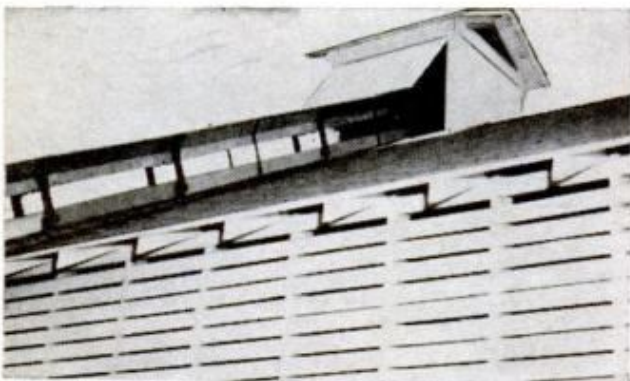
Wheel Warns Unwary

A discarded wheel from an old hay wagon warns visitors not to drive too close to the end of the culvert that crosses under this driveway. A coat of white paint and a truck-type reflector make for good visibility even at night. A few hollyhocks or other tall flowers planted beside the wheel add an attractive touch and serve to call attention to the danger spot that might otherwise go unnoticed.



Step Right Up

Climbing on and off a feed wagon several times every day virtually guarantees badly scraped shins and strained muscles. Clarence Kreider of Glasford, Ill. solved the problem effectively by welding a 2-in. angle iron step approximately one foot below the end gate. He completed the job by bolting to the gate a short section of metal ladder salvaged from a damaged grain bin.—A. M. Wettach



Corn Crib Cupola

An unusual cupola designed by James West of Shelbyville, Ill., provides plenty of ventilation for his double corn crib and granary, and at the same time keeps out even the heaviest rain. There are louvers in each gable, and one side of the cupola is hinged to admit the elevator. At harvest time, the awning-like position of the hinged side keeps out rain even when the elevator is left in place.

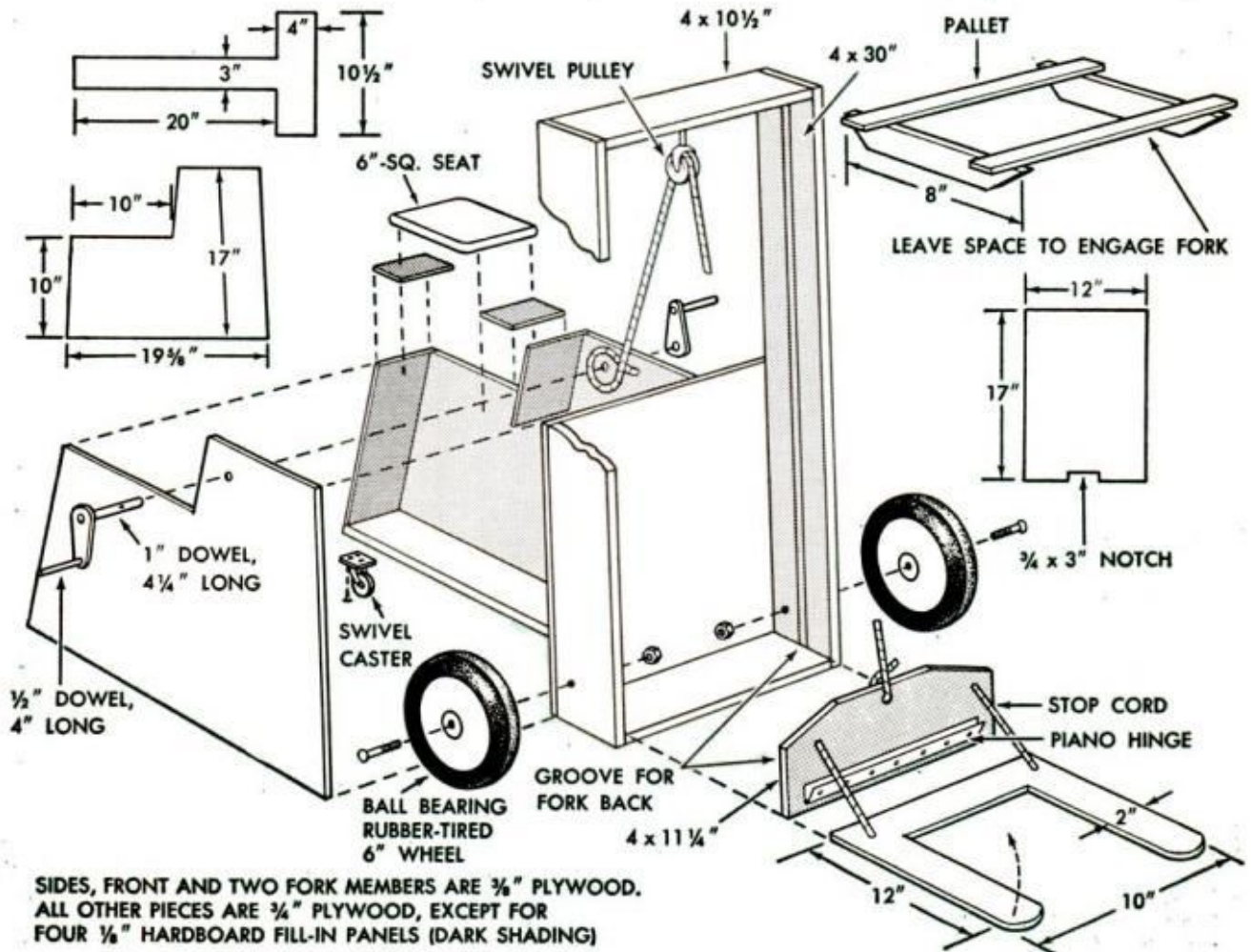


A Couple of Big Wheels

A pair of king-size wheels on this water tank wagon prevents bogging down and permits easier hauling, especially over muddy fields and on uneven ground. The chassis was made of welded angle iron; the tractor rims and tires were purchased at little cost in a junk yard. A large valve and hose allow the tank to be emptied quickly into the self-waterers used to supply hogs in the field.

FORK LIFT TRUCK

THE PAYLOAD is just a few empty cartons, but maneuvering this pint-sized truck will sharpen Junior's coordination and give him plenty of exercise as well. Turning the double-handled crank raises or lowers the fork assembly, which slides in dadoes cut in the two uprights. For easy operation, the dadoes are cut about 3/16-in. wider than the fork backboard. It's wise to double-check the location of the crank to make sure that Junior won't skin his knuckles. In the sketch, the fork is hinged to the backboard; if storage space is no problem, the fork and back may be screwed together.—Merton H. Slutz



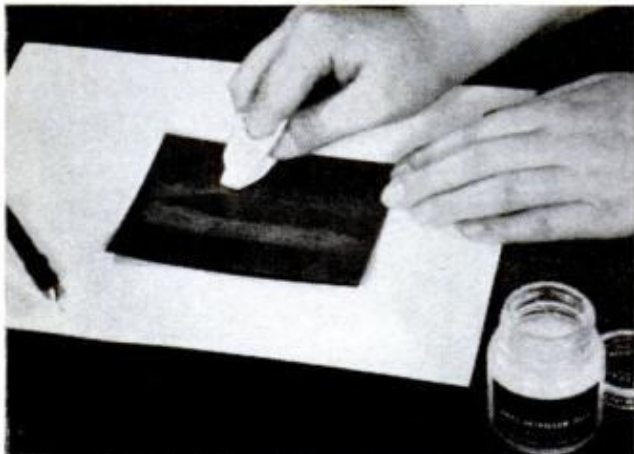
SIDES, FRONT AND TWO FORK MEMBERS ARE 3/8" PLYWOOD. ALL OTHER PIECES ARE 1/4" PLYWOOD, EXCEPT FOR FOUR 1/8" HARDSHED FILL-IN PANELS (DARK SHADING)

New for Camera Buffs



DARKROOM HINTS

FIRST AID FOR SCRATCHED NEGATIVES: To keep minor scratches from appearing on your enlargements, rub a thin coating of petroleum jelly on the negative. The jelly prevents scratches from focusing on paper

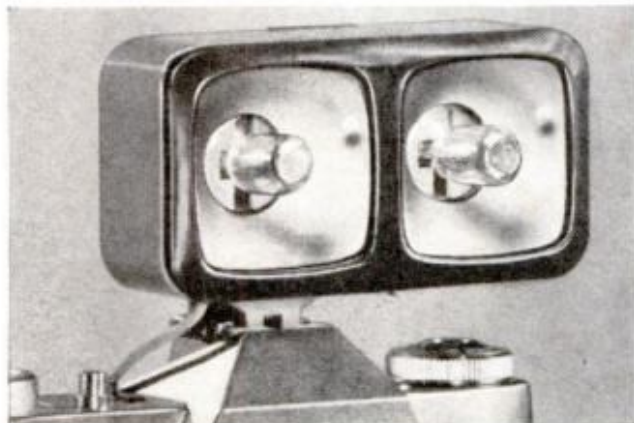


• • • • •
FOR GLAMOROUS DIFFUSED PORTRAITS, stretch a piece of nylon stocking across the opening of a fruit jar lid and secure it with a rubber band. When held under the enlarging lens during exposure, this device will soften the focused image pleasantly. For greater effect, use two or three layers of nylon



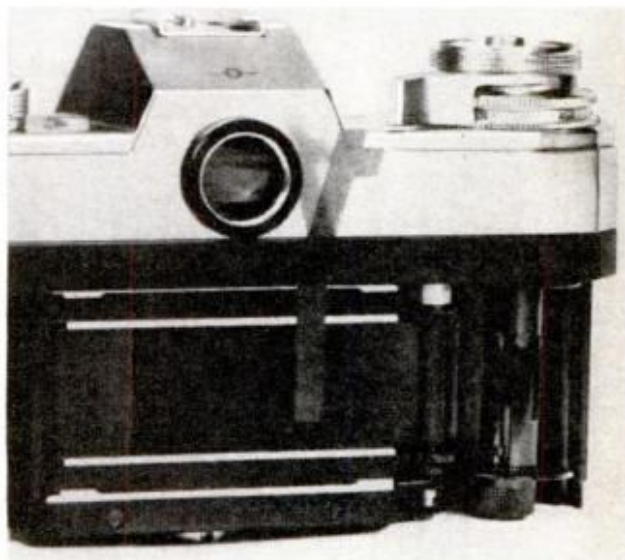
◀ **UMBRELLA REFLECTOR** for flash, flood or strobe gives that natural light, devoid of hotspots, that's ideal for portraits. With clamps available from the manufacturer, you clamp umbrella to a light stand, and a light source to the umbrella. In 29-in. (\$9.95), 44-in. (\$19.95) and 50-in. (\$29.95) sizes. Clamps are \$3.75 and \$3.50. Add \$1 postage per order. Tiffany Enterprises., 34 West 38 St., New York 10018

SEE-SHARP ENLARGING FOCUSER catches light rays from your enlarger, magnifies part of the image for critical focusing. In PM tests, it proved less handy than costlier types, but did good job. \$2.90, postpaid, from Cargille Scientific Inc., Cedar Grove, N.J.



▲ **WATALUX X2 FLASH GUN** has separate reflectors for each of two AG-1 bulbs. Button on rear permits you to fire bulbs in quick succession. For extra light you can fire both bulbs at once. \$6.95 at dealers only. Masel Supply Co., 442 Broadway, New York, N.Y.

DATA RECORDING SYSTEM of the latest Contarex 35-mm camera uses a plastic strip that's inserted in camera back. You write on strip with pencil or ball pen before shooting. Notes appear on edge of negative. Costs \$499. Zeiss, 444 5th Ave., N.Y., N.Y.



CHEMICALS ON TAP: By keeping stock developers and replenishers in opaque plastic picnic jugs, you can tap off the desired amounts through spigots. To prevent oxidation, spread a thin film of mineral oil on top of each solution. This saves having to store them in successively smaller bottles, as they're used up

SPEEDIER PRINT PROCESSING: A small shelf on your darkroom wall, just above the developer tray, can save you a lot of time. Expose several prints and place them on the shelf, emulsion side down. Then run them through chemicals in quick succession, handling dry prints with one hand, wet ones with the other



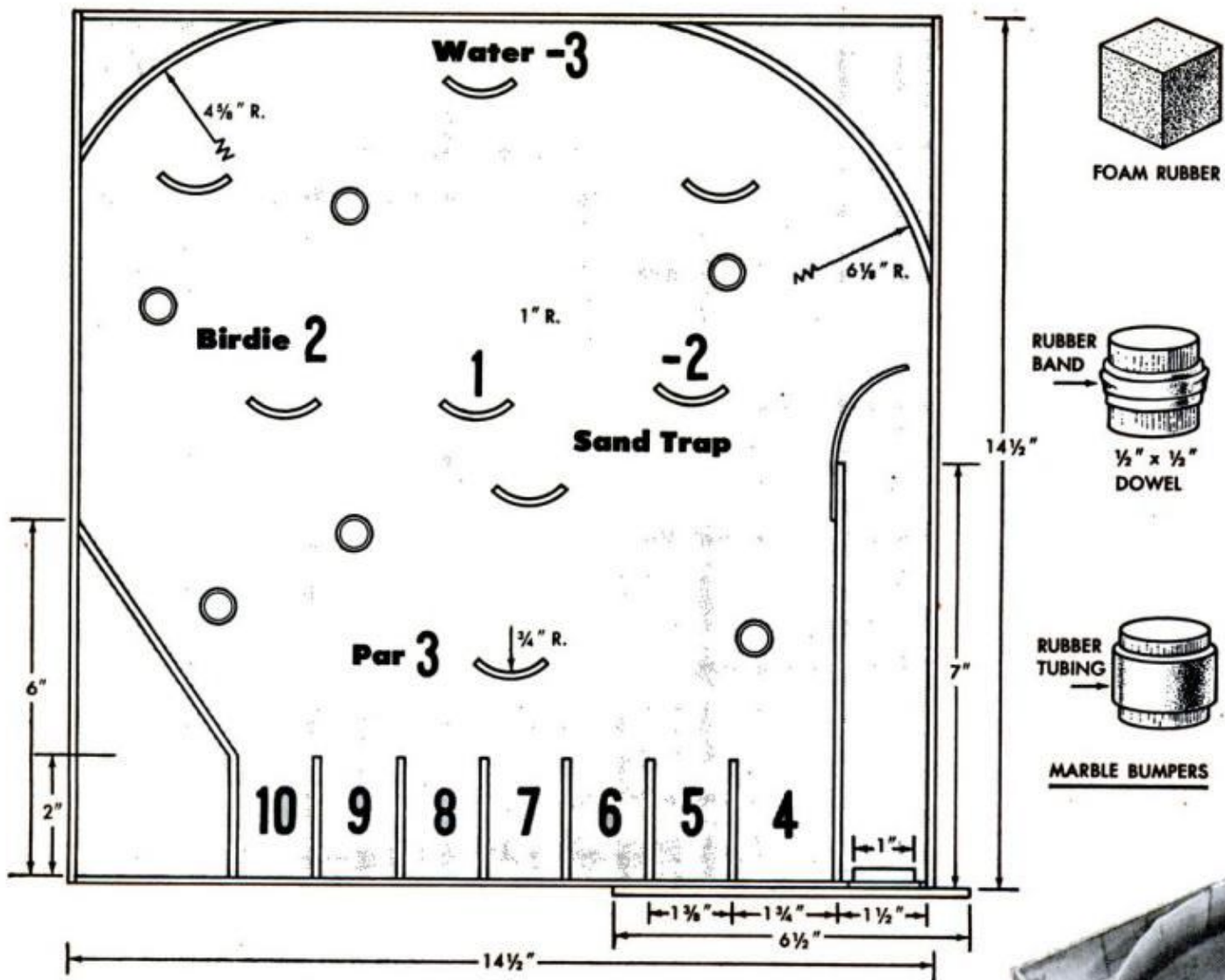


TABLE-TOP GOLF GAME

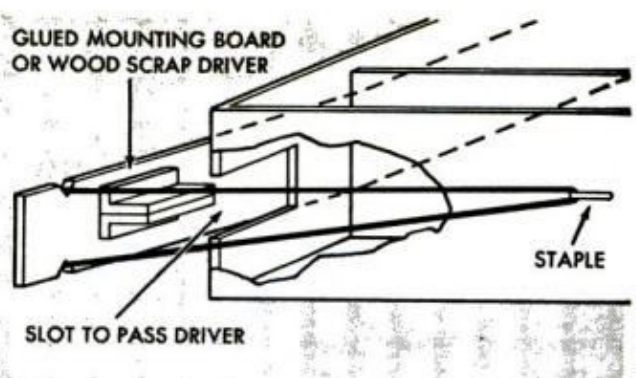
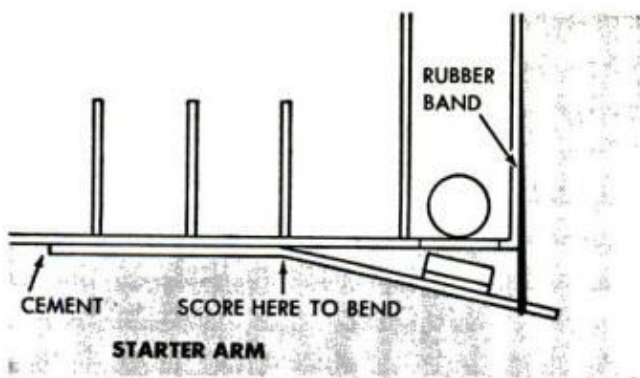
Though it looks like it's strictly for kids, this pint-sized golf game will make you burn the midnight oil while you try to break 100

HERE'S A GAME that offers much of the fascination of golf and yet you can play it in your own living room. It's designed for two players, who alternate turns until eighteen "holes" have been completed. As in golf, the low-scorer wins the game. A marble serves as a ball and cardboard semi-circular cups are the "holes." The game is played by placing the marble in the launching alley and driving it down the fairway by snapping the starter arm. If the marble lands in the water or sand trap, the number of strokes indicated are deducted from the opponent's score and the player must shoot again. Incline the board so the marble can't come to

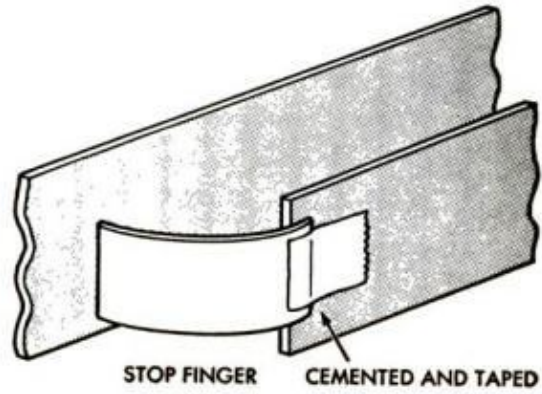
rest in any unmarked area. This can be done by propping up its top edge.

Building the game is a glue-and-knife job. The material is mounting or illustration board, which is readily obtainable at artist's supply stores. The bumpers shown in the drawing above add excitement by making the marble follow an erratic and unpredictable path. They can be made in a variety of ways as indicated and are held in place with a dab of glue.

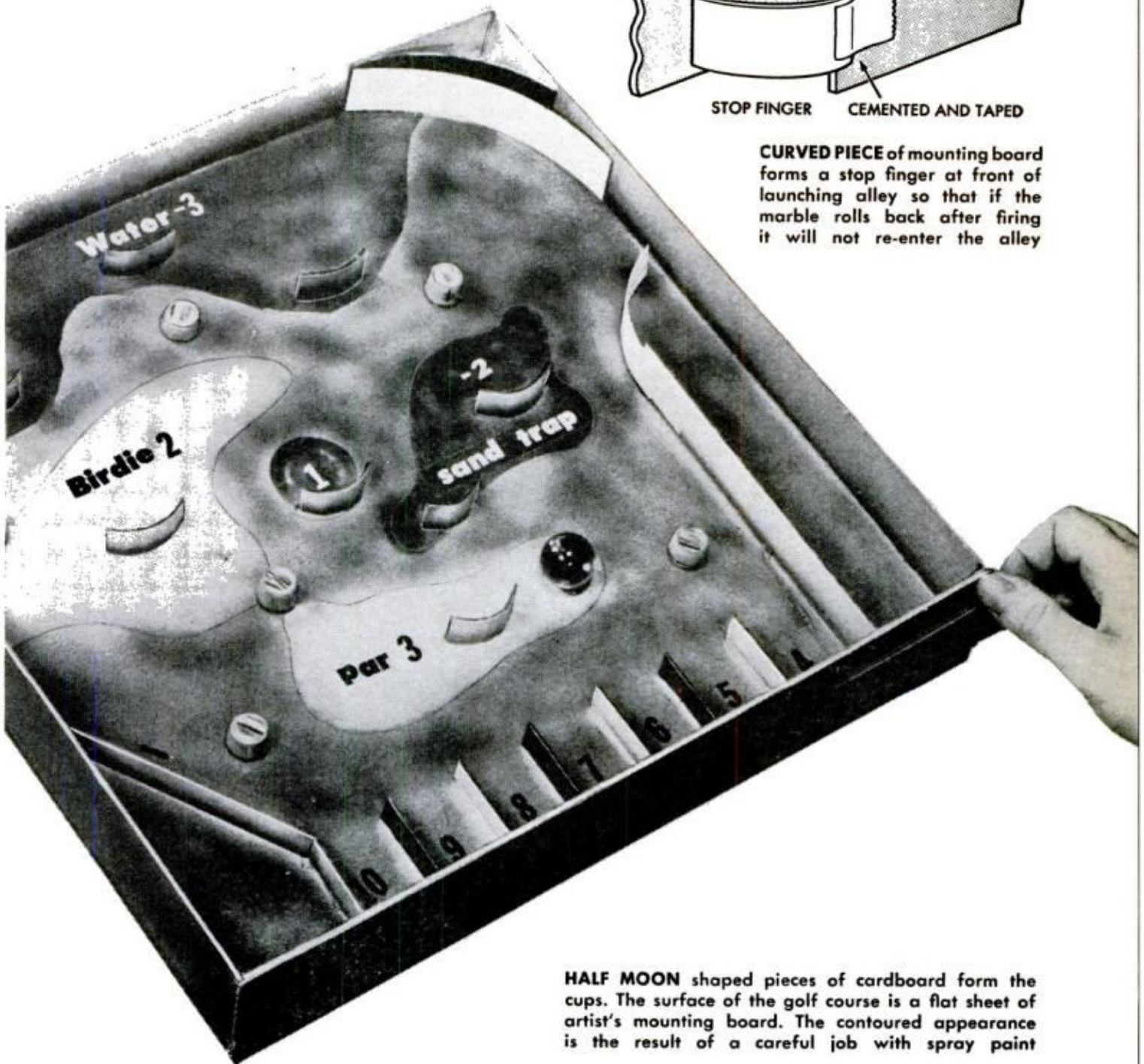
After sketching in the areas of the water and sand trap, finish the game with a neat paint job. For a realistic result, use green, blue and yellow aerosol spray enamel or even water colors.—David K. Eddy



STARTER ARM is powered by a husky rubber band which is stapled to the sidepiece. Drawing at top right indicates how the driver may be constructed from either mounting board or a small piece of wood



CURVED PIECE of mounting board forms a stop finger at front of launching alley so that if the marble rolls back after firing it will not re-enter the alley



HALF MOON shaped pieces of cardboard form the cups. The surface of the golf course is a flat sheet of artist's mounting board. The contoured appearance is the result of a careful job with spray paint

FLASHING YO-YO



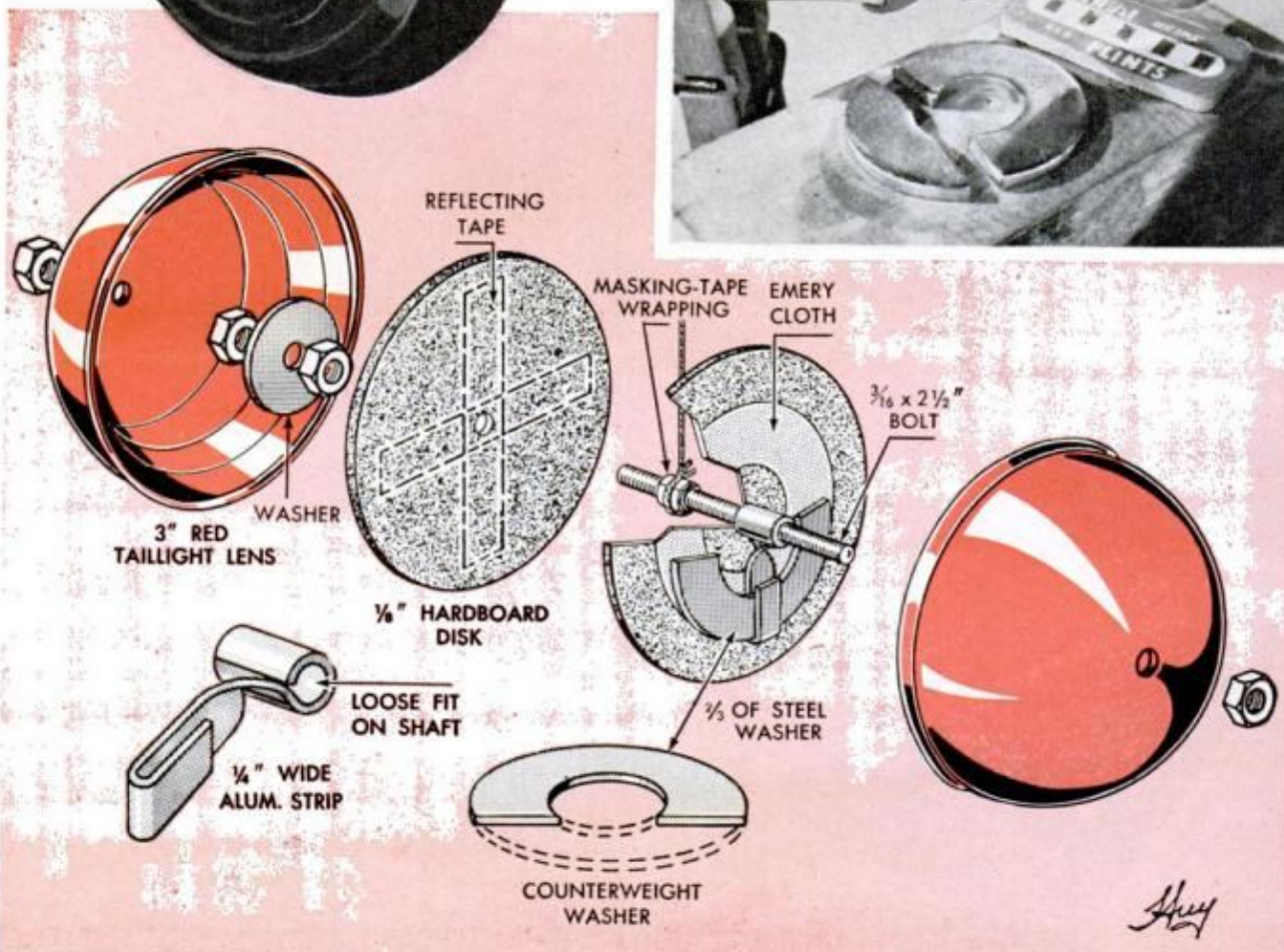
OTHER KIDS will wonder how your son makes this yo-yo flash like colored lightning, but the explanation is simple. A pair of lighter flints throw sparks when they brush against a rotating abrasive.

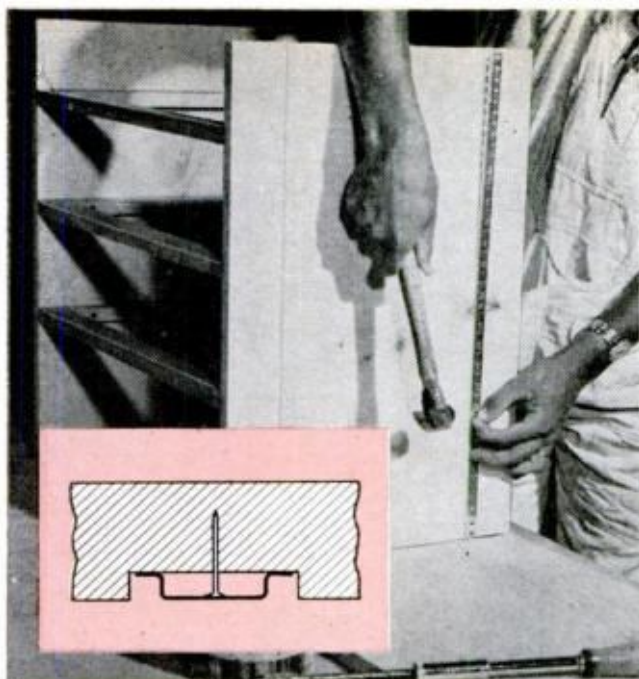
The body of the yo-yo is made from two taillight lenses. These are obtainable in various diameters and even a choice of color—red, green, amber and clear.

The lenses and both hardboard disks are centerdrilled so that they may be assembled with the other parts on a $\frac{3}{16}$ -in. bolt. The striker arm shown in the photo below is formed from a $\frac{1}{4}$ -in. strip of aluminum and swings on the bolt.

An important part is the washer mounted between two nuts. Its weight counterbalances the striker and keeps the yo-yo spinning in perfect trim.—Ken Murray

CIGARETTE LIGHTER FLINTS and $\frac{2}{3}$ of a heavy steel washer are cemented to the striker arm with epoxy





Close the Shelving Gap

The usual method of installing adjustable shelf brackets in a cabinet is to mount them on the surface. This is workable, but results in a gap between the shelves and the sides of the cabinet. This gap is easily eliminated, however, by setting the brackets in dados, as shown in the drawing above. Shelves will then fit flush.

