

POPULAR MECHANICS

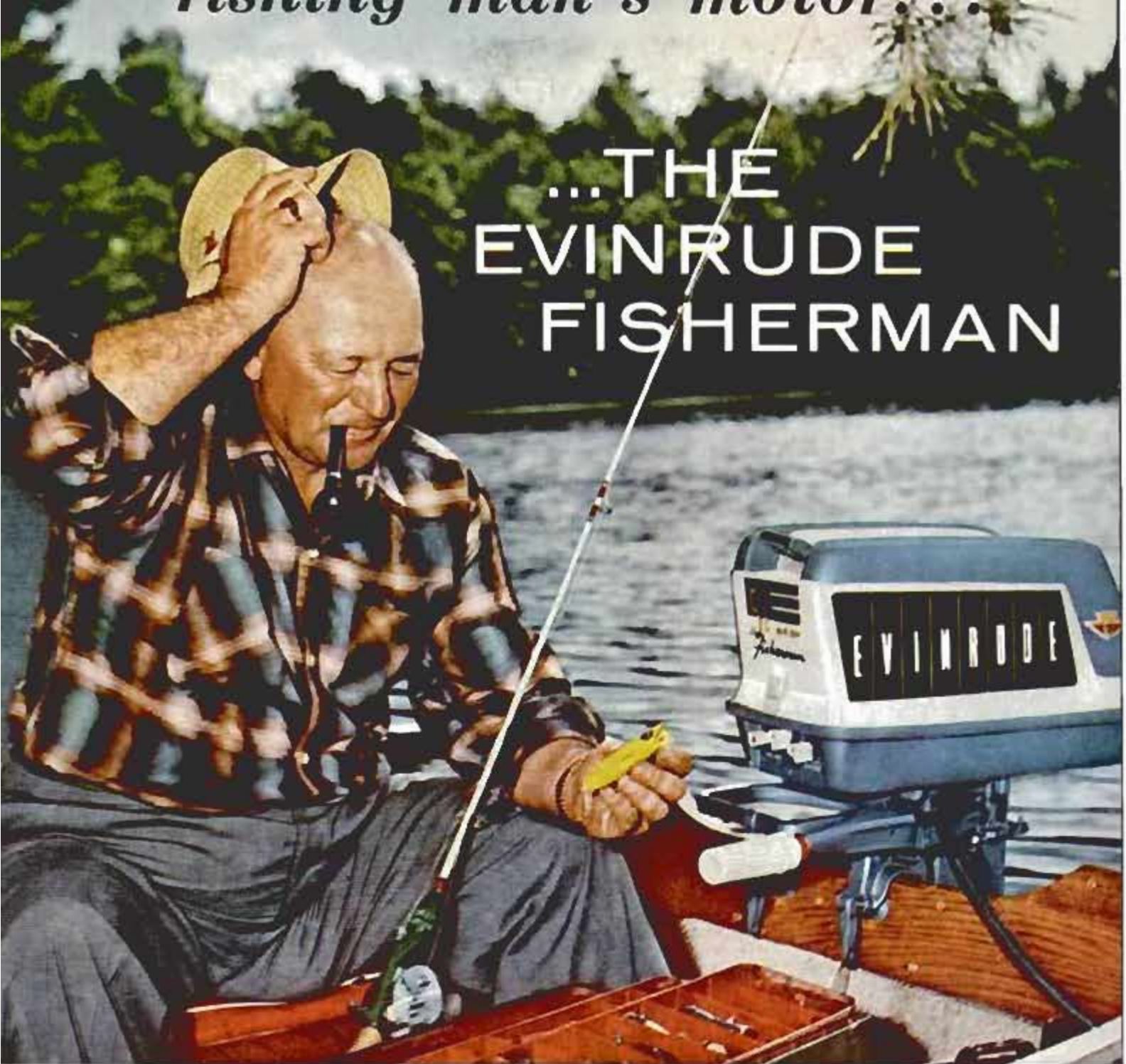
WRITTEN SO YOU CAN UNDERSTAND IT



WE BUILT THIS HOUSEBOAT TO SHOW YOU HOW—
Start Building It Now From Plans in This Issue

Fishing man's motor...

...THE EVINRUDE FISHERMAN



THIS IS THE ONE...preferred by serious anglers above all others.

5½ horsepower . . . power enough to hustle a good boat to good fishing ahead of the crowd. Small enough to use on rental skiffs. Light enough to be truly portable, without compromising an ounce of ruggedness or strength. *Smooth and quiet* beyond compare from slow troll to full throttle. Powerhead floats on live-rubber mounts. Fiberglass hood seals in sound. *Gearshift?* You bet! No one who has known its convenience would settle for less. *Easy starting* . . . next to effortless!

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As a Christmas gift . . . you couldn't do better than to give yourself a Fisherman . . . or a new Evinrude in any power range. See the new 1960 models now at your Evinrude dealer. *Colorful 1960 Catalog Free.* Write: EVINRUDE MOTORS, 4250 N. 27th St., Milwaukee 16, Wisconsin.

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EVINRUDE

FIRST
IN

OLD LOW BEAM

25 feet beyond those approaching headlamps there's a barrel in the road. It's not yet within the range of the low beam of any previous 2-headlamp cars.



**You'll see better
in spite of the
other car's lights!**

NEW G-E LOW BEAM

There's the barrel—225 feet away! This is how the low beam of G-E SUBURBAN Headlamps (made only for 2-headlamp cars) helps you see in spite of oncoming lights.



*Three-fourths of all night driving
is now done with the low beam!*

**New G-E SUBURBAN
Headlamps
have a "spotlight" effect
...in the low beam!**

Since nighttime traffic has increased tremendously, motorists find they must use the low beam more and more. So, General Electric now puts the *low beam* filament on focus to give maximum beam control where it's needed most—to provide a "spotlight" effect which directs more light down the right side of the road. That's why the low beam of new General Electric SUBURBAN Headlamps lets you see past the oncoming car when you're 75 to 200 feet apart.

Only General Electric SUBURBAN Headlamps have this feature for 2-headlamp cars. General Electric Co., Miniature Lamp Dept. M-913, Nela Park, Cleveland 12, Ohio.



**ATTENTION ALL OWNERS
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For approximately the same results as the four-headlamp systems in brand new cars (whose low beam filaments are also on focus) . . . have a pair of new G-E SUBURBAN Headlamps installed and aimed today. Tonight you'll see better in spite of other cars' lights.

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This One



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Next Month...

THE FAMOUS Auto Issue of Popular Mechanics is on its way. The 50-page section in January includes a six-page pictorial history of the auto industry in color; pictures and specifications of all the 1960 cars including many foreign models; road tests of the new American small cars, with an engineering analysis of their engines; a report on the world's largest auto show. . . . Plus regular features, including an account of an exciting "5000-Mile Game of Catch" and the spectacular story of "Masters of Explosives"

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Note: There's more big Plymouth engine news at the other end of the scale for '60—the 30-D Economy Six, first American production car with engine slanted at a 30-degree angle. Aluminum intake manifold, many other advances. Slanting of engine lowers center of gravity, makes car easier to handle, simplifies servicing and many adjustments. An economy engine which still gives brisk performance.

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SOLID PLYMOUTH 1960

383 cu. in. **SonoRamic Commando V-8:** HP., 330 at 4800 RPM. Torque, 460 lbs.-ft. at 2800 RPM. Comp. ratio, 10:1. Dual 4 bbl. carbs. Or choose the 361 cu. in. **SonoRamic V-8:** HP., 310 at 4800 RPM. Torque, 460 lbs.-ft. at 2800 RPM. Comp. ratio, 10:1. Dual 4 bbl. carbs.



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DECEMBER 1959

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Over the Editor's Desk



Attention, Space Candidates

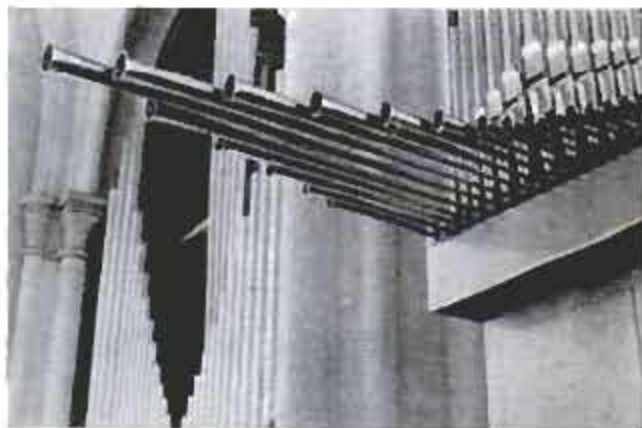
Apparently one prerequisite for piloting a space capsule is reading *Popular Mechanics*! The editorial team that lived with the Astronauts (page 74) discovered that all seven of the men, without exception, have been enthusiastic readers of *PM* for years —and still read it whenever they can find time in their crowded training program.

☆☆☆

To the Editor:

For at least 30 years I have read your magazine with great profit and interest. It must be a tremendous job to find new material each month, and I compliment you on your success.

In the September issue, however, you touch on a subject about which I know something — the German pipe organ, page 129. One gathers that this horizontal positioning of pipes is something new. There



is, however, in Leon, Spain, a set dating back to 1750, and perhaps others older. The resonator of pipes whose tone is produced in the "boot" by the beating of a metal "reed" against a "shallot"—much like the mouthpiece of a clarinet—gives direction to the sound. This is not so of other types of pipe. The Spanish go in strongly for this type of pipe and also that arrangement, hence the name. There are many examples in this country (e.g. St. Thomas, New York City).

As one who views you as writing "gospel," I hate to see even the most infinitesimal chink in your "armor."

Joseph G. Bradley, Jr.,
1165 Fifth Ave.,
New York, N. Y.

(Continued to page 10)

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To the Editor:

On page 136 of your magazine of July 1959 you have announced a note "Hey Detroit, Look at Poland." The note is not wrong and the photo is very witty.

Nevertheless I should like to complete your knowledge about our country. Poland has lost 6,000,000 of its people during the second world war; that is about 20 percent of the population of our country. We have lost many thousands of scholars, teachers, professors, engineers and technologists. Our towns, factories and mines have been spoiled in about 80 percentages.

I don't lay claim to you but I think it would be good that you as an editor of this excellent magazine would be acquainted with any information about our country. Perhaps you would change your look at our country.

If that would be interesting for you, ask, please, the opinion about Polish turning



lathes which were lately imported to your country.
Warsaw, Poland

EDITOR'S NOTE: No affront to Poland was intended. The "horse-before-the-coupe" was an amusing adaptation but it does demonstrate the will of the Polish to make do with what they have while fighting their way back from the ravages of a war that struck from both sides, engulfing Poland first of all. Poland may have lost professors and engineers, but not her spirit.

(Continued to page 12)

Enjoy
Velvet-Smooth Smoking
-the whole bowl
through!

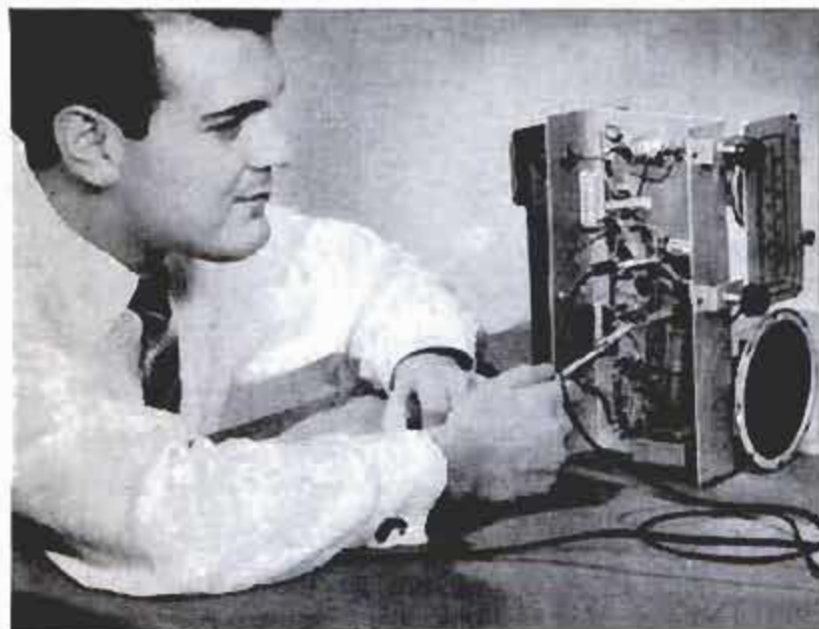


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at home in spare time for Radio-TV. With NRI 50-50 method, you study basic principles AND learn by practicing with actual equipment NRI furnishes. You learn with your hands and your head. You get dependable training, backed up by the reputation of the oldest and largest home study Radio-TV school.

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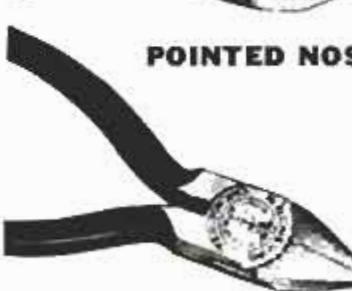
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A small oblique cutter only 4 3/16 in. long for cutting in confined space. Available with coil spring.



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FREE CATALOG 101A illustrating and describing the complete Klein line of pliers for every purpose, is available on request. Write for your copy.



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Established 1857 Chicago, Ill. U.S.A.
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(Continued from page 10)

A bound copy of the September issue of *Popular Mechanics*, which featured the story of Igor Sikorsky's 50 years in aviation, was presented to Mr. Sikorsky by distributors of the magazine in the Bridgeport, Conn., area. The presentation took place in Mr. Sikorsky's office at the Sikorsky plant in Stratford, where he is engineering



consultant. From left: Milton C. Rottman, owner, and Salvatore D. Grosso, manager, Fairfield County News Company; George Geils, Hearst Publications, and Mr. Sikorsky. Following the presentation Frank J. Delear, public relations manager of this division of United Aircraft, observed that Mr. Sikorsky was delighted particularly because he has been "practically a lifelong reader of *Popular Mechanics*."

☆☆☆

To the Editor:

Back in '28 or '29, while I was still building boats of wood, I read a small article in *Popular Mechanics* which included a drawing of a model boat made of one piece of metal. I made one of these models from a piece of light metal, and it was so slick that a small acorn was planted in my mind: Some day I would build boats of metal—but not as long as rivets were required, for I couldn't see myself punching holes and driving hot rivets to build a boat. But in 1933, when arc welding was getting out of three-cornered pants, I started building steel boats. I'm now getting ready to apply the basic principle I got out of *PM* 30 years ago to a superspeed boat for transoceanic service. . . . Just thought you might be interested in knowing that *PM* planted the little acorn that may grow into a giant oak.

Jack Casey,
Casey Craft,
Mermentau, La.

(Continued to page 24)

I WAS STANDING STILL IN A FAST-MOVING WORLD!



1
MANY OF MY NEIGHBORS WERE MAKING BIG MONEY... AND BUYING NICE HOMES IN THE SUBURBS...



2
... BUT I STILL WORKED ON AN ASSEMBLY LINE... EARNING THE SAME PAY... AFRAID OF A LAYOFF

I TRIED LOOKING FOR A BETTER JOB... BUT NO EMPLOYER WANTED AN UNTRAINED MAN



3
I SWALLOWED MY PRIDE WHEN MY WIFE RETURNED TO HER OLD JOB BECAUSE WE NEEDED MONEY

4
ONE DAY A PAL DROPPED IN... HE LOOKED PROSPEROUS

I OWN A REFRIGERATION AND AIR CONDITIONING BUSINESS. WHAT'S YOUR LINE?



5
IT WASN'T EASY FOR ME TO ADMIT I WAS IN A RUT

GET INTO REFRIGERATION!
OVER 20,000 NEW MECHANICS ARE NEEDED EACH YEAR. THERE'S AN EASY WAY TO TRAIN!



THE NEXT DAY MY FRIEND SHOWED ME HOW HE LEARNED THIS SECURE, HIGH-PAY CRAFT...

YES, I LEARNED QUICKLY BY PRACTICING AT HOME... C.T.I. SENT ME 25 KITS TO BUILD THIS REAL CONDENSING UNIT... TOOLS TOO!



I ALSO MADE MONEY AS I TRAINED!

7
THAT NIGHT I MAILED A COUPON FROM A C.T.I. AD FOR FULL INFORMATION



8
SOON I WAS TRAINING WITH REAL OPERATING EQUIPMENT DOING FIELD-TYPE PROJECTS



9
IN A FEW MONTHS I WAS READY FOR A GOOD JOB WITH A BRIGHT FUTURE



10
MY BIG PAY LETS US LIVE A LOT BETTER... MY FAMILY IS MORE SECURE... THANKS TO C.T.I.!

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Do You Know This Old-Timer?

Proud? You bet they are. And with reason. For more than a generation, this car's name was pronounced with pride. Unhappily, it is gone today. On this very early one-cylinder model the under-the-floor radiator was nothing more than a ventilated water tank. See page 228 for the name and year.

DON'T DECIDE YOUR FUTURE UNTIL YOU HAVE READ



How To Make Big Money Fast in the Accident Investigation & Adjusting Field

A. J. Allen earned over \$2,000 in ten weeks. Gary Williams doubled his former salary. Jessie Hill says "Had I not learned of Universal Schools' Accident Investigator Course I would still be just another time card puncher; but today I have a wonderful position, and I receive \$3.00 an hour plus an expense allowance."

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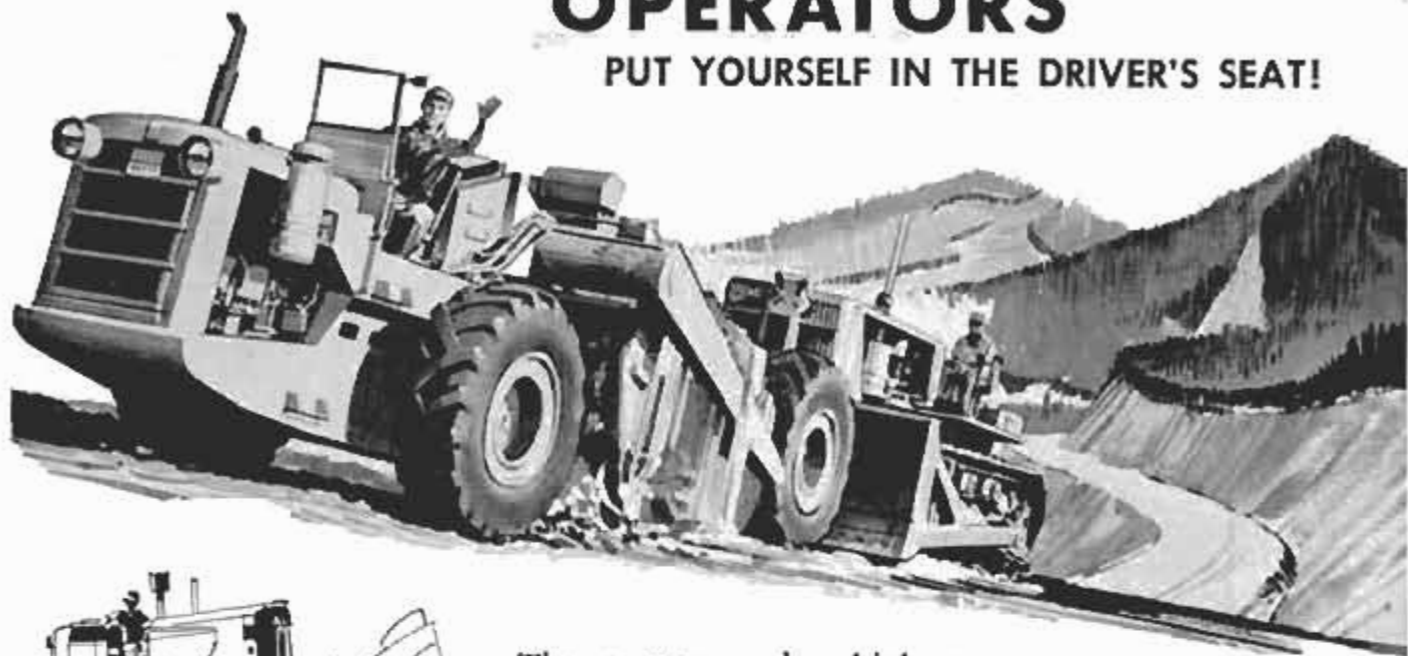
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Great Pioneers in Science Do You Know Them?

—By James S. Thistle—

DO YOU KNOW this member of the most notable husband-and-wife team in the history of science? Together with her marital partner, she succeeded in isolating an element 900 times as "radioactive" as uranium. They called it "radium."

To obtain radium in purer form, they labored over a ton of pitchblende in an old shed. After a good deal of hardship they managed to extract a tenth of a gram (less than four thousandths of an ounce) of radium, pure enough to determine its atomic weight.

In 1911 this renowned woman scientist won the Nobel Prize for a second time, the only woman to do so. American women presented her a gram of radium worth \$100,000. In 1934 the world grieved on learning that the "radioactive bodies" she and her husband had discovered for the benefit of others had taken her own life.

These letters, unscrambled, spell the name of this month's Great Pioneer in Science:

ICEARUMIRE

(First and Last Names)

Write the correct name here:

Now turn to page 226 for the answer.

Superior's New Model 70 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES



As an electrical trouble shooter the Model 70:

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.
- Will test all TV tubes for open filaments, inter-element shorts, burned out tubes, etc.
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- Will measure current consumption while the appliance under test is in operation.
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.
- Leakage detecting circuit will indicate continuity from zero ohms to 5 megohms (5,000,000 ohms).

As an Automotive Tester the Model 70 will test:

- Both 6 Volt and 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Horns • Also will locate poor grounds, breaks in wiring, poor connections, etc.

IT'S SO EASY!!



With tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good).



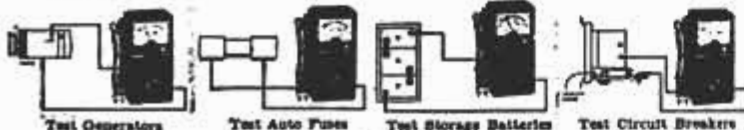
Small electric fan motor indicates 50 ohms (normal resistance).



Control circuits of most furnaces use 24 volts obtained from step-down transformer. Here's how to check room thermostat to see if wire to it are live.



Manual supplied with Model 70 shows meter needle moves to right when test leads are connected to pins 3 and 4 of this 6AU6 tube. Procedure for testing all tubes used in TV are detailed in manual.



READ THIS!

READ THIS!

READ THIS!



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- How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.
- How to trace trouble in the electrical circuits and parts in automobiles and trucks.

Model 70 comes complete with above book and test leads. Only...

15⁸⁵

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SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C.O.D.

Try it for 10 days before you buy. If completely satisfied then send \$3.85 and pay balance at rate of \$4.00 per month for 3 months—No Interest or Finance Charges Added! If not completely satisfied, return to us, no explanation necessary.

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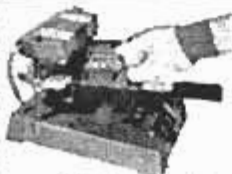
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home training course
IN ALL 3 PHASES



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at no extra cost

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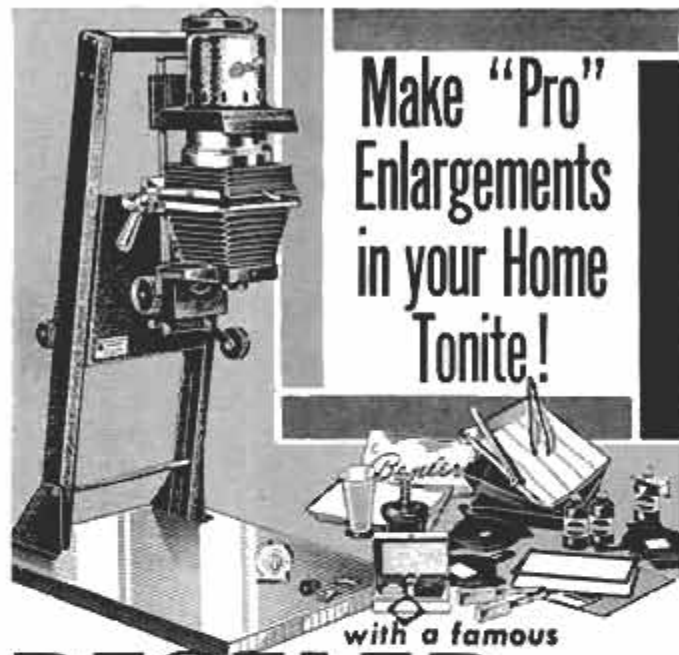
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To the Editor:

For a long time I have wondered why, now that we know about carrier-current transmission on power wires, nobody has seen fit to consider using this as a means to provide synchronization for electric clocks. Anything that will cause a break in the power to a clock for a time will cause it to be in error. In order to keep clocks running accurately I propose that utility companies put a pulse on their lines at, say, midnight. In the clock itself, a remarkably simple cold-cathode glow-discharge tube tied up to a resonant circuit could actuate a mechanism to cause the thing to set itself at midnight.

By adopting this scheme we could always be considerably more certain that when we looked at a clock, it would be set at the proper time, for it would, in the normal course of events, have corrected its setting at midnight the previous night.

James A. Davis,
Philadelphia, Pa.

☆☆☆

Now it's official. The American Rocket Society is in favor of rockets, but opposed to experiments by amateurs. Reporting 162 injuries to experimenters in a sample six-week period, the society points out that this rate is relatively higher than the automobile accident rate and concludes: "The development of the science of rocketry is not served by amateur experimentation. The somewhat debatable loss in opportunity for intellectual development which might be suffered by foregoing experimentation is small compared with apparently unavoidable and appalling losses of eyes, fingers and lives. . . ."

"All practical means must be taken to prevent the manufacture of propellants or rockets by amateurs. The launching of rockets by amateurs must be prohibited."

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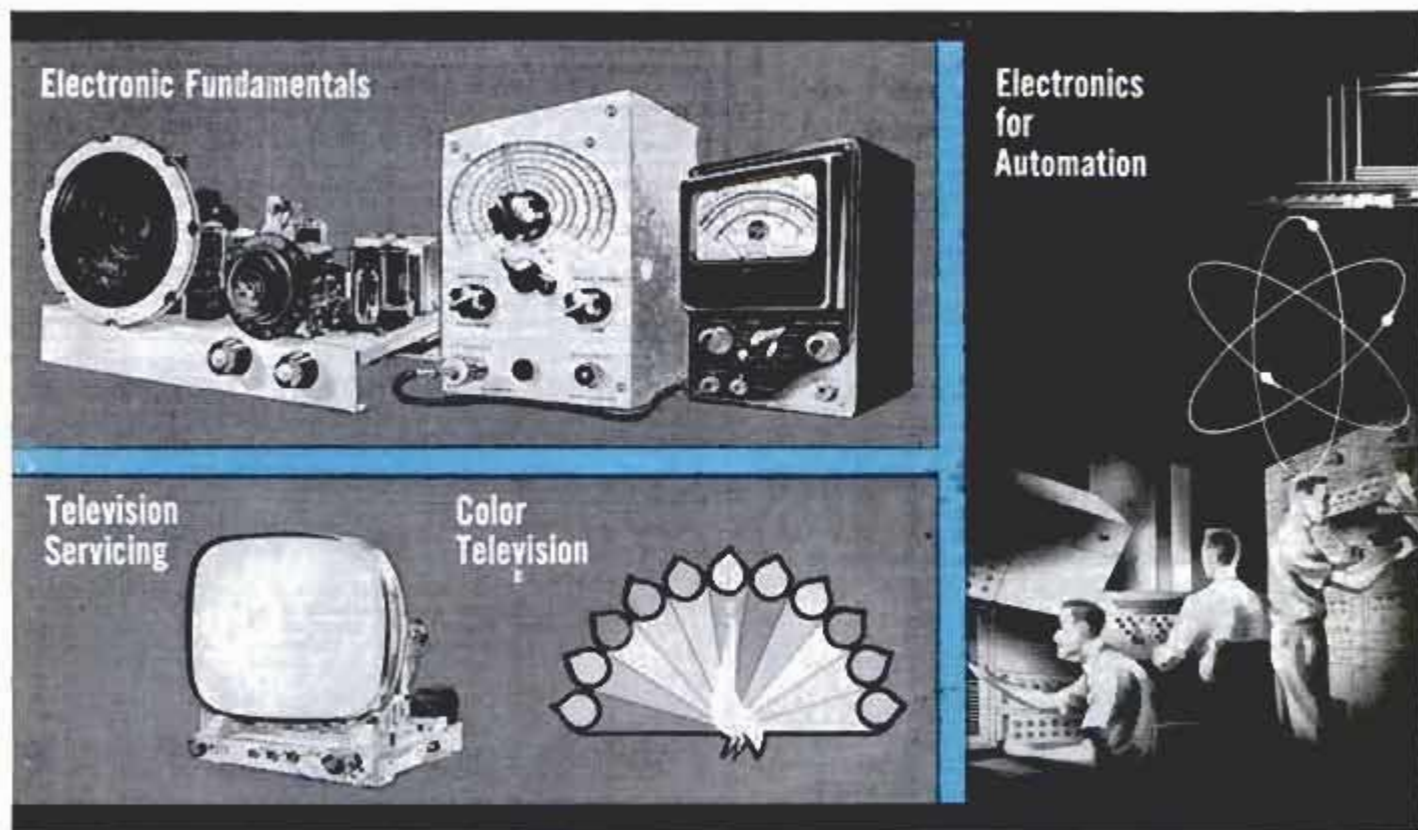


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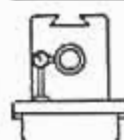
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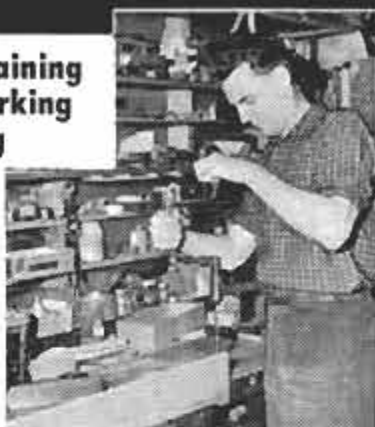
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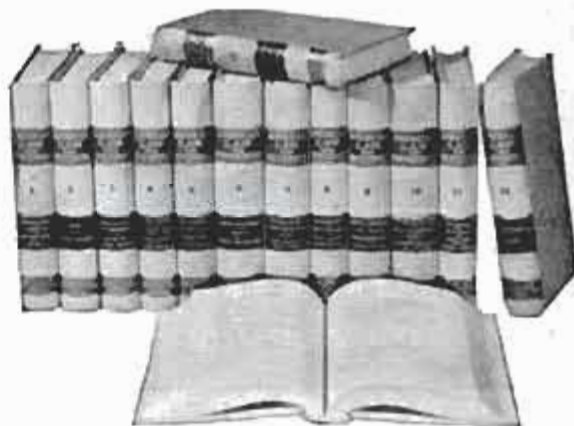
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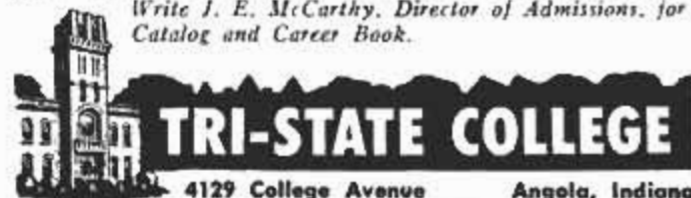
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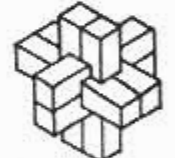
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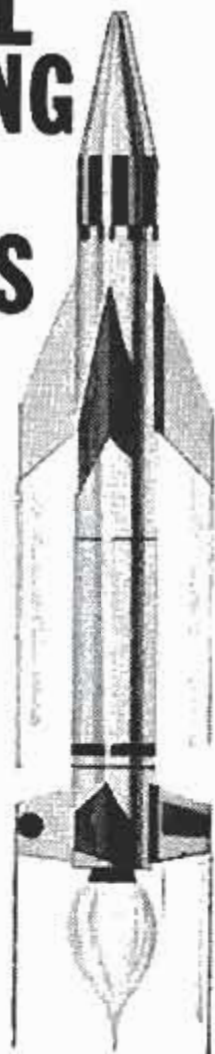
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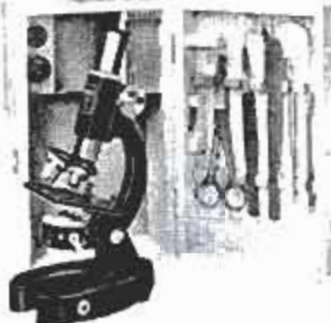
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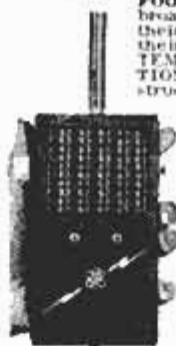
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Sidelights from the PENTAGON

By William R. Kreh

The Navy's looking for ways to shoo seagulls off air station runways, and is about to try the Army's secret weapon—Elvis Presley.

It's reported that an English airfield, beset with the gull problem, played a tape recording of gulls' panic signals to try to drive them away. The gulls left, but were back almost immediately. On the same tape was a recording of a teen-agers' party. . . . Out came the voice of Elvis and off went the birds, not to return for 24 hours.

The gulls are no fun for flyers. Mid-air collisions between the birds and planes have been recorded as high as 400 feet, although most accidents happen closer to the ground during take-offs and landings. The Navy's present method is to drive a Jeep down the runway to scare them off temporarily. They've tried sprinkling runways with moth crystals and other devices, to no avail.

They have found out one thing, though—it's not the distress call of the gull that scares others away, it's the odor emitted by the frightened gulls that warns the others.

A home-made cigarette dispenser, dreamed up by a sailor aboard the submarine tender *USS Nereus* to discourage moochers, sells lighted cigarettes for a penny. The customer, after dropping a penny in the slot, selects the size cigarette he wants and then watches his smoke pass under an ultraviolet light for sterilization, through a humidifier, onto a heating coil for a light, and then into an ashtray, ready for smoking . . . It's the brainchild of Fireman Robert W. Packard.

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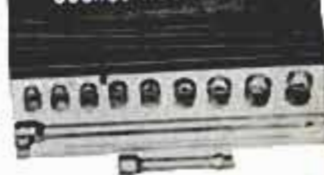
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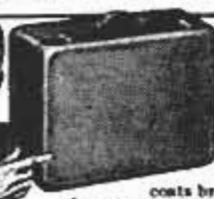
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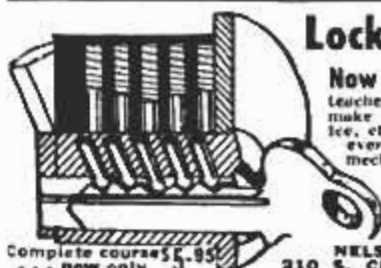
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DROPSHIP Buyers' Guide reveals 151 manufacturers mailing single orders using your label. Large profits; no inventory, delivery, packaging headaches. Complete operating instructions. Complete guide \$2.00 postpaid. Rutward, 112 Bryant, Columbia Station, Ohio.

SELL. By mail. Mail order specialist shows how to start on low capital. Modern merchandising methods, not crackpot schemes. Free details. Griffin, 322 West State Street, Ithaca, New York.

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AMAZING Profits selling books by mail. Everything furnished. Roe, 2317P Marshall, Chicago 23.

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"MAILORDER Laws and Regulations" and "Mailorder Rules for Beginners," \$2.00. Explains mailorder licenses, mail-order taxes, etc. Tasker, Box 3131, Alexandria, Virginia.

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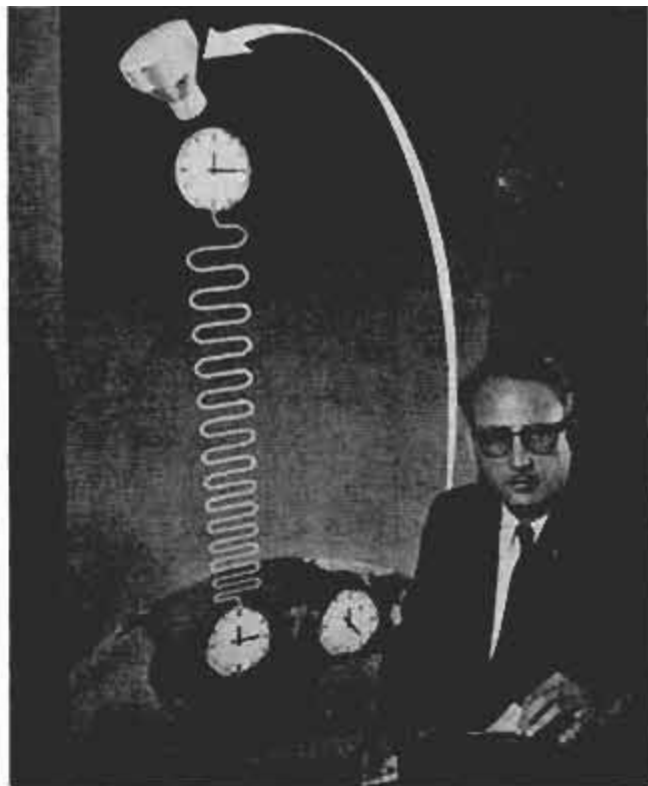
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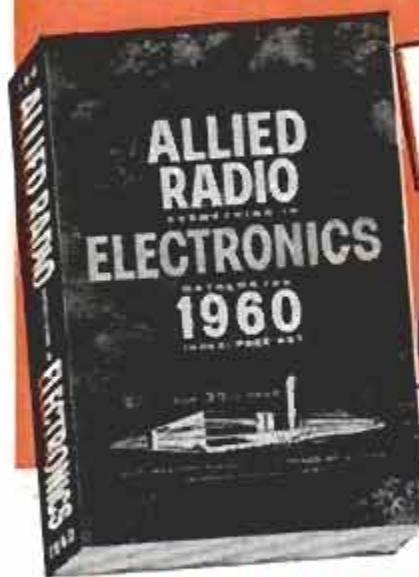
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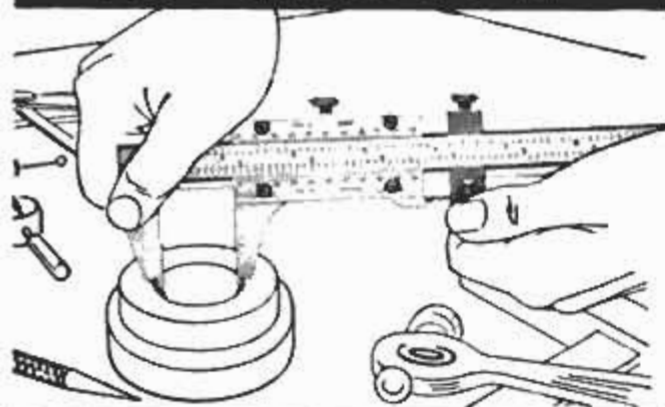
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Sun's Cosmic-Ray Outbursts Could Harm Space Travelers

Future space travelers may encounter greater radiation hazards than have been suspected, say two University of California physicists. They sent balloons carrying Geiger counters to an altitude of 90,000 feet above College, Alaska, and discovered that the amount of radiation in the atmosphere increased sharply when there were disturbances on the sun. The number of protons entering the atmosphere on those occasions was 10,000 to 100,000 times normal intensity, said Dr. Robert R. Brown, one of the investigators.

The physicists found no radiation caused by sun activity at heights below 50,000 feet. Brown said this indicates that solar outbursts of sizeable proportion are occurring more frequently than scientists have imagined, for only a sun disturbance—a flaring or boiling—of stupendous size will increase radiation at ground levels.

Space scientists recently have been concerned with the Van Allen radiation belts, discovered by satellites, surrounding the earth. A high-speed rocket would pass through these narrow belts in a few hours so exposure would be minimal. The danger to space travelers from solar particles may be more difficult to contend with however. It is quite possible, Brown says, that a manned moon rocket, for example, would run into a proton storm of deadly proportions if a solar outburst occurred at the right moment. (He found radiation from such outbursts could last as long as four days.) He explains that while the protons are mostly of the low-energy variety, they would interact with atoms in the hull of the spaceship to create lethal gamma rays, half of which would spray the ship's occupants.

Pacific Ocean Current Is 3500 Miles Long

A current that flows in an eastward direction along the equator beneath the surface of the Pacific has been found to be at least 3500 miles long. Direct measurements taken during the International Geophysical Year show that the current follows the equator from a longitude of 150 degrees West, near the Christmas Islands, to 92 degrees West, near the Galapagos Islands. The current is about 190 miles wide and 650 feet thick, sandwiched between shallower and deeper flows which both move westward. Velocities of up to five feet per second (three knots) were recorded. The flow was first described in 1954 and is called the Cromwell Current.

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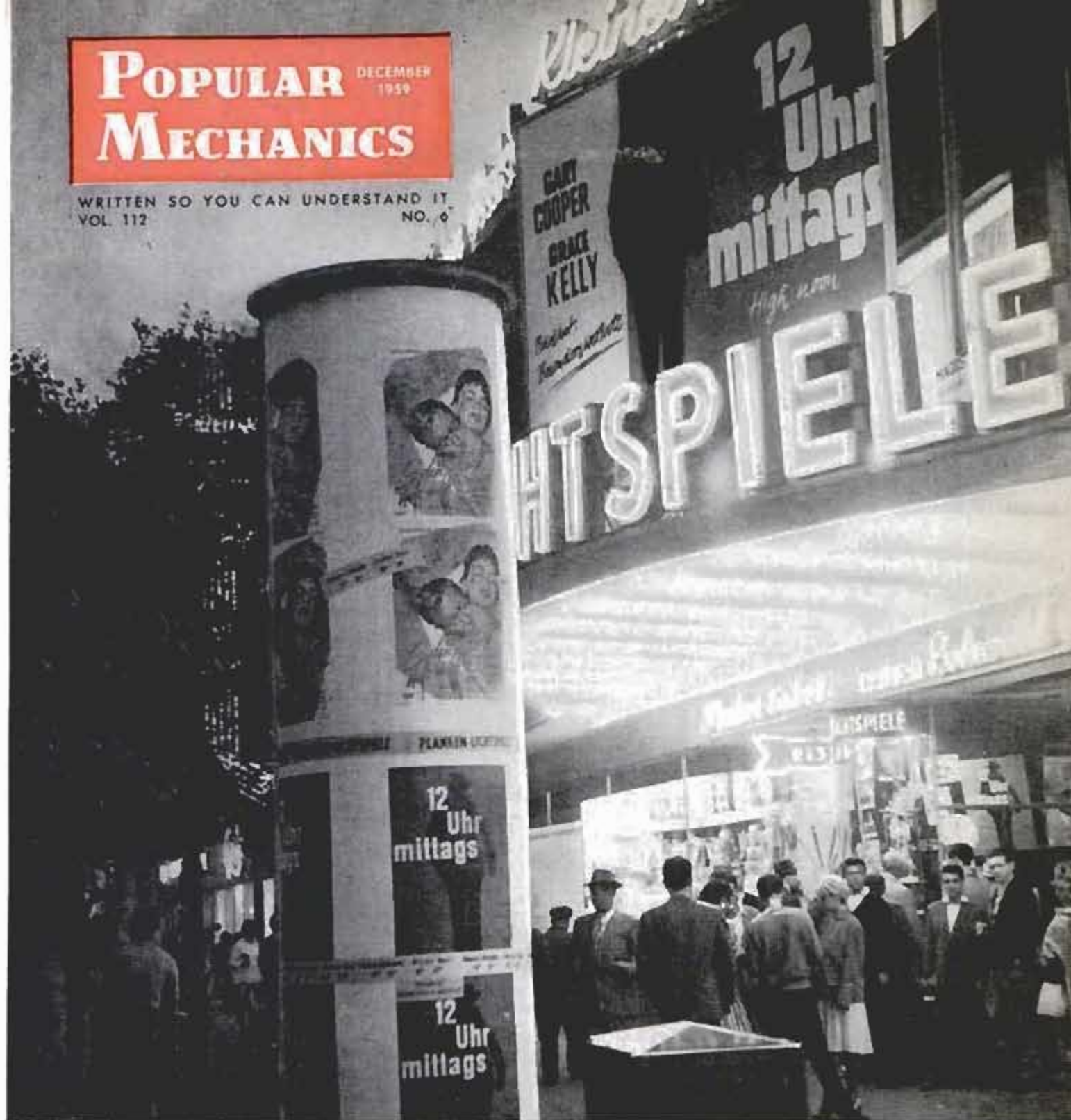
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Hollywood Spricht Deutsch

By
Sam Iker

THE ENTHRALLED AUDIENCE watched a lean-jawed U. S. marshal face the "heavy" in the streets of old Tucson, Arizona Territory. As the bad man's hands hovered over his sixguns, he snarled, "Schluss jetzt Brazos, oder ich drucke beide Lanfe auf Sie ab!"

This sparkling bit of German "wild west" dialogue, literally translated to, "Hold it, Brazos, or ah'll let ya have both barrels," was nothing out of the ordinary for the lederhosen-clad movie fans in the Bavarian town of Bad Reichenhall.



Through the control-room window, actors can be seen watching screen as they dub in German-language "take"

Yes, Hollywood spricht Deutsch — Hollywood speaks German and many other languages as its American-made films entertain around the world. All over Germany—and France, Italy and Spain—audiences take it for granted that their favorite Hollywood film stars emote fluently in their respective native tongues. Through the technical miracle of sight and sound synchronization, avid European moviegoers can enjoy America's top motion pictures

Magnetic sound film is adjusted in preparation for final blending of dialogue, sound effects and picture



without struggling with subtitles. Almost all of the nearly 300 feature films Hollywood exports overseas yearly—from multimillion dollar extravaganzas like "Ten Commandments" to low-budget westerns—are dubbed in with foreign dialogue.

The voices are amazingly well-matched with those of their Hollywood counterparts. Jimmy Stewart in German has the same hesitating, slightly nasal twang; Marlon Brando still mumbles; Cary Grant retains his clipped, deep tones; and even Marilyn Monroe manages to come through with her kittenish seductiveness.

But the faces behind the voices would sometimes jolt European movie fans. Tall, rugged Burt Lancaster's "voice" is a rather short, thick-set West Berlin actor named Horst Niendorf. On the other hand, actress Gisella Trowe who speaks Anne Baxter, Yvonne DeCarlo and June Allyson could easily hold her own with her Hollywood "faces." And young actor Ditmar Schonharr who dubbed for the late James Dean bears a striking likeness to the teen idol. The great majority of voices who speak for the stars in Germany, for instance, are prominent in their own right on the German stage and in the film industry. Many of them, furthermore, physically resemble their Hollywood alter-egos.

One of the largest of the German dubbing studios is Berliner Synkron. With over



This trio is dubbing in German dialogue for Thelma Ritter, Burt Lancaster, Audrey Hepburn and Sophia Loren

1000 actors in its voice file, the West Berlin studio turns out about 80 foreign films a year, including all features from Paramount, Universal-International and Allied Artists, as well as independent productions from Hollywood.

Essentials of synchronization are the same in all studios, though technical methods sometimes differ. When an American movie arrives, the first step is to do a raw translation of the script or "continuity."

At Berliner Synkron, there are two full-time writers plus a number of freelancers. While the writer (sometimes two working as a team) turns out a literal translation, the picture itself goes into the cutting room. Here, the film is run through a "moviola"—an apparatus that the technician can operate either automatically or manually at varying speeds. The picture shows on a small screen and the technician can run it frame by frame as he listens to the dialogue.

The film is marked at every natural pause in conversation and later cut into individual segments. Every one of these segments or "takes" makes up a speech. The cutter marks these takes on a copy of the original English-language script.

The takes are numbered and the English script goes to the writers. They divide their rough German translation into the same segments, and then the fun begins. . . .

The writers hibernate to the "check

room" for the next step in the process. The check room is simply a projection room where each take is run off separately while the writers wrack their brains to produce German dialogue in which lip movements approximate and at the same time retain the basic sense of the original English.

Berliner Synkron writer-director Klaus von Wahl explains that "the most difficult problem is that thoughts are expressed in fewer words in English than they are in German. English tends to be more abrupt. And so we have to jam more German words in and still make the speech look natural."

Some speaking habits of American actors drive the writers to distraction. "Jane Wyman has a tendency to start sentences with 'well,'" says writer Gerda von Ruxleben. In German, the closest approximation is "wissen Sie," and the repetition becomes murderous. Actors like Marlon Brando or Elvis Presley, who stop and start, sometimes mumble and come up with abrupt pauses, are also tough, comments Frau von Ruxleben. The corresponding Deutsch also has to stop and start and pause.

According to von Wahl and other writers, the easiest actors to "synch" are the best actors. Tall, lean von Wahl, himself an actor who dubs Danny Kaye's German voice, declares that "Gary Cooper, Bill Holden, Spencer Tracy, and others act not only with their voices but also with their



Cameraman in mixing room gets directions from tone-meister (sound director) before rolling finished film

faces and bodies. It's possible to follow the action and understand meanings without sound. This makes our job simpler."

On the other hand, actors who enunciate clearly with pronounced lip movements present problems. The German dialogue must produce exactly the same lip movements or the result looks unreal on the screen. Consequently, every writer has to be a walking wealth of synonyms in order to find the right words.

Actors like Rock Hudson and Alan Ladd who tend to speak with tight lips make the job easy for von Wahl and his associates. Because of the slight lip movements, the writers have much more latitude in picking out German equivalents.

Declares von Wahl, "The saddest thing is that many wonderful American accents are lost in translation. In a Civil War picture, for instance, we can't use a southern Bavarian accent and a northern Hanoverian-type speech. We always have to use the 'high German' that's understood all over the country. Consequently we sometimes lose the flavor and some of the fine shades of meaning in a film. In westerns and in other movies with foreign locales, we substitute broken German for the Indians and other characters who speak broken English."

Because of the German censors, the actual content of an American film is sometimes re-written. War pictures, westerns and mysteries come in for the greatest alterations. In war movies, slurring refer-

ences to Germans are softened to spare the sensibilities of local audiences. When the hero in a western or Civil War picture mows down a dozen adversaries, he'd better have good reason because the German censor board frowns on "useless, unprovoked killing." Thus, the "bad guy" sometimes has to be cleaned up. And the "hero" might assume a different character.

Writer Peter Kup of Munich's Riva Films recalls such an instance. In a recent "Alfred Hitchcock Presents" TV program, a mother whose son was murdered slipped poison into the killer's lemonade. This poetic bit of justice was softened in the German version, says Kup. "Instead of the woman adding poison to the drink, we had her using a powerful sleeping drug."

Writers Like Action

Depending on the length of a picture and amount and complexity of dialogue, the synonym-straining writing job takes anywhere from eight days to two weeks. A film with plenty of "ottos" puts smiles on the writers' faces. An "otto" in the jargon of the trade refers to points in the film where there's no speech — only action. A prime example, according to Kup, occurred recently with the TV mystery, "The Silent Stranger." Remarks Kup, "The usual TV show consists of about 140 takes. This one had only 70 because the silent stranger was really silent."

After the German-language script is completed, the scene changes to the studio. Here, the faces on the screen take on their new German-speaking identities. The typical studio is rather small, with a movie screen covering one wall, a podium with microphone in the center and a glassed-in control room at the back.

The director and "tone-meister" or sound director, sit in the control booth. The actors working a particular "take" cluster around the podium and keep their eyes glued on the screen. They have a script in front of them. But every speech has to be learned thoroughly since it's impossible to watch the script and the screen at the same time.

Here's how an average session runs. The particular film stars Carlos Thompson, Jeff Chandler and Esther Williams. In this case, Argentinean actor Thompson is doing his own dubbing. The studio is dark. A red light flashes. "Achtung" — attention — crosses the screen. Then rapidly, "1, 2, 3, 4," and immediately following, the actual scene. The actors are tensed, and, as Carlos Thompson on the screen speaks in English (the English sound is cut off), Thompson in the studio rattles off his new German dialogue. As Esther Williams answers, Inge Landgut matches her counterpart perfectly.

In a few seconds, it's all over. The take

A technician in the cutting room synchronizes final film and dialogue sound track by seeing and hearing the "pips" or "beeps" which occur at the start of every take in both sound and picture films. She matches the two



runs only four or five lines. But the director isn't satisfied. He explains from the control booth just what he wants in the way of expression and emphasis. Again the "Achtung" and "1, 2, 3, 4" flash up, and again the actors speak their parts—concentrating fiercely on both the acting job and also on matching the German dialogue with the lips on the screen.

This time Thompson fumbles his lines. He disgustedly tosses his head and repeats the German words over and over. A minute later, the process is repeated. Now the sound director is dissatisfied. The synchronization wasn't perfect. His trained eye and ear can spot immediately any variation of the dialogue in the studio from the lip movements in the film.

Finally, after the fifth try, all goes well. The take is run through once more, this time with its new German dialogue, to make sure everything is perfect. It looks and sounds real and everyone breathes a little sigh of relief. Several minutes later, the next take flashes up on the screen and the nerve-wracking business is repeated.

The 600 to 800 takes in an average picture

are dubbed in four to eight days. Most takes must be run through three or four times. But the final result creates a near-perfect illusion. According to actress Landgut, "It almost becomes automatic after a while. We don't hear the original voices in the English sound track. That way, we don't try consciously to imitate and our voices stay the same for every role in any picture we're doing."

Producer Gunter Kulakowski explains that, "The voice is vital. We don't try to find a perfect match. It's almost impossible. But we audition actors and actresses and classify them by which Hollywood voices they most closely resemble. Their acting ability makes up for any lack of similarity." He adds that many German actors and actresses speak two or three different screen personalities.

Once classified, they dub for the same Hollywood stars in every picture in which the particular stars appear. To German audiences, Marion Degler's voice is always that of Audrey Hepburn and Sophia Loren; Harold Juhnke is always Marlon Brando,

(Continued to page 232)

Making adjustments in lighting arrangement, a technician prepares to photograph a new German title for an American film



AN EYE ON SPACE



By Dr. Dan Q. Posin

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

THERE WILL BE many shots at the moon. Our nearest neighbor in the heavens patiently revolves around the earth, waiting for us to learn its secrets. What kind of moon shots can we use to find the answers to those secrets?

In some of the shots the traveling object—let's call it the "payload"—will miss the moon and continue out beyond, to go into orbit around the sun, as did Lunik I (Mecha) and Pioneer IV. The payloads which go into orbit around the sun become, in effect, little planets, and will continue in their orbital travels as long as the planets do.

Another moon shot might miss, but does not have enough speed to orbit the sun, and is "recaptured" by earth—that is, it becomes an earth satellite with a long orbit, requiring perhaps several weeks for one complete circuit. Whether or not this payload has also gone around the moon depends, of course, on the timing. If the speed of the payload is excessive, it may arrive at the moon orbit region too soon, make its loop because of the earth's pull-back, and that's that. Of course, some day, when the moon returns (in a month, two months, three months), the payload may be out there again on one of its swings and might go around the moon. But this is relying too much on chance.

The payload which is too slow, or is fired too late, may also miss the moon on the first try, and not go around it; but it, too, may be successful by pure chance on a future swing.

A payload which does make a tour around the moon may execute a distorted egg-shaped orbit around it, or may make a kind of S or inverted S, or a figure 8 around the moon, all, of course, depending upon the angle of approach.

A payload could, in principle, pass very close to the moon in such a way as to be yanked completely away from earth's control and flung out into space, soon to go orbiting around the sun. Such a "yanking away" is one method of space travel, utilizing the moon and the planets as "sling shots." This can only be achieved through careful guidance and speed.

There is also the moon shot in which the payload goes into orbit around the moon alone. This can be achieved by having the payload fire a braking charge so that it loses speed and allows the moon to keep it for its own satellite—a moon for the moon.

Or, the payload can go around the moon, return to the region of the earth and fire a braking rocket to become a modest earth satellite. Still other possibilities are "hard" and "soft" landings on the moon.

The difficulty of a moon shot can be stated in this way: What is the chance of coming close to the moon, which is almost a quarter of a million miles away and is traveling at a speed of more than 2000 miles per hour? Such a shot is difficult or easy (relatively speaking, of course!) depending upon whether it is a *free ballistic* shot or a *guided* shot. A free shot has only a slight chance of success, as an error of four degrees in pointing the rocket will result in a 16,000-mile miss. A guided shot, however, can afford to be a little contemptuous of timing and speed, since corrections can be made anywhere along the trajectory. The guidance can be from the ground by radio signal, or by a homing instrument in the payload.

Guidance-equipped devices are heavy, and therefore require much launching power. Some countries have more launching power than others. The latter can catch up. But it isn't easy.



Pedestrian Power Scooter

Louis Richards, graduate design student at Illinois Institute of Technology in Chicago, demonstrates his "Skeeter," a lightweight motor scooter for pedestrians. Powered by a 1.32 horsepower model-aircraft engine, the Skeeter has an 18-inch platform wide enough for both feet and an aluminum handle for balance and steering. It will carry an average person at 12 miles per hour, but weighs only 12 pounds and can be picked up and folded into a small canvas carrying bag.



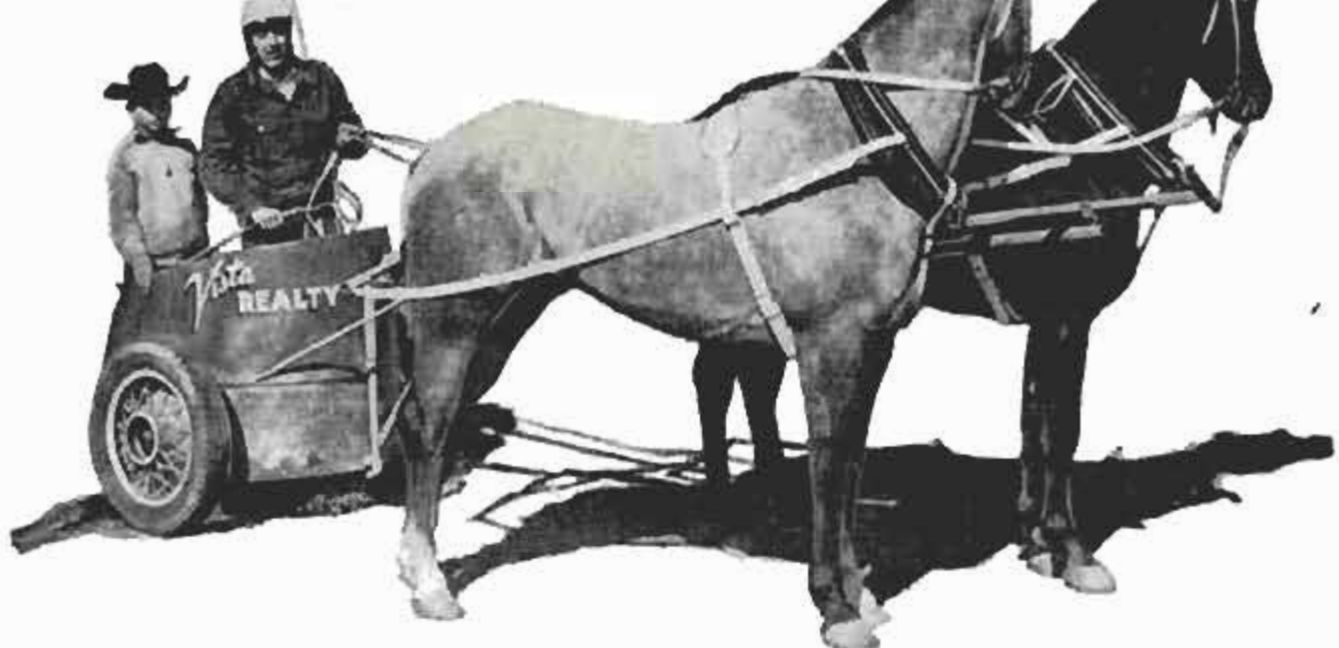
Toy Incubator Hatches Eggs

Which comes first—the beak or the feet? This small incubator, billed as an educational toy, can actually hatch one egg at a time before a child's eyes, letting him answer the question for himself. It is called a "Chick-u-Bator," and has a clear plastic cover through which the hatching process—from cracking of the shell to the first shaking of wings—can be watched. The toy, which fascinated children at a Chicago fair, comes complete with electric cord and bulb.

Dual Front Wheel Assembly Increases Truck's Payload

Front axle loadings of 18,000 pounds or more are possible with a dual front wheel assembly that has four tires mounted individually. All four tires are mounted on standard wheel bearings and each wheel rolls independently. Tire mileage is increased better than 50 percent, according to the manufacturer. Developed by the Truck Equipment Company, of Denver, Colo., the twin front wheels give 100 percent more road contact and allow increased payload, larger capacity and greater front end stability. A 30 percent greater turning angle makes long vehicles easier to maneuver. The front tires and wheels can be interchanged with the rear ones and the parts are interchangeable with standard units that are now in service.





His chariot is a 50-gallon oil can cut to size. Cost of chariot and harness combined seldom exceeds \$150

Ancient Sport of Chariot Racing Invades the West

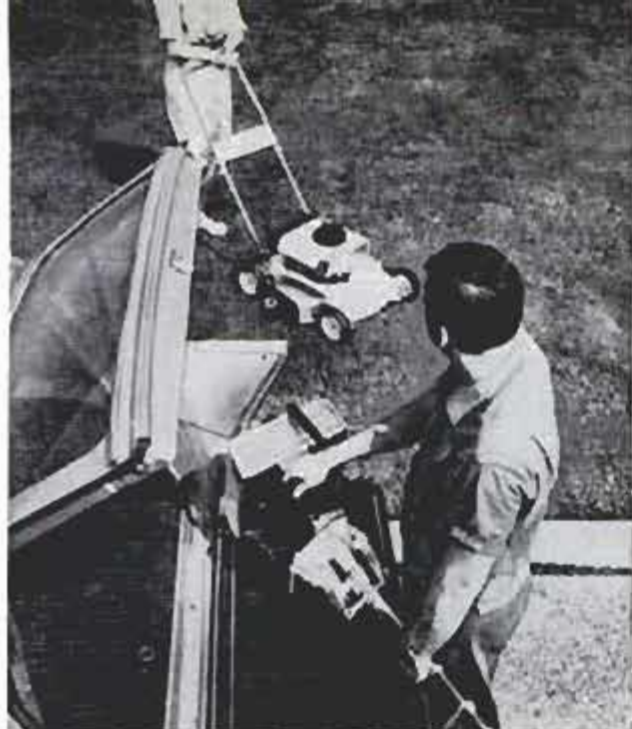
WHEN 36 AVID HORSEMEN get together for weekend races in the Boise, Idaho, area, the sound of their rumbling chariots now almost drowns out the thundering of their horses' hooves. The group took up the ancient Roman sport of chariot racing last

January, when not enough snow fell to support cutter racing, and members now race in two-team, quarter-mile sprints before thrilled spectators. No sport for sissies, charioteering takes a toll in broken arms and ribs among the drivers, ages 18 to 57.



Races are between two teams only—unlike Roman scrambles of 10 or more teams—but a swerve can lock wheels, sending drivers and chariots tumbling





Single Powerhead Operates Lawnmower and Outboard Motor

Ever have trouble deciding whether to do the yard work or go fishing? Here's a portable power unit that goes along in either case. If you're fortunate enough to get away to the lake, it fits on a light low-

er unit to make a small outboard motor; otherwise it'll stay home on another unit and mow the lawn. One four-cycle, air-cooled engine operates both. A wind-up starter works on both. It is sold as a set.

Seaplane Takes off From Dolly

How do you take a seaplane off a dry runway? At the de Havilland Aircraft Company's airport, located eight miles from the Toronto seaplane base, the planes roll down the runway atop a rubber-tired dolly. When floats lift from the cradle, the dolly brakes to a stop. This technique allows a plane to be built to customer specification and flown, as a seaplane, to his base.



Air Compressor Starts Jets

At London Airport, a Boeing 707 gets all four engines started in 70 seconds by a new Swedish air compressor. The unit also serves as an air-conditioner, warming or cooling the plane's interior within one hour, and functions as a de-icer when the hose delivering hot air is fitted with a wide mouthpiece. It has no wearing parts and runs 10,000 hours without overhauling.





Author discusses the training program with Astronauts Schirra, left, and Carpenter. All of the Astronauts are dedicated pilots, eager to keep their flying proficiency at peak level, even though they'll be cruising the heavens in a craft far different from the plane shown in the background

I LIVED WITH THE ASTRONAUTS

By Joseph N. Bell

Popular Mechanics photos by Joe Fletcher

PART I

Unnoticed by other NASA workers, four of the Astronauts discuss problems over a quick lunch at NASA cafeteria





Seven Astronauts and project director Gilruth examine tailor-made couches on which men will ride into space

I JUST SPENT a week with the Mercury Astronauts—the seven young Americans who were selected, after long and rigorous tests, for training as the first pilots to be blasted into space in a manned vehicle.

I found them a little bewildered at the attention they're receiving, slightly impatient to get the Mercury capsule into space, much more convinced of the probability of Project Mercury's success than the possibility of failure, and giving scarcely a passing thought to that much-posed question in the nation's press: Who is going to be the first man in space?

Although distinct individuals, the Astronauts share to a high degree earnestness of purpose, broad technical knowledge and skill, and a patient and understanding grasp of the necessity of explaining their work and problems over and over again to a world with little background for assimilating this new dimension in exploration.

The Astronauts definitely don't consider themselves in imminent danger of death, and they tend to scoff at the perils predicted for them. This isn't intemperate whistling past the graveyard; no one is in a better position than the Astronauts, themselves, to assess the chances of completing a successful manned space flight. They not only hope to go soon—they also expect to come back. And they have good reasons for feeling this way.

The oldest Astronaut, 38-year-old Marine Col. John Glenn—blond, crew-cutted, amiable and easy-going—told me: "Space travel is going to be accomplished, and we want to be in on it. We have all the faith in the world in the people running this program."

To the seven Mercury Astronauts, it's as simple as that.

Who are these first space adventurers? Here's a quick rundown:

Lt. Col. John Glenn, 38, of New Concord,

The editors of *Popular Mechanics* feel that the story of the Mercury Astronauts is one of the most exciting events in many generations. We have exerted every effort, since the program was first announced, to get a firsthand, factual, on-the-spot account of what's going on in Project Mercury. This two-part article is the result. It was written and photographed by a *PM* editorial team which lived with the Astronauts for a week in October. Over the past few months a strong impression has been given the public that the Astronauts are the exclusive property of a big weekly magazine. *PM* has proved that this is not the case—by going to the source and getting the story from the Astronauts themselves. The Astronauts belong to themselves, and their work belongs to the entire American public. We are proud that *PM* is the first monthly magazine to "live with the Astronauts."

Ohio, veteran of 150 combat missions for the Marine Corps in World War II and the Korean War, holder of a transcontinental speed record in the F8U, 5000 air hours, father of a boy and girl;

Lt. Comdr. Walter Schirra, 36, son of a team of barnstorming pilots, native of New Jersey, with 90 Korean combat missions and 3000 air hours, also the father of a boy and girl;

Lt. Comdr. Alan Shepard, 36, from East Derry, N.H., Navy deck officer in World War II who took flight training immediately after and became a longtime test pilot, 3600 air hours, father of two daughters;

Capt. Donald (Deke) Slayton, 35, native of Sparta, Wis., veteran of seven missions over Japan at end of World War II, 3400 air hours, father of one son;

Lt. Scott Carpenter, 34-year-old Coloradoan, primarily a multi-engine pilot who flew "big boats" during the Korean War and later served in Air Intelligence, 2800 air hours, father of two boys and two girls;

Capt. Virgil (Gus) Grissom, 33, from Mitchell, Ind., veteran of 100 combat missions in Korea in Sabre jets, 3000 air hours, father of two sons;

Capt. Gordon Cooper, 32, from Carbondale, Col., raised in a flying family where he soloed when he was 16, no combat experience, 2300 air hours (more than half in jets), father of two daughters.

These are the bare bones of the Mercury

Astronauts. Now, let's put their program into perspective before we move on to what the Astronauts are doing and why they're doing it.

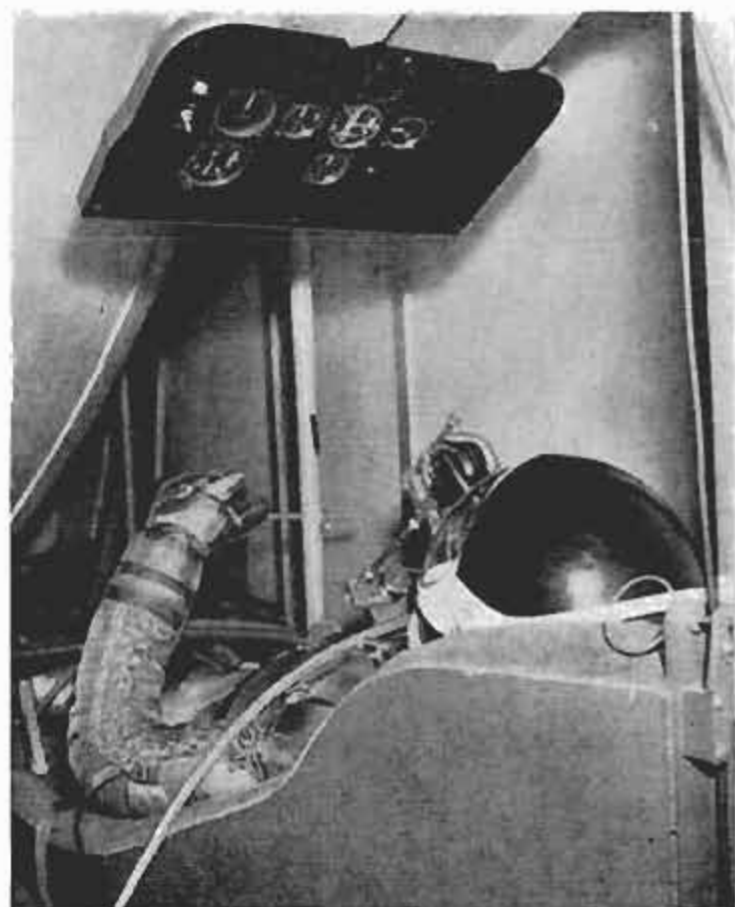
Project Mercury is the name given to the manned satellite program of the National Aeronautics and Space Administration. A Space Task Group was set up in October, 1958, under Robert R. Gilruth, headquartered at Langley Field, Va. Its objectives: to put a manned space capsule into orbital flight around the earth, recover the capsule and its occupant successfully, and investigate the capabilities of man in space.