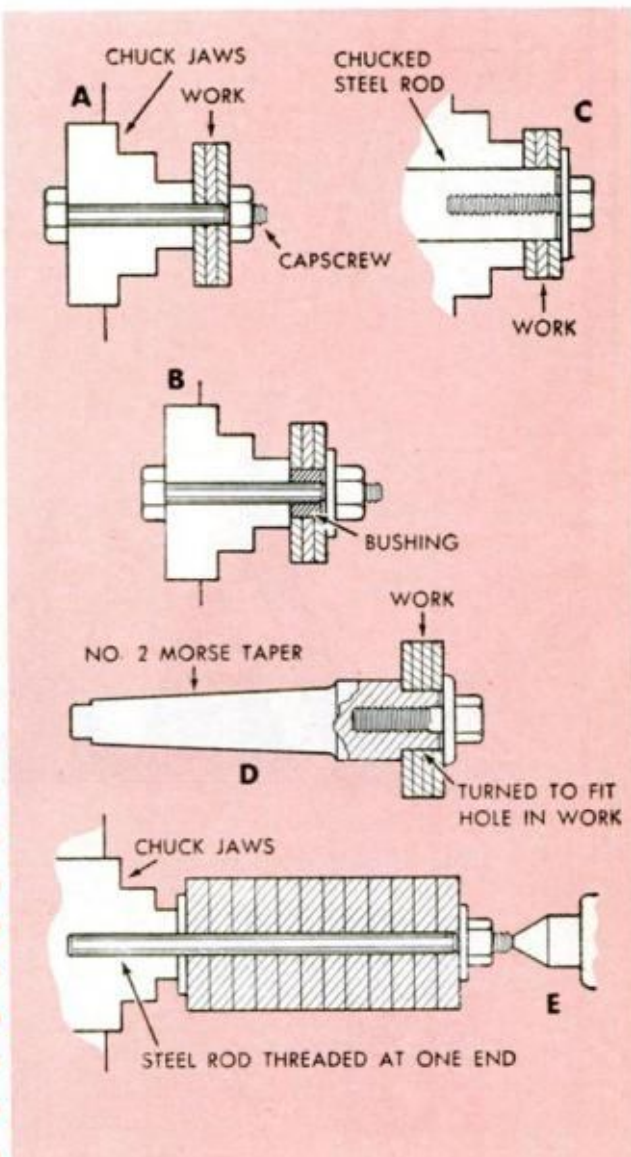
Keep Doors from Binding

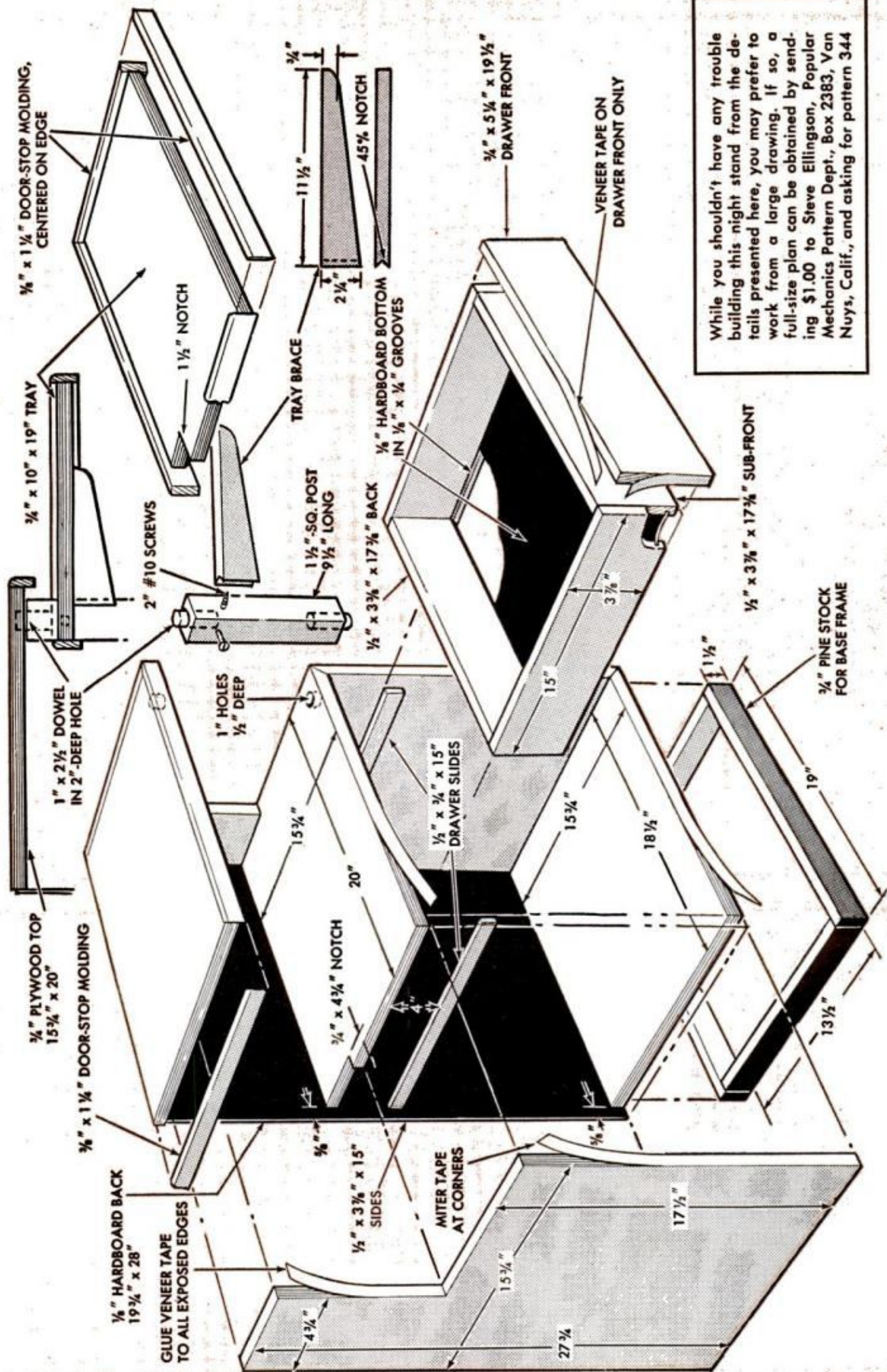
When you paint a new exterior door, it's important that you paint the entire door, including the top and bottom edges. This helps seal the end grain against moisture, which causes the wood to swell and the door to bind. You can use pure white lead, primer paint or resin sealer as a sealer before applying the paint.



Lathe Work Arbors For Special Setups

Gear blanks, washers, pulley wheels and other similar work which is made from disks can be accurately turned on improvised mandrels. In drawing "A" (below), for example, the mandrel is an ordinary capscrew. The work is clamped against the face of the chuck jaws by a standard hex nut. If the hole in the work is larger than the capscrew at hand, make up a bushing, as at "B", and clamp the work with a nut and washer. Work with a large diameter hole (drawing "C") can be mounted on a steel rod and clamped with a capscrew in the end of the rod. In drawing "D", a discarded drill bit with Morse tapered shank has been turned to fit the hole in the work, with a capscrew and washer again serving as a clamp. A mandrel for turning several disks to the same diameter can be made of drill rod threaded at one end for a clamp-nut (drawing "E"), and centerdrilled for tailstock support. Mount the work with a firm push fit.—C. W. Woodson





While you shouldn't have any trouble building this night stand from the details presented here, you may prefer to work from a large drawing. If so, a full-size plan can be obtained by sending \$1.00 to Steve Ellingson, Popular Mechanics Pattern Dept., Box 2383, Van Nuys, Calif., and asking for pattern 344

NIGHT STAND

Features Swing-Out Bed Tray

By Steve Ellingson

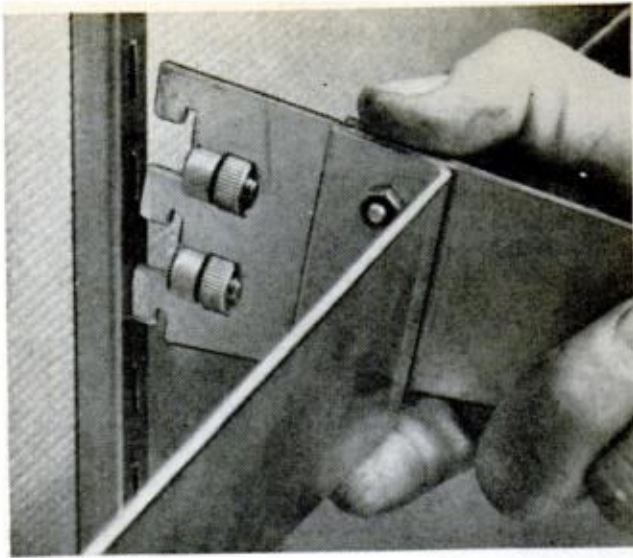
IN SICKNESS and in health, this highly functional night stand will serve you well. When you're confined to bed, the self-supported, swing out tray beats balancing a tray on your lap, and when you're finished eating, you can simply push the loaded tray aside without waiting for someone to remove it. Between meals, it will serve for letter writing, a game of solitaire or a place to rest a book. Nested under the table top, the tray is always handy when you just feel like having breakfast in bed.

The construction details show how the tray is pivoted to a movable corner post fitted with dowel pegs. Butt joints are used throughout and all exposed edges of the plywood parts are concealed with veneer tape to make them look like solid stock. Mitered strips of door-stop molding give a finished edge to the top of the night stand.

MATERIALS

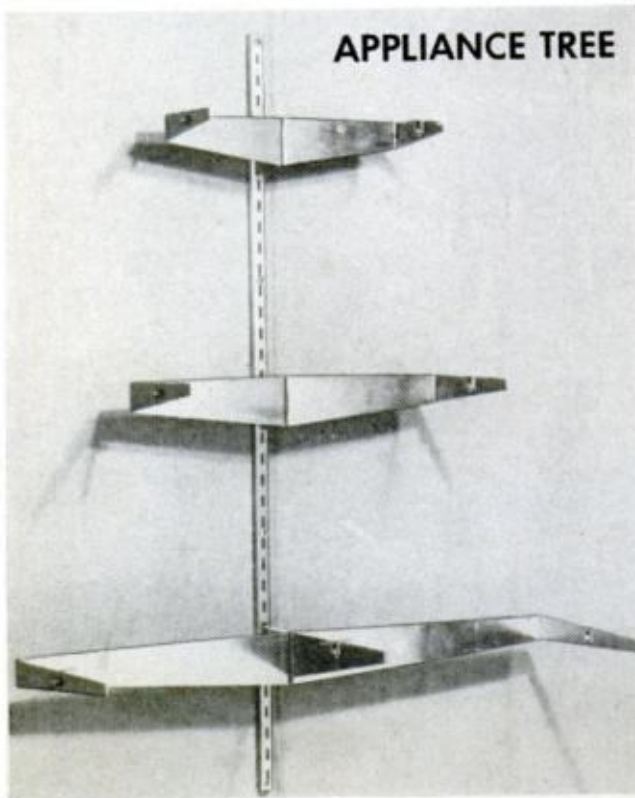
- 1 pc. 3/4"x48"x48" veneer plywood of your choice
- 2 rolls Matching veneer tape and cement
- 1 pc. 1/2"x24"x24" fir plywood for drawer
- 1 pc. 18"x24"x48" hardboard for back panel and drawer bottom
- 2 #10x2" flathead wood screws for attaching tray to pivot
- 10 ft. 3/8"x1 1/4" door-stop molding
- 1 pc. 1" dowel 6" long for pivot
- 1 pc. 1 1/2"x1 1/2"x10" hardwood for pivot
- Glue and fine sandpaper
- 6d and 3d finishing nails
- Matching wood putty
- Small quantity black enamel for base



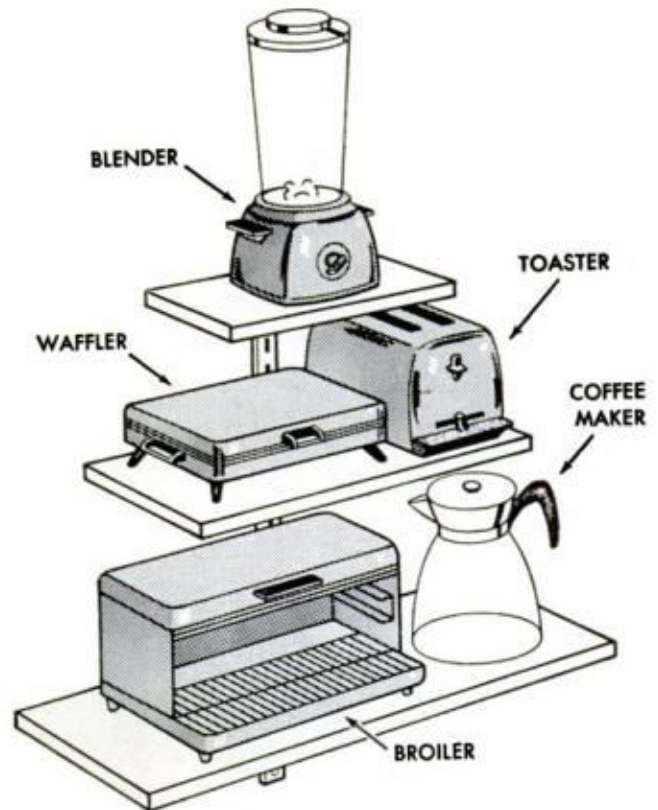


SINGLE-STANDARD SHELF BRACKETS

It used to take a pair of standards to support wall shelves. But new brackets let you hang a variety of arrangements from one

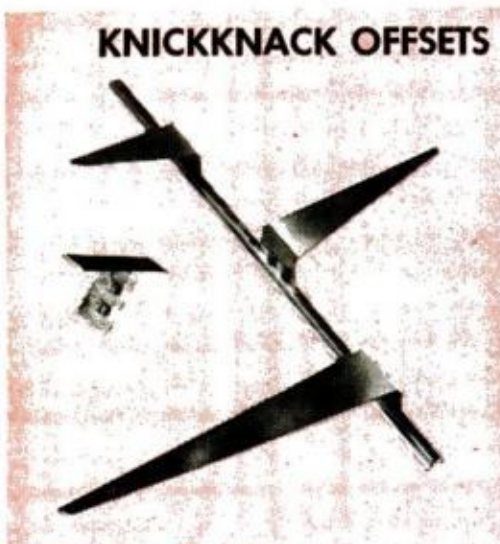


APPLIANCE TREE

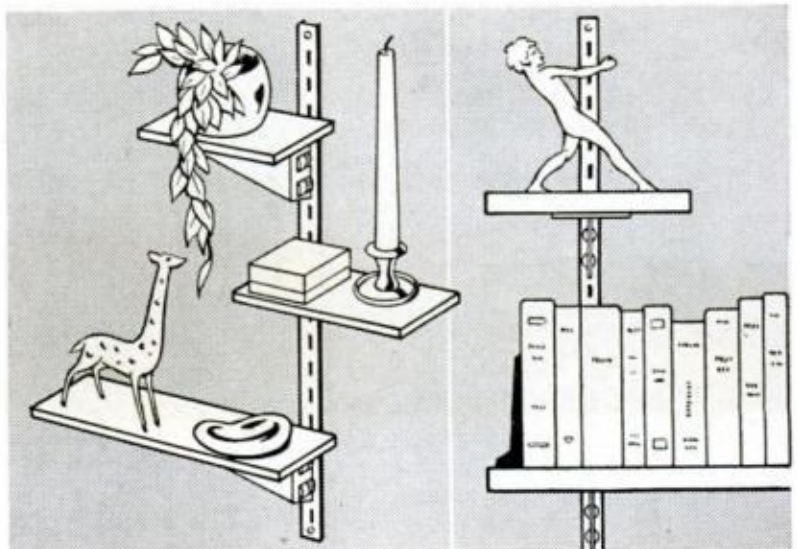


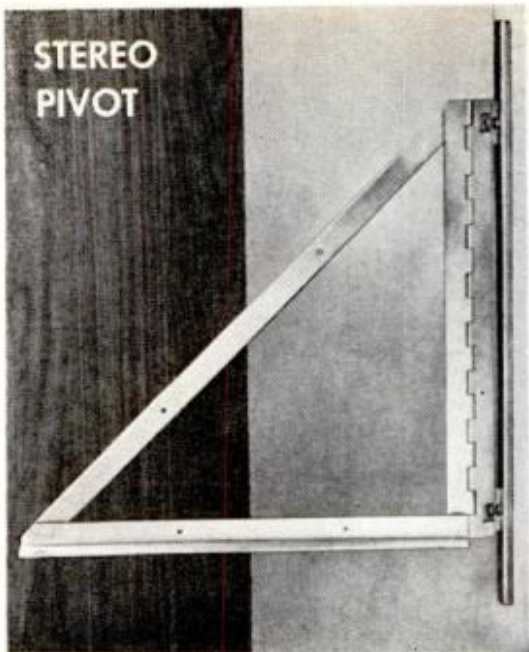
KITCHEN CABINETS JAMMED? Bring appliances into the open on shelves measuring 6x16 in., 8x24 in., 10x32 in.

STAGGERED STEPS are 2½-in.-wide shelves on L-brackets. T-bracket lets you fill in gap with figurine (right)

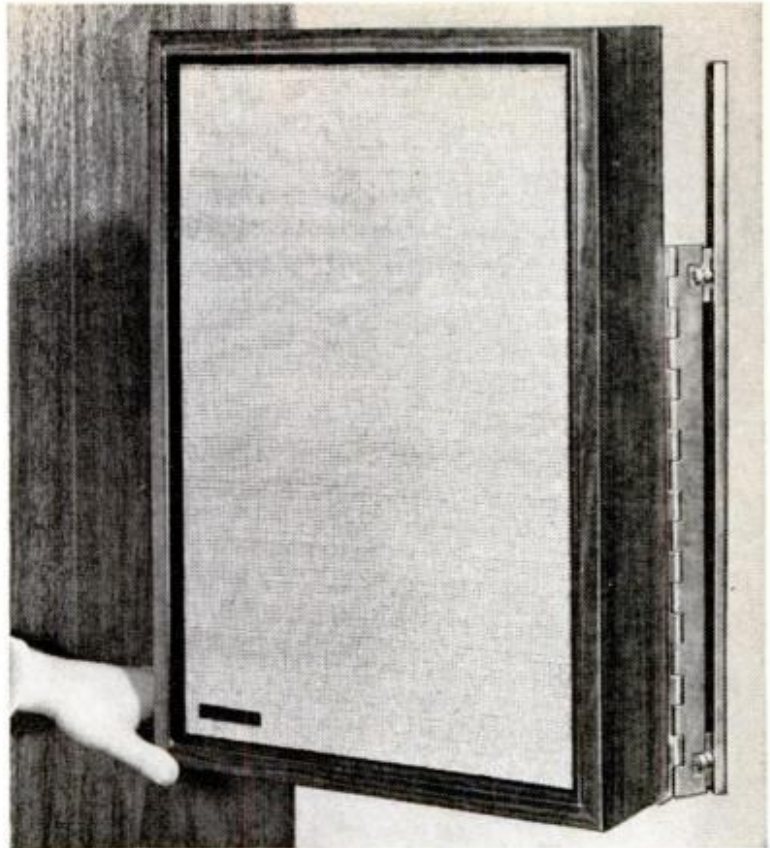


KNICKKNACK OFFSETS





SLIM HI-FI SPEAKERS, mounted on triangular brackets, incorporate the piano-hinge principle to fold neatly against wall when not in use. When you want pinpointed stereo, however, you swing them out so the sound converges at any selected point in the room



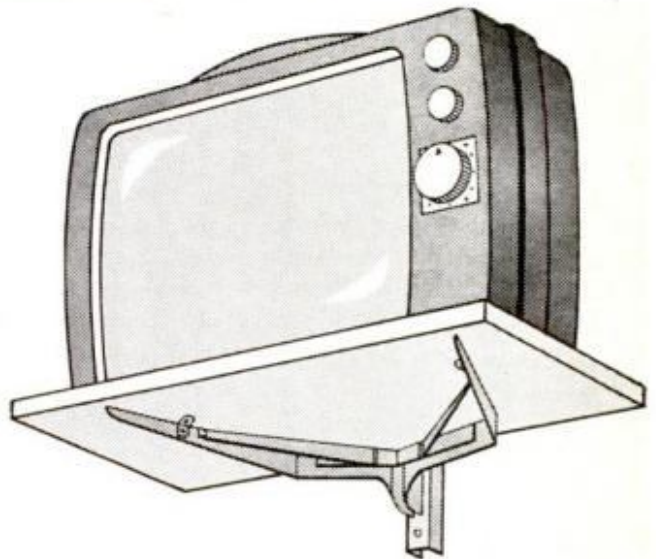
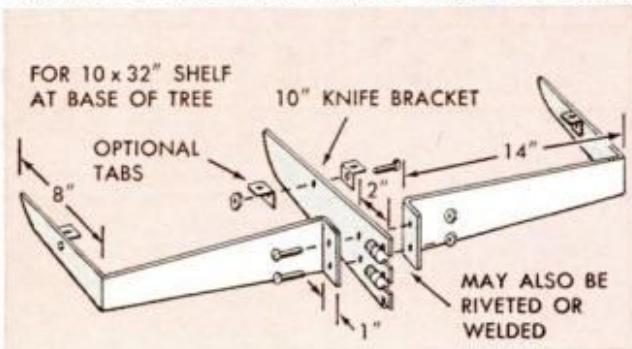
MANY A CRAMPED WALL space has gone without shelving because there wasn't room to install a pair of standards. A new line of brackets, designed by S. W. Stella for Fixture Hardware Mfg. Corp., 4116 1st Ave., Brooklyn 32, N.Y., requires only one standard, and permits much greater flexibility of design.

In the case of the pivot, above, the shelf is dispensed with entirely; speakers are set on a 1-in. flange and fastened to the bracket with woodscrews.

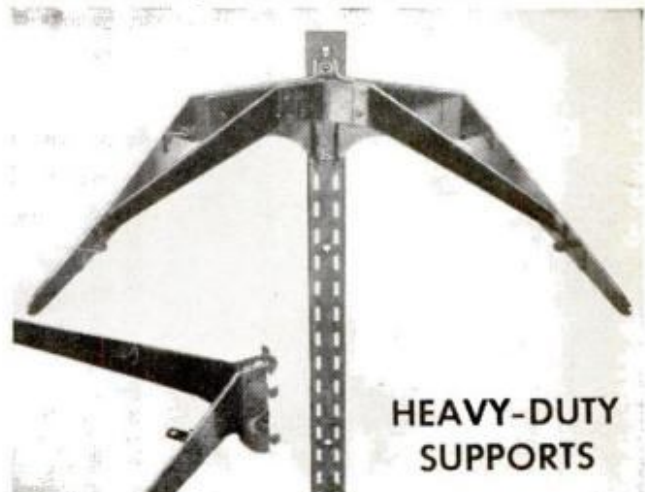
All the brackets shown (with the exception of the double-pronged heavy-duty types at right) feature knurled locks between the gravity hooks, to prevent wobble. Angle tabs permit you to anchor the shelves to keep them from shifting.

Want to design your own bracket? You can buy just the tooth and lock section for \$1 and take it from there.

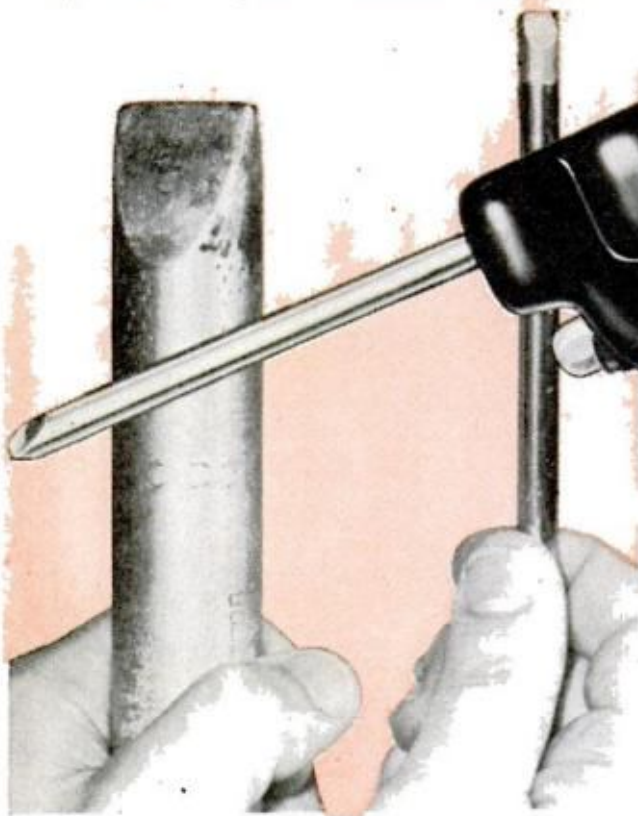
DO-IT-YOURSELF potential is demonstrated (below) with bottom bracket of appliance tree. You buy one 10 in. knife bracket and add a wing on each side. For upper tree brackets, add only one wing to bent knife



50 POUNDS of television can be safely hung on a single double-slot standard with the brackets below. The plain V yawns 19 in. wide by 10 in. deep; the braced V is deeper (\$5.95 and \$6.95, with standard)



PM TEST REPORT



HUSKY IRON (left) used to be necessary for heavy-duty soldering. With new superconducting wire, slim tip (right) can do same jobs, heats 36 times faster

WHETHER IT MIGHT be an earring or a down-spout you're soldering, this one tool with its three easily-switched tips will handle all your soldering jobs from the finest to the heaviest, with heat to spare. This we found out in putting the heat on Wen's new ATR (automatic thermal regulation) soldering gun. It's called the Model 450 because that's the upper limit of its three-stage heat span:—450 watts of transferable heat—far more than other soldering guns. Each of the three easily-switched tips provides its own heat range. The fine tip gives 25-100 watts of usable heat; the medium, 100-200; the heavy-duty, 200-450. The ATR feature of the 450 is made possible through the use of a high-temperature magnet wire developed for the missile program. The wire's remarkable efficiency lets the light- and medium-duty tip heat instantly with a surge of 110 watts, then draw only 55 watts to maintain their respective ranges. With the heavy-duty tip, there's a 220-watt surge and a 110-watt working current for the 450 watts of heat power.

The gun retails at around \$14, including the heavy-duty tip. Other tips are extra: \$1.30 ea. for the light- and medium-duty; 60¢ ea. for the two non-soldering accessories, which must be used with the medium-duty tip.

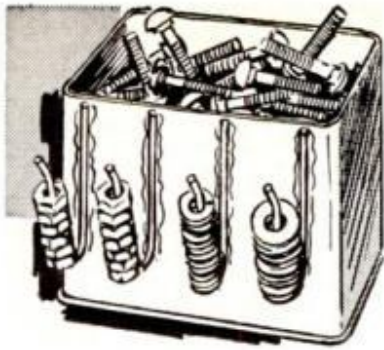


WEN'S ATR GUN *has 3 Heat Ranges*

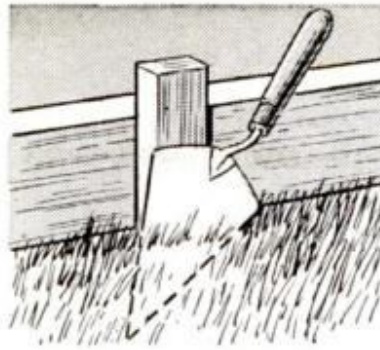


| TIP | TIP NO. | APPLICATION |
|-----------------|---------|---|
| LIGHT DUTY | 45F7 | PRINTED CIRCUIT WORK. TV AND RADIO REPAIR. JEWELRY REPAIR |
| MEDIUM DUTY | 45M7 | TOY REPAIR. HEAVY WIRE SPLICING |
| HEAVY DUTY | 45A7 | AUTO RADIATOR REPAIR. GUTTER WORK. SHEET-METAL WORK |
| FLAT IRON | 45P57 | HEAT SEALING. DENT REMOVING |
| PLASTIC CUTTING | 45S7 | TILE CUTTING. REMOVING OLD PUTTY |

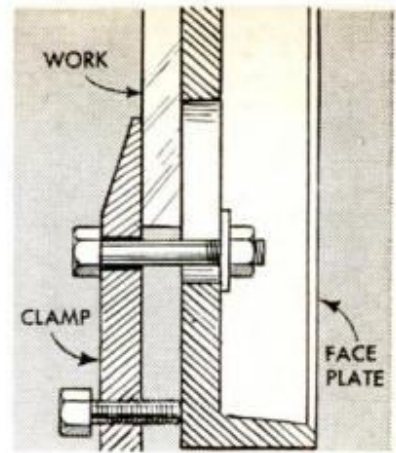
TAKE A HINT FROM READERS



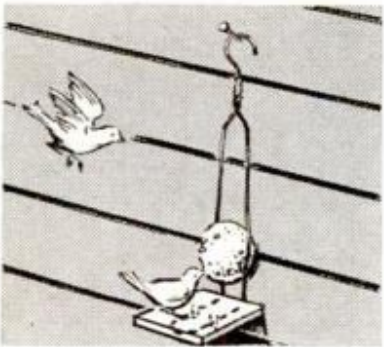
HANDY HOOKS soldered to the outside of can in which you store bolts will hold nuts and washers, make it easy to locate size you want. Use 1/8-in. welding rod or coat-hanger wire to form hooks and bend them to reach full height of storage can



WHEN DRIVING stakes to support the form for a concrete walk, you can make sure that they remain vertical and flat against the boards by inserting a trowel into the ground and holding it against side of the stake while it is being driven



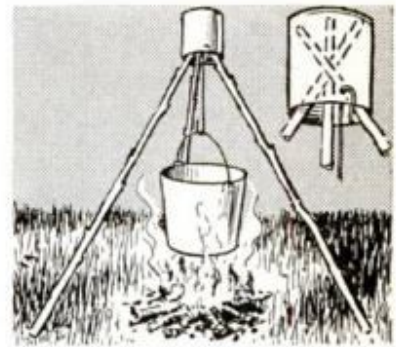
YOU'LL FIND THAT the jaws from toolmaker's clamps make excellent straps for mounting work on a drill-press table or the face plate of a lathe. If jaw has a tapped hole in square end, insert a capscrew into hole instead of using a packing blocks



LOW-COST FEEDER is easily made from a coat hanger. Just pull the hanger out straight until the two wires are parallel, bend up the lower end to form a right-angle projection which is stapled to perch and wedge a ball of suet between them

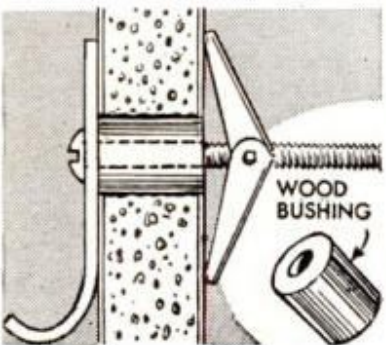


KERF WEDGE prevents binding when sawing thin panels. It's a shingle nail driven into a small block of wood which can be inserted above the saw once the cut is deep enough. The wedge also helps prevent the two sections from vibrating



TIN CAN is a foolproof support for a campfire tripod. The crossed ends of the three legs should be wedged securely inside the can. A cooking container can be suspended from a wire hook slipped through a hole punched in the side of the can, as shown

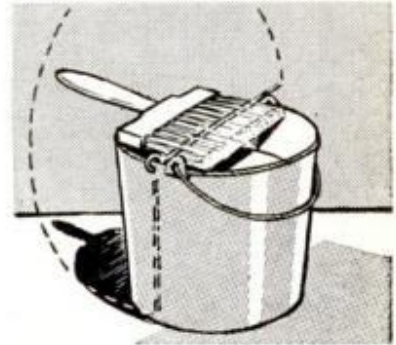
WHEN MOUNTING brackets on plaster walls with toggle bolts, the hole is necessarily larger than the bolt's diameter. For a snug fit, make a wood bushing from dowel the same diameter as the hole and slip it over the shank of the toggle bolt

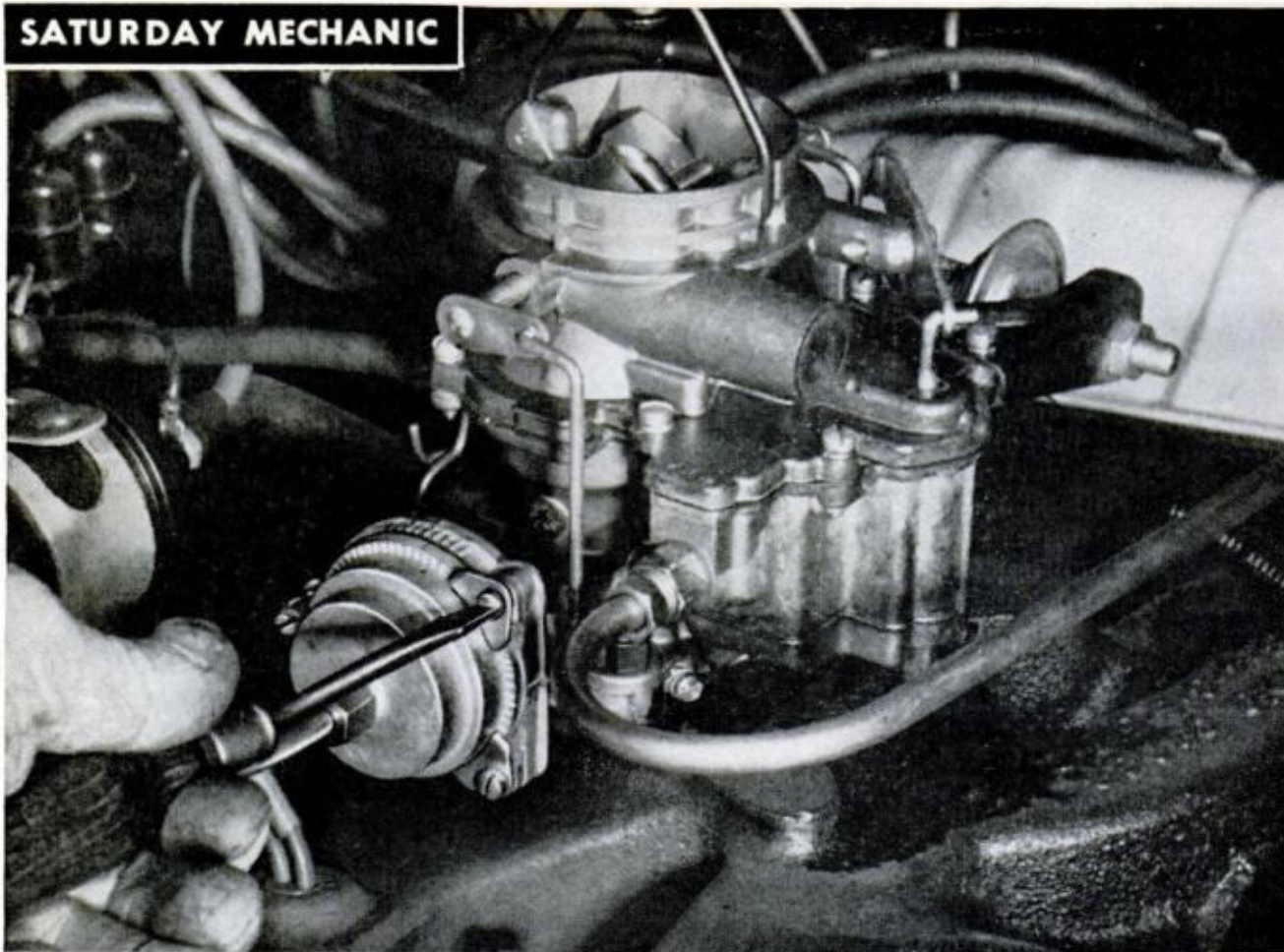


PICKLE JAR is a perfect container for storing stainless-steel welding rods. The wide mouth makes it easy to remove rods, and the cap provides a tight seal against moisture. Also, a glance tells you the size and number of such rods on hand



SWING-UP SUPPORT for paste brush is a handy accessory for paste pail. Drill hole through side of pail just under rim and attach a length of stiff wire. When you want to mix the paste, the wire support can be pivoted so it hangs outside can





Car Hard to Start?

BETTER CHECK THAT AUTOMATIC CHOKE

By Morton J. Schultz

EVER SINCE DETROIT removed the choke button from the dashboard, motorists seem to have forgotten that there is such a thing as a choke. Yet this device, in its present automatic form, is as much a cause of hard-starting complaints as dirty plugs, worn points, run-down batteries and the like.

It is difficult, if not impossible, to determine exactly where the automatic choke stands in the hierarchy of troublemakers. But, listen to what the experts say:

"When a person complains of difficult starting, one of the first things we check is operation and, more important, adjustment of the choke."

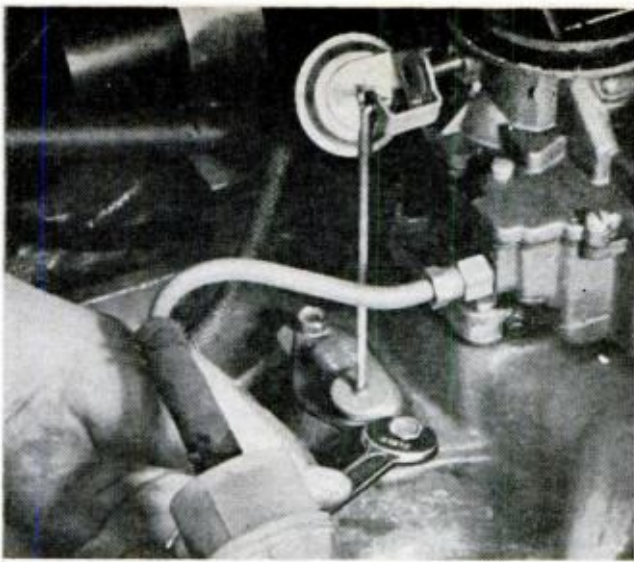
The words are those of Larry Gove, service manager of Bolmer Plymouth in Bound

Brook, N.J. But their meaning has been confirmed by 15 mechanics we spoke to.

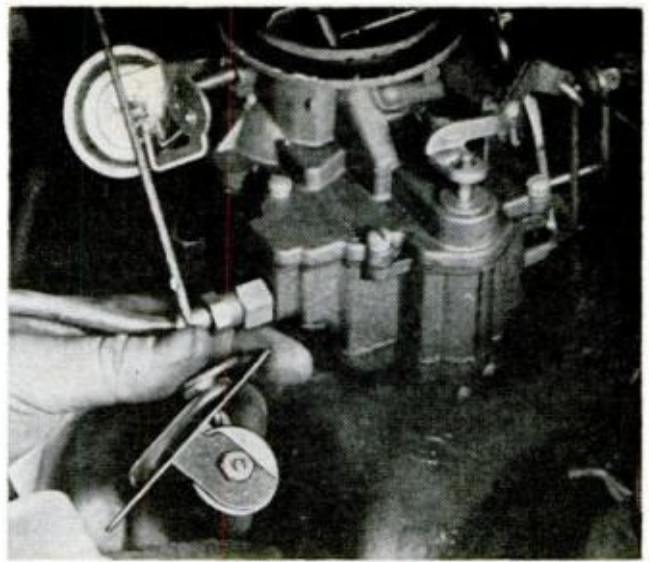
Fortunately, anyone who can handle a screwdriver can adjust or repair his automatic choke. Unknowingly, many car owners shell out for a service call which they could easily handle themselves.

Automatic choke adjustment is as much a seasonal maintenance task as draining, flushing and refilling the cooling system. And, just as with the cooling system, you should make this adjustment at least twice a year—now, in the fall, at the outset of cold weather, and again in the spring, at the outset of warm weather.

The function of the choke is simply to provide the carburetor and, in turn, the cylinders with a richer or leaner fuel



WHEN CHOKE IS INSIDE manifold cover, as in Chrysler Corp. models from 1957 to present, find it by tracing rod (center) extending down from choke linkage. To remove the choke cover, loosen the two bolts



ADJUSTMENT of Chrysler-type chokes is accomplished by loosening nut and turning the adjusting plate directly under it in the required direction. This action corresponds to turning cover on other chokes

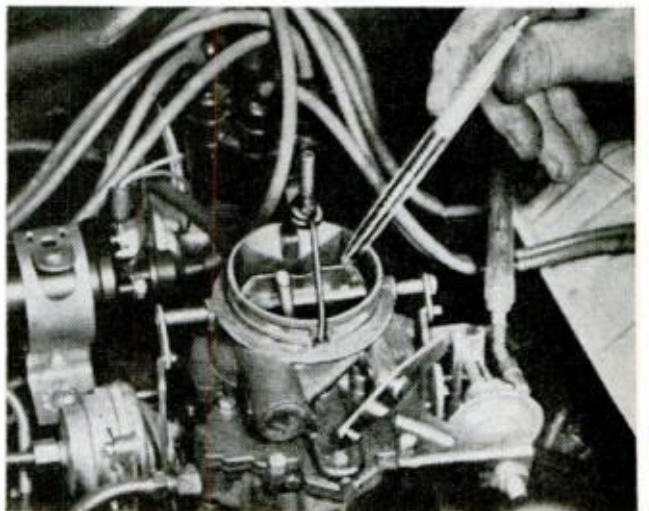
mixture. In the spring and summer, when engine parts are free and loose, less fuel and more air is the rule for easy starting. A mixture that is overbalanced on the fuel side can lead to engine flooding and, consequently, hard starting.

Conversely, in cold weather, engine parts are sluggish and a fuel mixture heavy in gas is needed to fire the cylinders. A lean mixture causes fuel starvation and, hence, hard starting.

But, no matter what the season, the leanest possible choke compatible with easy starting should be employed. Thus, the automatic choke is also a primary factor in fuel economy.

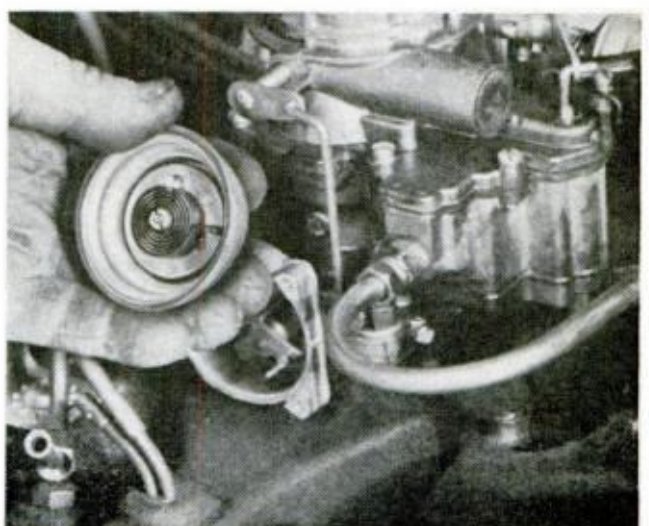
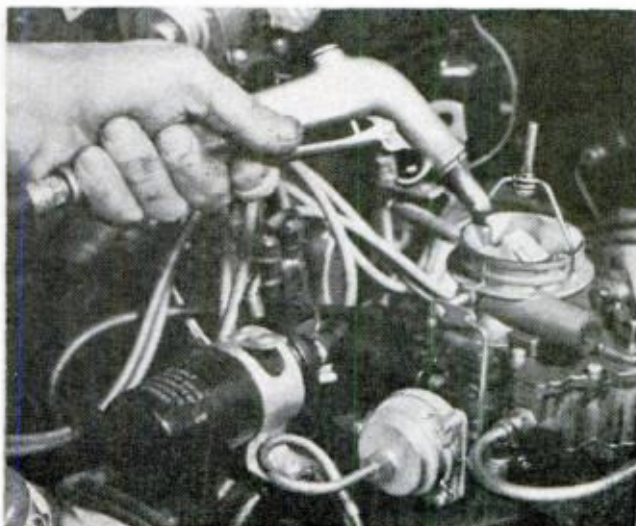
In all cars, except 1957 to present year Chrysler Corporation cars, the choke is mounted on the side of the carburetor. Chrysler cars of the years mentioned have

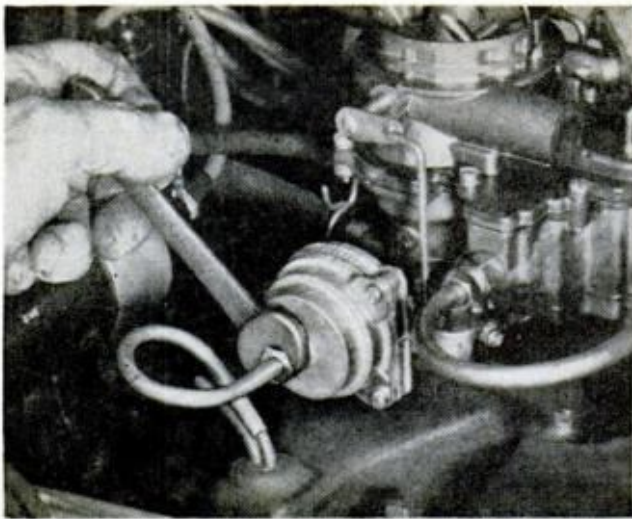
THE CHOKE BUTTERFLY is located in top of carburetor. With the engine at normal operating temperature, it should be wide open, as shown. Before starting, with the engine cold, it should be almost closed



BEST WAY TO DISLodge binding dirt from around choke butterfly is to blast it out with an air pressure hose. Once clean, prevent future dirt build-up by the regular use of an automatic choke cleaner

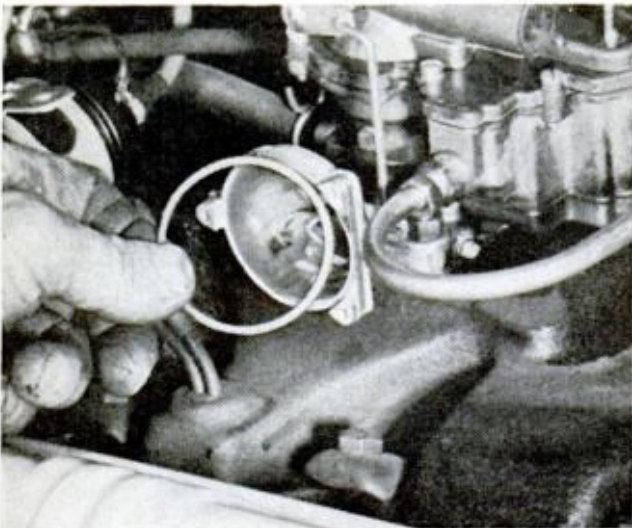
DIRT AND MOISTURE inside the choke cover can hamper movement of the thermostatic spring (center of cover), thus preventing a true adjustment. If you find any dirt, clean the cover thoroughly with solvent



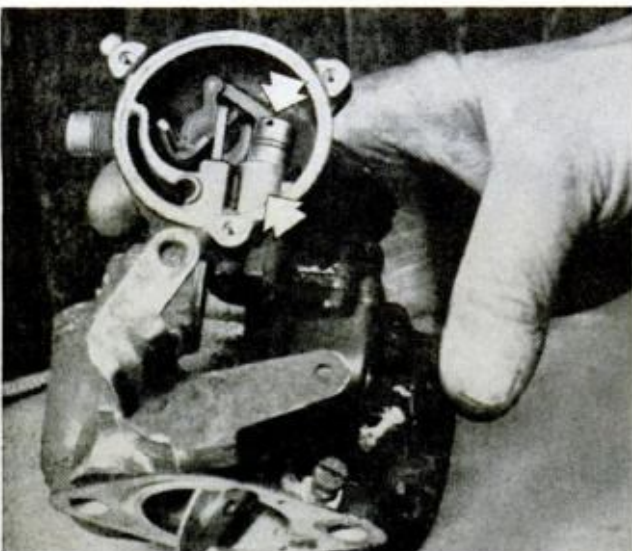


TO REMOVE HEAT TUBE, loosen the nut at choke cover, then detach tube from its seat on the manifold. Tube shown here merely fits over the seat, but in some models, it is held in place by a nut or retainer

A DAMAGED GASKET will destroy the vacuum inside the choke, impairing the operation of the choke piston. Therefore, it's a good idea to replace the gasket every time you have to take the choke apart



IN MOST CARS, choke piston (upper arrow) and choke piston cylinder are inside choke housing. In some, however, they are inside the carburetor. In operation, the choke piston pulls against the thermostatic spring



the choke control unit in the exhaust crossover of the intake manifold.

All car manufacturers issue choke-adjustment specifications in their manuals. These are given as "so many notches lean," "so many notches rich," or "zero" adjustment, which is mid-way between the extremes of rich and lean. But the sad truth is *you can't trust these specs.*

Several service managers have told us that choke mechanisms vary from car to car in their machining and accuracy—even on the same make, model and year. It would be inviting trouble, these mechanics state, to trust these controls and set them to manufacturer specifications.

Furthermore, adjustments among drivers differ. What would be an ideal adjustment for a car owner in New York may be a hard starting problem for a man in California, although the cars they drive might be the same.

To find the best adjustment for your choke, begin with a *cold* engine.

With the carburetor-type choke, loosen the screws of the choke-control cover (photo, page 180) and move the cover one notch *only* to the lean side. You'll notice that the cover is marked with the words *lean* and *rich*. Tighten the cover screws and crank the engine. If it starts easily, shut it off and move the choke cover another notch lean.

Crank the engine again to see how easily it starts. Keep adjusting and cranking alternately until you reach an adjustment at which starting becomes difficult. Then, move the choke cover back to the last notch at which starting was easy. This is the correct adjustment for your car.

During the adjustment procedure, be sure to let the choke cool off between cranks. If it's allowed to warm, you will not get a correct adjustment.

With Chrysler chokes, the procedure is the same, except for the method of getting at and moving the choke index. To remove the choke unit from the car, unscrew the bolts of the choke cover found on the manifold crossover, remove the cover and pull the choke unit from the manifold (photos, page 181).

Loosen the hex nut in the center of the thermostatic spring and adjust the pointer one notch at a time to the lean side. This unit may not be marked "lean" and "rich." However, turning the knob counterclockwise moves it to the lean side, while turning it clockwise moves it to the rich side.

Tighten the nut, reinsert the unit into the manifold, tighten the cover and crank the engine. Keep making adjustments as before until you obtain the leanest possible choke compatible with easy starting.

What you're doing in making this ad-

justment, whether with the carburetor- or Chrysler-type choke, is relaxing thermostatic spring tension. This permits the butterfly plate in the carburetor to open wider, allowing more air to enter the carburetor.

Mid-way through the winter, or if you should experience starting troubles when the weather really turns cold, it would be a good idea to readjust the choke back toward the rich side. This tightens up on thermostatic spring tension, shutting the butterfly plate and allowing less air into the carburetor.

In the summer, the same re-adjustment is recommended, but it is made to the lean side. When the weather gets hot, you may get excellent starting with a very lean fuel mixture, thus putting money in your pocket in the form of saved gas.

While adjusting the choke, you should test it for proper functioning. Since the only way a choke can malfunction is in failing to close and open, all you have to do is have someone behind the wheel slam the accelerator pedal to the floor just once. This should bring the butterfly plate inside the carburetor to the starting position, which is practically closed. (Here again, be sure to test with a cold engine.)

Now start the engine. As soon as it does start, the butterfly should open a little more, and should continue to open gradually as the engine heats up. It should be wide open as the engine reaches normal operating temperature.

If these things fail to happen, the trouble can be in one or more parts of the choke system. With carburetor-type chokes, for example, the fault could be with the choke linkage, butterfly, choke cover, heat tube, choke piston, thermostatic spring or choke gasket.

In Chrysler-type chokes, the trouble could be with the linkage, butterfly or thermostatic spring. (This type of unit has no other parts.)

The chart at the right and the photos accompanying this article show how to troubleshoot and repair each of these three parts. The parts are presented in the logical order in which troubleshooting should proceed. After checking and/or repairing each part, try the test again, making sure the engine is cold each time. If the trouble hasn't been fixed, try the next part.

One last word of caution: Notice the way in which the carburetor air cleaner is mounted. If tightened too much, it could collapse the sides of the carburetor throat which, in turn will bind the movement of the butterfly, keeping it open or closed at all times. Screw down the wing nut of the cover so it is just snug. ★ ★ ★

TROUBLESHOOTING LIST

| Part | Function | Repair |
|----------------------|--|--|
| *Choke Linkage | Operates the butterfly | With a rag, remove any dirt and moisture that could bind the linkage. Never oil the linkage as this will attract dirt and moisture |
| *Butterfly | Regulates amount of air entering the carburetor | Blow dirt from around the plate with an air pressure hose. Apply an automatic choke cleaner to the butterfly and linkage periodically |
| Choke Cover | Seals choke unit and adjusts operation of choke | Carbon and moisture inside the cover can hinder the operation of the thermostatic spring. Clean cover in solvent and check cover for cracks or warpage that could cause vacuum loss. If found, replace the cover |
| Heat Tube | Directs hot gases from exhaust to choke unit, to lessen thermostatic spring tension | Evidence of carbon and moisture inside choke cover indicate that exhaust gases could be seeping out of cracks and pinholes in the heat tube. Replace the tube |
| Choke Piston | Acts as weight on thermostatic spring to pull it down as spring loses tension. The piston operates by means of manifold vacuum. With most chokes, the piston is located right in the choke housing | Move piston up and down in cylinder. If it binds, remove it and clean with solvent. Run a piece of rag saturated with solvent inside the cylinder. Never use cotton, which might leave lint inside the cylinder |
| Choke Gaskets | Helps maintain maximum vacuum in the choke housing. Chokes mounted directly to the carburetor have two gaskets—one around the choke cover and one between the choke and carburetor. | If the gasket is damaged, there will be a loss of vacuum in the choke housing which will affect the operation of the choke piston. Replace the gasket |
| *Thermostatic Spring | To direct opening and closing of the butterfly in relation to spring tension | This part seldom goes bad. But if all else has failed, then it means the spring has probably lost its temper. Replace it |

*These parts are the only ones found in automatic chokes of Chrysler Corporation cars from 1957 to present.

AUTO CLINIC

Q I've read many times that excessive fuel pump pressure will cause flooding. How come? Doesn't it stand to reason that when the carburetor float reaches a certain level, it will cause the needle valve to close, shutting off the fuel to prevent flooding?—A. M., S. C.

A Theoretically, you're right. But it doesn't work this way in practice. The reason the needle valve doesn't offset the effects of excess fuel pump pressure is because that pressure causes the valve to be hit by a sudden and forceful surge of gas that knocks it from its seat. Manufacturers have tried to stop this "jarring" condition by equipping needle valves with a neoprene tip. It does the job for a while, but after the neoprene tip wears a bit the same thing occurs. The strong surge of gas due to high fuel pump pressure is too much for the small valve.

Q I notice the inside tire treads of both front wheels on my 1962 Chevy Nova II are wearing. I had the wheels aligned, but the trouble persists. I also had a new tie-rod assembly installed, but this hasn't helped. My tire pressure is kept to that recommended. What's the trouble?—R. J. P., Del.

A This problem is widespread and common. To put it bluntly, the Nova II has a tendency to toe-in and, as yet, there's no indication why—and no permanent cure. To check for the condition in your car, go to a state inspection station and run over the alignment machine. The situation might be alleviated, temporarily at least, by having toe-in adjusted. This, though, can be a continuous adjustment and expense, because the toe-in can pop out again in a few miles.

Q My 1960 Ford Fairlane 6-cylinder with standard transmission has a clutch problem I can't solve. At 5,000 miles the throw-out bearing started to squeak every time I released the clutch. A new bearing worked for about 3 months, but also started to squeak. At 15,000 miles, the clutch started to grab. I've changed everything that can be changed with no results. Can you tell me what the trouble is?—F. R., La.

A Your Ford has a centrifugal-type clutch. This means that the more you rev up the engine, the less clearance there is between the throw-out bearing and the clutch fingers. It is likely that the trouble comes from your having allowed too little clearance between the bearing and fingers when you installed a new bearing. But there's one other possibility. Some drivers unconsciously drive with their foot resting on the clutch pedal. Even the slightest pressure on a centrifugal-type clutch will force the bearing against the fingers. It takes only a relatively small amount of driving in this position to wear out the bearing and start it squeaking—and, eventually, wear out the clutch to where it starts to grab.

Q From the time my 1962 Studebaker Hawk with Carter 4-barrel WCFB carburetor was new, it would stall on fast left turns only. It never stalls on right turns or on a straightaway. The float level and ignition are OK. What's the answer?—C. E. B., Pa.

A That carburetor has a baffle plate in it which, if working properly, keeps the gas from surging through it to flood the engine on turns. If, however, you have a 4-barrel carburetor which hasn't been modified with stepped-up rods, you will get the problem since the baffle plate has a way of becoming loose and allowing gas to get past it. The basis for the modification is Studebaker Service Bulletin E1963-5, which your Studebaker dealer should know about. This problem, by the way, applies to all '62 or early '63 Studebaker models equipped with a 4-barrel carburetor.

Q Here's a strange one. The Powerflite transmission of my 1960 Dodge Dart doesn't shift into HIGH regularly. When I start out in the morning with the DRIVE button pushed in, I have to go ½ mile or more before it shifts. Once it does shift, it's OK and works fine for the rest of the day. The transmission is full and the fluid is clean and, of course, here in the Canal Zone it isn't cold in the morning. Is there a simple answer and solution?—G. W. B., Canal Zone

A The answer is simple—the solution not so simple. Don't be deceived by the fact that you aren't cold in the morning. Even at equatorial temperatures, transmission parts are cold—or, I should say, colder than they are after

being in operation. Because of the variance between non-operating and operating temperature, the O-rings in the gear box are in a contracted position in the morning. As such, there's a loss of hydraulic pressure around them, causing your no-shift problem which is alleviated once the transmission heats up and the O-rings expand, sealing off the pressure leaks. My advice is to leave it alone and not worry about the no shifting for that half mile—unless this causes you serious inconvenience, as it might if you had to start out in highway traffic. You could, of course, overhaul the transmission and put in new O-rings but there's no guarantee that the new rings won't react in the same manner. Just seems to be the nature of these little beasts.

Q Despite a complete engine overhaul, my 1960 Triumph Herald still burns a quart of oil every 60 miles. All the classic signs are there: blue-white smoke gushing out the exhaust, and plug fouling. I'll swear on a stack of Bibles that the mechanic who did the job was reliable. He's been working on my Buick for years and I never had a complaint. I can't figure it.—D. E. C., N. J.

A I can. First, from what you say, it sounds as if the cause of your problem is worn valve guides brought about by improper installation. Valve guide work on this car is very critical. Tolerances are extremely close and there are little rubber inserts that must be placed on the valve stems. What's probably happening is that the intakes are opening and sucking oil past the valves into the cylinders because of the improper tolerance condition. This is why you're getting blue-white smoke from the exhaust, why your plugs are fouling, and why your oil consumption is so high.

Can't blame the mechanic who did the job either—his intentions were probably honorable, and he's most likely a crackerjack on American cars. But any mechanic that's had no experience with a foreign car, especially an English-made Triumph, is asking for trouble if he tackles one. Critical areas, not present in U. S. autos, can easily be missed with the imports. Sound advice on any major work needed on a foreign car is to get that car to a mechanic who specializes in that make. None other should be allowed to handle it, no matter how good he is with domestic products.

Monthly Service Tips

★ After several years of noisy timing chain problems with the four-cylinder Tempest (see April, 1964, *PM Auto Clinic*, page 181), Pontiac has issued a new chain which should now be in the hands of dealers and which reportedly eliminates the problem. The chain carries part number 9772801 and is used with the standard Pontiac sprockets.

★ All Comets built from 1960 to April 1, 1963, could experience front bearing and front brake troubles from water entering and contaminating the area. The cause of this has been pinpointed as a backing plate not in complete contact with the spindle flange. Lincoln-Mercury Service Bulletin 21 (Feb. 7, 1964) holds the solution or, if you haven't as yet had the problem, the prevention. A new gasket (part number C4DZ-2044-A) is to go between the backing plate and the spindle flange to keep the water out.

★ Do you hear moans from the front of your 1963 Cadillac? Quite likely, they're coming from the power steering pump and are being transmitted into the passenger compartment through the power steering gear and car frame. The sound usually reaches a peak in fourth gear at about 20 to 25 miles per hour, although you can get it when idling in neutral. There's a pressure hose issued by Caddy that has a chamfered orifice to dampen the pump pulsations and reduce the noise. Its part number is 5692602.

★ If your Chevelle has a front door squeak, the glass is probably in too heavy a contact with the rubber seal strip that attaches to the door's outer panel. Chevy dealers have the word on how to correct this.