Selection Program

To bring this off, there obviously had to be men able and willing to attempt the flight. Accordingly, a massive selection program was undertaken to find the men best qualified. There were three primary considerations: physical, psychological and technical. The first two have been emphasized in the press out of all proportion to the third. As one of the psychologists attached to the Astronauts told me:

"We were looking for a professional group that could best fulfill the most requirements to achieve space flight at the earliest time. This brought us inevitably to military test pilots. Others could undoubtedly have been trained, but these men had a tremendous head start—and because they

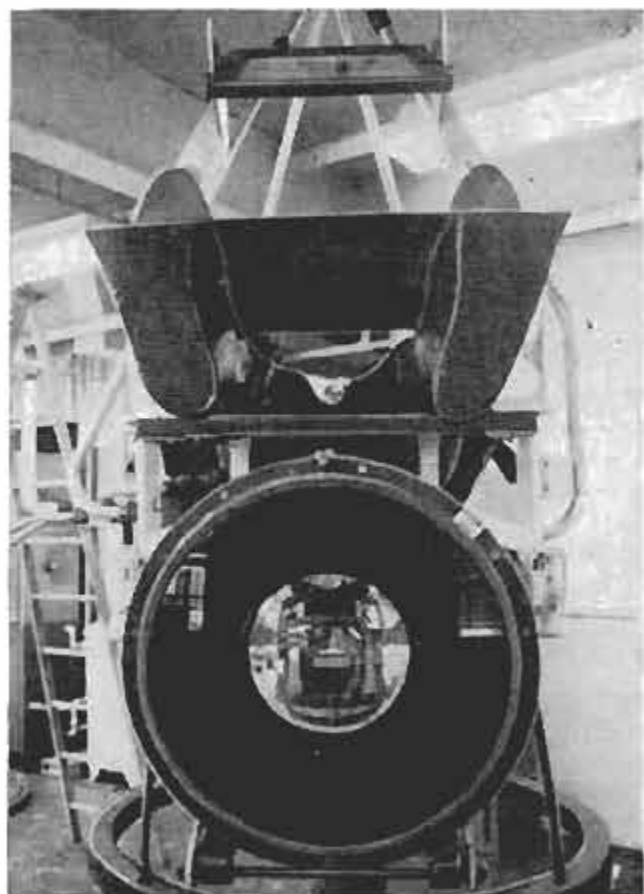
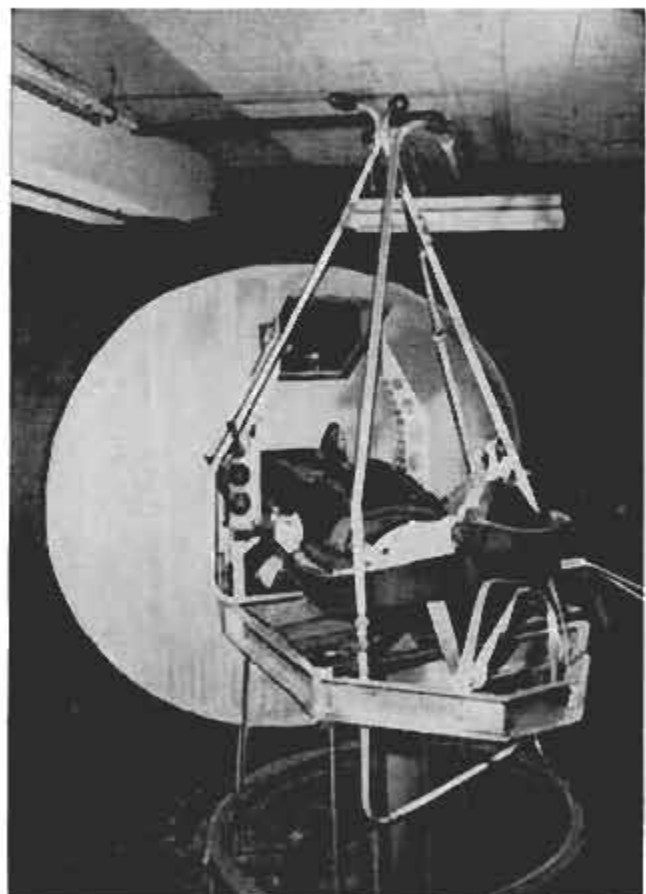
Astronaut Shepard, clad in a pressure suit, "flies" a training problem on the flight simulator. The instrument, with problems fed through a computer, is designed to give men the feel of the three-dimensional control

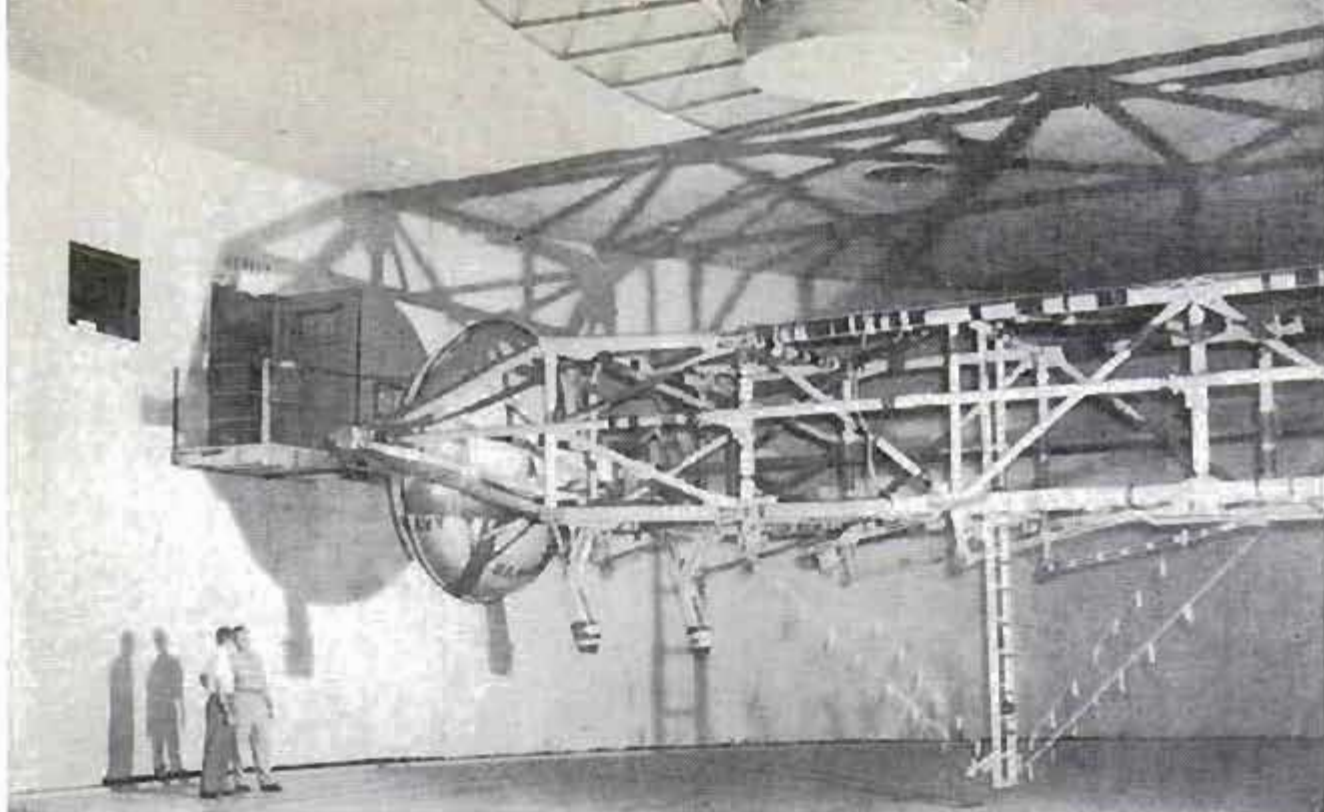




Astronauts make periodic trips to Wright Field to experience brief periods of weightlessness in a plane equipped for zero-G flights. Weightlessness is the most difficult factor to simulate during training

Grissom practices reactions in attitude simulator. He lies on couch, looking at projection of earth in mirror, and operates air jets to correct position of "capsule." Right, camera looks into periscope from outside





Cooper and Schirra inspect human centrifuge, which will whirl them around in simulation of space flight

were in the military they were also available to us. But it should be emphasized that throughout our search, the most important factor was technical skill."

Because these men were to be engineering consultants as well as pilots, the technical requirements dictated older men. The original list of 110 military test pilots invited to volunteer for the program was first winnowed to 32, and finally to the seven men selected as Astronauts. Seven

was considered the most workable number for the specialized training necessary; the seven men chosen also embodied special skills in particular areas which had to be explored as the Astronauts were being trained.

The Astronauts were released by their various service branches (three Air Force, three Navy, and Col. Glenn, the lone Marine) and reported to Langley Field for training last April. Since that time

Much of the Astronauts' time is spent listening to technical lectures and briefings given by scientists





Two F-102's are assigned for Astronauts' exclusive use. Men complain they don't get enough time in the air

the program has been moving steadily—but sometimes rather painfully—forward toward the day when the Mercury capsule will be secured atop an Atlas rocket and fired out of the Earth's atmosphere into space with one of these seven men strapped securely in the contour couch inside.

How do you train an Astronaut? There were no precedents to guide the directors of Project Mercury, and training devices had to be created almost from scratch. Here the technical skill of the Astronauts themselves proved of great help.

Astronauts Help Design Capsule

Wally Schirra told me: "One of our most important jobs is to put the pilot's ideas into the cockpit of the capsule. The engineers won't be going up into space with us. There's always a certain amount of conflict between the designers and the men who fly the machines, but we've worked it out well with the technical people here."

The Astronauts are stationed (and their families live in and around) Langley Field, near the southeastern tip of Virginia. They spend from half to two-thirds of their time at Langley; the rest is spent at various installations around the country where they personally consult on the building of equipment to go into the capsule or take training tests not available at Langley.

When I met with the Astronauts, they had just returned from a three-week trip to the West Coast which included extended visits at McDonnell Aircraft in St. Louis, manufacturers of the space capsule; Convair in San Diego, builders of the Atlas

rocket; and North American Aviation, which is building and testing the X-15. The week I followed them through their activities at Langley was typical of their fluid training program. Here are the essential elements of that program:

Technical lectures on basic astronautics, physics, astronomy, propulsion, biophysics,
(Continued to page 252)

Full-size model of capsule has retro rockets at bottom. Bags will float capsule if it lands in water





Right Out of the Barn!

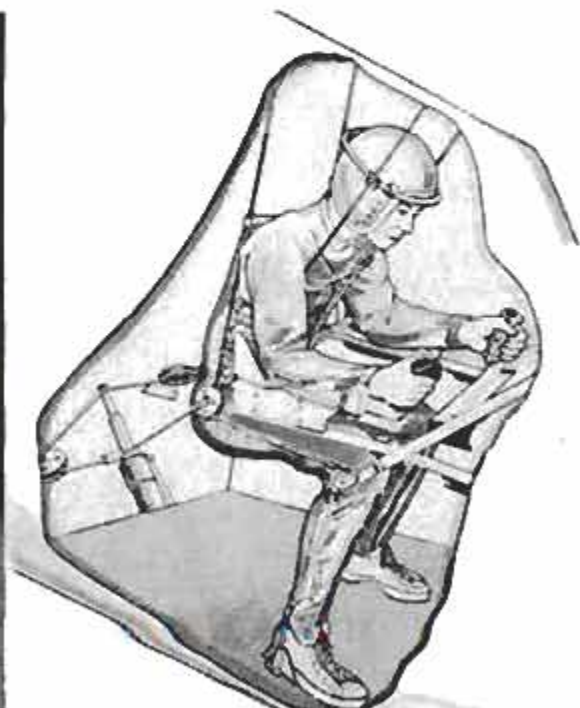
Both a jet fighter and a missile shoot out of a simulated ground shelter and streak away toward their targets. A self-contained "inertial" system, a form of memory navigation, makes the Air Force MACE missile invulnerable to enemy jamming. The system eliminates the need for ground control and guides the missile over any route, including water.



Built-in Steel Cables Support Spaceman's Suit

Though it looks like a suit of long-legged underwear, a new seat-suit design offers maximum protection and mobility for the future spaceman. Steel cables sewn into the seams of the nylon-net suit fasten the

suit to the spaceship's cabin, producing a hammock effect. The system permits the pilot to operate controls without tumbling around in gravity-free situations and protects his body from acceleration pressure.



NEXT MONTH--

PM's 8th Annual

AUTO ISSUE

Featuring--

PICTORIAL HISTORY OF THE AUTO INDUSTRY IN FULL COLOR

A six-page pullout that traces each present-day auto company back to its origin. The suitable-for-framing chart includes scores of drawings of old and new cars, chassis and engine diagrams covering six decades of automobiles.

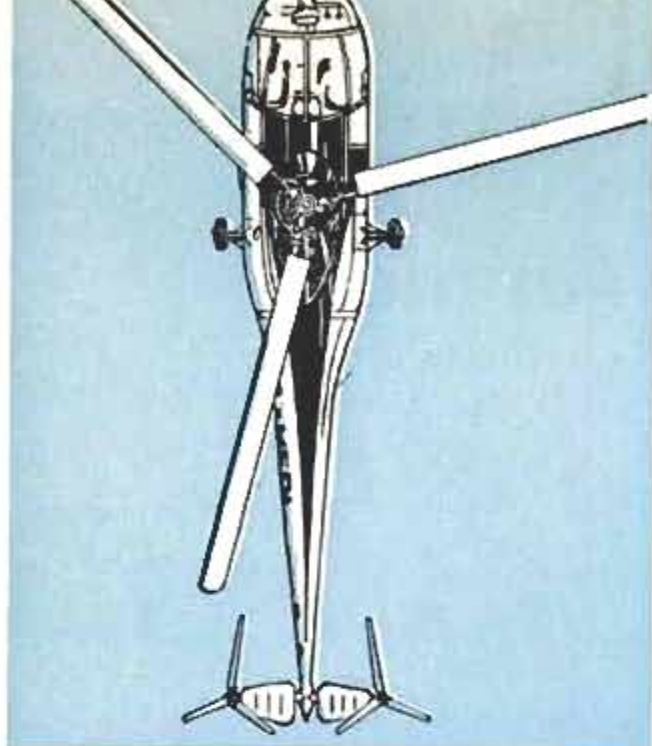
Also:

- Pictures and specs on all the 1960 cars, including many foreign makes
- Road tests on the new American small cars
- Engineering analysis of the Corvair, Falcon and Valiant engines
- Illustrated report on the World's Largest Auto Show
- Troubleshooting tips from a mechanic
- Plus all regular features

It's your yearbook of the auto industry:

PM's JANUARY AUTO SECTION

On the newsstand December 29



Three Rotors Operate First Postwar West German Helicopter

West Germany's first postwar helicopter, Kolibri I, operates with three rotors. In addition to its central rotor, it has two smaller ones on the tail that sit at 45-degree angles from the center line to provide greater stability and better control. Both the main rotor and the rear ones are three-bladed and all controls are operated by means of hydraulic pressure. While the helicopter underwent testing, its fuselage was kept uncovered. Tests have shown

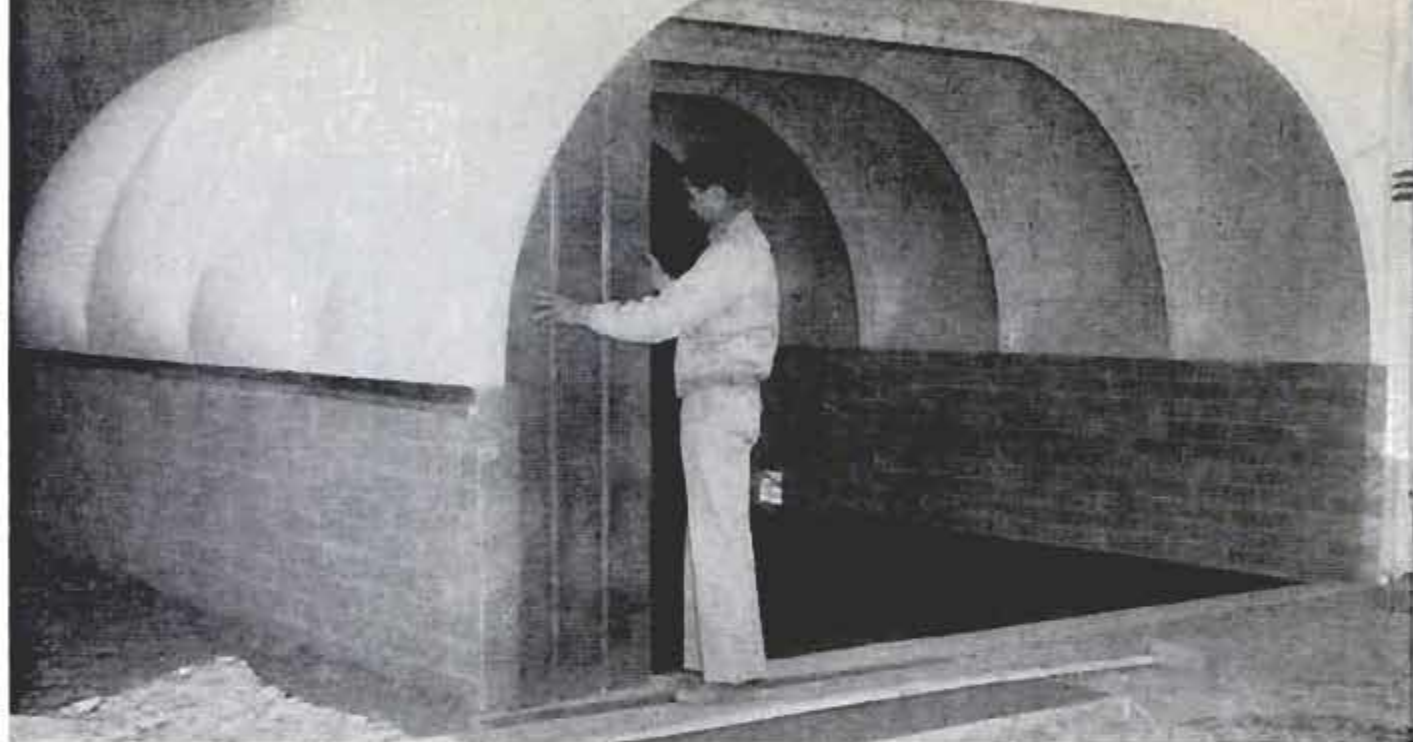
that the craft flies at a vertical speed of 99 miles an hour and a horizontal speed of 87 miles an hour. Its maximum altitude is 13,133 feet and it carries a pilot and two passengers. Designed by Professor Heinrich Focke, the helicopters are built by Carl F. Borgward GmbH of Bremen, Germany, the company that manufactures automobiles of the same name. The helicopters will be priced somewhere between \$37,500 and \$50,000.



Doglift Ends Stairway Problem

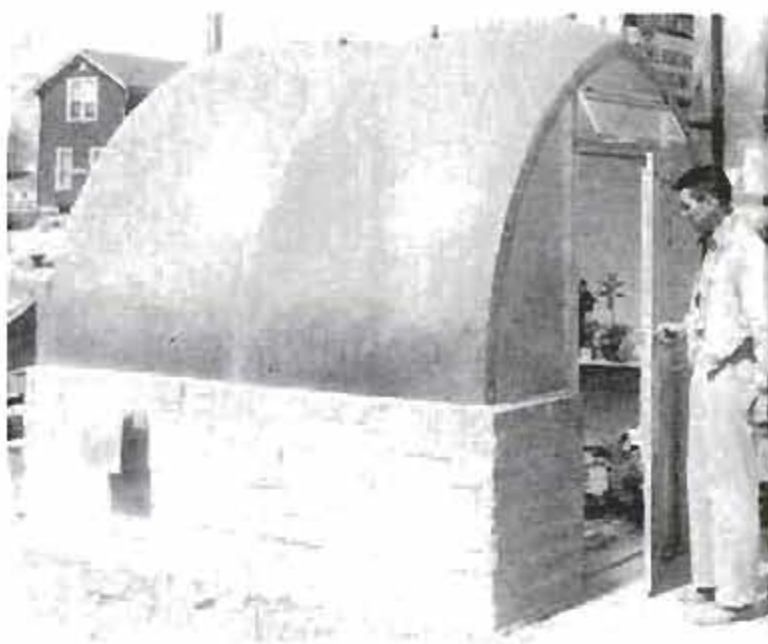
Actress Lynn Tracey is one of the few second-story pet owners who doesn't have a dog-walking problem, and her dachshund "Shortie" may be the only dog with a private elevator as a result. A friend rigged a basket lift which allows Miss Tracey to lower the dog to the garden from her second-floor apartment window. When he wants to come back upstairs, he climbs in the basket and rings a bell. The only trouble so far has been with a neighbor's big boxer; the big dog crams his bulk in the basket, pushes the button, and waits hopefully for a ride.





Fibreglas Sections Form Small Buildings

Curved Fibreglas sections in four-foot widths are joined to form a greenhouse, garage, storage building or other utility structure. The sections can be assembled by a handyman, and once they're erected, they're virtually maintenance free. The Fibreglas pieces rest on a masonry base. The greenhouse is sold as a complete package which includes doors, windows, screens and a heating and ventilating unit with thermostatic controls. The greenhouse canopy diffuses sunlight and prevents the burning of young plants.



Tire Inflated in Cage

Steel pipes and a steel plate make up a safety cage for inflating giant tires. Orders for building the safety device were given by Brigadier General George W. Power, commanding general of the First Guided Missile Brigade at Fort Bliss, Texas. The tire is placed in the cage so that it stands upright and is inflated through the bars. Pipe for the cage is one and a half inches thick, and is considered nearly foolproof in case the tire should blow up.



☐ There are 1.3 fatalities for each 100 million miles of travel on U. S. turnpikes — about half the fatality rate of 2.3 on other highways, reports the National Safety Council.



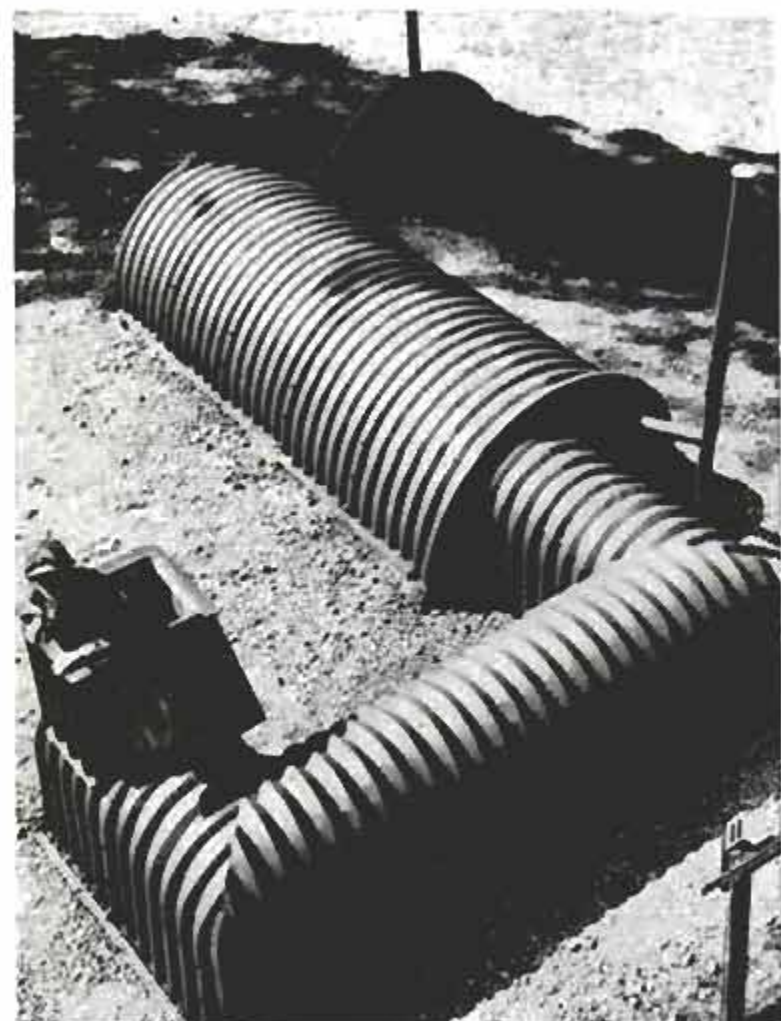
Ball Separates Oil Products

Inserted into a petroleum-products pipeline, a water-filled ball helps reduce by 50 percent the mixing that occurs when different oil products are pumped one after another through the same line. Shell Oil Company reports that as many as 10 of the balls may be used at the same time to separate various products that are moving through the pipeline.



Stand Holds Crooked Trees

Crooked-stump Christmas trees are no problem with a new tree stand that serves as a brace as well as a holder for any shape of tree. The tree holder allows you to take the tree as purchased, insert its trunk in the cup on the stand and then clip the trunk to a sturdy pipe, supported by circular tubing. It's not necessary to trim attractive bushy bottom branches.



Steel Troop Shelter

Replacing individual foxholes as a means of shelter for soldiers, a corrugated steel covering, called a "group helmet," has been demonstrated in Sweden. Instead of each man digging his own foxhole, a large pit is dug and the steel covering is placed over it. The "group helmet" is then covered with earth to help protect against possible radioactive danger. Here a soldier emerges from the exit of the protective cover. The apparatus, relatively light for its size, weighs about 2800 pounds.

Arrow Poison Ingredients Relax Patients in Surgery

Dr. Paul Karrar of the University of Zurich, Switzerland, has synthesized two of the 63 alkaloids (saltlike substances) found in the poison, calabash curare, and they are being used in Swiss hospitals to relax muscles of patients in major surgery. For centuries, Orinoco natives of the Amazon have used arrowheads poisoned with curare to paralyze prey.

YOU DID IT—you brought on the revolution. Are you happy? Did you get what you wanted?

After all, Detroit was shooting in the dark. It knew you wanted more economy, but how much more? It knew you wanted smaller cars, but how much smaller? It knew you wanted less opulence, but how much less? Are the new small cars what you wanted?

Small-car sales look good. Even better than expected. Chevrolet, for example, set up production to sell five big Chevys for each Corvair. After the cars came out, the ratio was lowered to four to one. Now, it looks as though it may come down to three to one.

Most 1960 models are out, but there's still excitement ahead. Ford Motor Company has announced it will bring out another "small" car, the Comet, to be sold by Mercury dealers this spring.

It will share much Falcon structure and machinery. Wheelbase will be 114 inches (the Falcon's is 109.5). The added length will be mostly in the trunk. The engine is expected to be the same as Falcon's except for more displacement.

Like the Falcon it will come as a two-door, a four-door plus a two-door wagon. The Falcon wagon is to be available by January and will sell for about the same as the Rambler American wagon.

Buick and Dodge will get into the big-small-car act, but probably not until next fall. Buick's will be all new. It won't be able to borrow from Corvair. You can't put a flat six between the front wheels. This just doesn't leave enough room for steering. Dodge's version may be a stretched Valiant.

Still to come is the Chrysler 300F. As before, it is the Chrysler shell with a distinctive grille, ornamentation and running gear plus plenty of power. The interior is emphatically "sports car" with four individual bucket seats. The driveshaft hump between the seats is covered by a panel containing such items as a tachometer, a sweep-second-hand clock and radio controls. It may offer an optional four-speed handshift transmission with a short, stubby lever coming up from the floor. The transmission that may be used is European and synchromesh in all gears. (If this keeps up, we'll be calling automobiles "pleasure cars" again!)

Is the industry going back into racing? There is evidence that it may. Top stock-car drivers are being signed up sub rosa by at least one company. Another company is working out a fuel-injection system obviously aimed at the race course. Items such as super-large-capacity radiators are being added to parts lists, ostensibly for



DETROIT LISTENING POST

By Art Railton

the taxicab trade. Watch for something to break soon. Involved could be Ford, Chevy, Pontiac, Plymouth and even Buick.

What's ahead for 1961? Is there anything exciting left? You bet there is. It will be as big a year for surprises as 1960. General Motors' transaxle is set for the 1961 models, from Cadillac down to Chevrolet. This will make the front seat a three-passenger seat once more. Bodies will be quieter in their styling, more sane in design (but lower, of course).

There will be less of the complex sheet-metal work, less crispness. Cars will look more like a cake of soap that's been used once. Even the big cars will occupy less geography, you'll be glad to know.

The Thunderbird will get some competition. The other companies are going out after some of that profitable business. One story is that this is to be De Soto's role in the Chrysler Corporation—to put out a distinctive car for the luxury class to compete with the T-Bird. Chevrolet is thinking along similar lines with a beautifully finished, jewellike version of the two-door Corvair. The only question is how big is the market? Do all people with lots of money insist on big cars? The Thunderbird seems to prove otherwise. Maybe even the rich like their automobile pleasures small?

Some 1961 cars may offer front-mounted mufflers. There are some legal hurdles to jump, but these have not stopped the industry before. By running the muffler crosswise under the front end, expensive, meandering exhaust pipes are eliminated. Exhaust gas is dumped into the front-wheel turbulence where it is dissipated harmlessly. The problem is to get the exhaust pipe far enough from the heater air intake to meet legal restrictions.

Big news also will be a heater-air-conditioner combination that operates on the heat-pump principle. Using engine heat to cool as well as to heat, it is cheap, small and solves the problem of air conditioning low-horsepower cars. With the help of a compressor, it gives hot air in winter, cool air in summer. ★ ★ ★

Skiing Is for Everyone:

By Stan Tomlinson

Chief Instructor, Squaw Valley Ski School

WITH A FEW hours practice of what you are reading here you can learn the rudiments of modern downhill skiing.

For best results you should practice these lessons in the sequence in which they are given. They are the same lessons that I give my beginners' classes at Squaw Valley, Calif.

First of all, your equipment: In selecting the length of ski you need, a rough rule is that when you stand a ski on end you should be able to reach up and catch its tip in the palm of your hand. A shorter ski will do if you are lighter than normal. Short skis are more maneuverable, long skis are fastest and track best. All good modern skis have steel edges that allow you to bite into the snow on side slopes. Modern ski techniques are based on this feature, and this is the kind of ski you want. The bottoms need waxing once a day. Use a paraffin wax for wet snow, a "silver" wax containing graphite for drier snows. Most modern skis have plastic bottoms that take the wax very well. Inexpensive skis that have varnished bottoms can be improved a great deal by removing the varnish and applying a coat of lacquer.

Your ski boots should fit snugly, more so than walking shoes, and should attach to the skis with safety bindings that release you in a spill. You'll want sun glasses, snug warm clothing and gloves or mitts. The two ski poles should come up to your armpits. The safe way to hold a pole is to run your hand up through the leather loop so that the leather rests in your palm, then grasp the pole as shown. This grip will allow your hands to slip free in case of a spill without losing the poles.

Always try a new outfit on at home where you have time to become familiar with it. This saves possibly an hour of making adjustments when you are out on the snow.

First I ask new skiers to walk around on their skis on level snow for 10 minutes or so, to help them become accustomed to the skis. They learn how easily the skis slide through the snow, how to propel themselves with the poles and how to turn around by taking a series of short steps.

Making a Kick Turn

This method of turning won't work on a side slope, so the first actual lesson is how to make a kick turn. This always is done while standing still.

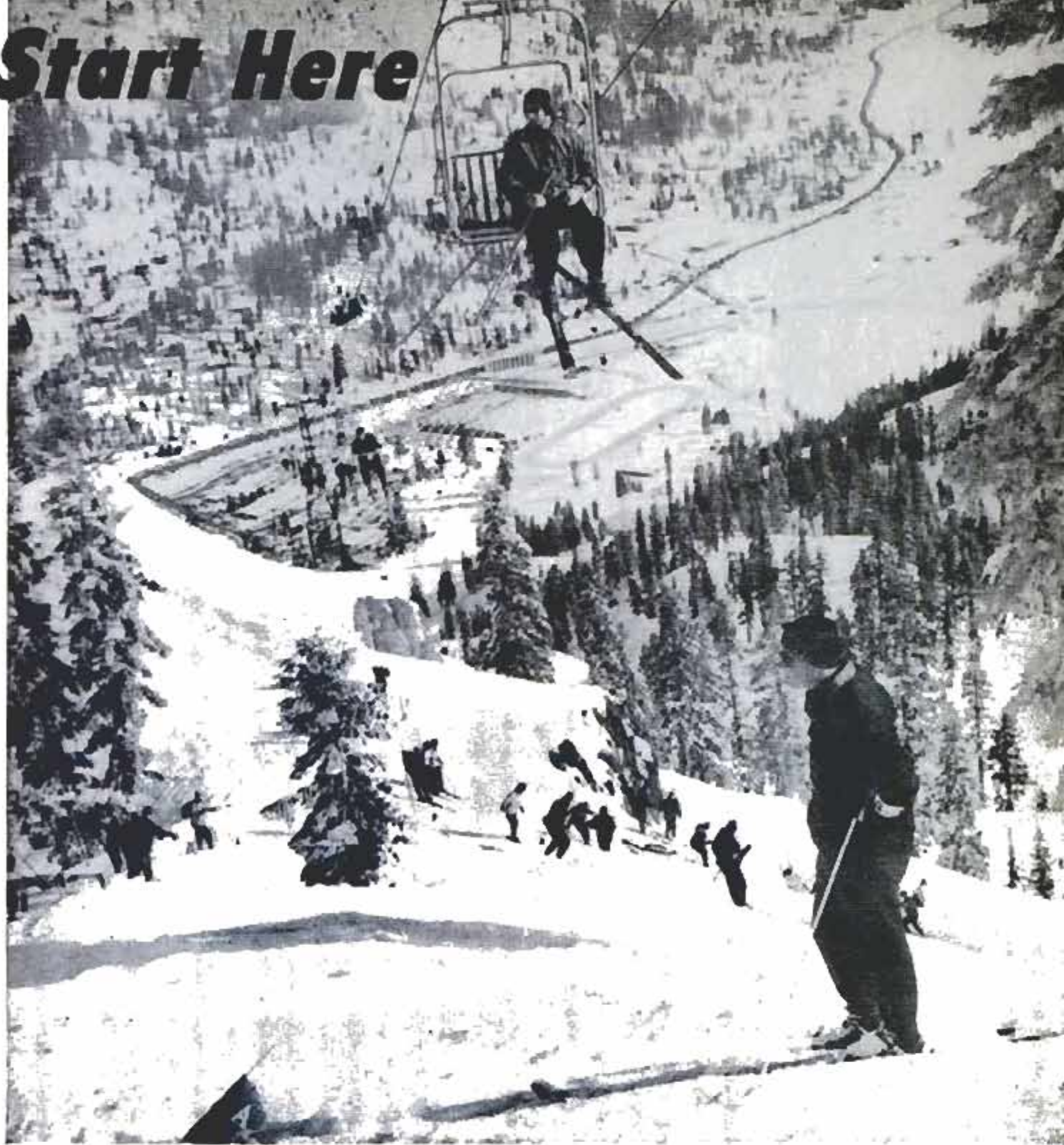
With part of your weight resting on the poles, kick one foot up until the heel of that ski rests in the snow. Now pivot on that ski, turning your foot outward and around and bringing it down beside your other foot, at the same time bringing one pole around to help keep your balance. Now pick up your other foot and bring it around into place. The turn is now complete. Some people find it easier to do a reverse kick turn, first drawing one foot back and around and then kicking up the other foot and pivoting it into place.

Your next lesson is how to walk up a small hill. It's done sideways. Stand at the bottom with your skis parallel and sideways to the slope. Step sideways up the hill with one foot, bring up the other, and take another sidestep. It's

First, get "feel" of your skis. Here, author demonstrates proper form



Start Here



necessary to dig in with the uphill edges of the skis to prevent slipping back; in fact part of the reason for this lesson is to teach you the importance of the edges and how to use them. After a few such climbs you can try the half sidestep, stepping up and forward at the same time and always digging in with the edges. This is somewhat less tiring and carries you diagonally up the slope.

Now practice the herringbone climb, named for the pattern the skis leave in the snow. Face straight uphill with the tails of the skis close together and with their tips about three feet apart. Plant each foot firmly in the snow as you walk ahead, using the inside edges to prevent skidding, and using your poles to prevent slipping back.

By now you are ready for the first downhill runs.

Spectacular Squaw Valley will be the scene of the 1960 Winter Olympics. Chair lift is one of several for the skiers. Below, ski pole is held with loop of leather across the palm. This grip permits hand to let go without injury and without losing pole





Don't try this if you are a beginner! At Squaw Valley, championship skiers deliberately make long jumps in a downhill race to gain speed. Championship skiing requires split-second timing and keen balance



Use a very gentle practice slope, 50 to 100 feet long, preferably level at the top and with a long flat runout or even a slight rise at the bottom. Keep your skis parallel and no more than four inches apart. Lean forward a bit with bent knees almost as if you were preparing to kneel on your skis. This attitude helps maintain your balance.

After pushing off with your poles at the top of the slope, reach forward slightly with the arms and hold your poles pointed toward the rear. This, too, helps you keep your balance and that's principally what you are learning at this point. Don't look

SNOWPLOW STOP:

Feet are spread and tips of the skis are brought close together. Note how skis are riding on their inside edges. Friction on these edges stops skier

KICK TURN:

Part of weight is rested on poles to balance yourself. Then kick up left foot until tail of ski rests on ground. Pivot foot outward and around until feet are again parallel but pointing in opposite directions. Remaining ski then is swung around and into place, completing turn

down at the skis. Keep looking some distance ahead and continue to coast along until you glide to a stop. After you've made a dozen or more easy runs and have gained confidence, you may stand straighter if you wish, and even push yourself along with your poles to go faster. Bending and extending the legs will usually help you relax.

Snowplow Stop for Beginners

Learning how to stop is the next step, and the snowplow stop is the easiest for a beginner. It's done at slow speed in easy snow. While you are coasting down the practice slope, apply the brakes by spreading your feet and pointing the tips of the skis toward each other. Press your heels out so that the skis ride on their inside edges. The friction produced by the edges will bring you to a stop in 15 or 20 feet if you are not traveling too fast.

This snowplow maneuver may be used for making slight changes of direction and also for complete turns. With the ski tips close together and riding on the inside edges, shift some of your weight away from the direction in which you wish to turn by leaning your shoulders to that side. This puts more weight on the outside ski and tends to make it track in the direction it is pointed.

The skating turn is another way for changing direction on easy slopes. It's the same kind of turn you make on ice skates, a series of short steps that gradually lead you around.

When you can handle yourself in these maneuvers you are ready to traverse a steeper slope. Traversing allows a skier to select his own downhill grade, no matter how steep the hill happens to be. He travels downhill in a series of tacks, moving first in one direction across the slope and then in the other. With knees slightly bent and with the skis resting mainly





Running a slalom course, a skier demonstrates how edges of skis dig into snow while turn is made downhill

on the uphill edges, keep the uphill ski about half a bootlength ahead of the other. This allows both knees to bend the same amount and lets you place more weight on the downhill ski, preventing it from slipping away.

When you reach the end of the traverse there are several ways in which you can stop and turn, preparatory to the next traverse. One is to use the skating step to turn uphill. Or you can snowplow to a stop. Now you make a kickturn to change direction, then shove off on the next traverse. Or, you may make a snowplow turn downhill

and then continue traversing without stopping at all.

Incidentally, one of the mountains that rims Squaw Valley and on which some of the Olympic events will be run in February, is known as KT-22. The mountain is named for the fact that the first woman to negotiate its steep slopes required 22 kickturns to reach the bottom.

Don't point your skis at too steep a downhill angle when making your first traverses. It's safest and gives you more confidence to pick a flat angle that allows you to slide

(Continued to page 236)

HERRINGBONE CLIMB:

Inside edges of the skis help prevent skier from slipping backward. Poles also provide leverage



UPHILL SIDESTEP:

Easiest way for the beginner to go uphill, and it teaches you to dig in with uphill edges to prevent sliding down





Railroad Ferries Carry 40 Autos

Two railroad ferries, capable of transporting 40 automobiles and 10 freight cars each, connect their respective ports in Switzerland and Germany. The Swiss ferry, *Romanshorn* and the German ferry *Schussen* are each 180 feet long and 39.3 feet wide. The two ships have twin 600-horsepower diesel engines and are capable of attaining speeds of about 15 miles an hour. Both of the vessels are equipped with radar.



Experimental Outboard Motor Tests Unique Features

Following the lead of the automobile industry in building experimental models to explore new design ideas, the McCulloch Corporation has built the Scott R-120, a high-performance outboard power unit which incorporates many new features. The four-cylinder radial engine develops 125 horsepower from 90 cubic inches of displacement, but is smaller in every dimension than current outboards of half the power. A turbo-supercharger improves fuel economy while increasing performance, and gives automatic altitude compensation and better sound control. An oil-lubricated crankcase eliminates fuel mixing and cuts oil consumption; the engine has direct cylinder fuel injection. All engine controls are remote and electric. The motor is hung from the transom on a mount that lets it tilt forward *behind* the transom and keeps the powerhead out of the boat at all times. Steering is done by moving the lower unit only; the powerhead does not turn. Tilt and trim of the motor are also remotely controlled. The propeller pitch is variable and reversible. The experimental model is not intended for production and sale, but its features may eventually be incorporated in Scott production motors.

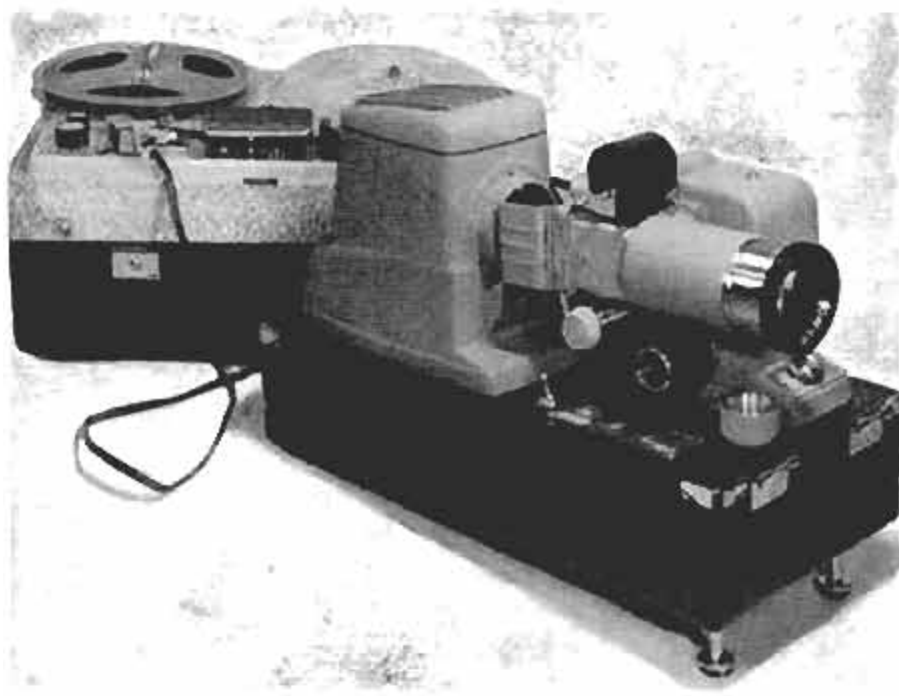
Unique features of the experimental Scott R-120 will be displayed at the major 1960 boat shows





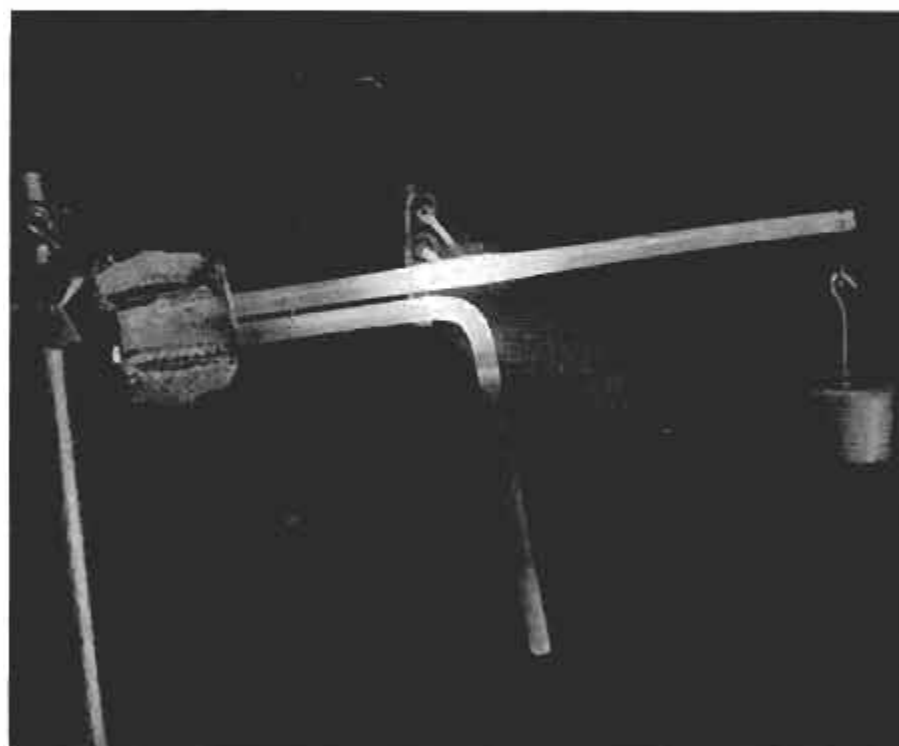
Sea-Going Truck "Flies" on Water

Suspended on three hydrofoil water wings, this 26,000-pound "Flying Duck" can travel 50 miles an hour with its hull four feet above the water. The converted amphibious landing craft, developed for the Army, uses a Lycoming T53 gas-turbine engine. It rises from the water at 13 miles an hour and can maintain high speed over a long, rough-water haul.



Tape Recorder Runs Projector

Home color transparencies and a "sound track" can be presented in unison while the operator sits back and enjoys the show. The tape recorder is attached to the projector, and, once adjusted and set in motion, the recorder changes pictures in synchronization with the narration. The tape can be re-used for new sound as often as desired, and the recorder can be adjusted so that it will change transparencies to suit the new narration.



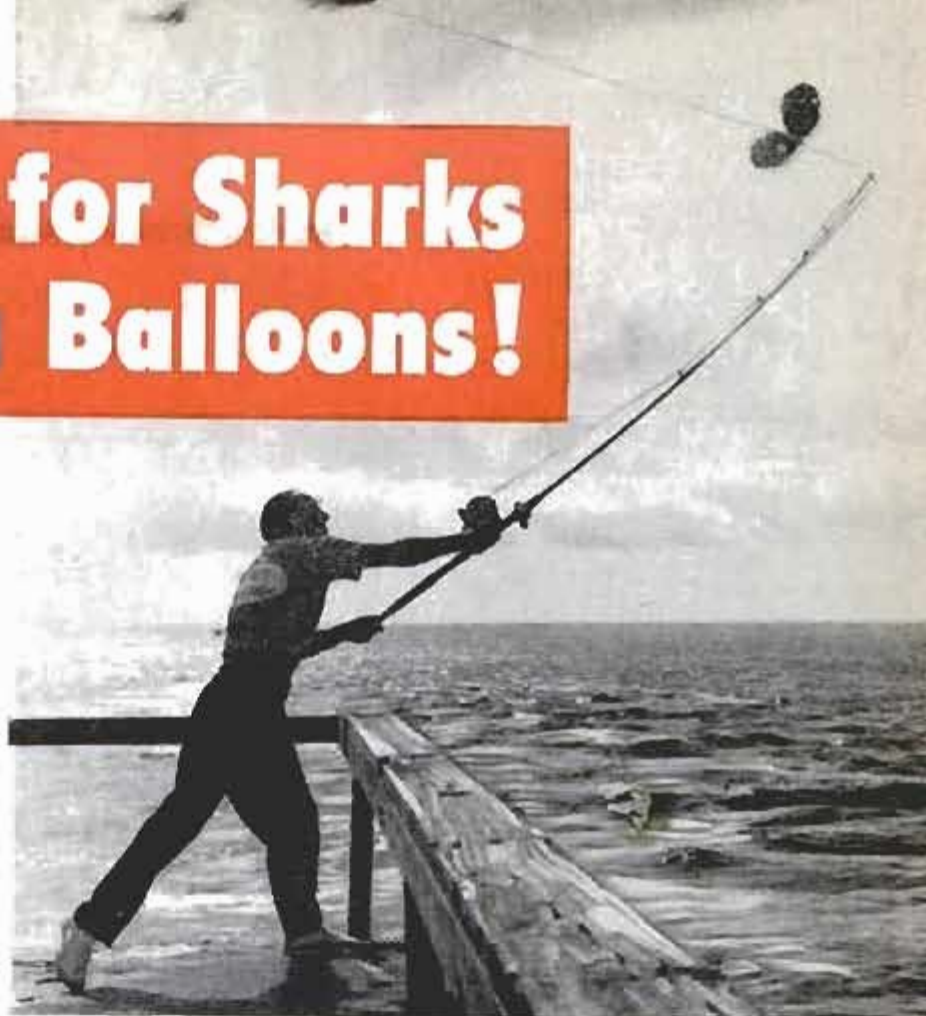
Strong Ceramic Is Translucent

Lucalox, a polycrystalline ceramic developed by General Electric Company, has in its unique combination of properties high strength, heat resistance, ease of fabrication and the ability to transmit light. It is made from powdered aluminum oxide and is closely related to sapphire and ruby gem stones. In tests, a bar of Lucalox and another of fused quartz were heated; the quartz bent under its own weight at 2350 degrees while the Lucalox supported 50 grams.

He Fishes for Sharks — With Balloons!

By
George X. Sand

Louis ("Herb") Goodman heaves mightily to cast bait and balloon floats into the outgoing tide. The current carries his bait out to where the big sharks feed



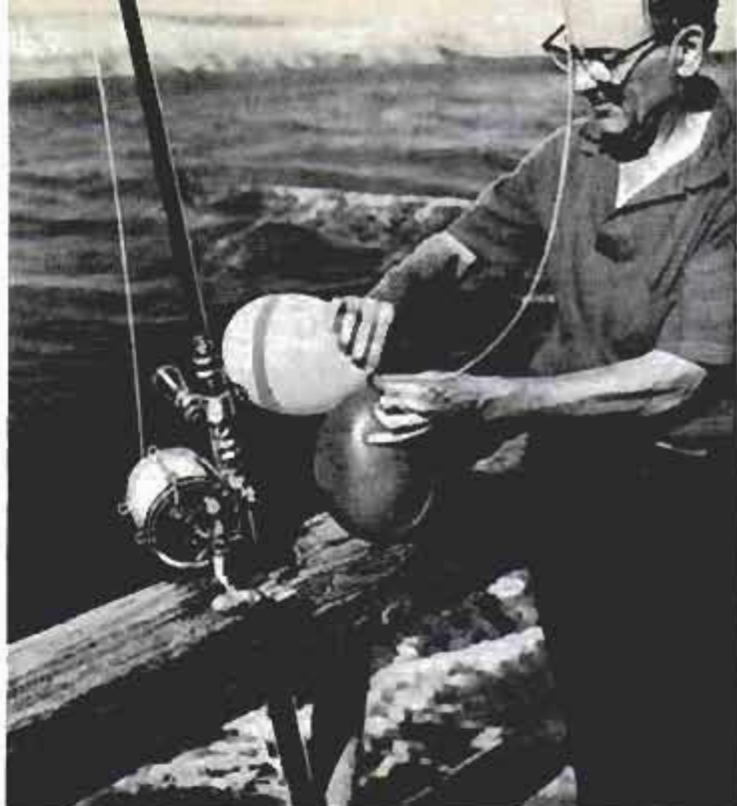
Down in Lake Worth, Florida, a wiry 130-pound fisherman passes up the popular salt-water fish and slugs it out from a jetty with sharks four times his weight . . .

Toughest part of the fight—Goodman wades into waist-deep surf to gaff a still-dangerous blue shark





Typical bait—a keeping-size bonito laced with two hooks. Third hook carries “teaser”



Bright-colored toy balloons keep the bait moving off the bottom, act as a bobber, and mark its position as it goes

HERB GOODMAN lives within rock-throwing distance of Florida's finest salt-water game fishing. His tackle shop in Lake Worth serves fishermen and charter-boat outfits that work offshore into the fabulous Gulf Stream grounds for sailfish, marlin, tuna, and other big game species.

Pesky little (four foot!) barracuda interferes with an outgoing bait. Herb once hooked a six-foot sailfish this way



But he passes up the glamor fish and does his fishing from shore, and for only one kind of fish—sharks, and the bigger the better.

In six years of strenuous fishing, Herb has landed 65 big sharks weighing up to 600 pounds, and hundreds more under 100 pounds, which he doesn't count. His biggest catch was an 11-foot 4-inch hammerhead. He's lost count of the number of fish and rigs he's lost (he uses 10/0 Scobey hooks at 25 cents apiece, and 130-pound test line at \$13 per thousand-foot spool, and often loses the whole works when a big shark strips his reel).

Herb has worked out a unique method for getting to his sharks—he stands on the north jetty of the Boynton Beach inlet, which is noted for its fierce outgoing tides, and lets the outrushing current carry his bait out to sea. The bait is a big chunk of bloody fish; bonito or kingfish or dolphin, and he lets the tide carry it out a thousand feet or more. A couple of balloons, in bright colors for easy visibility, serve as a combination of float, bobber, and spotting device.

Goodman uses a homemade nine-foot glass boat rod with an



Goodman beaches a nine-foot, 350-pound blue shark while a bystander holds the rod. Like most shark fishermen, he always inspects the stomach contents of his fish, but says he "never finds anything interesting"

auxiliary handle bolted above the reel seat for heaving against the big fish, and a big game reel of a size more often associated with marlin and tuna. Bait is easy—the sport fishing captains who pass through the inlet encourage Herb to rid the waters of all the sharks he can, and provide him with bait fish. They also speed his fishing occasionally by carrying his bait offshore on their way out.

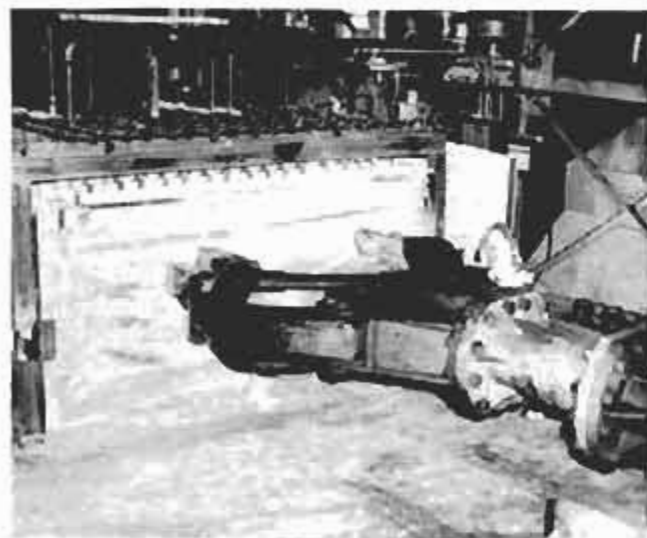
Usually Herb manages to persuade a bystander to carry his bait and balloons to a bridge over the tidal rip and drop it in for him. When no one is around, the huge

bait requires a heroic casting technique shown in the photograph on page 93.

The long, hard job of wearing down the powerful sharks attracts a lot of attention along the waterfront. The day he beached the 11-foot hammerhead a crowd of over a thousand crowded the area, blocking traffic a mile down the highway. The bystanders help, though—when the shark is whipped down and ready to beach, Herb must hand the rod to someone while he wades into the surf to gaff his fish as with the nine-foot, 350-pound blue shark that he caught "to order" for these *PM* photographs. ★★

Big shark puts a good arc in Herb's rod as he plays it back through the tidal currents toward the beach





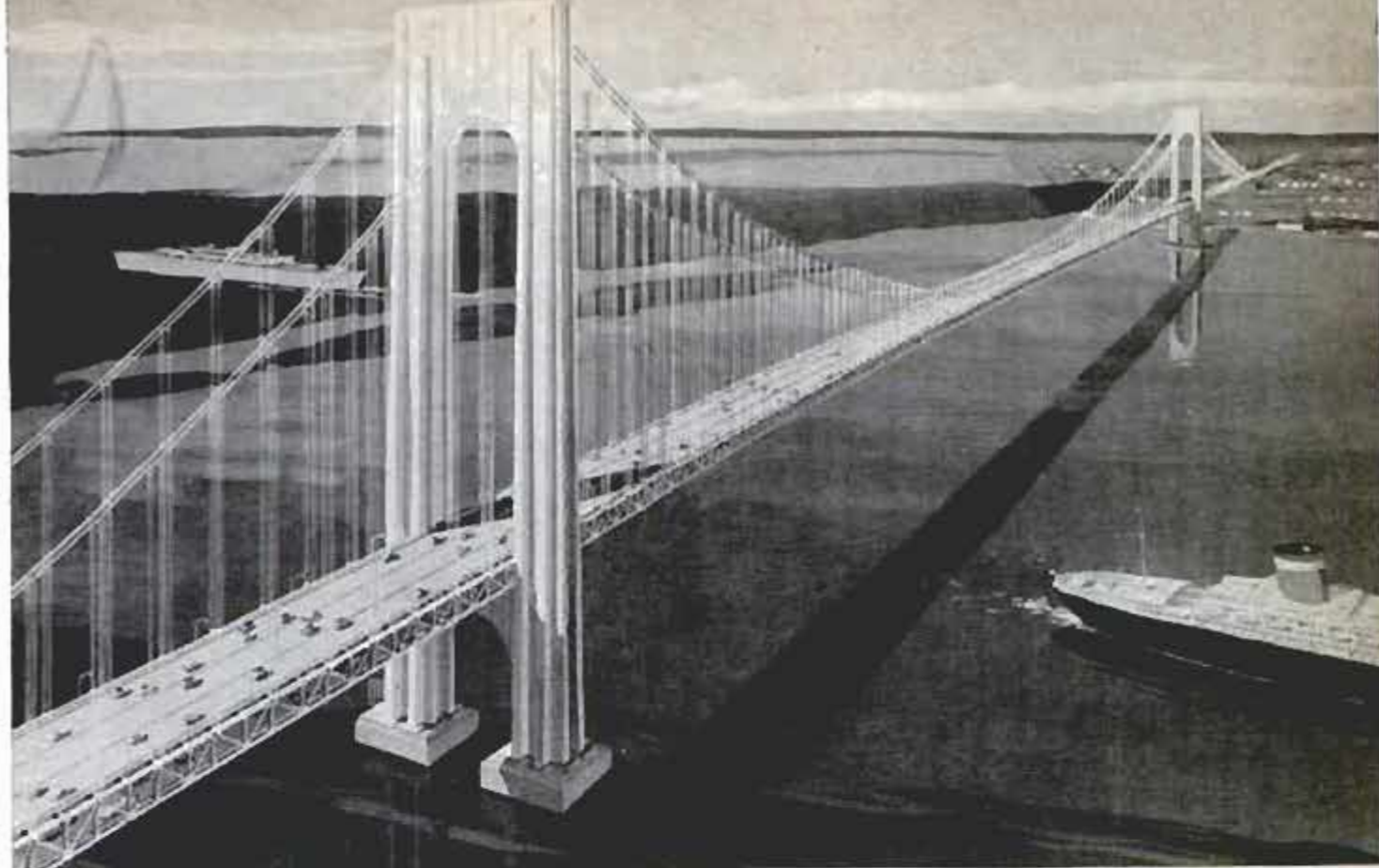
Heat-Absorbing Shield Forged for Space Capsule

America's manned capsule designed to circle the globe in just 90 minutes will have a huge, heat-absorbing shield made of beryllium. The dish-shaped piece has been forged by Alcoa from a record-size billet supplied by Brush Beryllium Company. The workers shown above in aluminized suits are guiding the die set's top half into the bottom half. At the left, a beryllium billet in steel jacket is removed from the furnace after being heated at about 2000 degrees Fahrenheit. During the rocket ride, the beryllium shield will form the outside covering of the space capsule's "floor."



Globe Shows Satellite Movement

Two scientists at the Sohio Research Center in Cleveland, Ohio, have invented a globe that can illustrate, in proper scale, a satellite's orbital movement about a celestial body at any desired time. Made from a bowling ball, the device also enables scientists to calculate the position of a satellite when viewed from any position on the celestial body. The globe has two rotatable hemispheres. The upper one represents a terrestrial hemisphere; the lower, the celestial sphere. The terrestrial hemisphere is inscribed with meridian and latitude lines, and the celestial sphere graduates in declination and right ascension.



World's Longest Bridge Under Construction

Ground was broken recently on Staten Island as construction began on the \$320,000,000 Verrazano-Narrows Bridge that will link Brooklyn and Staten Island when completed in 1965. The suspended center span of 4260 feet will exceed the 4200-foot center span of the Golden Gate Bridge in San Francisco, currently the world's largest. From anchorage to anchorage, the bridge will be 6690 feet long, supported by 690-foot steel towers at either end. Including the immediate approaches, the new structure will be nearly three miles long. It will have a double deck with six traffic lanes on each level.



Electric Candlelight for Table Makes Attractive Display

Thanks to a German manufacturer, hostesses can now have the beauty of candlelight at their tables without the concern about wax drippings on the tablecloth. The manufacturer has marketed a seven-arm candelabrum that holds electric bulbs shaped like candles.

□ A Norwegian scientist has computed that the Gulf Stream gives off as much heat to the Norwegian shores as would be produced by burning the oil required to fill a 100,000-ton tanker every other minute.





Yale's Unique Hockey Rink Doubles as Campus Center

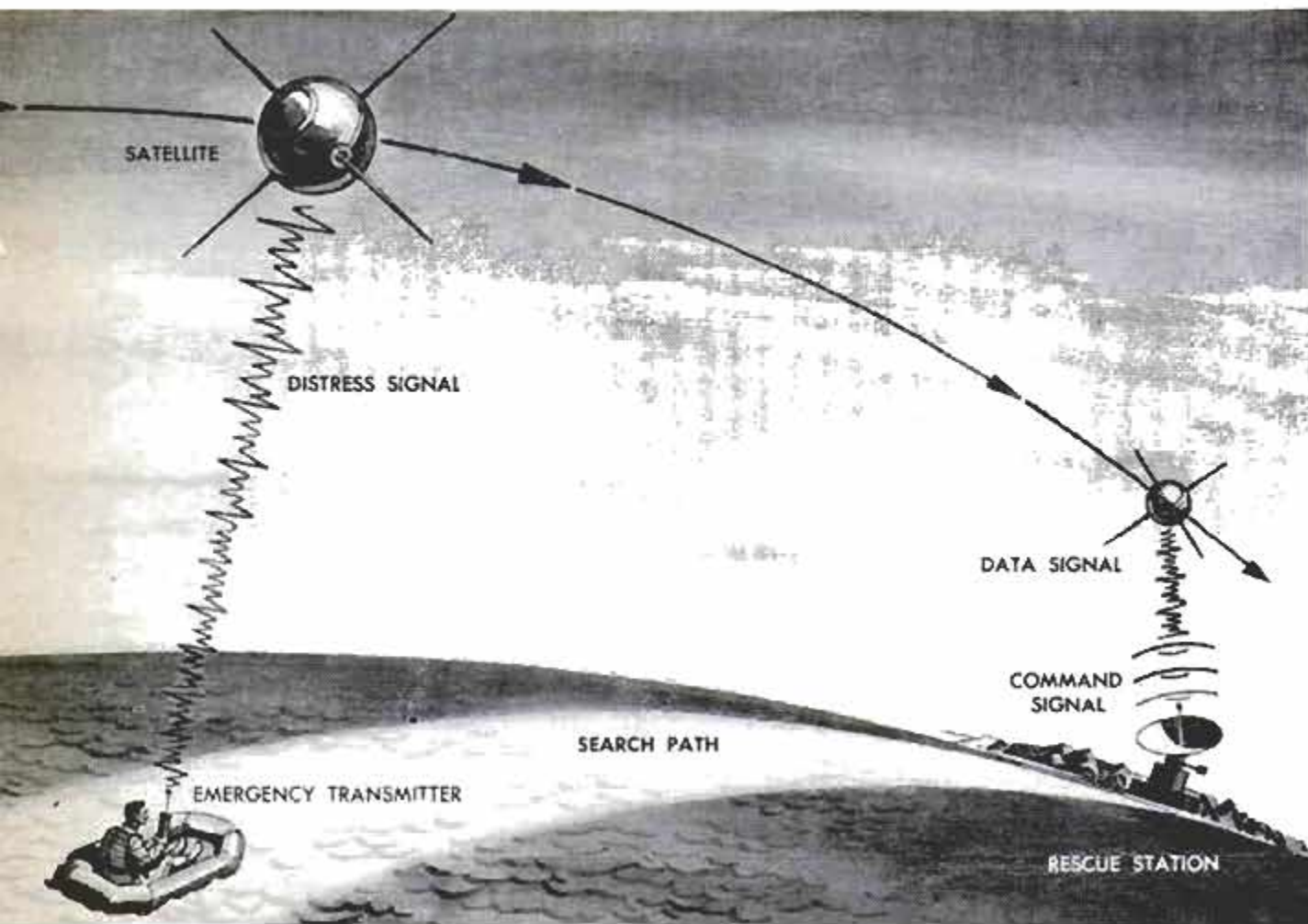
Looking like some prehistoric monster, Yale University's hockey rink serves as a unique activity center for the campus. When the skating area is not in use, the structure will seat 5000, and can be used for lectures, concerts and dances. The unique

feature of the rink, designed by Eero Saarinen, is a central concrete arch that forms the backbone of the building. The ceiling of planks, covered with black plastic neoprene, is suspended on cables like those used in a suspension bridge.

Satellites May Find Craft Lost at Sea or in Air

Satellites, orbiting far above the earth, may soon be able to help search out and locate to within one mile any type of craft in distress. Lost craft in the air or at sea, including nose cones and space capsules, would be equipped with subminiature radio

transmitters so that they could send out distress signals. Satellites, receiving the signals, would measure their frequency and transmit them to ground stations. Analysis of the signals by ground crews would locate the lost craft.





Chrysler's Valiant Offers Two and Three-Seat Station Wagons

First of the Big Three's compact station wagons is the Chrysler Corporation's Valiant Suburban. Available in two and three-seat versions, the wagons continue the continental styling of the sedans. The wagons feature a cantilever roof post structure. Side windows wrap around into the rear end. Captive-Air tires are standard on the rear-facing third seat wagon

and can be obtained as an option on the two-seater, providing locked luggage space under the floor usually taken up by the spare. The rear window rolls into the tailgate, which opens as a single piece, similar to other Chrysler wagons. The two-seat wagons are the same length as sedans, three-seaters 1.1 inches longer. Both are unit-constructed on a 106.5 wheelbase.

Compactor Speeds Construction

Two 15-foot rows of vibrating shoes do the job on a giant road-building machine that compacts granular material into pavement foundations in half the usual time. Hydraulically operated and controlled, the shoes will compact up to 1500 tons of rock and sand screenings an hour. One engine drives the hydraulic pumps and another the roadpacker.

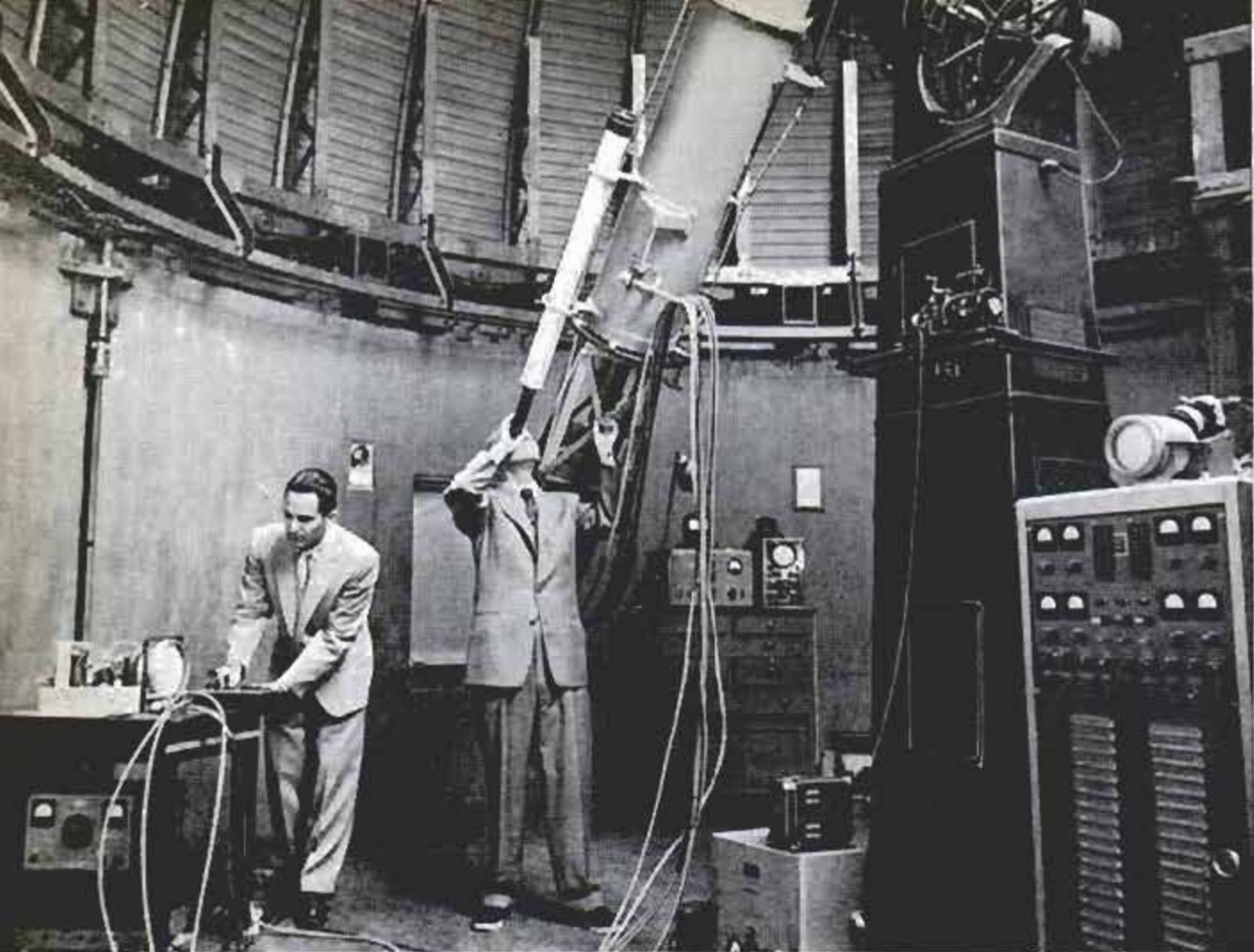


Christmas Tree "Plugs" Into Simple Conical Stand

Just two simple operations are necessary to erect a Christmas tree on a new stand. First, a plastic plug is screwed to the bottom of the tree trunk; second, the plug with the tree attached is inserted into a recess in the conical base of the stand. It

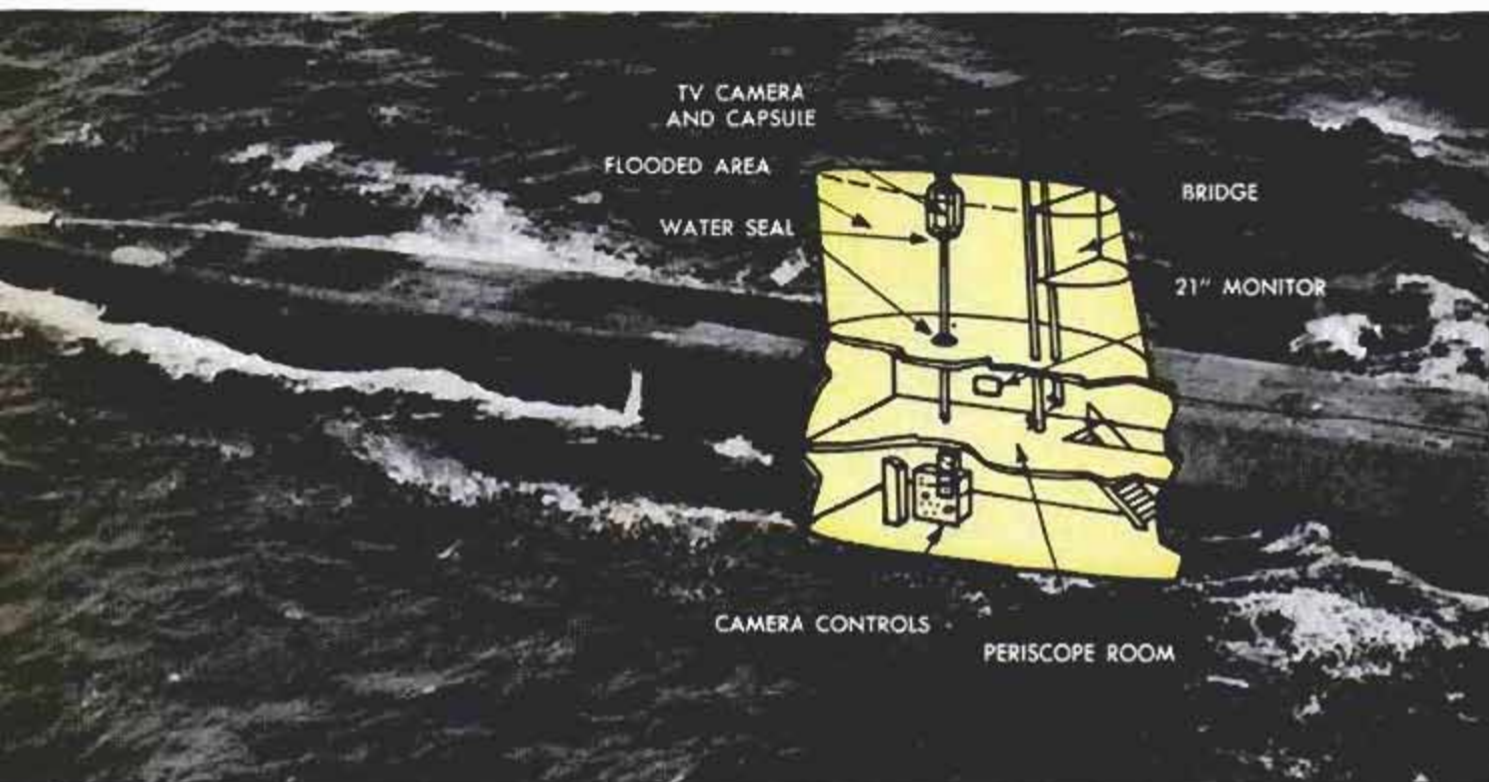
isn't necessary to cut off low branches of the tree or tighten pressure screws to get the tree up. The base, 19½ inches in diameter, has leveling screws on the underside and a cup around the base of the tree to hold water.





Light-intensifying system connected to 10-inch telescope permits stars to be photographed in broad daylight

"CAT EYE" TURNS NIGHT



By
Art Zuckerman

AN ATOMIC SUBMARINE glides cautiously under the polar ice cap, its skipper intently watching a 21-inch television screen set into the bulkhead of the control room. On the screen he sees the ice cap itself gliding ominously overhead. He can make out details of its structure.

Suddenly a huge break in the ice comes into view on the screen. Just what the skipper has been waiting for. He orders the ship trimmed for surfacing. Soon he stands on the bridge, watching a "shore party" of his men at work collecting specimens from the floes that make up the polar cap.

The television rig that enabled the submarine commander to see where he was going under water is no ordinary TV setup. It is a unit that actually amplifies light. It provides a picture in the underwater darkness where ordinary television equipment would draw a complete blank.

Submarine exploration is but one of many applications being found these days for the electronic amplification of light.

Near the Wright Air Development Center, at Wittenberg College in Springfield, Ohio, the Air Force is working on television gadgetry coupled to a 10-inch refracting telescope that makes it possible to photograph a star in broad daylight. More important by far is the fact that the device shows details of heavenly bodies never before visible with such a small telescope, and it permits the taking of astronomical pictures with a sharpness never before possible with any telescope.

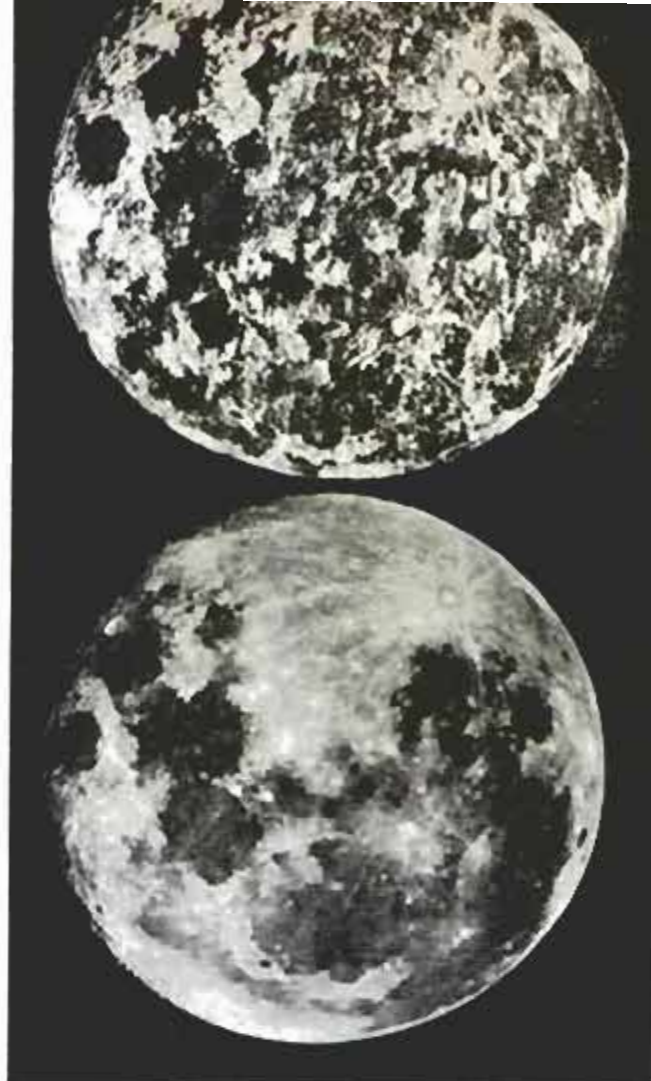
Light Amplification for X Rays

Another light-amplifying device promises to give the Army new long-range night vision. And unlike present Army night-seeing devices, it won't need an infrared light source to function. Still another light-amplifying device has successfully been adapted to a medical fluoroscope to reduce the amount of harmful X rays needed. This special fluoroscope actually permits viewing in a lighted room—and viewing after the subject has left the scene!

To industry, closed-circuit television with light-amplifying properties will provide observation where poor light conditions have in the past made such observation impossible.

Probably the first time light amplification figured in the news in a really big way was when the Navy's famed *USS Nautilus* made the first underwater penetration of the

Commander of *Nautilus* could view underside of polar ice cap thanks to light-amplifying TV system with camera mounted in a capsule in the conning tower



Top, "Cat Eye" moon photo; bottom, ordinary photo

INTO DAY





Early experiments by General Electric established that certain phosphors will amplify light when current is passed through them. Here, screen barely shows test pattern projected by ultraviolet light



When an electric current is passed through the screen of the phosphor, the image brightness increases at least 10 times. This phenomenon, known as electroluminescence, is basis of light-amplifying projects

polar ice cap in the summer of 1958. A special light-amplifying, closed-circuit TV system supplied by General Electric provided the *Nautilus*' crew with man's first fish-eye view of the North Pole's underside. The camera for this system was encased in a one-ton pressurized steel capsule mounted in the sail, or conning tower, of the atomic sub. This camera fed a 21-inch monitor screen, much like your own television set, that was located in the control room.

Cigarette Produces Picture

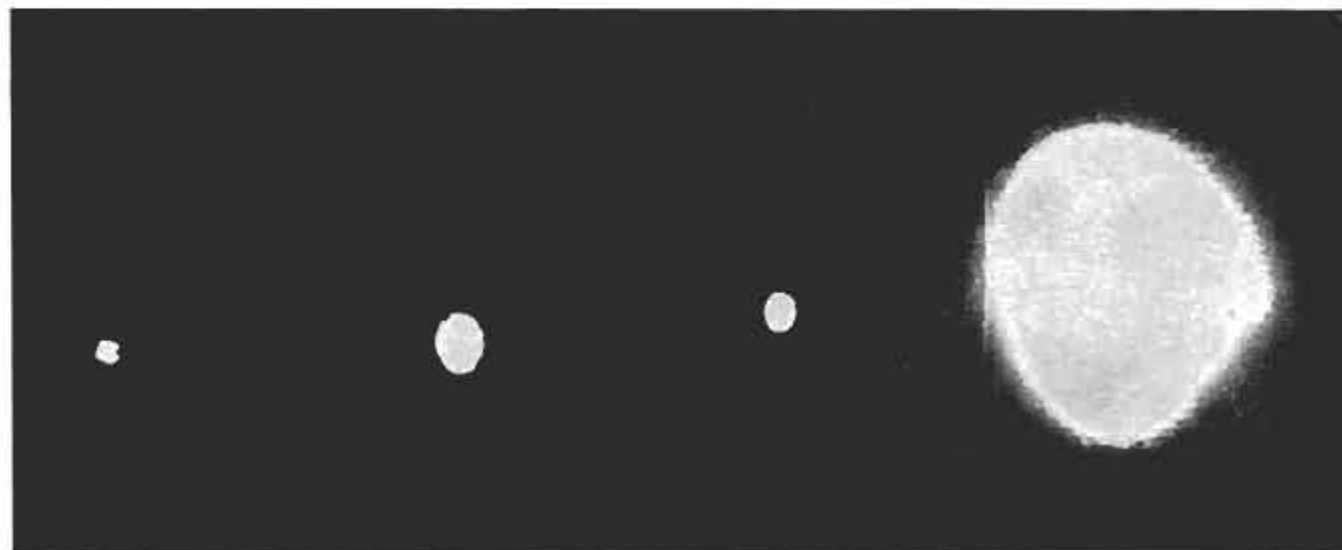
GE has since developed a TV camera so sensitive that it makes the *Nautilus* equipment look as light-hungry as the world's first video camera. The new version, which was designed with military needs in mind, is built around a cylindrical, 30-pound cam-

era that requires only a lighted cigarette to produce a clear picture in an otherwise completely dark room. A supersensitive image orthicon tube—the same kind of pickup used in commercial broadcast cameras—and a high-powered preamplifier give the system its superkick.

A key to the GE system's sensitivity is the fact that it provides 800-line resolution under top conditions and 200 lines at its lowest usable light level. Standard home television under normal lighting conditions delivers 300 lines. In addition to military uses, the company has fond hopes that the equipment will win favor as a night surveillance device in railroad yards, on highways and in dark factory areas.

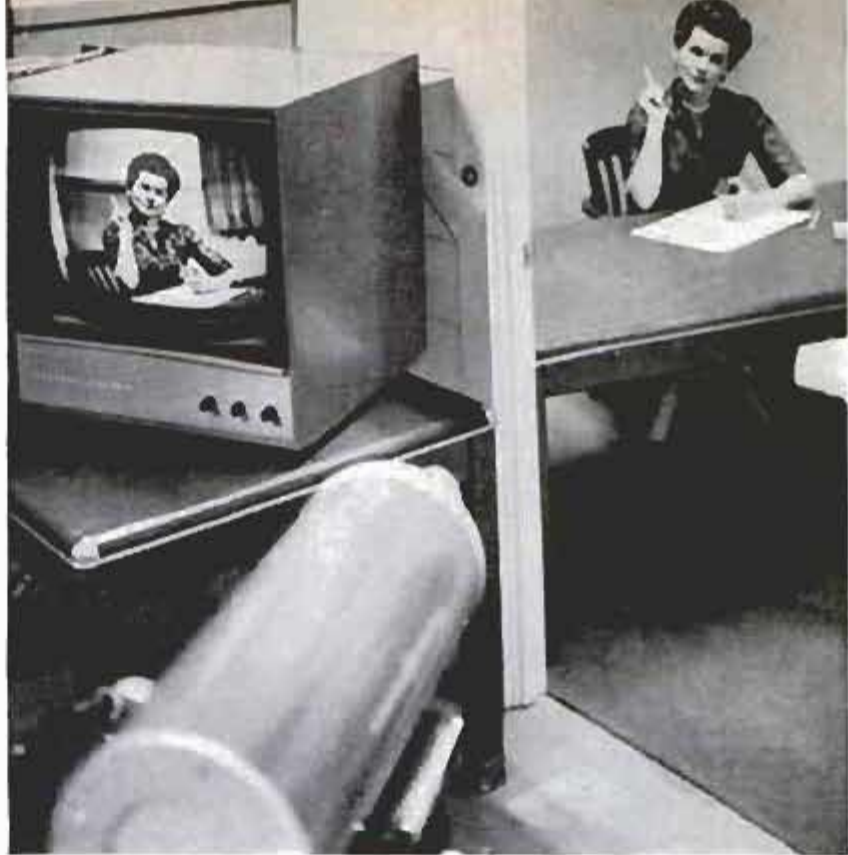
General Electric is loath to reveal the exact means by which its image orthicon

"Cat Eye" photo of Jupiter reveals three moons, with a fourth at right causing planet's irregular shape





Set-up at right shows a normal TV photo with standard room lighting. Above, screen shows clear picture when room is lighted only with match



goes about amplifying light. But similar devices form the heart of the Air Force's experimental "Cat Eye" project at Wittenberg College. The RCA Tubes Division, and Westinghouse, have both developed special image-orthicon pickups for the project, which was brainstormed by a civilian scientist, Radames K. H. Gebel, at Wright Air Development Center. To understand how these special image orthicons work, let's take a look at a conventional model.

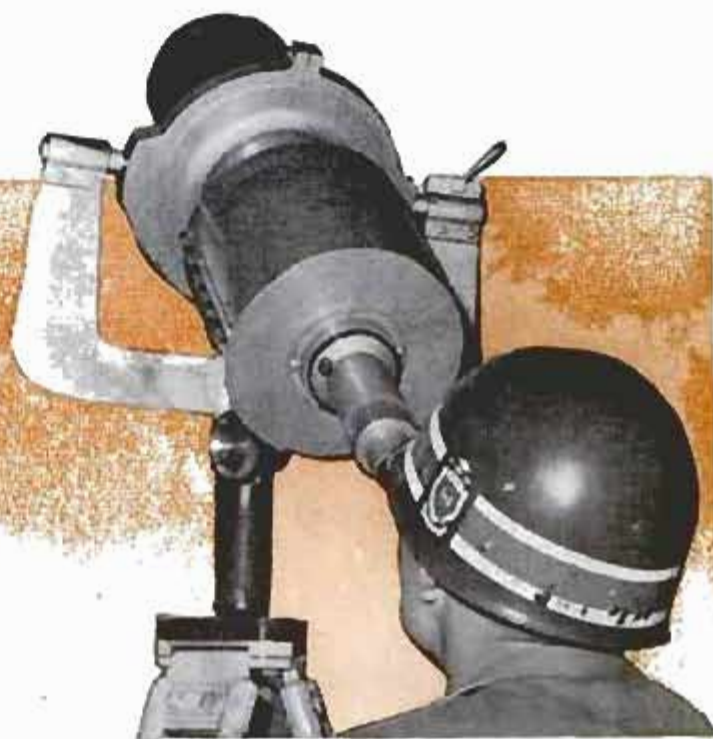
An image-orthicon tube has a photosensitive surface. When light hits this surface, it gives off electrons in quantity varying directly with the intensity of the light. This

creates a negative charge on a nearby target screen, which in turn induces a corresponding but opposite positive charge on an adjacent target plate. A scanning beam moves across this target plate, dropping off electrons to restore the plate to its original negative charge. The number of electrons dropped off by the beam at each point of its scan is translated into a video signal.

In a Cat Eye image orthicon, two inten-

(Continued to page 218)

Left, "Cat Eye" tube is much more sensitive than conventional tube. Below, night-spying instrument developed for Army has two tubes to boost weak light





Single Xenon Lamp Bulb Lights Europe's Largest Hall

Deutschland Halle, the largest hall in Europe, and the officers and stockholders of Berlin's light and power company, pose for a photograph in the light of a single bulb — a 65,000-watt xenon tube produced by the Osram Works of Berlin. The occasion was the 75th anniversary of electrical illumination in the city.

Lifter Aids Panel Installation

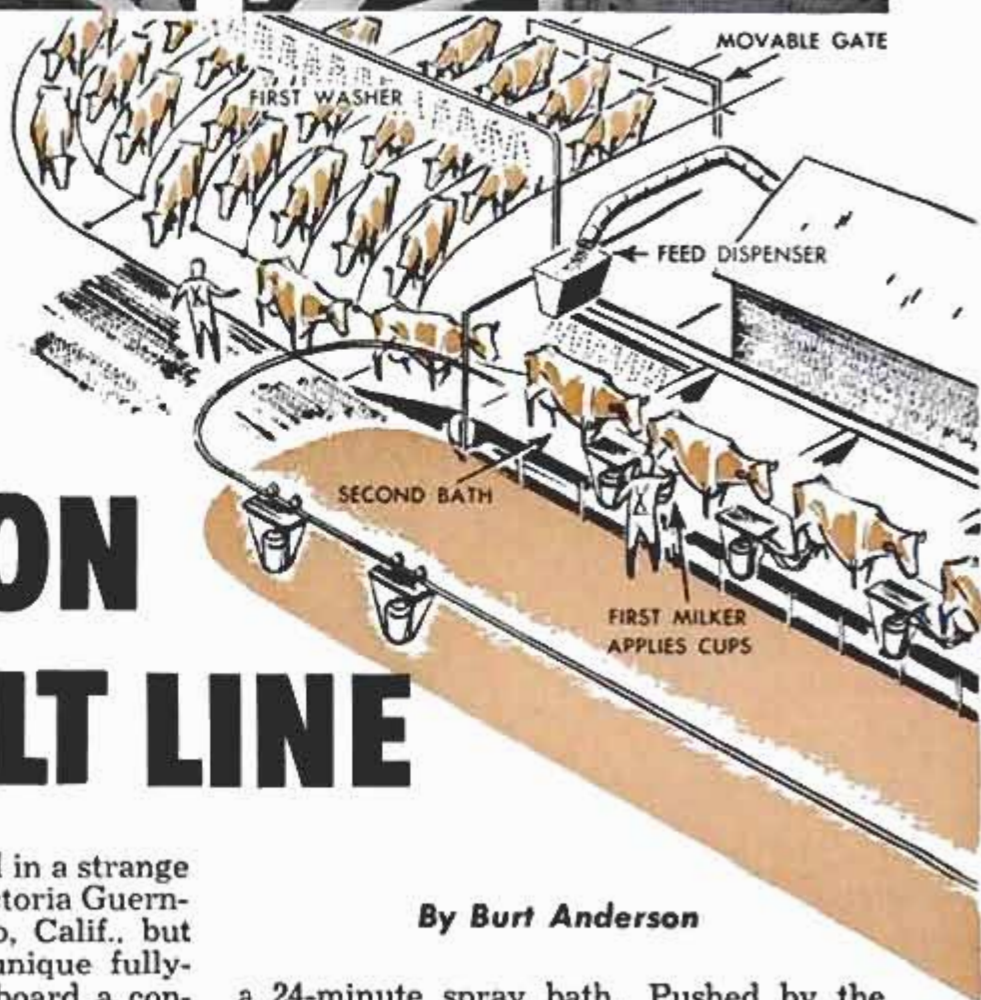
Solving an old problem for handymen and professionals alike, a new on-the-shoe panel lifter lets a single installer lift and fit the biggest sheets of wallboard or plywood while remaining erect and with both hands free for guiding and nailing. The one-piece aluminum lifter will raise 200 pounds two inches with little effort, and works equally well on doors. It's designed to roll upright from any position to save bending over to slip it on.



SNOOPER WITH AN ELBOW



With three engineers in the palm of its hand, this articulated bridge inspection machine reaches under a stone bridge arch in northern England while the passengers check the condition of the ancient masonry. Self-powered and mounted on a flatcar, the arm-and-platform device saves days on each inspection job by eliminating the scaffolding that once was necessary for a thorough check-up or a minor repair job



COWS ON THE BELT LINE

COWS ARE BEING milked in a strange way these days at the Victoria Guernsey Dairy in San Bernardino, Calif., but it's paying off. There, at a unique fully-mechanized dairy, 300 cows board a conveyor belt and in three hours are automatically washed, fed and milked.

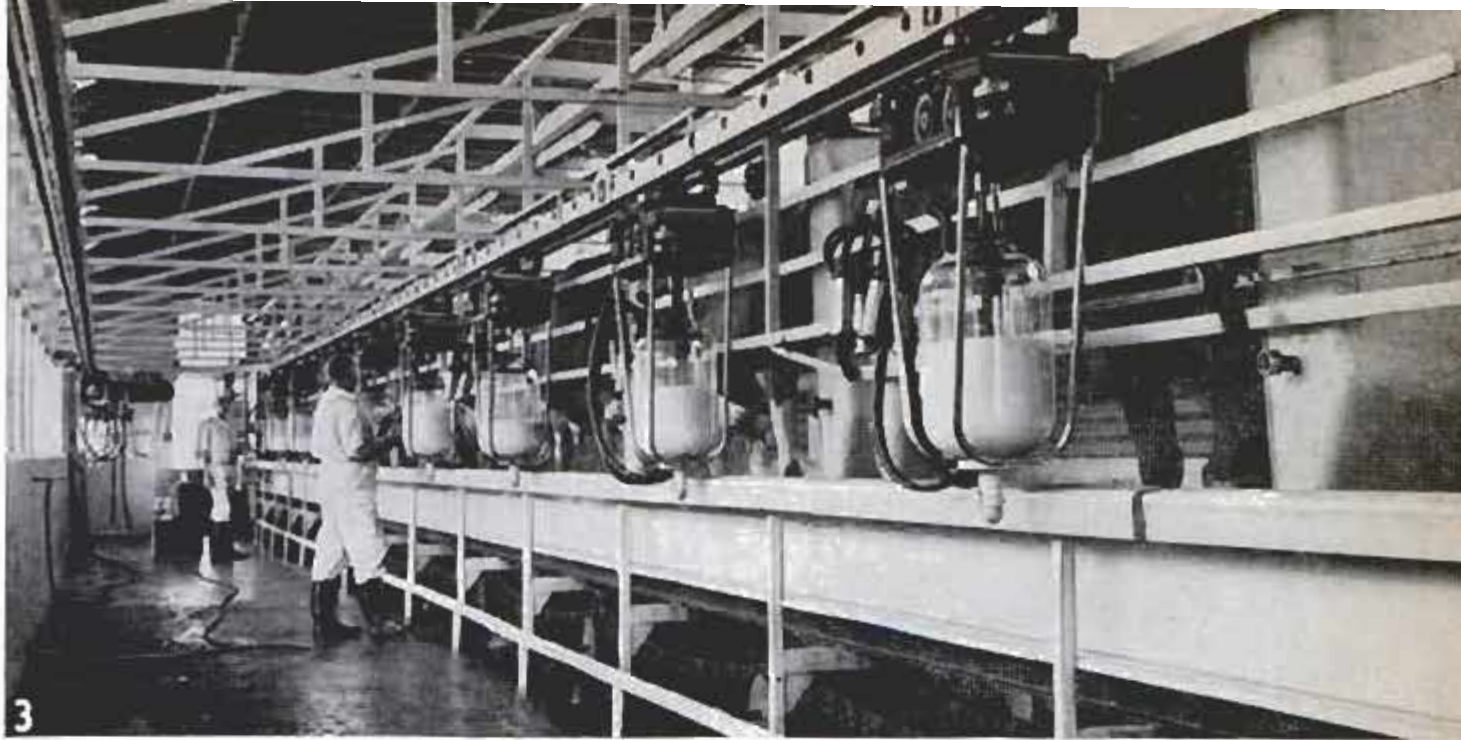
Designed and built by Harry C. Cain at a cost of \$30,000, the belt is now milking the 300 Guernsey cows three times as fast as the conventional stall method with an estimated saving of \$5000 a year.

Twice a day, at 1:30 in the morning and afternoon, herdsmen drive groups of 60 cows from nearby corrals into a milking line where they are automatically divided into eight columns. A chain-driven gate drops down and nudges them forward into

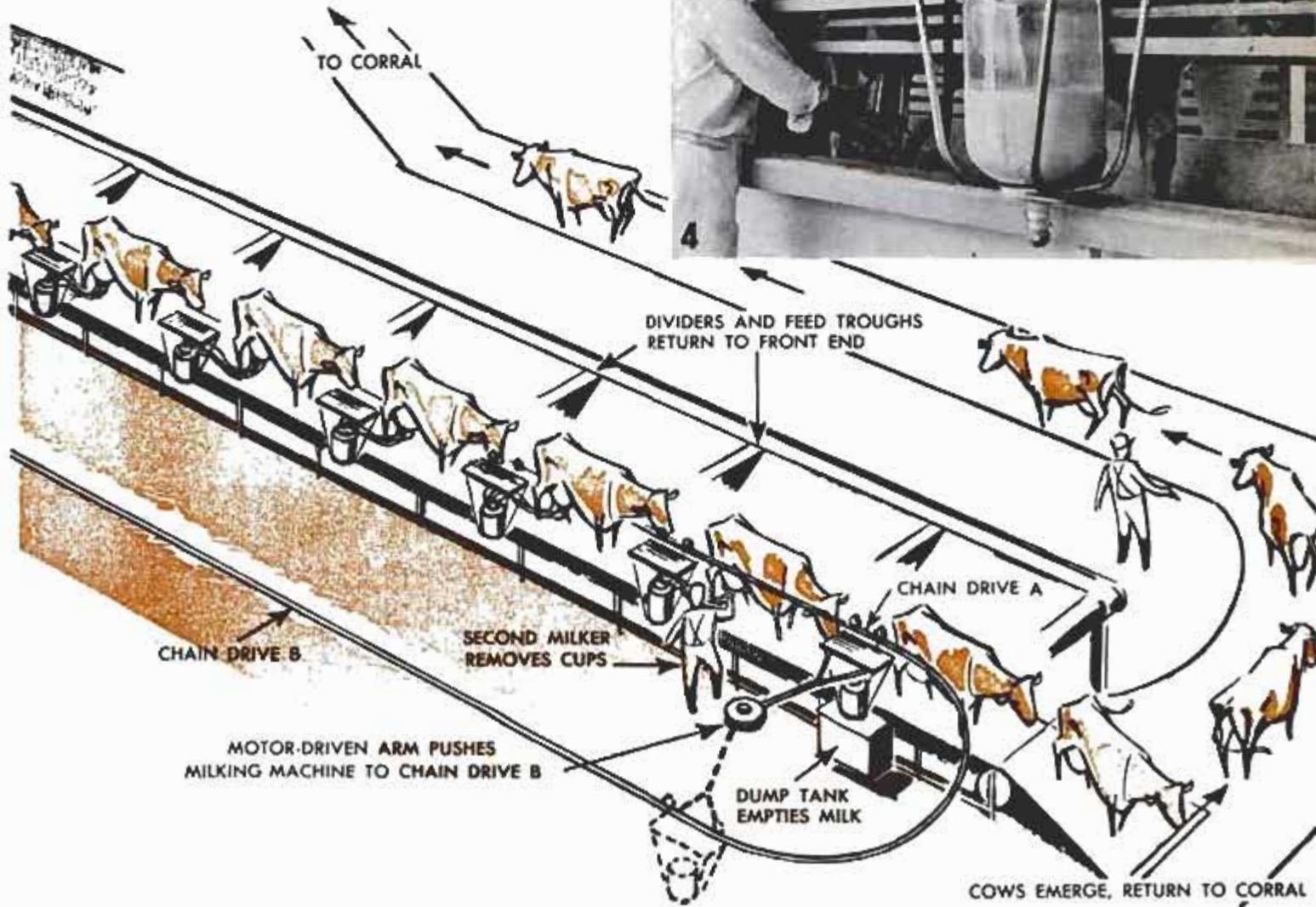
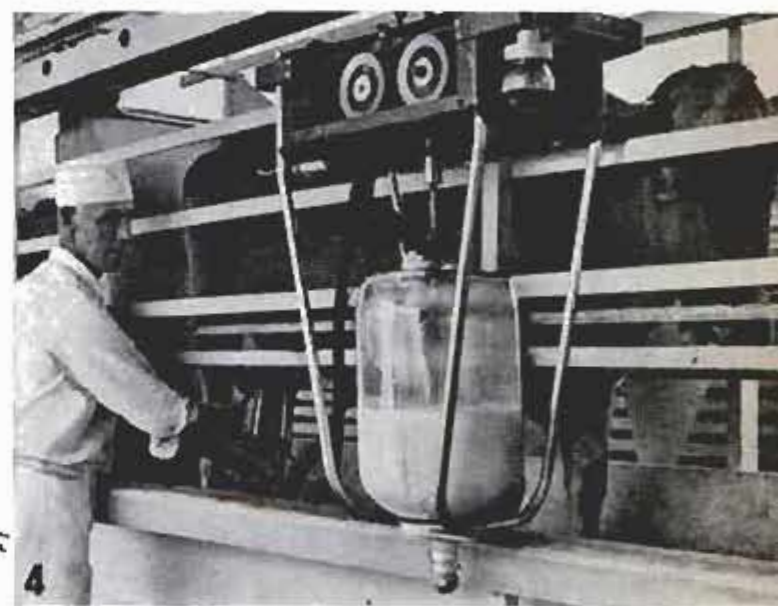
By Burt Anderson

a 24-minute spray bath. Pushed by the gate, they board the conveyor belt.

Feeder troughs drop before them. Spying their food they push ahead and are washed again. Then the first milker wipes the udders and applies the cups. For the next 107 feet the cows do nothing but eat and give their all into 12 milking machines. At the end of the line they step off and go back to the corral. The advantage? Speed, say Robert and Harold Willis who own the dairy—the system reduces milking time from nine hours to three and it's all done automatically. ★ ★ ★



Nudged by moving gate at rear (1), a group of 60 cows moves forward to be milked. Lanes converge into one long path that leads cows onto conveyor belt (2). Once on the belt (3), cows eat as they are milked automatically. At the end of the line (4), suction cups are removed and cows leave. Milking time is reduced from a total of nine to just three hours





"Dialed" Sign Describes Road Conditions Ahead

ROAD CONDITIONS along California's Sierra Summit route on U. S. Highway 40 are now being flashed to motorists by two electronic signs that give up-to-the-minute information on highway hazards ahead. Placed in heavy snow country, the signs flash such messages as "Chains Required Over Summit" and "Road Closed Over Summit." Radio controlled, the signs are activated at a mountain maintenance sta-

tion or at a communication center in Sacramento. Radio signals are transmitted to the signs by an operator dialing a special telephone. The words in each line of the three-line signs can be changed by the radio signal, and each sign can be operated independently of the other. Nine messages are possible. They are produced on glass faces, and lights inside the units illuminate the messages to be read by night drivers.





He Paints With Nails

Britain's champion cobbler since 1952, George Brockwell is an artist in leather—the kind that goes on the bottom of shoes. Spending as much as six months on one pair of shoes, Brockwell uses thousands of tiny chrome nails to outline pictures on soles and heels and then fills them in with colored paints. Collectors pay high prices for his shoes, but not to wear as most are too heavy. Some of the paintings are composed of as many as 12,000 rivets. Brockwell has been called the “Da Vinci of the leather industry.”



Good Scarecrow Needed by Air Force

Recordings of machine-gun blasts, and thunder and hawk cries are being used to scare birds away from the missile sled track at Holloman Air Force Base in New Mexico. Birds, perched atop the monorails, cannot hear the sleds coming at faster-than-sound speeds of 1000 to 3000 miles an hour and cause considerable damage when they are hit by the sleds. The impact rips holes in the steel nose cones, tears apart sheeting and even wrenches the sleds.





Geological conference studies rock specimens—in 60 feet of water on the bottom of the Gulf of Mexico

Oil Hunters With Aqualungs

By Rafe Gibbs

Timing his ascent by his own bubbles, a diver brings up a sack full of specimens



WITH HIS EYES on the piece of crustaceous rock in his hand, the geologist jotted down notes on a pad—just as geologists have been doing for many years in many odd corners of the world. What made this jotting unusual was that it was being done at the bottom of the Gulf of Mexico—about 50 feet below the surface.

An aqualung attached to his back, the geologist was breathing easily. He was writing easily, too—with a wax pencil on a plastic slate.

Oil men have a reputation for going to great lengths in their quests for black gold, but skin-diving operations are in a class of their own. In fact, the oil industry claims a first in using skin-diving techniques for industrial development.

Thirty-five petroleum companies, which have already spent more than \$1,250,000,000 in probing for drilling sites in the Gulf, are continually seeking ways to cut down the number of "dry" holes in the water. A series of wells drilled in a new field from a single platform can quickly run up a bill of more than a million dollars.

There's oil in the gulf—plenty of it. About 120,000 barrels are being sucked up through the water daily. But the cost of exploration and development is heavy. That is why the skin-diving geologists have been put on the job to seek new scientific short cuts.

Pioneering in the new search technique have been six Socony Mobil men—four geologists and two geological technicians. They were selected because they knew their diving as well as geology. After additional diving training in the San Marcos River of Texas, they were put through the U.S. Navy test for frogmen, and were ready for the Gulf.

When first working out of Galveston in their 65-foot converted shrimp boat, the scientists took a bit of kidding:

"Going after shrimp—the hard way?"

"Not unless they're oil-bearing."

They began plying waters far from the coast—up to 45 miles—and when the divers went overboard they sank as much as 65 feet before touching bottom.

Sixty-five feet is considered deep water for oil wells in the Gulf, although Continental Oil last year set a new record by sinking a wildcat through 137 feet of water about 25 miles off the coast of Louisiana. Near the California coast, wells have been sunk in much deeper water.

The underwater work of the geologists in the Gulf is pleasant, because the water there is eight to nine degrees warmer than in the ocean. And it is quiet. Commented one scientist:

"I could even hear the clams clicking their shells shut when I approached."

Every now and then, however, the quiet is shattered, and there is a stirring of fish—and geologists. The cause of the disturbance? Dynamite.

A common way of conducting hunts for oil in the Gulf is by setting off blasts of



Rocks, shells and samples of bottom sand—all are trail markers for underwater oil explorers

dynamite in seismographic surveys. Crews operating 10 or more miles away can be heard—under water.

"First time I heard the sound below I thought someone had knocked on my air tank with a metal tool," said one diver. "I looked around, thinking one of the other divers was trying to signal me. Except for some scurrying fish, there wasn't a living thing near me."

The principal tool used by the diving

Offshore oil drilling costs big money; diving geologists cut costs by cutting the number of "dry" holes





You can't make notes "on the cuff" when you're not wearing a shirt, so the divers use plastic slates strapped to one leg

geologists can be found in many a garden shed—a dandelion digger. With it, the geologists loosen specimens of rock and shell from the sand and coral bottom.

To pry out larger specimens, some of the divers carry regular geologic picks. The specimens are tucked into gunnysacks, and wriggled to the surface with the same care—and effort—afforded possible pearl-bearing shells.

For taking photographs of the Gulf floor, the divers carry watertight still cameras. Movie cameras are being considered—they have been successfully used by a Union Oil crew off the coast of California in another phase of oil development.

The crew was core drilling in waters 1500 feet deep, and had a problem: Landing conductor pipe—without bending or breaking it—on the ocean floor. The depth was too great for a diver to follow the pipe to its destination, and this made the task a precarious one.

Almost before you could say "I Love Lucy," however, somebody came up with the idea of adapting closed-circuit TV to the job. A TV camera in a watertight case was lowered to the ocean bottom and operated from the drilling platform. The drillers on the platform could see on a TV screen just what was happening below.

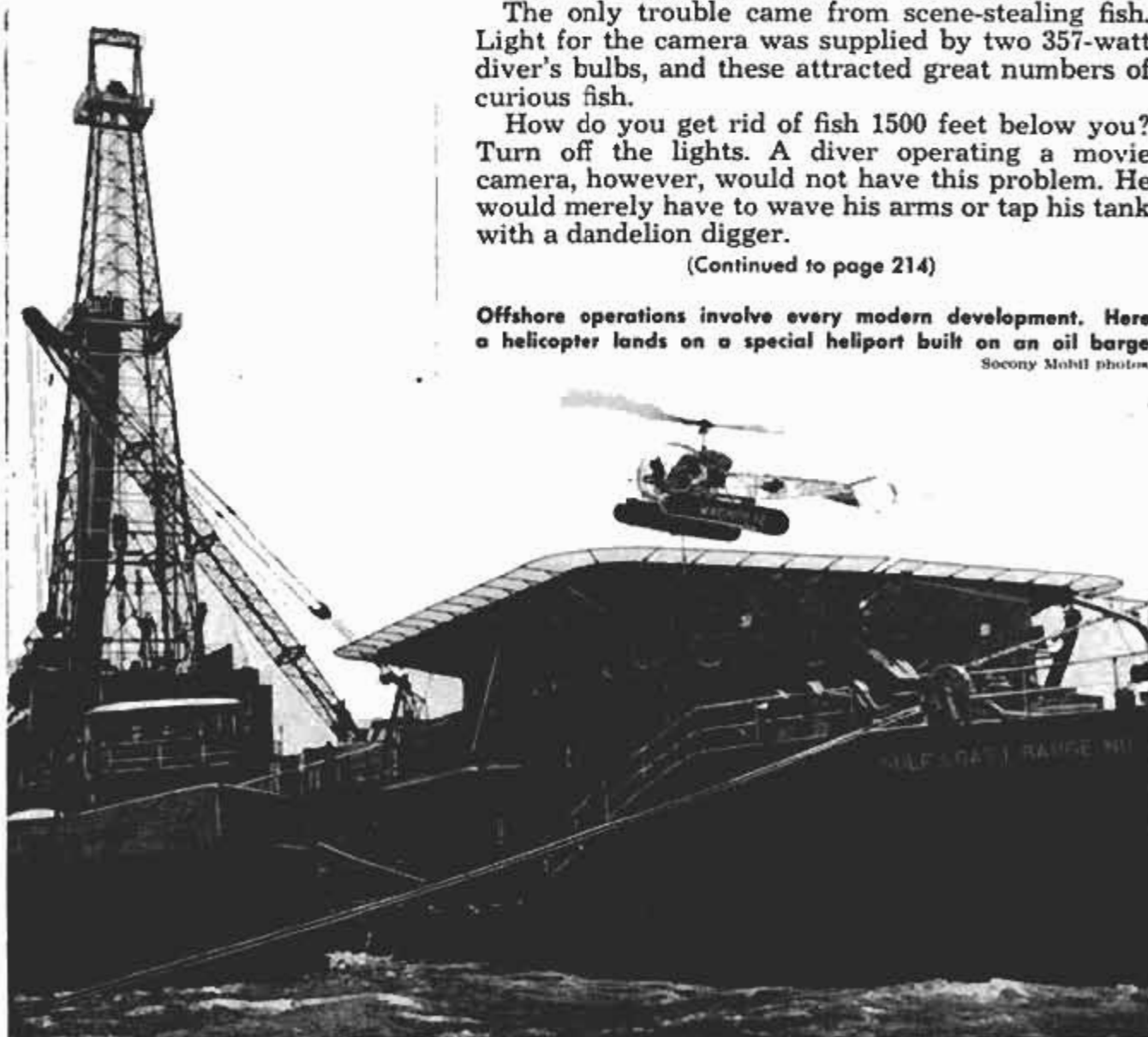
The only trouble came from scene-stealing fish. Light for the camera was supplied by two 357-watt diver's bulbs, and these attracted great numbers of curious fish.

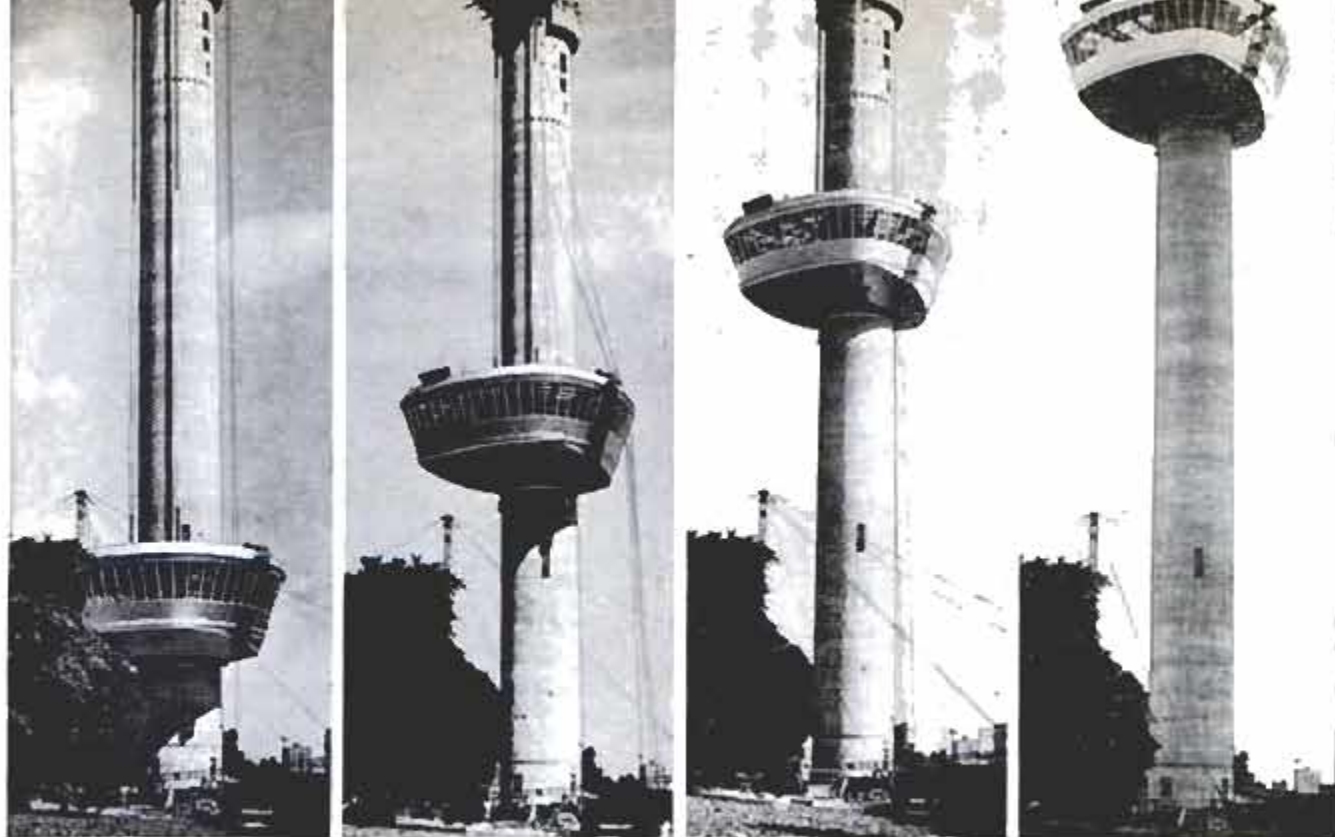
How do you get rid of fish 1500 feet below you? Turn off the lights. A diver operating a movie camera, however, would not have this problem. He would merely have to wave his arms or tap his tank with a dandelion digger.

(Continued to page 214)

Offshore operations involve every modern development. Here a helicopter lands on a special heliport built on an oil barge

Socony Mobil photos





Rotterdam Restaurant Is Hoisted to Top of 350-Foot Mast

In less than five days, a crew of 60 men working in shifts around the clock hoisted a 240-ton restaurant to its permanent position atop a 350-foot mast. Diners will be able to see 60 miles in every direction. The eating place, which will seat 800 per-

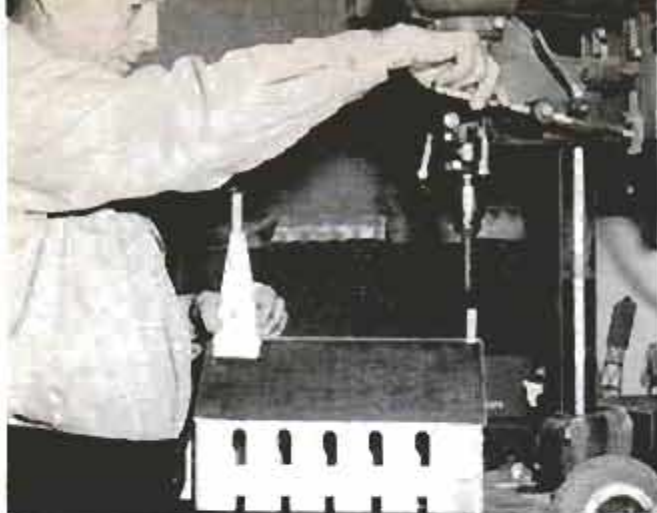
sons, is scheduled to open next March in Rotterdam when that port city becomes host to the Floriade, a giant international horticultural show. The Euromast, as the structure is called, will remain a permanent feature of the city.

Time-Saving Egg Carrier Holds Seven Containers

Seven egg containers can be stacked on a carrier invented by a California poultryman. The containers, or flats, rest on two prongs that fit in the ridges of the bottom flat. The malleable iron rods are coursed vertically, then curved forward to form a carrying handle. A cross bar provides a carrying grip. Golf-club tape wrapped around the handle keeps the hand from slipping. Empty flats are carried on hooks welded on the vertical part of the shaft near the top and pointed upward. Two downward-pointing hooks enable the carrier to be hooked onto the side of the nest.

☐ Developed for supersonic fighter planes flying at speeds up to Mach 3 (1950 miles per hour), a plastic laminate for the pilot's canopy, will withstand the impact of a .45-cal. bullet and temperatures up to 400 degrees. The plastic bubble over the pilot is optically clear.





Rheingans puts the finishing touches on a church that will soon take its place in the miniature town



Lifelike animals inhabit the neat farm at the edge of town. This scene is a favorite of young visitors



With his wife, the Wisconsin carpenter watches a team of horses pull a load of logs onto a sled hitched to another team. The team is one of nine moving objects in north-woods sawmill scene

HOBBYIST CREATES TOWN ON QUARTER-INCH SCALE

By Wally E. Schulz

IN 17 years of spare-time building, a Wisconsin carpenter has created a miniature animated village which features everything from a stream rushing down a mountainside to an operating sawmill. The builder, Melvin Rheingans, has even constructed a full-size house to display the tiny town, which he enjoys showing to young visitors. Among the 60 buildings, built on a quarter-inch scale, are many replicas of larger ones, including the homes of friends. Typical of the detailed work is the sawmill on which Rheingans spent 12 to 14 hours a day for four months.

Details, such as streetlights, sidewalks, shrubbery and pedestrians, add realism to the miniature village





Jointed Metal Pipe Speeds Loading of Tankers

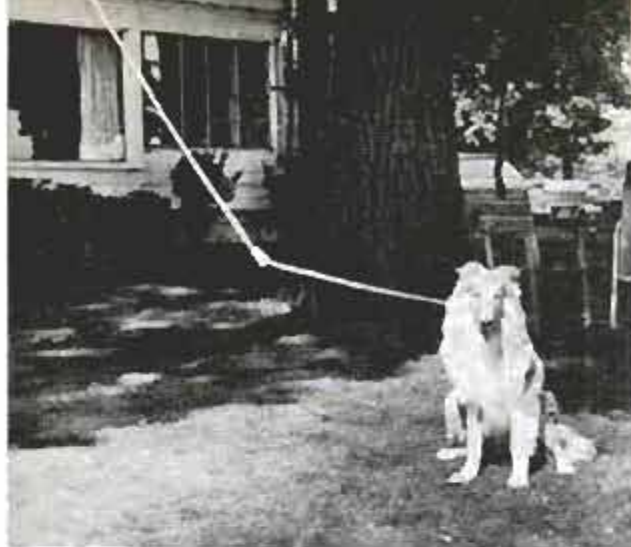
Long, robotlike arms that move by hydraulic power are adding speed and safety to tanker loading and unloading operations. The arms are two-section swivel-jointed metal pipes that swing out from a dock structure to the tanker's manifold to take on or discharge petroleum products. There may be as many as 11 of the 54-foot arms—8, 10 or 12 inches in diameter—on a single structure; all are powered

from a single source and manipulated from a single control point. This tanker-loading system, built by Chiksan Company, eliminates the need for manhandling heavy rubber hoses, as has been the practice at marine terminals. The smooth bore of the metal pipes offers a faster rate of flow than rubber hoses. The 12-inch-diameter arms are capable of moving 15,000 to 20,000 barrels per hour.

Outboard Operator Has "Car Control"

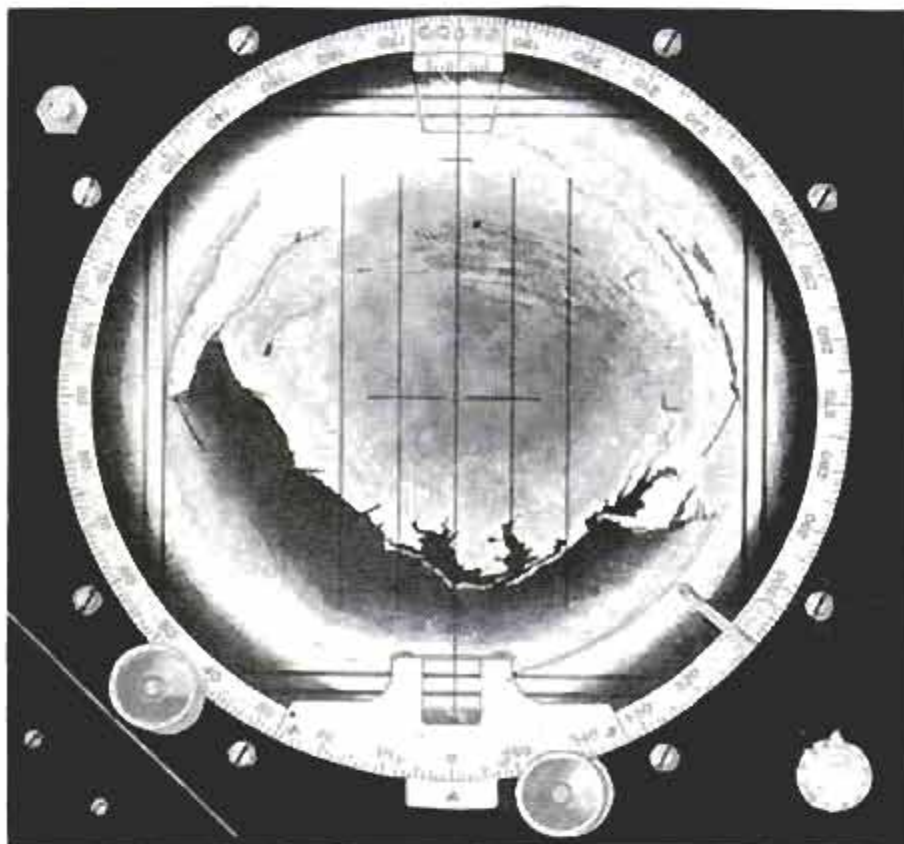
Pivoting at its center, this foot throttle for operating outboard motors causes acceleration when the toe is depressed and deceleration when the heel is pushed down. The treadle remains in one position while the boat is under way, making control in rough water easier. The foot throttle employs standard control cables. Adjustable pads allow it to be mounted level on any interior boat contour. Mounting is accomplished with strong epoxy paste.





Chain Follows Dog's Movements

Rover won't get tangled in his chain anymore with a retractable chain that feeds out and returns as the dog runs back and forth. The chain, giving the dog a feeling of freedom since he never feels the chain tugging, doesn't touch the ground and stays above the dog's collar. Easily attached on an overhead line, the chain is rust resistant.



Periscope System To Guide Astronaut

On an eight-inch diameter screen, an astronaut will be able to view the earth below him and, should his re-entry system fail, "navigate" his own re-entry. The screen, part of a unique periscope system being developed for a manned space capsule, will enable the space man to view the earth and make measurements of his altitude, direction and position in space, and thereby fire the retrograde rockets that make re-entry possible. The artist's drawing shows how the East will appear, with Florida at the left and Connecticut at the right.



Gas Appliance Plugs Into Outlet

If you've ever thought it would be convenient to plug in a gas appliance like an electric one, a new system will appeal to you. German engineers have developed a white hose similar to an electric cord that connects by a union to the appliance. At the opposite end is a plug that fits into a gas outlet. A quarter turn of the plug to the left opens the outlet. It turns off to the right and then easily disconnects.



C. G. Conn, Ltd. painstakingly makes more than 50,000 musical instruments a year

The Big Round Sound

By Kenneth Anderson

Photos by Joseph Fletcher

THERE'S A ROOM in a building at Elkhart, Ind., where the walls literally close in on a busy musician known as "Hot Lips Harry." Harry can't read a note of music and he doesn't get a nickel for his long hours of trumpet and cornet playing. But he can produce tones with measured precision and he can hold a note longer than any professional player.

Hot Lips Harry actually is a robot in the research laboratories of C. G. Conn, Ltd., a company that manufactures more than 50,000 band instruments a year. It's one of many devices employed in a scientific search for the elusive thing musicians call the "big round sound."

The "fat sound," the full clear tone for which the music man strives, is a bit difficult for scientists to capture because

it's subjective. Whether it's good or bad depends to a certain extent upon the judgment of the listener. The people who study musical acoustics can make a "picture" of a sound by playing a trumpet, or any other instrument, and recording the sound's wave pattern on an oscillograph.

In a similar manner, scientists can contrive a shade of color and measure its wave length. But the artist who works with the color must decide, subjectively, whether the color is pleasing to the eye. And the musician who plays the trumpet must determine whether the tone is pleasing to the ear. In fact, juries of musicians convene regularly to vote on the tones they think an instrument should produce.

After the juries decide how a horn should perform, the scientists try to design



This unconventional instrument, called a Connosax, was introduced to music in the roaring twenties but failed to meet with public approval. It is now consigned to Conn museum

Dr. Jody Hall, chief acoustical engineer for Conn, plays the first Sousaphone, below, ever made. It is now a museum piece, together with the "snorklephone" at the right, built as an experiment. The snorklephone is like a Sousaphone with part of the curve straightened out

the instrument that will give the desired performance.

"We only try to produce the most acceptable instrument," says Dr. Earle Kent, director of research at Conn. "Nobody has made a 'perfect' instrument. And probably never will."

Designing a nearly perfect cornet, trumpet, trombone or saxophone isn't as simple as it may seem to a person browsing among the merchandise in a music store. The mathematical formula for the effective length of a horn at a single frequency fills a piece of paper five feet six inches long. Before the days of digital computers, it took a researcher two days to solve the formula and check the answer. An electronic brain can handle three of the giant problems per minute.

All Things Are Interdependent

But there are many other factors besides the length of the horn to be considered. And a number of these variable factors are interdependent—if one changes, the others change. Changing the diameter of a horn bell, for example, can upset the measurements for a dozen other parts of the instrument.

Even the player's lips and oral cavity can affect his performance. Dr. Jody Hall, chief acoustical engineer at Conn, discovered that after a dentist had worked on his teeth, his playing of some of the low notes was off by $\frac{1}{100}$ of a semitone.

A factor not immediately apparent, even to the musician, is the relation of the mouthpiece to the horn. Each instrument is designed to be





Each instrument is tested by a musician, who checks tones with an electronic device called a Stroboconn

used with a certain mouthpiece, and custom fitting is needed. An error of only $\frac{1}{16}$ of an inch in the placing of the mouthpiece in the tone chamber, or mouthpipe, can make a good instrument sound bad on some notes.

Almost everything, including people, in the room will have some effect on the sound of a musical instrument. For this reason, Hot Lips Harry sometimes works by remote control. A transducer can be attached to the mouthpiece, as well as a rubber disk, to produce controlled sounds through a horn. And levers can be set up as fingers to push the valves of a cornet or trumpet.

The strange room in which the robot trumpet player performs is referred to as "Bulgy." The walls and ceiling bulge toward the center to provide as much asymmetry as possible. The method in this apparent madness is the elimination of parallel surfaces that might reflect or "build up" sounds of the instruments being tested. Patches of felt cloth have been attached to the walls and ceiling where

necessary to remove the last effects of sound reflections. The temperature in the room is controlled to within $\frac{1}{10}$ of a degree Fahrenheit.

The usual approach, according to Dr. Kent, would be to construct an anechoic chamber, or "dead room." However, it was discovered that professional musicians find it extremely difficult to make music in such a room. The asymmetrical room permits a bit of "liveness" for the player's benefit without emphasizing or detracting from any part of the tone.

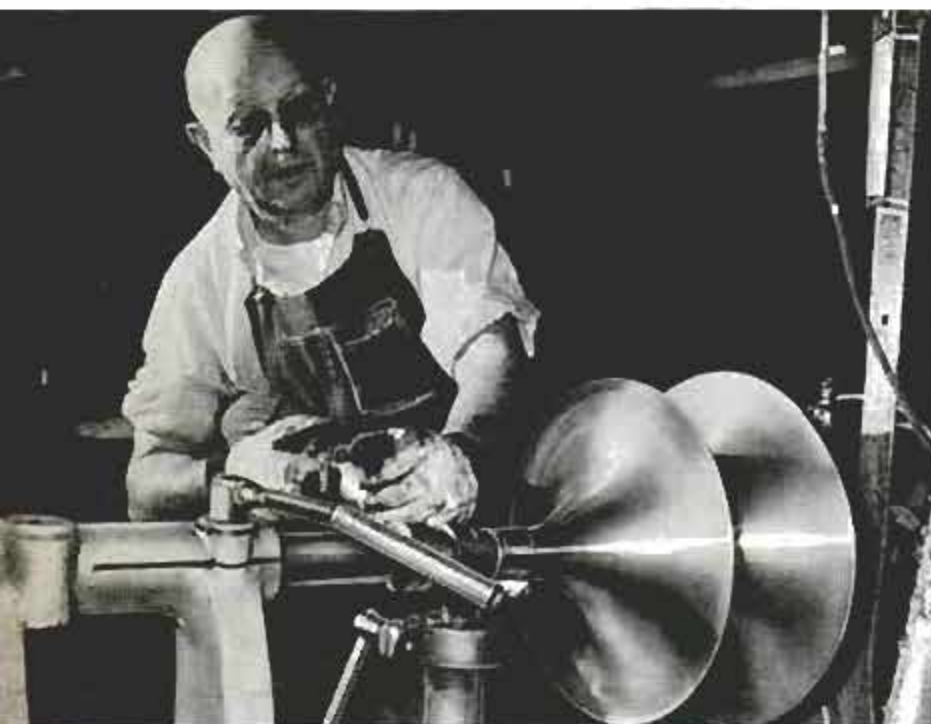
Wet Plaster Affects Tone

To illustrate what a difference a room makes, when the acoustical plaster on the walls of "Bulgy" was still wet, musicians using the chamber found they could play a half-octave higher than usual. The tones returned to normal after the plaster dried.

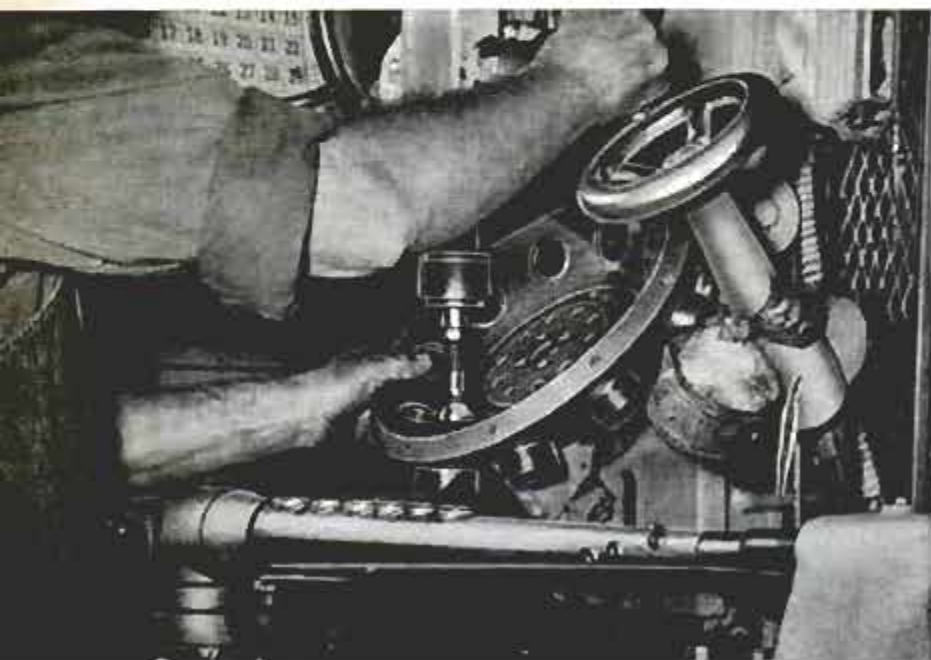
One of the carpenters who worked on "Bulgy" commented, "It's the only room I've seen like it and I hope I never see another." The three-dimensional blue-



Electroformed tone chamber and bell unit of horn is yanked out of chemical vat, where copper was deposited on mandrel



French horn's bell is created by mounting brass disk against mandrel on lathe. Below, holes in saxophone chamber are drawn out by machine that pulls metal dies through brass from outside



prints, which the builders probably will never see again, were prepared from mathematical formulae that plotted quadrants of different ellipses.

Most people don't realize that it takes longer to build a cornet or trombone than it does to produce an automobile. Although the music men probably could turn out a playable horn on short notice, the usual length of time required to shape a fine instrument from a sheet of brass is three to four months.

Production of the horn with the "big round sound" usually starts under a microscope in the materials-testing laboratory. Here the researchers study samples of metals that will be used in the various parts of an instrument. Each part requires an optimum grain size that is a key to the strength and ductility of the metal. If the ductility is poor, the metal may tear while it is being shaped or bent. If the grain size is too large, the metal may develop a rough, "orange peel" surface.

The metal parts also are tested for optimum thickness, which has a measurable effect on the tone of the instrument. One of the electronic devices used in such research can detect variations in the thickness of metal plating with the accuracy of a microscope. Called a non-destructive thickness tester, the device generates eddy currents in the metal and senses variations in thickness by measuring the eddy currents.

Use Copper Ions for Bells

Conn's research workers have experimented with silver, copper, brass, bronze and many other metals in a search for better ways to make a more perfect horn. Out of their research has come a method of producing one-piece seamless horn bells from copper ions.

Electroforming a horn bell is similar to electroplating, except the microscopic bits of copper are allowed to build up in a thick layer. The copper ions are deposited electrolytically on the surface of a stainless-steel mandrel that has been machined to tolerances measured in millionths of an inch. Stainless steel is used



On a revolving drum, pens attached to valves record degree of bounce, which may cause slurring of notes.

for the mandrel, or form, because the pure copper bell can be separated easily from stainless steel. Brass cannot be used in the electroforming process.

Electroformed horn parts reportedly cut intonation errors in half, permitting a more even balance of tone in all ranges. Mouthpipe tolerances are 10 times as close as in instrument parts produced by the more conventional methods of drawing and soldering.

The bulk of the brass instruments, however, are still made by hammering, drawing, soldering and swaging—starting with a thin sheet of brass. If the ultimate product is a trumpet, the piece of brass is held on a tubular metal form and whacked with a wooden mallet until it has the shape of the form. The seam is soldered and smoothed under pressure. The bell is spun from a flat disk and fastened to the rest of the horn with silver solder. The disk is attached to a flared mandrel on a lathe. As the disk spins on the lathe, a craftsman forces a long pole against the piece of brass. The pressure exerted through the pole makes the brass disk bend along the surface of the mandrel until it has the same flared shape.

After the brass disk has been shaped into a bell, it is burnished by pressing a metal tool against the bell as it spins on the lathe. A bell for a French horn goes through a series of six spins and five anneals. Each anneal requires 15 minutes of baking in an oven heated to 1050 degrees

Long straight horn without valves, another Conn experiment, has same tone as conventional trumpet



Dr. Earle Kent, Conn's research director, checks trumpet tone by attaching transducer to mouthpiece

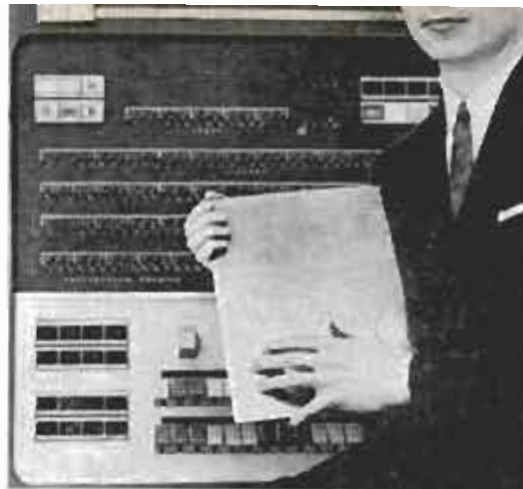
Fahrenheit. The annealing is handled on a critical schedule because the bell can crack if the process isn't stopped at the right time.

Jigs Used for Bending

Specially designed machines bore valves, shape tone holes, test valve bounce and make the inside of a curved column as smooth as the polished outside surface. The curves are added to the horn columns by bending them in jigs. The curved sec-

(Continued to page 220)



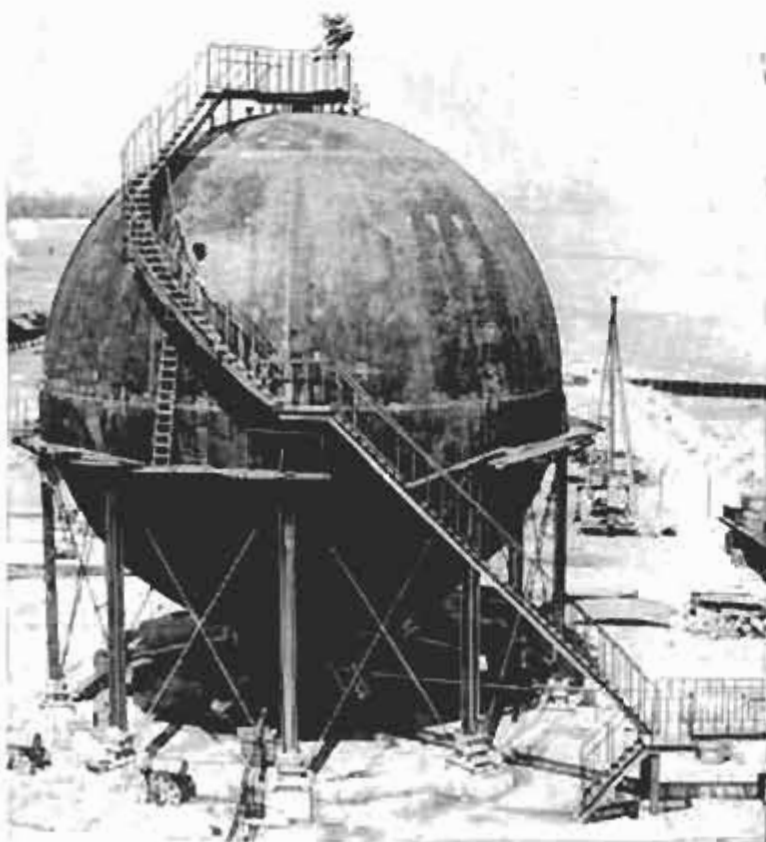


Braille Translator

Printed text can now be translated into braille at electronic speeds. A braille embossing machine, shown above left, is linked to a punched-card reading device, making it possible to produce automatically the metal plates, right, used to print braille books. The punched cards with the braille language are translated directly from English by an IBM computer at the rate of 4000 words per minute. The new method was developed by mathematicians of the International Business Machines Corporation for an IBM 704 data-processing system.

← Bag Purifies Water

Campers don't have to take a chance with questionable drinking water. They can purify the water in five minutes by pouring it into a pocket-size plastic bag containing a supply of filter material mixed with disinfecting ingredients. The bag holds a quart of water. The cleared and purified water is drawn from a spout at the bottom. A plug is used to stop the flow. The bag, which weighs less than eight ounces, is good for about 200 fillings, or 50 gallons of water.



Welded Sphere

In Copenhagen, Denmark, is a spherical gas tank that is entirely welded. Built by a German firm, it is the first of its kind to go up in Europe. Spherical gas tanks usually are riveted. The "Gasometer" at Copenhagen has a volume of 1500 cubic meters. Its diameter is 47½ feet. A much larger spherical gas tank is now under construction at Wuppertal, Germany.



Fishermen Carry Boat Between Plane's Pontoons

Anglers flying to the remote lakes of Florida, Alaska and Canada are now taking their boats with them. Most of these air-minded fishermen tuck the craft between the spars of the plane's pontoons. The sportsmen in the picture above con-

structed their own flat-bottomed ketch and equipped it with a small motor. The ketch fits snugly along the spars of the single-engine seaplane. This plane-boat combination enables the men to visit many different Florida waters in one outing.

Stomping Feet Launch Rocket

Toy rockets go soaring high into the sky with nothing powering them but the two stomping feet of a youngster. The rocket toy consists of a 40-inch launching tube attached to a big rubber bulb. An eight-inch tubular rocket, with a soft-rubber nose cone and plastic guiding fins, slips on the end of the thin tube. When the child jumps on the bulb, the rocket takes off. One person can work it, but when one holds the launching tube and the other jumps with both feet, the rocket goes a lot higher!

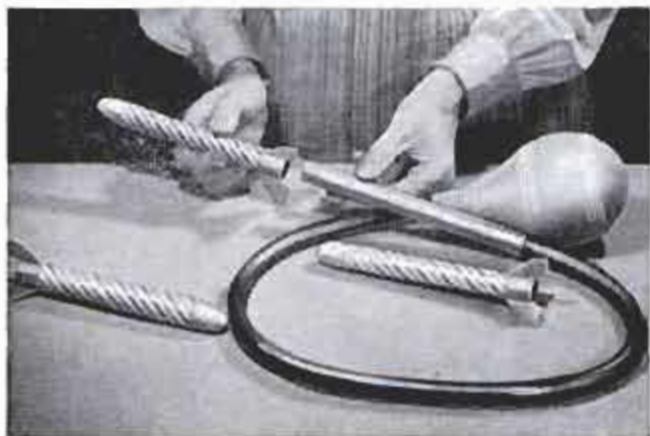




Table and Stools Fit Station Wagon

For the field worker, camper or picnicker, an engineer in Portugal has designed a table and stool combination that fits into a station wagon. The table stands on the floor deck at window height. Small stools make the outfit handy as a desk or dining table during travel, or the furniture can be removed from the car for picnicking. Even with the table in the loading space, there is still ample room for a spare tire and other luggage beneath the table.