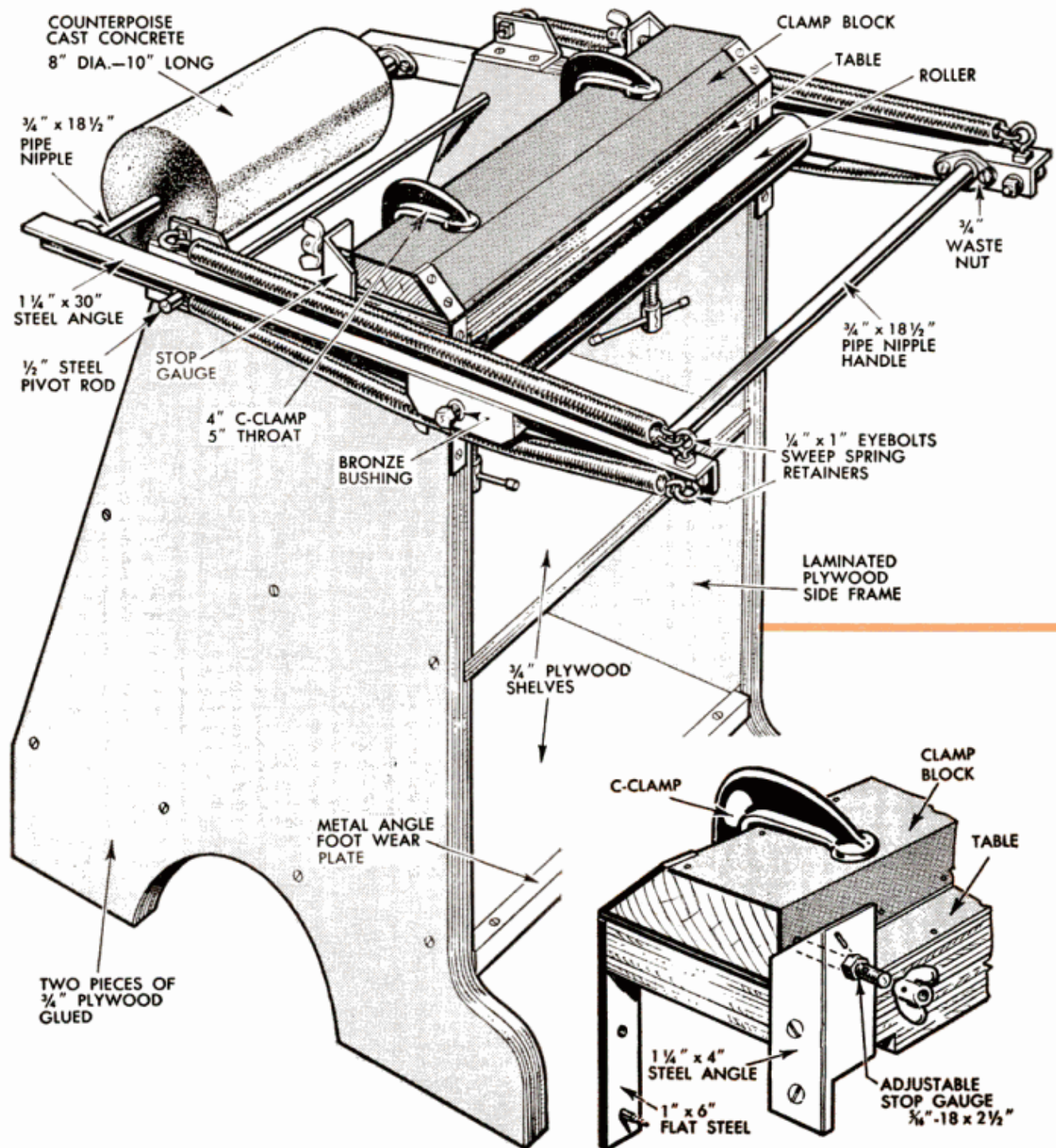
As a service to the readers of *Popular Mechanics* in solving problems relating to their cars or to driving in general, you are invited to submit your questions for answering either through this column or by mail. Address Auto Clinic, *Popular Mechanics Magazine*, 575 Lexington Avenue, New York, New York 10022

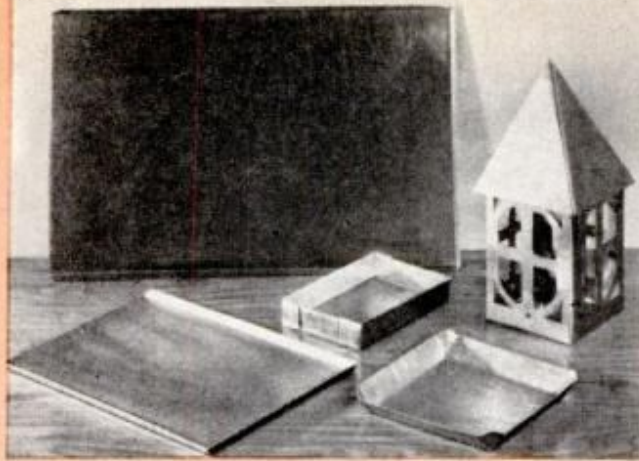
SHEET-METAL BRAKE

By Manly Banister

SHEET-METAL WORK can be either fascinating or frustrating—it all depends on the sort of a bending rig you use to do the job. In most home shops, metal bending is done in the simplest possible way; the work is clamped so that it overhangs the edge of the bench and is then hammered with a mallet to produce the

desired bend. For occasional basic jobs there's nothing wrong with this method, but there's no denying that the results are crude and the types of bends that can be made are limited. The man who takes his shop work seriously won't be satisfied with such primitive techniques. He'll want a heavy-duty metal brake capable of mak-





COOKIE SHEETS, flowerpot trays and a garden lantern are just a few of the projects that can be turned out on this sheet-metal brake. Bending is simply a matter of forming metal over a suitable mold



ing clean, precise bends, seams and coves.

The machine shown on these pages really fills the bill. Its design departs from conventional sheet-metal brakes by employing a steel roller instead of a bending leaf. This feature extends the versatility of the machine greatly because the roller can be worked both downward and upward, providing exceptional latitude in project design. By using the proper forming block or mold, you can bend sheet metal to any angle, make radius bends, reverse bends and seams.

The machine's construction is rugged enough to permit bending 20-ga. sheet iron the full 18-in. width of the table, though material of this size and thickness will require the aid of a mallet to "sharpen" the bend. Lighter metals, and narrow widths of heavy-gauge stock, can be bent

easily. For example, $\frac{1}{8}$ x $\frac{3}{4}$ -in. strap aluminum can be bent sharply with a single stroke.

A 4 x 8-ft. sheet of $\frac{3}{4}$ -in. plywood will provide enough material to build the frame and table. Both the table and the two sides are constructed by gluing two pieces of plywood together. The double thickness of these pieces, plus the bracing effect of the shelves, which are attached with glue and screws to the sides, assures rigidity. Lag screws are used to attach the table to the frame, making it a simple matter to remove the table for replacement.

To insure accuracy, both side pieces should be clamped together and drilled at the same time for the pivot shaft. A 2-in. square steel plate, set into a snug-fitting recess chiseled in each side piece, serves as a bearing for the shaft.



IT'S NO TROUBLE to dado the shelf grooves in the sides of the frame if you make the cuts while the stock is still square, before bandsawing it to shape

The top of the table is faced with a piece of 14-ga. sheet steel attached with countersunk F. H. wood screws. The bottom is covered with 20-ga. sheet steel. To begin with, you will need only one clamp block, shaped as shown in the drawing. You will have to bend the sheet metal cover by hand, but after that all your bending can be done on the machine itself.

The roller may be made of cold rolled steel, though you'll find that hot rolled steel costs less and is as serviceable. Use your lathe to remove the scale and true the ends; then, if you have a tool-post grinder, use it to grind the surface. Otherwise, careful filing while the work rotates in the lathe will smooth the surface sufficiently. The holes to be drilled and tap-

METAL-CUTTING SAW makes short work of a tough job: cutting the 14-ga. steel table top. If you lack this tool, a sheet metal shop can do the work for you



THE SIDE MEMBERS of the frame are brought to their finished form with a bandsaw. Large work is easier to handle if you rig up an auxiliary table as shown

ped in the ends of the roller must be perfectly centered.

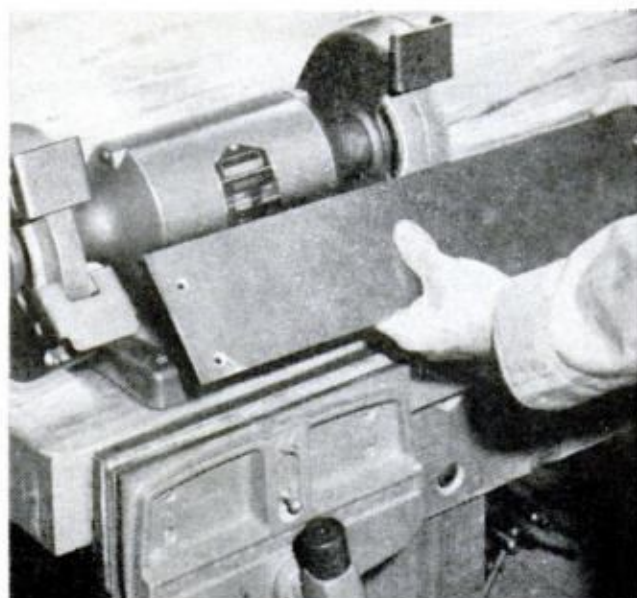
Two oak bearing blocks with $\frac{1}{2}$ -in. bronze bushings are fastened with screws to the steel-angle sweep. A machine bolt passed through the bushing secures the end of the roller and allows easy removal should the roller require refinishing.

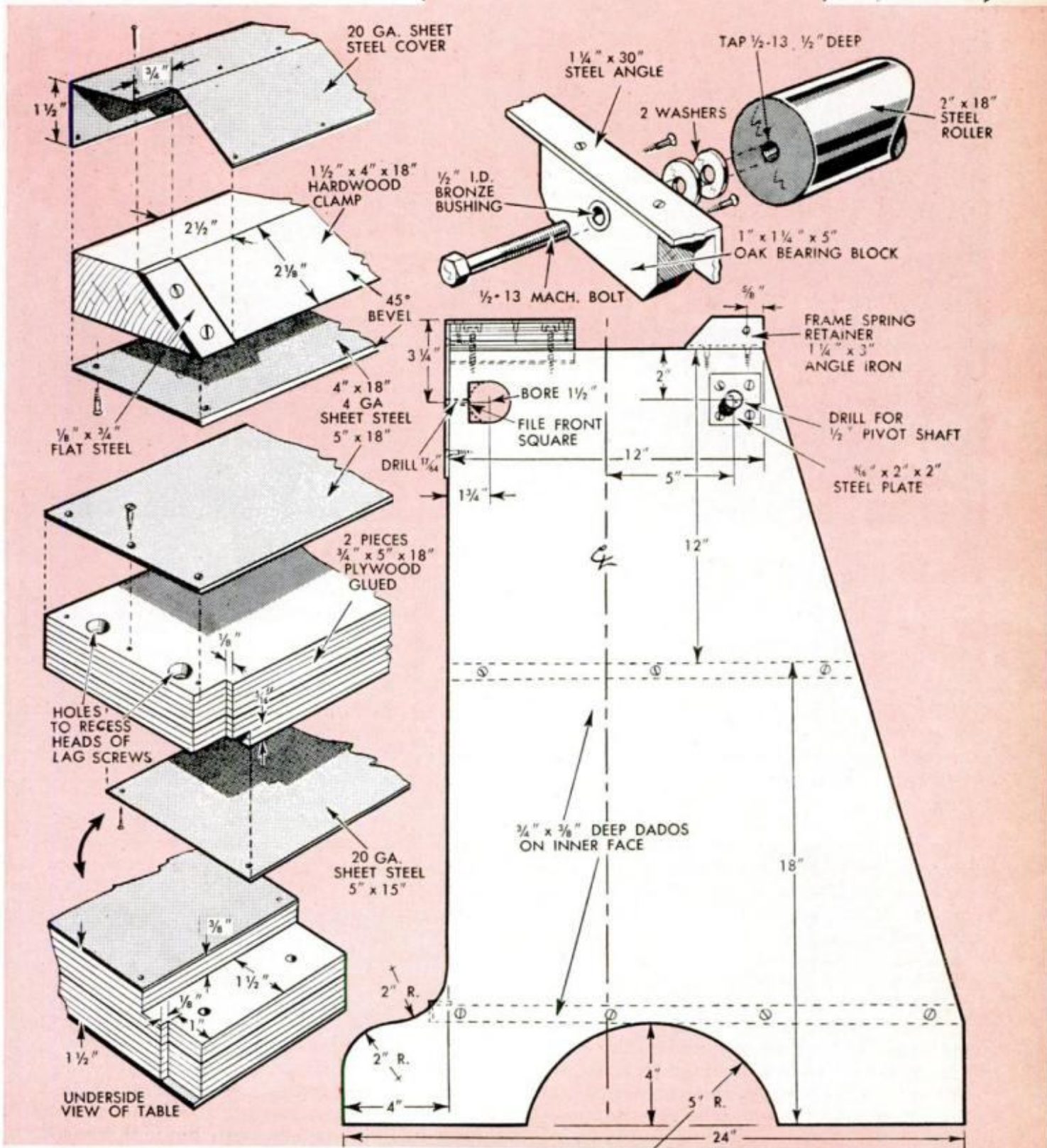
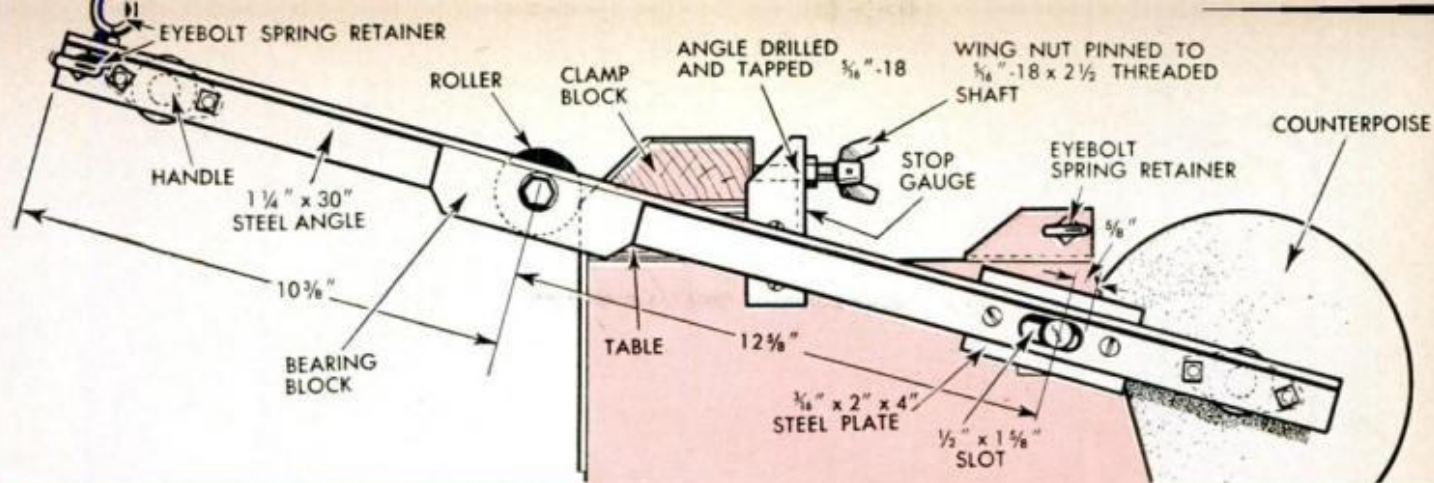
The counterpoise should weigh about 45 pounds. A concrete cylinder will do the trick or you may prefer to use barbell weights.

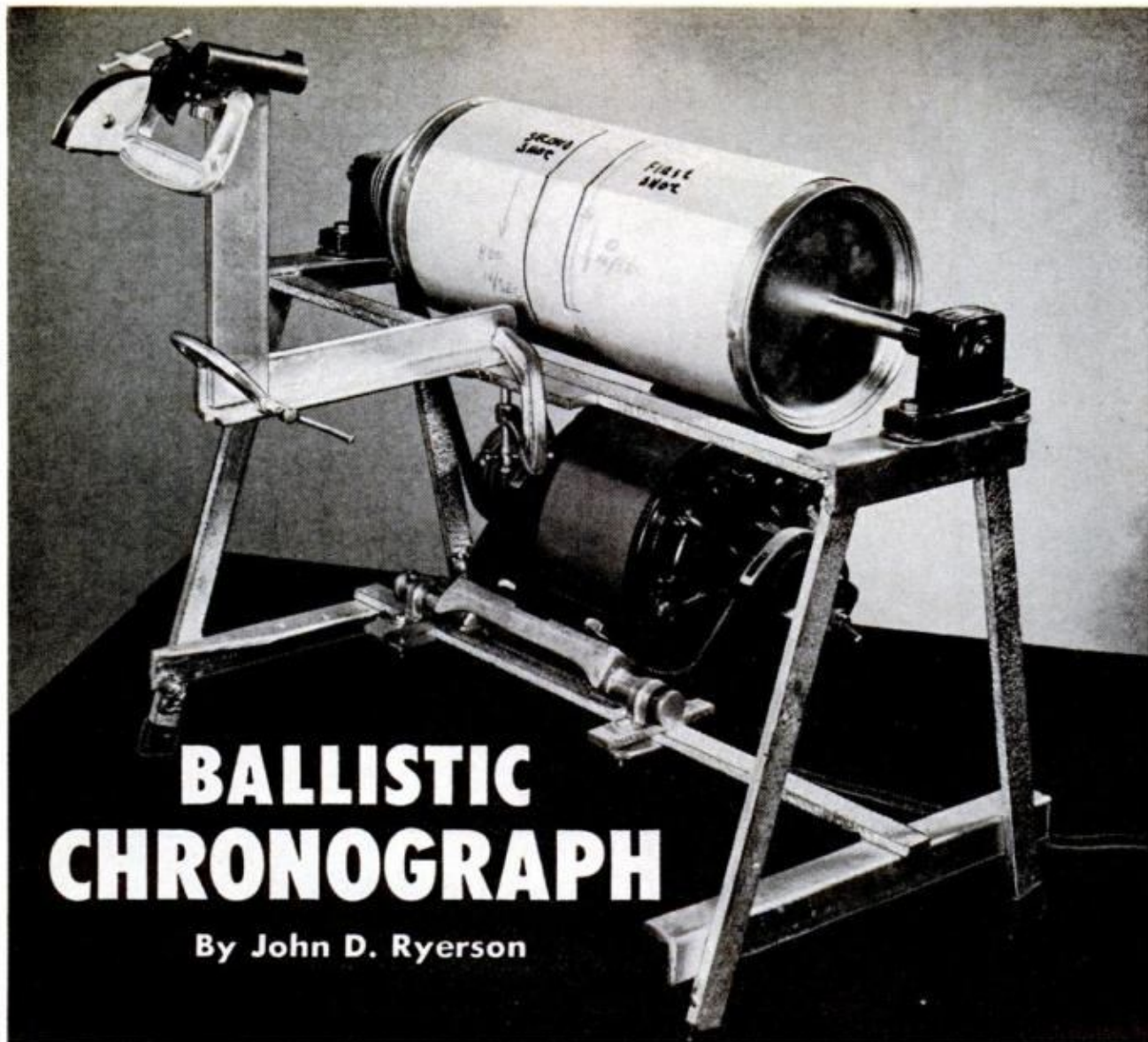
The springs are a standard item. They are 16-in. long, 1-in. outside dia., and are of 12-ga. wire. Stretched to a length of 22 in., they each provide a 25-pound pull.

In the November *PM* you'll learn how to put the brake through its paces. ★ ★ ★

THE SOLE PLATE for the clamping block is 14-ga. sheet steel. The leading edge of the metal should be ground to a 45-deg. angle and then finished with a file







BALLISTIC CHRONOGRAPH

By John D. Ryerson

Simple device for measuring the speed of a bullet is made from empty coffee cans and a motor salvaged from an old washing machine

SERIOUS HAND LOADING enthusiasts who like to determine the velocities of their homemade ammunition are hampered by the relatively high cost of buying a chronograph or sending sample cartridges to a private testing laboratory.

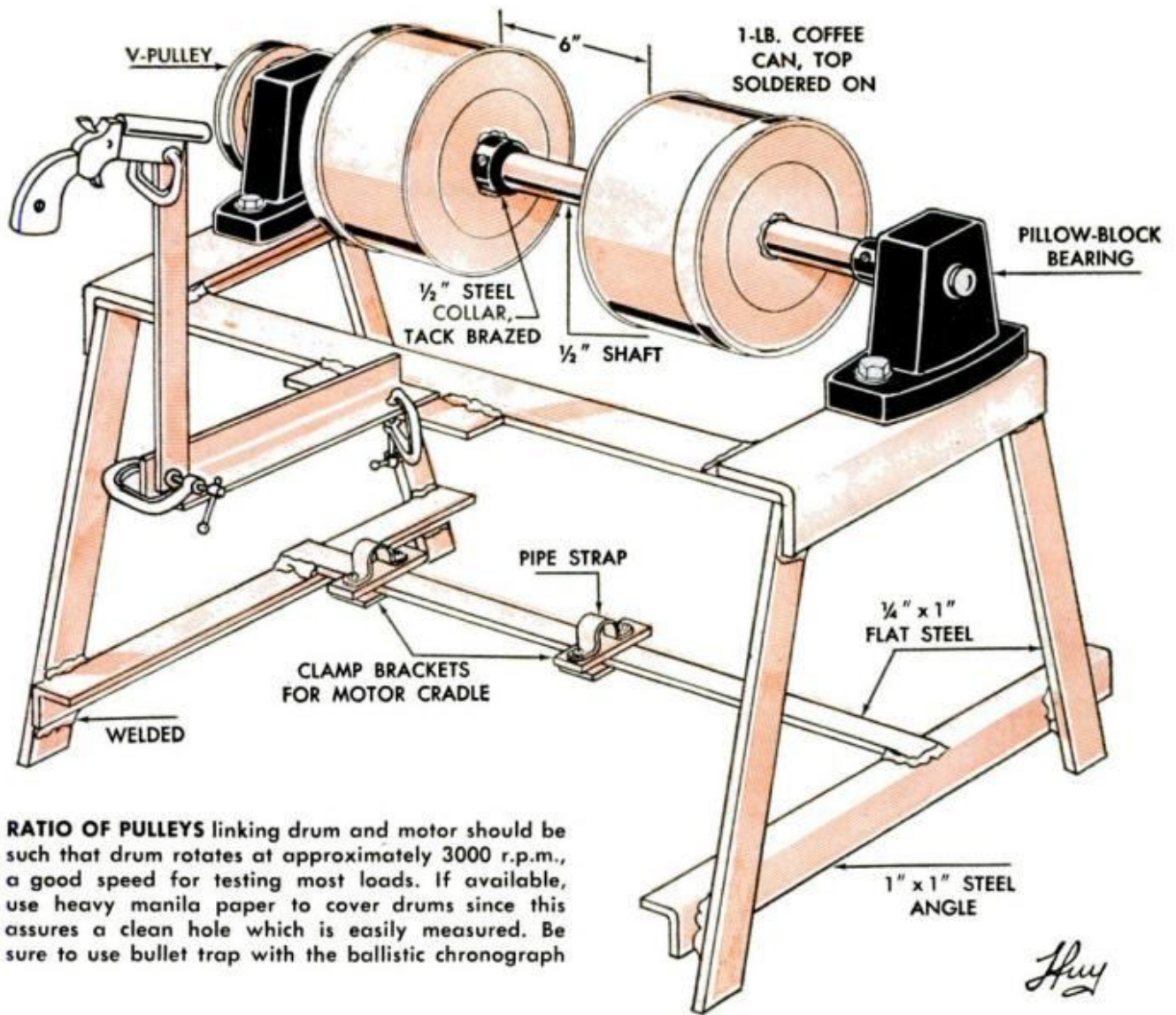
But a reasonably accurate ballistic chronograph is easier to make than most people would imagine. The one I made, for example, is little more than a welded steel frame which supports an electric motor and a drum made of two paper-covered coffee cans. The motor rotates the drum at a constant known speed, while the ammunition being tested is fired through paper and the 6-in. space between the cans. As each bullet passes through, it makes a hole in the paper on the way in, and another on the way out. The relative positions of these two holes permit you to

calculate how fast the bullet was going. This theory is explained in more detail on the opposite page.

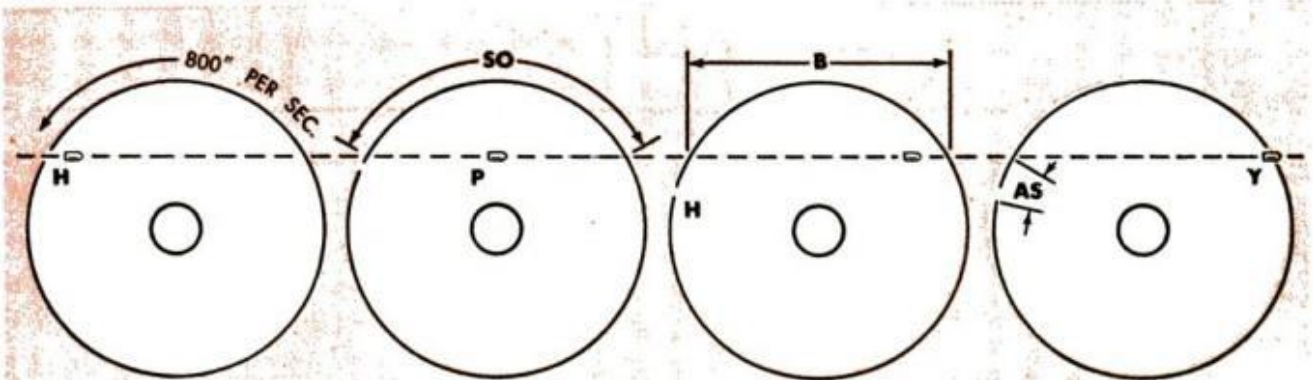
When tried out with .22 shorts rated by their manufacturer at 1125 feet per second, my home-made chronograph gave a calculated speed of 1132 feet per second.

When testing low-powered, small caliber cartridges, you can clamp the gun directly to the steel frame, as in the photo above. However, high-velocity loads should be fired from a separate machine rest, as their heavier recoil will knock the chronograph over.

Another point to keep in mind, as with all shooting, is safety. Obviously, if you test fire in your basement, be sure to use an adequate backstop or bullet trap to catch the bullets. Outdoors, place the chronograph in front of an earth embankment.



RATIO OF PULLEYS linking drum and motor should be such that drum rotates at approximately 3000 r.p.m., a good speed for testing most loads. If available, use heavy manila paper to cover drums since this assures a clean hole which is easily measured. Be sure to use bullet trap with the ballistic chronograph



CROSS SECTION THROUGH PAPER-COVERED DRUMS

HOW THE BALLISTIC CHRONOGRAPH WORKS

The projectile fired into the rotating drum enters at point H and exits at point Y. In order to discover the projectile's velocity, you must know the distance it travelled through the drum and the amount of time it required to travel this distance. The distance, B, can easily be measured. The time can be computed by measuring how far the drum rotated during the projectile's passage, arc AS, and dividing this distance by the rotation speed of the surface of the drum. Divide the distance by the time and the result will be the velocity.

EXAMPLE

$$AS = \frac{1}{4}''$$

$$T = \frac{\frac{1}{4}}{800} = \frac{1}{3200} \text{ sec.}$$

$$SO = 5\frac{1}{2}''$$

$$B = 4\frac{1}{2}'' = 0.354'$$

$$V = \frac{0.354'}{\frac{1}{3200} \text{ sec.}}$$

or 1132 Ft./sec.



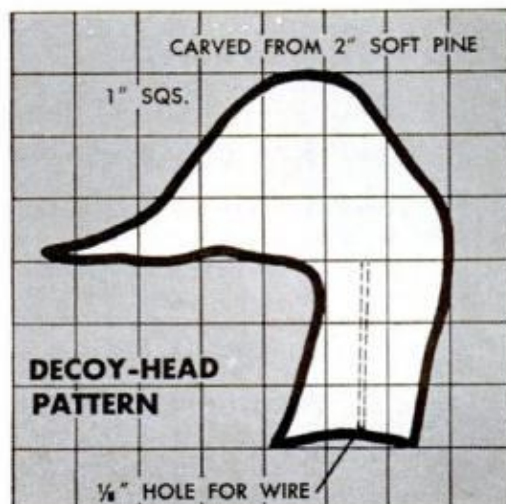
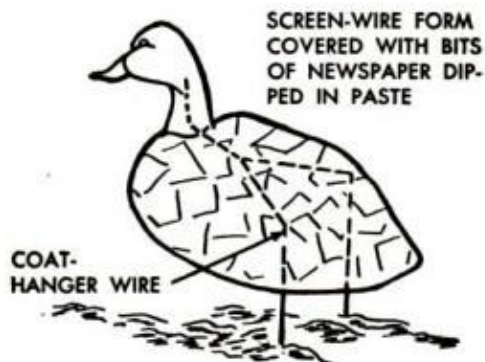
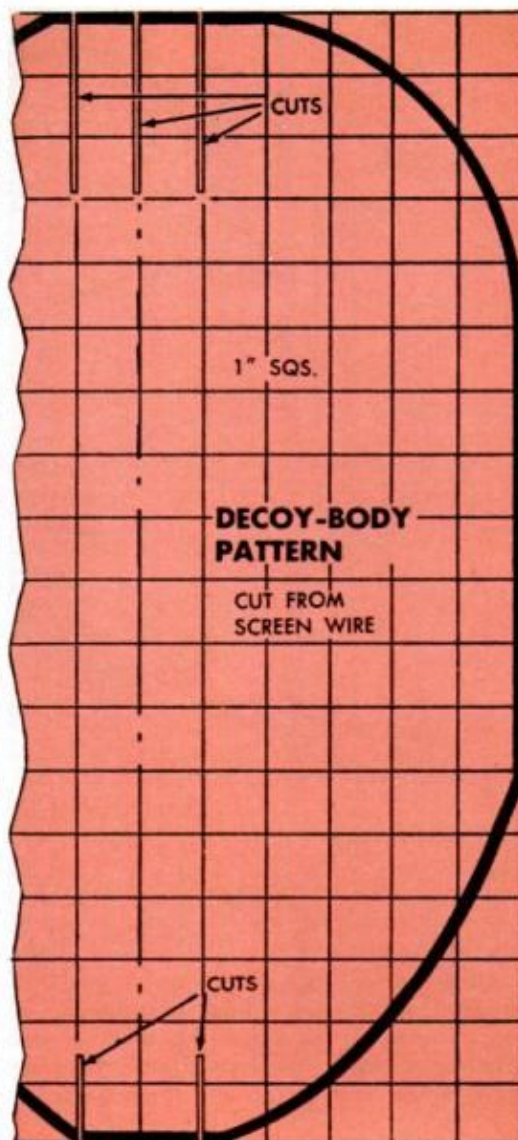
LIGHTWEIGHT FIELD DECOYS

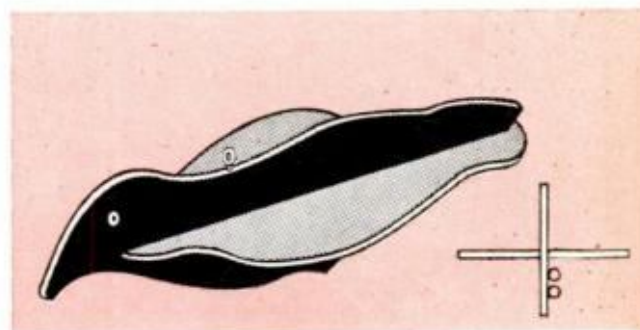
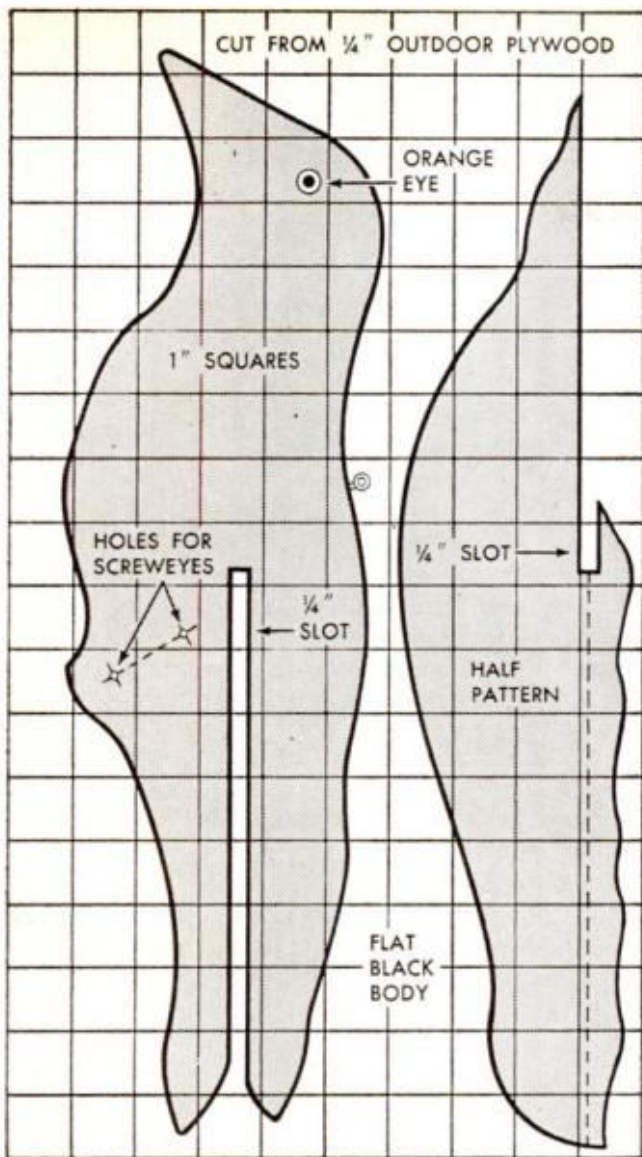
IT'S NO EFFORT to tote these light, easy-to-disassemble decoys in the game pocket of your hunting coat—and they cost just pennies.