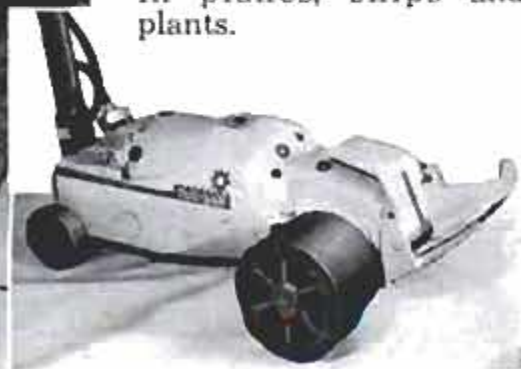


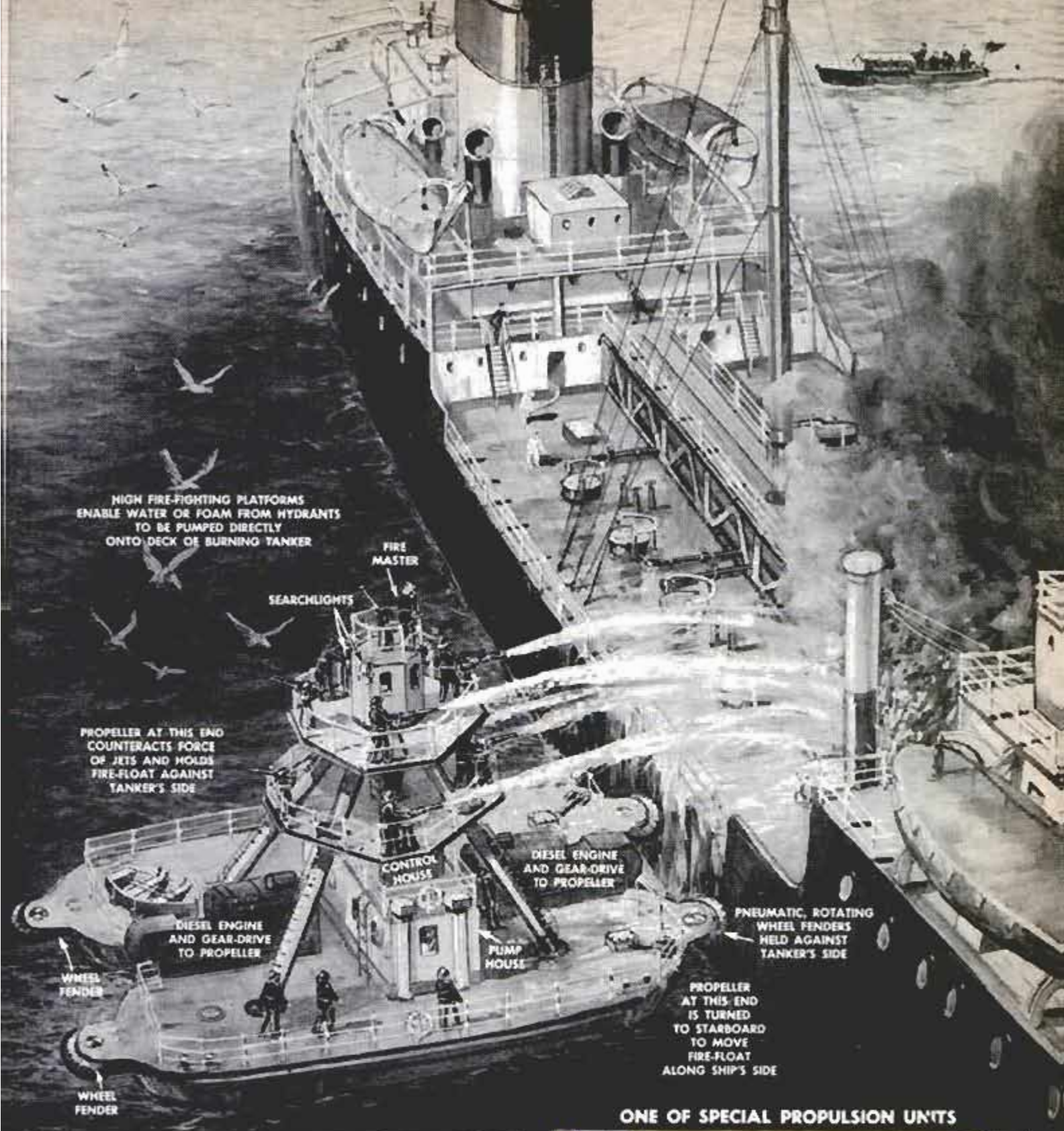
Tree Treatment

By adding a fungus-killing chemical to the asphalt varnish used for painting tree wounds, growth of decay-producing fungi can be prevented. The U. S. Department of Agriculture says a formula including .25 percent phenyl mercury nitrate is ready to market, but warns against the public mixing its own antiseptic varnish because the mercury compound is highly toxic.

Electric Pry Bar Moves Seven Tons

Able to maneuver in close quarters, an electric pry bar can move as much as seven tons of weight. The machine, which weighs 110 pounds, can be handled by one man since it does all of the work, pushing cargo in planes, ships and plants.





HIGH FIRE-FIGHTING PLATFORMS
ENABLE WATER OR FOAM FROM HYDRANTS
TO BE PUMPED DIRECTLY
ONTO DECK OF BURNING TANKER

FIRE
MASTER

SEARCHLIGHTS

PROPELLER AT THIS END
COUNTERACTS FORCE
OF JETS AND HOLDS
FIRE-FLOAT AGAINST
TANKER'S SIDE

CONTROL
HOUSE

DIESEL ENGINE
AND GEAR-DRIVE
TO PROPELLER

PNEUMATIC, ROTATING
WHEEL FENDERS
HELD AGAINST
TANKER'S SIDE

DIESEL ENGINE
AND GEAR-DRIVE
TO PROPELLER

PUMP
HOUSE

WHEEL
FENDER

PROPELLER
AT THIS END
IS TURNED
TO STARBOARD
TO MOVE
FIRE-FLOAT
ALONG SHIP'S SIDE

WHEEL
FENDER

ONE OF SPECIAL PROPULSION UNITS



Firefighting Float

BRITAIN has introduced a firefighting craft that has two diesel-driven propulsion units to counteract the force of water jets against a burning ship. The new catamaran-type craft can keep its position even though all nine of its hydrants are shooting at full force. The float's propellers can be turned 360 degrees, and two wheels fore and aft aid in moving it along the side of a burning ship. The firefighting capacity of the craft is 3100 gallons of water a minute or 12,500 gallons of foam a minute



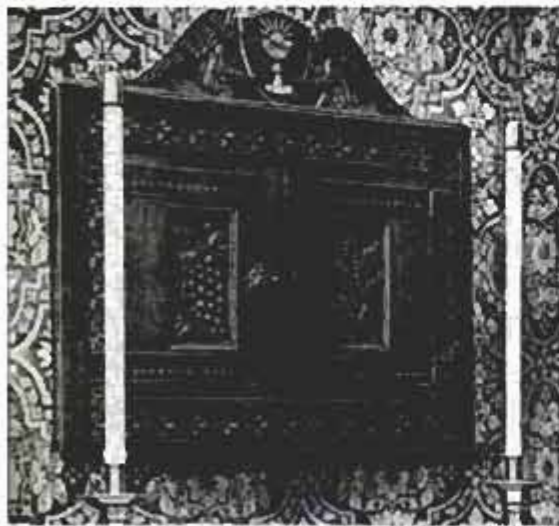
The Rev. Carl Eberhard at the lectern he carved when his church couldn't afford the one he wanted



Under Pastor Eberhard's skilled knife, a figure of Moses emerges from a block of aged white oak

THE PASTOR

By John Fetterman



Intricately carved doors of the ambry, above, conceal the church's wall safe for safekeeping of sacramental equipment. Below, the notice board which hangs just inside the entrance



CONCORDIA LUTHERAN CHURCH, in Louisville, Ky., was built during the depression of the 30's. When the building was finished, so was the building fund; the congregation and its pastor, the Reverend Carl Eberhard, were broke. But despite his pride in the new church, Pastor Eberhard felt that something was lacking. There were no works of art to add to the beauty of the interior—and no money to buy them. The architect had designed an ornate lectern, but professional artisans estimated its cost at \$3500. They might as well have said a million, but the pastor set out to find a way.

Pastor Eberhard decided finally that he'd have to do it himself, so he bought a book on wood carving and a few simple tools. Today, the pastor is an accomplished wood carver, and his church is full of beautiful carvings which he has created with his own hands.

The first project was a small crucifix. The work progressed slowly, but the basic steps were soon mastered, and finally the crucifix materialized—a textured walnut figure of Christ on a cross of aged oak. Then came the lectern, put together piece by piece over 14 years. Meanwhile he added figures of David, Moses, and the angels, a notice board and a gleaming ambry. With growing confidence the pastor met new problems, often returning to his reading on the art of wood carving. He studied woods and went to great lengths to get fine pieces (a piece from the White House, salvaged from the last re-



Figure of King David which decorates the front of Pastor Eberhard's reading stand



Walnut and oak crucifix was the pastor's first carving project



Carved angel forms the back corner of the lectern rail

IS A SCULPTOR

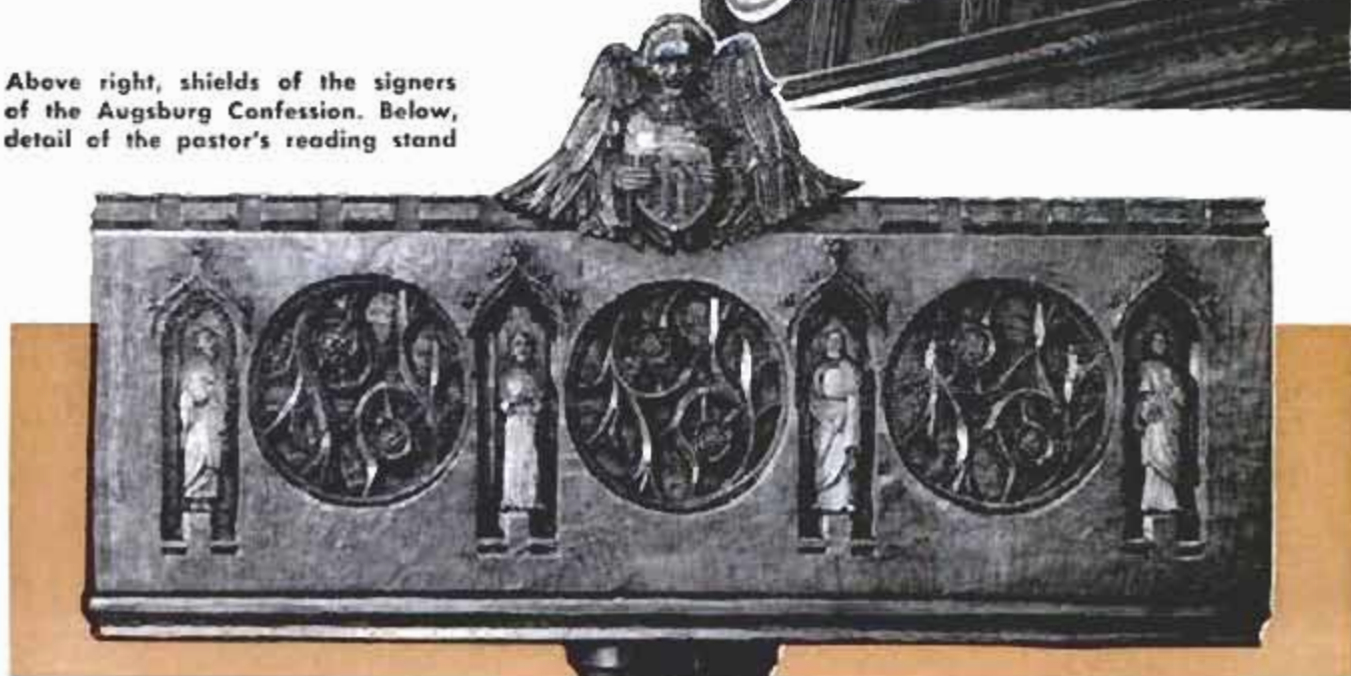
modeling, is part of the lectern). Most of the carvings are done in sugar maple, white oak, and walnut.

Would Pastor Eberhard recommend wood carving as a hobby? "It takes patience," he says, "but you can start with a couple of dollars' worth of tools. It's all in your head and hands. And it's satisfying."

It's especially satisfying each Sunday when he steps up to his pulpit and places his hand on the polished wood of the lectern his church couldn't afford. ★ ★ ★



Above right, shields of the signers of the Augsburg Confession. Below, detail of the pastor's reading stand





Safe Car TV Works in "Park"

One Cleveland man has a television set in the glove compartment of his car, but he doesn't worry about criticism. It's installed so that it will turn on only when the automatic gearshift is in "park." Dorse R. Johnson says he installed the 8½-inch portable to use at the beach and on picnics.



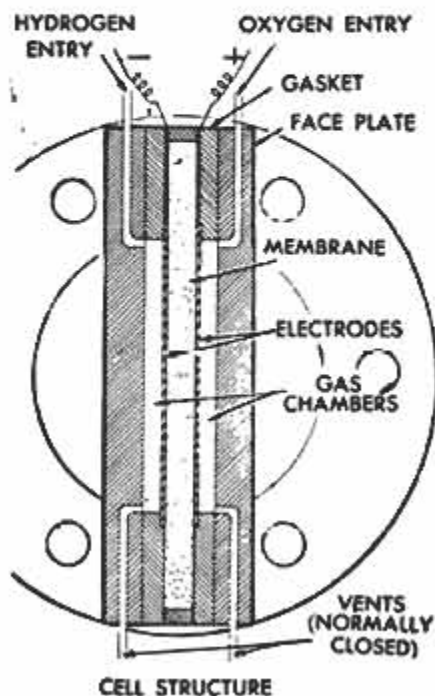
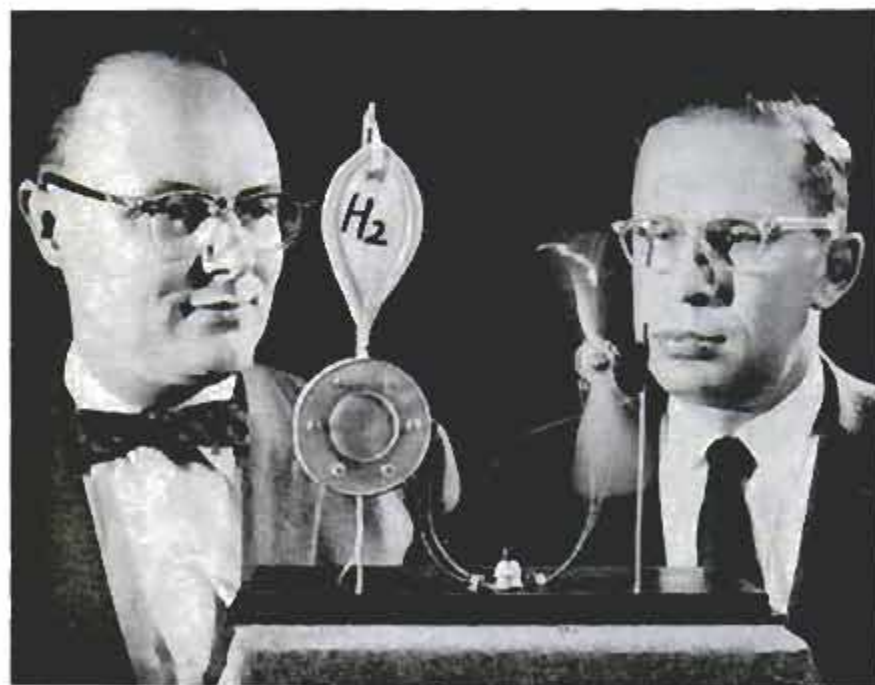
Swiss Chalet Comes in "Kit"

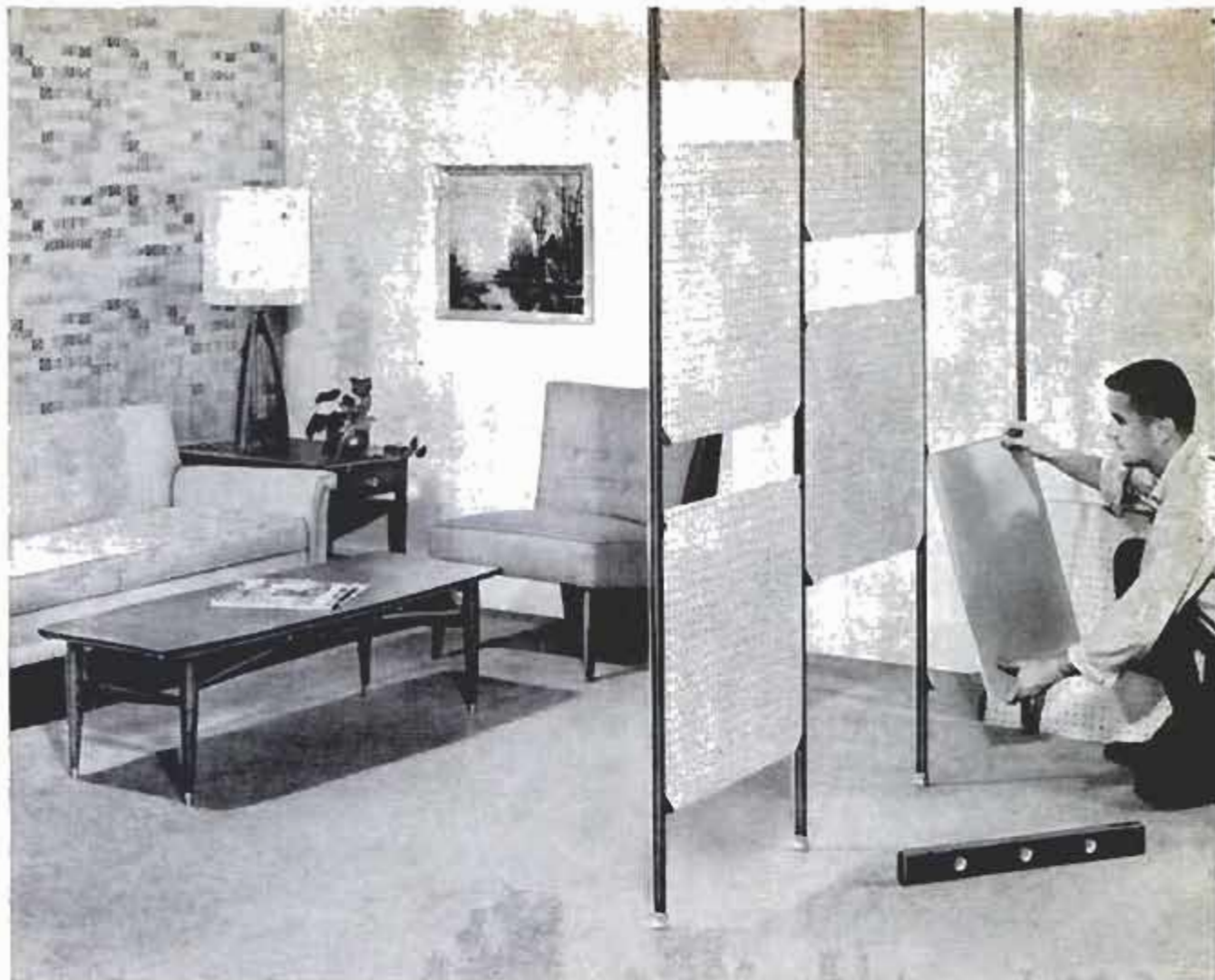
You can now order prefabricated Swiss chalets built exactly to your plans. Imported from Switzerland, wood parts for the chalet are numbered according to your design to assure simple and accurate assembly. Each house is made of four-inch-thick lumber held together by joints and oak pegs. Interior walls are similar, but three inches thick. No nails are used anywhere in the walls.

Fuel Cell Produces Electricity Directly From Gas

Electricity generated in a small plastic cell spins a miniature propeller in a demonstration by General Electric Research Laboratory scientists, Drs. Leonard W.

Niedrach and W. Thomas Grubb. The fuel is hydrogen, contained in the balloon. The hydrogen reacts with oxygen in the air, producing electricity.





Carpenter's level is used to make sure poles are vertical. Wooden or metal panels are mounted with clips

Versatile Room Dividers Permit Quick-Change Decor

YOU CAN give the interior of your house a "quick change" by setting up room dividers that take just a few minutes to install. Spring-loaded, slotted-steel poles are placed vertically between the floor and ceiling. Then metal or wooden panels are mounted on the poles with clips. The poles have rubber tips and feet, and can be adjusted to fit any ceiling between seven feet four inches and nine feet one inch in height. Shelves can be installed on the dividers by inserting brackets in the poles, which are a slate-gray color.

Top of pole is placed at desired point on ceiling. Pole then is lifted up against spring pressure. Shelf, left, can be adjusted to one-inch intervals



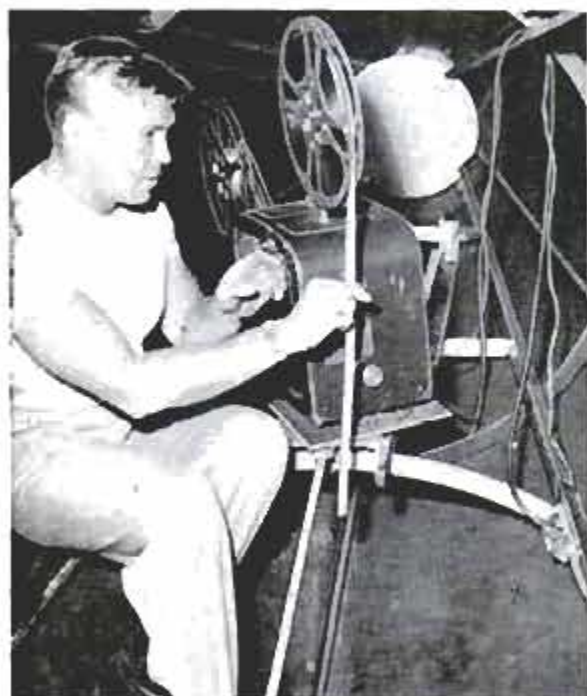


Visitors to the Peralta playground in Oakland, Calif., prepare for their first flight into outer space

Playground Rocket Ride Creates Sensation of Flight

Thirty-three passengers board an aluminum spaceship, fasten their seat belts and travel to the moon and back in a rocket that never leaves the ground. They're riding the Star Flyer, a carnival ride owned and invented by two former Oakland, Calif., policemen, John G. Taggart and

Samuel Daugherty, Jr. The rocket's nose tilts to a 23-degree angle 35 feet above ground. At blastoff, motors thunder and seats thrust forward. A film takes riders into space, bringing the moon into view. Minutes later, the ship "returns" to earth with all of the sensation of landing.



Flight sensations are created by film that shows the heavens sweeping by on a front-end screen



Passengers sit tensely as they near the moon. Later, film brings earth gradually closer creating feeling of return

There's a Name for It . . .

Next year the census taker will be around to see you. When he asks your occupation—can you give him a straightforward answer? Are you a knocker or a wrinkle chaser or a vinegar man?

Try on some of these strange-sounding occupations and see if they fit. Everyone knows a carpenter is a carpenter and a painter is a painter. But some aren't so familiar. The out-of-the-ordinary names below appear in the U. S. Department of Labor's Dictionary of Occupational Titles:

By H. P. Behnke

BOOSTER: Circulates among patrons of night club or gambling den to encourage spending.

TURTLE-BACK MAN: Assembles airplane parts to bottom of plane to give rounded appearance.

DIMPLER: Forms dimple around rivet holes in airplane sheet-metal parts.

HORSE PUSHER: Takes care of horse in transit.

KNOCKER: Harvests fruit or nuts from trees by knocking them down with a long pole.

CORN SNAPPER: Corn picker.

WRINKLE CHASER: Worker in shoe factory who takes wrinkles out of shoes by hand or with hot iron.

FIDDLER: Scrapes rough edges from shoe left by edge trimming operation.

PRETZEL STRINGER: Uses wire mechanism to loosen pretzels from board before they go into oven.

BACK SPIKER: Railroad term for man who spikes rails to ties after track has been laid.

BOOTMAN: Works mechanism for spreading oil or bituminous liquid on highway from truck.

BRICKMAKER: Molds codfish cakes in fish cannery.

DREAMER: Sells lucky numbers.

FLYMAN: Raises and lowers scenery.

BELLY SELECTOR: Grades hog bellies in slaughterhouse.

CABIN MAN: Sorts bobbins of yarn and stores in boxes or cabins.

DOPE RUNNER: Worker who moves raw material in textile mill, such as glue, starch, etc.

CHEESE FORMER: Forms tobacco into cakes called "cheeses."

FINE-SCRAP SEARCHER: Picks out foreign material from tobacco.

BANANA MESSENGER: Accompanies shipment of bananas to make sure of safe arrival.

FUR PLUCKER: Picks coarse hairs from flat skins for better appearance.

NECK FELLER: Sews in blind stitches in garment industry.

TEASER: Feeds raw material to glass melting tank in glass industry.

SMOKE CHASER: Fire lookout.

PONY PACKER: Fills sacks of grain.

SCALPER MAN: Cleans foreign objects from grain.

LURER: Worker who gives luster to felt hat crowns with heated pad.

HOOKEE: Couples up mine cars.

YEAST MAN: Mixer in iron and steel industry.
BOSOM PRESSER: Laundry worker who presses shirt bosoms.

SHORT GIRL: Locates lost articles in laundry.

PICKLE HOUSE LUMPER: Hide picker in leather working.

SAMMY MAN: Uses water to dampen hides.

EYE-LASH PASTER: In manikin making, one who affixes lashes to forms.

GREENSMAN: Worker in motion-picture industry who decorates sets with flowers, shrubs, etc.

BELLYMAN: Assembles and mounts sounding board to back of piano.

VINEGAR MAN: Mixer in paint factory.

PONY-ROLL MAN: Paper-factory worker who wraps and seals small rolls of paper.

SAND SMELLER: Geologist in petroleum industry who collects core samples for analysis.

JIGGERMAN: Pottery worker who forms ware.

SHUFFLEDOWNER: Shingle stacker for binding in bundles.

TICKET CHOPPER: Railway ticket taker.

BOARD DUSTER: Bakery man who sprinkles flour on boards, pans, etc.

OUTPEELER: Removes baked crackers from oven.

RUSTLER: Looks after haulage system in coal mining.

DRIFTER: A rock-drill operator.

SPECIAL-NOISE MAN: In dairy industry, a man who checks for unnecessary noises.

STAR LOADER: Loads and assembles ship signal lights.

SPIKE PITCHER: Farm worker who uses pitchfork to move grain from ground to wagon or reverse.

RED MUD THICKENER: Works with red mud in smelting and refining.

DUBBER: Ship-frame trimmer.

COTTON PICKER: Machine operator in mattress factory.

NECKER: Neckline stitcher on neckties.

CAT DOCTOR: Tractor mechanic.

DONKEY DOCTOR: Donkey-engine mechanic.

BULLY OR TWISTER: Boss in logging camp.

BUCKWHEATER: Tenderfoot lumberman.

BALL HOOTER: Rolls logs down slopes.

HIGH CLIMBER: Removes limbs from tree tops.

PIGMAN: Greases logging skids.

ROAD MONKEY: Works on logging roads.

BUSH MONKEY: Tanbark piler.



Soldier Fires Guided Missile

Guided missiles as ground-troop weapons are forecast by Red-Eye, an anti-aircraft guided missile that can be transported by troops and is shoulder-fired. The bazooka-type launching tube contains propellant, electronic guidance, and a high-explosive warhead. It weighs 20 pounds.



"Zoomar" Lens for Microscope

By turning a power-selector dial, continuous zoom-type magnification is available on a three-dimension research microscope. It eliminates the step-by-step increase on regular microscopes and allows study of the specimen through all magnification stages without shifting eyepieces.



Portable TV Set Doubles as Serving Table

Resembling a tea cart, a portable television set can be rolled on rubber wheels to any location desired. Slim and lightweight, the unit, with its wooden top, can double as a utility service table in the living room, dining room, or patio. If desired, attractive floral arrangements might also be placed atop this versatile all-purpose unit.

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"Thermostat" Controls Room Lights

In the home of the future you may never have to worry about adjusting the proper amount of lighting. A thermostat-like instrument that can be preset to any lighting level, just like the heating thermostat, will do it for you. A photoelectric scanner located in the ceiling measures the amount of daylight in a room and automatically dims or brightens lights to the level of natural light in the room, at electricity-cost savings of 50 percent. Such lighting controls are presently designed for offices and schools, but can be expected for homes of the future.



Tubes Prevent Clogging of Gutters

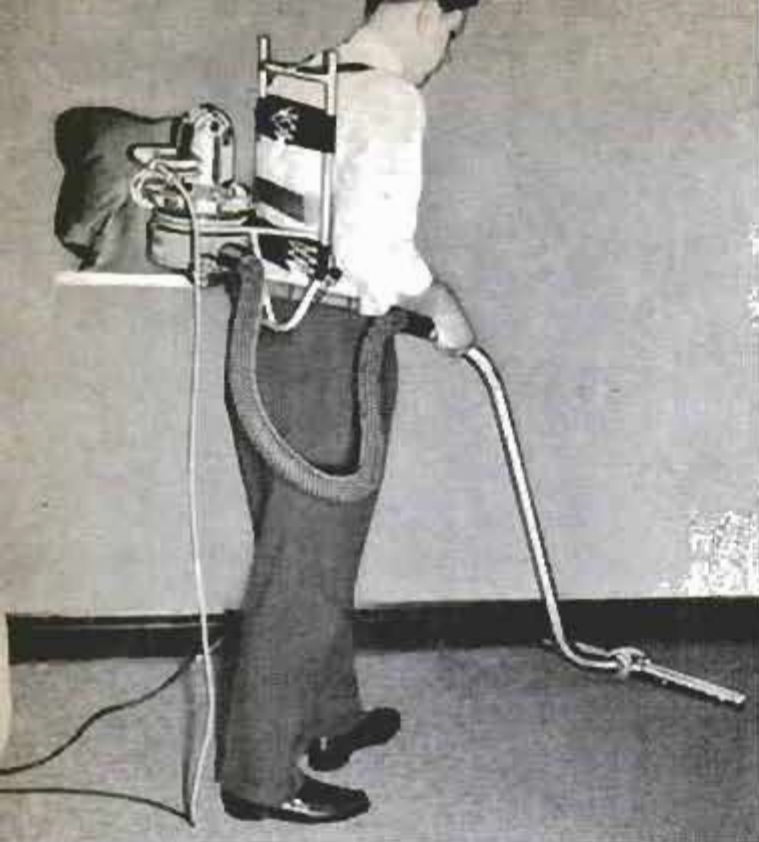
Clogging of roof gutters by falling twigs and leaves can be eliminated by placing plastic tubes lengthwise in your gutter. The tubes, made of polyethylene resin, form a tunnel, and arch high enough above the gutter edges to provide a natural slope, shedding airborne litter in the same way as a peaked roof. Water flows down over the guard and enters through a scallop-edged open side, while litter passes on. The guard is lightweight and rustproof, and its sections are laid end to end. It also provides the same type of protection from ice and snow.

Marines Move Heavy Tank From Ship to Shore in 63-Ton Carry-All

U. S. Marines have a new 62-ton heavy-gun tank in their amphibious arsenal. It is carried from ship to shore by a 63-ton

tracked vehicle. The tank mounts a 120-mm. cannon that fires a 50-pound projectile more than 18 miles.





BACK-PACK VACUUM CLEANER is fully portable, making it easy for the operator to reach out-of-the-way spots. The machine draws dirt into an attached bag, or, with the air flow reversed, operates as a sweeper to blow debris forward and out from under hard-to-clean places. The electric cleaner can be detached from the shoulder straps and pulled along on its sled-like frame. Many attachments are available

Brewer Electric Manufacturing Company,
5100 N. Ravenswood Avenue, Chicago 40, Ill.

WHAT'S NEW FOR Your Home



PORTABLE HEATER has thin, ribbon-like heating elements which glow and give off warmth the moment the user pushes a button. The heater is mounted on a U-shaped frame so that it can be tilted to direct heat upward or downward; it also swivels to face any direction. The unit has a combination high and low wattage (1,320 and 1,650 watts) and operates as a radiant heater or a fan-forced convection heater

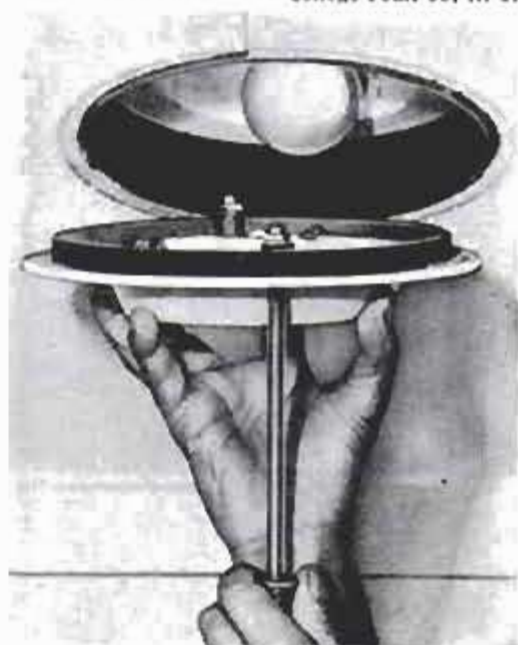
Cory Corporation,
3200 West Peterson Avenue, Chicago 45, Ill.

BENCH-PICNIC TABLE combination solves the problem of outdoor seating and eating. The back of the bench is hinged so that it flips forward to become a table top. Two benches set together form a table top 32 inches wide. The kit for each bench contains all necessary metal parts, bolts and screws—no lumber is included. Benches up to six feet in length can be built from one kit; for an eight-foot bench, an extra set of legs should be used in the center to provide additional strength

Leavenworth Steel, Inc.
First and Walker, Kansas City 15, Kansas

SPRING CATCHES that hold this lens frame to the recessed ceiling-light fixture are released with just a quarter turn of a screwdriver. It takes only ten seconds to remove or replace the frame—cutting substantially the time that is ordinarily spent in an awkward over-the-head position to remove long screws in such ceiling fixtures

The Simes Company, 114-15th Avenue,
College Point 50, N. Y.





DATED PACKAGE (above) tells the housewife how long the food inside has been in the freezer. The lock-on cover of this handy flexible container has a dial which can be set to show either the week and month of freezing or the latest date for using the frozen food. Each carton also includes a chart showing maximum safe storage period for all foods. The container is available in 14, 24 and 32-ounce sizes.

Plastomatic Corporation, Malvern, Pa.

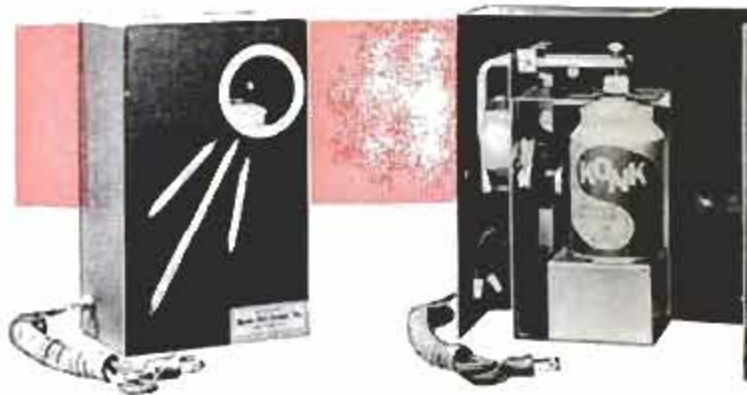


INTERLOCKING FLOOR TILES go into place and stay there without adhesive or tools of any kind. Edges of each tile dovetail into adjacent tiles. The pattern may be changed at any time by rearranging the tiles—or the entire tile floor can be removed and used in another room. Composed of a composite rubber material, the tile can be installed over any relatively smooth subfloor, including below-grade concrete.

Sears Roebuck and Company,
925 S. Homan Avenue, Chicago 7, Ill.

AUTOMATIC INSECT SPRAY keeps the house free of flies, mosquitoes and gnats 24 hours a day. The electrically-operated unit releases measured amounts of non-toxic insecticide spray into the air at regular 15-minute intervals. The dispenser, weighing five and a half pounds, may be carried from room to room and installed high enough on a wall to disperse its spray effectively. It is both odorless and harmless to humans.

Synco-Mist Controls, Inc., 270 Madison Avenue, New York, N. Y.



SLIP-COVER ANCHORS are simply fiber tubes that act as wedges to hold ready-made or custom-tailored slip covers in place. The tubes are tucked into the furniture at the same time the slip cover is put in place, where they remain, holding the cover material tight. Housewives can also insert moth balls or flakes, wrapped in gauze or cloth, in the open-end tubes to protect the furniture from damage by moths.

National Fibre Can and Tube Association, 274 Madison Avenue, New York 16, N. Y.



Log Unloader Empties Truck in One Big Bite



Two giant prongs of a log unloader reach down and lift the entire load from a truck in one grasp. It can do the same with a railroad car—empty it with one bite. Used by the Pacific Lumber Com-

pany of Scotia, Calif., the unloader provides quick unloading for convenient sorting of the logs before they go to pond storage or to the debarker for additional processing.



In a lily pool outside his home in Japan, Teizo Yokomizo and his son grow pearls from fresh-water mussels

Pearls From Fresh-Water Mussels

By Albion T. Sawyer

WADING IN HIS lily pool one day, a Japanese school teacher named Teizo Yokomizo stubbed his toe on something hard in the mud. Reaching down with a stick, he poked out a large black mussel.

Unknown to him, the mussel had become attached to a wild lily he had transplanted in the pool some years earlier. Curious, Yokomizo got some cutting instruments and started dissecting. While he was thus engaged, the village letter carrier came by and, after learning what Yokomizo was doing, told him that a farmer nearby had tried to use mussels for food but had given up in disgust. They were too tough and ill smelling. However, said the mailman, the farmer had found pearls in one of the mussels.

So Yokomizo delved into the cool wet tissues of his mussel with heightened interest. But he found no pearls. Next day he bicycled to the village where the farmer lived. There, on a piece of white cloth in the farmer's house, Yokomizo saw mussel shells and several pearls. All the farmer was able to tell Yokomizo about his dis-

coveries was that mussels occasionally contain beautiful pearls.

The sight of those pearls on the farmer's shelf was enough to start Teizo Yokomizo searching for a way to make mussels grow good cultured pearls. The search was to last 17 years.

In that time, Yokomizo experimented with six different ways to operate surgically on mussels before he found a successful one. Each of the operations, which involve insertion of mother-of-pearl nuclei in the mussel's flesh, required at least three years to evaluate. Finally the sixth experiment produced what Yokomizo was looking for—pearls with large spheres and good luster.

There is a ready market for the cultured pearls that Yokomizo gets from his fresh-water mussels. Japan's pearl-export business has increased more than four times in the past nine years. In 1950 the country exported \$4,022,783 worth of cultured pearls. By 1958 the figure had jumped to \$16,751,000. The U. S., Italy, France and Switzerland are the biggest buyers.

Yokomizo finds that mussels can produce



Using instruments he designed, Yokomizo inserts an American mother-of-pearl nucleus in a live mussel

pearls better and less expensively than oysters can. This, he says, is because mussels grow larger than oysters and have thicker shells, which means they can accept—without injury—larger mother-of-pearl nuclei than the small oysters used in the pearl industry.

Also, mussels are not subject to the hazards of cold currents and sudden storms, nor to the depredations of salt-water enemies like starfish and red microbes.

In general, fresh-water mussels thrive over a wide range of climate where food is plentiful and where water chemistry is favorable. They live widely over the United States, and have been a source of industry in the Mississippi River's tributaries.

In fresh-water mussels you may find one or more natural pearls loose on top of the mantle that lines the shells. You may also find one embedded in the mantle or even under the mantle. A natural pearl, whether in oyster or mussel, is begun by accident. The cultivated pearl, on the other hand, is begun by cutting a small mother-of-pearl nucleus — about the size of a ball bearing—and inserting it into the flesh of the mussel by surgery.

This operation requires speed and skill. Speed is important because the mussel weakens while out of water and is not fit to undergo a severe or prolonged operation. Many mussels die when the mother-of-pearl sphere is placed in their bodies.

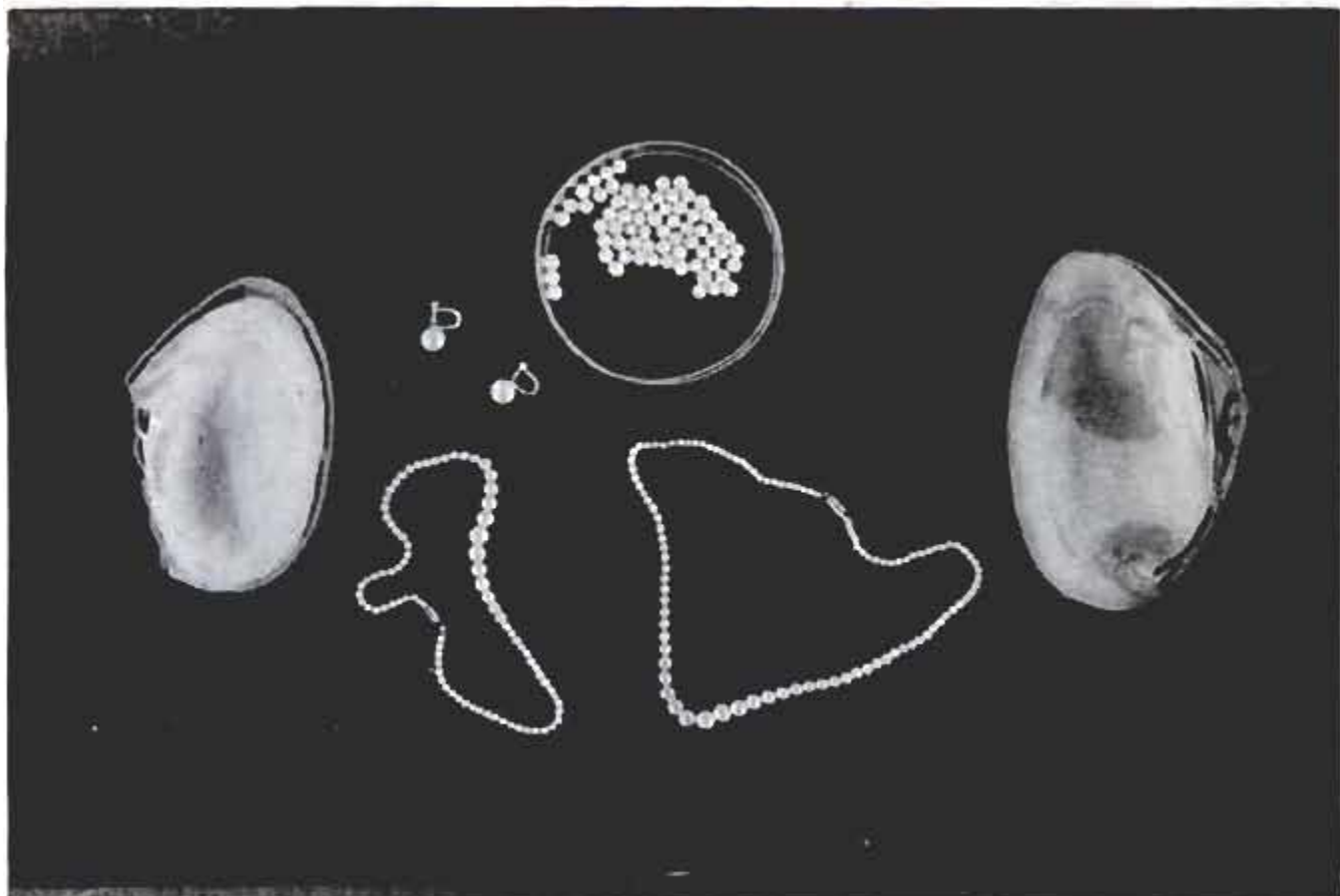
Anyone interested in growing his own pearls can construct a large lily pool in his back yard, hunt up a half dozen mussels from streams or lakes, insert the nuclei and lay the mussels in the bottom of a pool. The pool should have masonry walls and be at least six feet wide and eight to ten feet long. It should have four to six inches of clean gravel or pebbles on the bottom, covered with about eight inches of earth. Duck weed, pond lilies and other varieties of fresh-water plants can be added to the pool. The mussels prefer cool water and can stand ice water, but they can't tolerate acids. Dead tree leaves should be kept out of the pool.

You also will need special surgical instruments. Yokomizo designed his own and contracted an expert machinist to make them. Basically, his set includes the following four instruments:

1. Reverse forceps with thin, wide jaws for prying open and holding apart the shells of the mussel. A sliding metal band holds the jaws apart at the desired spread.

2. A long, slender cutting instrument that has one small end flattened and sharpened to a razor's edge for making tiny incisions. The other end has a tiny spear-point for picking up fragments of live tissue for transplanting.

3. This instrument, also long and slender, has tiny cups at each end, one a trifle larger than the other. The cups are moistened in



This jewelry was made from fresh-water pearls taken from mussel shells like these. Unset pearls are in the box

water and serve to pick up the nuclei beads for insertion in the tissue. Molecular attraction holds the beads in the cup.

4. A slender tool, ending in a small, rigid wire loop, that is necessary for the looping operation in which the nucleus is enfolded in a section of the mantle. The loop, pressed gently down over the bulge in the mantle, assists in tying of thread to hold the pearl nucleus in place.

All of these instruments are made of stainless steel.

Here's how you can insert the nucleus in the mussel's flesh: Using extremely small simulated pearls for nuclei, make a

slit in the surface of the membrane. It should be large enough to admit just one bead. Push the bead inside and away from the slit. The slit will heal. Then lift the membrane and tie under the bulge with a nylon thread. Don't tie too tightly.

When you return the mussel to the water, it probably will dig into the bottom of the pool and stay put. This method will produce a pearl—but it may have a slight bump on one side. Don't be discouraged, though, for perfectly round pearls of gem color are the exception, even in mass production. And don't be impatient. You won't see any results for at least three years. ★ ★ ★

Radar Tracks Copper Chaff To Chart High Winds

Smoother rides on high-flying jet airplanes and greater accuracy for missiles are two of the benefits from a unique method of charting high-altitude winds. Using a method developed during World War II to confuse enemy radar, Navy scientists are now charting winds as high as 100,000 feet. They eject fast-falling copper chaff from a sounding rocket, then track its descent by radar. Wind velocities are computed from the chaff's drift rate during the 33 minutes it takes to fall from 100,000 feet. The new method lets meteorologists determine wind direction and velocity eight times faster than possible by any other means.

Plastic Foam Glue Permits Quick Use of Broken Bones

Bone glue that allows you to walk out of a hospital on a fractured leg in three days is being tested by scientists in medical schools and hospitals. Developed by Dr. Michael P. Mandarino, the glue, a plastic polyurethane foam, becomes tougher than bone when it dries. During treatment, the glue is poured on the end of small pieces of bone removed from each of the broken ends. The pieces are replaced so that the two ends of the bone dovetail, and within a few hours the fractured member can be moved. Normal bone eventually grows through the glue and in about a year the bone joins solidly.

Chute From Rocket Ship Brings Kids Back to Earth

Getting into this spaceship means a quick trip back to earth for youngsters in Hanover, West Germany. They whiz down a graceful, curved slide from the starting point inside the rocket ship. The slide is located in a modernistic play area on the spacious grounds of the German Flower Show.

First Protonic Microscope

Capable of probing much deeper into the unknown than ever before, a protonic microscope, the first of its kind, has been built by French scientists. Unique because it uses protons rather than electrons, it has been used so far only to study the structure of certain crystals. Using the new microscope, scientists expect to see six times deeper into the microcosm than has thus far been possible with the most powerful electron microscopes.

Propeller Drives Car Over Siberian Snow

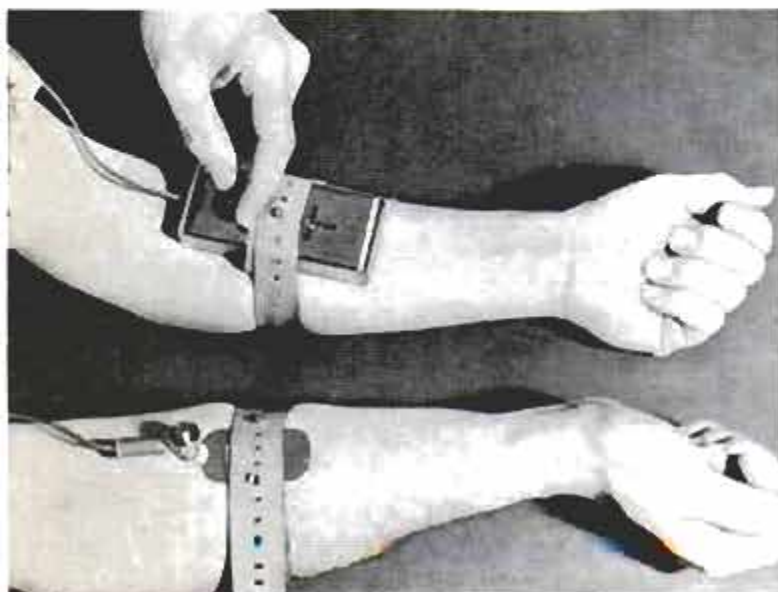
There's no worry about chains or deep drifts when the driver of this Russian vehicle takes off for a midwinter jaunt. Wheels of the car have been replaced with wide skids which ride over the snow. The vehicle, now being used in Siberia, is powered by a 260-horsepower engine which drives an airplane propeller.

Monitor Warns Surgeon Of Heartbeat Deviations

Strapped to a patient's arm during surgery, a tiny, self-contained instrument translates the electric-wave activity of the patient's heart into audible "beeps" to warn the surgeon of cardiac arrest or other disturbance. By monitoring the electrical currents produced by each heartbeat, it can give instantaneous warning of deviations with greater accuracy than pulse or blood-pressure counters. An electrode strapped to the other arm accomplishes the completion of the circuit.



UPI photo



Those Little Things Count..

In the Sound of Your Hi-Fi System

By John Gayner

YOU PROBABLY recall the day you first flipped the switch of your spanking-new hi-fi system and listened with delight to the clarity and realism of the music coming from the loudspeaker.

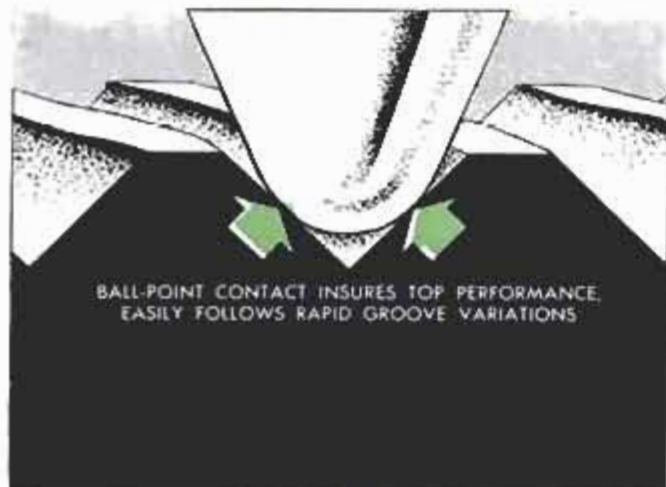
Does it sound as good now? Are the trumpets as saucily brassy and the voices as crisp and clear as they were? Or do the records sound scratchy? Fuzzy? Do they crackle and pop? Does Como seem to "tremolo" when he didn't before, and does your favorite piano piece seem to w-a-a-w-a-a-w-a-a-w?

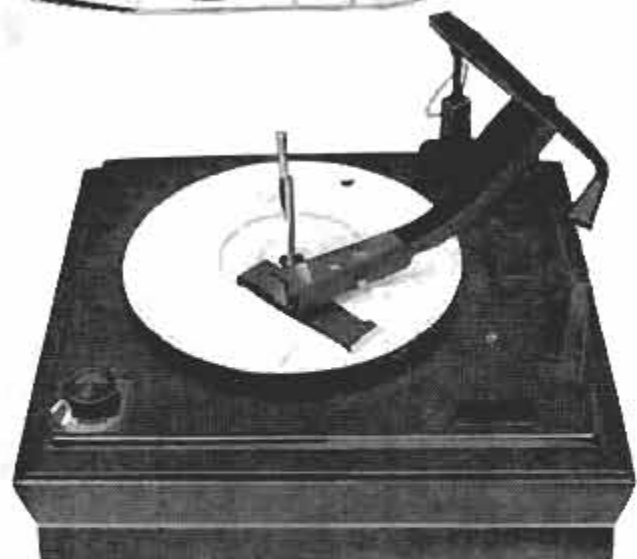
If your system has lost some of its original brilliance you are no longer getting a good return from your investment. And,

when you uncover and cure certain maladies by the simple means described here, you may find that the original sparkle and clarity have wilted away so gradually that you may not even have noticed the change. The improvement, therefore, will be all the more startling.

Like an automobile, a hi-fi system requires periodic checks and some special care to remain in top-notch condition. Elec-

Worn stylus can cause as much distortion and more damage than a defective electronic component. Periodic stylus inspection with inexpensive microscope, above, lets you know when it's time for a change





Stylus pressure, too much or too little, is detrimental to high fidelity. Most hi-fi record players have accessible pressure adjustment in tone arm, as above. Inexpensive pressure gauge placed on turntable permits accurate adjustment for optimum results

Level that turntable. It may cure those sticking or groove-jumping habits of your pickup arm. Simple bubble levels are available from hi-fi dealers to make this an easy job. You may find that it will also improve stereo balance and overall fidelity

tronic parts age, components change in performance and, even in the absence of major troubles, after a year or so of use the characteristics of the system may no longer be the same as they were originally. Such gradual deterioration, if it becomes noticeable, can be localized and corrected only by a qualified audio technician.

But there are a number of routine checks that you, yourself, can and should make at regular intervals. They take only a few minutes of your time and require a very small outlay, but they can prolong the life of your equipment and eliminate some rather expensive service calls. Here are some of them:

STYLUS WEAR—The stylus (needle) of your record player does not come to a point. It's rounded so that it contacts both walls of the V-shaped record groove. After some use that rounded tip wears down and develops chisel-like edges. Instead of accurately tracing the delicate patterns of sound impressed into the groove it chops and hacks its way through the wave peaks and valleys.

Result is distortion: Fuzzy, hard-to-listen-to sound, with the high flutes and piccolos going or gone.

And, it murders your records!

To avoid this, check the stylus tip regularly with a microscope. Your audio dealer sells a little, inexpensive pocket unit that lets you inspect without removing the stylus. If it shows signs of wear, don't play another record with it! Replace it!

The styli of most phono cartridges can easily be changed according to directions

given in your instructions manual. If you don't have the manual, ask your dealer for it or write directly to the factory. They'll be happy to send you one.

And, even if the cartridge originally came with a sapphire stylus, replace it with a diamond. These cost more, but they last 10 to 20 times as long and represent a worthwhile investment. It's a good idea to inspect a sapphire stylus for wear after every 10-hour period of use—a diamond at 100-hour intervals.

STYLUS PRESSURE—If your phono cartridge bears down too hard it will permanently distort the relatively soft plastic material of the record. If it rides too lightly it will climb the walls of the groove and may even jump out. Either condition causes serious distortion.

Answer: Buy a stylus pressure gauge (cost—about \$1-\$4) and adjust for the correct tracking pressure called for in the manual. On most record players or changers, such as the Glaser-Steers unit shown here, the adjustment is easily made.

Note this: On some changers, stylus pressure may rise above the recommended maximum as the record stack on the turntable rises. Make sure that it remains within permissible limits from one record to the top of the stack. If it doesn't, don't load the changer with its full complement of records.

TURNTABLE LEVEL—If your record player—changer or manual—rests on an incline, the stylus bears more heavily on one wall of the record groove than on the other. Again, distortion and excess wear

for Keeping the HI in the FI



Dirt, dust and grime are archenemies of both records and stylus. Lightweight "atomic jewel" attached to tone arm neutralizes static electrical charge which causes dust to cling to record grooves



Wipe away "crackle, snap, pop" with swish of chemically impregnated cloth before playing any record. Below: plastic cover, available for most record changers, is useful accessory for uncased instruments

are the results. In stereo, balance may be affected. An inexpensive bubble level, made for the job, will show any turntable tilt and permit you to compensate for it by raising one side of the unit. **DUST, DIRT, GRIME**—Those fine, spiraling grooves in your records are as attractive to dirt as a mud puddle is to a 4-year-old. Dirt not only causes annoying crackle and pop, it can also cause serious wear. Every time the stylus crashes into a microscopic "rock" of dirt it imbeds it deeper into the soft vinyl plastic. What should be a zig in the shape of the groove becomes a zag and the sound suffers. It takes its toll of the stylus too, acting like a fine abrasive and prematurely wearing the tip to a dangerous chisel shape.

One way to help keep dust off the record is to neutralize its static electrical charge. That way the record won't attract and hold the tiny dust particles. You can do it with a silicone anti-static spray, with an impregnated "Jockey" cloth that cleans the record at the same time, or with an "atomic jewel" that attaches to the pickup arm. Another low-cost and useful item is a small brush which attaches to the tone arm and sweeps the record ahead of the stylus.

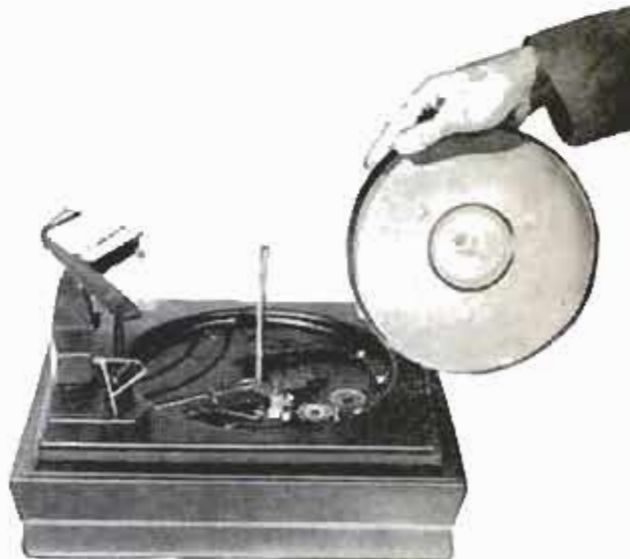
If your record changer sits out in the open, a plastic cover is a handy item to shield against all forms of dirt. And a little common sense in handling your precious records—such as always replacing them in their original jackets as soon as possible and handling them by their edges to prevent dirt-attracting grease and moisture from getting into the grooves—will greatly increase their useful life.

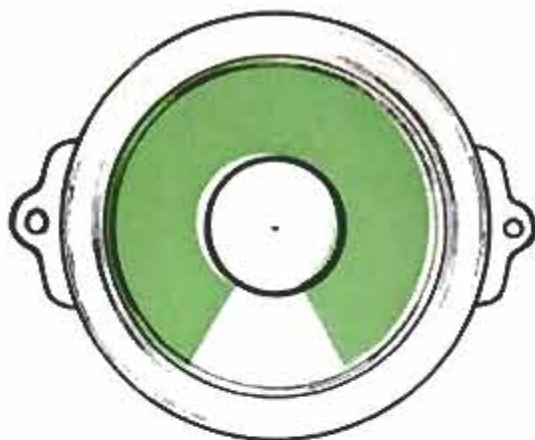
TURNTABLE WOW—The word "wow" tells the story. That annoying repetitive waver in pitch is caused by an alternate slow-down and speedup of the turntable. If it stems from a defective or badly-

(Continued to page 226)



Removal of "C" washer from changer spindle lets you lift off turntable to expose driving mechanism. Careful cleaning and lubrication may eliminate "wow" and "flutter" which has marred your listening pleasure and save costly service call





BULLS-EYE TUNING WITH YOUR RADIO

By Rudolf F. Graf

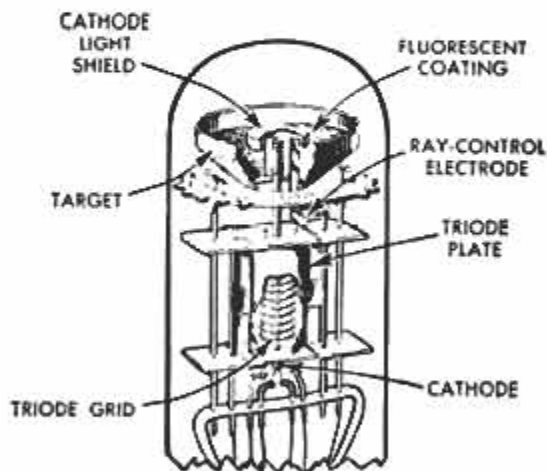
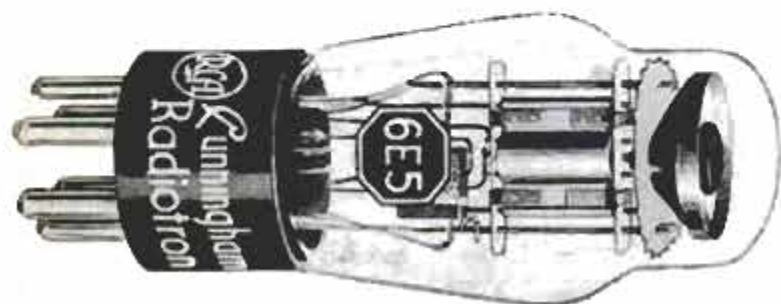
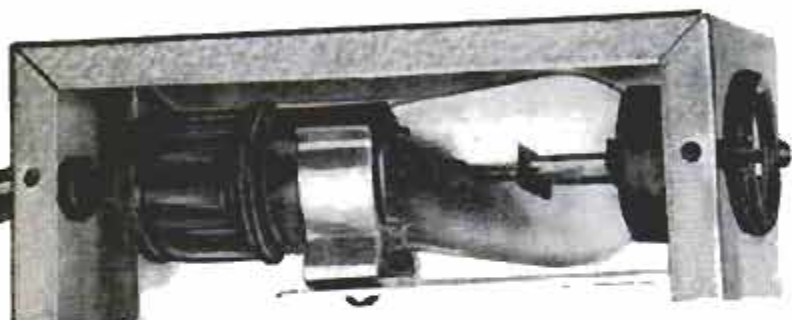
FOR HIGHEST QUALITY reception of AM and FM radio broadcasts the receiver must be tuned exactly to the carrier frequency of the desired station. Some of the more expensive radio sets incorporate some sort of tuning indicator which permits easy, on-the-nose tuning, but a good many receivers are not so equipped. As a result, such sets are difficult to adjust and are often left in a detuned position which causes a great deal of distortion and listener fatigue. The addition of a tuning indicator will greatly improve their performance.

The easily constructed tuning indicator shown here employs the popular and inexpensive 6E5 electron-ray tube illustrated below. The cut-away illustration of Fig. 1 shows the essential parts of the tube. Here's how it works.

The target, a funnel-shaped piece of metal at the head of the tube, is coated

with a fluorescent chemical which gives off a green glow when bombarded with a stream of electrons. It is connected to a positive d.c. voltage in a receiver and thus attracts the electrons emitted from the heated cathode. In the absence of a control voltage the electrons strike all parts of the target, giving it the appearance of a green ring of light.

Located between the target and the cathode is a small piece of wire which serves as a ray-control electrode. When this electrode is at the same potential as the target it has no effect on the electron stream. If, however, the electrode is negative with respect to the target it will repel the electrons in its vicinity, effectively keeping them from reaching the target. As a result, the target area directly behind the electrode does not glow, causing the familiar pie-shaped shadow.



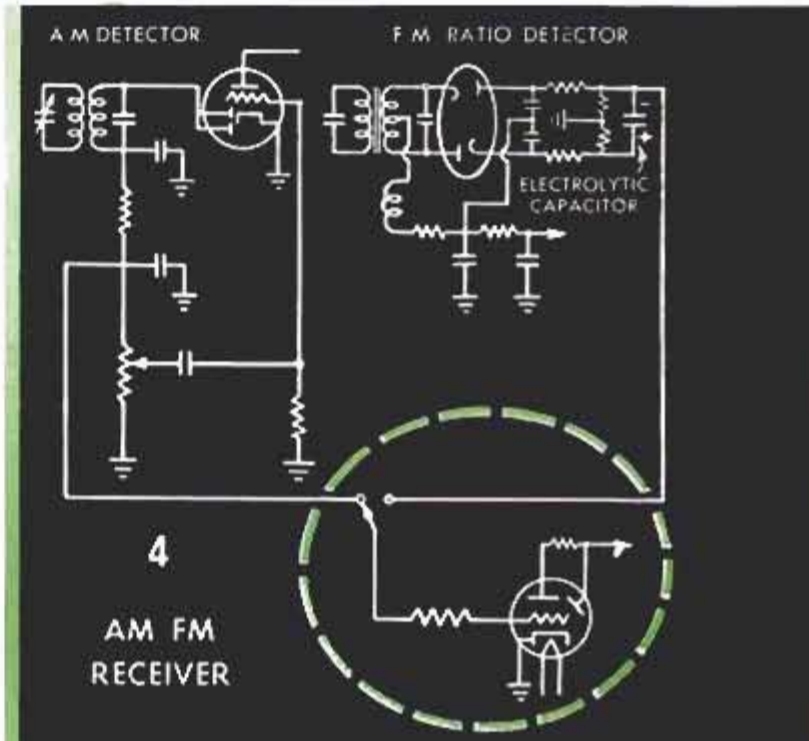
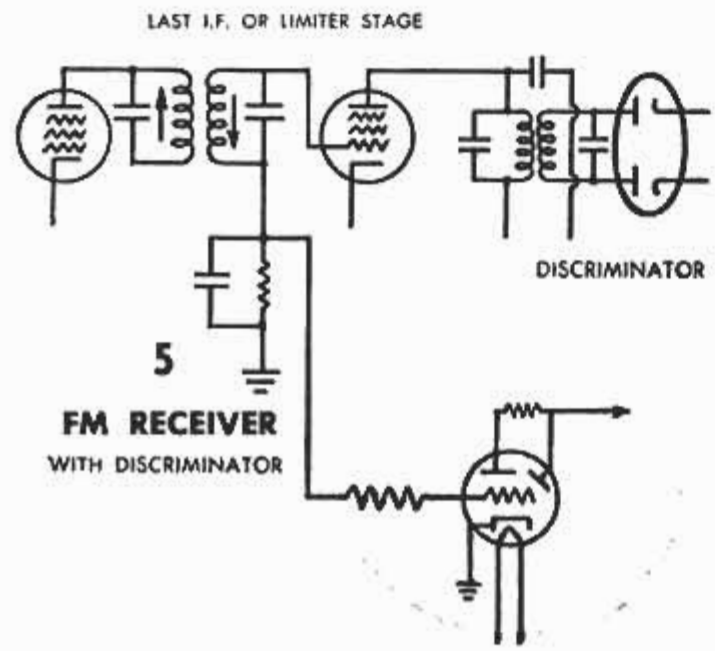
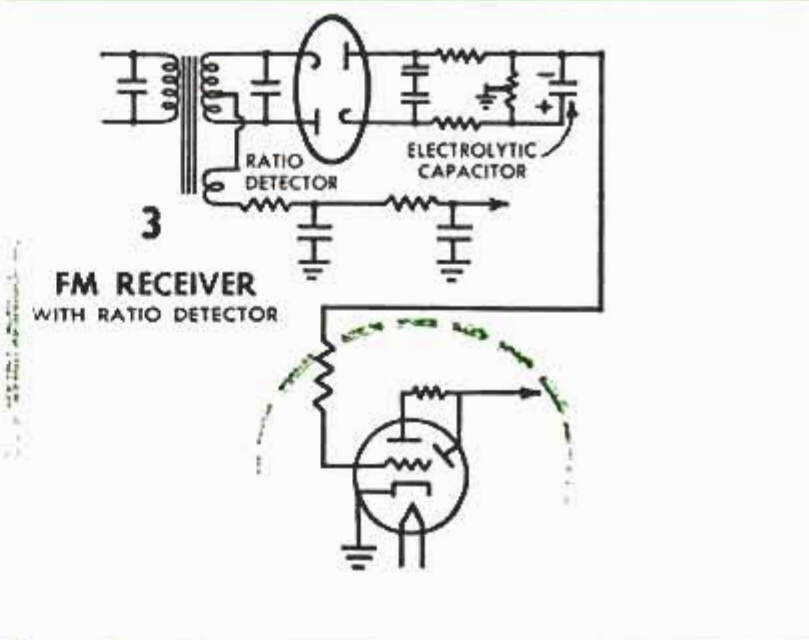
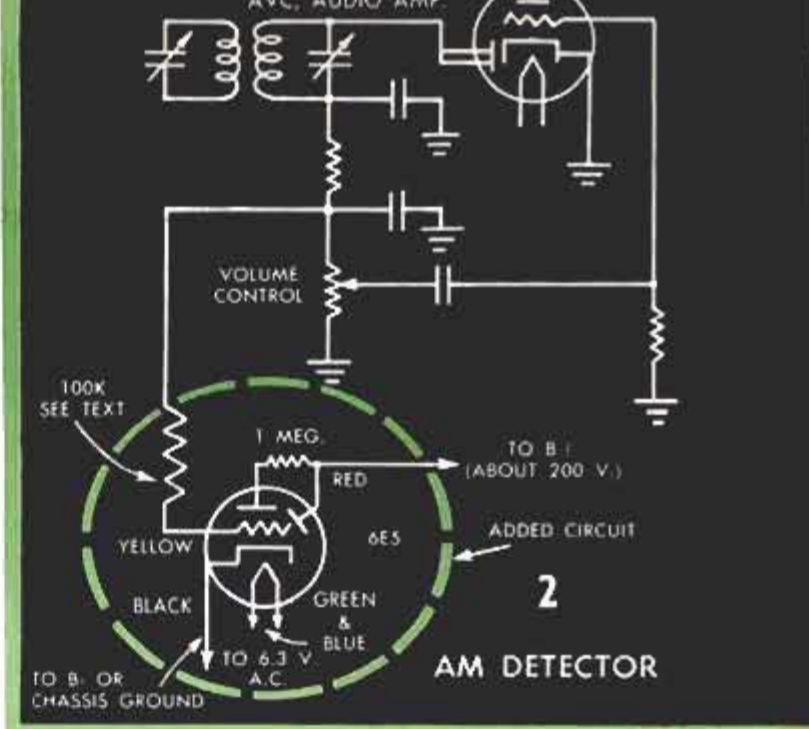
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The size of the shadow is proportional to the voltage difference between the target and the ray-control electrode. For the tube to act as a tuning indicator, therefore, it is merely necessary to connect its control grid to a point in the receiver where the voltage varies in accordance with the signal strength. Such a point exists in all modern AM and FM radios.

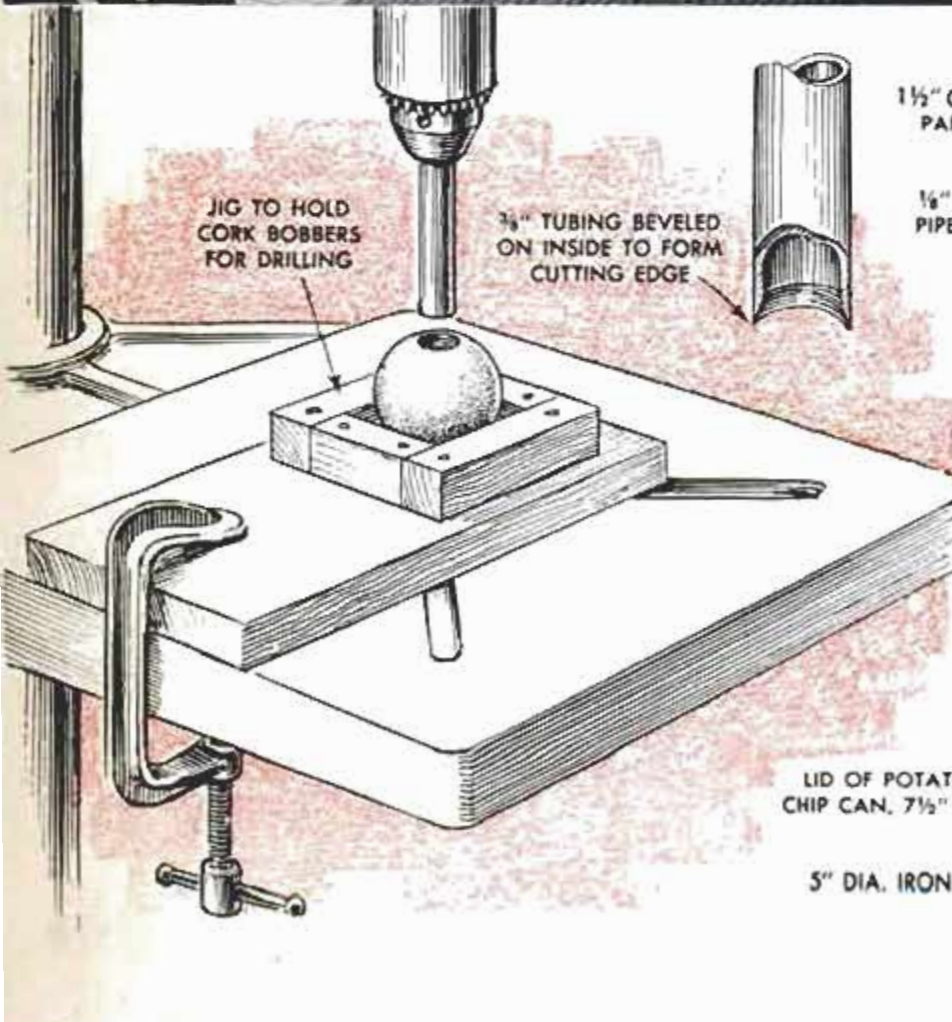
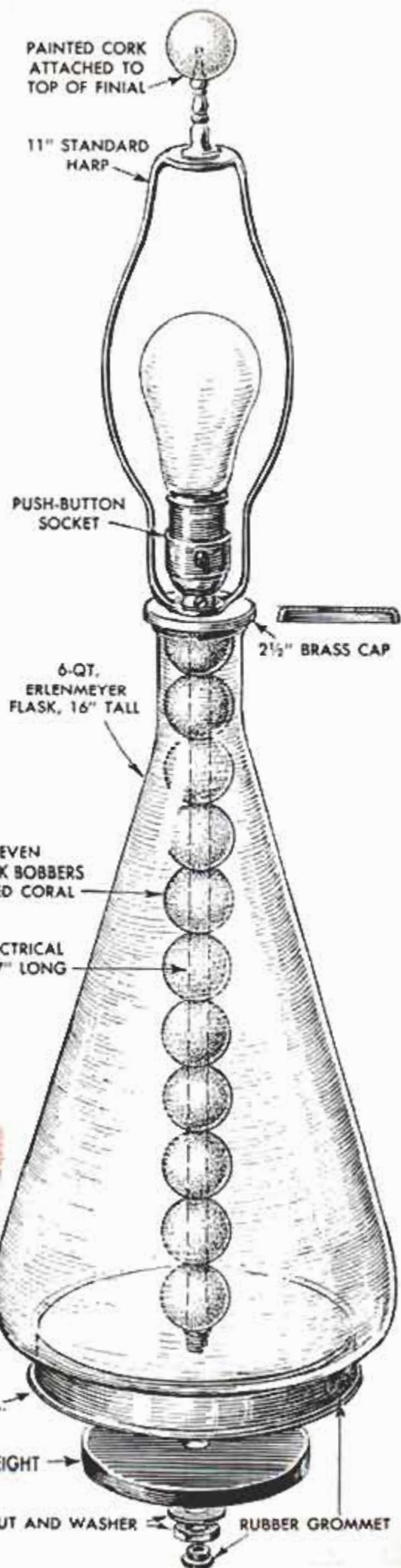
Construction of the tuning indicator is simplicity itself. The required parts—the 6E5 tube, the Amphenol 58-MEA-6 Tuning Eye Mounting Assembly and a small aluminum box (Bud, CU2106A) are inexpensive and are available from most large radio parts distributors or dealers. The mounting assembly is supplied with bracket, escutcheon, light shield and socket. Five color-coded wires emanating from the back of the socket are sufficiently long to reach the back of most any receiver when the completed tuning indicator is placed on top. It is merely necessary to mount the tube and assembly inside the box (this requires the drilling and punching of 4 holes in the box) and to connect the 5 wires to the appropriate points within the receiver. If desired, the receiver can be outfitted with an appropriately wired 5-prong socket, and a matching plug wired to the tuning-eye wires, so the two units can easily be interconnected or separated.

Making the proper connections within the receiver requires some knowledge of radio circuitry—at least the ability to read and follow schematic diagrams. These connections, for various types of sets, are shown in Figs. 2 through 5. It will be noted that the green and blue filament leads of the 6E5 require 6.3 volts of a.c. This restricts the use of the tuning indicator to

(Continued to page 230)

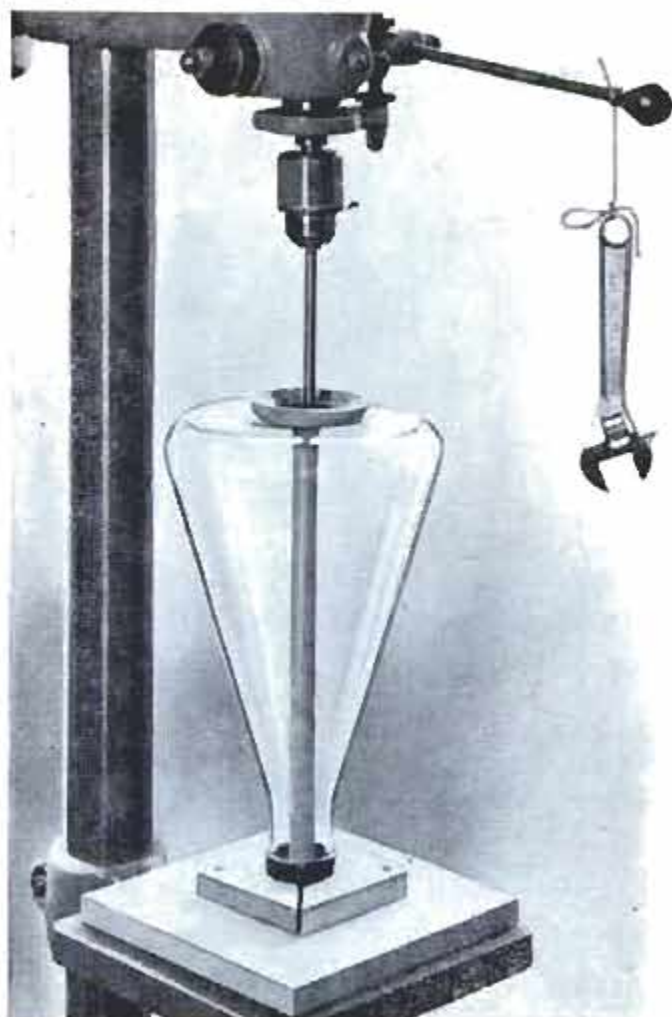


FLASK



LAMP

The CRAFTSMAN



Wrench of sufficient weight to apply right amount of pressure for drilling glass is tied to handle of drill, so it can be run with minimum of attention

Here is a novelty-type lamp that is suitable for a bedroom, nursery, or den. Using a large flask as the basic unit on which standard lamp parts are assembled as shown, you can make a pair of the lamps in a few hours. A unique feature of the lamp is the column of painted cork fishing bobbers that are stacked on threaded electrical pipe fastened in the center of the flask. Not only do the bobbers conceal the lamp cord but they can be repainted any number of times to fit into the decor of any room. In most cases the same shade could be used.

Begin the lamp by drilling a $\frac{3}{8}$ -in. hole in each of the bobbers, using a jig and an improvised bit as shown in the detail on the opposite page. Next drill a $\frac{3}{8}$ -in. hole in the bottom of the flask to take one end of a 17-in. length of electrical pipe. A workable procedure for drilling glass is explained below. Since this job is the most time consuming of the project, make a jig to hold the flask in position on your drill-press table as shown in the photo. Meanwhile the rest of the assembly can be completed as shown in the drawing.

When painting the bobbers, string them on a taut wire and use a hat pin to hold and turn each one as paint is being brushed on them. The potato-chip can lid used for the base is painted flat black. If a 5-in. dia. iron disk base weight is unavailable, melt some lead and pour one directly in the lid.
Bob Joselyn, Chicago

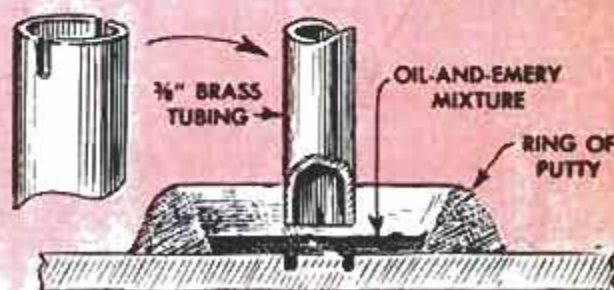
HOW TO DRILL GLASS

About the easiest way of drilling a hole in glass is to chuck a length of brass tubing in a drill press and use a jig to hold the object while the relatively slow process of drilling or grinding is in progress. A weight, such as a wrench, is tied to the drill handle to apply sufficient pressure to grind away the glass without overheating or breaking it as in the photo above.

An oil-and-emery dust mixture confined to the drilling area by a putty dam as detailed at right, provides the abrasive. Slots cut in the end of the improvised bit help to circulate the mixture. This cools the glass and brings a constant supply of abrasive to the grinding surfaces of the bit. The drill must be run at slow speed to avoid overheating the glass, which might crack it.

When drilling a hole in the bottom of a thin-wall bottle or flask, the flat surface must be supported at a point directly under the bit to counter-balance pressure exerted by the drill. In the case of the flask illustrated, a prop consisting of a length of dowel with a rubber disk glued on each end

serves this purpose. The lower end of the dowel is fitted in a hole drilled in the bottom of the jig. The latter is made up of two squares of 1-in. lumber, the lower one of which is one piece. The upper square is sawed in half diagonally and notched at the center to clamp the neck of the flask when screwed to the bottom square. A portable power drill may be used for drilling glass in this manner but it is a tiresome job since the weight of the drill must be balanced carefully.



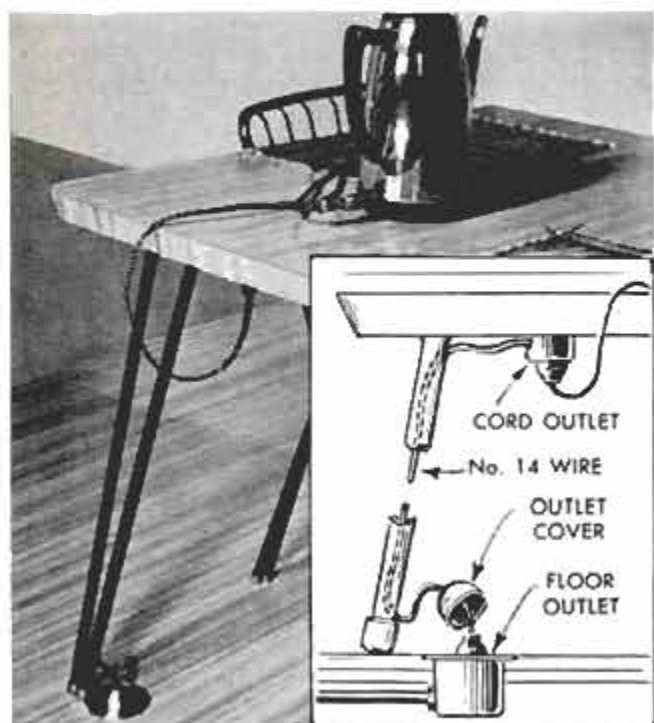


Quick Way To Make Rounded Wood Buttons

Decorative wooden buttons for surface gluing can be made by first rounding the end of a dowel freehand on a sander and then sawing partway through with your circular saw. Finish cutting off with a jigsaw to avoid damaging the completed button.

Outlet for Breakfast Table In Center of Kitchen

Do away once and for all with that electrical appliance cord reaching from a wall outlet to the coffeemaker on a table in the center of the kitchen. Install a floor outlet close to the table leg, then drill holes in the latter and pull the cord through and connect to a cord outlet as shown in detail below.



Improved Bulletin "Board" On Plastered or Tiled Wall

Office bulletins or shop plans and blueprints can be thumbtacked to any wall simply by drilling two holes in the wall material and pressing a cork into each hole. Corks should fit tightly and should be spaced to suit the width of the sheet.

Cross Handle for Allen Wrench Gives Additional Leverage

When you have to use the long leg of an Allen wrench a cross handle gives you the extra "torque" needed to seat a screw properly. Make a handle by grooving a piece of hardwood about 2½ in. long and ½ in. square. Drive an escutcheon pin a little offcenter through the groove and insert short leg of wrench as shown.



STAIRWAY CLOTHES HAMPER

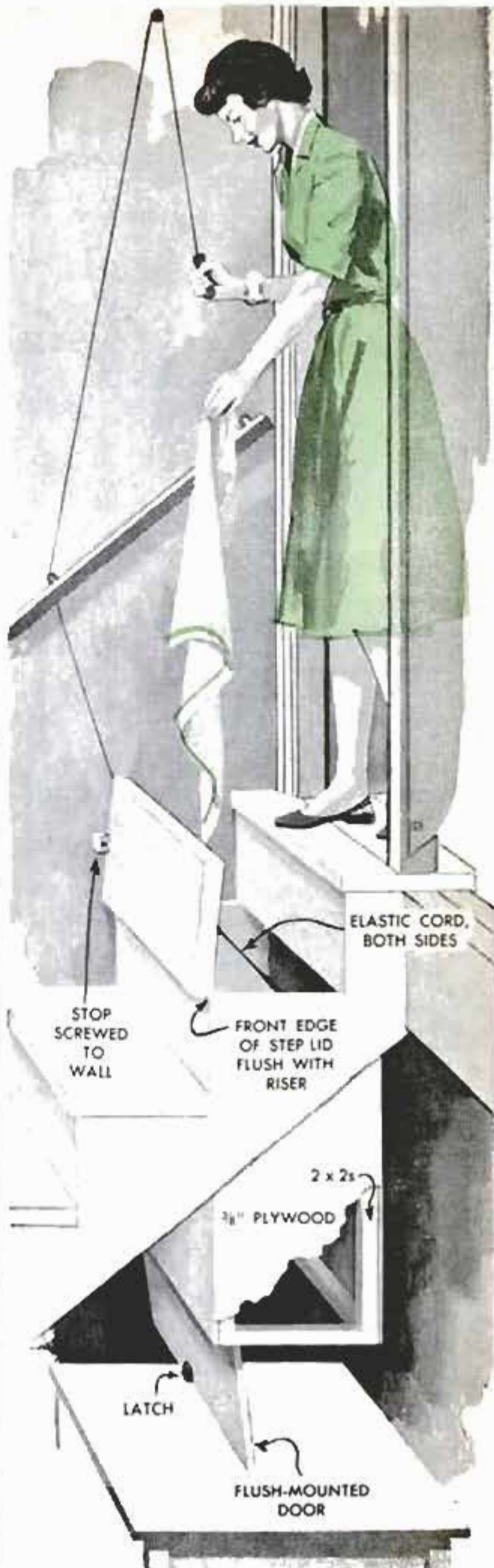
If your home is without a built-in laundry chute, here is a device which will save the lady of the house many steps to and from the basement. The top basement-step tread, planed flush with the riser, becomes the laundry-hamper lid. It is hinged to the riser and is opened with a simple string-and-pulley combination, which runs up the wall. A stop screwed to the wall prevents the lid from falling too far open, and elastic cords serve to close it. The hamper is as wide as the step case and about 6 in. deeper so that it extends under the landing. From the lid, the hamper falls vertically to within 3 or 4 ft. of the basement floor. It is made of $\frac{3}{8}$ -in. plywood mounted on a frame of 2x2-in. stock. Clothes are easily removed through a trap door flush mounted in the bottom.

Novel Hardware Caddy Made From Cigar Boxes

A household hardware caddy can be made from two cigar boxes, a dowel and paper cups. The cups are set in openings cut in one box, and its lid is sealed. The sides, cut from the second box, are fastened with screws and the handle is attached. The caddy carries light hardware or serves beverages.



DECEMBER 1959





In warm, dry climates where snow is a rarity, this type of decoration can appeal strongly to homeowners

DECORATE YOUR MAILBOX FOR CHRISTMAS

By Ted Lau

COME CHRISTMASTIME why not change the plain, year-'round look of your rural mailbox by including it in your outdoor decorating plans? It's no problem to fit the mailbox into the general plan and it takes only a little extra time. Working with bright ribbon, a candy cane or two, or a few pieces of foil and artificial snow, you can make box and post symbolize a gaily wrapped gift package, a church with an open door, a post festooned with new snow—decorations that bring a warm thought of Christmas to the passerby.

But while you're planning the box decorations remember your mail carrier. He'll have bundles of cards, letters and small packages for you every day of the week before the holiday and the chances are he'll deliver your mail on Christmas day. Make it as easy for him as possible. Arrange the decorations so that they do not interfere in any way with opening and closing the box. If you're a newcomer to the neighbor-

Snow, Santa and reindeer go together. Here's happy combination

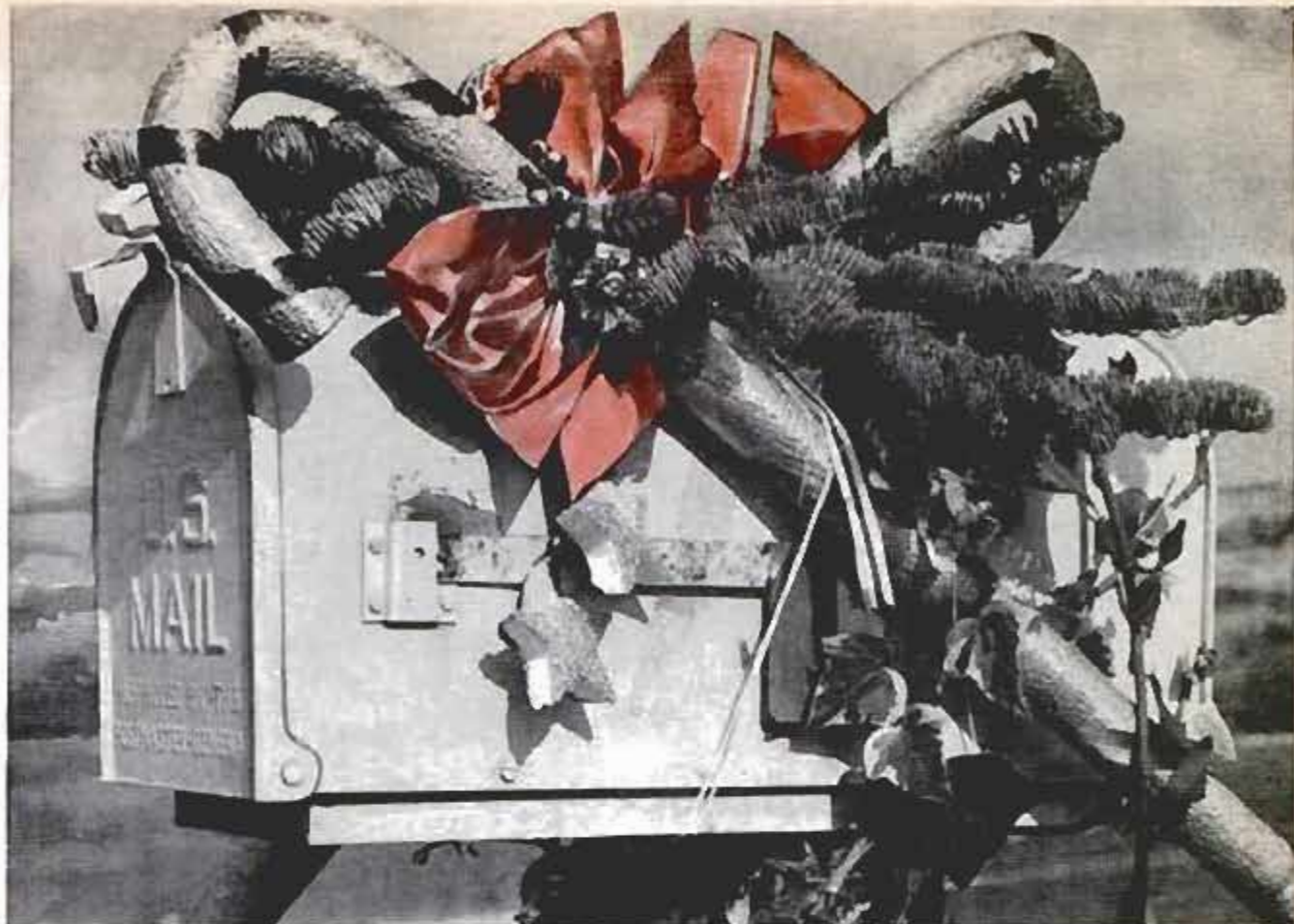


Church with open door, cross of foam plastic, are in keeping



This decoration can only mean that Santa Claus comes for mail on time





From a distance you can easily imagine this to be a specially wrapped gift package, anything but a plain mailbox on a post. It very well expresses the owner's wish of a "Merry Christmas" to all who pass by

hood and the decorations cover your name lettered on the box, then it's a good idea to letter name and address on a card and tape it to the front of the box where it is easily read by your carrier.

Boxes unduly exposed to wind and weather should be decorated with materials which are easy to fasten securely in place and which will withstand the elements for the week or so they are in use. Many suitable materials are readily available and easily utilized to get the desired effect. ★ ★ ★

Below and at right are boxes similarly decorated with foil and ribbon cut from brightly colored plastic





Suet Feeder for Songbirds Made From Milk Carton

Winter birds, whose main problem is a constant food supply, will soon spot this novel feeder. It's made from a 1-qt. milk carton having openings about 2 by 2 in. cut in the four sides. The flaps are bent upward to form awnings which protect the openings from entrance of snow or rain. Two $\frac{1}{4}$ -in. dowels, each about 10 in. long, are forced through undersized holes punched in the sides of the carton just below the openings. The dowels project equally on both sides to form perches for the convenience of the customers. Hang the feeder with two wire hooks to a tree branch at least 5 ft. above ground and tie a cake of suet to the dowels as indicated. Although altered to serve primarily as a suet feeder, the carton can also serve usefully as a small seed feeder.



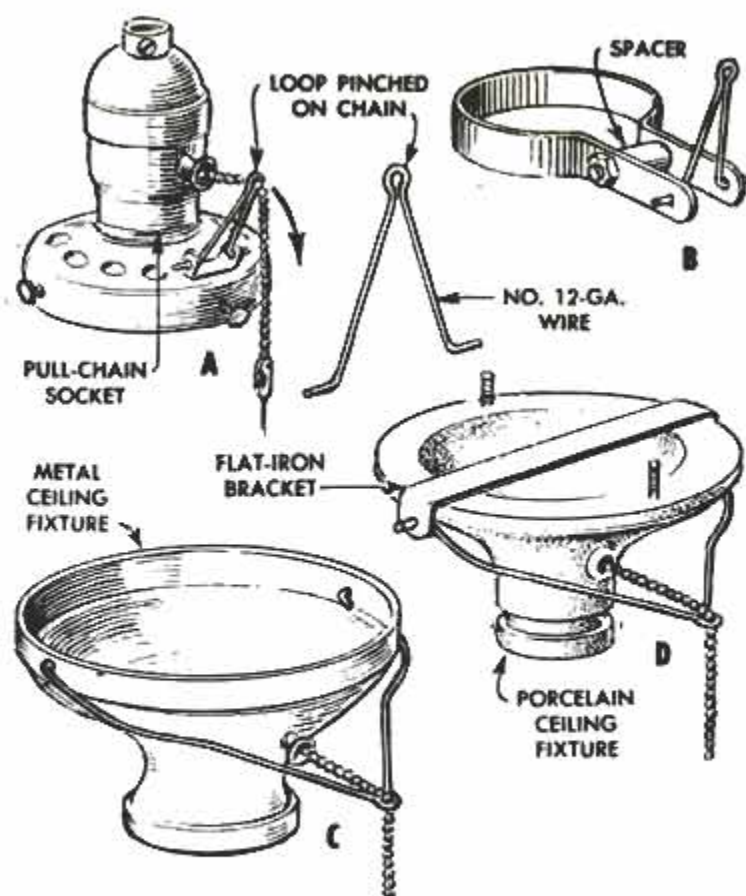
Sanding "Drum" Expands To Hole Diameter

There are times when you need to smooth the inside of a large-diameter through hole for the sake of appearance or to obtain a tight fit of some joining part such as a round tenon. The only sanding drum you have won't enter the hole. But before you go to a half-round file or a piece of sandpaper wrapped around a dowel, grab a magazine, roll it up tightly and wrap the piece of sandpaper around the roll. Then pass the whole thing through the hole, release the rolled magazine, allowing it to expand, and there you are. Sand with a back and forth stroke, turning the roll simultaneously and you'll do very nearly as good a job as you could do with an oscillating-spindle sander.



Coated Developing Reel Loads Without Sticking

When roll film sticks in the groove of the developing reel you're in trouble. Once it sticks it's difficult to move it in either direction without the chance of damaging the film itself or getting it smudged with fingerprints. But if you wish to save the film, there's nothing to do but keep trying until you finally get it safely in place. You can avoid this trouble simply by rubbing the groove with silicone-coated tissues of the type used for cleaning eyeglass lenses. Wad several tissues and press into the groove tightly so that all surfaces take a light coating. The trace of silicone, which is chemically inert, forms a smooth surface that prevents the film from sticking.



Preventing Breakage of Lamp Pull Chains

Repeated breakage of pull chains on overhead lighting sockets or ceiling fixtures, caused by binding of the chain on the bell-shaped bushing, can be avoided with a simple swinging arm shown in detail A. This exerts a horizontal pull on the chain and thus prevents binding. The pivoted arm, formed from a length of No. 12-ga. wire has a loop, which is pinched on the chain after the arm is set at a 45-deg. angle. It pivots in tabs formed by cutting the shade holder and turning the cut ends up, or, if desired, a U-shaped piece of brass

may be soldered into place on the holder.

For porcelain sockets and some types of ceiling fixtures, the arm is pivoted to the ends of a band tightened around the socket shell or fixture body as shown in detail B. For other porcelain ceiling fixtures on which a band cannot be fitted, a flat-iron or sheet-metal bracket can be inserted between the ceiling and the fixture base as in detail D. For spun-metal fixtures the pivot holes can be drilled in the sides of the base, and the ends of the arm bent over inside as in detail C.

Part of Paint-Can Cover Cut Away to Provide Edge for Wiping Brush

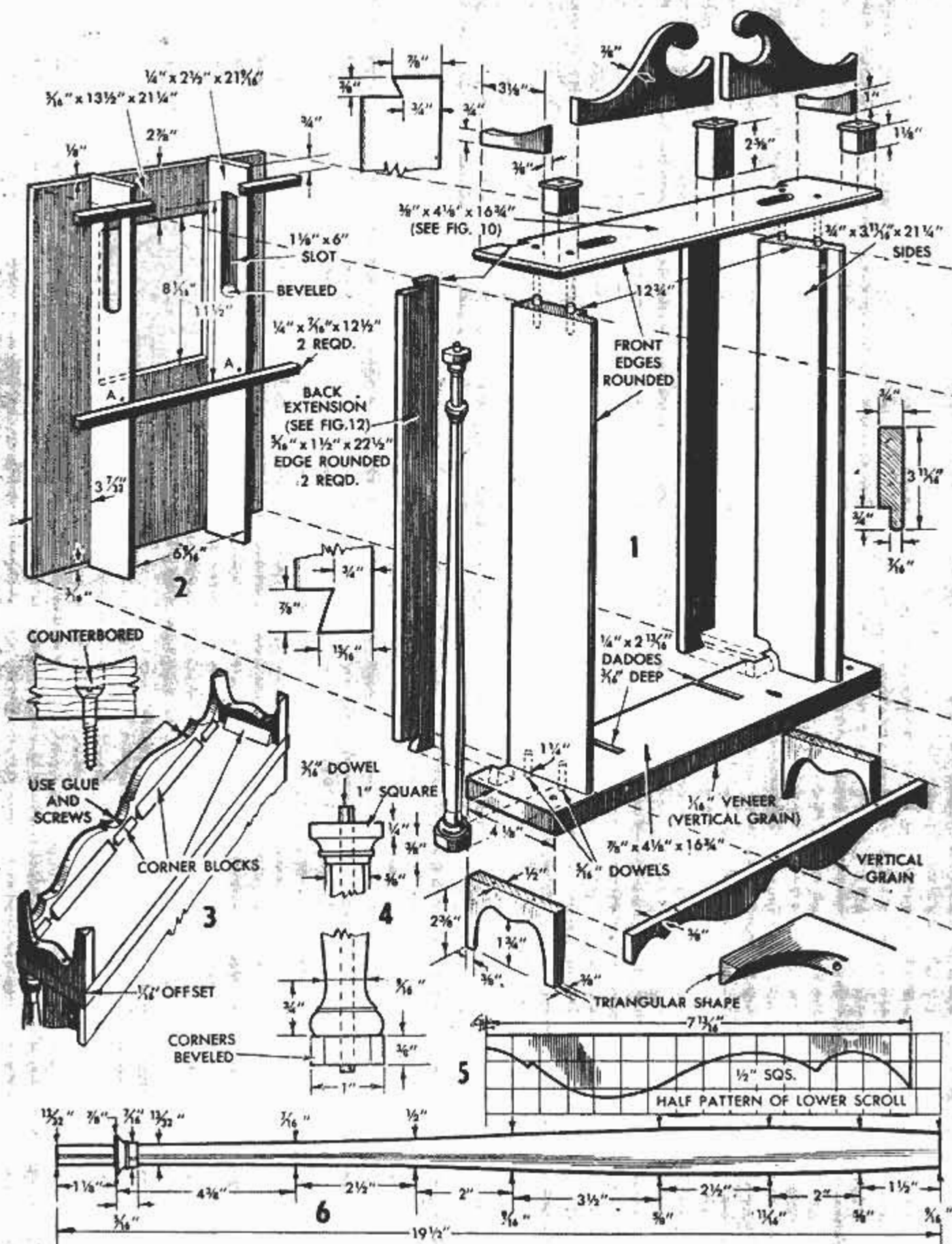
Altering the cover of a paint can as shown not only keeps the groove on the can free of paint, but also acts as a straight-edge for wiping the brush. Since most can covers are interchangeable with other cans, several of different sizes can be kept on hand for any need. The cover is altered by cutting away just a little less than half the top, leaving the rim intact. Then the sharp edge is bent back on itself to form a wiping strip as indicated.

Richard Hanscom, Elmhurst, Ill.

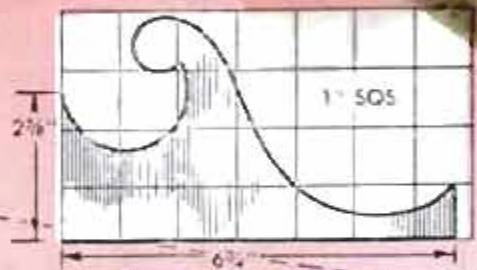
☐ When using a ruler or straightedge as a guide for cutting glass, make heavy crayon marks on the glass. The wax will provide friction to help keep the rule from slipping.



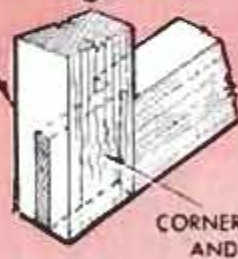
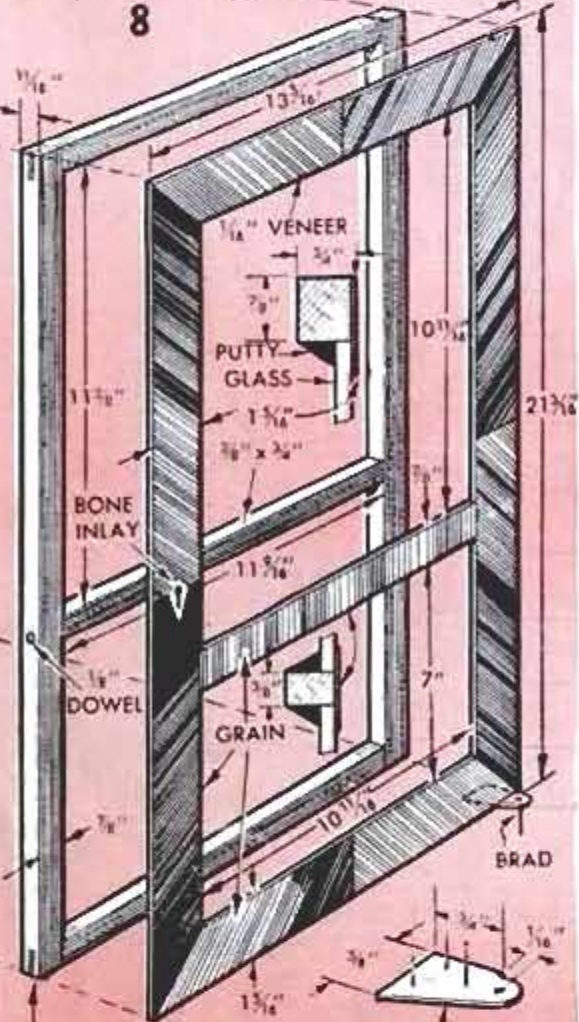
Early American Clock Has



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8



9

No. 20-GA. BRASS HINGE

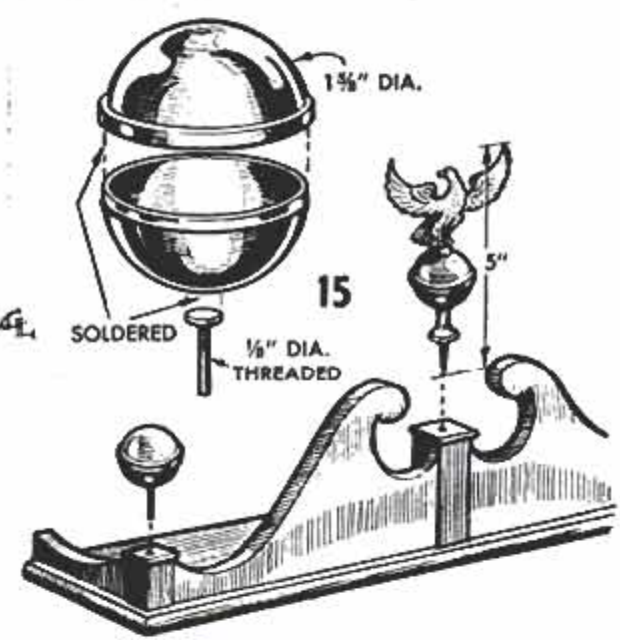
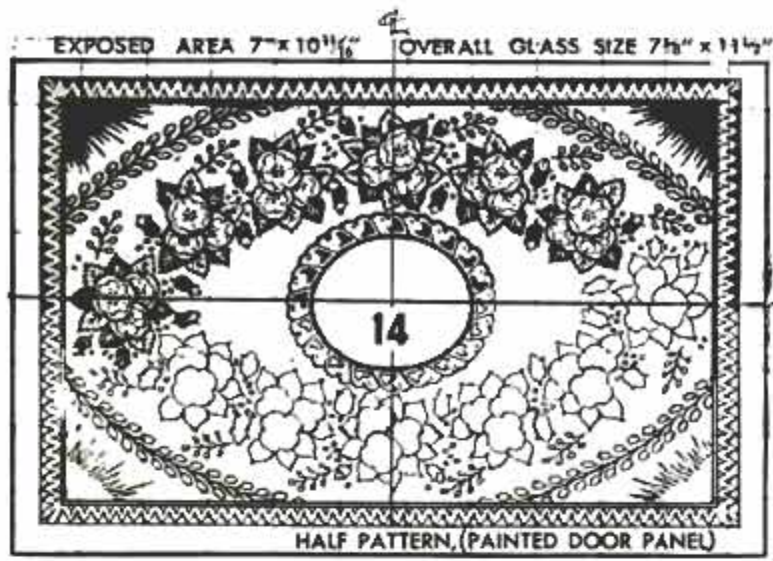
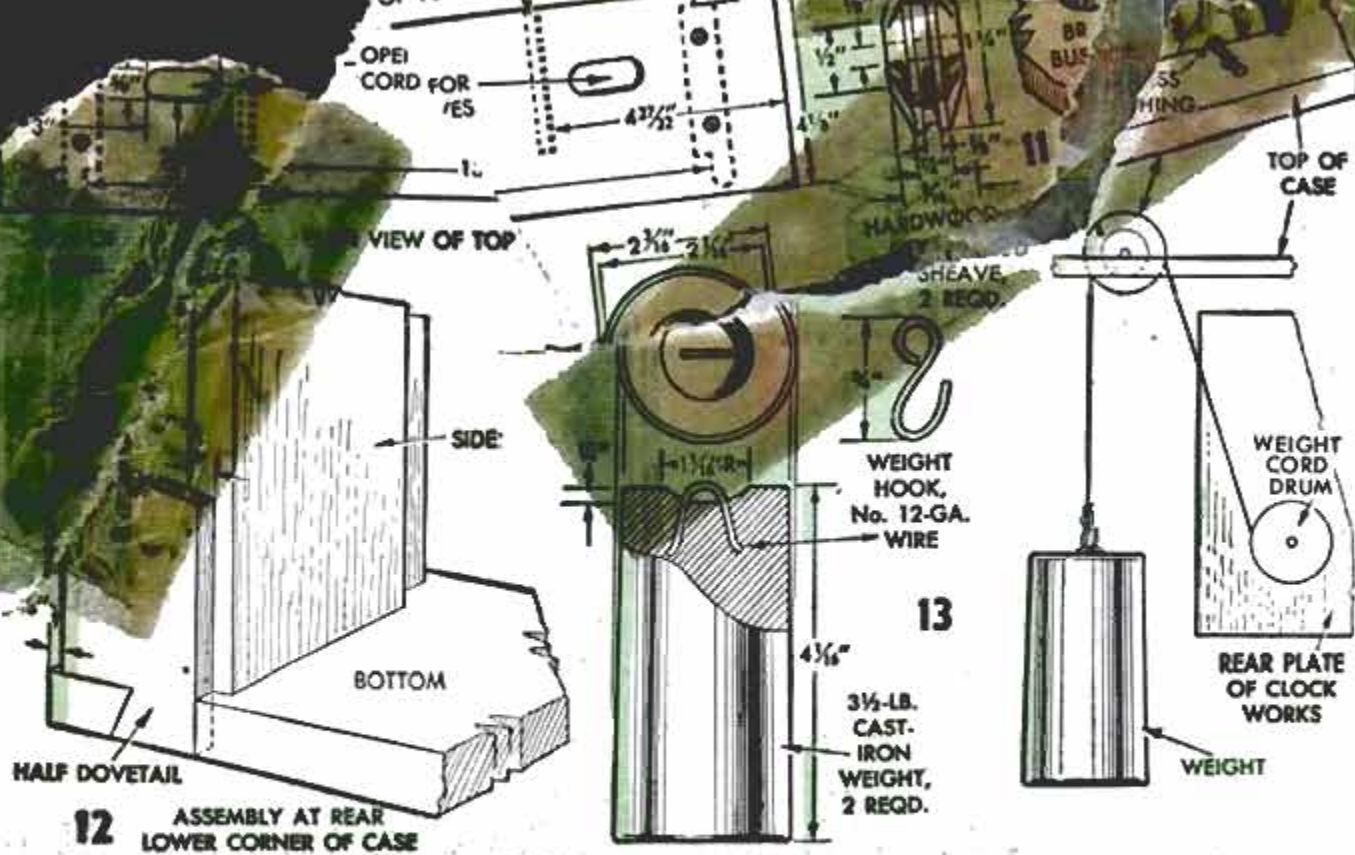


PART I

CASE AND MOVEMENT MOUNTING

By E. R. Haan

SHELF CLOCKS of the pillar-and-scroll type were made by several American clockmakers in the early 1800's. Most of these early clocks were fitted with 30-hour wooden movements housed in handsome mahogany cases. Pictured above is one of them, at least 130 years old and still in running condition. It was loaned to *Popular Mechanics* by courtesy of The Museum of Science and Industry, Chicago, for the purpose of making the accompanying measured drawings of its construction. From these you can build a



copy of the clock, now a comparatively rare American antique.

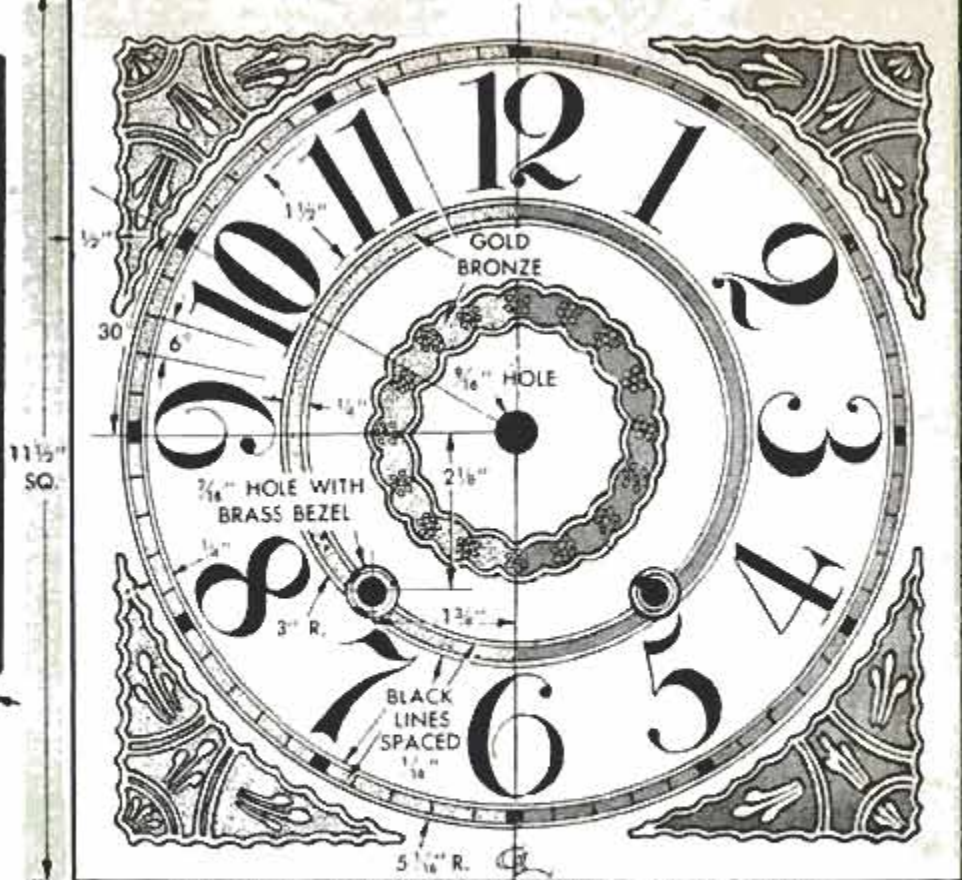
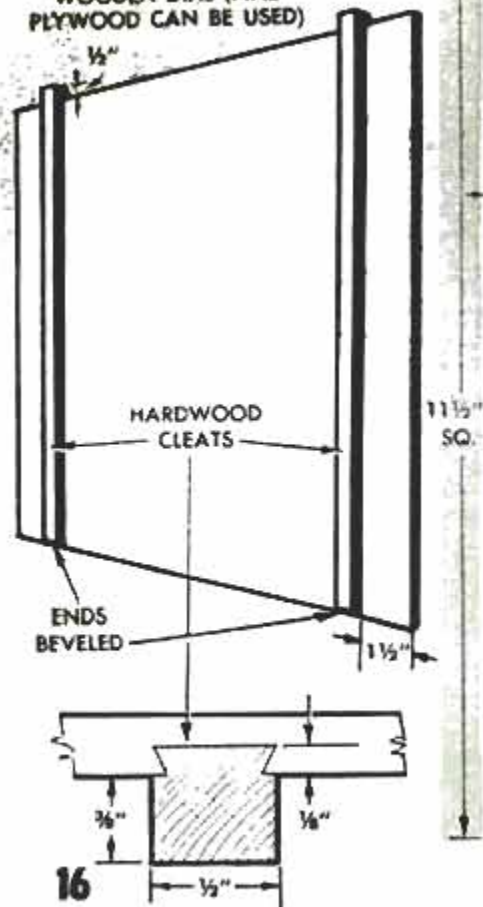
You have a choice of procedures. You can build the case alone and fit it with an electric movement, time only, or a spring-driven movement with strike. Or you can go all the way and build case and weight-driven movement complete. If you build the case only simply omit the movement opening in the back panel. Fig. 2, the vertical mounting strips, Fig. 2, and the tell-tale opening in the lower glass door panel, or tablet, Fig. 14. The case alone is quite simple to build. Building the wooden

movement is, of course, a painstaking job.

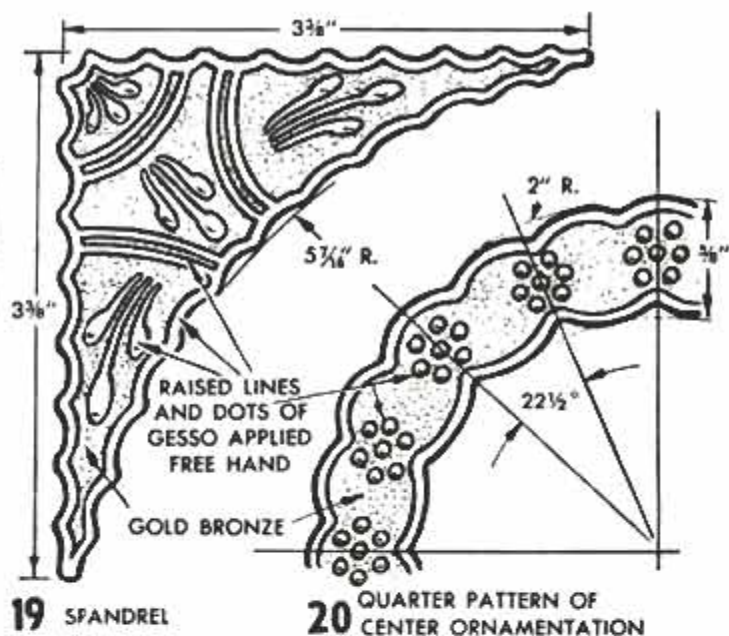
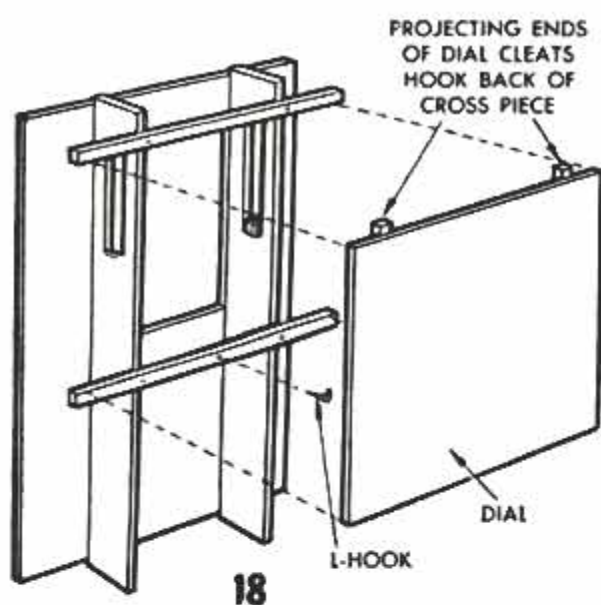
The case, without ornamentation, consists of the side members, the top and bottom and the back extensions, or wings, Fig. 1. These parts should be made and joined first. The top is detailed in Fig. 10 and the half dovetail joint made at the lower ends of the wings is shown in Fig. 12. Joinery of the wings at the top is the same except that the half dovetails are shorter. Note that the wings lap onto the back edges of the side members to form rabbets into which the back panel fits.

Next, cut and fit the movement supports

$\frac{1}{4}$ " x $11\frac{1}{2}$ " x $11\frac{1}{2}$ "
WOODEN DIAL (PINE
PLYWOOD CAN BE USED)



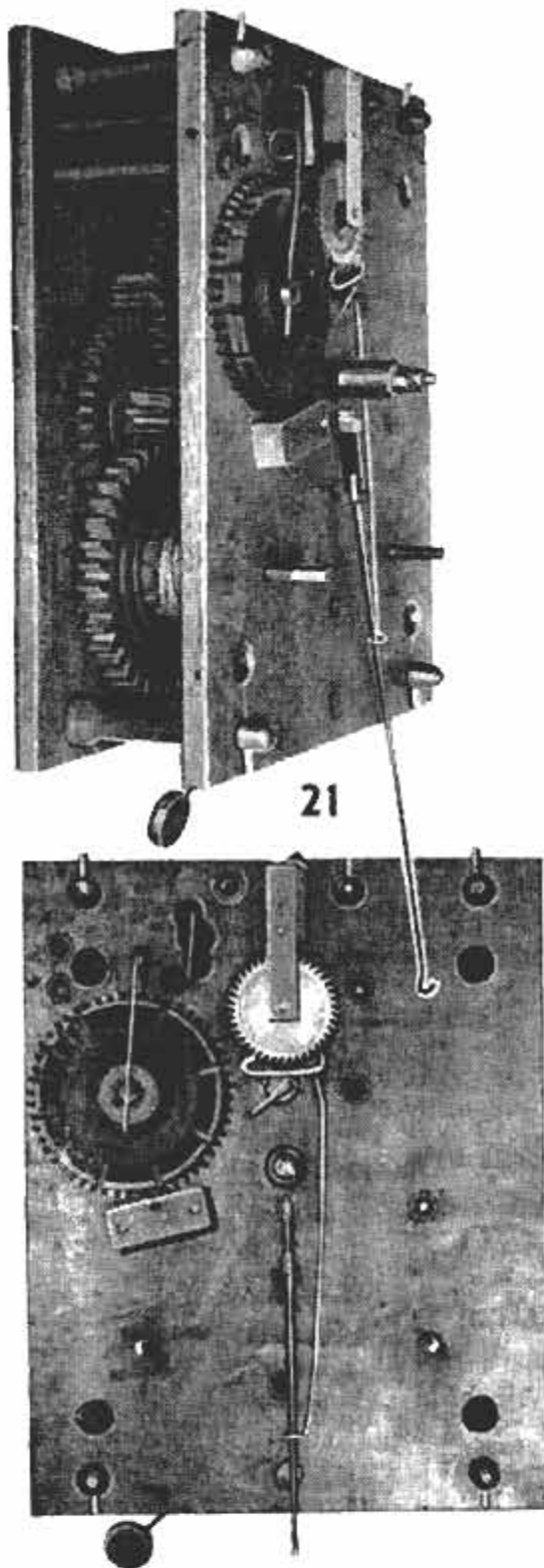
WHITE DIAL. GOLD BRONZE IN CIRCLES AND SPANDRELS.
BLACK NUMERALS, MINUTE DIVISIONS.



and the back panel, Fig. 2. The slotted movement supports fit into dados cut in the top and bottom members and need not be glued in. If you use an electric time movement or spring-driven striking movement, these supports can be omitted and the dial can be attached to cleats screwed to the sides of the case. The original pillars, Figs. 1, 4, and 6, were made in three parts, the long column, Fig. 6, and the top and bottom caps, Fig. 4. The pillars are doweled in place after test-fitting. Although not so indicated in Fig. 1, the dowels at the top can be made to project

1 in. to serve as anchors for the ornament base blocks, Fig. 7. The pillars are turned from maple or birch. All other exposed parts of the case are selected mahogany.

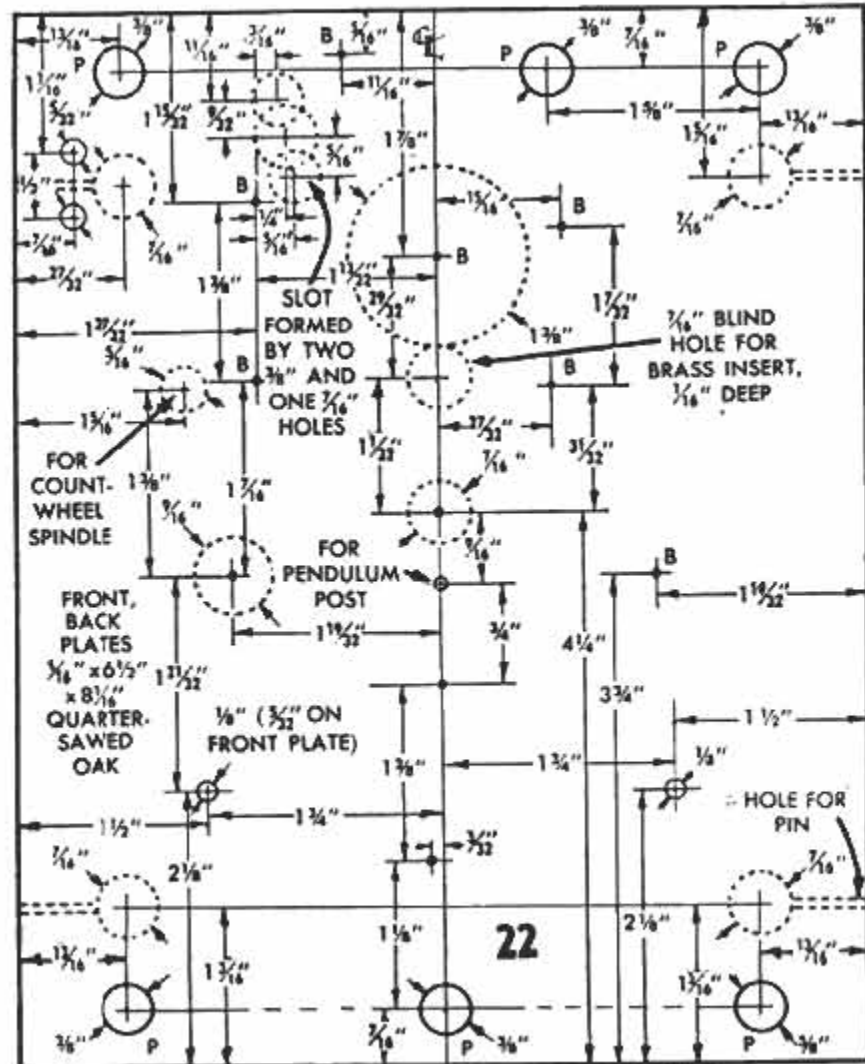
Cut the top and bottom scrolls, Figs. 5 and 8, slightly longer than the dimensions given to allow for fitting. Although the originals consisted of veneers laid on solid stock, top and bottom scrolls can be cut from plywood faced with figured mahogany. End pieces of the lower scroll form the legs, Fig. 1. Leg pieces and the lower scroll are glued, screw-fastened and corner-blocked in place as in Fig. 3.



Dots and solid-line circles of template at right indicate the holes to be drilled through both plates while clamped together. Round dots are No. 52 drill holes. Holes Marked B are $\frac{1}{8}$ in. diameter to take brass bushings having No. 52 center holes. Dotted circles indicate added or enlarged holes in the front plate only. The $\frac{1}{8}$ -in. holes for spindles carrying the winding drums and drive wheels are not bushed. As noted on template, these holes are drilled $\frac{1}{8}$ in. dia. in the back plate and $\frac{5}{32}$ in. dia. in the front plate. Dotted lines to $\frac{7}{16}$ -in. holes in front plate indicate holes taking pins holding movement in place between supports

The door frame, Fig. 9, is made from selected straight-grained white pine and is faced with $\frac{1}{16}$ -in. sawed mahogany veneer, the grain running in the directions indicated. Note in the sectional views, Fig 9, that the facing veneer forms the glass rabbets when glued in place on the door frame. This construction is necessary in order to provide ample clearance for the hand post, or hand spindle, of the wooden movement. The door swings on two simple hinges, one located at the top, the other at the bottom corner. Brads driven into the top and bottom members of the case form the hinge pivots. A replica of the door latch originally used is no longer available, but you can use a very small chest lock. Or, simply mortise the door for a small skeleton key of the type supplied with small chest locks and then use a friction catch or magnetic latch. Fit the inlaid escutcheon as indicated.

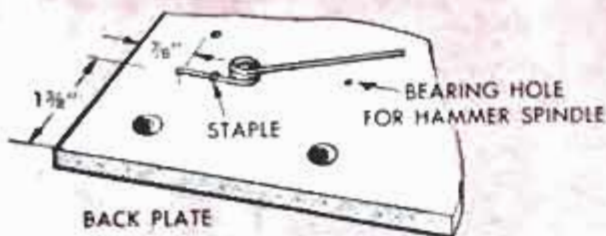
The addition of the dial, Figs. 16 to 20, the tablet, Fig. 14, and the top ornaments, Fig. 15, complete the case for either an electric or spring movement. Ornaments like those in Fig. 15 are no longer made, of course, but similar ornaments are available and are authentic for the pillar-and-scroll case. If you don't feel equal to making the dial you can have it custom made at a nominal cost. It can be made with Arabic numerals as pictured, or with Roman numerals as both types were used by makers of the original pillar-and-scroll clocks. Likewise the tablet designs varied. That in Fig. 14 was taken from an original and it will be noted that



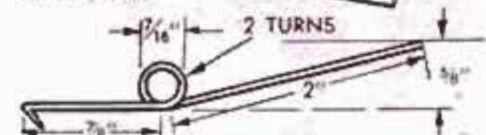


UNDERSIDE OF FRONT PLATE

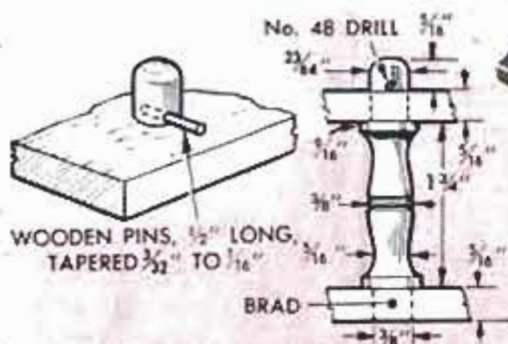
23 HOUR-WHEEL HOLDDOWN



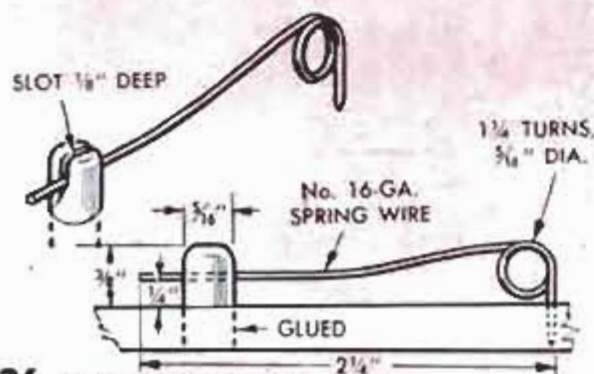
BACK PLATE



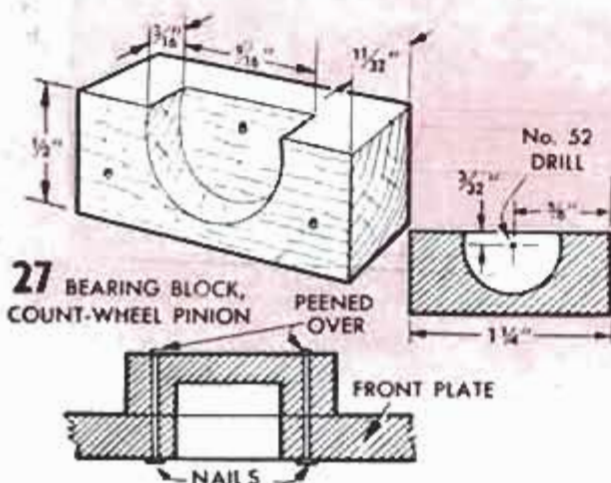
24 BELL-HAMMER SPRING



25 PLATE SPACERS (SEE FIG. 21)
6 REQD.



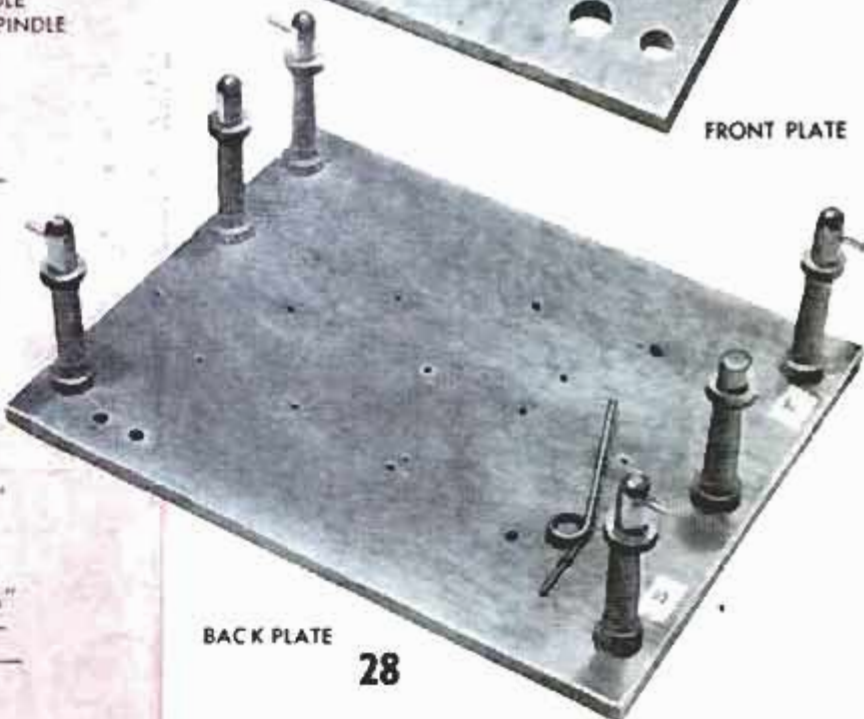
26 COUNT-WHEEL KEEPER



27 BEARING BLOCK,
COUNT-WHEEL PINION



FRONT PLATE



BACK PLATE

28

the overall pattern is slightly wider than the exposed area of the glass opening in the door, Fig. 9. When the pattern is laid out on the glass panel this correction should be made. The design is painted in reverse on the back of the glass panel, using gold and black in the border design, bright colors in the floral design and ivory for the background. In the original the area within the center oval was left clear so that swing of the pendulum could be observed. The tablet pictured in the clock on page 155 is not the original.

If you're following through with construction of a replica of the original wooden movement, you continue with the addition of the cord sheaves, Fig. 11, and then take up layout and drilling of the movement plates, Figs. 22 and 28. Two views of the original movement with all fittings are shown in Fig. 21, and parts that are attached to the movement plates are detailed in Figs. 23 to 27 inclusive. These include the plate spacers, or posts, Fig. 25. Note that in Fig. 22 the holes indicated by dotted lines are drilled in the front plate only. Those marked with the letter P are

(Continued to page 212)

THE P M HOUSEBOAT

PART I

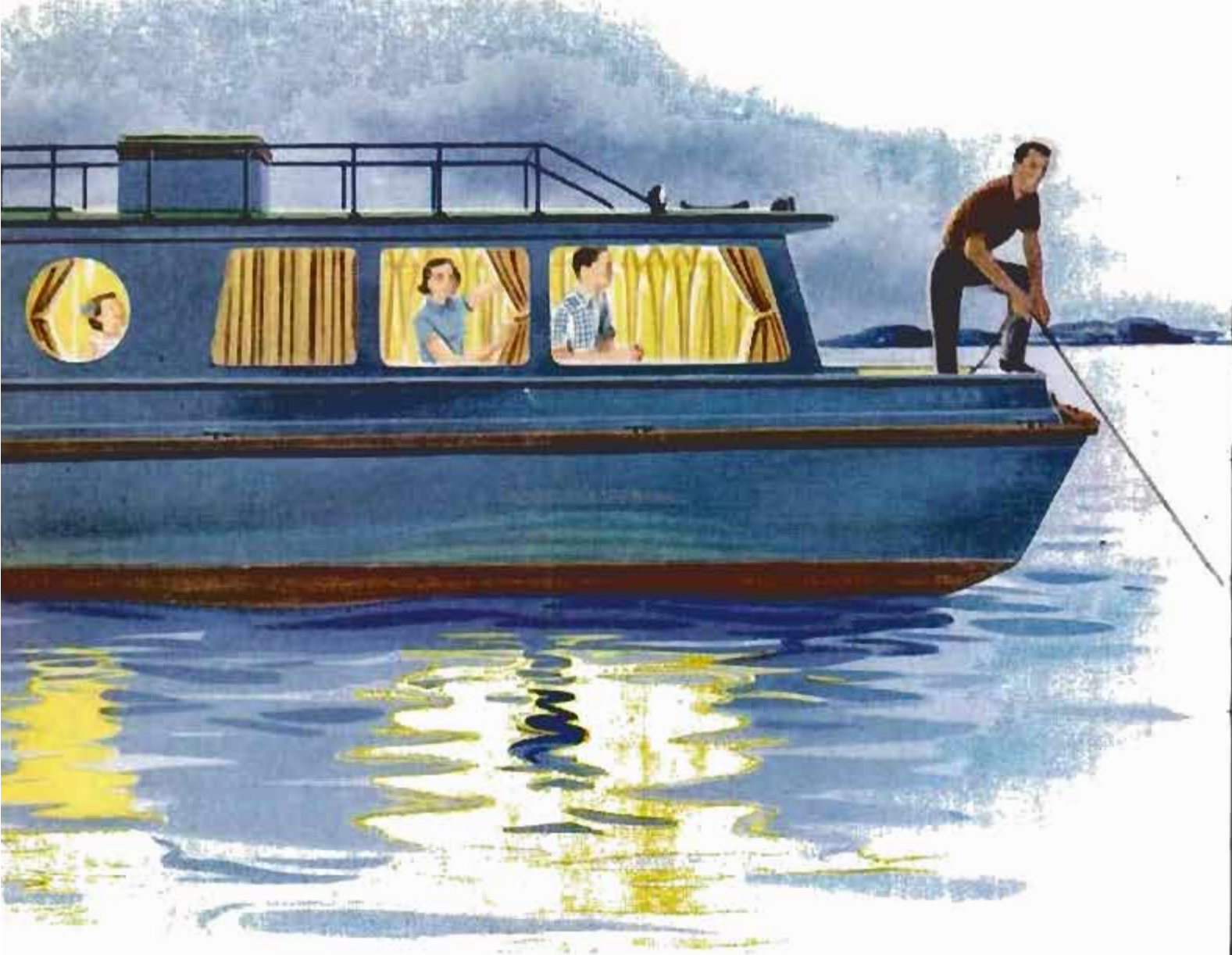
Length: 24 ft.
Beam: 8 ft.
Cabin: Approx. 7 x 16 ft.
Construction: Plywood
Sleeps five plus
Enclosed head
Running water to sink
and lavatory
Spacious galley
Hanging locker
Fuel: 36 gallons

Aware of the growing interest in houseboating, the editors of Popular Mechanics had this trim little houseboat designed and built for you and your family. The straight lines make it comparatively easy to build by anyone handy with tools, and its size permits trailering it to almost any waters desired. The interior of the cabin has virtually all the comforts of home. The roof provides a sun-deck, and inside are sleeping accommodations for five, three forward and two amidships; a galley to delight any "chef," consisting of a stove, sink, 100-lb. icebox, and storage cabinets and work surfaces galore. There is a dining booth for four which converts to a large bed for two. The enclosed head, or toilet, contains a lavatory, mirror and storage space, and there is a full-length closet for clothes. Lights over galley sink, dining booth and in head provide plenty of illumination.





A table by day and a bed by night—
double-duty dining table has folding leg
table top drop down to form full-size bu
Foam cushions provide comfortable seati
Silverware drawer pulls out from und



Recess, housing two-burner alcohol stove, is fitted with two-section hinged cover to provide unbroken counter surface when stove is not being used. Cover folds back against window when stove is used

Fresh water for washing and drinking is piped to galley sink and lavatory from combination storage tank and seat on cabin roof. Both sink and lavatory drain overboard through fittings just above waterline



1. Follow instructions on the other side

Back

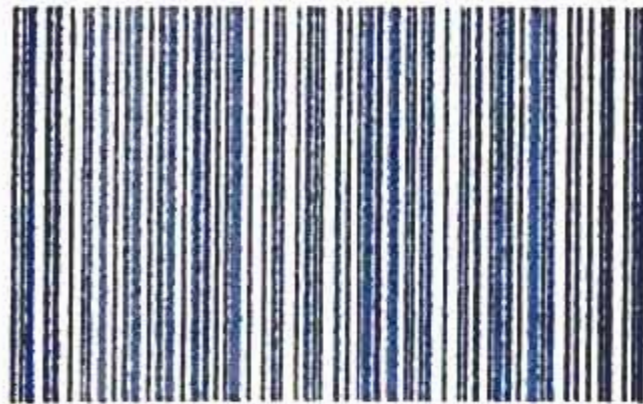
0018-backsip-0018



Inverted Back

1. Follow instructions on the other side

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GbslipSheet-001

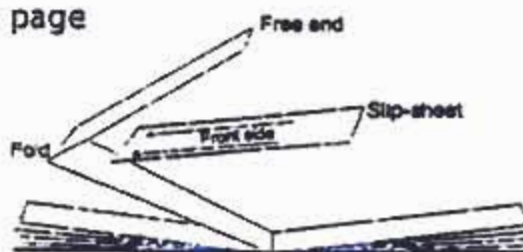
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet



CHANCES ARE most builders will build their houseboat outdoors since a sizeable building is required to complete it under cover. So until such time as the cabin is in place and enclosed, tarps will have to be used to protect the work during early stages of construction. However, parts such as the hull frames, for example, can be prefabricated inside. All eight frames, plus bow and transom members, are ripped from standard 1 1/8-in. fir stair-tread material. Each one measures 95 in. wide and Fig. 2 gives the height of each one, plus the widths of the bottom and side frame members and the location of the various notches for the battens, keel, chines and sheer parts. The latter are cut 1 1/8 x 3 1/2 in. Although not shown, limber notches should also be made in the frames. These form openings for the bilge water to pass through the frames to points where it can be removed through openings in the floor. The limber notches should be about 1/2 in. square and located in the bottom members of the frames at points midway between the batten and keel notches.