To make the duck decoys, cut aluminum screen wire into 12 x 18-in. rectangles, then trim these to match the pattern. The edges of the screening are bent inward, creating a cup-like form which is held in place with a few strands of wire. After completing the forms, tear up newspaper into 2-in. squares, dip these in wallpaper paste and place them over the form. Build up at least a four layer thickness on both the inside and outside of the body for each of your birds.

The heads are jigsawed according to the pattern and then shaped with a jackknife. To duplicate the coloring of a drake mallard, paint the head green and band the neck with a narrow white collar. The body is given a coat of shellac and finished with flat gray enamel.

Don't forget to set your decoys so they face upwind just like live ducks. Speaking of live ducks, you can do your bit in protecting the eggs





THREE SCREWEYES make it easy to hang the decoy from a branch of a tree located in a strategic position. Tell-tale reflections that may tip off wily crows is avoided by painting decoy with flat drying enamel

of this valuable game bird by polishing off as many crows as possible. The expense of factory-made decoys discourages most hunters, but by following the pattern, you'll be able to cut nearly two dozen

decoys from a 4 x 8 sheet of 1/4-in. plywood. Slotted construction permits disassembly for storage or carrying. Credit for the duck decoys goes to Bob Cary. The crow decoy is by Nicholas Karas.

Feather-Weight Duck Boat

Though I like duck hunting, my enthusiasm dwindles when I have to lug a heavy skiff through the woods to the back ponds where the big mallards are. But now I have a new boat that is as light as a feather. It costs me only \$10 and is so light I can carry it with one hand. You can buy one just like it at most toy shops or department stores. Actually, it's a kid's boat, molded of plastic and measuring only 5-ft. long, but it safely carries me, and I'm a 200-pounder. Adapting the boat to hunting use is a cinch, a coat of duck skiff paint for camouflage and a 2 x 2 1/2-ft. piece of plywood for a seat platform, does it. Because of its small size and light construction, the boat should be used only in calm water. Either a pole or a paddle can be used for locomotion.—*Stan Henschel*



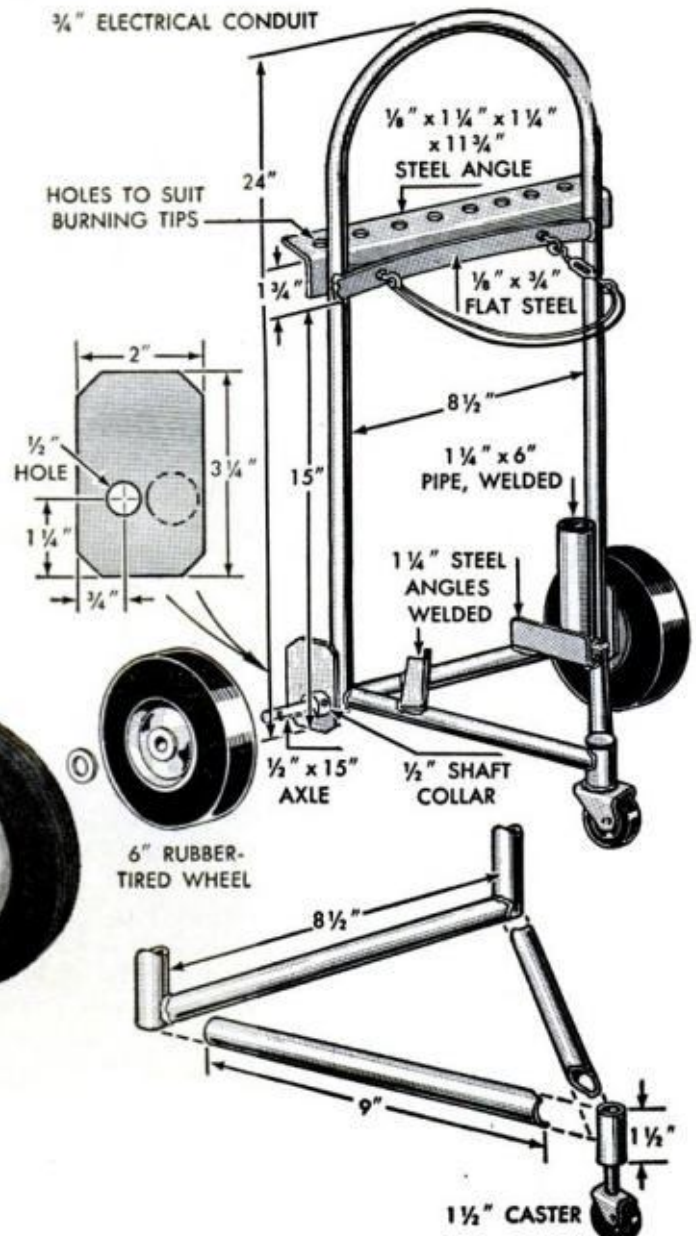
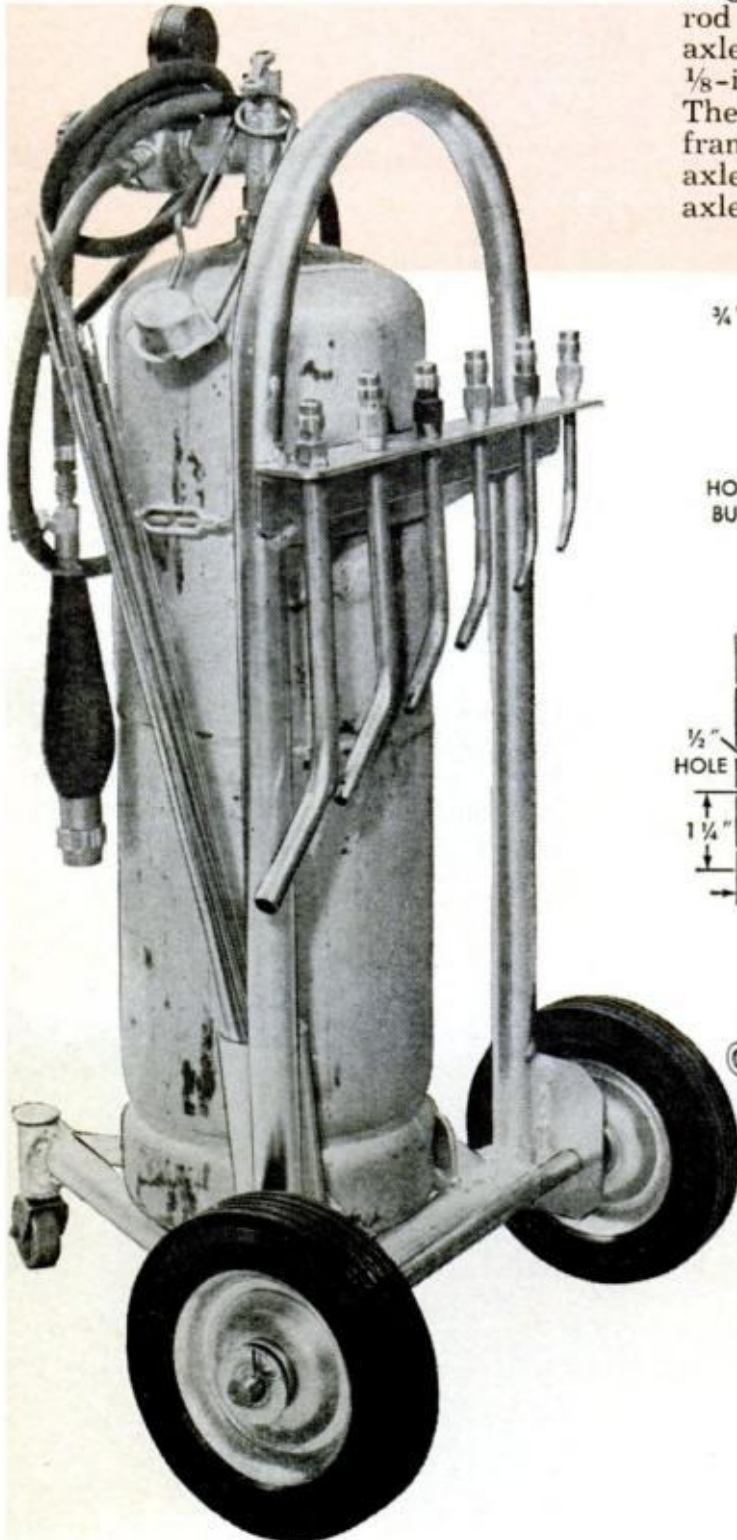
WELDING-TANK CADDY

BESIDES SERVING as a dolly for a "B" size welding tank, this caddy will also hold extra tips, a spark lighter, plus a supply of welding rods. It's made almost entirely of $\frac{3}{4}$ -in. electrical conduit, welded together.

To bend the U-shaped handle, fill a 5-ft. length of conduit with sand, plug

both ends and bend around an $8\frac{1}{2}$ -in. pulley or wheel. Then trim to final 24-in. height. The $\frac{1}{8} \times \frac{3}{4}$ -in. flat steel that cradles the top of the tank is drilled for a $\frac{1}{4}$ -in. eye-bolt near each end to accept the doubled brass wire and turnbuckle which hold the tank in place.

Before welding on the steel-angle bottom cleats, determine their exact lengths and positions with the tank and rod holder in place. Finally, pass the axle through the axle plates, which are $\frac{1}{8}$ -in. steel, and through the wheels. Then, with the caster installed and the frame blocked level, mark where the axle plates go, and weld them on. The axle passes behind the frame.



Sand Small Parts Easily

Wood-working hobbyists often find it necessary to sand pieces of wood which are much smaller than the surface of an electric sander. In such cases, you can avoid many tedious hours of hand sanding if you fasten your power sander upside down to a large board by securing a pipe strap over the handle. This makes it possible to bring the work to the sander.—*Ken Patterson*

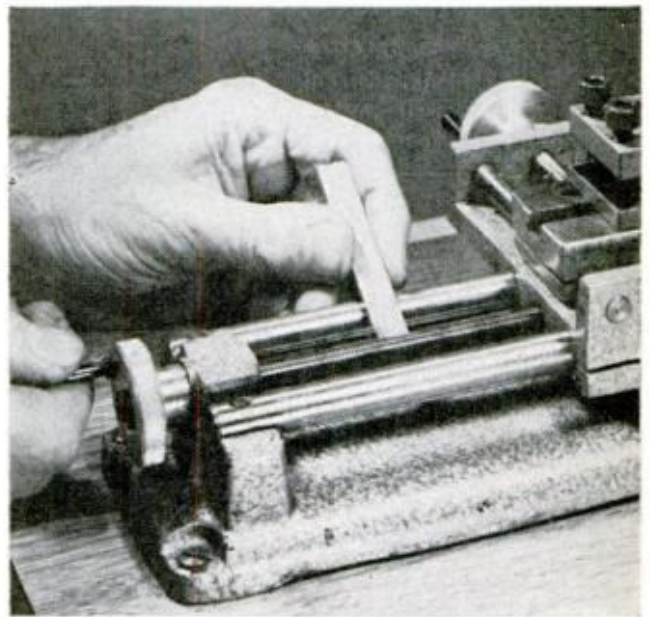


When using a vulcanizer to apply hot patches to inner tubes, place a piece of aluminum foil over the plate of the vulcanizer. The foil will prevent the patch from sticking to the plate and permit you to remove it without damage.

—*Henry Josephs, Sr.*

Clean Threads with Scrap

To make an effective tool for cleaning external threads, such as those on a lathe feed screw, whittle one end of a bamboo strip to a thin chisel-like edge and file shallow notches in this edge to conform roughly to the thread shape and spacing. When the screw is turned with this edge pressed against the threads, dirt and grease will be removed.—*Walter Burton*



To make a low-cost waterless cleanup kit which can be carried in the trunk of your car, slip a tube of brushless shaving cream inside a roll of paper towels. It's perfect for cleaning up after changing a tire or other roadside repair jobs.

—*R. M. Woodbury*

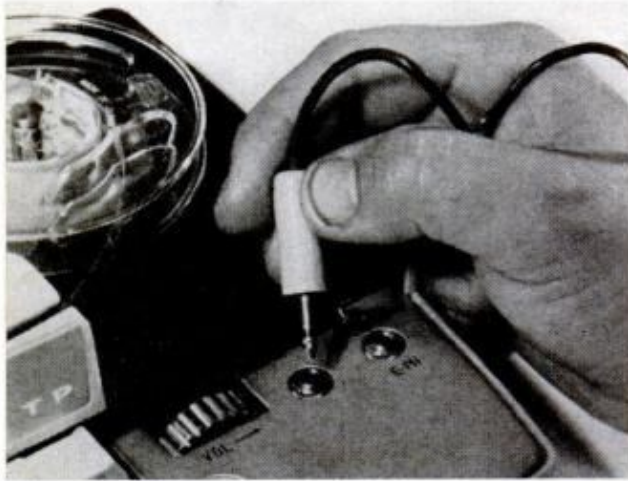
NEXT MONTH IN SHOP AND CRAFTS

- ★ **PARTITION BUNKS.** When small, several youngsters can be bedded down in one room. But when sisters have to be separated from brothers, these built-in partition bunk beds provide a low-cost solution to the problem of space. With only one bunk facing each room, the upper and lower berths create a dividing wall to convert one large bedroom into two rooms
- ★ **SHOTSHELL RELOADING.** Whether your interest is trap, skeet or game birds, you won't want to miss this shooter's special in next month's *PM*. It not only gives a complete rundown on all the latest equipment, but takes you step-by-step through the complete reloading operation. If you'd like to cut the cost of your shooting in half, get the November *PM*
- ★ **THOSE MAGIC URETHANES.** Virtually unknown five years ago, urethane finishes are rapidly making a name for themselves because of one big reason—performance. Some are hard enough to roller skate on, others stretch like rubber. Whether you want to paint a boat or refinish an old porch rocker, be sure to read this up-to-the-minute survey in next month's *PM*
- ★ **HOW PERMANENT IS "PERMANENT" ANTI-FREEZE?** Sure, it'll keep your coolant from freezing if you leave it in winter after winter, but antifreeze offers other important protective benefits, and these aren't so durable. How long can you expect "permanent" antifreeze to do its full job? *PM* tackles this important controversy in next month's *Saturday Mechanic*

DICTATE TO YOUR TAPE

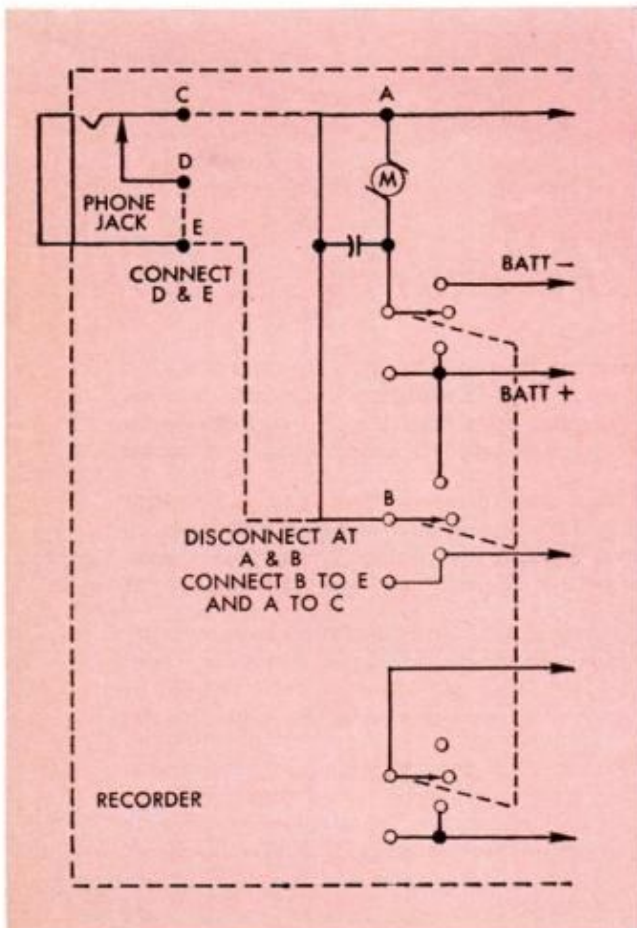
Add a phone jack, make some minor wiring changes and your transistor tape recorder quickly becomes a handy dictating machine

By Clint McGirr



ADDED JACK for the foot switch is mounted near the existing earphone jack to give a professional look

PARTIAL CIRCUIT DIAGRAM shows the switch wiring that must be changed to allow for adding foot pedal



ANY OF THE LOW-PRICED, transistorized tape recorders now on the market can be converted easily into a compact dictating machine. With a few inexpensive electrical items and an hour's time, you can add a foot switch and increase the recorder's versatility many times over.

Once you add the switch you can turn the recorder on or off with a touch of your foot. This makes dictating easier, of course, but it helps the typist even more. Typing from the recorder would normally require the typist to remove one hand from the typewriter each time she switched the recorder on or off. At normal dictating speed this means she must interrupt her typing every 30 seconds or so.

Adding a foot switch isn't expensive. You can mount a simple single-pole-single-throw pushbutton switch to a plastic or rubber door stop. Then add a few cents worth of wire, a miniature phone jack and matching plug, and you've got your foot switch assembly.

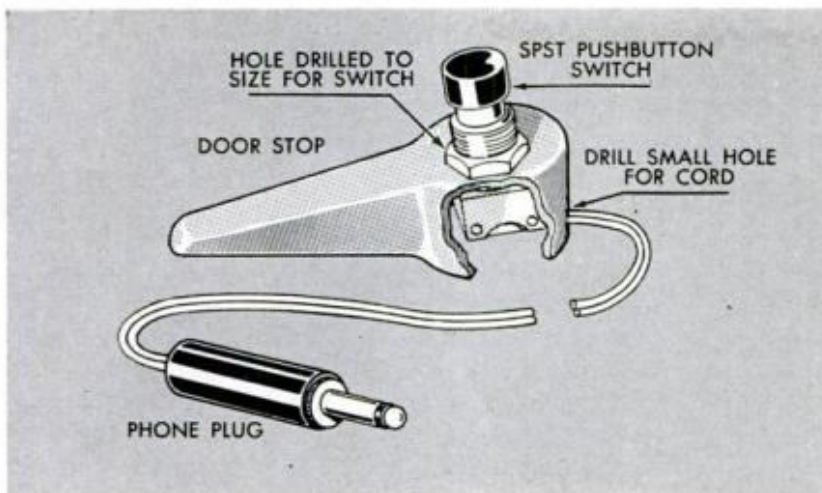
Connecting the foot switch into the recorder circuit requires one minor change in the recorder wiring. You will have to connect the miniature phone jack in series between the battery and the motor.

Take a look at the schematic diagram. To make the wiring change, first disconnect the wire between points A and B. Now connect points B and E. Then connect points A and C. The jack is now added to the circuit. Find a convenient mounting spot for it—possibly out the side of the recorder case or lined up with the earphone or microphone jacks already on the recorder.

As a final wiring step connect points D and E on the jack. This connection completes the motor circuit when the foot pedal is not being used, permitting normal use of the recorder.

The foot-switch operation is ideal for a dictating machine that you can use while driving your car. However, to make mobile dictating safer, replace the hand microphone with a throat microphone. Another alternative is to fasten the microphone onto the steering wheel so you can talk into it and still keep both hands on the wheel.

RECORDER



HERE'S HOW to make a foot pedal out of an ordinary rubber door stop. Use a single-pole-single-throw pushbutton switch for the job.



PM Tests a New Stereo Tuner

\$300 quality in a \$155 kit is a "buy" for high-fidelity sound, but FM stereo indicator is awkward

By Larry Steckler

THREE MANUALS come with the Eico 2536, a combination of FM stereo tuner and a 36-watt stereo amplifier. One manual details the step-by-step assembly instructions. The second contains diagrams showing how to place and connect parts. The third is an operating manual.

Assembly is comparatively rapid—total time ran into 21 hours. As we worked along, several leads seemed to be short even though they had been cut to the specified length. A quick check with Eico brought a rather extensive correction sheet. So if you get one of these kits and don't find such a correction sheet don't start putting the kit together until you've got the changes and have entered them in the manual. It will save rewiring time.

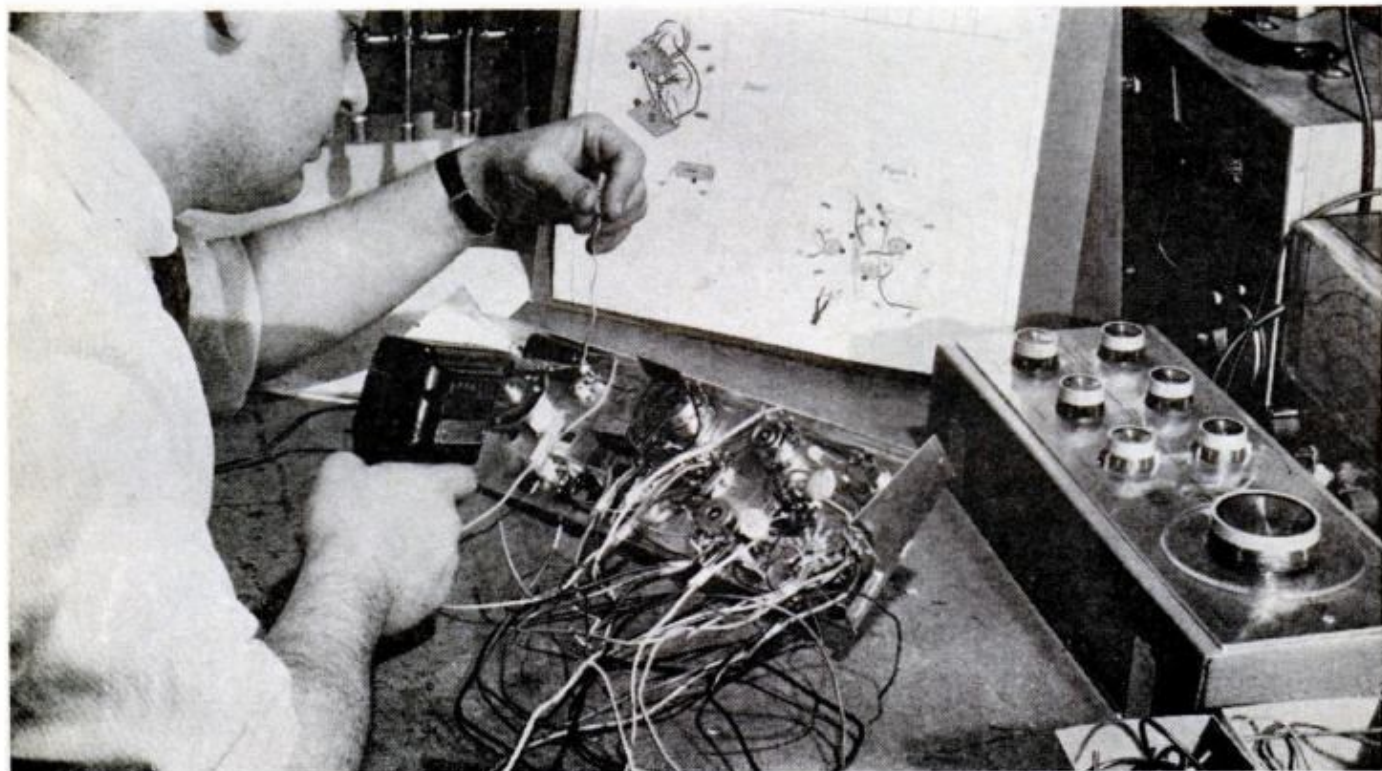
Finally it was time to turn on the power. It only takes one wrong connection to put the set out of commission. But all went well, extra proof of good instructions.

Several listening hours later we had determined that unit was a pleasure to hear. Then it went up on the bench for a check against the manufacturer's specifications. The result was better than expected. Everything other than FM sensitivity was well within 10 percent of the specs. Sensitivity was farther off and a realignment of the "prealigned" i.f. strip was needed to get it back where it belonged.

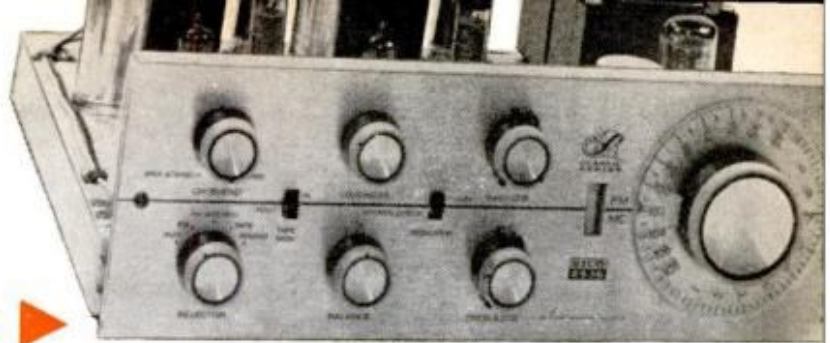
FM sensitivity can be boosted a microvolt or two by leaving off the chassis bottom cover plate. As long as the set is not going to be moved around very much there is no particular risk in doing this, and it does improve chassis ventilation. The increase in sensitivity obtained in this manner is enough to bring in those otherwise borderline "sometimes-they're-there and sometimes-they're-not" stations.

While you get good quality for your

INSTRUCTIONS and wiring diagrams are easy to follow. When wiring the front panel be extra careful. When the unit is complete, changes are hard to make as there just isn't enough free space to get in at panel-mounted components



Amplifier



dollars you also get some disadvantages. However, if you are interested in high-quality stereo sound at a reasonable price the Eico 2536 is hard to beat. The main inconvenience we found was the stereo indicator switch. After you've tuned in an FM station you must depress the switch; if the tuning eye closes, the broadcast is in stereo. If not, it's mono. The automatic indicator light used in most current FM stereo tuners is much more practical and requires no fussing with a switch.

Another missing feature is a front-panel jack for stereo headphones. But this you can add yourself without too much trouble. Also missing are rumble and scratch filters.

On the plus side, there are separate bass and treble controls, a feature we like. With separate controls, it's easy to compensate for minor variations in speakers and differences between the two amplified channels. There are inputs to the amplifier for magnetic phono cartridges, tape recorders, and high output sources such as a TV or AM tuner. Also there is an output for a tape

recorder for convenient recording of FM stereo programs. A tape monitor switch lets you listen in while recording.

The Eico 2536 measures 6 x 16 x 14 inches, weighs 25 pounds and in kit form costs \$154.95. Wired, the price goes up to \$209.95. The brushed aluminum front panel is beautiful in appearance. Cabinets are extra for both the kit and wired versions: \$7.50 in metal and \$19.95 in wood.

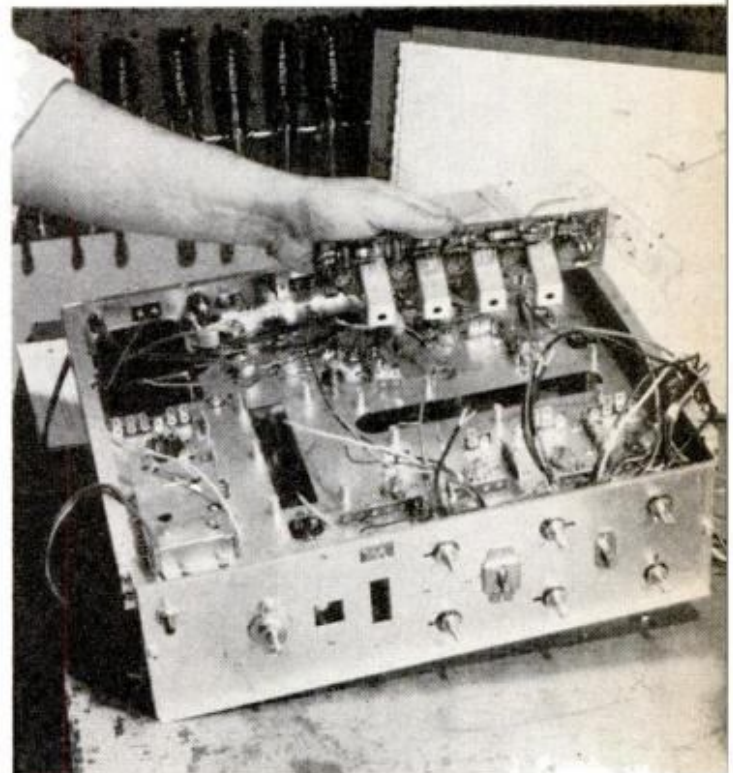
SPECIFICATIONS

Tuner: IHFM usable sensitivity: 3 μ v for 30 db quieting. I. F. bandwidth: 280 kc at 6 db points. Audio bandwidth at FM detector: Flat to 53 kc. IHFM signal to noise ratio: 55 db. Harmonic distortion: 0.6%. Stereo channel separation: 30 db.

Amplifier: Power output: 36 watts IHFM music. IM distortion: 2% at 14 watts. Harmonic distortion: 0.6% at 10 watts. Frequency response: ± 1 db from 15 cycles to 40,000 cycles. Speaker outputs: 8 and 16 ohms. Noise: 60 db down on phono; 80 db down on others.