The side members lap the ends of the bottom members and are both glued and bolted to hold the parts at right angles. In drilling the holes for the bolts, keep in mind that the corners of the frames are later notched for the chines, and, therefore, should be spaced to clear the notches. You may find it best to drill the holes after gluing and clamping the corners. You also may find it more convenient to cut

Twin forward bunks, port and starboard, make use of space under forward deck. Additional center bunk is provided by removing ladder and filling gap between with lift-out panel and covering with extra cushion



Johnson twin 18s were used to power the PM houseboat and provide greater maneuverability in cross winds, but one 35-hp. outboard motor will do. Motors clamp to mounting board bolted to transom brackets



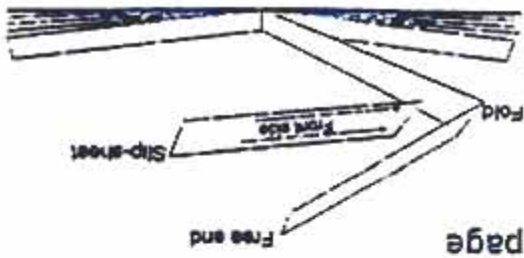


In lowered position, table fills gap between dining benches and when fitted with extra cushion, beds down two. Bunks extending under fore deck accommodate three persons. In each case, center section of mattress, plus bedding, stows away under fore deck

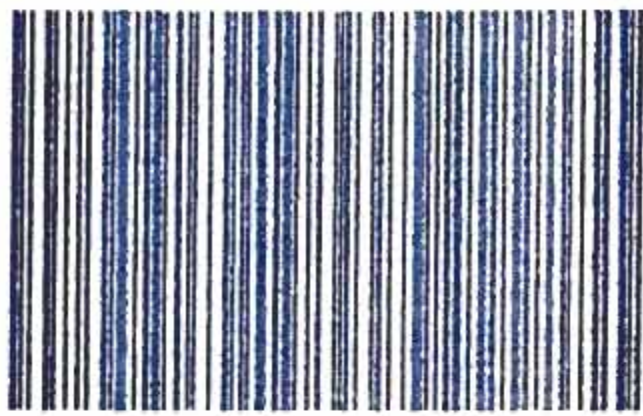


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1. Open the foldout page
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3. Slice the folded edge
4. Close the page and slip-sheet



Inverted Foldout slip-sheet



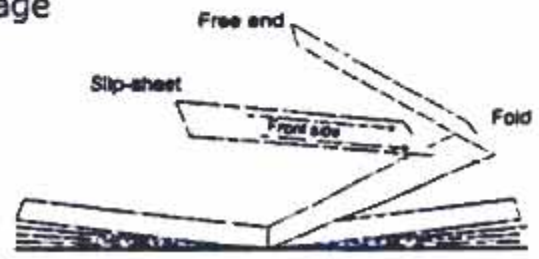
GbsSlipSheet-001



Foldout slip-sheet

Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

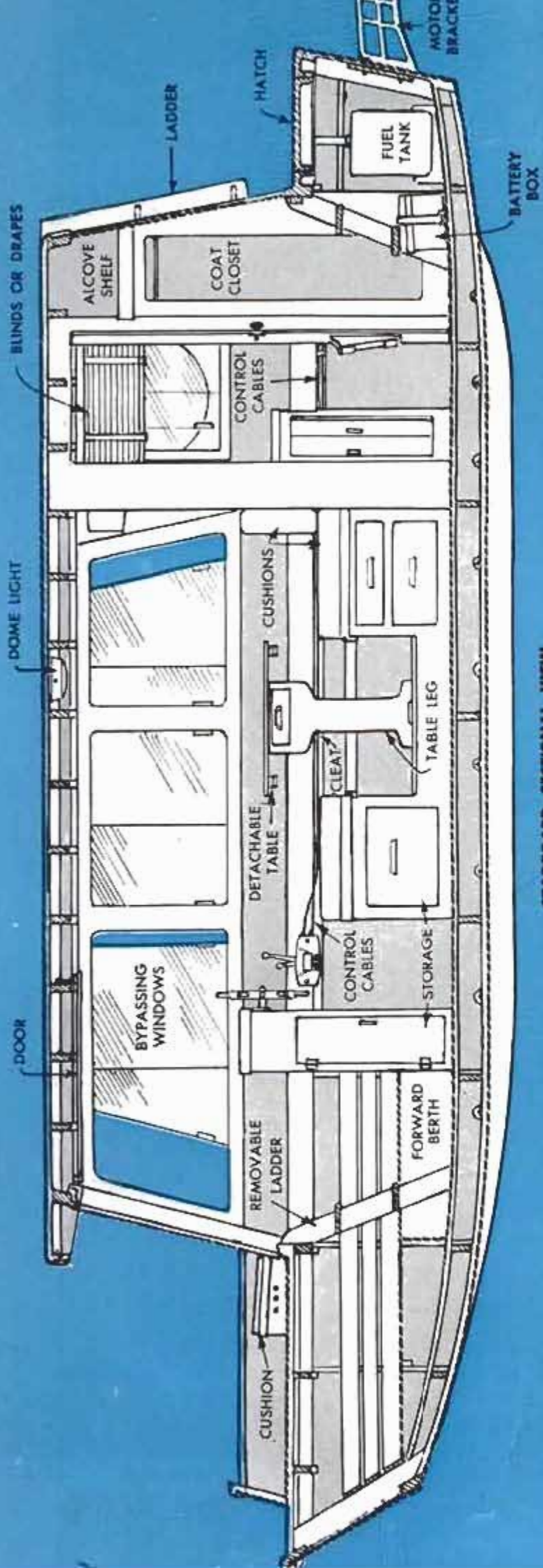
Inverted Back



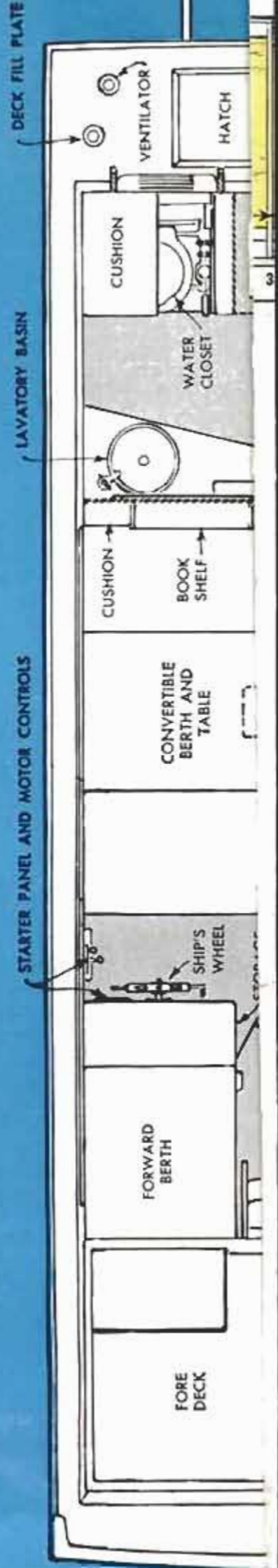
GbsSlpBack-0018

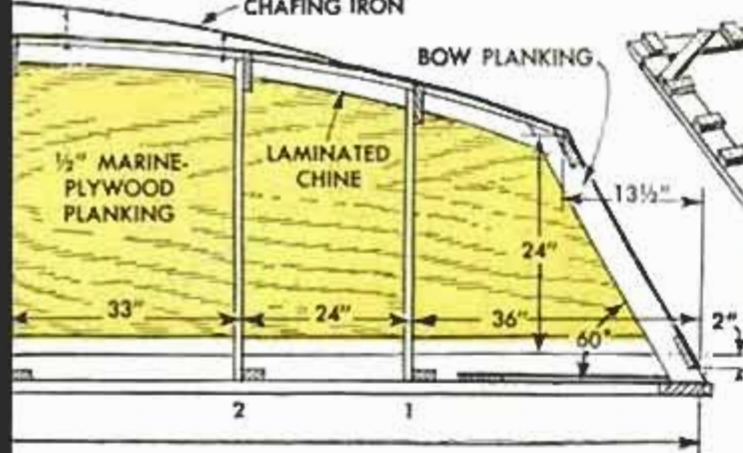
Back

1. Follow instructions on the other side



STARBOARD SECTIONAL VIEW

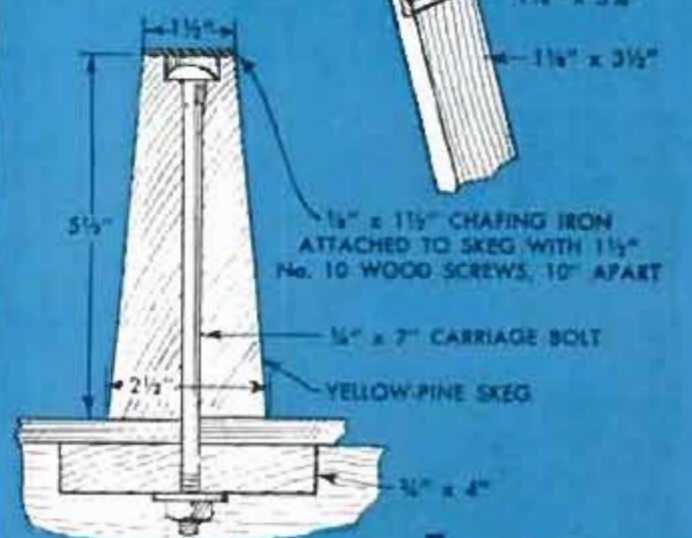
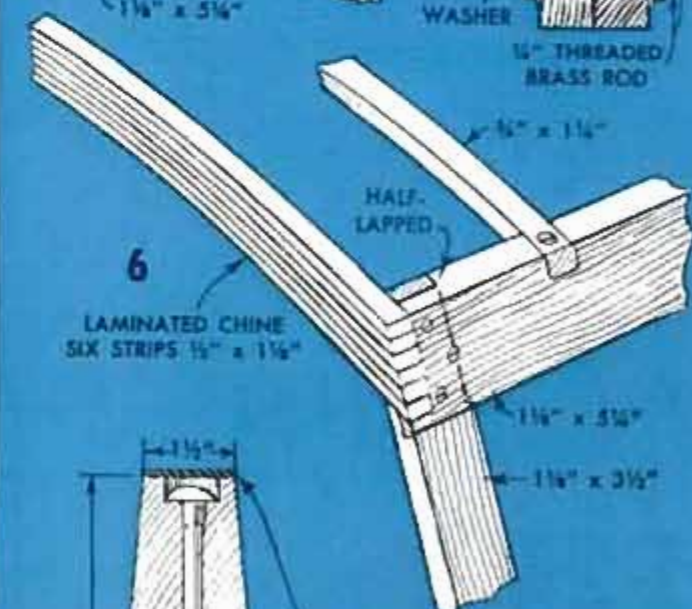
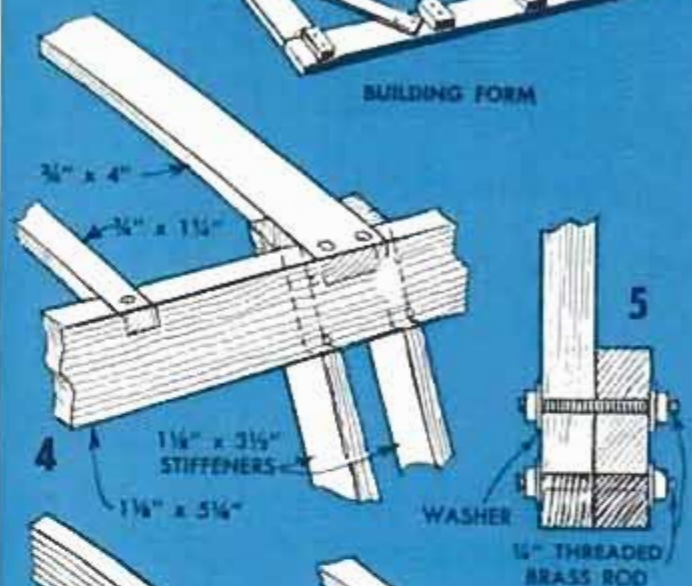
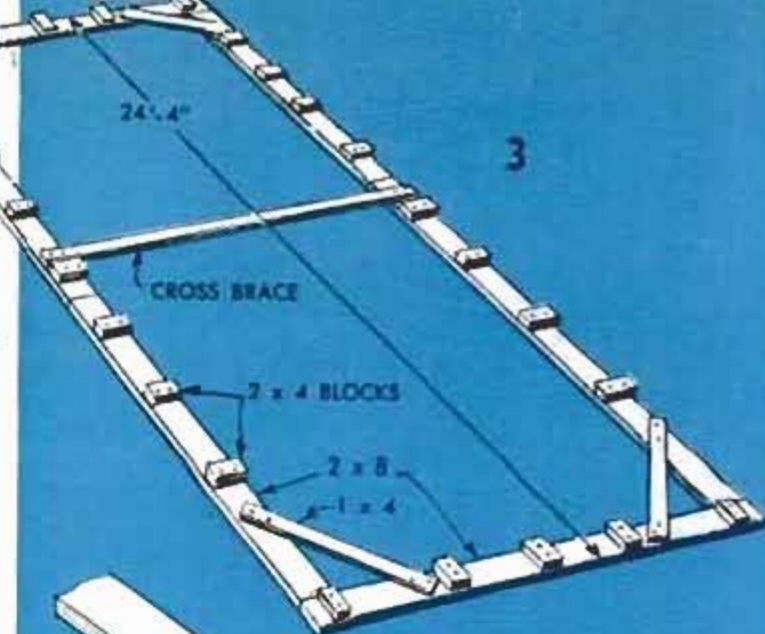


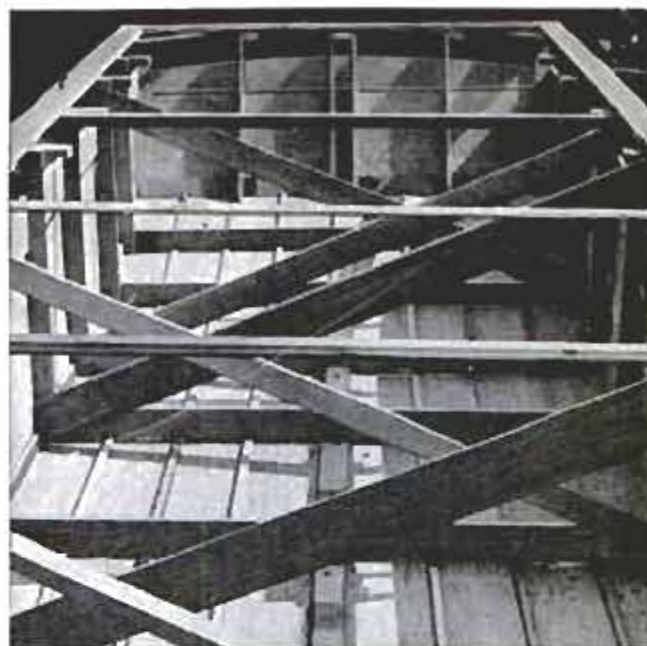
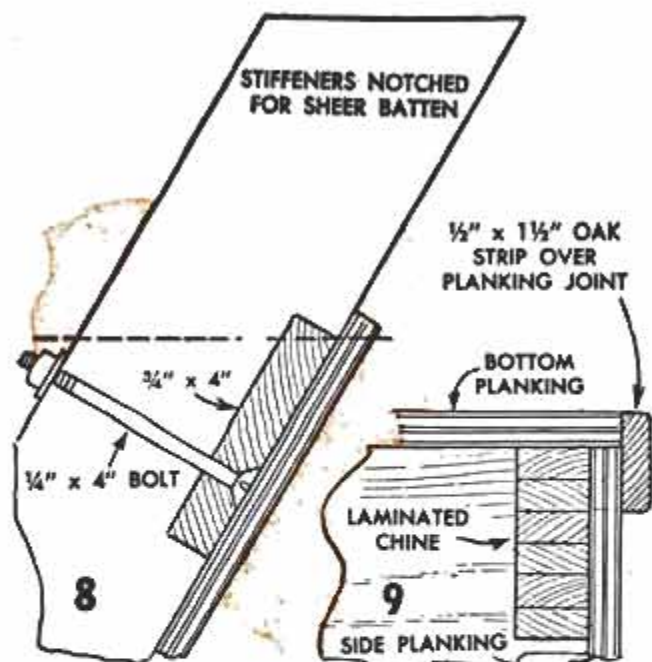


frames are set up on a building board, or platform. Although it serves only as a temporary part of the hull, the building form plays an important part in providing a solid foundation on which to fabricate the hull. Fig. 3 shows what the building form looks like. It consists of 2 x 8 planks placed end to end and flat on the ground to which they are staked. It is made the same width as the frames, 95 in., square at the corners and blocked up where necessary to make it perfectly level both transversely and longitudinally. It should be a few inches longer than 24 ft., which is the overall length of the hull framework. Since it is unlikely that you would be able to obtain planks 24 ft. long, the length of the building form will have to be equaled with two or more planks. You will find this true in purchasing material for the keel, battens, chines and other long hull members. The 2 x 4 blocks which are spiked to the building form and to which the waste ends of the frames are nailed, are spaced according to the dimensions given in Fig. 1. Those placed across the ends are omitted until later.

The frames are erected in an upside down position to stand plumb and even with the outer edges of the building form. Keep in mind when placing the frames that the bottom members of frames 6, 7 and 8 are positioned to face aft as compared to the others which face forward. The frames will have to be braced to keep them standing plumb until they are held so by the keel and other longitudinal members. Before going further you should paint the frames with a clear liquid preservative to prevent wood rot.

The bow and transom differ from the others in that they are assembled flatwise and half-lapped at the corners as shown in Fig. 6. Brass screws are used here instead of bolts and are kept clear of the 1 1/8 x 3-in. chine notches which are cut after assembly. In studying Fig. 1 you'll note that the bow frame is placed at a 60-deg. angle and the transom, a 78-deg.





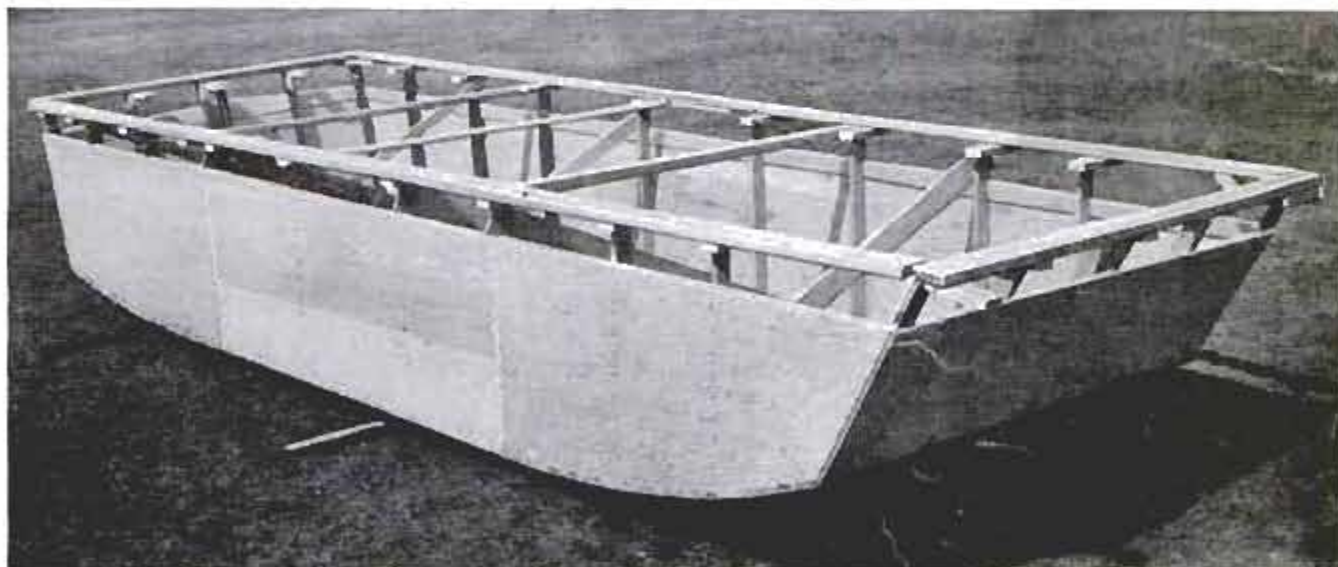
How hull must be cross-braced prior to rolling it over to add rigidity to otherwise unsupported frames

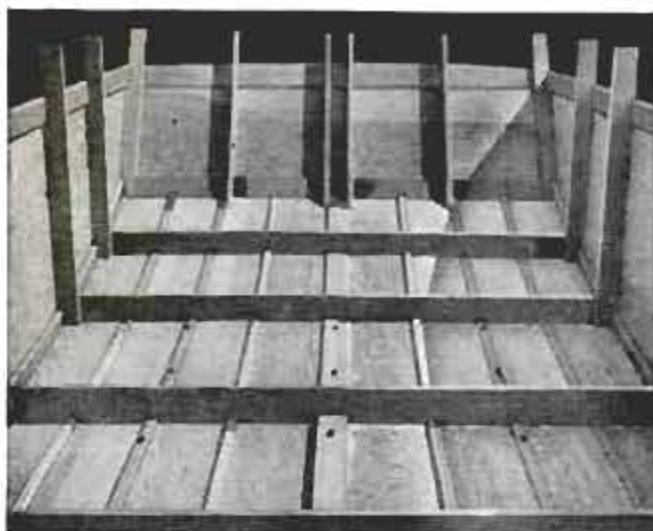
angle, which is $13\frac{1}{2}$ and 6 in. respectively from the vertical. Like the others, these frames are positioned even with the edges of the building form, braced and toenailed to blocks placed $3\frac{3}{4}$ in. in from the corners.

The most practical way to make the long curved chines is to laminate each one from six strips of $\frac{1}{2} \times 1\frac{1}{8}$ -in. fir. This is done right in the chine notches, letting the first strip assume a natural curve in following the notches. One by one the rest of the strips are coated with glue and clamped to the first one until the full width is built up. Where single-length strips cannot be obtained, shorter ones are spliced into the layers as you go. A number of C-clamps will be needed to hold the sandwiched strips until the glue dries. Finally, holes are made in the chines at each frame for fastening to the latter with two flat-headed brass screws. Prior to forming the chines, the bottom of the chine notches in frames 1, 2 and 8 should be

faired to make the chine strips lay properly. The six battens, plus the keel, which fit flush in the frame notches, are set in bedding compound. One flat-headed, $2\frac{1}{2}$ -in. No. 10 brass wood screw is used to fasten each batten to each frame, whereas two screws are used to fasten the keel. The bottom of the notches in the bow and transom frames, as well as frames 1, 2 and 8, must be faired before the batten and keel members are fitted. Here, again, where full-length pieces are not being used, separate lengths are joined by half-lapping the ends and centering the lap over a frame. Four $1\frac{1}{8}$ -in. members, called stiffeners, are installed at both the bow and transom and Fig. 4 shows how two of them are positioned alongside the keel and notched to fit over the bottom frame member. The other stiffeners are installed alongside battens as in Fig. 2. As before, the stiffeners are bedded in

Once right side up, hull cross bracing, plus the building form which still remains attached, is removed





Waste ends of frames above sheer are sawed off flush

HULL MATERIAL LIST

(All dimensions net or approx.)

FIR LUMBER (1 1/8" stair-tread stock)

FRAMES

- 2 pcs.—1 1/8" x 4 1/2" x 95"—Bottom frame members
- 6 pcs.—1 1/8" x 5 1/4" x 95"—Bottom frame members
- 2 pcs.—1 1/8" x 5 1/4" x 95"—Bow and transom members
- 2 pcs.—1 1/8" x 3 3/4" x 37 1/2"—Side members, frame #1
- 2 pcs.—1 1/8" x 3 3/4" x 42"—Side members, frame #2
- 2 pcs.—1 1/8" x 3 3/4" x 44"—Side members, frame #3
- 2 pcs.—1 1/8" x 3 3/4" x 43 1/2"—Side members, frame #4
- 2 pcs.—1 1/8" x 3 3/4" x 43"—Side members, frame #5
- 2 pcs.—1 1/8" x 3 3/4" x 42 1/2"—Side members, frame #6
- 2 pcs.—1 1/8" x 3 3/4" x 42"—Side members, frame #7
- 2 pcs.—1 1/8" x 3 3/4" x 39 1/2"—Side members, frame #8
- 2 pcs.—1 1/8" x 3 1/2" x 42"—Bow side members
- 2 pcs.—1 1/8" x 3 1/2" x 39"—Transom side members
- 4 pcs.—1 1/8" x 3 1/2" x 42"—Bow stiffeners
- 4 pcs.—1 1/8" x 3 1/2" x 39"—Transom stiffeners
- 12 pcs.—1/2" x 1 1/8" x 22'-9"—Laminated chines
- 1 pc.—3/4" x 4" x 22'-9"—Keel
- 6 pcs.—3/4" x 1 1/4" x 22'-9"—Bottom battens
- 2 pcs.—1 1/8" x 3 1/2" x 24"—Sheer members
- 2 pcs.—1 1/8" x 3 1/2" x 24"—Sheer-clamp members
- 1 pc.—3/4" x 14" x 56"—Transom doubler board (plywood)
- 2 pcs.—1 1/8" x 5 1/2" x 95"—Bow and transom top frame members

PLANKING (1/2" marine-grade plywood)

- 2 pcs.—1/2" x 48" x 9"—Side planking
- 2 pcs.—1/2" x 48" x 8"—Bow and transom planking
- 4 pcs.—1/2" x 48" x 8"—Side planking
- 2 pcs.—1/2" x 48" x 8"—Bottom planking
- 4 pcs.—1/2" x 48" x 10"—Bottom planking

SKEGS (Yellow pine)

- 3 pcs.—2 1/2" x 5 1/2" x 11"—Center sections
- 3 pcs.—2 1/2" x 5 1/2" x 45"—Aft sections
- 3 pcs.—2 1/2" x 5 1/2" x 66"—Fore sections
- 3 pcs.—1/8" x 1 1/2" x 23"—Skeg chafing irons

BUILDING FORM

- 2 pcs.—2 x 8 x 14"—Side members
- 2 pcs.—2 x 8 x 10"—Side members
- 2 pcs.—2 x 8 x 8"—End members
- 1 pc.—2 x 4 x 84"—Scrap for nailing blocks
- 4 pcs.—1 x 4 x 36"—Corner braces
- 1 pc.—1 x 4 x 8"—Cross brace

bedding compound and fastened with brass screws. The blocks which hold the stiffeners to the building form are positioned to hold them plumb. Frame notches must be cut in the stiffeners before the plywood planking is applied to the bow and transom, Fig. 8. Since there is a 2-in. deck crown to the hull, the location of the notches are found by holding a fairing stick at the sheer notches in the side members and bending it accordingly. Removal of the waste from the notches is simplified by making a series of saw cuts 1 1/8 in. deep and then chiseling away. The frame member itself is bandsawed to a 2-in. crown and half-lapped into the side members. Brass screws and bedding compound are used to hold the bow and transom frame members in place. Except for the frames which have already been treated, all the other members are painted with wood preservative.

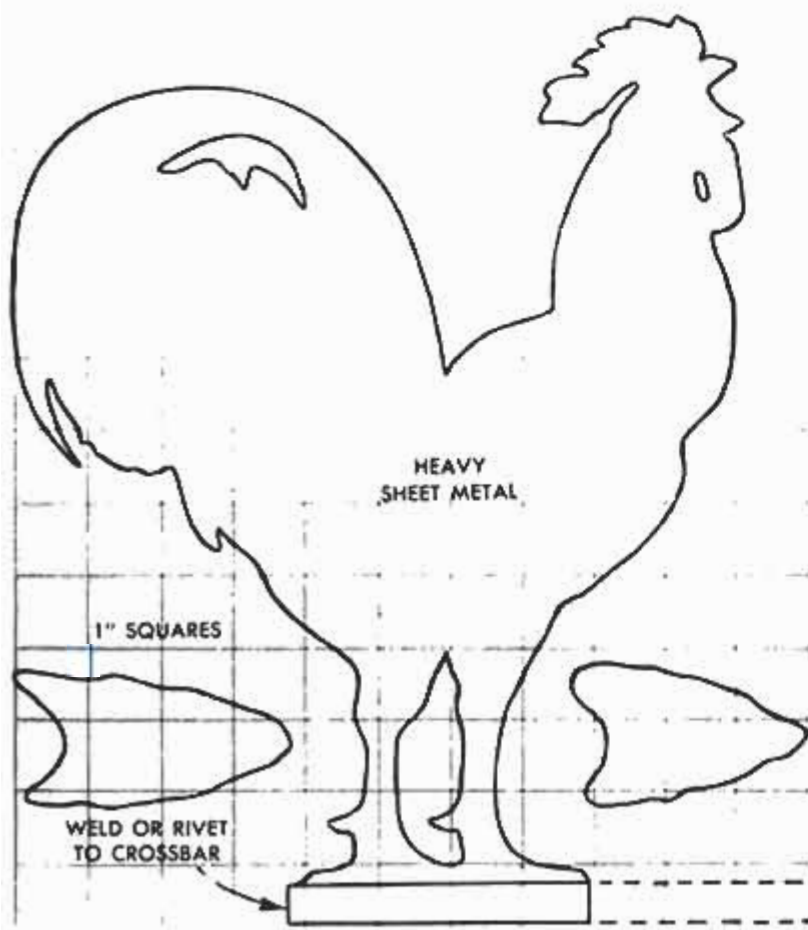
Before the planking can be applied, the bottom members of the bow and transom frames, plus frames 1, 2 and 8, must be faired (planed) to the designed lines so they are even with the battens, chines and keel.

In the case of the side planking, a 9-ft. length of 1/2-in. marine-grade plywood will center midway on frames 3 and 6 without trimming since the distance center to center equals just 108 in. However, in the case of the bottom planking, 10-ft. sheets are required so the joints can be staggered. You'll have some waste here that can't be helped. Since the side planking laps the bow and transom planking, the latter two should be planked first. A full 8-ft. length will cover each nicely without cutting. Rip the panels lengthwise so they project a little beyond the top and bottom members of the bow or transom frame as the case may be. This will allow for later planing when fairing the planking. Apply glue to the edges of the stiffeners and end members and tack the planking in position to let you get a screw or two started. All planking is fastened with 1 1/4-in. No. 8 flat-headed brass screws which are spaced 3 in. apart at the frames and 2 1/2 in. apart at the sheer and chines. In the case of the transom planking, a 3/4-in. plywood doubler board, 14 x 56 in., must be notched into the stiffeners before applying the planking. The board adds additional rigidity to the planking at this point for the motor-mounting brackets which are later bolted to it. While the board is shown located at a point 21 in. from the sheer, it is better to increase this to 23 in. Both port and starboard sides are planked alike. The 9-ft. side panel is glued and screwed in place first, then the panels fore

(Continued to page 228)

All-Metal Weather Vane

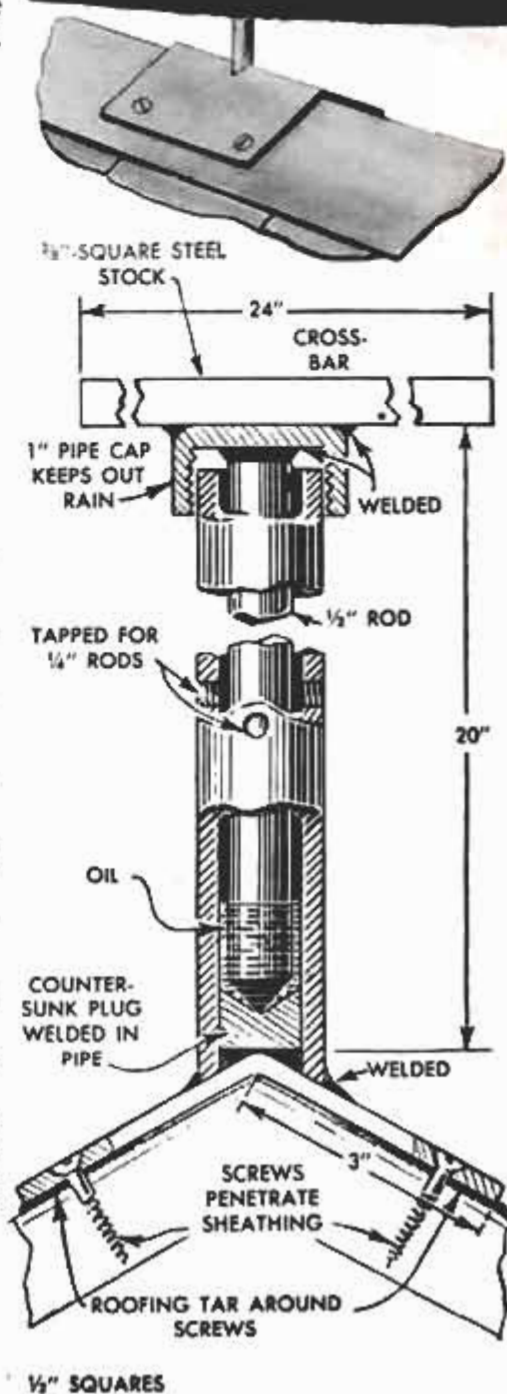
THIS CROWING ROOSTER on his lofty perch indicates the direction of the wind, and does it silently, as it is mounted on a column that rotates in an oil reservoir and never needs lubrication. Cut the bird from galvanized sheet steel and rivet it to a length of $\frac{3}{8}$ -in.-steel square stock. After the arrowhead and feather have been attached to this member, weld it to a $\frac{3}{4}$ or 1-in. pipe cap as indicated. The pipe cap now is welded to the upper end of a length of $\frac{1}{2}$ -in. steel rod, the lower end of which is ground to a point. This assembly is fitted inside a 20-in. length of $\frac{1}{2}$ -in. pipe, the lower end of which is sealed by welding a plug in it. The pipe column now is welded to a sheet-metal saddle that is shaped to fit the angle of a particular roof. The saddle is fastened to the roof with screws driven into pilot holes drilled through the shingles into the wood. Paint the entire weather vane a flat black so it makes a sharp outline against the sky.



Above is squared pattern for rooster, arrowhead and feathers. Below are patterns for letters used to indicate directions. These letters are fastened to lengths of $\frac{1}{4}$ -in. steel rod, threaded and turned in holes drilled in the pipe column of the weather vane

SE
NW

DECEMBER 1959



$\frac{1}{2}$ " SQUARES

Milk Cartons Collect Sap At Maple-Sugaring Time

When sap begins to flow in the sugar maples there's no time to waste. It's then you may discover, at the last minute, that there are not enough sap buckets to go around. Ordinary milk cartons, either the 1 qt. or the 1/2-gal. size, can fill in for the missing buckets. Cut a hole in one side of the carton near the top, the hole being just large enough to fit over the spile. Notch the spile lightly to hold the carton in place. Closed cartons have the additional advantage of keeping the sap clean.

A roller-type window shade sprayed with aluminum paint makes a reasonably good screen for home movies. When applying the paint care should be taken to obtain a uniform coating. The shade must be in good condition with no tears, wrinkles or worn spots.

Artist's Palette Covered With Foil for Easy Mixing of Colors

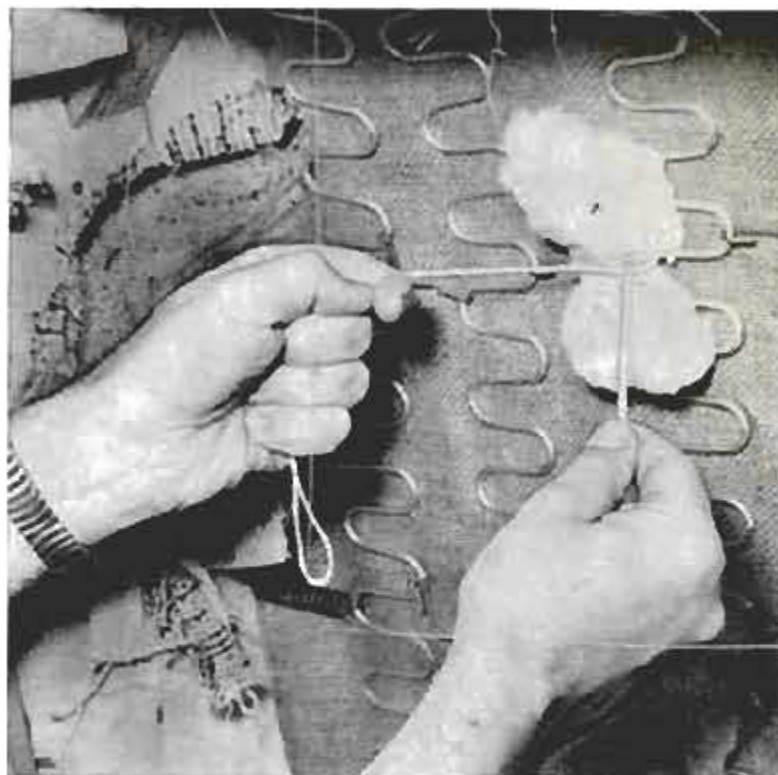
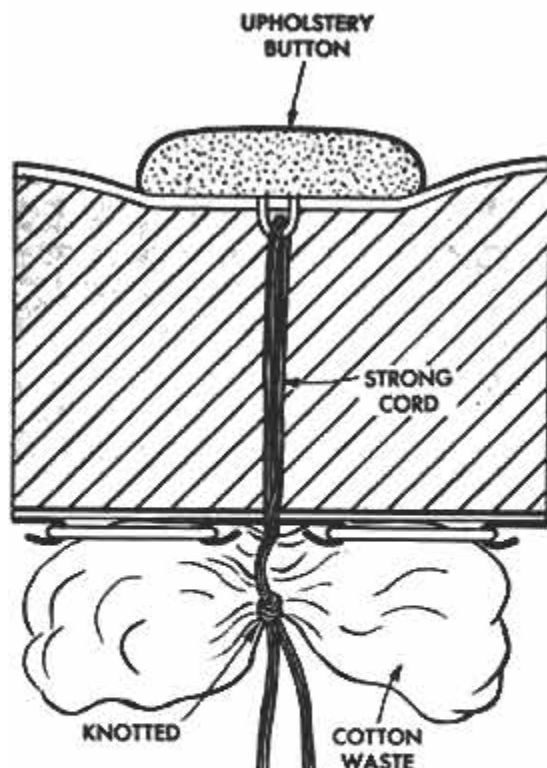


Artists using oil colors have found that covering the wooden palette with aluminum foil not only makes the heavy oils easier to mix, the foil-faced surface of the palette also is much easier to clean when the work period is finished. When the foil facing finally becomes coated with hardened traces of the paints it is simply replaced with a fresh sheet. The foil sheet is cut to the shape of the palette and slightly oversize so that the edges of the foil can be folded down over the edges of the palette to hold the facing securely in place. The foil does not absorb oils or pigments.

Auxiliary Carrying Strap For Binocular Case

Not all binocular cases are equipped with a short strap to serve as a carrying handle. Although the shoulder strap makes it easy to carry the heaviest case and instrument, there are times when a carrying handle, or strap, is a convenience well worthwhile. Nearly all shoulder straps are provided with buckles for adjusting the length and usually it is possible to rivet a short strap in place below the buckles to serve as a carrying handle. Placed at just the right point this will in no way interfere with the normal use of the shoulder strap or opening and closing the case. The carrying strap should be cut from the same leather and to the same width as the shoulder strap.





Replacing Lost Buttons In Upholstered Furniture

When an attractively upholstered and buttoned chair seat or chair back loses a button or two there's nothing about the house more unsightly. But replacing the button is simple when you know the trick. Obtain a matching button and an upholsterer's mattress needle from a local dealer in upholsterer's supplies. Loop a length of strong cord through the eye of the button

and thread through the needle. Then remove just enough of the dust cover from the bottom or back of the chair to enable you to reach the point on the cushion where the button is to be placed. Press the needle through the cushion at this point and pull the cord through. Then knot the cord securely over a pledget of cotton batting or cotton waste as in the photo.

Giant Footprints Cast in Concrete Make Novel Flagstone Walk

At first sight of these huge footprints leading to your door passers-by may well conclude that Paul Bunyan once called and left his tracks in your lawn. But you'll know better because you mixed and poured the concrete of which they are made. They're about 30 in. long and are spaced about 15 to 20 in. apart edge to edge so that you can walk on them comfortably without stepping on the grass. As the first step, make a cardboard pattern for laying out the excavations. Turn it over to make right and left footprints. Excavations should be about 6 in. deep with vertical sides. Pour fine gravel to a depth of 3 in. in each excavation and tamp firmly. Apply a grouting of concrete 1 in. thick and from coarse-mesh hardware cloth cut a shape slightly smaller than the excavation. Lay this over the grouting, pour concrete to grade level and trowel smooth. Round the edges to a radius. If the soil is sandy, use a sheet metal form when pouring. This is easily bent to the contours desired and held in place with small stakes.





Car-Door Weather Stripping Repaired With Tape

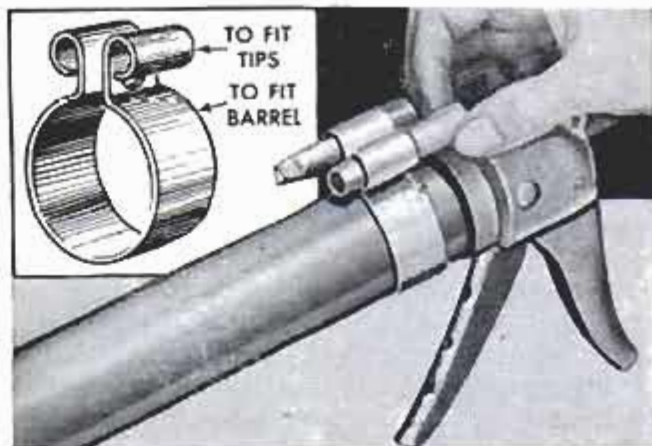
If you have forced a frozen car door open and torn or loosened the weather stripping, try this temporary repair. It may save you total replacement of the weather stripping later. With a piece of cloth, dry an area on both sides of the car door and around the weather stripping. Place a piece of tape on the outside surface of the door and run it over the weather stripping to the door's end section. A piece of masking, adhesive, or plastic tape will usually hold the loose end in place. Later at a more convenient time, when the car door and the weather stripping are dry, remove the tape and permanently replace the loose section with rubber adhesive, sold in any automobile supply store.

Robert V. Thompson, Clinton, Iowa

Holder for Calking Gun Tips

Calking gun tips will always be at hand if kept in a holder fitted to the gun barrel. The holder is made from a piece of springy sheet metal about $\frac{3}{4}$ in. wide. Bend the strip around the gun barrel. Then bend the extending ends to fit around the calking tips so that the tension of the metal holds them tightly. Holder and tips will stay firmly in place if a nut and bolt are inserted in the holder between the gun barrel and the loops holding the calking tips.

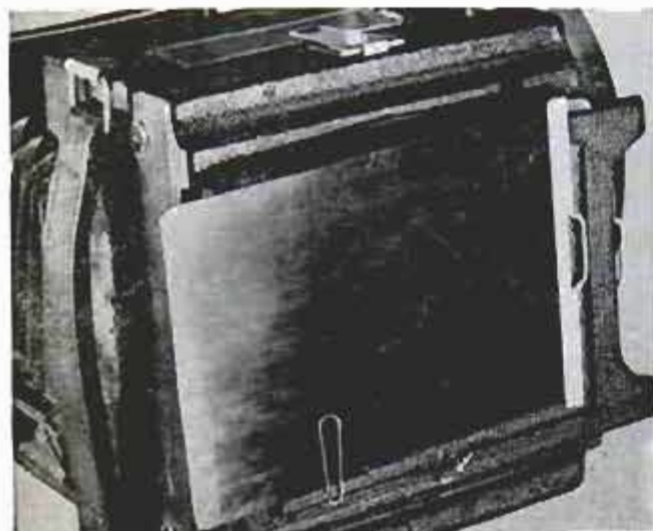
R. Hanscom, Elmhurst, Ill.



Hints and Facts for the Use and Storage of Glue

Never thin liquid glue when it is cold. When warmed to room temperature (70 deg. or warmer) it will be thinner and have the proper consistency for use. Should a thin glue be needed, pour some into a separate container before adding warm water. Caps on glue bottles, shellac and other adhesives will unscrew easily if the threads

are coated with a film of petroleum jelly the first time they are opened. Use a bead headed pin as a stopper in the end of a tube of glue. It is easy to remove and helps keep the glue free flowing. When gluing dowels in holes, ridges filed in the dowels will keep the glue from being forced out when the dowel is inserted.



Paper Clip Holds Film Slide

The busy photographer who finds himself working against time, or surrounded by general shop confusion, will agree that a film slide can be a very elusive piece of equipment. For a quick solution to this problem, try using a wire paper clip fastened to the hood on the back of the camera. The clip will provide a simple yet effective slide holder. A stiff paper envelope, of the kind used to store light-sensitive paper, taped to the hood, will provide a holder for several film slides. The envelope will prevent the slides from getting lost and will keep them free from dust and damage.

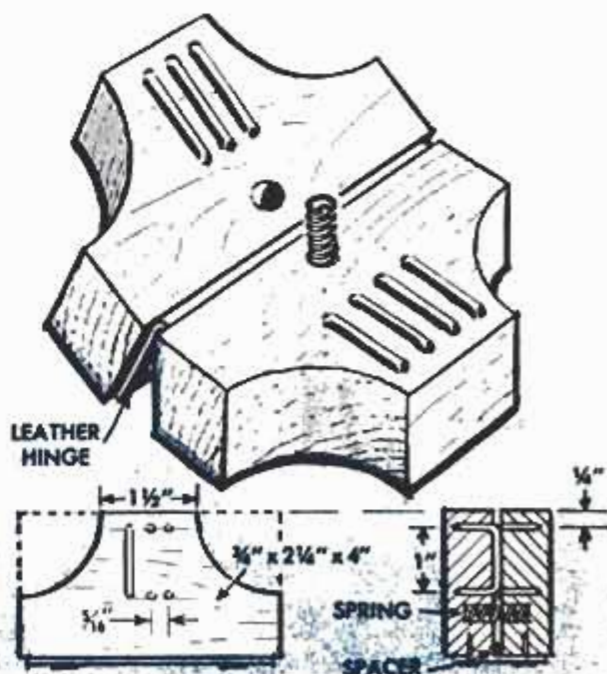
Bil Toman, Palatine, Ill.



MAKE THIS SIMPLE CRIMPER FOR WIRE AND SHEET METAL

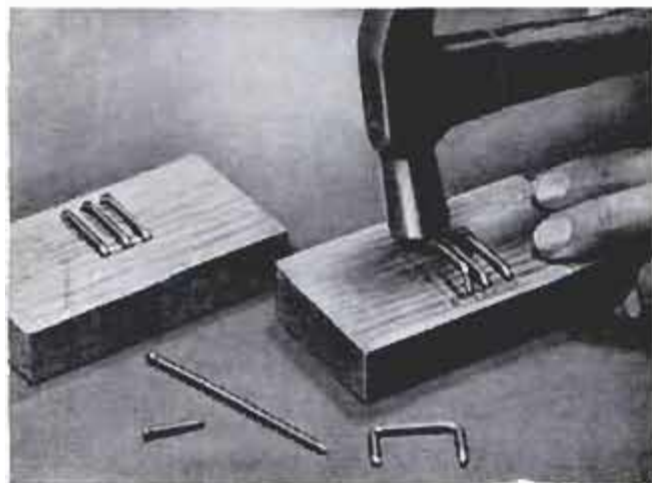
USING TWO SMALL BLOCKS of hardwood, 7 finishing nails, a coil spring and a piece of leather you can make a sheet-metal crimper that will turn out work such as you see in the photo above. Bandsaw the blocks to the shape detailed and hinge together with leather. Drill a hole in each to take the spring, then space and drill holes in each block to take the metal crimpers. These are made from 10d finishing nails by cutting off the heads and bending to form a staple as in the left-hand photo below and the lower right-hand detail. Drive the crimpers into the blocks, 3 in one, 4 in the other. Be careful not to bend the crimpers as you drive them home. When crimping curved work as in the lower right-hand photo use a C-clamp to apply the necessary pressure.

Walter E. Burton



Crimpers are made from 10d finishing nails by cutting off heads and bending to the form of a staple

In crimping curved work such as the edges of stove-pipe or furnace pipe, use a C-clamp to apply pressure



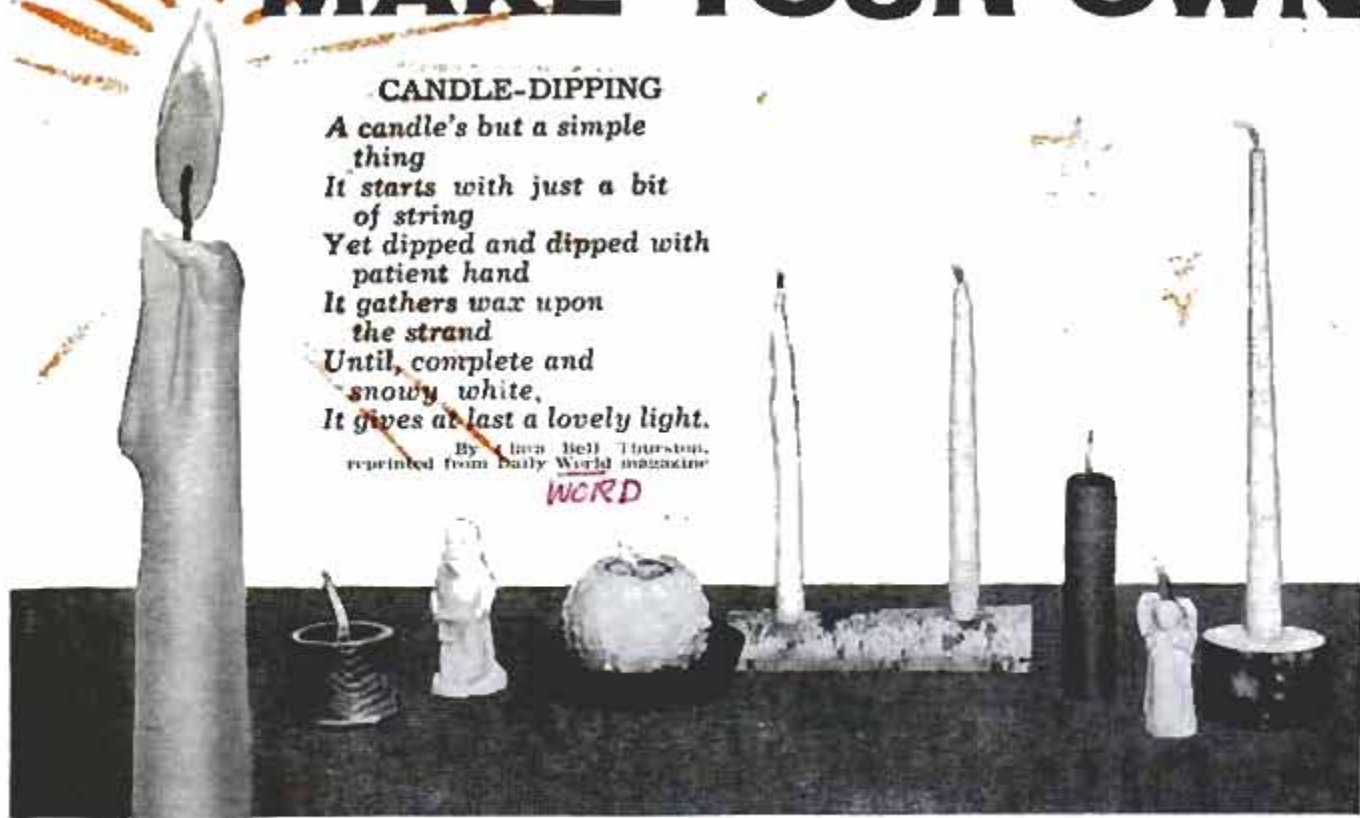
MAKE YOUR OWN

CANDLE-DIPPING

A candle's but a simple thing
 It starts with just a bit of string
 Yet dipped and dipped with patient hand
 It gathers wax upon the strand
 Until, complete and snowy white,
 It gives at last a lovely light.

By Ellen Bell Thurston,
 reprinted from *Daily World* magazine

WORD



CANDLEMAKING can be a lot of fun, especially when all members of the family join in, each one trying to create the most unusual candle of them all. A pre-holiday project such as this also is a good one to plan for that last sewing or bridge club meeting just before Christmas. Each member is asked to bring a part of the needed materials. At the end of the candlemaking session, prizes may be awarded to the creators of the most unusual candles.

The basic ingredients needed for making candles consist of paraffin, beeswax, stearin (a wax) and wicking. Decorating materials such as color tints, glitter and sequins, may be used to obtain special effects. Combined in the proportions shown in the photo below, the waxes provide sufficient stock to make 20 hand-dipped candles 8 in. long, or about 25 small figurine candles. Stearin, also called stearic acid, is a hard type wax that, when combined with the softer paraffin and beeswax, helps to prevent the candles from

Formula for wax dip to make 20 medium-size candles consists of stearin, 1 lb., paraffin, 2 lbs., and beeswax, 1 oz.



CHRISTMAS CANDLES

dripping and bending. For some candles the dripping feature is desired, so as to produce certain effects as the candle burns, in which case the stearin is omitted.

While paraffin and beeswax are quite easy to obtain locally, it may be necessary to have your druggist order the stearin since there is little call for it. If braided wicking is unavailable, use 4 to 6 strands of cotton string twisted together. Or, you can avoid having to assemble individual items by buying a candle-making kit from a hobby shop.

Most candles are made either by the dipping process, or by molding. In either case, the wax stock must be melted and kept a few degrees hotter than the temperature required to liquify it. The best way to do this is to use the double-boiler method as shown above. Any tall can will do for a dipping can.

Actual candle dipping is done as follows: Cut a length of wicking that is long enough to permit dipping two candles at once as above. The candles being formed must be kept apart when dipping. If the wicks tend to become wavy, pull them straight while the wax from the first dip is hardening. Then dip the candles quickly, allowing the wax to harden between dips. When the candles reach the desired diameter ($\frac{3}{4}$ -in. base is standard), trim the base and cut the wicks to the correct length.

For a frothy appearance, dip a half-completed candle in wax that has been foamed with an egg beater, detail A. If you want colored candles, add powdered tinting color to a small amount of liquid wax in a slender beaker. Dip the candles

By Ivan H. Crowell

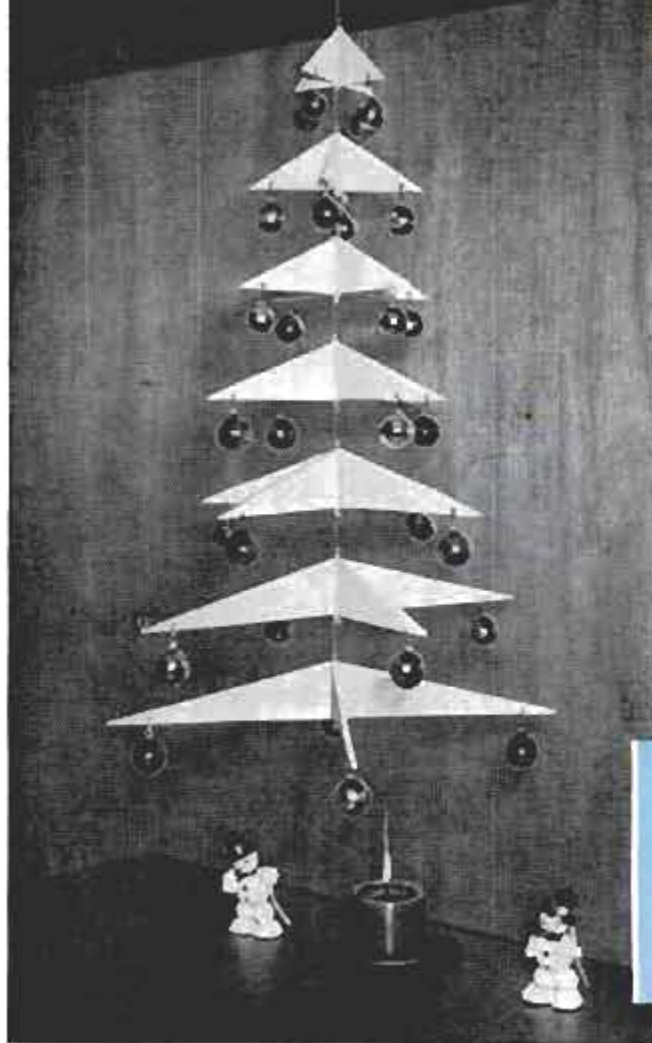


individually 3 times as in detail B. Candles can be hand painted by tinting the liquid wax as above and applying it with an artist's brush. Wax crayons also may be melted and used for coloring purposes as above. Glitter and sequins add sparkle to candles. To apply them, dip the candle in hot wax and roll it in the colored granules scattered on a sheet of paper as in detail C.

Unusual shapes are produced by pouring candles in rubber molds made for this purpose, and in any other molds that ingenuity can dream up. Some examples are shown in the photo on the opposite page. The wicks for these must be held in place until "frozen" in place by hardening wax. Wash rubber molds with soapy water before using for easy removal. Candles are released from rigid-type molds by heating them slightly.

Attractive holders can be made by drilling candle holes in birch "logs," or disks as shown on the opposite page. Other holders can be devised from jar lids, bottles, saucers and various discards. ★★★

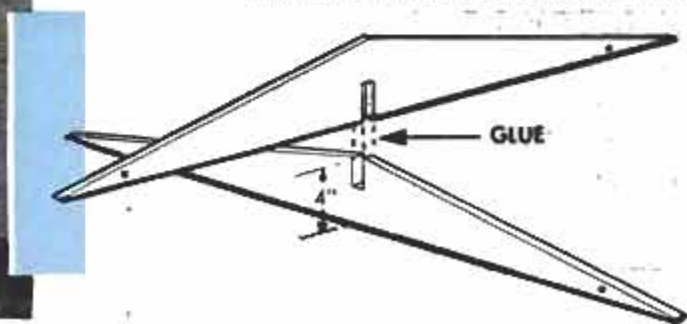




Christmas-Tree Shaped Mobile From Hardboard and Ornaments

Seven pairs of hardboard triangles in graduated sizes are joined together to form the interesting mobile shown in the photo at left. Cut from $\frac{1}{8}$ -in. hardboard smooth on both sides, paired triangles are slotted at the center and glued together to form a four-point "star" as detailed below. Triangle lengths are 4, 6, 8, 10, 14, and 16 in. Height of 4 in., peak to base, is the same for all triangles. Lengths of fine wire glued in the joint of each triangle pair at top and bottom permit tying them together, spaced 2-in. apart. The mobile may be painted white, gold or silver and decorated with tree ornaments hung from holes drilled in the ends of the triangles.

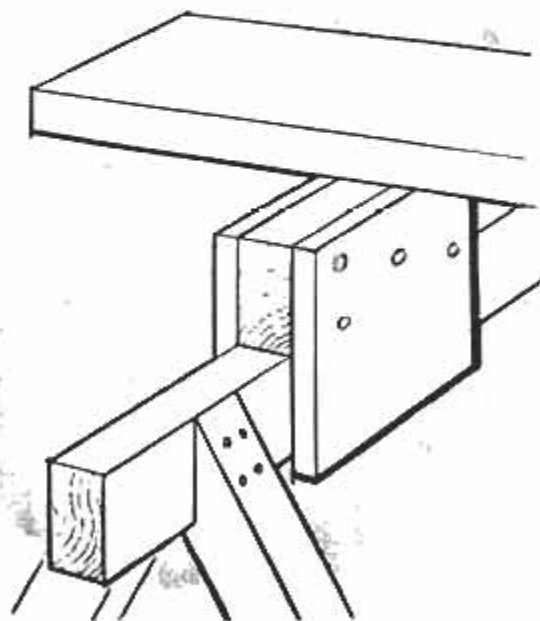
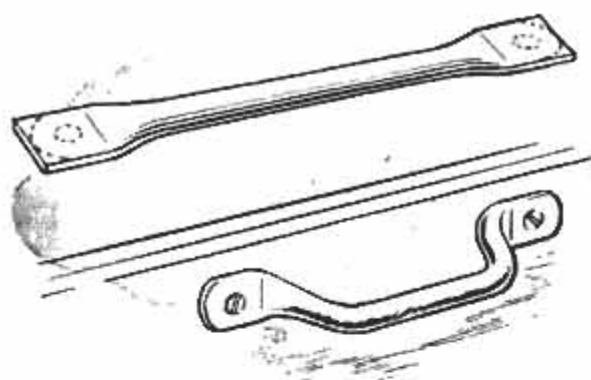
Photo and information courtesy Masonite Corp.



Workshop Cabinet Pulls Made From Copper Tubing

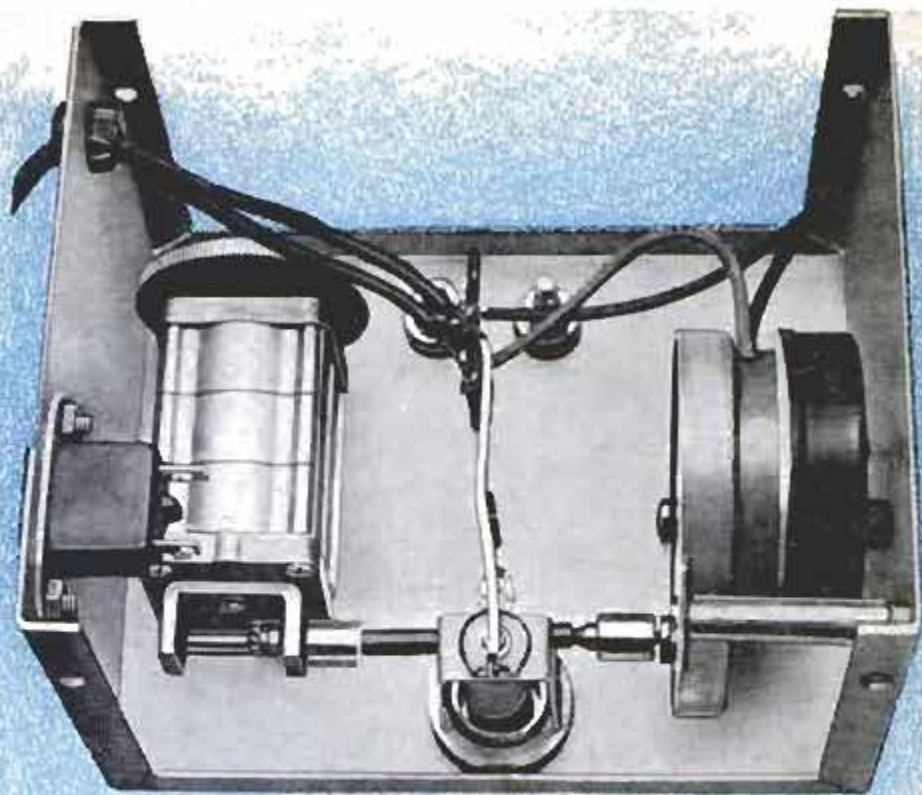
Sturdy pulls for workshop drawers and cabinet doors can be made easily from lengths of copper tubing as detailed at left. A pull is made by cutting $\frac{1}{4}$ or $\frac{3}{8}$ -in. tubing to the desired length, after which the ends are flattened and the corners are rounded with a file. Holes to take screws are then drilled and the piece is shaped as indicated. To predetermine the length of the drawer pulls make the desired shape and size of pull from wire solder and then straighten it for use as a pattern.

G. E. Hendrickson, Argyle, Wis.



Blocks Elevate Scaffold Plank For Short Plasterer

To gain a few additional inches of height on a scaffold plank supported by sawhorses, one plasterer of short stature used two saddle blocks in the manner shown in the drawing at left. Each of the blocks is made of a short length of 2 x 4 sandwiched between pieces of scrap material as shown. Since the blocks slide freely on the horses, it is important that the outer pieces overlap the member on which they are placed. For safety, it's a good idea to make the saddle blocks wider than the plank to be used on them.—G. E. Hendrickson, Argyle, Wis.



ELAPSED-TIME INDICATOR

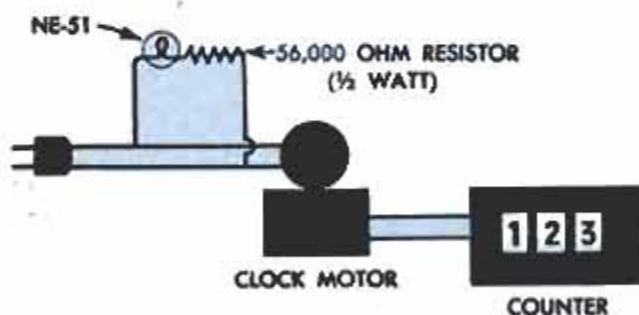
KEEPING TRACK of the length of time a piece of electronic equipment has been in actual use, makes good sense and can save you costly replacements and repairs. For your more sensitive components, here is an elapsed-time indicator you can build for only a few dollars. The indicator uses a self-starting motor from an electric clock with an output shaft turning at 1 rph; and the counter from an antenna-reel control box, available from almost any mail-order supplier of electronic parts.

Remove the counter and the flexible shaft from the antenna-reel control box. Mount them at the front of an aluminum box measuring 3 x 4 x 5 in. Mount the

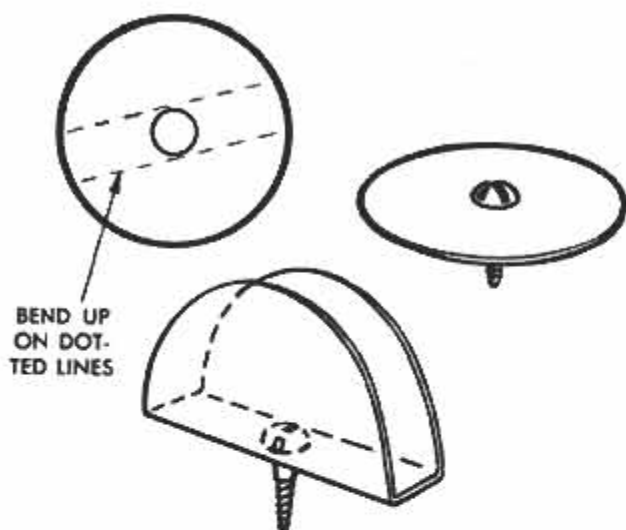
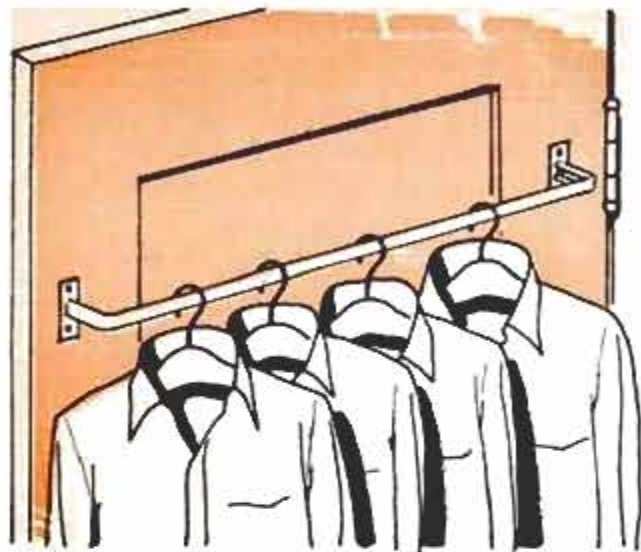
clock motor at the rear of the box, aligning the two so that the two shafts may be coupled. If you use the pilot-light assembly that comes with the control box, then use an NE51 bulb in series with a 56,000-ohm, 1/2-watt resistor across the 117-volt line. However, you may find it more convenient to use a regular neon-bulb socket with a built-in resistor.

When you have assembled and wired your time indicator, you will be ready to connect it to a piece of equipment. If, for example, you use it to measure the length of time a phonograph stylus is used, connect the indicator to the phonograph through the A.C. receptacle or jack with which your phonograph is equipped. Thus, each time the phonograph motor is turned on, the indicator will run and count the cumulative number of hours your turntable operates.

The elapsed-time indicator may also be adapted for use by remote control. A transformer, mounted on the equipment to be timed, steps the current down so that it may be carried the desired distance unshielded. A second transformer, mounted in the housing, restores the voltage to 117 volts and operates the time indicator.



BASIC CIRCUIT DIAGRAM



BEND UP
ON DOT-
TED LINES

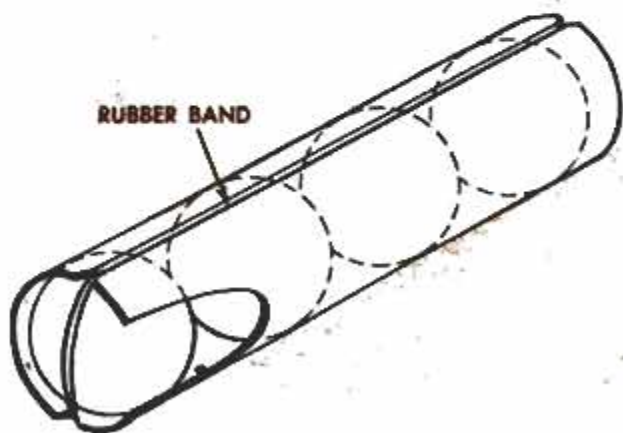
Solving Home Problems

Above, freshly ironed shirts and similar lightweight garments may be hung prior to putting them away on an ordinary flat-type curtain rod attached to the back of a kitchen or utility-room door. The rod will support a number of wire hangers holding light apparel and may be removed and stored away in a convenient place when the day's ironing is completed

Above, when a turnbutton is needed for a small cabinet a neat one can be formed quickly from a scrap of sheet metal. First cut a disk about 2 in. in dia. and drill a hole in the center for a screw. Then bend up the edges on the dotted lines to form wings for turning the button. Sharp edges on the metal can be smoothed with a file to avoid cuts on the fingers

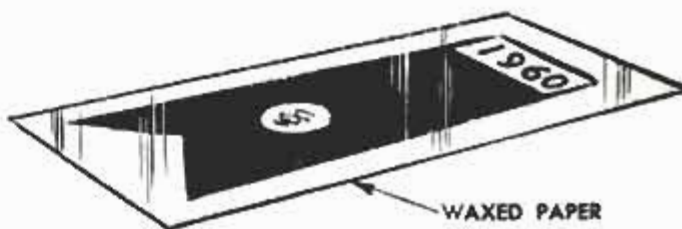
Below, before you try more drastic methods of cleaning wallpaper that has lost its fresh look and yet is not really bad enough to replace, borax may save the day. First wipe the soiled places with a clean cloth dipped in dry powdered borax. Follow this by dusting with a second clean cloth. You'll be surprised how the powder will freshen faded and soiled wallpaper

Below, you will find your table-tennis balls readily available and in good condition if you keep them in this handy tube dispenser. To make it cut notches in the ends of a length of mailing tube to take a rubber band and cut out an oval section in one end for your thumb. The rubber band holds the balls in place yet allows them to be removed as they feed down the tube





Above, basement clotheslines stretched wall to wall can be kept from sagging by attaching hooks to the center supporting I-beam. Regular clothesline hooks are soldered to square pieces of sheet metal and the edges crimped up over the beam. Right, a pressing "cloth" of waxed paper will take the wrinkles out of a ribbon badge.



Lower right, pictures can be made to hang straight if a strip of ordinary sandpaper is glued to each of the bottom corners of the picture frame. Below, for a unique lawn basket, cut away 3-in. strips from the sidewalls of a discarded tire. Loop the freed treads under to form a base and join the beads for a handle.

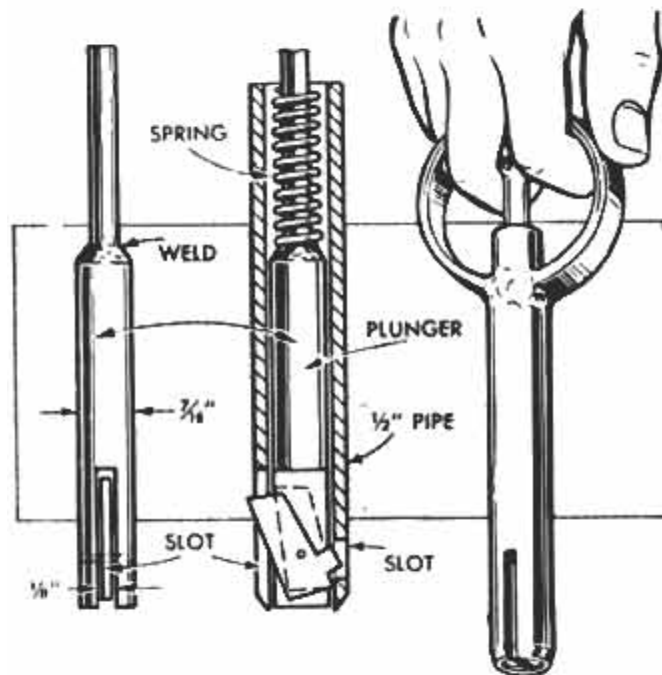




Low-Load Milk Cart Minimizes Lifting

Loading full cans of milk and carting them from the barn driveway to the milk-house is an easy job for this farmer who made the low-bed cart, illustrated at left, especially for the job. The all-steel push cart is made of angles, flats and pipe welded together to form a strong unit that can accommodate three cans of the type shown. Small diameter, 200-lb. capacity utility wheels, mounted on an axle that is welded directly to the underside of the frame at the center, help to reduce the loading height of the cart. A caster at each end gives rolling support when the ends contact the pavement.

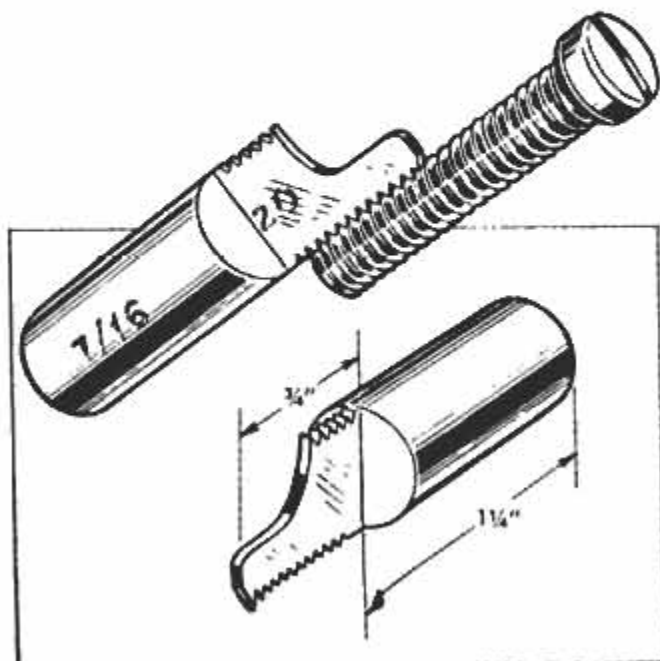
John Krill, North Lima, Ohio



Hitch Pin for Tractor Drawbar Has Locking Feature

Needing a hitch pin that would not work free of the tractor drawbar, yet be easy to insert or remove when necessary, one farmer made the locking pin detailed at left. The locking feature is provided by a dog shaped as shown and mounted on a pin that permits it to pivot in slots cut in the lower end of the plunger and pin housing as shown in the cross-sectional view. A small ear at the lower end of the dog engages a short slot in the housing, so that when the plunger is released a compression spring mounted on it forces the dog into locked position. When the plunger handle is pulled up, the dog is withdrawn, permitting the pin to be removed.

A. M. Wettach, Mt. Pleasant, Iowa



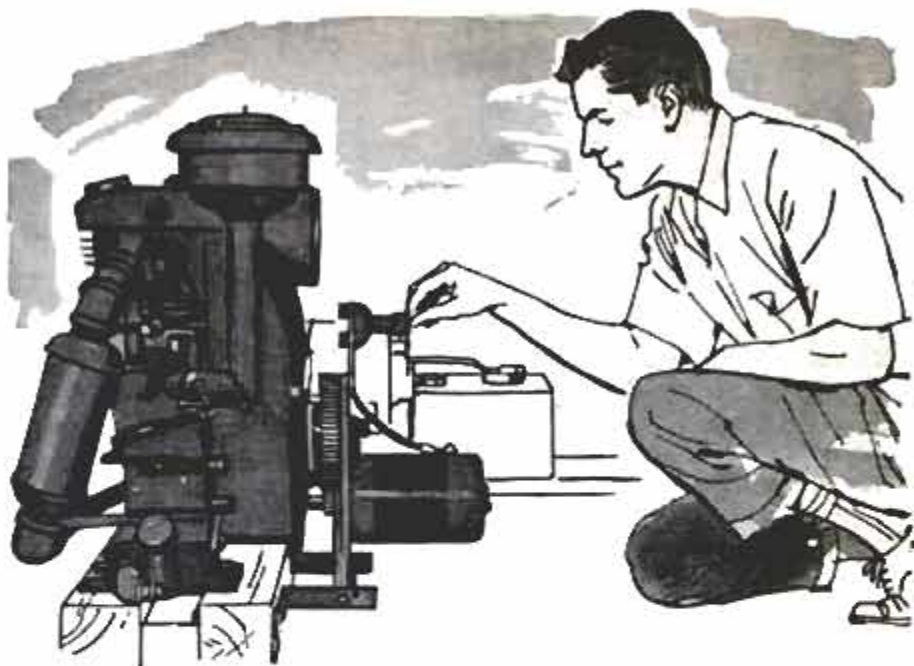
Special Thread Gauge Made From Bolt

When a special thread gauge is needed for checking bolt and nut sizes, make it from a bolt or threaded rod of the desired diameter and number of threads per inch as indicated in the drawing at left. The first step is to file or grind a $\frac{3}{4}$ -in.-long flat tongue on the threaded end as shown. The tongue should be about $\frac{1}{16}$ -in. thick and made with an offset approximately as shown to permit easy checking of internal threads. About $1\frac{1}{4}$ in. of the whole portion of the bolt is left for a handle. The bolt diameter and thread-gauge numbers are die stamped on the completed tool for quick, positive identification.

Walter E. Burton, Akron, Ohio

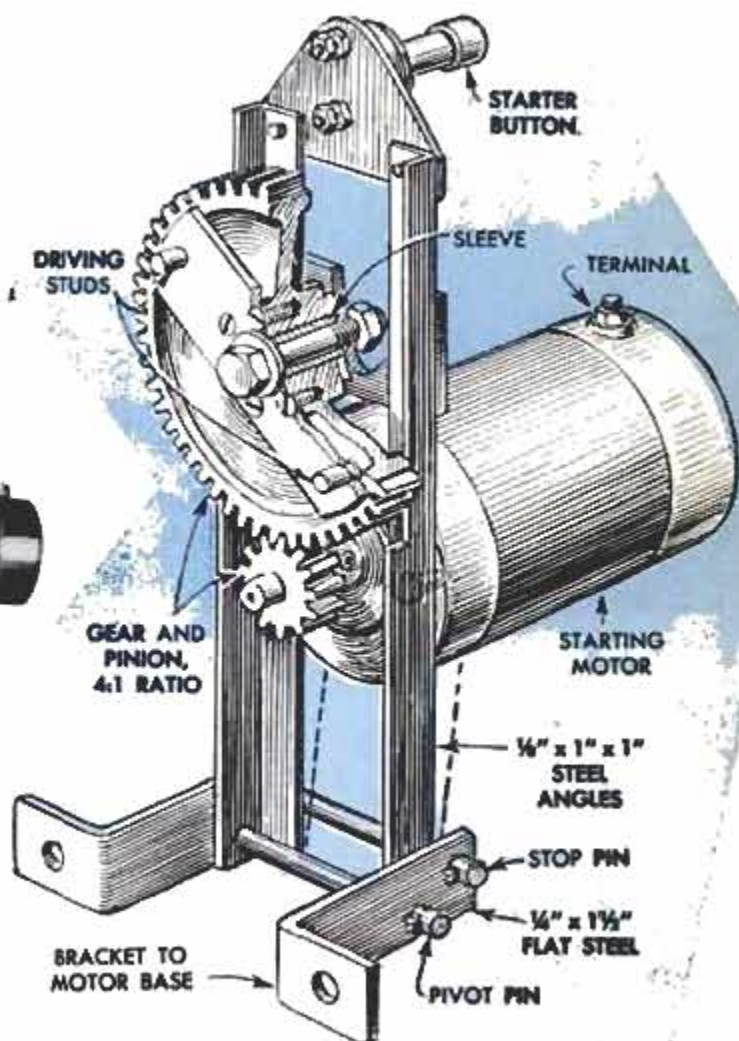
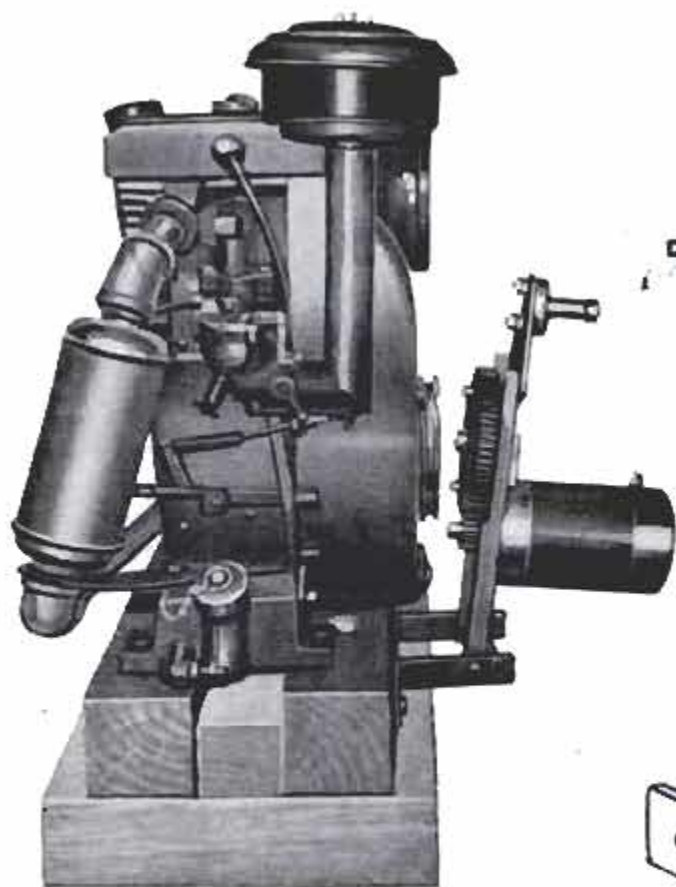
STARTER FOR STANDBY GENERATOR

By Ray B. Dorward



HAND-STARTING a large air-cooled engine that operates a standby electric generator is not the easiest job, especially during cold weather. This problem was solved on one farm by making an electric-starting device from a car-starting motor and other objects found around the workshop. The parts are assembled and bolted on the engine base as detailed. In use, the driving

studs on the large gear wheel engage the starter-rope notches when the starting unit is pushed forward as shown above. Thumb pressure required to depress the starter button is sufficient to hold the driving studs in engagement with the rope-starter wheel. When released, the starting unit disengages automatically and remains in the position shown in the photo.



STORAGE CLOSET

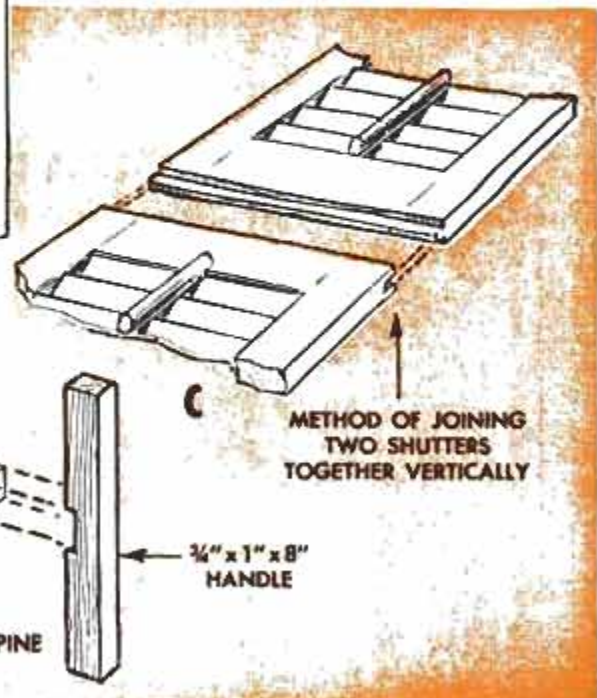
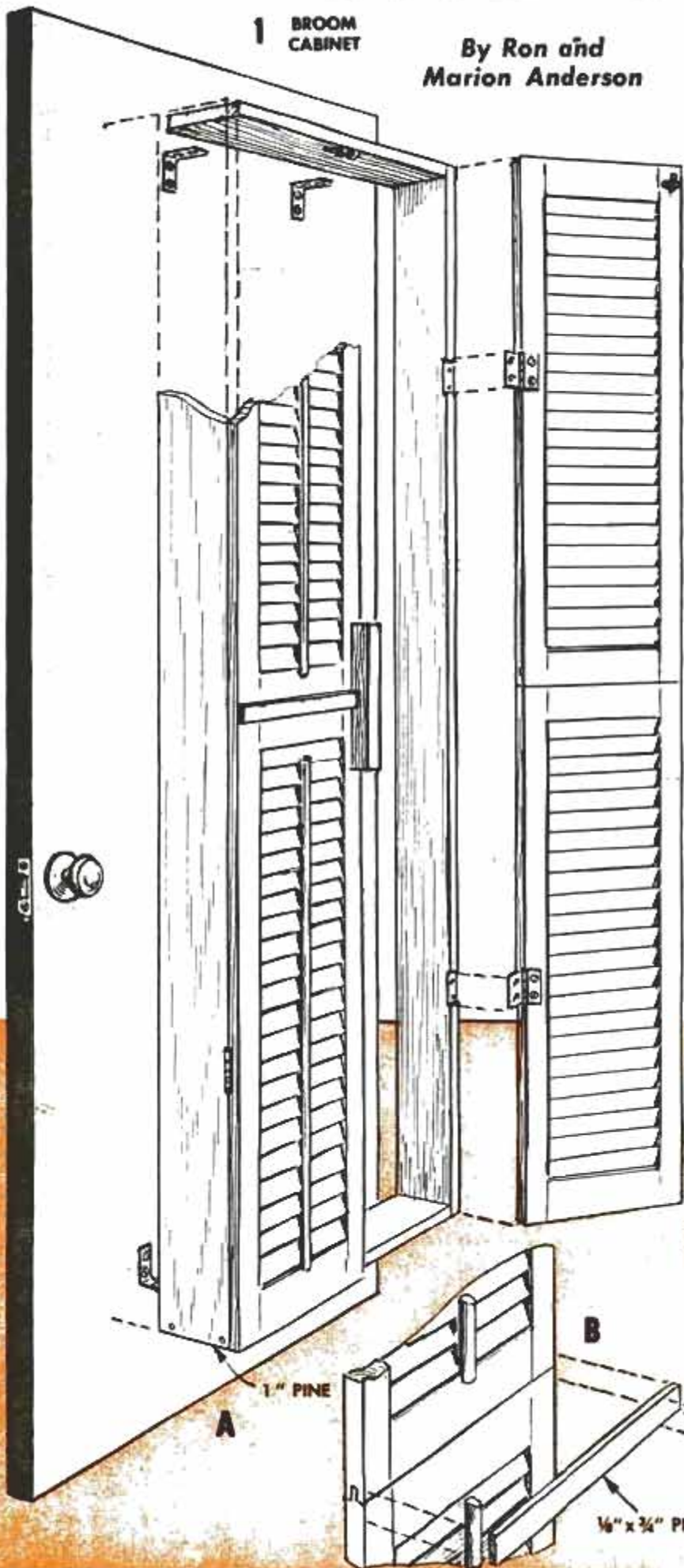
1 BROOM CABINET

By Ron and
Marion Anderson

TAKE A TIP from the current trend in refrigerator-door design and add new storage cabinets in most any room of your house having an inside door. The idea is called the "storage door," the added cabinet of which occupies wholly unused spaces in most cases.

On the back of a kitchen door you can have a broom cabinet; on a bedroom door, a tie and shoe cabinet, or an "auxiliary" clothes closet; a hat and glove cabinet on a guest-closet door; and a bookcase, or gun cabinet on a door to the family room. And don't forget miniature versions on the backs of kitchen cabinet doors. They are fine for spice containers.

Illustrated are four ideas with tips on how to build such cabinets. Simple box construction is used for all of them. Dimensions are determined by available space, cabinet use and door clearance. Joints are fastened with glue and screws. The door on which a cabinet is mounted serves as the back. Cabinets are mounted on steel brackets as in Fig. 1. Screw anchors fasten the



ON A DOOR

latter to hollow-core doors, standard screws for solid ones.

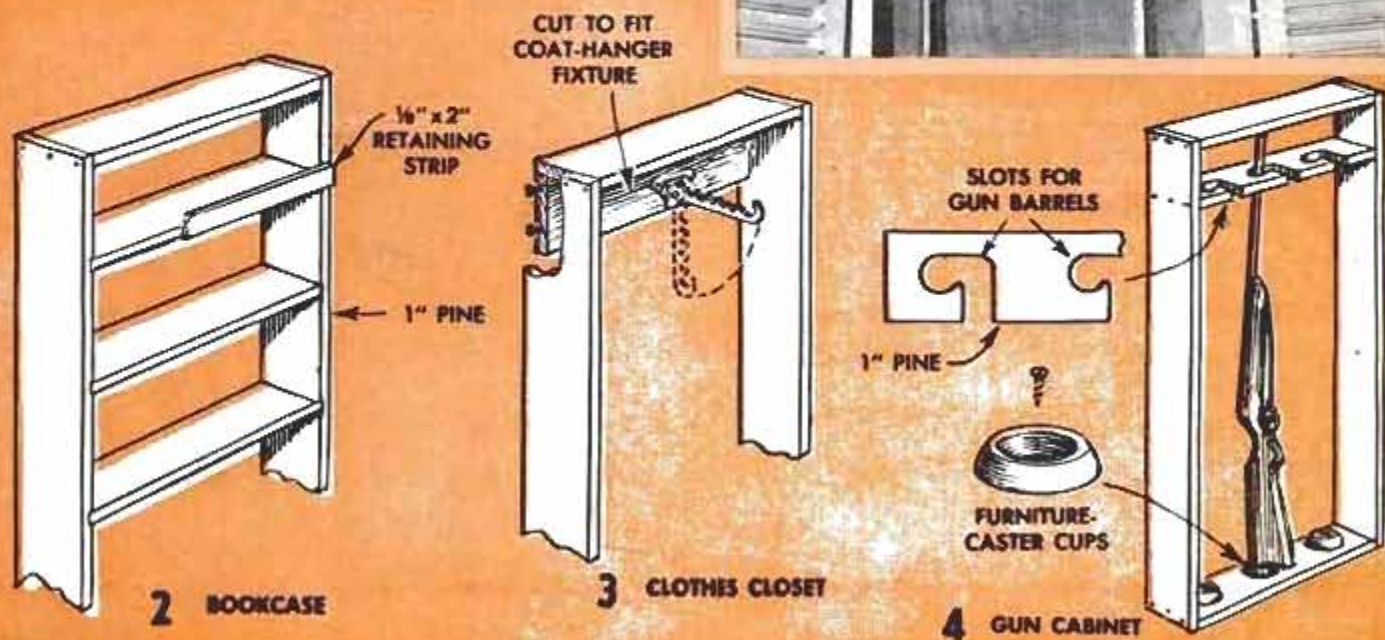
Any style of door may be used for the cabinets. To obtain a shutter-style door that cannot be purchased in the required length, piece two short ones together as shown in details A, B and C. It's a good idea to check on sizes of available shutters before starting construction. It may save time and possible embarrassment.

Since these on-a-door cabinets are subject to frequent movement, it is necessary to make provision for holding the contents in place. Available hardware and fixtures may be used for this purpose as is, or they can be adapted to accommodate the item.

Retaining strips on bookcase shelves as suggested in Fig. 2, hold books in place. A clothes-hanger fixture of the type shown in Fig. 3, is ideal for the closet illustrated since it can be folded flat when not in use. Brooms and mops are hung in the broom cabinet by means of a screw eye driven in each handle and slipped on a hook screwed in the underside of the top as shown in the photo at right. A hanger formed from a length of wire and mounted as shown, permits hanging a sponge mop sponge-end up to avoid crowding at the bottom. Slots cut in a cross member near the top of the gun cabinet help to keep guns in place, Fig. 4. Furniture-caster cups screwed to the bottom prevent the butt ends from sliding out.

Care must be taken not to overload a door, or it may sag. Completed cabinets may be painted or varnished as desired.

★ ★ ★



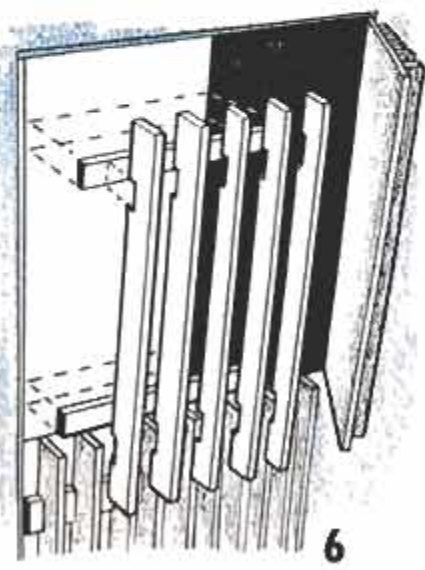
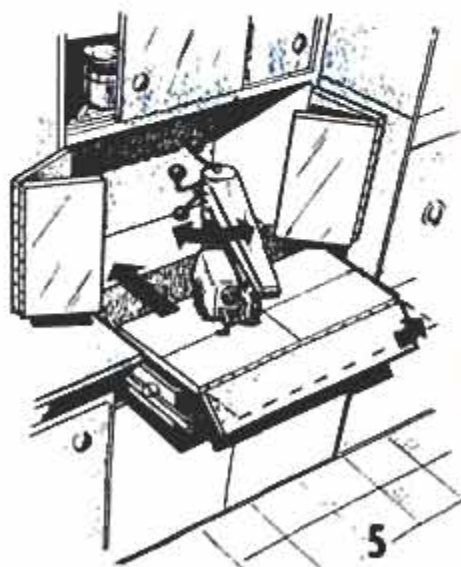


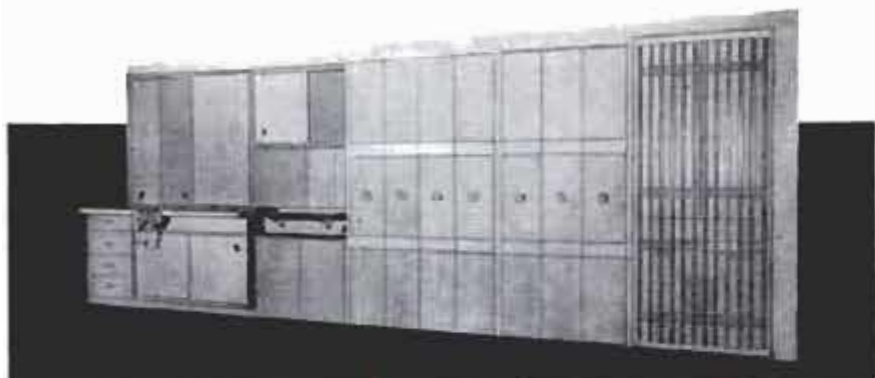
Built-In

FAMILY WALL FOR ALL

THERE IS NOTHING quite as effective for getting a lot of living into a small space as the modern storage wall or living center where one or both sides of the wall are utilized. Just about the ultimate in such walls has been attained by the noted craftsman and designer, Bill Baker who created this living center. Sponsored by AMF DeWalt Power Tools and United States Plywood Corp., this family wall or living center offers many suggestions that may be adapted to a wall in the average home. Or, in some cases, such as in a basement playroom or modern family room, it may be possible to use the wall in its entirety.

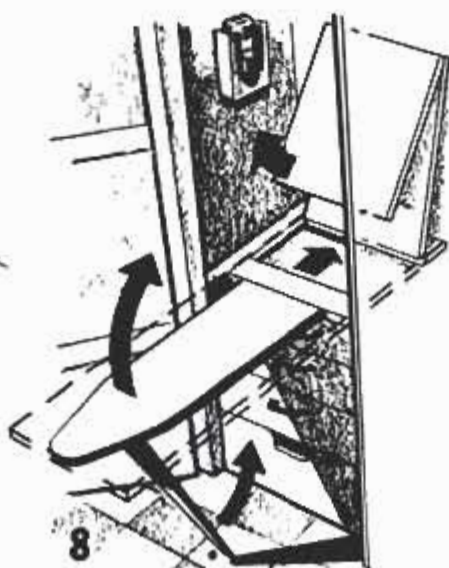
Among the many functional space savers incorporated in the wall is a music center, which contains a lazy susan for record storage, Fig. 1, with a speaker underneath, a television set, and a radio and stereo hi fi components, Fig. 3. There also are record storage compartments under the TV set. At one end of the wall is a home workshop, Figs. 2, 4 and 5, complete with a hideaway radial-arm saw, vise, storage cabinets, hand-tool rack and a work-

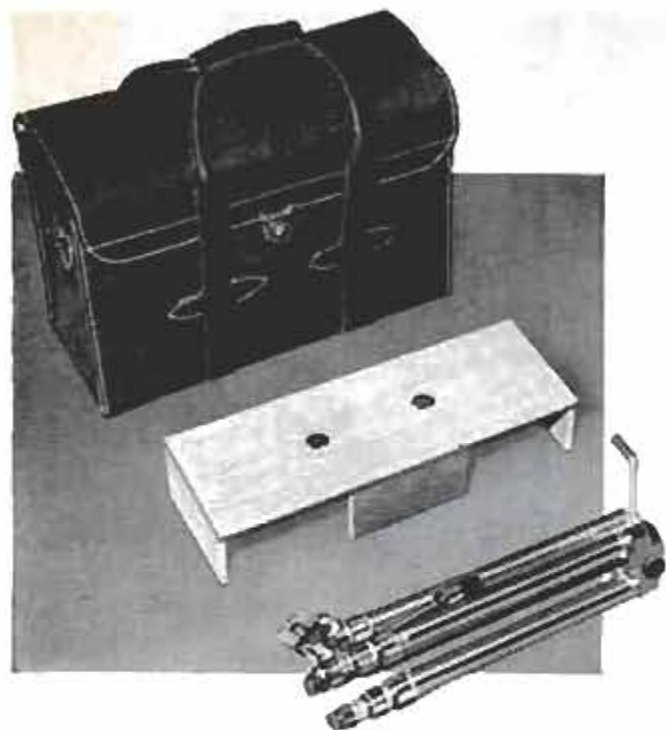




bench. In the center of the wall is a sewing center which is divided into two sections. One section contains drawers and storage space, a fold-out ironing board, Figs. 8 and 9, a fold-out work table and a cabinet for scrap materials. The other section contains a slide-out sewing machine table, Fig. 7, racks of patterns, spools of thread, measuring tape, etc. Not shown on the opposite side of the wall are a fold-away bed, beverage center and storage closets.

All centers or compartments are covered by foldaway doors, and each center may be used independently. Fig. 6 shows how the unusual effect on the surface of the doors over part of the music center is produced. ★ ★ ★

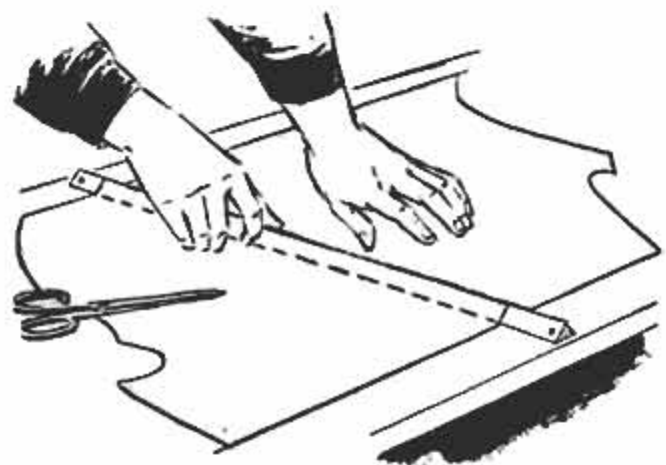




False Bottom in Photo Kit Bag Stores Tripod and Accessories

For the photographer who prefers to carry a tripod in a press or kit bag but dislikes the clutter it creates, here is a good way of providing out-of-the-way storage for the tripod. Tripod, cable release, straps and seldom used accessories are simply packed under a removable false bottom as indicated in the photo. For the model shown, $\frac{1}{8}$ -in. hardboard was used for the top and $\frac{1}{4}$ -in. pine stock for the two end pieces and two side members. Joints are fastened with glue and screws. Finger holes cut in the top, permit easy removal of the false bottom. The depth of the latter is equal to the minimum vertical clearance required for the tripod. Clearance of $\frac{1}{16}$ in. is provided at sides and ends. The completed unit weighs only a few ounces.

M. Rosko, Jr., Rahway, N. J.



Crease Oilcloth on V-Strip For Straight-Line Cutting

General store owners, here is a way of quickly marking oilcloth for cutting with a scissors when it has no straight-line pattern oriented at right angles to the sides. First a strip of wood having a V-shaped cross section is tacked on the store counter where oilcloth from rolls is sold. The length of cloth desired by the customer is then pulled over the strip and creased at the cut-off point by pressing the cloth against it with the thumb and forefinger as shown in the drawing at left.

G. E. Hendrickson, Argyle, Wis.



Plastic Cap on Oil-Can Spout Prevents Spillage in Toolbox

When carrying a small oil can in a toolbox it is wise to provide some kind of stopper for the spout, to guard against oil spillage should the can tip over. A plastic cap from an empty lighter-fluid can or other container is ideal for this purpose. Simply slip the cap on the end of the spout when the can is not in use as shown in the photo at left.

Disk Corrects Flash Exposure

To avoid overly-exposed closeup photos when using M-2 flash bulbs at the recommended shutter speeds, one amateur photographer uses a 3-in. disk of black paper cemented to an extra M-2 adapter. To arrive at new guide numbers for film, reduce the given number for each type by 30 percent and take a few test pictures.

Ken Patterson, Tribune, Sask.



Good Way to Cover Nail Holes in Wood Joints

Raising a chip at the point where a nail is to be driven, and then gluing the chip in place over the nailhead is one of the best ways of hiding it, especially on fine cabinet work. To do this, drill a blind pilot hole for the nail to within about $\frac{1}{16}$ in. of the surface. This can be done easily by positioning the drill as in Fig. 2 and then setting

the stop at this point. After drilling the hole, cut off a nail and drive it through the hole to break out the chip as in Fig. 1. Then drive a regular nail into place, Fig. 3, and glue the chip down over it. A little sanding will smooth any roughness and make the spot almost impossible to detect after the finish is applied.

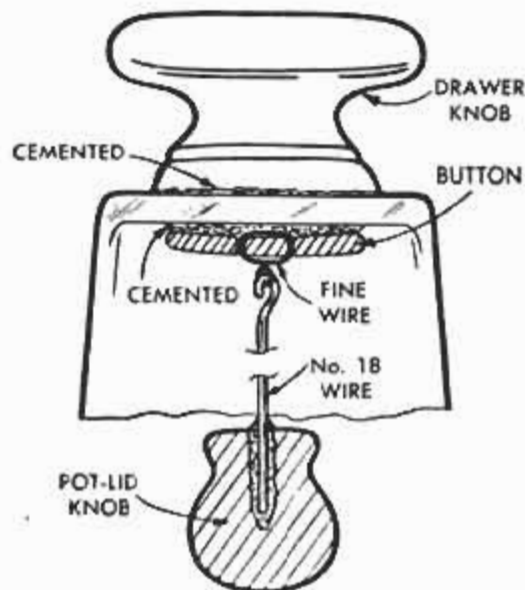
Remember These Problem Solvers for Your Home Chores

Most vexing problems that arise during your daily work around the home often have relatively simple solutions. For example, a rug that curls at the corners usually can be straightened by placing a dampened bath towel over the curled spot overnight. And those hooked rugs you thought useless because of worn edges may be renewed by edging them with regular carpet binding. If dad or the children have tracked in some road tar on your linoleum, cover

the spot with petroleum jelly for a few minutes, and then wipe it away with a paper towel. Rubber-heel marks usually can be removed in the same way. When your do-it-yourself husband heads toward that beautifully chrome-plated plumbing with his pipe wrench, be sure he wraps some electrician's tape around it before applying the wrench. The tape will prevent marring the plated fixture, and even help prevent his wrench from slipping.

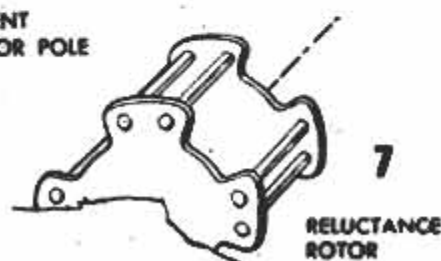
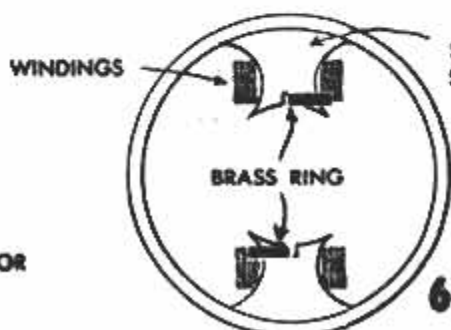
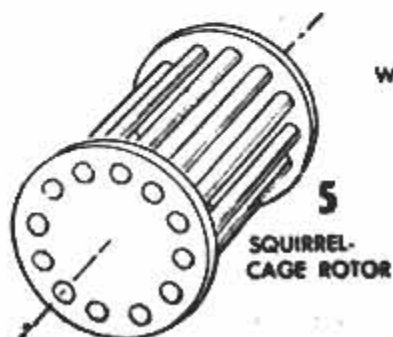
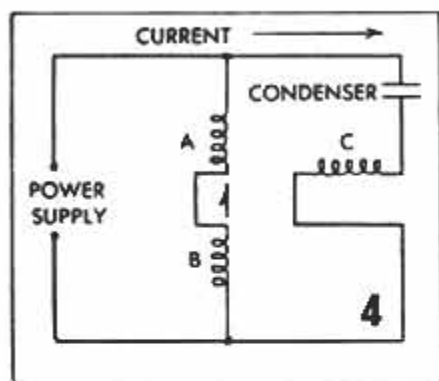
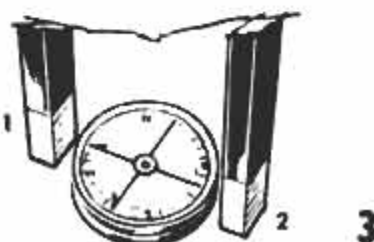
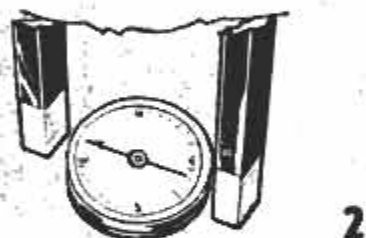
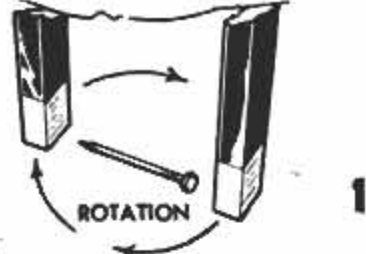
Novel Dinner Bell Made From Tumbler

This little bell is not only practical for use in the home, but it also may be used as an unusual what-not item. To make it, select a glass tumbler that sounds a pleasing note when struck lightly. To the bottom of the glass cement a wooden drawer knob, and inside cement a large button to which has been "sewed" a clapper made as indicated at the right.



HOME REPAIR

By H. D. Eckerson



FAILURE of a home appliance motor can upset the daily schedule of any modern household. Everything must be put aside until the motor is fixed and running again. Electric motors powering home appliances and shop tools are extremely durable and long-lasting units, and under normal conditions they keep running for many years without attention. But occasionally they fail due to worn parts, hardened lubricant or some other abnormality that may have developed unobserved. It's then that you can save yourself money and time by knowing how the various types of motors work and how to make simple motor repairs.

Action, or power, of an electric motor results from interaction of the magnetic field of a stationary winding, usually called the stator, and a rotating member generally referred to as the rotor. Note the nail between the poles of the horseshoe magnet in Fig. 1. If you rotate the magnet very slowly the nail will turn with it, following the magnetic field rather jerkily due to inertia. If rotation of the magnet is started quickly the nail will not follow, as it cannot respond quickly enough to stay within the field of the magnet. This "motor" is not self starting.

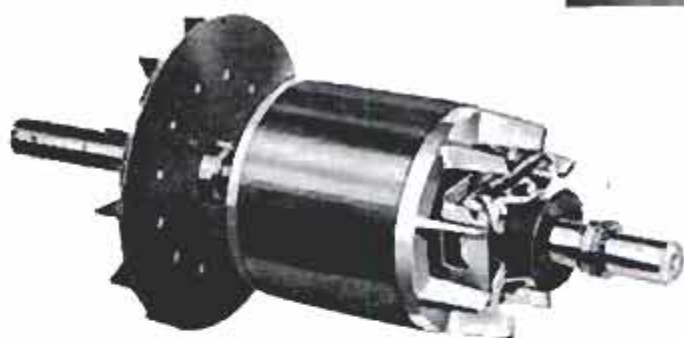
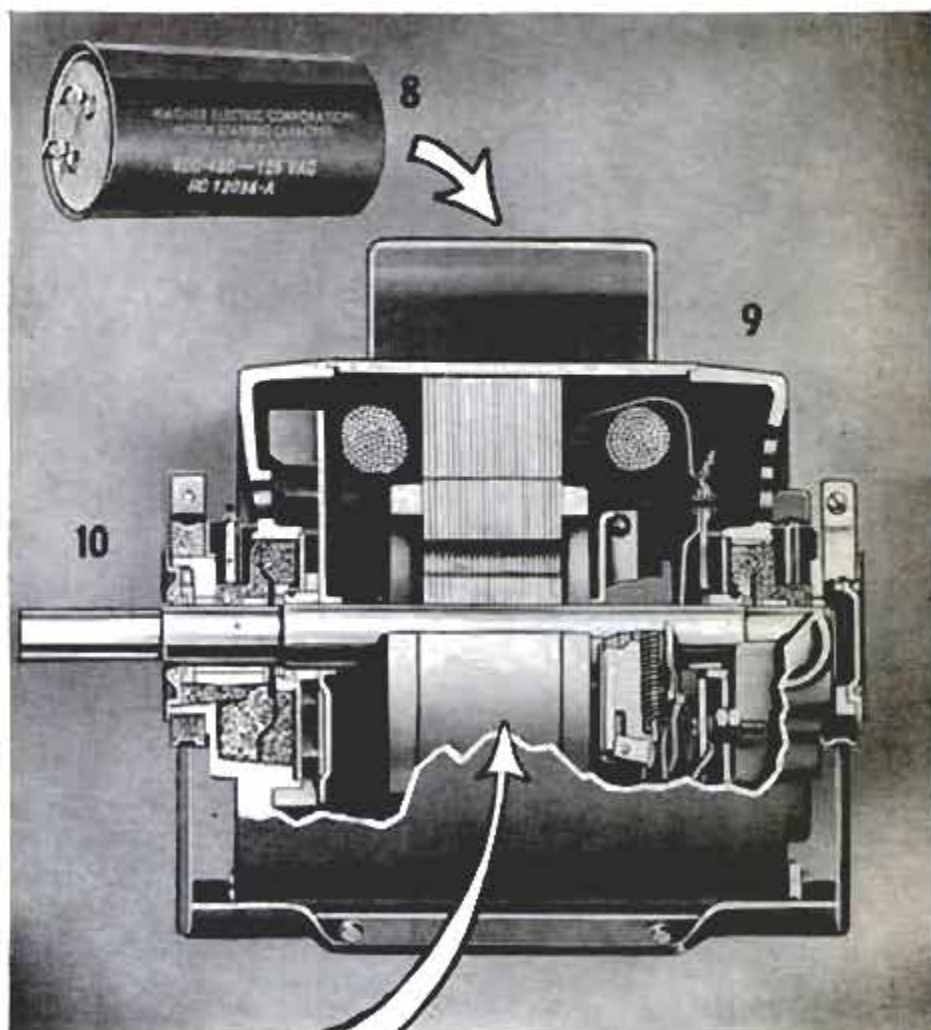
Now note Fig. 2 and think first of the compass needle and then the body of the compass as being the components of the rotor. When the magnet is rotated, fast or slow, the needle will follow quite precisely. But think of the body of the compass being pulled around with the needle, making a slower start and following at its own pace. Several conclusions can now be drawn: The magnetic field still must rotate and, although the rotor is self starting it will not turn as fast as the magnet. It will lag, or "slip," a little.

Finally, think of the compass as having two needles fixed at right angles so they will rotate as one, Fig. 3. It will be noted that the needles start to turn when the magnet is placed in position. When the leading needle passes pole No. 1 it will be pulled in the opposite direction from the second needle which is approaching pole No. 1. The result will be a kind of pulsating movement. But suppose that polarity of the first

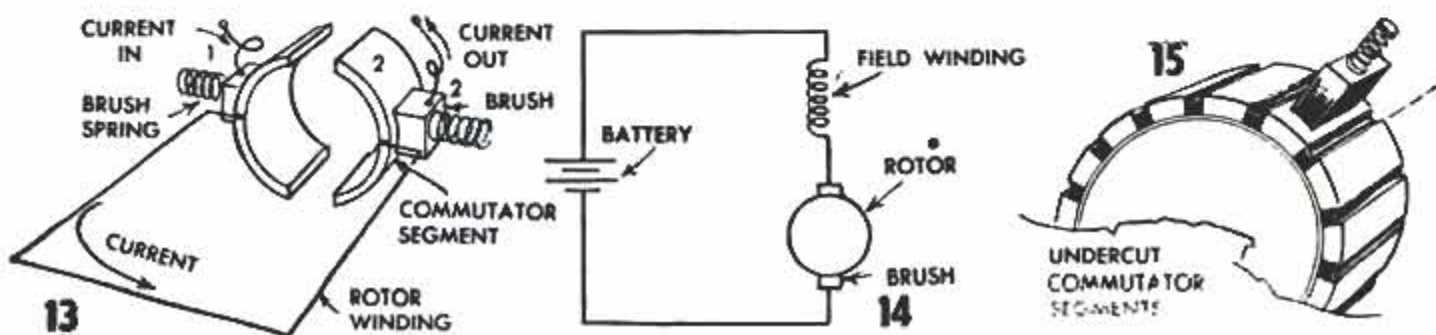
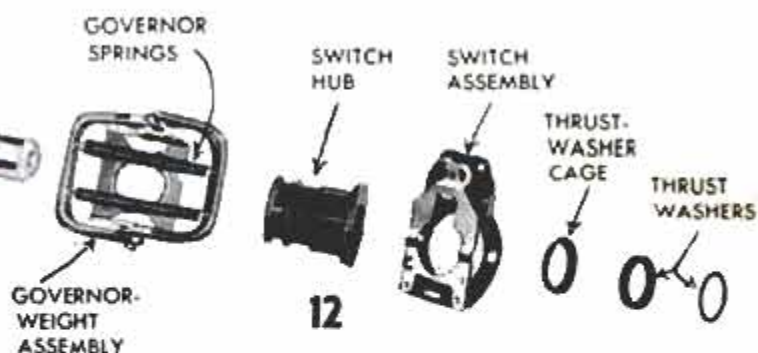
of ELECTRIC MOTORS

needle is reversed the instant it passes pole No. 1. It then will continue to rotate toward pole No. 2. This action will set up a continuous rotation of the fixed needles and you have in effect, a d.c. motor, still assuming, of course, that the body of the compass is being pulled along with the needles and is rotating about a center. From this action it can be concluded that the stator field need not rotate, that the fields must switch, or reverse, polarity each time they pass a stator pole and, finally, that this type of motor also is self starting.

Fig. 4 shows how the stator fields of an induction motor are connected. Windings A and B are main field windings and the auxiliary winding C is connected into the circuit through a condenser. Operating on a.c. the condenser in effect keeps current in the auxiliary winding out of step with that in the main windings with the result that the stator field is oriented in the direction



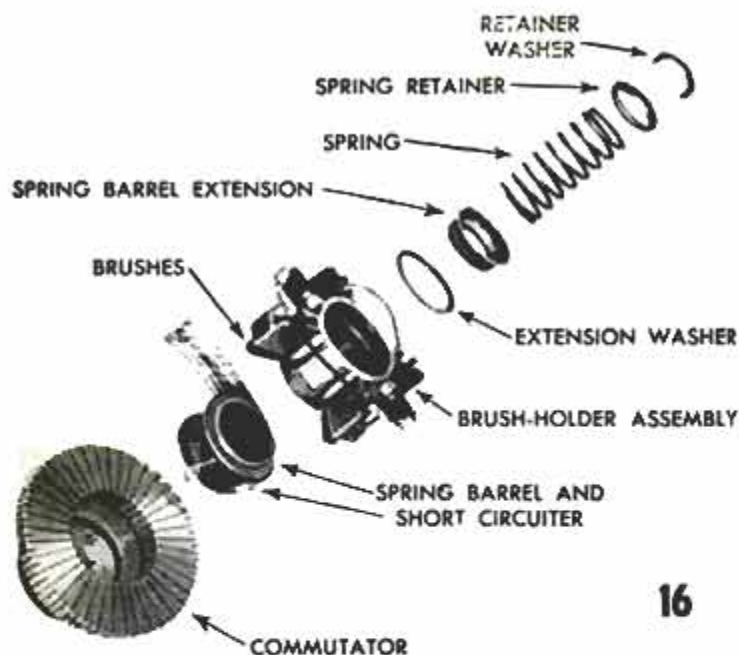
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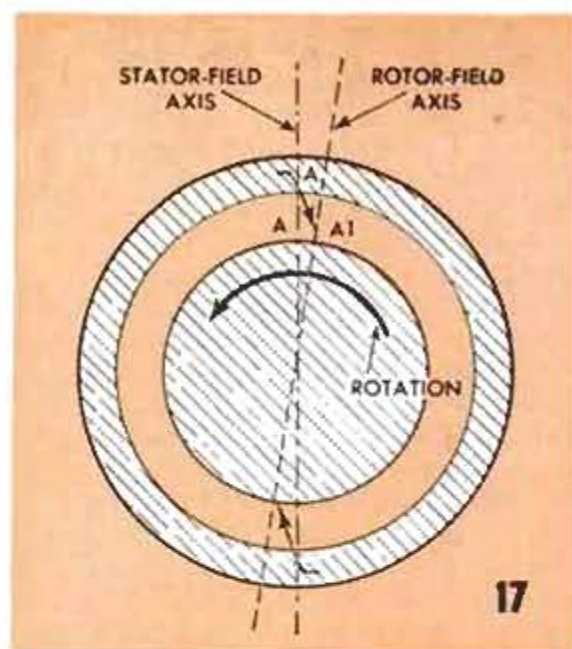
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of the arrow, Fig. 4, at one instant and in the direction of the secondary winding at a different instant. In effect, the rotor "follows" a magnetic field which rotates around the air gap.

The rotor's magnetic field, not shown in Fig. 4, is set up by induced currents, there being no connection between the main windings and the rotor. Fig. 5 shows a typical induction rotor of the squirrel-cage type, found in nearly all appliance motors of fractional hp. In this connection, refer also to the cutaway view of a typical appliance motor, Fig. 10, and the rotor in Fig. 11. These views show the finished parts. In these motors the condenser, Fig. 8, is mounted in a housing, Fig. 9, which is attached to the frame of the motor. Also, in this type of motor, the condenser is

used only for starting and is then automatically switched out of the circuit by the centrifugal switching device. This switch is shown in a pulled-apart view in Fig. 12 and assembled in Figs. 10 and 11.

After the rotor attains full speed and the condenser has been switched out of the circuit (this occurs when the rotor attains about half its normal speed) the rotor continues to spin by what might be termed straight induction. When the motor switch is turned off, the governor, Fig. 12, returns the centrifugal switch assembly to the starting position just before the rotor stops. This usually results in an audible click.

These motors are of the capacitor-start, induction-run type (see the table below) and the condenser and centrifugal switch

TYPE	IDENTIFYING FEATURES	CHARACTERISTICS	APPLICATIONS	REPAIR
Induction (capacitance & "split phase")	None of the features used below	Fair all around operating qualities	Common household uses: fans, vac. cleaners, pumps	Check condenser and all terminals for good contact
Induction capacitance-start	Centrifugal switch	Good starting torque & good running qualities (especially if combined with permanent capacitor)		Check switch, change condenser
Induction shaded-pole	Salient-stator poles with brass ring	Low torque, low efficiency	Very small fans, etc.	If cleaning & checking contacts doesn't help, you're stuck for a rewinding job at the repair shop
Reluctance	Salient-rotor poles	Synchronous, large for HP rating	Very rare	Check condenser & switch
Hysteresis	Usually a smooth rotor identified best by application	Low torque, synchronous speed, quiet	Clocks, phonographs	Cleanliness essential & also check condenser. Try setting motor on its side for several hours
Universal	Brushes "AC or DC" on nameplate	Small, light wt., high speed	High-speed applications, hand tools, etc.	Check brushes & spring tension. Clean commutator segments & governor contacts
Repulsion-induction	Brushes, brush-lifting device, shorting ring	Good starting torque, but large & expensive for its horsepower rating	Only older motors are likely to be this type	Check brushes, commutators, springs, shorting clamp, brush-lifting device

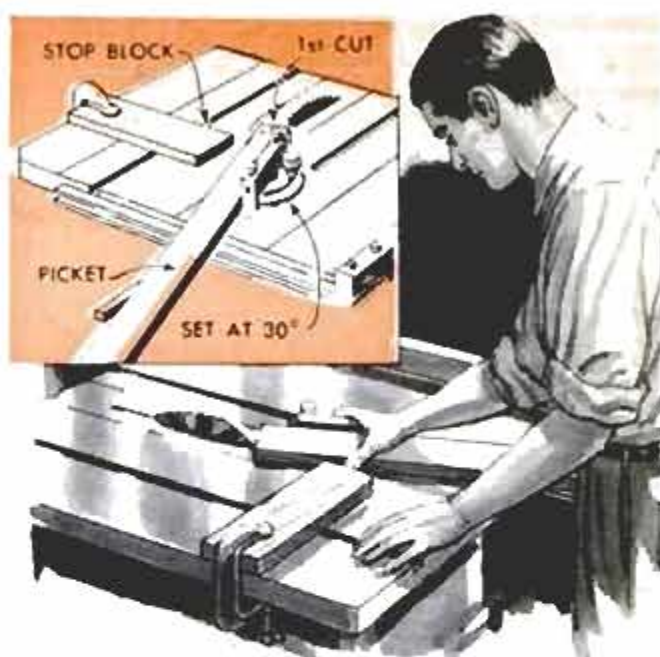
are the parts most likely to fail. A burned-out condenser is easily replaced and careful use of a solvent generally restores the switch to efficient operation.

Variations of the induction motor include those with two condensers, one for starting and one for continuous running. These are sometimes called capacitor-start, capacitor-run motors, and are not commonly used to power home appliances. Other types have a brass ring around one half of each pole, Fig. 6, to change the magnetic properties of the halves and simulate the effect of an auxiliary winding. This motor is limited in application because of a very low starting torque.

Recall that in Fig. 3 it was noted that a change in polarity can cause the needles to rotate continuously in one direction and that the magnetic field does not rotate. Basically, this is the principle on which the universal, or d.c.-a.c., motor operates. The device for changing current direction in these motors is the brush and commutator, Figs. 13, 14 and 15. The rotor of such a motor consists of a group of current-carrying coils. Fig. 13 shows an elementary rotor winding, the latter terminating on the brass (or copper) segments which are called commutators. Current is fed through the brushes to the commutator segments and around the coil, thus setting up a rotor field. When the rotor turns, commutator segment No. 1 will eventually contact brush No. 2 and commutator No. 2 will contact brush No. 1 and thus the direction of the current around the coil will be reversed. Fig. 14 shows a series connection of such a motor with a battery as the power source. If the battery is replaced by an a.c. power source, the stator magnetic field will reverse its polarity periodically with the alternating current, but because of the series connection the rotor field will change its direction in step with the stator and the rotor will continue to turn.

This is the universal motor you find in nearly all portable power tools and about the only servicing it requires is a periodic cleaning to remove thrown lubricant and dust, and replacement of worn brushes.

In the repulsion-start, induction-run motor (see table on the opposite page) a centrifugal switch short circuits the commutator and in some motors lifts the brushes after the rotor has attained about half its normal speed. Fig. 16 is a pulled-apart view of the short-circuiting, brush-lifting mechanism showing the various parts. Other motors sometimes used on light equipment and in special applications are the "reluctance" motor, Fig. 7, and the "hysteresis" motor, Fig. 17, the latter used in clocks and phonographs. ★ ★ ★



Pointing Fence Pickets Fast

With a stop block clamped to the table of your bench saw to automatically position the work, you can point fence pickets as fast as you can feed them through the saw. Place the crosscut guide in a reverse position in the right-hand table slot and set it at 30 deg. Hold the picket against the guide so it touches the stop block and push it through the saw. Make the second cut in the same manner by flipping the work over. The width of the picket, of course, determines the position of the stop block. A 30-deg. setting will produce a 60-deg. point.

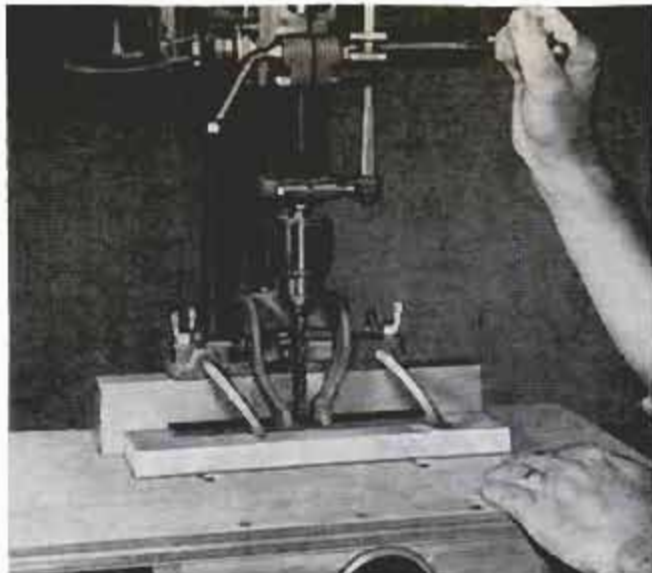
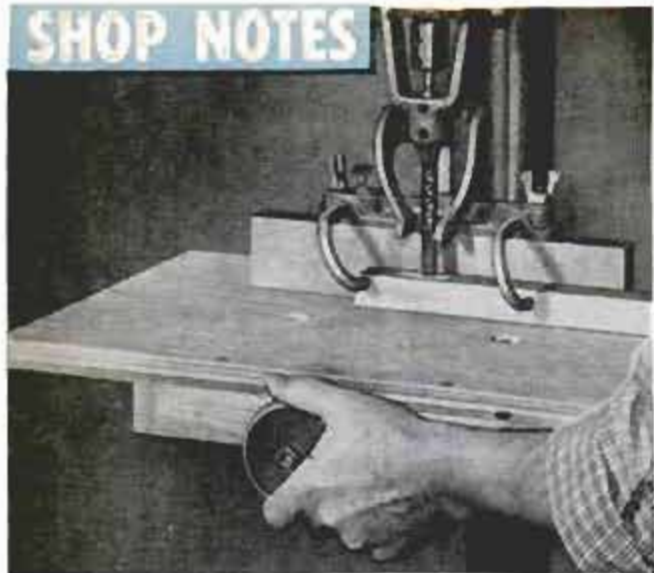
Marking Extension Cords

When several extension cords of different lengths are used from time to time, picking the right one for length when packed in a camera case can be a waste of time. I found a good way to clearly mark them for quick selection by painting the footage of each one on both the plug and the socket with a small brush and quick-drying enamel. With both ends marked it's easy to spot the desired cord at a glance.

Don Honick, Bartlett, Ill.

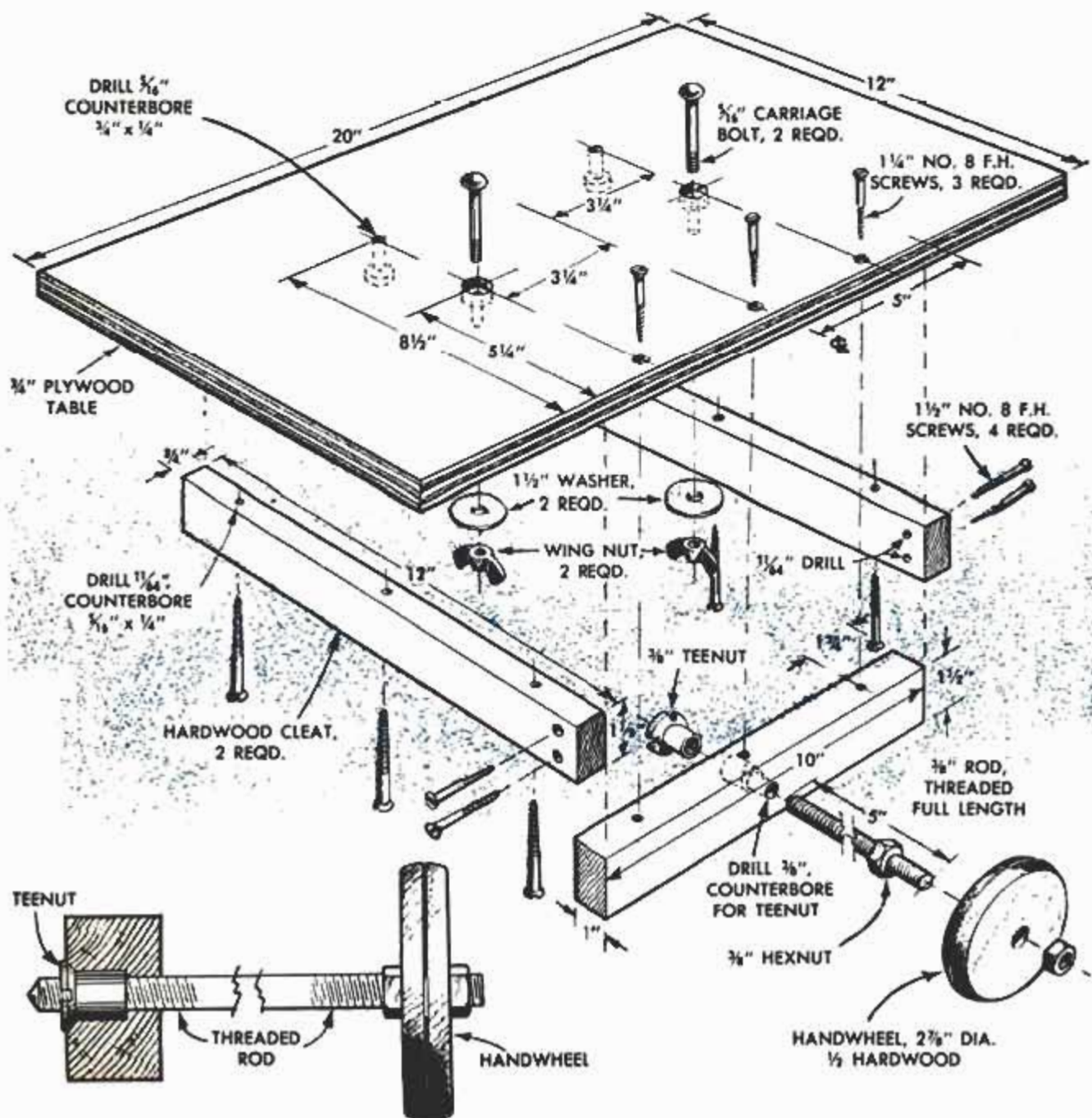


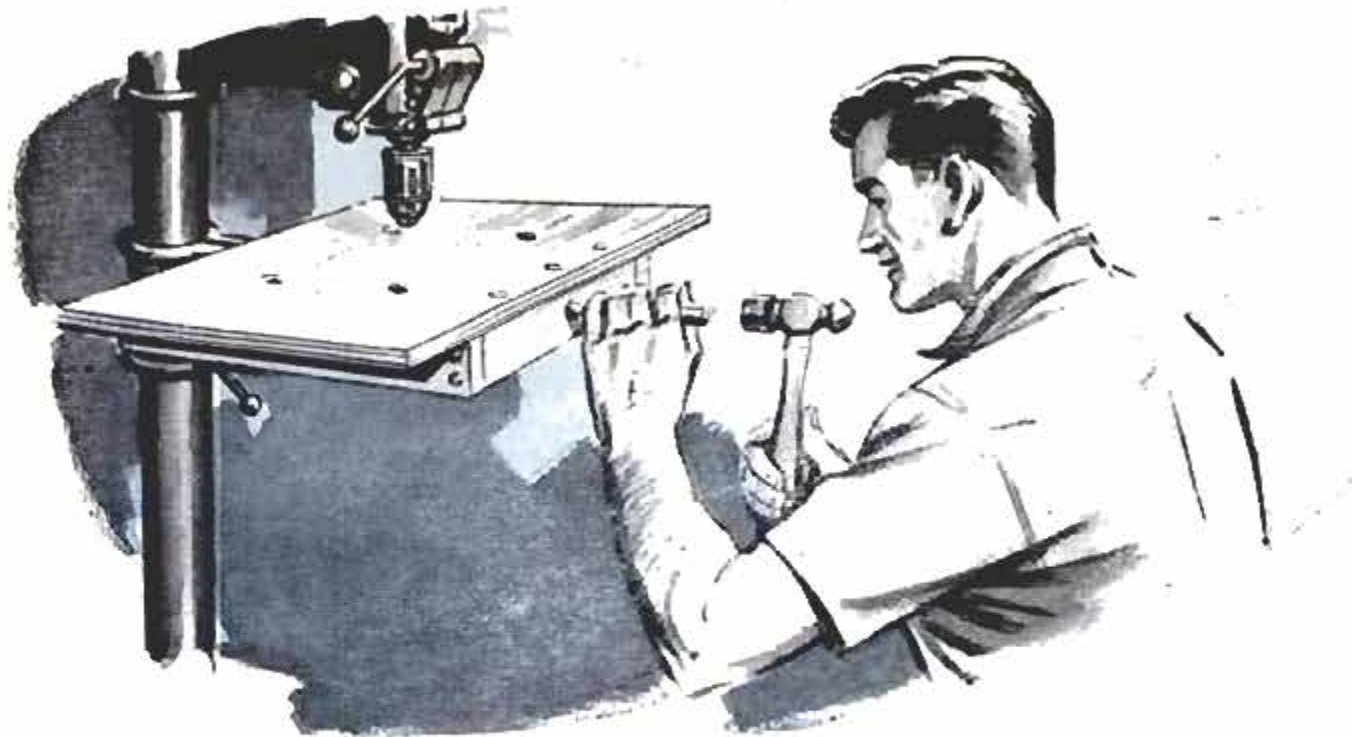
SHOP NOTES



When setting up for mortising with the hollow chisel the handwheel provides a means of positioning the work accurately. Table can be made any desired size

Table and fence of mortising attachment also can be used for holding and drilling flat steel with twist drill. Always use backing piece when drilling through





MORTISING TABLE

FITS YOUR DRILL PRESS

By Howard R. Clark

ALTHOUGH the standard drill-press table is adequate for all ordinary work with twist drills and wood-boring bits, it's helpful to have an auxiliary sliding table for the special jobs such as mortising. A screw-actuated table enables you to position work with much greater accuracy when mortising and routing. Nearly all mortising attachments for the drill press can be bolted to the auxiliary table and thus will travel with it, making positioning of the work under the bit easy and precise.

As detailed on the preceding page the table is made from $\frac{3}{4}$ -in. plywood and is 12 in. wide and 20 in. long, a good average size. Before you drill any holes in the auxiliary table, be sure to check the size of your drill-press table, the location of the slots and the distance from the bit to the column. These measurements may differ from those given in the detail.

When the auxiliary table has been positioned on the drill-press table and bolted in place, measure and cut the two crosswise cleats and clamp in place, one on each side of the machine table. These cleats serve as guides and must fit against the sides of the table rather tightly and yet allow it to be moved back and forth by hand. Test and adjust for fit before attaching permanently in place with screws.

The front piece, which serves both as a closure and as a support for the handwheel,

fits between the two cleats and is held in place with screws. The piece is center-drilled and counterbored to take either a regular hex nut or a flanged nut of the type shown. The handwheel consists of a turned disk of hardwood and a length of threaded rod ground to a point at one end. The handwheel disk is attached to the rod with two hex nuts as indicated.

With the auxiliary table in position and before you turn the handwheel screw in place, insert a center punch in the hole in the front piece as in the illustration above and punch mark the front lip of the machine table. Then remove the auxiliary table and spot-drill on the punch mark to a depth of about $\frac{1}{8}$ in. to form a seat for the pointed end of the handwheel screw. At this point you can, if desired, drill and tap a hole for the handwheel screw in the front lip of the machine table. Then omit the nut in the counterbore in the front piece of the table. Run two nuts on the screw and lock them at the handwheel, insert the screw in the hole in the front piece and run on a second pair of nuts, locking them in a position that will permit the handwheel to turn freely. Installed in this way the handwheel will run the table in and out, rather than in one direction only. Installed either way it gives a very close final adjustment for positioning work under the mortising chisel, router bit, or twist drill. ★ ★ ★

Sand in Mailing Tube Provides Traction in Snow

Should your car stall unexpectedly on a treacherous ice patch or in heavy snow, a mailing tube filled with dry sand will help you get going again. The tube serves not only as a reliable container but is a handy dispenser as well. It enables you to place sand just where it's needed most and in just the right amount. Use a good sized tube, one of the heavier types that is exceptionally rigid. Fill with dry sand and close the ends with tight-fitting corks.

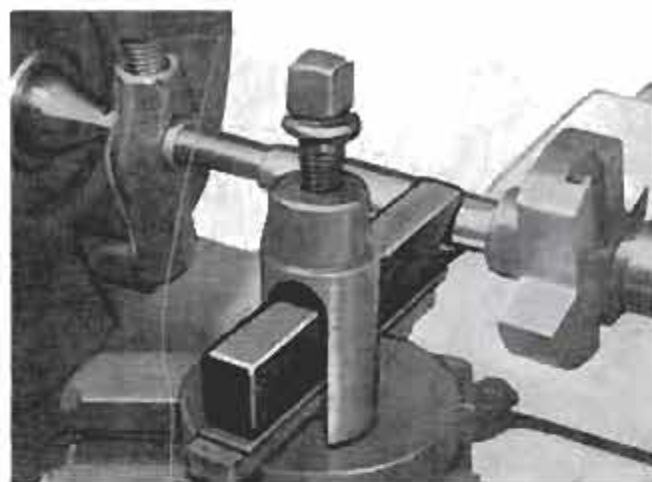
Running two or more nuts onto a threaded rod or bolt will prevent damage to the threads when clamping in the vise for hacksawing to length. When you finish the cut, running the nuts off the ends will straighten the threads cut through at an angle by the hacksaw. For a clean, square cut with minimum damage to the threads, use a hacksaw blade with fine teeth, about 24 to the inch.



Rubber-Bonded Abrasive Gives Controlled Polishing Action

Polishing in the lathe with a flexible, rubber-bonded abrasive stick reduces the possibility of distortion in concentricity to the minimum. At the same time pressures are more easily equalized and controlled, there is less tendency to heat the work and there is no danger of scoring. The stick is notched as in the illustration and mounted in the tool post on a solid support that extends to the working end. The lathe is operated at its highest speed with the back gears out and the carriage is slowly traversed right and left as the work rotates.

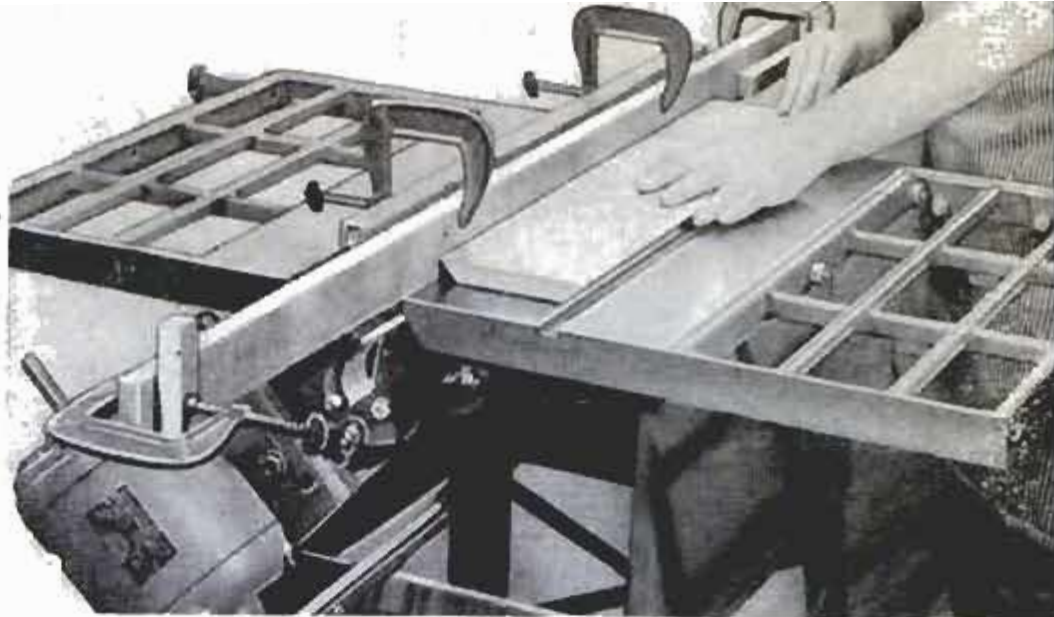
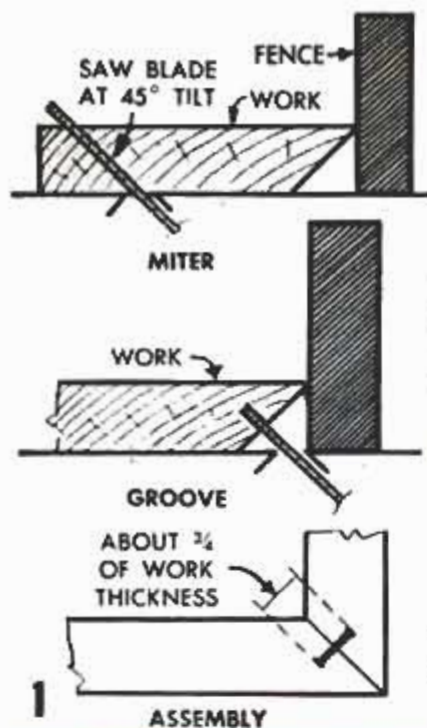
H. J. Gerber, Stillwater, Okla.