PRINTED-CIRCUIT BOARDS speed construction and reduce wiring errors. After soldering parts into place, clip excess leads as close to the board as you can

AT THIS PREWIRED STAGE i.f. strip is being fitted into place. In this particular kit it had to be realigned later to deliver the specified sensitivity



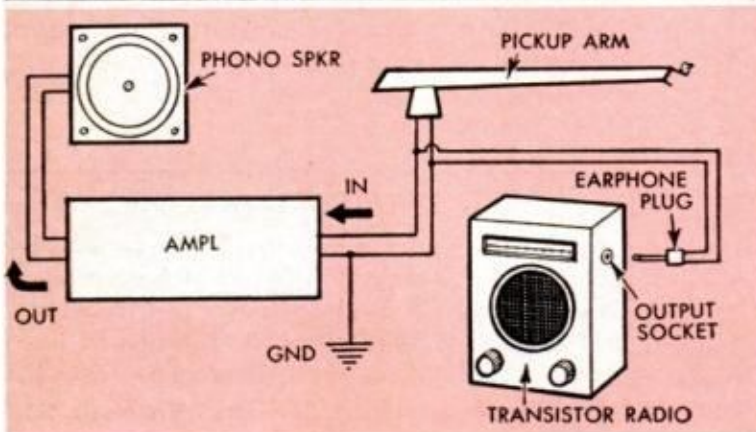


Add Radio to Phono

It takes only a few minutes to make that portable stereo record player do double duty as a powerful radio. For the necessary AM tuner you can use any transistor radio. Most of these sets have earphone jacks and this is your sound take-off point.

Connect a patch cord between the radio earphone jack and the input of one channel of the stereo phono amplifier. The patch cord should consist of a two-conductor cable terminated with a miniature phone plug at one end and a standard phonograph plug at the other end.

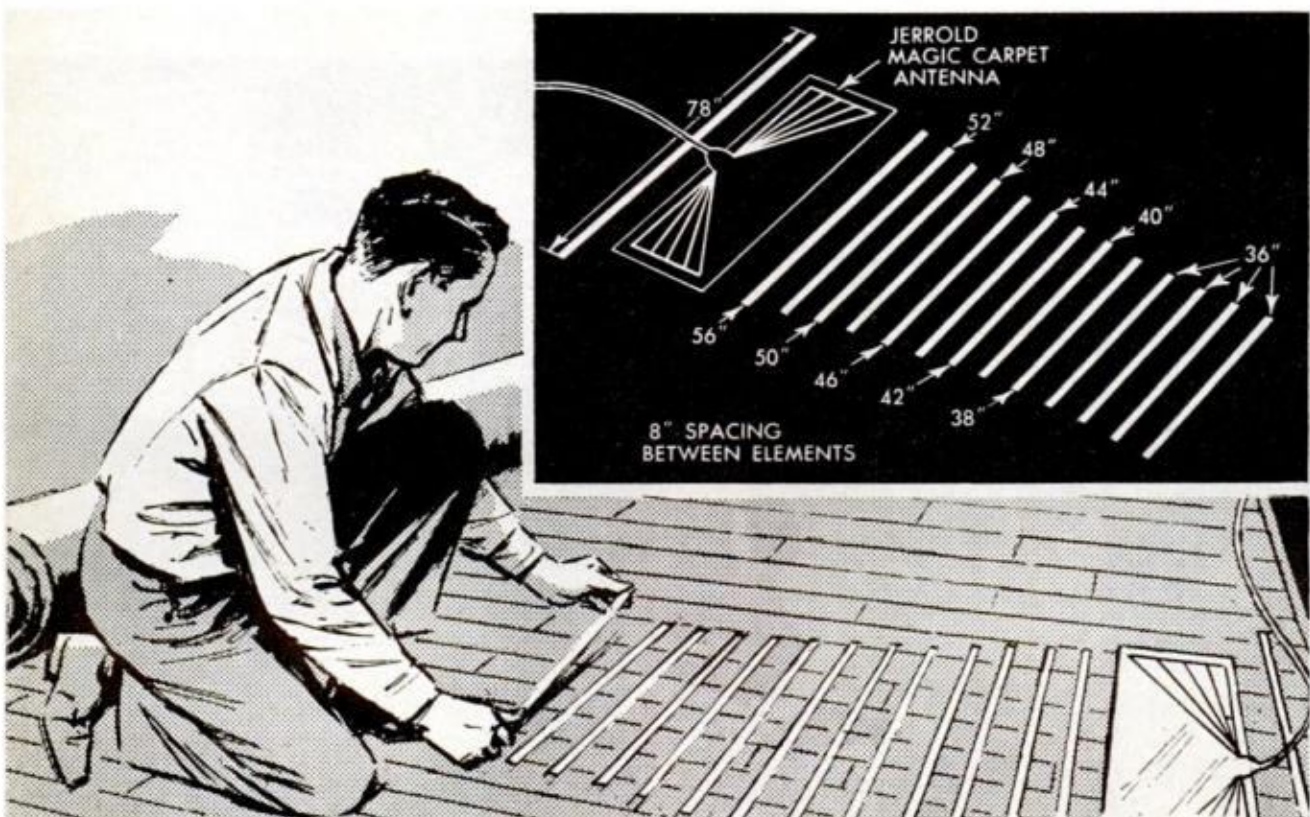
Once the hookup is complete, turn on the radio and the phono amplifier. Results will be quite pleasing as you'll be getting big sound from the phono amplifier that the radio alone could never produce. You also have the advantage of a remote speaker. As a final touch add a switch to turn off the turntable.—*Glen F. Stillwell*



Yagi TV Antenna Made of Foil to Go Under the Rug

In our location we cannot use an outdoor antenna for our TV. So we bought an under-the-rug antenna. It did a fair job, but there was a ghost problem. What was needed was a Yagi, but how?

I used aluminum foil and cut half-inch wide strips to act as reflector and directors for the ready-made antenna. The 16-element Yagi remarkably improved reception of the three local channels.—*Rae Hoopes*





We're sorry about what we did to your old motor.

Some things can age a motor fast. Like what's happening at Evinrude right now, for instance.

We're getting ready to take the wraps off a new compact "5" that's hardly bigger than a "3." Weighs less than a can of fuel. Makes existing "5's" look like vintage "10's." It has a companion deluxe "6."

And remember the "9½"? The only people who didn't like it in '64 were the ones who couldn't get it. We'll be building lots more of these sporty little shorties in '65.

The same thing is happening all along the line. A new "33." Improved 18's, 40's, 60's, 75's, 90's.

And that's only *half* the story.

This year we're adding more deluxe equipment to our SWEET-16 and SPORT-16 boats. And introducing a whole new series of Gull Wing 14-footers! We warn you now—a ride in one of these new Evinrude boats can spoil you.

We're sorry to have to make your old motor seem older. Or make your boat ride harder.

But look at the bright side! This could be a great time to make a deal. After 1965—what else could we possibly do in 1966?

Your Evinrude dealer will be showing the new boats and motors—just as soon as he can get them.

In the meantime—we'll trade you a dream book for a stamp.

Just tear out the coupon and we'll rush the new 1965 Evinrude boat and motor "dream books" by return mail—with our compliments.

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LOOK! TWO

for smoother ride, more



First independent front suspension with big-truck durability!

Ford's remarkable new Twin-I-Beam front-end gives you not one, but two front axles! Two rugged I-beam axles to stand up to the abuse of the roughest

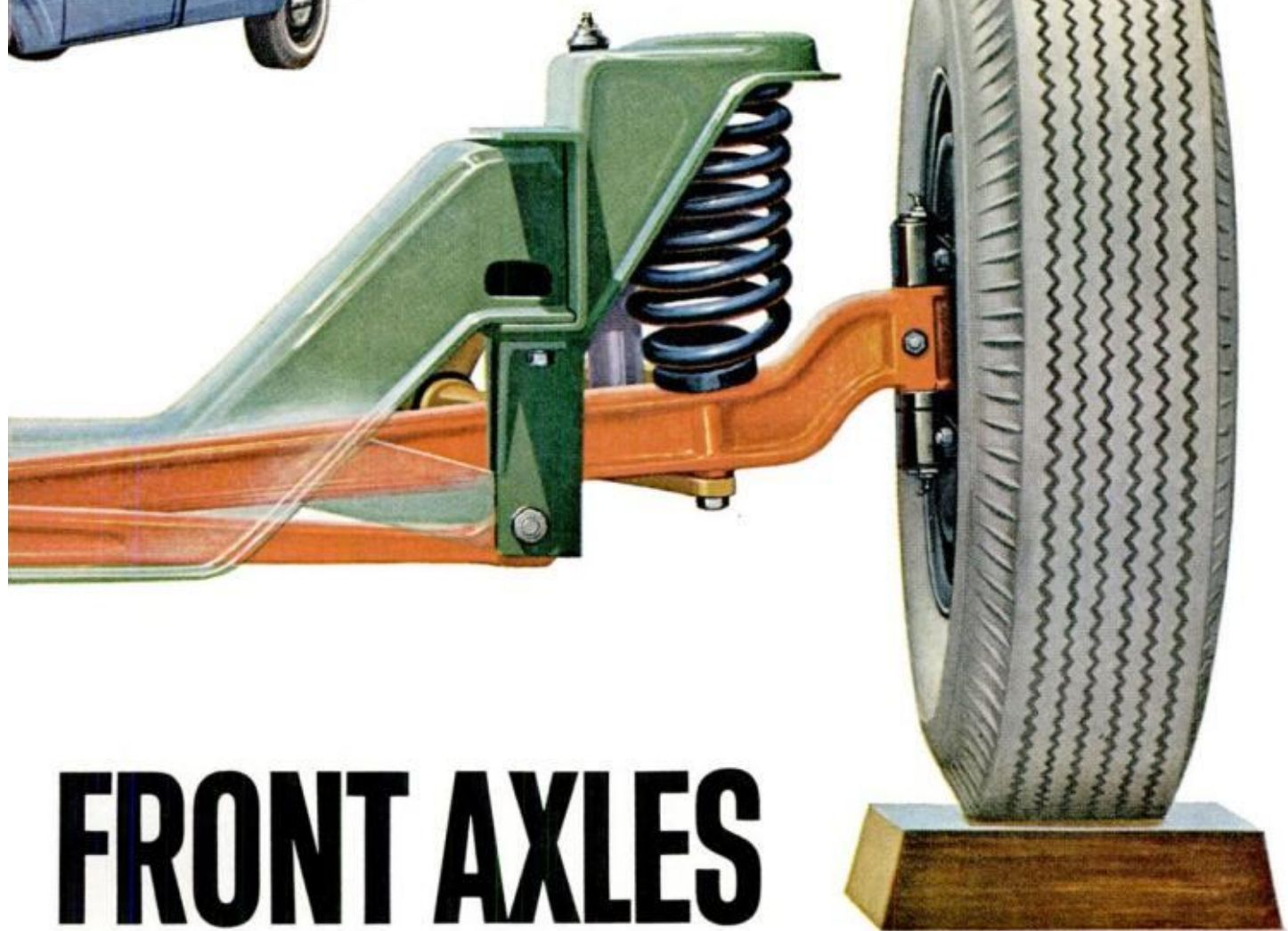
roads! Two axles in an entirely new kind of independent front suspension that results in a new kind of driving satisfaction!



Here's how it works: each front wheel is suspended independently, on its own axle—a forged steel I-beam axle of the type the big trucks use. Forged

radius rods—again, the same type that big trucks use—secure the axles to the frame. And husky, easy-acting coil springs cushion your ride.

It's easy to see how Ford's Twin-I-Beam suspension offers durability no car-type independent suspension can match. Ford's unique combination of I-beam radius rods and axles anchors wheel alignment, caster and camber so solidly that routine front-end maintenance



FRONT AXLES

durability in '65 Ford Pickups

costs and tire wear are substantially reduced.

Twin-I-Beam is, without question, the most rugged, most reliable suspension ever built under the front-end of any pickup.

And Twin-I-Beam makes a big difference in ride...it's better balanced with safer control. To detect any dip or dive when brakes are applied is virtually impossible. The front end doesn't "mush out" on curves. You don't lose steering control

when you need it most. Experience the wonderful difference in Twin-I-Beam ride at your Ford Dealer's soon!



**TWO NEW SIXES!
NEW V-8!
NEW FEATURES!**

Completely new engines for '65! Standard is new 240-cu. in. Economy Six; optional, new 300-cu. in. Big Six, powerful new 352-cu. in. V-8! Also new are longer wheelbases, bigger cab, alternators!

'65 FORD



PICKUPS

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 The best-performing shells I've ever used—at all ranges.



Allen W. Warren, Minneapolis, Minn.
 The most powerful game loads I've ever shot. And the waterproof body is a great bonus.



Don A. Dianda, Hillsborough, Calif.
 Plenty of power—excellent patterns. They're the only shells to use.



F. S. (Red) Hawkins, Dallas, Texas
 Remington shells have performed best—with cleaner hits and fewer cripples... more power.



J. H. Sargent, Jr., St. Louis Park, Minn.
 They give me the distance I need for those shots that are just barely within range.



Andrew Kleeber, Glenshaw, Pa.
 They're everything I want in a shell—more power and better patterns.



A. G. Schuehle, Roselle, Illinois
 Terrific range—the kind of patterns you can't miss with.



B. L. Williams, Shaker Heights, Ohio
 Their knockdown range is fantastic. I use 'em all the time.

You do!

The quotes above are typical of the enthusiastic comments we continually receive about Remington plastic shells. And frankly, we're not too surprised.

We've known about the performance advantages of Remington "Express" and "Shur-Shot" plastic shells ever since the beginning. How they seal powder gas so perfectly, give more power, better patterns. That they keep 100% of their factory-fresh power...

even from one season to the next. That they're waterproof and scuff-proof. Feed slick and smooth. Can't swell or split, regardless of hunting conditions. (You should see the pile of unsolicited comments we have about that!)

We first said it in 1960. Four years and hundreds of millions of plastic shells later, we still say it: Remington plastic shells are the most powerful

you can buy. Write for free Guns and Ammunition catalog to Dept. KH-10, Remington Arms Company, Inc.



Remington DU PONT

"Shur-Shot" is Reg. U.S. Pat. Off., "Express" is a trademark of Remington Arms Company, Inc., Bridgeport, Conn. 06602. In Canada: Remington Arms of Canada Limited, 36 Queen Elizabeth Blvd., Toronto, Ont.

What Won't Catch Bass

(Continued from page 140)

fishermen in that part of the country—notably Florida—have a way of doing it that would make that inveterate fly caster Izaak Walton either spin in his grave like a dervish or tremble the top soil with laughter. They simply tie two or three feet of line to the end of a stout cane pole, put on a good-sized hook with a piece of pork rind attached, then row around a lake furiously jiggling the hook and rind up and down along the edge of lily pads and other growth. This is called dibbling and it catches bass.

The "Doctor's Special" is a favorite with Art Smith, outdoors editor of the N.Y. *Herald Tribune*. He has caught bass with it all over the country and wouldn't think of going on a fishing trip without a half dozen on hand.

Angler's Medicine

This is an ordinary, large-size medicine capsule that is cast with a fly rod. It doesn't attract the big fish, but with a fly rod an angler will get all the action he can handle from the smaller ones.

Holes are punched in each end of the capsule, which is then strung on the shank of a hook. Glue is applied to the holes where the shank emerges. Thread is wound around the glued ends and is carried over the body of the capsule in two layers. Finally, clear finger nail lacquer is applied to make it an airtight and waterproof floating bug. The weight of the hook keeps it half-submerged on an angle, and a twitch of the rod tip gives it an action irresistible to a bass.

On a particularly frolicsome fishing trip I took a bass on a champagne cork, and another time did very well with an ordinary clothespin decorated with a few strands of colored yarn and the hook trailing in the rear.

The truth is, the bass is a voracious, arrogant fighter that fears nothing. A trout is shy and can be disturbed by a fine leader on the water or the unusual appearance of a lure. A bass, on the other hand, is attracted by the noise and vibration of a lure. I knew a fisherman who always carried along a battered old frying pan which he banged like fury against the sides of his aluminum skiff. He said it made the bass so mad they'd strike anything. I can't vouch for the scientific proof of this, but that fellow caught a lot of fish.

The average diet of a bass will include: dragonflies, butterflies, frogs, shrimp, mice, water snakes and—in the South—tender young cotton-mouth moccasins, smaller

(Please turn to page 202)



Ten sizes 6" to 60"

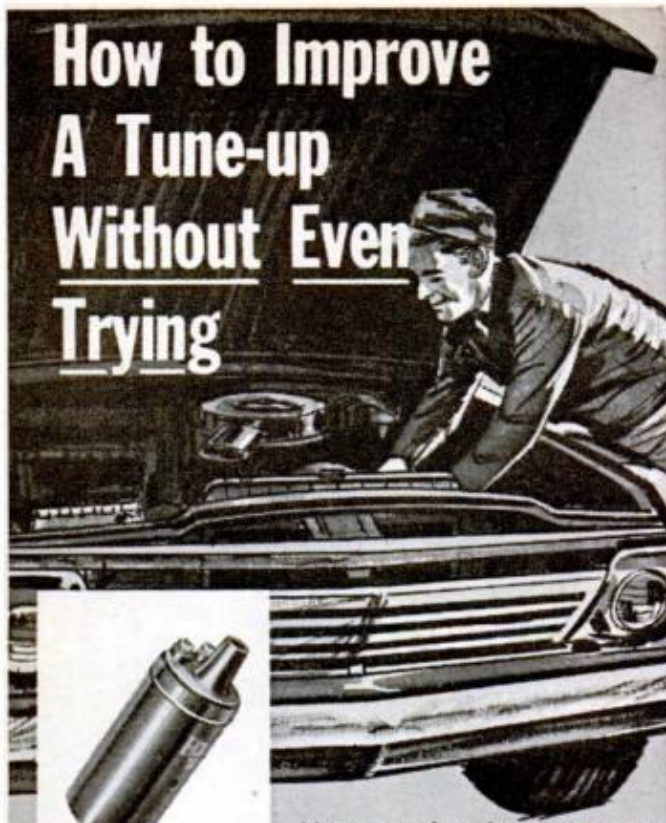
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What Won't Catch Bass

(Continued from page 201)

fish, worms and ducklings. He'll add to this bill of fare, any delicacies that appear à la carte and are of edible size. And almost every serious fisherman has seen a bass try to take a low-flying bird out of the air.

Game or Feud

A curious little drama takes place in the south between the chameleon and the bass that is either an age-old game or a feud. It is a common sight where the thick cypress roots arch down into the water to see a chameleon teasing a bass lying just below the water surface by running down the root dangerously close to the water, and then scurrying away when the bass leaps. It is the general consensus of opinion that in this sweepstakes the bass is way ahead.

Unpredictable Brawler

But just because he bites on almost anything when the mood hits him doesn't mean that the bass is easy to catch. A bass will strike a lure, taking it high into the air, and just shake it loose before he hits the water. A good-sized bass can straighten a hook so that it looks like a darning needle. And if he can't shake loose or break the line, it's just like him to dive to the bottom and wrap himself around a stump or submerged tree.

An underlying factor in bass fishing is that you will not necessarily catch fish by thinking like a fish, which is a highly regarded rule for fishing in general.

You can't think like a bass, because this fish doesn't seem to think at all most of the time, and when he does it is usually with the inconsistent perversity of a derby-hatted, cigar-smoking, loud-mouthed bar-room brawler who is unpredictable even to those who know him best. ★★★



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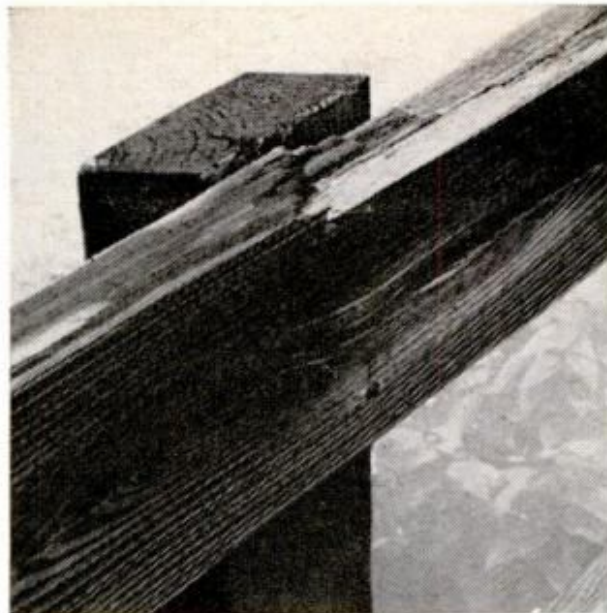


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Come see us at the New York World's Fair—Better Living Building.

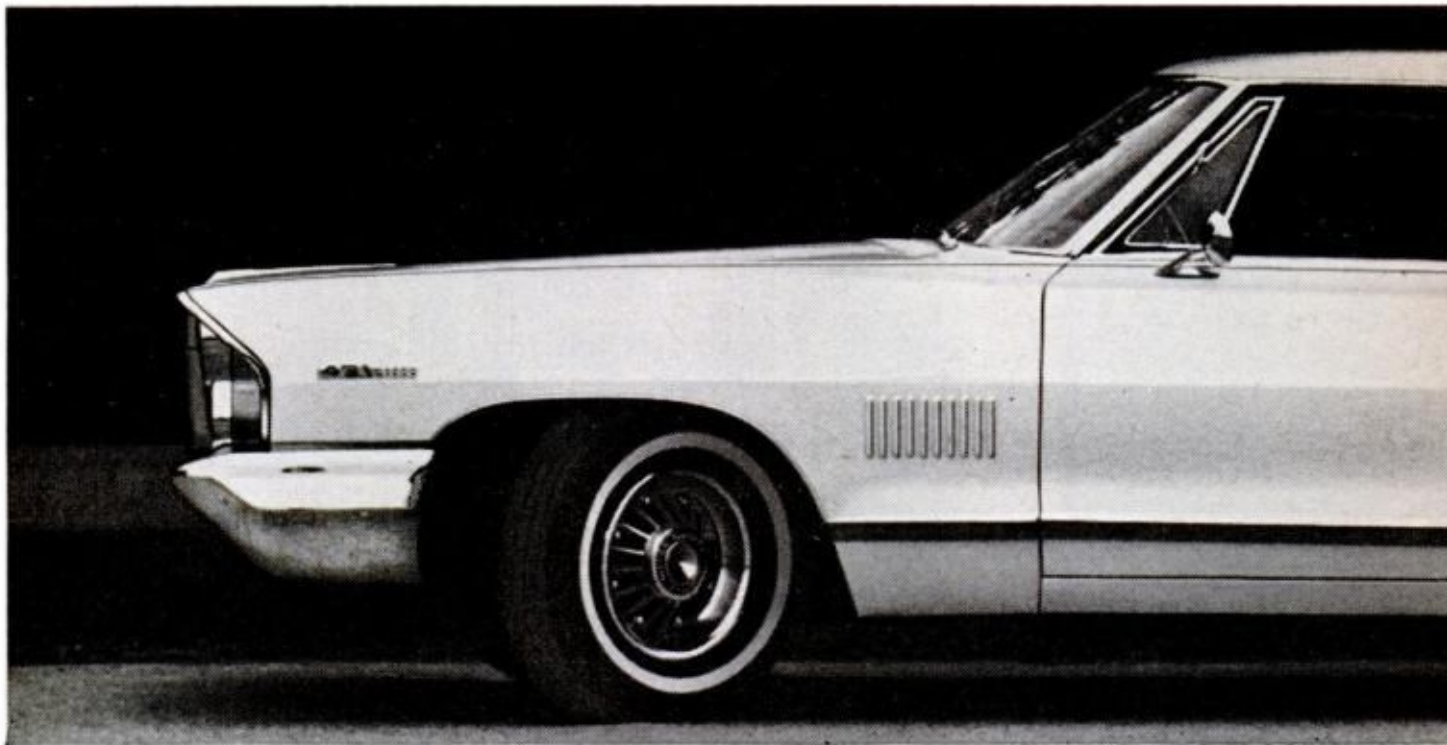
Other Weldwood wonder-workers for woodworkers:



Weldwood Deep Finish Firzite® gives beautiful hand-rubbed oil finish effects—without all the old-fashioned hand rubbing.



Weldwood Plastic Resin Glue for wood joints that are stronger than the wood itself. No more bond failures—glue it, forget it.



421 cubic inches standard equipment. Pontiac 2 + 2.

You read that right. Hulking under the 2 + 2's hood is our whacking great 4BBL 421. Horsepower—338.

Torque—459 lb-ft. Blam!

Other standard equipment:

new all-synchro manual 3-speed with Hurst floor shift

heavy-duty springs and shocks

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full carpeting

custom pinstriping and like that.

You're the 4-speed type? Order the all-synchro Muncie unit with a close-ratio gear set.

For stab-and-steer men there's a new 3-speed automatic you can lock in any gear. Turbo Hydra-Matic.

No lag, no lurching, no surprise shifts. Just straighten

right leg, wind tight, move lever. Repeat. Make small

noises in your throat. Attaboy, tiger!

There are two 2 + 2's—a hardtop and a convertible.

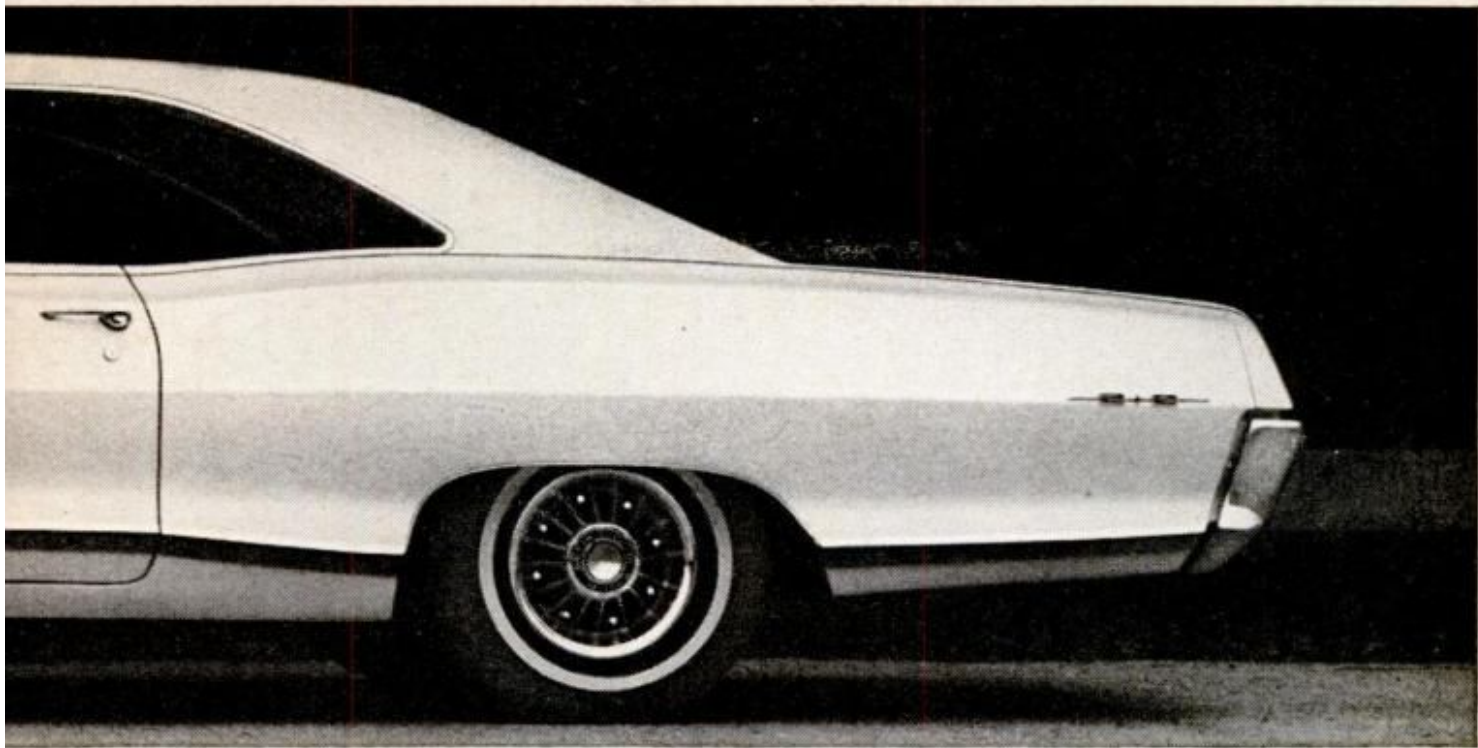
And two other engines to stuff in them—356 and 376

bhp, both breathing through 3-2BBL.

Decisions, decisions.

Have new tigers. Need tamer.





335 horsepower standard equipment. Pontiac GTO.

Just a friendly little 389-inch saber-toothed pussycat. Gas-works—one 4BBL. Torque—431 lb-ft. One of these at a fast idle sounds like feeding time at the zoo. Other standard equipment: manual 3-speed with Hurst floor shift heavy-duty springs, shocks, stabilizer bar dual exhausts chromed air cleaner, rocker covers, oil filler cap 7.75 x 14 red-circle nylon tires bucket seats custom pinstriping and like that.

There are three GTO's—a hardtop, a sports coupe, and a convertible.

Except for new looks, more power, and a few dozen other things you can have like an all-synchro 3-speed; new instrument package (oil pressure/water temp/ammeter, plus tach); and a 3-2BBL engine that churns out 360 bhp, with mechanical carb linkage installed at the factory on stick shift jobs, the GTO hasn't changed a bit from last year.

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Both Bonds do the same job of helping your country, too, by building the financial strength Uncle Sam needs to manage his affairs and safeguard our rights.

Whichever suits your needs—Series E or Series H—buy some Bonds soon. They're good for your future.

Help yourself as you help your country

BUY U.S. SAVINGS BONDS

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Hunting Pheasant without a Dog

(Continued from page 135)

around like a windmill if you're not ready for him.

An innovation by a couple of enterprising Nebraska hunters is the chicken wire barrier. They cut the mesh into two-foot-high strips. Hauling the fence afield in their car, they find a likely looking bird spot—usually a corn or milo field—and erect a low barrier at one end of the field. Then they circle the field to the opposite end and work their way towards the fence.

When the running pheasant hit this small barricade they either try to hide in some nearby cover or they take off over the barricade 'way out ahead. The hunters have a chance to show what they can do with really long shots.

Birds Get Rattled

Another hunting aid used in South Dakota is a simple noise maker. This works best with two hunters who want to work a freshly cut corn or milo field. The two men stretch out a cord, about 200 feet between them, tying one end to their belt loops, so hands will be free to handle the gun. They hang a few empty tin cans on a string to the rope, so they will rattle atop the milo or corn stalks, and then march down the field. As the cans dangle and bounce, the birds scamper out ahead and between the gunners until they run out of cover, where they will invariably take to the air and present some pretty challenging high speed targets.

Pheasants hate to move on mornings when heavy dew is on the ground. And during a light, drizzly rain, or after a light snowfall, you'll find they are less likely to run when danger approaches. Under these weather conditions, the birds generally hunker. Flushing them from their hiding spots is a simple matter.

One of the best methods is the old system of driving. This works best with a party of at least six hunters. In most states, regulations restrict the size of driving parties.

Cornfield drives are the most popular—and productive, particularly when the cornfield adjoins heavy cover or feeding stubble. Most of the hunters are assigned as "drivers." The rest are placed at the far end of the field to act as "blockers."

If the field is heavily weeded, the drivers should be spaced fairly close together to prevent the birds from doubling back. With the blockers at their stations, the drivers proceed toward them, weaving back and forth among the corn rows, with the outside or flanker men, about 50 yards

(Please turn to page 208)

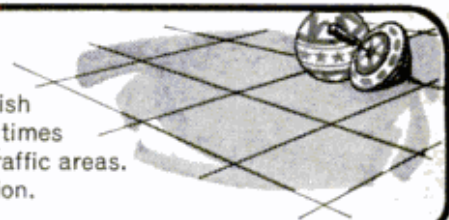
Don't paint it—

MIRA-PLATE IT!

O'Brien's miracle strength epoxy protects and beautifies longer and better than any paint!

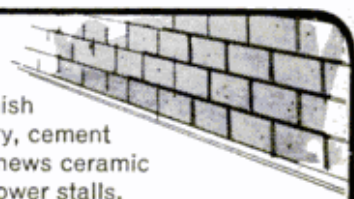
FLOORS

Tough, hard finish outlasts paint 5 times even in heavy traffic areas. Superior adhesion.



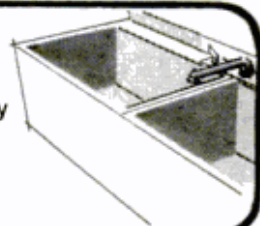
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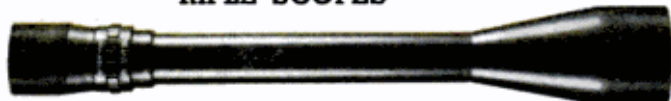
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BAUSCH & LOMB 
RIFLE SCOPES



Hunting Pheasant without a Dog

(Continued from page 207)

ahead of the drivers. This pattern forms a cup and prevents too many birds from escaping at the sides as drivers advance.

As the drive progresses, many of the birds are flushed, affording shots for the drivers. And as the drivers near the end of the cornfield, flushing birds provide additional shooting chances for the blockers. But make no mistake—it is no cut and dried, guaranteed bag.

Fancy Evasive Tactics

When the drive is into the wind, the cagey ringneck usually flushes into the wind, and then quite suddenly zooms downwind over the drivers in a fancy exhibition of evasive tactics. This maneuver makes him a difficult target, for he uses the tail wind to advantage, thundering up to high speed and altitude in a short space of time.

Downwind driving should be done in short drives, as the bird is fully aware of just where the driver is. Often, the pheasant will not take wing until after the gunner has walked past him. In downwind drives, space the drivers four to six corn rows apart. This gives the bird fewer escape avenues, but you'll still find yourself trying to shoot backward over your own head with some frequency.

In wheat country veteran hunters make their drives across wheat fields in zig-zag casts. This system covers the field pretty well, forcing the pheasant to stay ahead of advancing hunters. When the ringneck hits the end he has nowhere to go but up.

These methods will never replace the good field dog for total efficiency in flushing pheasant, but for something different in hunting, so you'll end the day with the satisfied feeling of having outwitted a wily competitor and really earned your limit of birds—leave the dog at home. ★★ ★

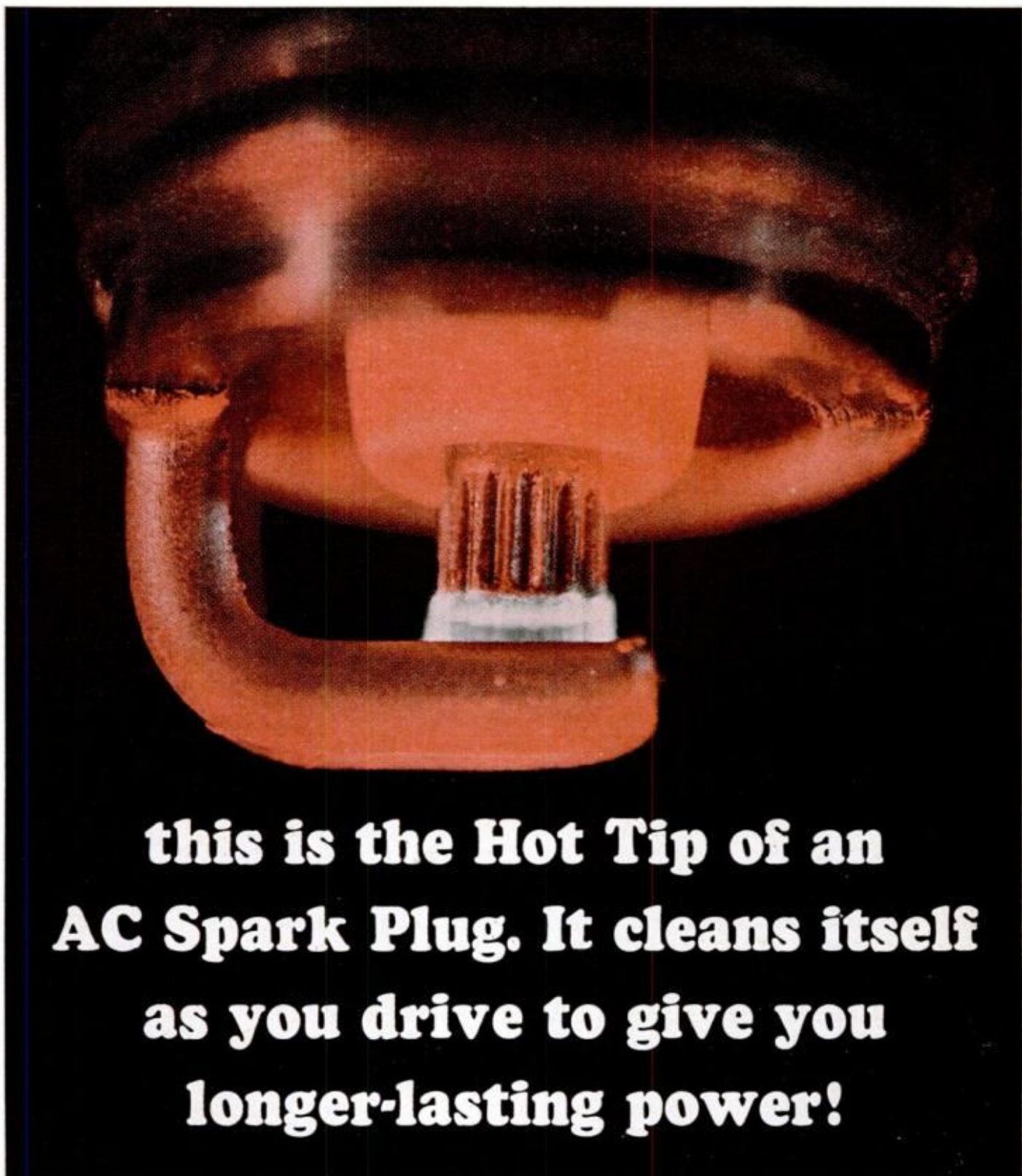
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AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

OCTOBER 1964

209

Emergency Hot Squad

(Continued from page 147)

Squad, driving a sewer cleaner's truck to be unobtrusive, raced to the scene.

They spent an entire day getting ready to enter the contaminated room. They built a wooden tunnel leading into the room, lined it with sheet plastic and fitted it with a plastic-coated air lock. (Plastic normally is resistant to contamination.) They set off several smoke bombs to check air currents and determine where airborne radioactivity might have spread. Then, using a modified exhaust system to create a negative pressure at the mouth of the tunnel, the crew made sure that no contaminated air flowed from the room into the rest of the plant. With all these precautions taken, the de-con squad donned their yellow anti-C clothing and moved into the "hot" region.

The men were prepared to face heavy radiation. They wore respirator masks with filters designed for chemical warfare, plastic hoods, plastic cover-alls, thick gloves covered with plastic and special rubber boots. Where separate pieces of clothing met, the gaps were sealed with plastic tape.

Inside the room, every move was carefully calculated. "In some situations," explains Gallagher, "a quick movement or passing of a tool can stir up settled dust and increase radiation hazards."

Using high-efficiency vacuum cleaners, three Squad members swept the room from ceiling to floor, including all machinery, to suck up loose radioactivity. Unlike ordinary vacuums, which allow fine, respirable particles to pass through, these 5-hp. units retain virtually every fleck they pick up and are usually able to remove most loose contamination.

Next, Gallagher and his men tackled the tricky job of "damp mopping." How this is handled often spells success or failure in a de-con operation. One Pittsburgh physician, for instance, recently tried to clean up a radium spill with water and ordinary soap flakes. He succeeded only in driving the contamination deep into the floor and spreading it to two other rooms.

The detergent Gallagher uses contains chelating agents, chemicals that combine with metals. They tend to keep heavy, radioactive material in suspension and prevent it from dissolving and seeping into porous surfaces. Special mops are also used; they both release the detergent and suck up the liquid residue.

Mopping took a whole day. The collected radioactive waste was passed through filtering devices and then into 55-gallon steel barrels, where it was mixed with

cement. The drums were then sealed.

With the "hot" vault free of industrial film and oil residue, the scrubbing operation started. This is mostly hand-and-sponge work, using another detergent with efficient wetting agents. The workers got an assist from an ultrasonic cleaning device that agitates a liquid with sound waves and helps break up radioactive dirt. The residue was pumped into steel drums.

Now the room was ready for the final procedure. Manning hoses, the Hot Squad sprayed live steam on the ceiling, walls and floor. Mixed with it was a detergent designed not to "crack" in steam.

Four days after the accident the de-con crew walked out of the vault and passed through the monitoring zones for the last time. Thirty-three steel drums had been filled with radioactive waste and were awaiting shipment to AEC disposal centers in Kentucky and New York, where they would be buried in deep trenches. The factory, threatened with a complete shutdown only days before, was amazingly clean. Geiger counters could pick up nothing more dangerous than normal background radiation. Gallagher's fee for the job was \$5000, a small sum compared to what the emergency could have cost had it been mishandled.

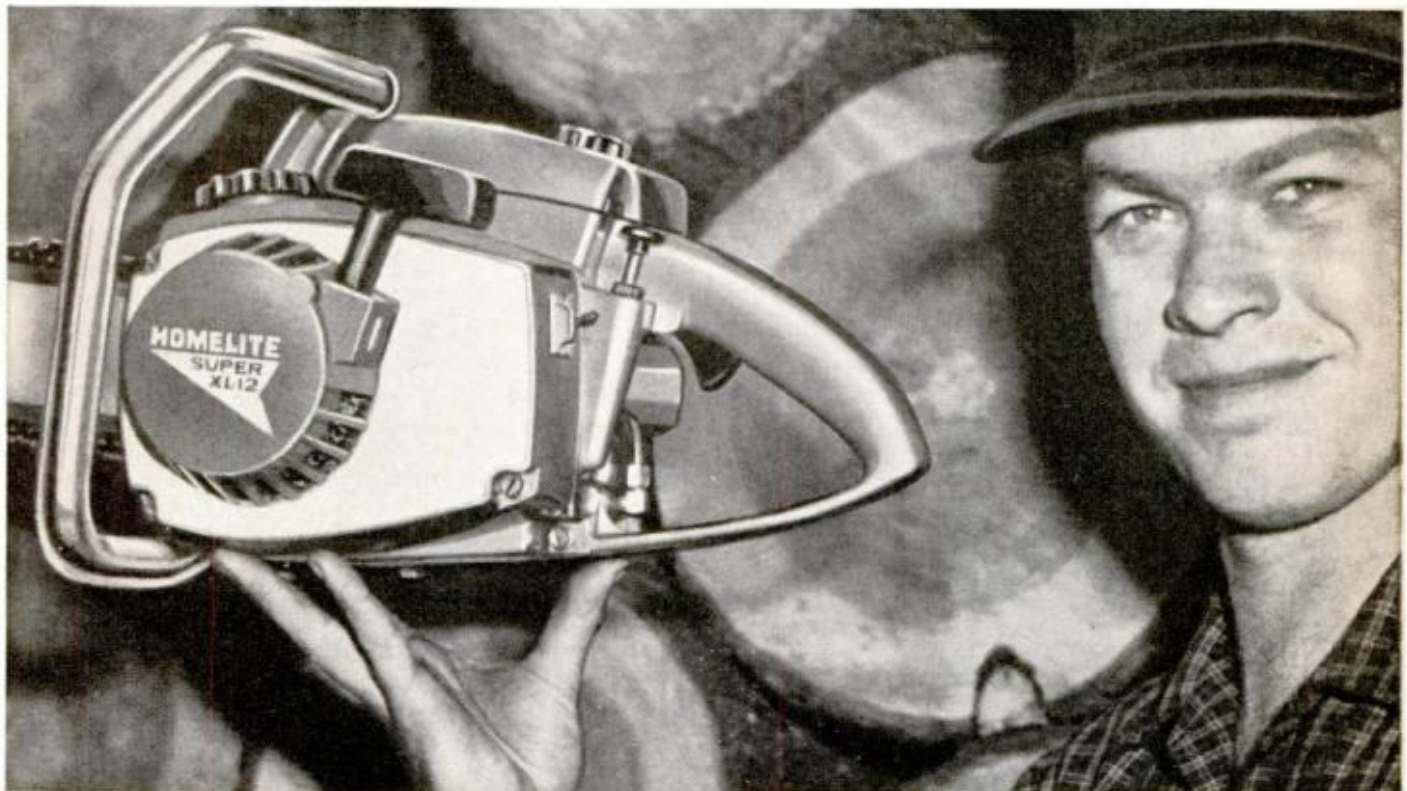
Mothballs for "Hot Stuff"

In some instances, if a single piece of industrial equipment is contaminated, either through accident or chronic exposure to radioactivity, Gallagher arranges to have it sprayed with cocoon material (like the Navy uses to mothball battleships) and expressed directly to his plant. There it is moved into a de-con cell for cleaning.

While the increase in radiation accidents seems inevitable as more ways are discovered to use radioactive materials, Gallagher maintains that the safety record of the atomic energy industry is better than that of industry as a whole. "Properly trained, employees can learn to handle hot stuff just as safely as they work with poisonous chemicals, high voltages and explosives," says the health physicist. "Most accidents need not happen. The most important service of our organization is to prevent them." ★★

A giant cosmic ray trap is being erected by Bolivian scientists atop a 17,500-foot mountain. The super neutron pile will be able to collar as many as 10 million cosmic ray particles an hour and give more reliable data over longer periods of time than can be obtained by space rockets.

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I Fly the Man Rockets

(Continued from page 123)

have had previous flight experience.

How difficult is it to learn to fly the man-rocket? For the neophyte with better than average reflexes, judgment and visual perception, the learning is not much harder than mastering two-wheel bike riding. Most of my teammates soloed after 10 minutes of tethered practice.

After a few rocketing minutes of free flight you're an "expert," veteran rocketeer. None of us, when you figure it, have had more than 80 minutes of flight time. I've been called the "World's No. 1 Rocket Man" simply because, having flown about 250 flights, I've logged more air time than anyone else on the team. Yet those flights, measured in seconds, add up to only about 1 hour and 20 minutes.

What makes the man-rockets easy to fly is their simplicity. They're strictly no frills—and all power.

Uses Chemical Reaction

What gives them their thrust is a chemical reaction so simple, yet so violent, it astounds even the experts. The violence occurs when 90 percent hydrogen peroxide (the same stuff your wife may use as a hair bleach in a much different formula) contacts a silver-mesh screen catalyst.

Forced under pressure across the catalyst (dubbed the "cat bed"), hydrogen peroxide (H_2O_2) breaks down into its two constituents, water and oxygen. The by-product of this violent (but flameless) reaction is a withering heat of about 1300 degrees F across the silver mesh "cat bed." The heat vaporizes the water, expanding it and turning it to steam. Result: A hurricane of super-heated air. The super hot jetstream escaping through twin stainless steel rocket nozzles, directed downward and outward from the rocketeer's shoulders, produces the 330 pounds of lift.

To put the jetstream to work, you merely control the direction and thrust.

How? Well, for a preview of your first man-rocket flight, strap on a rocket belt and work the controls yourself.

Two tubular metal armrests jut out in front of you. They have three functions:

- They support your arms in flight.
- They control the tilt of your nozzles permitting you, by raising or lowering the armrests, to fly forward or backward.
- They mount (at their tips and within easy hand reach) motorcycle-type twist-grips which vary and direct your thrust.

The twist-grip throttle on the right armrest controls the rocket's thrust. A twist to the right increases it; a left twist checks it.

The left armrest's grip operates the "jetavators"—little thrust-directing rings at the tips of the nozzles. The rings, with a twist to left or right, deflect the jetstream (and you) in that direction.

To take off, you merely throttle to full thrust. As the rocket's thrust exceeds the weight of you and your gear, you rise. To fly forward, you lean forward, pushing down on both armrests. This tilts both nozzles back, thrusting you ahead. Lifting the armrests directs the nozzles' thrust forward—and you jet backwards. To move left or right, twist the jetavator grip in the direction you want to fly. To land, you simply ease off the throttle, decrease thrust. As your weight overcomes the lift, you descend to a gentle landing.

The trick, aloft, is to coordinate what amounts to six-way thrust control (up-down, left-right, forward and backward) so you go where you want to go.

All Kinds of Maneuvers

Once you've got the knack, you can hover, spin around in midair, turn left or right—like a human helicopter. What you can't do—again like a 'copter—is loop-the-loop or fly upside down. You can't because you've got to keep your back-packed fuel tanks pressurized. That means keeping them approximately vertical (and right-side up). Lose your fuel pressure and you lose your thrust.

Assuring that you won't (so long as you keep your tanks vertical) is a "source" tank, or reservoir, of nitrogen gas under 2100 pound pressure. Through valves and regulators, it maintains about 500 pounds of pressure on each of your two hydrogen peroxide fuel tanks. The pressure forces the fuel into your rocket engine.

Though the thrust-stream is a torrid 900 degrees F, the nozzles are suspended behind you and well away from your body. And they are heavily insulated. So are you. "Upstairs" you fly cool and comfortable.

What about wind, rain and weather? I've rocketed aloft in 45 m.p.h. gusts, and hardly felt the wind. Rain is uncomfortable but nothing more.

The buzzer in our helmets, triggered by a timer built into the throttle control, warns when our flight time is nearly up. We set the timer to sound the buzzer after 10 seconds of flight and, during the last 5 seconds, to keep up a steady warning. By then, of course, we've eased off the throttle, reducing thrust, and are dropping down for a stand-up landing.

But louder in our ears is the roar of the thrust stream, as man-rockets and their rocketeers—perhaps one day you among them—fly with the birds. ★★★



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Waterproof Your Basement

(Continued from page 158)

at least 12 inches deep to insure good drainage, before you backfill the trench.

In the long run, you may have no alternative, but surely a simpler method can be tried before going through this expensive, exhausting job. One alternate is to create a waterproof liner on the inside of the basement with an application of waterproof mortar (photos page 158). We can't say that such a seal will work for you, but we know that it has worked in many instances. Surely it's worth a try, even though the application is a big job.

Prepare the cement mixture according to the instructions on the package of epoxy, emulsified latex, or Anti-Hydro—all of which are bonding agents you add to mortar to permit the mixture to adhere properly as well as to provide a waterproof coating. Smear the stuff over the walls, but to assure proper adhesion, make sure you keep those wall surfaces thoroughly wet as the material is applied.

There are also prepared brush-on epoxy sealants. For these, you want the walls as dry as you can get them. This liquid is expensive, and is chiefly used to seal the joint between wall and floor, although you *can* coat the wall with it, if plugging all cracks hasn't stopped your leaks.

Some may tell you that interior seal coats aren't worth the time or effort because they won't work. Such "experts" advocate digging down around the entire outside foundation to the footing and coating the foundation with a watertight membrane. This is the approach usually employed in new home construction, of course, where a coat of tar is brushed on, or a layer of asphalt paper is applied with a waterproof mastic. But with an existing house it's a lot easier to put a seal coat on the *inside* rather than the *outside*. Anyway, the material used for membraning the outside of a foundation—whether it's the tar, the asphalt paper, a polyethylene film, or a waterproofing mortar such as we described above for interior use—may break down after a few years' constant exposure to moist earth. Then what? Another excavation to re-coat?

Combatting Outside Pressures

The most serious of all wet-basement-producing conditions is *hydrostatic pressure*, which results from a high water table in the area that exerts pressure on the foundation, forcing water in through cracks and the porous foundation material. If you have a wet basement for only a few months of the year, while at other times it's dry, your problem's probably

hydrostatic, since the height of a water table and the pressure it exerts often vary with the seasons. The methods we spoke of thus far might keep water under hydrostatic pressure from entering a basement for all time. Then again the water table might exert so much pressure that it breaks through any watertight seal. Another danger of blocking out water is that it will then seek the line of least resistance which is beneath the home's footing and up against the floor.

If the water table exerts so much pressure it breaks through a waterproof seal, a more drastic method of stopping that water is called for. One professional drainage system, called the Vulclay process, alleviates wet basement problems that stem from hydrostatic pressure.

The process isn't cheap, running from \$200 to \$1000 or more, depending on the seriousness of the condition and the size of the area to be treated. It is guaranteed for 5 to 10 years, depending on the height and force of the water table in the particular area. However, no one in good conscience can guarantee a waterproofing job for a much longer time.

The process is applied to the outside of a foundation without having to excavate. Long tubes are inserted into the ground to relieve pockets of water pressure and a special material is pumped through high-pressure hoses into spuds placed about 3 feet apart along the foundation. The material fills cracks and pores in the basement wall. Its chemical makeup also enables it to absorb water like a sponge. Thus, a water-tight seal is formed around the foundation from the footing to above grade level.

If hydrostatic pressure begins to react against a basement *floor*, there is only one sure cure. A trench has to be made around the entire perimeter of the floor along the footing, which usually involves breaking up of the concrete with a jack hammer. Then, 3 to 4 inches of so called land or weeping tile are laid at the footing. This tile absorbs moisture and drains it off to a hole where there is a sump pump. The pump in turn is connected to a dry well away from the house into which the pumped water is diverted.

Condensation on the other hand, is an "inside job." It doesn't involve seepage of soil water. It can occur in a basement in both winter and summer. Two things are involved: cool surfaces and warm moist air. In summer, warm moist air inside the home can contact cool wall surfaces, causing the walls to sweat. In winter, the warm moist air can be provided by moisture-producing appliances in the home

(Please turn to page 216)

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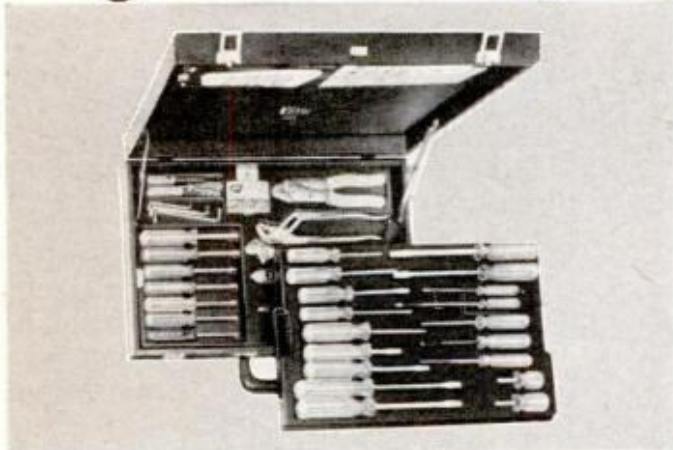
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How You'll Vote

(Continued from page 110)

you read out results or feed in new information, the arithmetic units stop working. This enforced idleness may last only seconds, but a computer can make hundreds of thousands of calculations in one second. Because of its design, as one unit in the Burroughs machine becomes idle it automatically becomes available for other work. Thus, on election night, when the machine is asked to read out its projection of the electoral vote, it will, at the same time, be updating its programs on state results, the make-up of the Senate and House, the popular vote and other programs that have been written into the mathematical model.

Those programs must calculate the effect of campaign issues, yet most issues do not develop until late in the summer. How do the programmers feed issues into the machine?

"To handle late-developing issues, we continually modify and update not only the program in the computer, but our list of bellwether precincts," says Dr. Moshman.

Occasionally an issue will develop that simply cannot be covered *early* on election night. For example, in the 1956 campaign Stevenson suddenly struck pay dirt in Western states when he hammered away at

(Please turn to page 222)

Waterproof Your Basement

(Continued from page 214)

and even by a humidified heating system.

The cure for condensation lies in finding the best way to dry out the air coming into the basement. It might be as simple as providing more ventilation by opening a window or inserting vent louvers into the wall to the outside. You can often eliminate the problem by studding out the wall and putting up new walls of panel or plasterboard. The dead space provided between the finish walls and the masonry foundation walls, between which some form of waterproof aluminum-backed paper should be placed, might be just enough to make a vapor barrier. If only exposed water pipes are sweating, wrap them with insulating tape.

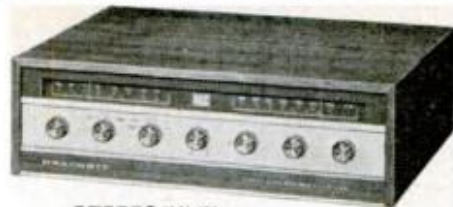
Severe condensation might call for more drastic measures, such as the installation of a dehumidifier to "dry out" basement air before it can condense. Many types, chemical and mechanical, are on the market. The effective ones can collect over a gallon of water a day from an average-size basement. ★ ★ ★



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Regatta in Salty Old Hulls

(Continued from page 130)

long, powered by a one-lung 9-hp. kicker that burns three quarts of gasoline per hour, they are slow, comfortable and fantastically seaworthy.

The lucky purchaser of a Monterey does one of two things: he preserves its traditional looks in all respects except for possibly enlarging the small wheelhouse into a comfortable cabin, or he may "modernize" the craft by installing a streamlined superstructure and flying bridge.

Up in Friendship, Maine, the Lash Brothers as well as other boat builders have been restoring some of the famed Friendship sloops that were built between 1870 and 1900. Open-hulled or decked over, according to their original use, these excellent sailers are from 27 to 47 feet long. The single mast is the same length as the hull and supports a jib and a gaff-headed main. A typical restoration job includes replacement of any weakened hull planking, re-calking, and installation of cabin accommodations.

Coral Head Bouncers

Down in the Bahamas, where boat builders are still using the same designs and construction techniques of a couple of centuries ago, the old-fashioned Bahama sloops simply won't die out. More of them are being built every year. The Bahama design is a rugged, broad, open hull of up to 30 feet length, with a short mast and a long boom that carries a triangular, loose-footed mainsail. Headsails include a handkerchief-sized spinnaker set high above the water.

Several years ago Dick Cooter and Paul Small of Redondo Beach, Calif., built themselves an 18-foot reconstruction of an early American pilot schooner, just for fun. The original vessel, 62 feet long, had been captured by the British in 1812 and sailed to London, where the hull lines were taken off. Cooter and Small couldn't find design data in this country, but finally they got the information they needed from the British Admiralty and from the French National Museum. Their miniature schooner proved so fast and able that other people wanted similar boats.

It wasn't long before the two young men formed Heritage Marine and went into business. Today they offer the 18-footer rigged as a schooner or a cutter, either open or with a small two-bunk cuddy with head and alcohol stove. A small one-lung inboard engine can be used in light airs. Depending on rig, the 18-footer carries as much as 300 square feet of sail, and sells for \$2700 to \$4500.

All Heritage Marine boats are authentically traditional in appearance, but are built with modern tools, methods, and materials. Thus, the little pilot boat has the bowsprit, raked masts, quarter deck and manila running rigging of her original, yet the standing rigging is of stainless steel. Clear polyurethane is used in place of paint and varnish because this plastic coating lasts for years instead of months. The boats carry enough foam flotation to remain afloat even if stove in.

The most recent Heritage Marine venture is a 31-foot cutter that has the hull lines of an old Baltimore clipper, slightly modified. The design was selected as a result of a market survey that the partners conducted, and the composite dream-boat specifications were pretty staggering. "About 30 feet long. Full headroom below. Lots of room on deck. Simple sail plan. Lots of stability. Must have good performance and be competitively priced."

Canoe Price, Liner Comfort

This is something like asking for a high-performance sports car with the simplicity of a VW, the ride and roominess of a Lincoln, and all for the price of a compact.

Heritage Marine found the basis for this paragon of sail in the Baltimore clippers that were popular in the early 1800. The originals were from 70 to 100 feet long. Their smaller version has a flush deck (providing lots of deck space) and six-foot-plus of headroom below. The original clipper was a two-masted topsail schooner, far too complicated a sail plan for week-end sailors, so a cutter rig was substituted. Working canvas adds up to 650 square feet, with a full suit of 1100 square feet. The main is gaff-headed, both to keep the sailplan low and thus reduce heeling, and to avoid the use of after backstays, which add handling complications.

Orders for six of the 31-foot cutters were signed before the first one was finished.

All Heritage hulls are of modern skin-stressed construction. They don't depend on the frames for strength. Narrow strip planking (1-inch wide, 3/4-inch thick for the pilot boat) is used for ease in bending, and each plank is edge-glued with epoxy, then edge-nailed with bronze nails.

Hull and deck planking are spiked to the frames with trunnels ("tree nails," or wooden dowels) because these traditional old fastenings are not only best but turn out to be the cheapest.

These days it's becoming harder and harder to find old hulls that are sound enough for restoration, and so the chances are that more and more "brand new" old-fashioned boats like those of Heritage Marine are going to be built! ★★

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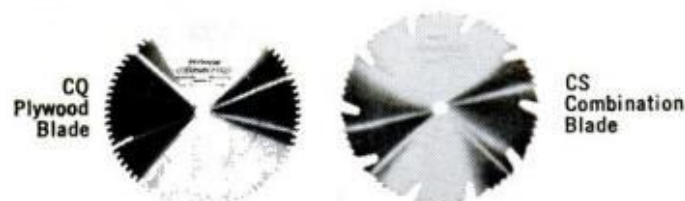
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How You'll Vote

(Continued from page 216)

conservation of natural resources. Political experts were certain that he was swinging some Western votes his way, yet no one knew how many. The effect of this issue couldn't be determined early on election night because it was of little interest in the early-reporting Eastern precincts.

"Occasionally as the returns roll in," says Dr. Moshman, "two or three states will seem to be going haywire. Apparently a particular campaign issue has strongly affected the vote. We then ask the computer to run through the mass of data we previously stored in its memory, and the machine gives us an evaluation of the factor that most likely is producing the erratic behavior. We need such information so we can project the effect of this same issue in late-reporting states."

Next month, shortly before the vote counting begins, a "base line projection" will be fed into the computer. This will be an arbitrary, but quite accurate projection of how the election seems to be going. It will be determined through analysis of many national and local polls, the informed comment of the national press and ABC-News, and the opinion of Oliver Quayle, ABC's political analyst. The base line speeds computations on election night, for the computer can compare real figures to this base line instead of making computations from scratch.

Dry Runs

In addition to the last minute poll-taking, several rehearsals will be held this month. During some of these dry runs, actual votes of the key precincts from past elections will be fed into the computer, and the results checked. Network reporters will even rehearse how to place their phone calls to election headquarters. Everyone concerned will know what to expect—including the unexpected.

Inevitably something happens that isn't anticipated; results from key precincts are delayed for mysterious reasons, or unidentified issues seem to be gremlins in the circuitry. Then human computers take over judgment from the machine.

"I personally will be watching the computer crank out its results at a rate of 800 printed lines per minute," says Dr. Moshman. "At some point early in the evening we in the 'Brain Trust' monitoring the computer output must flash a signal of confidence in the computer's accuracy. A network official then will have to decide when to put the projection on the air. These are hairy decisions, because we

(Please turn to page 224)

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How You'll Vote

(Continued from page 222)

climb out on a very long limb in front of millions of people.

"That limb seemed mighty weak on election night in 1960. Prior to that election we had carefully selected several key precincts in Louisville. We expected them to report about 6:10, before anyone else. Seven o'clock came and went with no reports. At 7:15 we began getting results from key precincts in Ohio, but still none from Louisville. By 7:30, primarily on the basis of Ohio, the computer had convinced us that it was a Kennedy night, even though Ohio went for Nixon. Our confidence was based on the computer's precise read-out that Ohio was slightly less Republican than it had been in past elections.

"By 7:30 the other networks had already gone on the air with early projections for Nixon. The pressure to forget our results and join the Nixon bandwagon was terrific. But on the basis of key precincts in only one state, we were almost certain that Kennedy would win.

"By 7:45 we were getting results from other Northern states, and at 8:00 we signaled we definitely were ready to project Kennedy as the winner. It took the network 20 minutes to put us on the air, and we were the only computer group that didn't have to switch early in the evening from Nixon to Kennedy."

On the Sunday before that election, Dr. Moshman took the results of all available pre-election polls and informed political comment and fed them into the computer. The big machine digested the poll votes and forecast Kennedy as the winner with 50.4 percent of the popular vote, a remarkably accurate prediction *before even one person had voted.*

This is getting very close to electronic brainwatching indeed, and suggests that the use of election computers has serious social implications. Eric Sevareid has repeatedly pointed out that if a computer can proclaim the next President of the United States hours before millions of persons have voted, then the computer can persuade those voters it is useless to cast a ballot because their man already is the winner or loser. The computer thus no longer *mirrors* the social forces of the nation, *but is an active social force itself.*

"We used to do it with a pad and six pencils," remarked David Brinkley nostalgically during an election-night telecast. The pencils couldn't possibly affect an election. The computer probably can.

Perhaps someone should put a computer to work on the problem of pinning down the effects of computers on elections. ★ ★ ★



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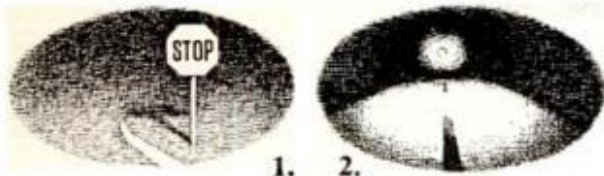
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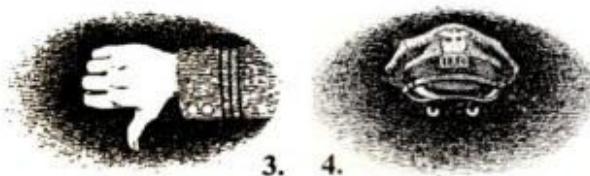
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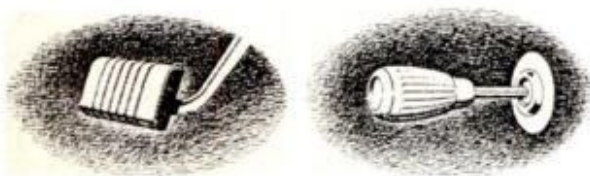
2. SAVES DECISIONS. One-eyed cars call for one-man decisions. Quickly now: Which light is out? Or is it a motorcycle? Can you get by? Time's up! Now you know how the other guy feels when the one-eyed car is yours.



3. SAVES TRIPS. Burned-out lamps cause 60% of all rejects at vehicle safety checks. Take 30 seconds to check your lights or have 'em checked *before* inspection. Why make two trips to earn your safety sticker?

4. SAVES MONEY. A burned-out tail light, headlamp or turn indicator can signal a cruiser. When you break the law you invite a warning or even a ticket—to make it an expensive trip.

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Sonic Boom

(Continued from page 116)

overpressures. The reflectivity of ground over which the cone falls affects the boom, because congested areas with large buildings can "echo" the boom annoyingly. Flat, open areas can absorb it more easily.

Whatever the final configuration of the supersonic transport, the FAA has laid down some stringent specifications about what it can do when it finally gets off the ground, based, in part, on the above findings. The SST must not create overpressures of more than 2 p.s.f. while accelerating through the sound barrier, and no more than 1.5 p.s.f. while cruising. Also, the SST probably will be required—on all supersonic flights—to climb to 40,000 feet or more before breaking the barrier.

As indicated, most Oklahomans had become used to the booms when I visited them, but that may be meaningless. It's like moving next to a factory or a railroad track. You may adjust to the noise, but it doesn't necessarily mean you appreciate it.

While their emotional damage to humans is questionable, the booms can definitely cause physical damage to homes unless overpressures are held to less than 2-p.s.f. Even the controls aren't certain because, the FAA has admitted, some atmospheric conditions such as air, clouds and wind patterns may *magnify* presumably safe booms into booms above the safe overpressures, and by as much as 50 percent.

This was one of the surprising discoveries of the Oklahoma City tests.

As the tests were set up, supersonic F-101s or F-104s from nearby Tinker Air Force Base would make eight regular, announced runs at about Mach 1.5.

Little Bit of Everything

The flight path, which ran northeast, was chosen because it had a little bit of everything below it—farmland and city, rural low-cost housing and urban high-cost homes and high-rise apartments, a shopping center and an amusement park, a children's home and a hospital, and even a zoo and a lake. It also had four homes rigged with recording instruments by the FAA, one right under the flight track and the others up to eight miles to the sides. Also, three instrumented mobile units were deployed daily to various locations up to 20 miles from the track.

The home under the track, chosen as a typical \$15,000 home, also had a little bit of everything in it, pictures on the wall, china in the cupboard, bric-a-brac on the shelves, and television in the living room, as well as \$100,000 worth of recording instruments. Strain gauges measured the

amount of stress, accelerometers measured the length of time of stress, microphones picked up the noise level and seismic apparatus recorded the vibrations outside.

Sonic Bed Ride

One hairline crack was discovered in the plaster of one of the FAA homes about midway during the tests. Other residents claimed more extensive damage, however. Ten to 20 percent of citizens interviewed, after the last of 1253 booms reverberated through the city, objected to the tests. Some four percent made formal complaints. Some said their entire ceilings collapsed. One lady complained that the 7 a.m. boom moved her castered bed across the room while she and her husband were still in it, each morning. In rebuttal, the FAA points out that more than 80 percent of the claims, after investigation, were rejected. Of those approved, mostly for windows and plaster, they averaged out to about \$50 per claim. And, unofficially, FAA spokesmen suspect that in most cases, incipient damage already existed.

Some of the rejected claims make the most interesting reading, however.

Fishermen claimed the booms were scaring the fish away.

Farmers claimed their cows stopped giving milk and chickens quit laying eggs.

One woman said her furniture was shrinking and another claimed her electric clock started running backward.

Dogs climbed fences and were naughty indoors when the booms boomed.

One matron claimed a boom broke her bra strap.

Some of the calls came from crackpots. One man said that if the FAA kept booming him he was going to bomb them.

However, there were some silver linings. One man claimed the booms straightened out his back and he no longer needed a chiropractor.

Many called to say they appreciated the early morning boom. It was better than an alarm clock.

There were other sidelights. An enterprising businessman set up a roadside stand and sold Sonicburgers.

The calls were all taken by an answering service hired by the FAA. From a peak of 552 calls in one eight-hour day early in the tests, they dwindled off to an average of about 70 a day.

The chief significance, however, is that most of the calls came in the first two weeks when the booms were new, then fell off drastically. They peaked slightly twice thereafter, once when the newspapers publicized the small plaster crack in the FAA home and again when a lawyer got an injunction suspending the booms

(it was later rescinded). In other words, the Oklahomans learned to live with the boom until they were reminded of it.

However, this is too pat a conclusion, and the FAA knows it. No one can really draw any firm results from tests lasting only six months.

One man has drawn up some guidelines for the average home owner to think about, however. He is Jack Huntress, an FAA engineer for structures.

"Plate glass and wet plaster are most vulnerable," he said, "so I would go to smaller window panes, and sheet rock or plaster board for the inside walls and ceilings. Modern shells, especially thin shells, and dome-shaped roofs and cantilever designs are highly susceptible.

"If I were building a home, I would put more money into the foundation, go a few feet deeper to prevent moisture from getting under the house, especially in areas subject to alternate dry-wet spells and great temperature changes. If water gets under the foundation, then dries up, it sets up a rocking stress that can strain joints and even crack them. Then the home is vulnerable to the boom. Joining dissimilar materials is also bad.

"In frame homes, I would use extra stiffening members, such as collar beams

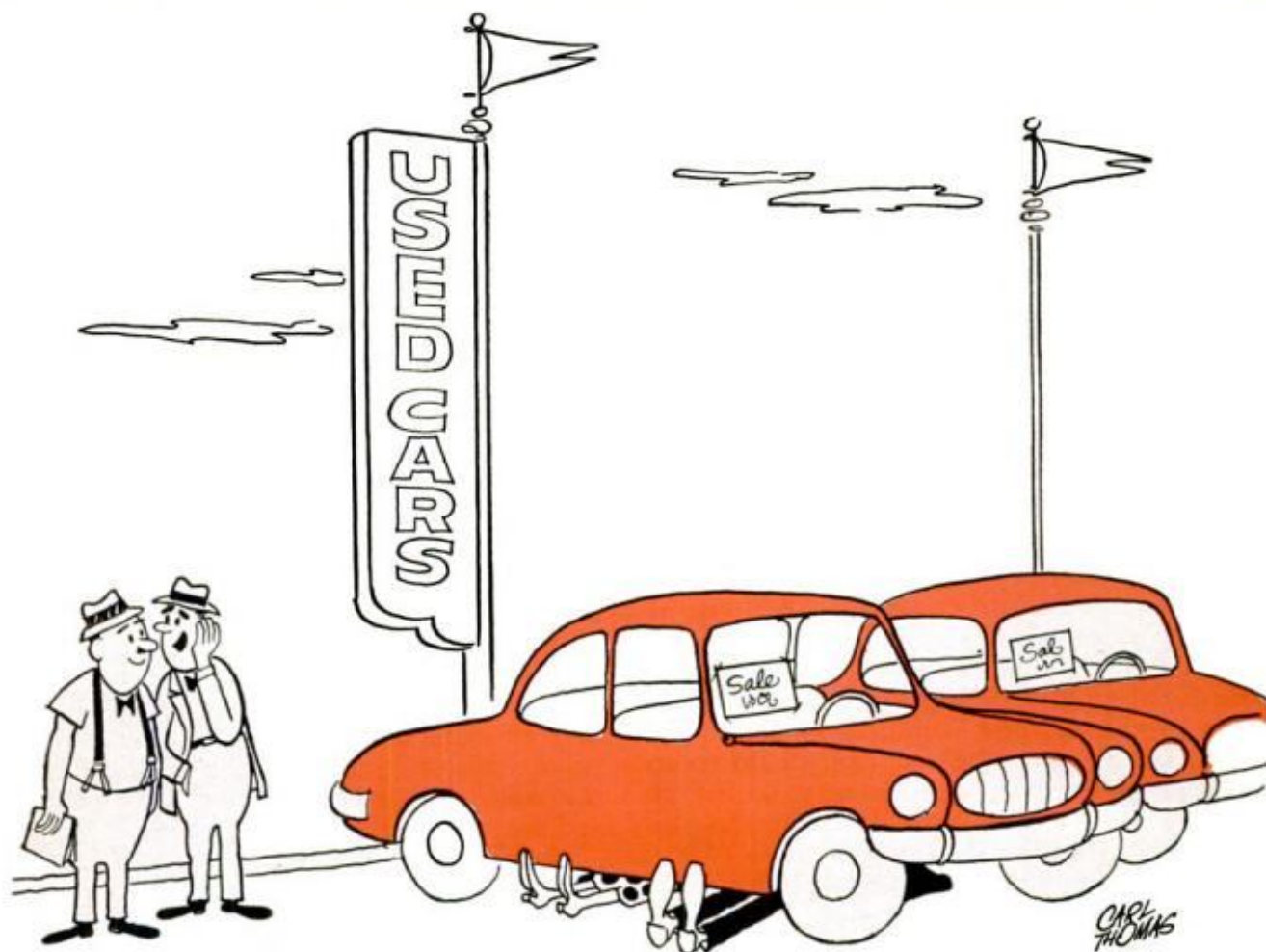
in the rafters and a stiff back over the ceiling joists. In most cases, I would recommend using an electric drill and screws instead of nails that come loose with moisture changes.

"In general, though, I have never found any trouble in a well-kept building. Any man who takes pride in his home and keeps it in good repair has nothing to fear. It's the poorly built or neglected home that's most vulnerable."

Each generation, because of progress, has something new to adjust to, starting with the steam locomotive, then the horseless carriage, then the airplane, and now the boom. It took some time, and a lot of research, to minimize the noisy features of the first three, and it will take just as much for the boom. Meanwhile, we can build the SST as sleek as possible, fly it intelligently and learn to adjust to weather and its effect on the sonic wave.

Or we can forget about the SST altogether. Because, if we build it, the boom is here to stay.

When I was leaving Oklahoma City, I reviewed my notes on the eight booms that went off the day before, but found I had notes on only seven. Somewhere, I had missed hearing one. Who knows? Maybe we'll learn to ignore it after all! ★ ★ ★



"They seem interested."

The '65 Cars

(Continued from page 104)

less precise than the 1964's.

Big Chevys have also acquired a "wide stance" for '65, with front and rear treads more than two inches wider. Chevy engineers say this increases the car's resistance to cornering roll or heel-over. On the '65 Chevy, for example, it takes 432 lbs. of force to generate one degree of roll in front; in 1964, the rate was 393 lbs.

Chevy's rear suspension is similar to Ford's except that Chevy, for its bigger, optional V8, adds a second upper arm.

Dimensional and engine changes are slight. But the more curvaceous lines are new. So is the tempered glass rear window for the big convertibles.

FORD's styling is about as sharp a departure from earlier models as you'll find in Detroit. It's clean and crisp with light creases along the side. Only the Custom 500 uses trim on one of these creases—and then only part way back on the door.

Ford's test course showed us that their new breed corners better. With the new perimeter frame, Ford has finally switched from leaf- to coil-spring rear suspension. This gives more trunk room and reduces lean.

After all that jibing at Pontiac's "wide track," Ford has widened its tread an inch in front and two in the rear. Upper suspension arms have been tipped back three degrees to resist brake dive. Improvement of 50 to 60 percent is claimed.

Four-door hardtops in both lines exhaust inside air under the rear window through a pair of vacuum controlled louver grilles controlled by the driver.

Doglegging the right side of the dash forward about five inches makes the front compartment feel spacious, though legroom actually is down a hair. The glove box should have shrunk, but it's actually 60 cu. in. bigger.

There's a tight-weave new upholstery fabric with a silky feel available for both big Fords and Mercurys. Among themselves, engineers call it "panty cloth."

Ford's 240-cu.-in., 150-hp. Six is a totally new thin-wall engine. It replaces the 223-incher of last year as the basic big Ford engine. It has seven main bearings, wedge-shaped combustion chambers and a single-barrel carb. There's no room to enlarge the bore significantly, so future displacement growth will have to be through stroking. The over-square (4.00x3.18) block could reach about 300 cu. in.

PLYMOUTH'S. The four-door Belvedere II we drove had the 318-cu.-in. V8. A difference of only ¼ to ½ inch in accelerator and power-brake pedal heights will be a

big help in stop-and-creep traffic. Without revving our prototype's engine, we made one 0-60 in 13 seconds, another in 12.7. This with an automatic and 2.93 axle.

You needn't accept a 318 V8 for your Plymouth, though. The 273 offered in mid-'64 for Valiant is available. Fury, once just another trim level among Plymouths, now has its own bigger wheelbase, greater over-all length and four trim levels: Fury I, II, III and Sport Fury. The old 116-inch wheelbase carries the basic Plymouths under Belvedere's name. The Satellite (two-door hardtop V8) is added and Savoy dropped.

DODGE's Monaco, a new two-door hardtop, is basically a '64 Custom 880 with an inch shorter (121-inch) wheelbase and 212.3-inch over-all length. The Monaco is slightly roomier inside but makes no pretense of carrying more than four except for "very short trips." Wicker-like panels on doors and front seat backs won't appeal to everybody, but they do add a flavor of fine old coachwork.

The Monaco starts out as a performance vehicle, with the 383-cu.-in., 315-hp. V8 as its basic engine. Options go as high as a 10.3:1-compression, 426-inch tiger rated at 365 hp.

We tried the Monaco's standard engine in a Custom 880 four-door and did an easy 0-60 in 10.4 seconds. The 880, by the way, has perhaps the most precisely readable speedometer available. It's graduated every mile per hour.

Power steered Dodges—as well as their brothers from Chrysler-Plymouth—take 3½ turns lock-to-lock, fastest in any U.S. car except Corvette. And this year there may be a new valve in Chrysler's power steering pump that will increase available fluid flow when you're driving slowly. It will enable you to spin the wheel fast when backing into a tight parking slot.

RAMBLER'S AMBASSADOR—10 inches longer but still a compact, according to American Motors—remains a comfortable family car rather than dragster's dream, even with the top-option 327-inch V8. Wheelbase is four inches longer. The prototypes we ran moved majestically; they're solid and comfortable.

The popular reclining seats have seven positions this year instead of five. The first two are driving positions, so you can relax your sacroiliac during a long day on the road. A power-operated top is standard for Ambassador convertible.

Redesigned seat backs add an important inch and a half to rear legroom. But most of the added car length is in the extra 1½ cubic feet of trunk volume. Trunk opening is down at the bumper line

(Please turn to page 230)

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The '65 Cars

(Continued from page 228)

for easier loading.

American Motors' disks, from Bendix, are available on the Ambassador for around \$65 or \$70—including power assist. The big, 10-inch drums that were on all V8s for '64 will also go on the rear of any Sixes ordered with disks.

Valves on the 232-inch Torque Command Six have grown for '65; they're interchangeable with the valves from American's big V8.

BUICK used to be a banker's car. It still isn't hard riding, but it corners better. That showed up when we compared '64 and '65 Wildcats on the handling road at GM's proving ground.

The first turn is a hard right with decreasing radius; the new Wildcat took it tautly.

Maybe bankers are getting younger.

The 'cat shares Electra's 126-inch wheelbase and front end sheet metal. The rest is essentially LeSabre.

Rear doors from the big Electra 225 are used also on the Wildcat and LeSabre, adding three inches to entry room.

LeSabres and Wildcats are wider inside. LeSabres gained almost four inches of shoulder room in front and 3½ inches in back on four-door models. They also got an inch and a half more legroom in front, although a fraction was cut off in back.

The big Buick transmission now has a variable stator in the torque converter and an L-1 position on the shift quadrant. With two stator positions available, you get engine braking, by putting the planetary gears in Low. If you try it at over 40 m.p.h., they'll downshift only to Second as though you had moved the lever from Drive to L-2.

The big Buick's variable-stator Super Turbine 400 transmission is similar to the Super Turbine 300 introduced last year for the Special series. Either size is available on the LeSabre.

Big Buicks have new perimeter framing with slightly swept-in hips in place of the right-angle torque boxes Ford uses.

OLDSMOBILE has about the finest blend of curve and clean side styling in the GM stable. Its perimeter frame uses torque boxes to do some flexing, but they're angled toward the ends of the car instead of being parallel to the cross members—a design that's slightly more rigid than Ford's.

Olds' "new" 425-cu.-in. "Super Rocket" engine is a reworking of the 330-incher introduced last year. (The 330 is still standard only in the Jetstar 88.) Although bore spacing remains the same, an alumi-

num flywheel cover lightens the block.

While displacement is up nearly eight percent, the new 425 engine is actually 50 pounds lighter than its '64 counterpart. Pistons, starter housing, distributor body, even the camshaft gear, are aluminum. (But the gear has nylon-covered teeth.)

Different compression ratios (9:1, 10.25:1 and 10.5:1) come from different circular depressions in the piston crown. Sounds easier to change than the cylinder head.

General Motors' variable-stator torque converter transmission is now Oldsmobile's Turbo Hydra-Matic. It's smooth with no sensation that the engine is winding higher and higher while you wait for the box to take hold.

Carrying nearly 800 pounds of passengers and without a high-revving start, a Starfire prototype took us from 0-60 in 10.5 seconds. We had the 370-hp. Super Rocket under the hood, too, and made it from 40-60 in 5.6 seconds.

PONTIAC attacked the problem of braking irregularities from another angle—the king pin angle. They increased it by pushing the lower ball joint out a little, giving the car better directional stability to help resist any hot lining grabbiness.

Shaving weight off the front suspension system also let Pontiac engineers increase brake width without increasing unsprung weight. Front-brake swept area is increased by about 10 percent.

Even the least expensive wheel covers from Pontiac have real cooling vents, instead of simulated openings of black paint which some still use.

The ultimate is Pontiac's integral-hub option, in which the finned aluminum drum-hub combination pokes its way through a large wheel opening. The whole drum runs in a wash of cooling air, since no wheel covers are used. And the wheels themselves have a 10-inch bolt circle; they're attached at the edge of the drum. Pontiac has no disks, and the company says: "We haven't found any that'll match our drums."

The roll stiffness, especially on the Catalina, is increased although wheel rates are softer. The improvement in front was accomplished by a thicker antiroll bar.

As *PM* predicted in July, the three-speed manual gear box Pontiac uses this year is one bought from Ford.

A new model at Pontiac is the "2+2," essentially a Catalina with room claimed for two passengers fore and two aft. There is actually room for another adult in back.

But the hottest Catalina options come in a package with the 2+2. They include Pontiac's 421-inch engine (rated at 338 hp.), a four-barrel carburetor, 10.5:1 com-

(Please turn to page 232)

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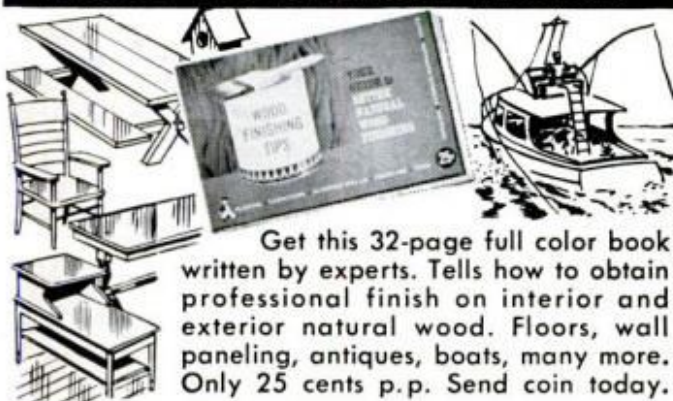
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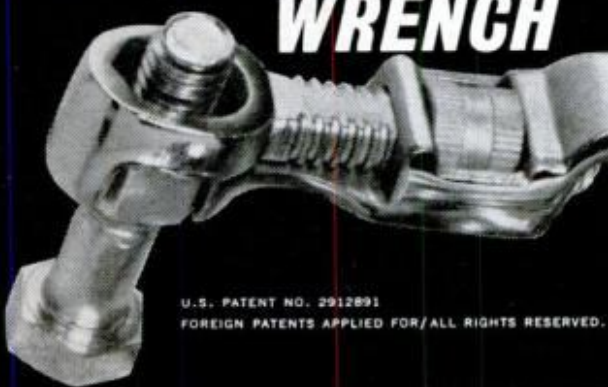
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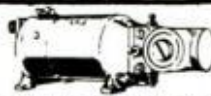
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The '65 Cars

(Continued from page 230)

pression ratio, oversize radiator, heavy duty springs and shocks, a three-speed floor-controlled box (without console) and dual exhausts. The odds are strong that you'll be able to pick up these options individually with an ordinary Catalina if you like. But you won't get the 2+2 trim, of course.

MERCURY shares with Ford this year's frame and body changes. Its new perimeter frame has only four body mounting points on each side—one on each torque box and one beyond each of the wheel arches. This lets the frame flex without passing as much twist into the body.

Wagons in both lines have been upgraded with some appealing new features. On wagons, you can choose a pair of smaller seats, one at each side of the cargo area, instead of the optional third, rear-facing seat. Each of those smaller seats could take two small youngsters.

The spare is behind the right rear wheel housing and the gas tank is behind the left one, providing a large foot well or storage for the folded extra seat. In basic wagons this space (optionally lockable) provides nearly 12 cu. ft. of storage.

The distance between the wheelhouses is up from 44.0 inches to 48.6 so you can now lay that 4x8 sheet of plywood flat. But the floor is 3 inches shy of eight feet, so the tailgate must stay open.

The gas tank has been moved in the standard Mercury to the front of the trunk, where it stands on edge, for more luggage room.

Mercury wheelbase is up from 120 inches to 123. Over-all length is up correspondingly and the car runs on 15-inch wheels this year. They let more cooling air flow around the drum brakes.

Wiper blades are an inch longer. And, if you choose, you can make your wipers park anywhere from one to 12 seconds after each cycle during a light rain. Sharp acceleration overrides the interrupter delay and blade action is fast.

The passenger side of the dash in the wagon is doglegged forward like Ford's. There are no idiot lights—Merc has gauges all the way. Back-seat legroom is good.

CHRYSLER. Stretching out wheelbase a couple of inches (and over-all length three inches) has boosted inside dimensions slightly.

There's a New Yorker sedan with two extra windows in the rear quarter. They give the car's "greenhouse" a real greenhouse look.

The standard Newport engine is now the 383-cu.-in. 8 that was the 300 model's

standard in '64. But it has 270 hp. and a 9.2:1 compression ratio instead of the 10:1 ratio retained on the 300. Last year's Newport basic engine, the 265-hp. 361-incher, is gone.

CADILLAC was supposed to abolish fins this year, yet something vestigial still sits atop the rear fenders, sloping downward toward the rear.

Although Cadillac joined the perimeter-frame parade, only the Fleetwood Sixty Special changed wheelbase. It's now 133 inches long, with 3½ inches added to rear passenger length. Tread is an inch and a half wider front and rear.

With the engine six inches farther forward, there's more foot room.

A variable-stator transmission, new to Cadillac, is virtually identical to the big Buick's.

The familiar Sixty-Two series is renamed Calais. Like most other Cadillacs, its major dimensions are changed little.

Standard on the Eldorado convertible (and optional in other Cads) is a compressor-operated load leveler that adjusts rear shocks to load.

The cross-flow radiator in Cadillac is common also to Buick, Olds and Pontiac. It lets the cores extend the full height of the radiator so the fan sweeps all of them.

LINCOLN. Disk brakes are standard on 1965 Continentals, and they're coupled with a dual-diaphragm master cylinder that helps to maintain a 60-40 power assist, front to rear, needed for heavier brake loads on a car's front end.

A spring-loaded diaphragm in the automatic transmission tailors the shift points so variations in atmospheric pressure—such as you encounter on a mountain trip—don't spoil the box's behavior.

Transistorized ignition is optional.

IMPERIAL designers had a kind thought for rear seat passengers when they added a release lever to the reclining seat option. Now passengers can exit easily even if the front seat is tilted back—a foot release swings it up out of the way.

Locking one front door of the Imperial from outside automatically locks all four. Panes of tempered glass are added in front of Imperial headlights.

A new camshaft in the Imperial's 413-cu.-in. engine should bring peak output to 350 or 360 hp.

THUNDERBIRD changes for '65 are mostly limited to thoughtful pleasantries. Even the convertible, for example, has a dome light. It's attached to the rear roof bow over the back window. Sequential turn signals (p. 89) make your intentions unmistakable.

For the first time, a limited-slip differential is optional on the 'Bird. ★ ★ ★

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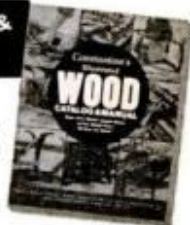
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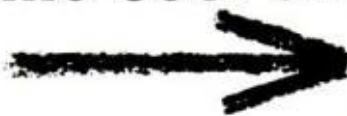
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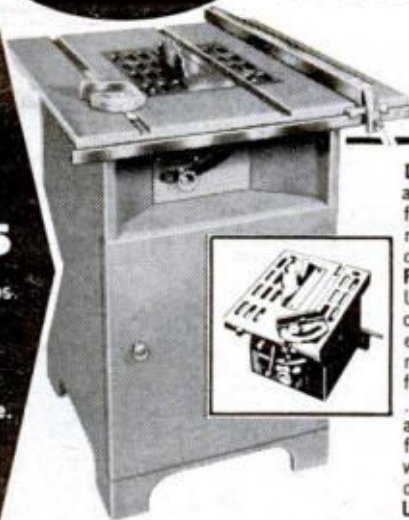
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What an opportunity to be a hero! To be your family's runaway choice for "man of the year"! How? By wrapping five of the women in your life—your wife, your mother, your sisters or daughters, even your mother-in-law—in super-luxurious mink coats! Plus a whopping \$10,000 cash bonus for you!

Or you can take the whole prize in cold cash—\$25,000—if you can convince the gals that mink doesn't buy happiness.

It's easy to enter. You don't have to buy anything, guess anything or write any jingles in the big "Zerex" Anti-freeze Mink Giveaway.

All you have to do is pick up a free entry blank wherever "Zerex" is sold... fill

in your name and address...and sit back to see if you are a winner. Don't worry if you are single. You'll still make out great. You win five mink coats, too. (Who you give them to is your problem.) Plus the \$10,000 cash.

There are over a thousand other big mink prizes from "Zerex" Anti-freeze. Fifty beautiful mink stoles and a thousand mink collars.

So visit your nearest "Zerex" dealer today and enter the "Zerex" Anti-freeze Mink Giveaway. And while you're at it, get your supply of "Zerex". No other anti-freeze known, no other anti-freeze made protects your car better than "Zerex".



Better Things for Better Living...through Chemistry

(the best anti-freeze since mink)

Any licensed driver (man or woman) is eligible to enter. Void where prohibited by law. (Special contest for residents of these areas. See your "Zerex" dealer for details.) Mink Giveaway closes December 1, 1964.

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Chesterfield People:

They like a mild smoke, but just don't like filters. (How about you?)



M. Fillmore Harty, Jr., industrial designer, Michigan



J. W. Richards, automobile dealer, Louisiana



Randall A. Osmon, paint tester, Florida



If you like a mild smoke, but don't like filters, try today's Chesterfield King—mildest-tasting Chesterfield in 52 years. Vintage tobaccos—grown mild, aged mild, blended mild. Made to taste even milder through longer length. They satisfy!

CHESTERFIELD KING tastes great...yet it smokes so mild!