Make These Candle Trees For Your Holiday Decor

These candle trees could well be the novel touch you are looking for to top off the holiday decorative scheme. Using a small plastic funnel as a mold it takes only a few minutes to make each tree. Place the funnel in a glass tumbler and wedge a short candle into the funnel. Then melt candle wax (not paraffine) and pour slowly into the funnel until it is filled. A light tap will release the tree from the funnel, after which it may be tinted or otherwise decorated with liquid food colors. Support the tree in a short candle holder as pictured.





When the stock is joined along the edge, the miter cut is run with the saw blade tilted to 45 deg. Then the cut faces are grooved for splines

Cutting the MITER JOINT

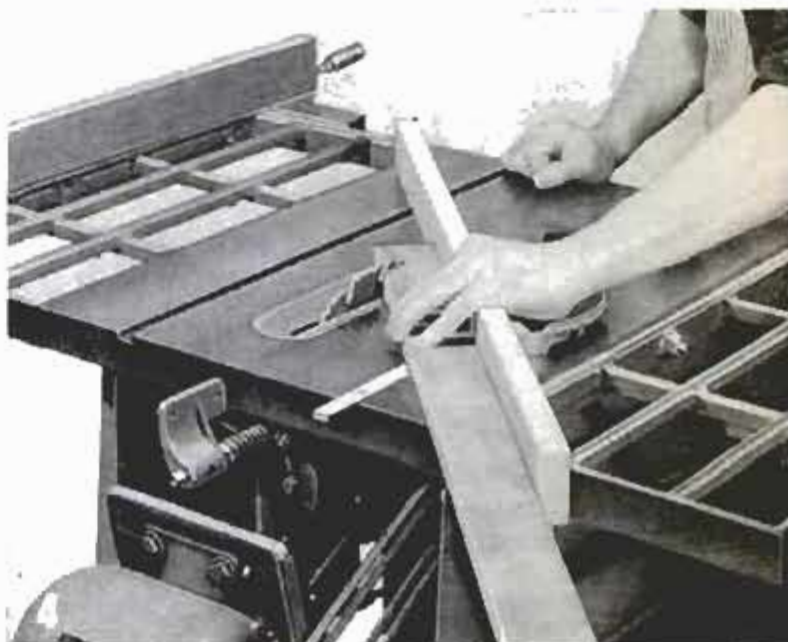
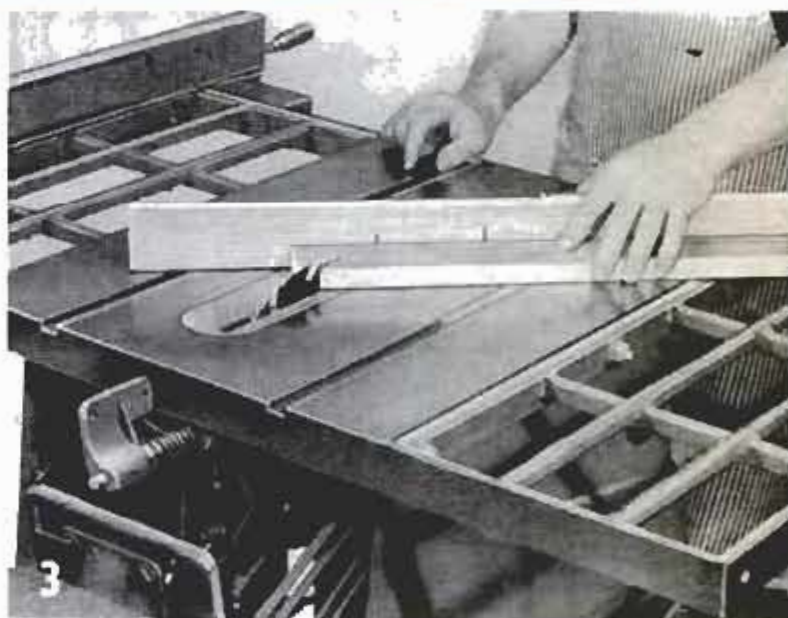
By Sam Brown

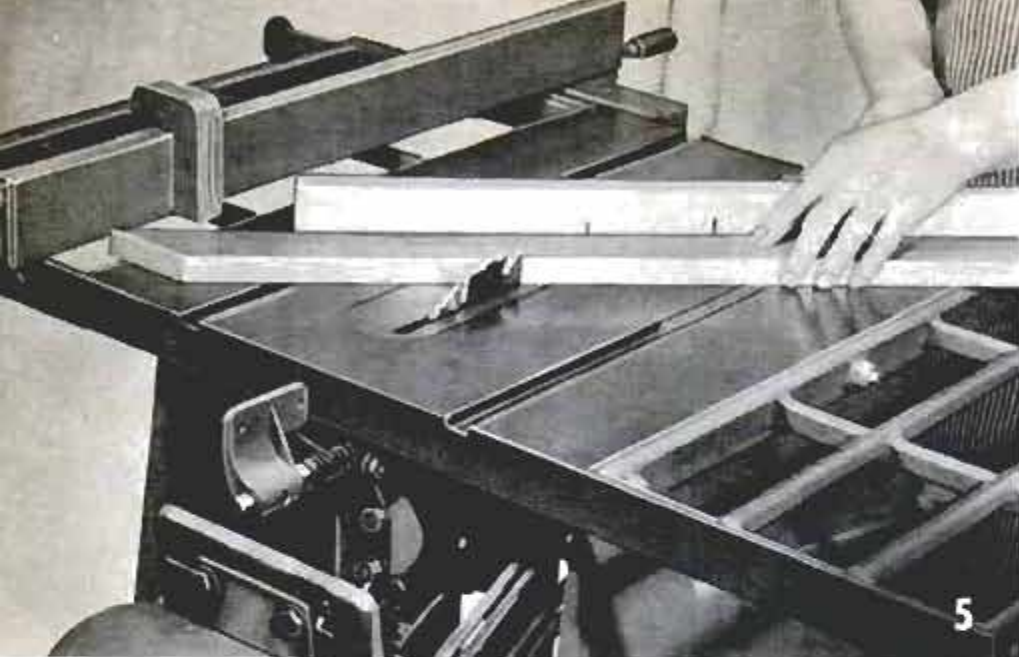
NOTHING PLEASES the eye of the craftsman more than a neatly worked miter joint which leaves the grain of the wood unbroken at the corner and shows nothing more on the surface than the fine line indicating where the parts were joined. A good, tight-fitting miter joint is quite easy to produce, either by hand with a simple miter box or with a power saw. About all it takes is careful attention to setups and procedures.

When mitering the corners of a boxlike structure, the 45-deg. cuts are made along the edges of the stock as in Figs. 1 and 2, and to add strength and rigidity the joint is splined, Fig. 1. The joint can be made complete on the circular saw with the blade tilted to 45 deg.

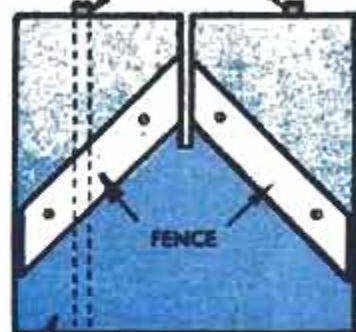
The crosscut miter is perhaps the most common type of miter joint. It is worked with the saw blade set at 90 deg. and the miter gauge set at 45 deg. Two work positions are possible in each table groove, as shown in Figs. 3 and 4. The open position, Fig. 3, is preferred by most craftsmen as it tends to keep the hands away from the saw blade. The closed position offers somewhat better support but is not as safe because the feed hand is behind the blade—the area where most saw accidents happen.

There is seldom any need to use the closed miter-gauge position. If the work can be turned over, face to back, both ends can be cut without disturbing the position of the miter gauge, Fig. 7. It can be seen that the same edge is toward the miter





WOODEN STRIPS ON UNDERSIDE
FIT IN SAW-TABLE GROOVES

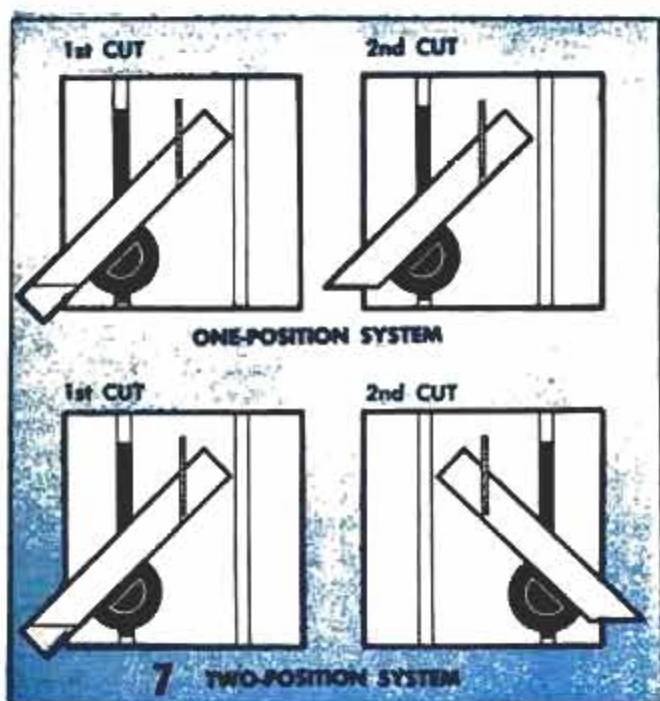


3/8" PLYWOOD

MITER TABLE

6

When making crosscut miter cuts on strips of equal length, use a stop on ripping fence for accuracy



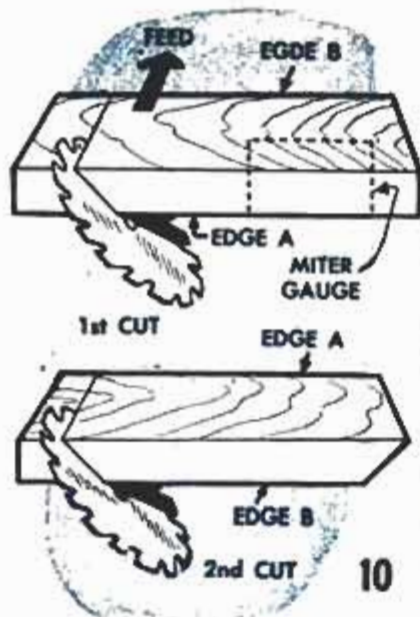
gauge for both cuts, but the work must be face up for one cut and face down for the other. This, of course, can't be done with moldings and various jobs where the work must remain face up. In this case, the open position is used for both cuts but the miter gauge must be turned to the opposite 45-deg. position and used in the opposite table groove, as shown in Fig. 7. If you are doing a lot of molding work, the auxiliary miter table shown in Fig. 6 is useful as it permits right and left-hand cuts at will. The simplest type of miter cut occurs when pieces are cut from a long work strip. Both right and left cuts can be made by simply turning the work alternately edge-for-edge and face-to-back, Fig. 5, using the same miter-gauge position throughout, and without reversing the work end-for-end.

Grooving for splines on crosscut miters can be done freehand with the aid of a

First splining groove is run with stock in this position. Note use of hold-in to keep stock against fence

Opposite end of stock is spline-grooved with piece in this position. Use special care in making cut





When crosscut mitering as in Fig. 11, use a stop to assure accuracy. For second cut turn stock, Fig. 10

spring hold-in. One end of each work piece can be cut in an open position, Fig. 8, but the other end must be worked in the objectionable closed position, Fig. 9. Only the shallow depth of the cut, rarely exceeding $\frac{3}{8}$ in., makes this kind of freehand sawing practical and reasonably safe. Splines of $\frac{1}{8}$ -in. plywood will usually fit the saw kerf if sanded lightly on both sides. For exact control of the saw kerf width, the well-known trick of slipping a piece of paper between the arbor flange and saw blade is worth keeping in mind; the slight wedging action of the paper will make the saw wobble slightly and cut a slightly wider groove than normal. The spline stock is usually cut square and is fitted slightly beyond the inside corner of the joint, as in the right-hand detail, Fig. 9.

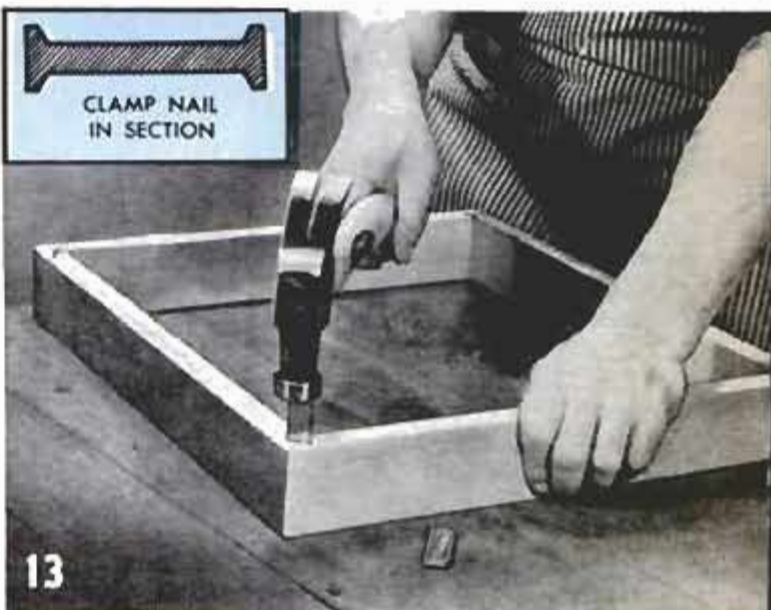
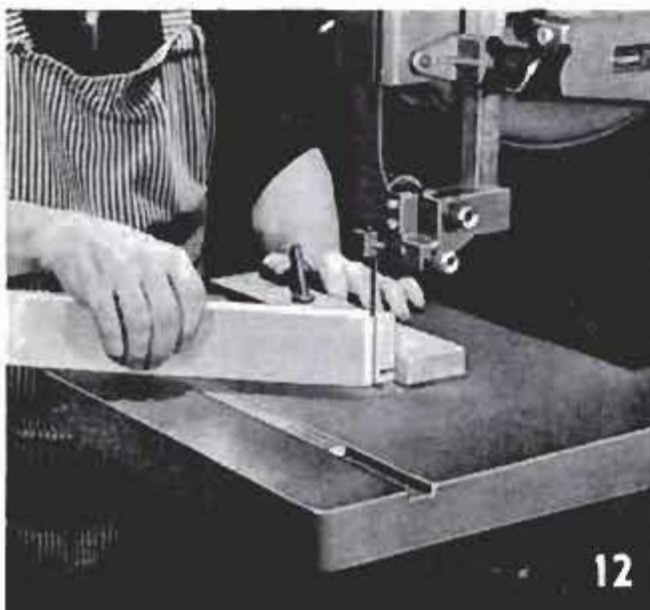
A second type of common crosscut miter is done with the work flat on the table but with blade tilted, Figs. 10 and 11. In work

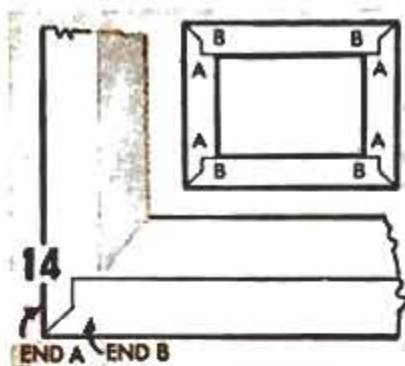
of this kind the miter gauge is in the 90-degree position and can be used in either table groove as desired, with a slight preference for the right-hand position because this puts cut-off waste pieces under the blade. Both ends of the work can be cut with the same miter gauge position; the face side of the work is up for both cuts but the edges reverse, Fig. 10. It is necessary that the stock be of uniform width, since non-parallel edges would cause inaccuracy in cutting.

Other than the conventional wood fastenings (splines and dowels), there are mechanical fasteners for several types of miter joints. One in common use is known as the clamp nail, which draws the members of the miter joint firmly together, Fig. 13. A special thin blade cutting a 22-gauge kerf is required to cut the spline groove. For narrow work, one method is to cut the kerfs with a band saw, Fig. 12. This is worked with the miter gauge and with end

Miters on narrow stock are often joined with clamp nails. Bandsaw blade cuts a kerf of the right width

Clamp nails have flanges shaped to draw the mitered faces tightly together to form strong, rigid joint

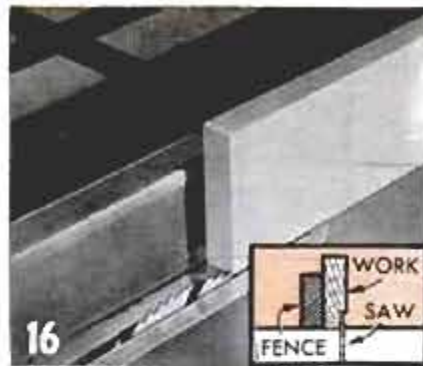




14
In making a rabbeted miter joint cut all parts square to net length



15
Run a test piece with shoulder $\frac{1}{2}$ the work thickness. Use miter blade



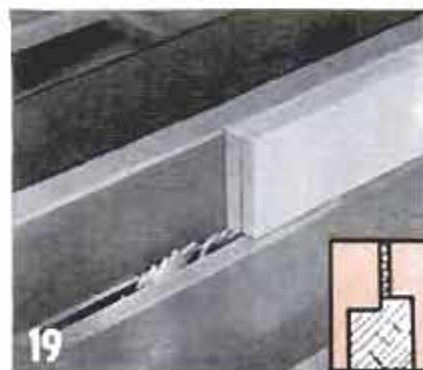
16
Set rippling fence to locate saw blade exactly flush with work face



17
Beginning with end A, Fig. 14, make a shoulder cut with blade in waste



18
Follow with successive cuts to clear waste just beyond miter line



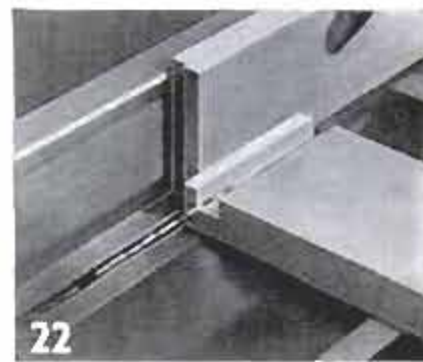
19
Using the test piece set the rippling fence at $\frac{1}{2}$ work thickness



20
Make shoulder cut on end B, Fig. 14. Repeat on all ends marked B



21
Tilt blade to 45 deg. and miter corners on all ends marked B



22
Make same mitering cut on all ends marked A. Note use of test piece

and depth stops as shown. The average bandsaw blade produces a kerf of just the right width. The width of the average clamp nail is $\frac{9}{16}$ in.; a saw kerf $\frac{7}{16}$ -in. deep will accommodate and also will allow just the right clearance.

There are many special types of miter joints but the extra work in cutting them tends to limit their use to choice pieces of cabinet work. One such joint, excellent for cabinet bases and similar work, is the rabbeted miter, Fig. 14. Its main feature is the rabbet which provides a square butting corner easily assembled with glue or nails. In an average assembly with four work pieces, the A and B ends of each work piece go together as shown in Fig. 14. Cutting this or any other fancy cabinet joint requires care in making exact saw settings. Follow the step-by-step procedure shown in Figs. 14 to 22.

In all miter work done on the circular saw it is very important to have the miter gauge and saw set at 45 deg. This is simply a matter of checking. Before you start work on the actual job, run cuts on scrap stock and test with a square. If the cuts check true, you are all set to begin work. If not, adjust the miter gauge setscrews or change the settings of the tilt stop.

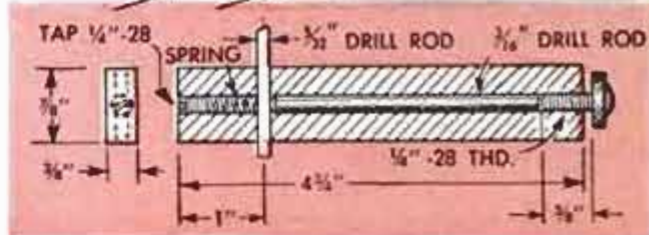
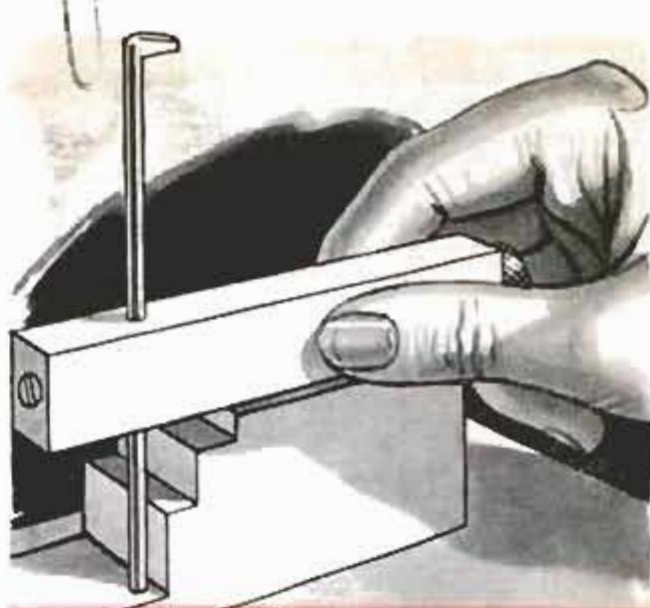
In all types of miter work it also is important to use a sharp saw blade to give a clean, true cut. If you use a circular saw to make the cuts, it is best to use a hollow-ground blade which runs without set in the teeth. The hollow-ground blade does not chip the lower edge of the stock, which is important when the piece must be reversed or turned over to make a second miter cut. Never crowd the blade. Run all cuts slowly. Hold the stock firmly to prevent creeping.

★ ★ ★

Versatile Combination Tool Is Depth Gauge and Caliper

This combination tool can be used as a depth gauge and as a caliper. Cut a piece of tool steel to $5\frac{3}{4} \times \frac{7}{8} \times \frac{3}{8}$ in. The hole for the lock rod is drilled through lengthwise and each end is tapped $\frac{1}{4}$ -28. The hole for the depth rod is then cross drilled. Harden the stock by uniformly heating it to 1800 deg. F. and cooling it in still air. The depth and lock rods are made of $\frac{5}{32}$ in. drill rod. Heat one end of the depth rod to a bright red, bend it to a right angle and file it to shape. The thumb screw is turned, shaped and threaded on the end of a $\frac{5}{8}$ in. steel bar chucked in the three-jaw chuck. To assemble the tool, insert the depth rod in the stock, and force the compression spring against it with a headless setscrew. Insert the lock rod in the opposite end and turn the thumbscrew in place. The usefulness of the tool will be greatly increased if the depth rod is graduated with marks set at $1/16$ -in. increments.

C. W. Woodson, Chicago, Ill.



Wooden Tilt Board Turns Hatchery Eggs

With this tilt board, you don't need to lift the egg case to turn the eggs—just tip the board the other way. The case rests on a 1 x 12 x 28-in. board. Cleats across both ends keep the egg case from sliding off. Two 1-in. cleats are screwed to the center on the underside an inch apart. Their inside edges are mitered to allow the board to tilt on the stand at about 40 deg. The stand itself measures 1 x 6 x 16 in. and is braced on both sides by pieces 4-in. high.

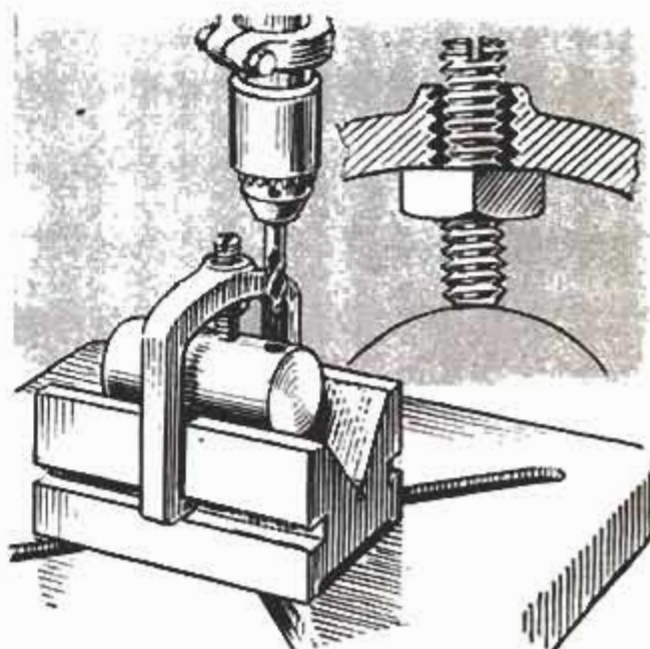
A. M. Wettach, Mt. Pleasant, Ia.



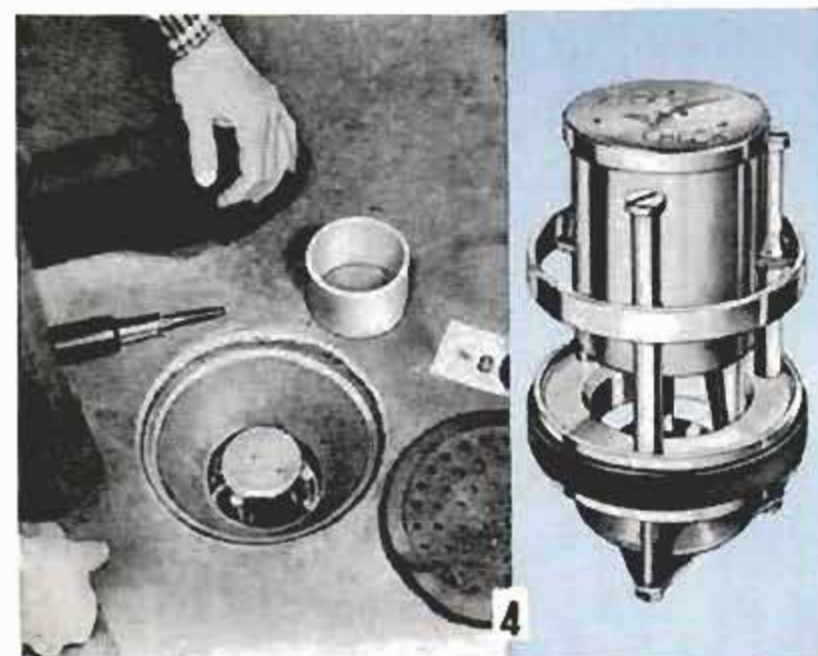
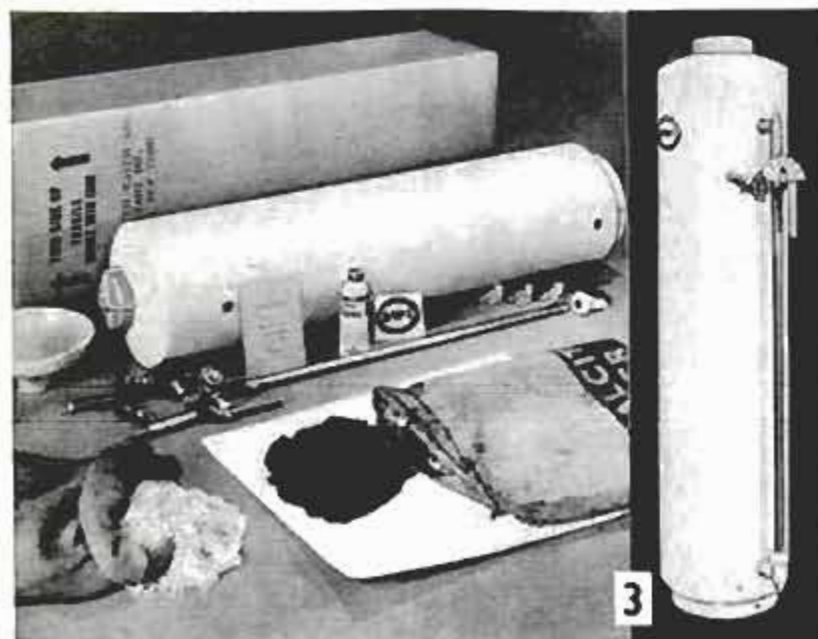
Small Setscrew and Nut Hold Stock in V-Block

When you are drilling a hole in round stock, the knurled screwhead of the V-block clamp may interfere with the chuck. Here is a tip which may save you a case of frayed nerves the next time a similar job comes up. Remove the screw from the clamp and in its place use a setscrew of a smaller diameter which will slip-fit into the hole. Run a nut up the setscrew but position it under the clamp. The tension exerted by the nut against the clamp will force the screw down onto the piece being drilled and hold it in place. When clamping a piece in the V-block, simply lift the screw and turn it. The nut, forced against the underside of the clamp, will not turn but will allow the screw to tighten.

Frank LaSaracina, New York, N. Y.



On the
MARKET
for Do-It-Yourselfers



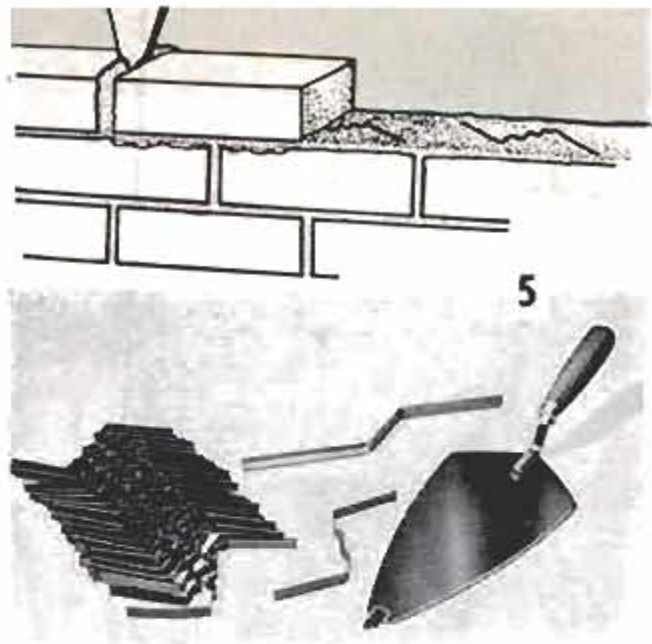
1. MASKING TAPE and a specially developed paper are combined in one large sheet for masking while paint is rolled, brushed, or sprayed. Strip-gummed edges allow use as drop cloth or application to walls, windows, moldings or furniture with light thumb pressure. Do-it-yourself painters and decorators can get professional results
J. E. Fricke Co., Philadelphia 6, Pa.

2. FURNITURE LEGS of molded and colored plastic are made especially for upholstered furniture, coffee tables and phonograph cabinets. In simulated wood and twelve solid colors, legs come in 4, 5, and 6-in. lengths. Extra rigidity, strength and endurance are provided by a metal bolt extending vertically through center of leg
Hassick-Sack, Div. of Stewart-Warner Corp., Winston-Salem, N. C.

3. A SOFT-WATER UNIT and all its benefits are available in an easily assembled softener kit. Unit has epoxy coated 12-ga. steel tank, automatic backwash and regeneration control. Softening is done by a special permanent-type mineral agent. Provides 48,000 grain softening capacity. Entire unit can be installed in 3 hours
Associated Water Industries, 277 Military Rd., Buffalo 7, N. Y.

4. AUTOMATIC DRAIN VALVE "senses" trouble long before it arrives. Sensitive float mechanism actuates a powerful spring which closes the drain. Made of stainless steel and neoprene, valve needs no lubrication or electric power and is clog proof. Installed with three screws in any standard 4-in. drain
Hally Manufacturing, Inc., 427 Lake Ave., Racine, Wis.

POPULAR MECHANICS



5. HOME BRICKLAYING JOBS take on that professional look when you use this do-it-yourself kit. Supplied in the kit are flat steel spacers which are laid in the mortar under each brick to space the horizontal joints uniformly. Tip on trowel spaces vertical joints and jointing tool supplied finishes both

Lemco Products, 1207 Boyce Ave., Ruxton, Md.

6. METAL POLISHING without drudgery is made possible with a new polish. Originally developed to give a protective coating to earth satellites, this product acts as a polish on all common metals, glass, jewelry. Gives a high luster. Nontoxic and non-flammable, it can be applied easily with a cloth

Certified Mfg. Co., Inc., Ge-Haltin Div.,
41 E. 11th St., New York 2

7. SNOW for Christmas decorations comes in a bag with a "flocking" gun which utilizes air blast from vacuum cleaner. Cost of kit with 1-lb. bag of snow is less than \$5.00. Bag coats 5-ft. tree adequately. White coating really looks like snow, can be colored, is fire-retardant, prevents needle drop indefinitely

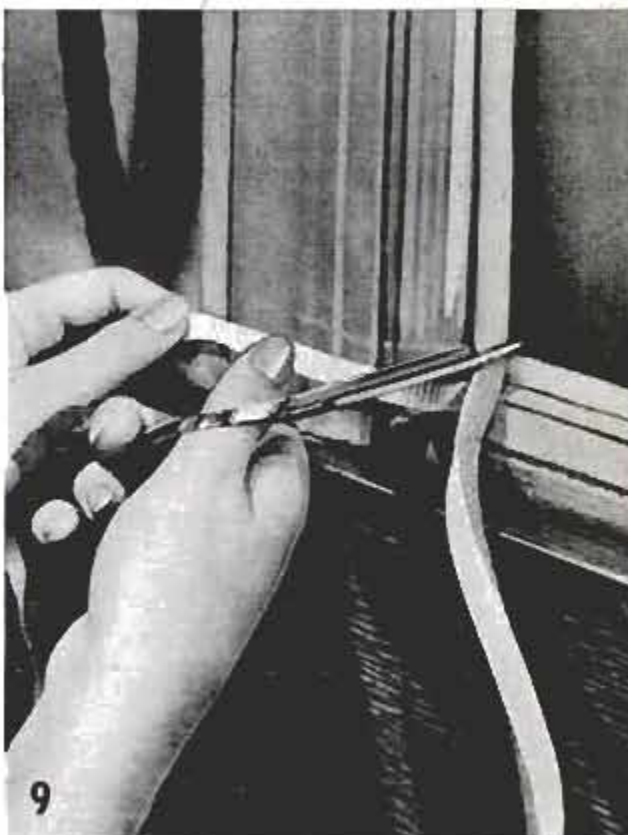
General Mills, Inc., 9200 Wayzata Blvd., Minneapolis 26, Minn.

8. HYDRAULIC CLOSER controls door movement even against strong wind. A piston and rod moving through an oil-filled cylinder make the device self adjusting and insure smooth, quiet and positive closing. Barrel fastened to the jamb bracket holds door against sudden gusts and prevents bent rods

The Illinois Lock Co., 800 S. Ada St., Chicago, Ill.

9. SELF-ADHESIVE weather stripping can be used in many different ways. Pressed into place, it reduces vibrations of household appliances and rattles around car doors. Taped around garden tools it prevents blistered hands. Thermal insulating qualities make this foamed tape ideal for refrigerator doors

Little Falls Import Co., 55 Jacobus Ave., Little Falls, N. J.



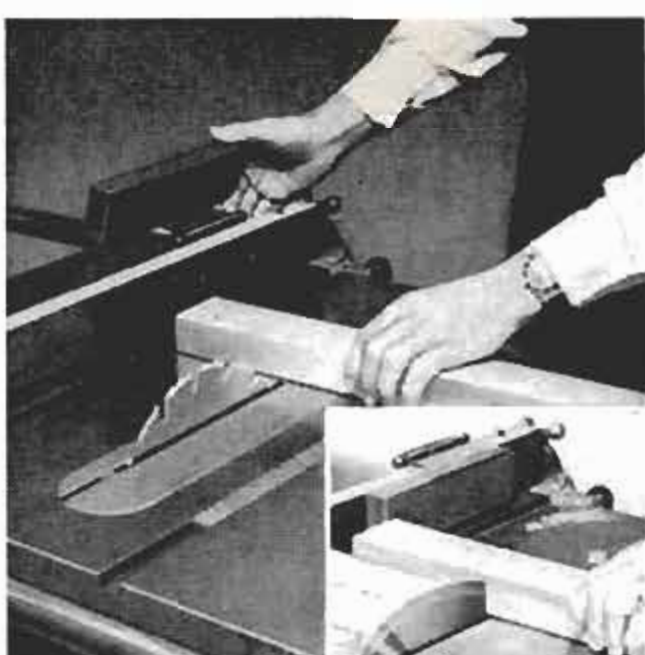
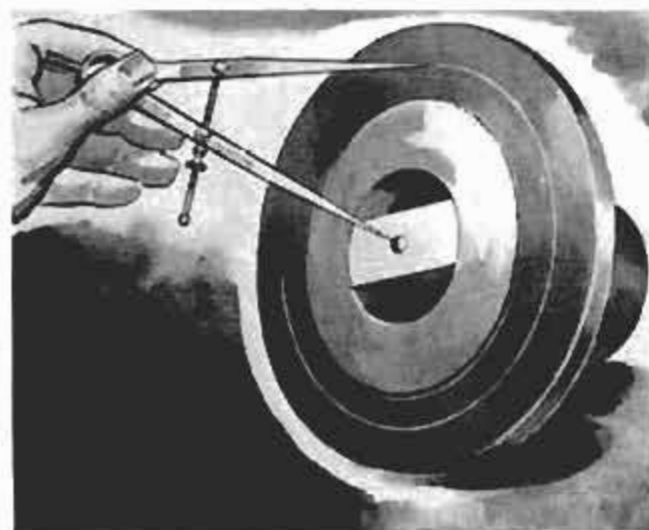


Waxed Bit Drills Clean Hole

If you've had trouble drilling soft metals with a twist drill, try running the bit into a cake of paraffin or beeswax beforehand. The heavy wax fills the flutes and prevents chips from sticking to the cutting edges. This kink works equally well when cutting soft metal on a circular saw. Just push the cake of wax into the blade while it is running. The wax will fill the gullets and prevent clogging and heating. When drilling or sawing soft metals feed slowly and uniformly for a smooth cut.

Centering A Scribed Circle

Locating a layout center on cored castings can pose a rather baffling problem unless you remember this procedure. Cut a piece of hardwood to fit snugly in the bore. Then locate the center of the crosspiece, or "bridge." Center a punch lark on the head of a thumb tack and seat the tack on the center previously located, making sure the tack is driven straight. Then set one leg of the dividers on the punch mark.



Stop Hinged To Ripping Fence

Instead of clamping a stop block to the ripping fence for use when cutting duplicate lengths, hinge the block to the fence as pictured. Use a $\frac{3}{4}$ x 2 x 6-in. block. Extend one leaf of a butt hinge by welding a strip of $\frac{1}{16}$ -in. flat steel to the outer edge. Drill holes in the extension piece for wood screws. Attach the block to the hinge. Then drill and tap the fence for cap screws which hold the hinge in place. Adjust with shims if necessary so that the block fits snugly against fence when in the down position.

Prevent Rust On Shop Tools

Coating machine tables, hand saws, wide chisels—any machined or polished surface—with ordinary paste wax will prevent rusting of the exposed metal where dampness is present, especially in a basement. On machine tables such as that of the circular saw, the wax serves a twofold purpose, prevents rusting and permits the work to slide easily over the surface. The wax coating should be renewed periodically.



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The Kodak Cine Scopemeter Camera, Turret f/1.9, shows correct lens setting automatically. Built-in exposure meter, filters,

three-lens range. Only \$99.50. 8mm Kodak Cine Showtime Projector threads itself all the way—automatically. Model A20, \$137.50.

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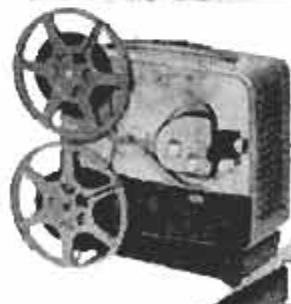
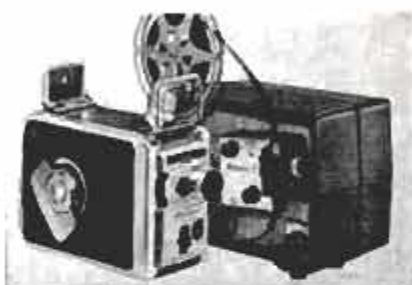
Brownie Movie Camera Kit, f/2.3—Color movies easy as snapshots. Complete with camera, light bar, lamps, titler board. \$39.95.



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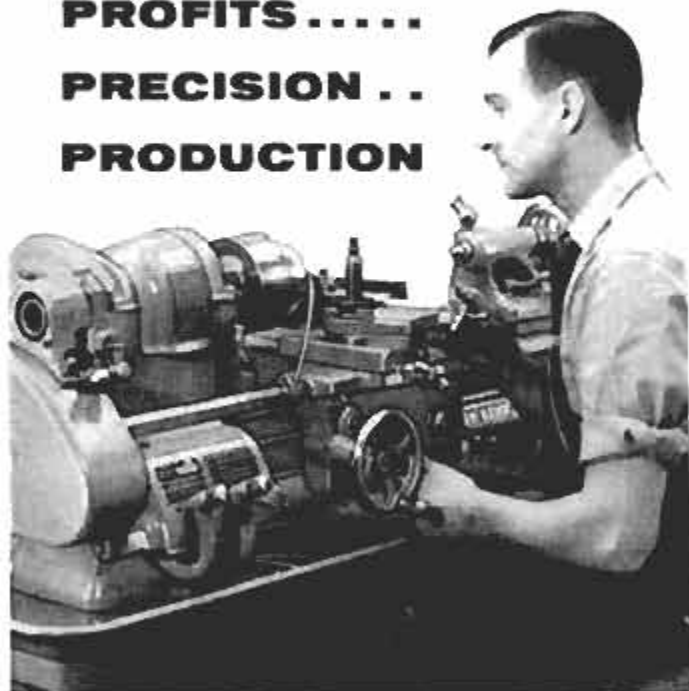


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Repairing Sink Top

Q—My sink top is quite old and was made by cementing linoleum to plywood. Although worn it still is in good condition over the whole area except near the sink rim where two small cracks are opening. I'm told on the one hand that the thing to do is replace the linoleum top entirely and on the other that the cracks are easily

patched. Which, in your opinion, is the best procedure?—P.T., La.

A—It's rather hard to say with certainty at such long range. Ordinarily we would think of patching, especially if the sink top is large, extending, say, across the end of the room. But if, on the other hand, the top is relatively small, then it might be best to replace it entirely with a plastic-faced countertop. Patching a linoleum top is quite simple to do but requires painstaking care in order to finish with a neat, tight fitting patch. Of course, a matching linoleum must be used, and it should be of the same weight and quality as the original. Begin by marking out an area about the crack which is large enough to include all damaged linoleum in the waste to be removed. Mark approximately the same area on the patching material, cut out a section somewhat larger than the marked area and then place this over marked waste that is to be removed. Tape the piece down securely and then, with a sharp knife cut through both thicknesses, the knife being canted outward at a slight angle. Lift off the patch thus cut and remove the waste from the original top, making sure that all the old cement is removed and the bare wood exposed. Coat the bared area with linoleum cement and immediately press the patch in place.



Condensation in Walls

Q—I have an older home with blow-in insulation in the north and west walls, none in the south and east walls. Recently I removed plaster from a west and south wall when making a repair. I found that the insulation and framing in the west wall was damp with moisture, but that in the south wall was perfectly dry.

What causes this condition in one and not in the other?—W.H., Minn.

(Continued to page 210)

(Write your name here)

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99712 St. John St., New Haven 5, Conn.**Mossberg**
for accuracy

(Continued from page 208)

A—Condensation. Space does not permit a lengthy discussion of why and how this variation is brought about, but stated simply moisture-laden warm air passes rather quickly through the uninsulated wall to the drier air outside. The air passing through is not cooled to the dew point within the wall and for this reason the moisture it carries does not condense. Insulation in the west and north walls, which are not faced with a vapor barrier on the room side, slows the passage of warm air and at some point within the wall the dewpoint is reached and the moisture condenses. It is this condensate that causes the condition of dampness you describe. Had the west and north walls been protected with a barrier which prevents moisture entering the wall from the room side, you would not find the framing and insulation damp. Curing this trouble in a home already built is not simple, as all component parts of the wall are permanently in place. One rather makeshift procedure that does help to some extent is to paint the affected outside walls on the room side with two coats of oil-base paint. The only fully effective step is to remove the plaster on the room side of the uninsulated walls, apply a vapor barrier, and finish with plasterboard, or with conventional lath and plaster.

**Removing
Water Stains**

Q—I have a drop-leaf table, some years old, and there are several discolorations on the top which look to me like water stains, the areas affected being a whitish-gray color with the grain of the wood showing. Otherwise the finish is still in quite good condition. Can these discolorations be concealed without removing the old finish and refinishing with new materials?—O.E., Tex.

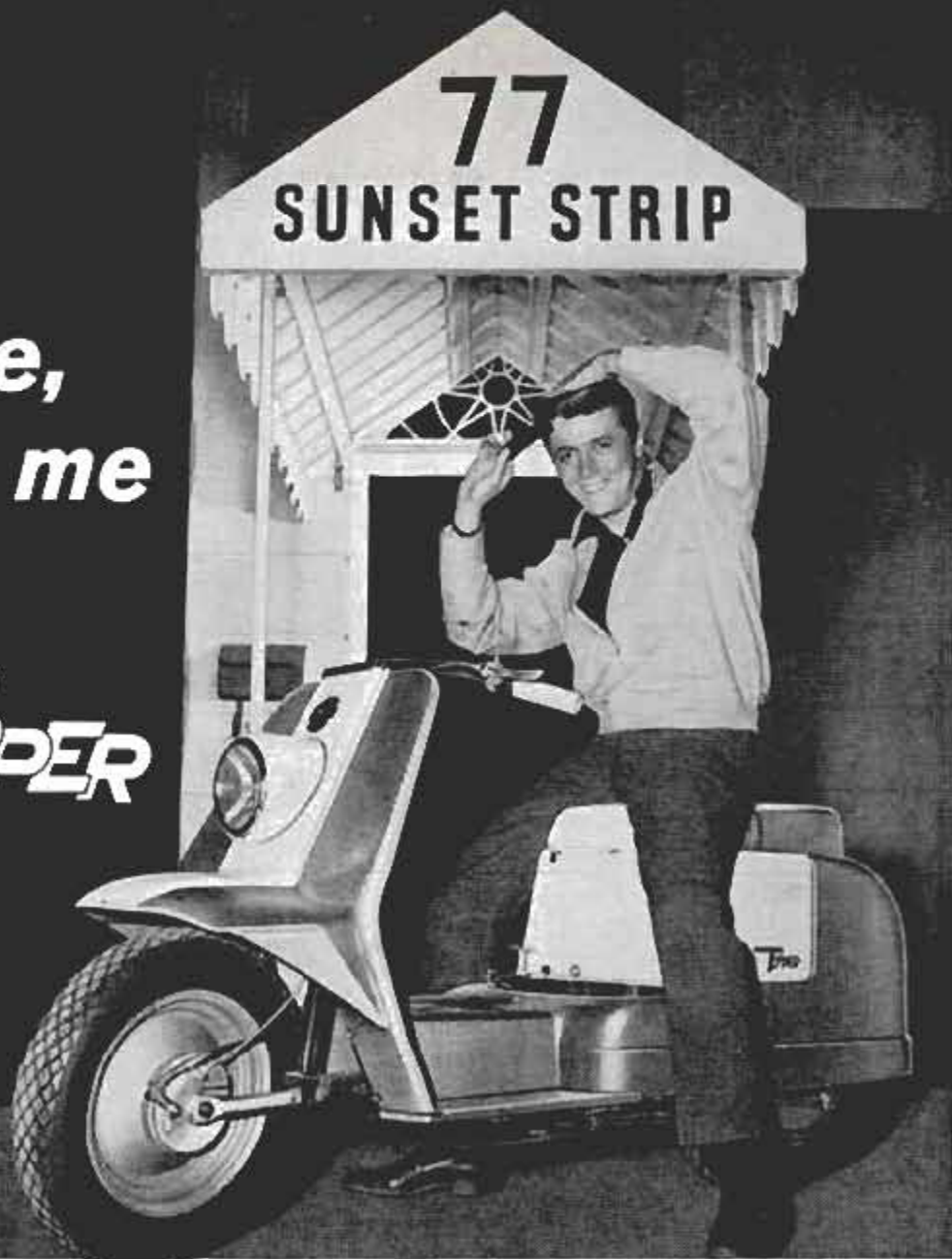
A—We assume that the wood has been stained under the original finish and that the water-stained areas will have to be darkened to match as nearly as possible. No procedure can be said to be entirely reliable under such conditions but we would suggest that you try an old method which almost invariably gives good results. Pour olive oil into a shallow container and add scrapings from a white candle (if the wood is a reddish color add scrapings from a red candle). Heat this mixture until the wax melts and apply to the water-stained area with a piece of soft cloth folded into a pad. Rub lightly with an easy circular motion until the oil from the first application is absorbed. Wait a few minutes and then polish with a linen cloth. If the spot is still lighter in color than the adjacent finish, apply again and polish in same manner.

Painting Brick

Q—My home is old and the walls are brick and natural stone. Mortar joints in both the brick and stonework need pointing up with new mortar. This done this coming spring I want to paint the masonry but I'm at a loss to know what kind of paint to use. I'm told to use a masonry paint, as this will not peel. Also I'm advised to apply only an oil-base exterior paint. The reason seems to be rather vague. What is your opinion?—W.D., Pa.

A—Why paint the masonry? It would seem to us that a house having masonry walls of brick and stone would be quite attractive just as it stands, especially after the mortar joints have been cleaned and repointed in a professional manner. In our opinion paint will add little if anything, except possibly color, to the brick work and it certainly will not enhance the stonework, especially natural stone or field stone. There are two other points to be considered. Once masonry has been painted one must accept the painted finish with little possibility of change except the color. Painting a home built of masonry and brickwork may change its general appearance appreciably. Also, certain stones in the wall may be of much greater density than others and neither a masonry paint nor an oil-base paint will bond solidly to these. We do think that it would be advisable to coat the walls of brick after pointing with a clear masonry sealer.

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Early American Clock

(Continued from page 159)

drilled in both plates and take the spacers. The holes marked B are brass-bushed on both plates, are drilled $\frac{1}{8}$ in. through and counterbored about $\frac{1}{16}$ by $\frac{1}{4}$ in. to take the bushings, which are disks cut from $\frac{1}{4}$ in. round brass. The disks are $\frac{1}{16}$ in. thick and are center-drilled with a No. 52 twist drill. Nylon bushings are available, but if you use these have them at hand so that you can determine the counterbores.

Note the hole B at the center of the larger $1\frac{3}{8}$ -in. hole drilled in the front plate. The large hole forms the opening for the escape wheel. The hole B is drilled in the back plate and is bushed for one end of the spindle carrying the escapement. The other end of this spindle is carried in an outboard bearing as in Fig. 21. Making and installing this bearing will be covered in Part II. The hole taking the rear end of the hand post is bushed in the back plate in the same manner as that taking the rear end of the escapement spindle. In the original movement the holes taking the winding drum spindles were drilled $\frac{1}{8}$ in. diameter in the back plate and $\frac{5}{32}$ in. in the front plate. These holes are not bushed.

Note the four $\frac{7}{16}$ -in. holes drilled near the corners of the top plate. Holes for $\frac{1}{16}$ in. pins are drilled into these holes from the edges of the plate as indicated by the dotted lines. The small holes take pins which hold the movement in place. The pins pass through holes drilled in the movement supports as at A in Fig. 2. The holes in the supports should not be drilled until the movement has been completed.

The count-wheel keeper, shown in position in Figs. 21 and 28, is detailed in Fig. 26. The count-wheel spindle also is shown in Fig. 26. This is made from a short length of dowel and the location of the hole into which it is fitted and glued is shown in Fig. 22. The bearing block for the count-wheel pinion is detailed in Fig. 27 and shown in place on the front plate in Fig. 28. It is made from oak to the size given and when in position forms the outboard bearing for the count-wheel pinion. Note that the blind hole which forms a recess in the block for the pinion is fitted directly over the $\frac{9}{16}$ -in. hole in the front plate. The bearing block is glued and bradded in place and note from Fig. 21 that it is set at an angle of about 15 deg. The plate spacers, Fig. 25, are turned from hard maple or birch and care must be taken to turn them all to the same length between the shoulders. They are bradded and glued in the holes drilled in the back plate.

(To be continued)



TIPS FROM TEXACO

Seven ways to save the life of your battery this Winter

Cold weather is rough on your battery. At 32°F. even a fully-charged battery delivers only 50% of its power! At 0°F. only 40%.

- 1** Starting causes the most drastic drain. So, before you start, be sure all electrical units — lights, radio, heater, etc. — are *off*.
- 2** If your car has a manual shift, be sure it is in neutral *and* depress clutch. Avoid flooding engine by pressing accelerator clear to floor *once*, then engage starter.
- 3** If engine doesn't start, check gas supply. In damp weather, wipe off spark plug porcelains with a *dry* rag. Then try it.
- 4** Cold garage? Not using your car often during extreme cold weather? It will pay you to buy an inexpensive trickle charger. Hook in overnight as required.

5 Best plan for cold weather: have your battery looked at, at least every 2 weeks, by your Texaco Dealer. He will check water level, test, and re-charge if necessary. This may save the life of your battery.

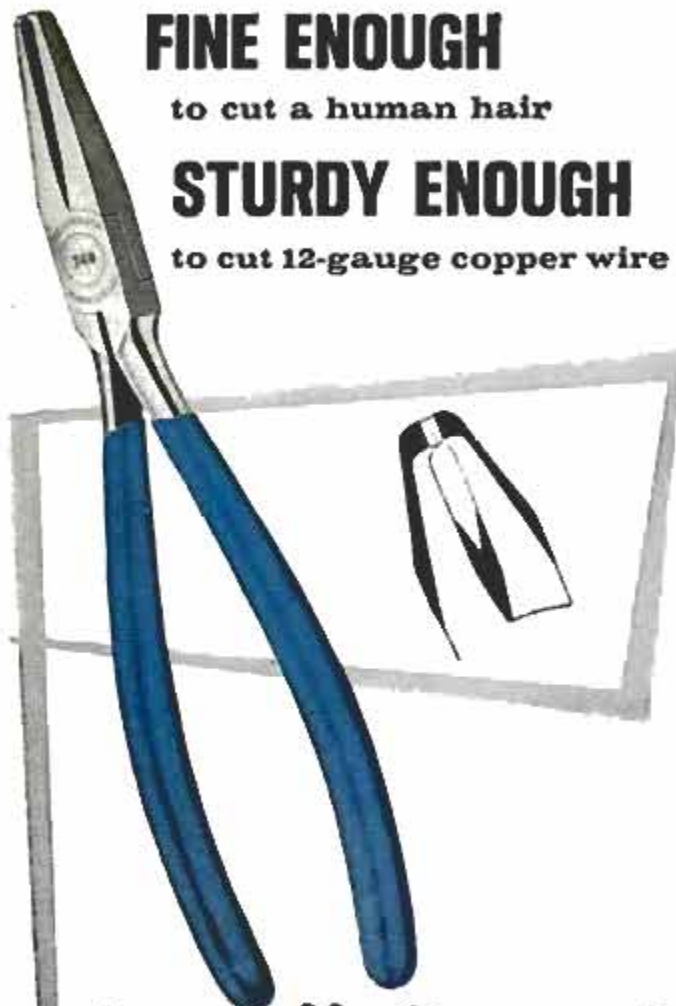
6 Keep terminal clamps *clean*. (Every time you have a Texaco Fall Safe-T check-up, your Texaco Dealer will remove corrosion and protect with coating of Marfak.)

7 Take the cold-weather load off your battery and engine by keeping crankcase filled with Havoline Special 10W-30. This is the *all-temperature* motor oil that stays free-flowing, prevents cold-starting wear (with less drag on your battery) — prevents harmful varnish, sludge and deposits.

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CHAMPION DEARMENT TOOL COMPANY

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Oil Hunters With Aqualungs

(Continued from page 112)

Frequently the divers in the Gulf see eye to eye with tropical fish—technicolor at its best. Swimming up to peer into face masks are red snapper, angelfish, sheepshead, triggerfish. One species, unscientifically identified as "ostrichfish," doesn't go for close-ups. As soon as a diver approaches, this fish sticks head—and tail—into the sand until the disturbance stops.

The divers have raised several questions for oceanographers, such as:

After the death of shell-plated marine life such as oysters, clams, snails and echenoids, what happens to the shells? Do they remain where death occurred or are they tumbled about by wave and current pressure? If so, how far?

Sands of beaches usually grade into finer-grained sediments seaward, and those of barrier islands and offshore bars may grade into finer sediments both shoreward and seaward, but how gradual is this transition and what is its cause?

Most of the big oil fields are in what is known as "structural traps"—subsurface closures formed by the subterranean folding and fracturing of rock layers. But some of the very biggest oil finds, including the great East Texas strike, have been in stratigraphic traps. These are sandstone bars of limestone reefs formed in ancient seas by the gradual deposition of sediments over a period of many centuries.

Finding stratigraphic traps by conventional exploratory methods is about as difficult as locating a diamond lost in a newly spaded garden. Luck is an important factor. Many of the big oil fields in stratigraphic traps, such as the Pembina field in Alberta, were discovered while drilling for structural traps.

What the divers in the Gulf of Mexico hope to accomplish is to lessen the importance of the luck factor. And they may be like the Texan who was drilling for water in his back yard and complained that all he could get was oil.

A report issued in February this year by Dr. Roger T. Revelle, Director of the Scripps Institution of Oceanography at San Diego, states that the ocean bottoms are "strewn with deposits of manganese and cobalt so rich they probably could break the world market in those metals if they were mined on even a modest scale."

All of which leads to this conclusion:

Man today is pretty busy investigating the stratosphere, but there is still plenty to be learned in the ocean depths. ★ ★ ★

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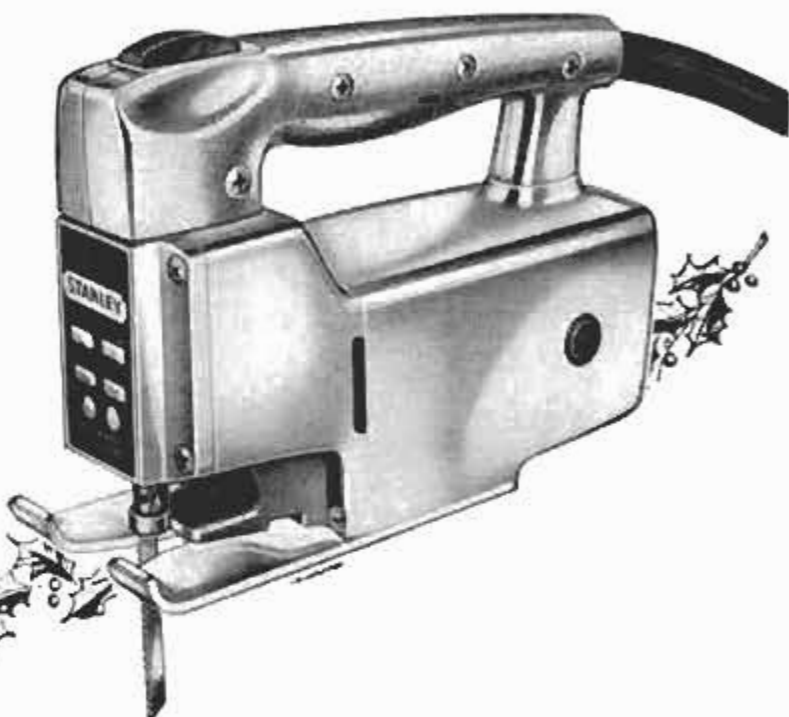


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\$6.00 Off on 3-amp $\frac{1}{4}$ " drill. Reg. \$24.95 Stanley Christmas special price — \$18.95 Most powerful $\frac{1}{4}$ " drill for the price on the market. *Plus* rugged bearing construction, non-slip pistol grip, 3-jawed geared chuck, 3-wire cord.



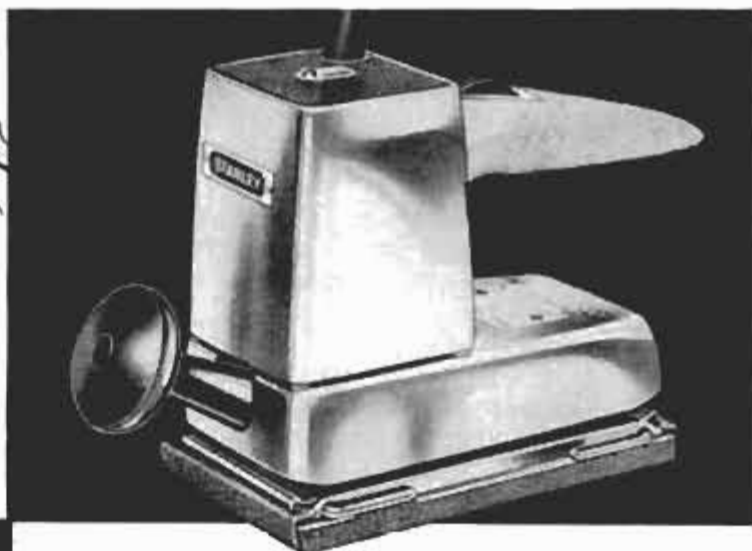
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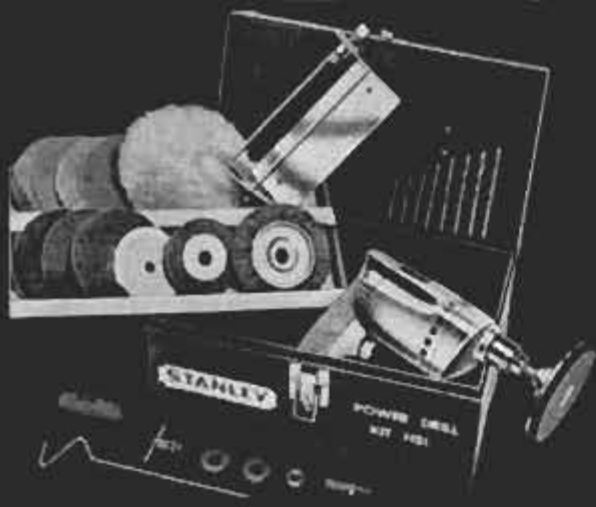
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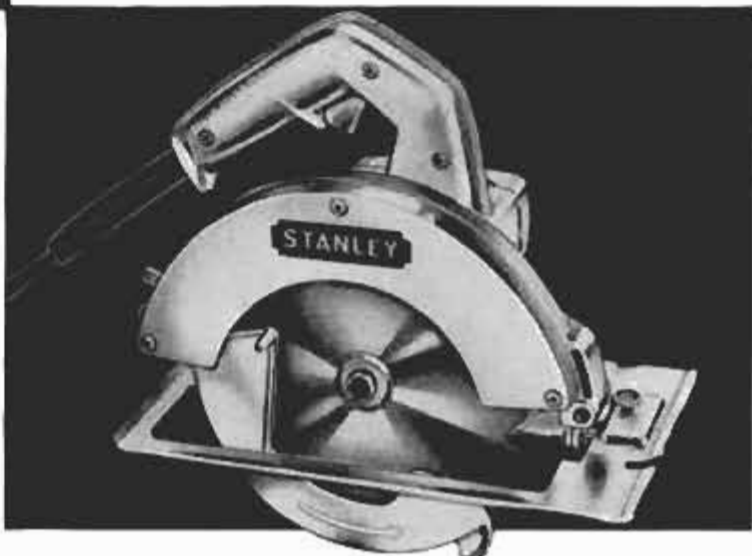


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"Cat Eye" Turns Night Into Day

(Continued from page 103)

sifier layers are placed between the photosensitive surface and the target screen. For every electron given off by the photosensitive surface, the first intensifier gives off 10 to 20. This process of electron multiplication is repeated by the second intensifier, with a resultant 100-to-1 ratio between the photosensitive layer and the target plate.

The result is that light levels 1000 times below the needs of a standard pickup will provide a usable picture. The tube, in short, is 10,000 times more light-sensitive than the fastest photographic film.

This special Cat Eye pickup is coupled directly to the 10-inch telescope at Wittenberg College's Weaver Observatory. Because of its speed, photographs can be made from a monitor screen at less than 1/25 of a second. This eliminates the jitters that plague normal photographic exposures as a result of fluctuations in the earth's atmosphere. Even more important, it provides vast new ranges of contrast that reveal hitherto-unseen detail.

Night Vision for the Army

A similar but less complicated device has been developed by RCA for use by the Army as a night-vision aid. Resembling a rather stubby telescope with a dangling electric cable, this unit also combines optics with electronics. A double-image tube, the first stage serving as a preamplifier for the second stage, picks up and amplifies the weak light gathered by the lens. A system of transformers and transistors takes power from a six-volt battery and converts it into a 25,000-volt kick to power the tube.

The Army and RCA don't say just how the tube works, but chances are it's a relative of the Cat Eye image orthicon.

In the long run, however, the development with the most far-reaching possibilities is the discovery of electroluminescence. General Electric researchers several years ago demonstrated that certain phosphors, when electric current is passed through them, will actually amplify light directly.

They proved this by making a special screen of the phosphor and attaching two electrodes to it. A lantern slide was projected onto this phosphor screen with a projector, using ultraviolet light. The resulting image was extremely dim until current was passed through the screen. The image then showed a 10 times increase in brightness.

Normal light, X rays and other types of radiation have the same effect on the phosphor screen as does ultraviolet light.

Since this initial demonstration, the de-

vice has been improved by General Electric and RCA researchers through the addition of a photoemissive material that gives off electricity when light strikes it.

Persistent Image

So far the unit has not proved applicable to television because it tends to retain an image, thus ruling out the rapid building up and breaking down of individual pictures that is the heart of the television illusion. But RCA has turned this problem to good advantage by adapting electroluminescence to the X ray fluoroscope.

The company took a medical fluoroscope and replaced the conventional viewing screen with an electroluminescent panel equipped with its own power supply. The electroluminescent viewing screen yields normal image intensity at a fraction of normal X-ray exposure. With normal power the unit gives an image 100 times brighter than that supplied by a standard fluoroscope screen, making it possible to view the image in moderate room light. Since the image can be made to persist up to 30 seconds, the screen can be inspected after the X rays have been turned off and the subject has walked away from the machine.

Researchers are now hard on the trail of the image-persistence phenomenon. When they lick the problem, they will be opening new vistas not only for television but a host of other applications. ★ ★ ★

Compound Makes Fabrics Immune to Insects

Fabrics can now be impregnated with an antimetabolite compound that makes them immune to insect attack. The compound makes the material indigestible to carpet beetles, clothes moths and other insects for the fabric's lifetime. Structurally similar to essential nutrients, the compound has slight differences that eventually lead to the death of young insects. Mature insects recognize the antimetabolite quickly and leave the impregnated material.

Skim Milk Halts Plant Virus

Scientists are recommending that tobacco growers spray their crops with a skim-milk solution to inhibit tobacco mosaic virus. Tests have shown that skim milk not only protects tobacco plants, but peppers and tomatoes as well; when tomato and pepper pickers dip their hands in skim milk, the incidence of mosaic virus is greatly reduced. Dr. G. B. Lucas, North Carolina State College plant pathologist, reported that an unknown globulin in milk causes this disease inhibition.

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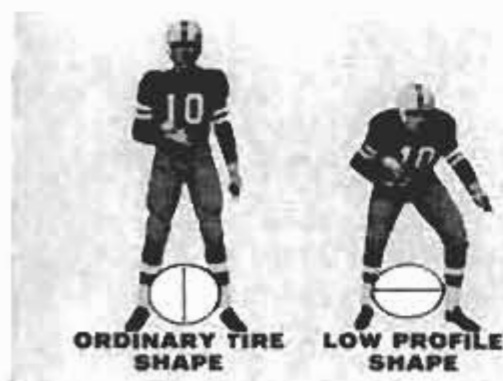
3. TURNPIKE GAS ECONOMY—6 to 12 extra miles per tankful!



4. TURNING EFFORT—20% more stability on curves!



5. SKID RESISTANCE AND TRACTION—raised 5 to 10%!



Low profile tires are as different from ordinary tires as the two football players shown at the left. Notice that one fellow is lower, wider, harder to knock off his feet. In the same way, new U.S. Royals are lower, wider, more stable. Built to roll easier, run cooler, give you greater safety and longer mileage

on today's tire-killing superhighways. There's a *Low Profile* tire to match your budget...at your U.S. Royal Dealer's!



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CLIP THIS AS A SUGGESTION FOR YOUR WIFE

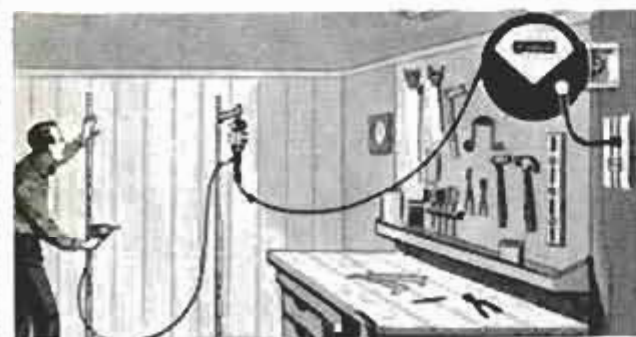


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It's just what you need for all kinds of jobs from attic to basement... around the yard, too. Wherever you want light and power, they're at your fingertips. Best of all, they're on the job without the inconvenience and hazards of tangled cords. 20 feet of cord locks at any desired length...retracts automatically into case. Handle has built-in outlet for electric tools and appliances. Mounts easily on wall or ceiling. Guaranteed. Only \$8.95 at hardware and department stores.

Cordomatic®

17th and Indiana Ave., Philadelphia 32, Pa.

The Big Round Sound

(Continued from page 121)



High-speed polishing wheel puts lustrous finish on band instrument, which goes next to lacquer room

tions are placed in precision dies, and water is forced through under pressure of 2800 pounds per square inch. The water pressure not only smooths the inside surface but puts the proper acoustical measurements in the column.

The calibration of the instrument's bore, from mouthpiece to bell, must be accurate within millionths of an inch. Conn researchers use the term "cali-bore" to describe the accurate calibration of the tone column that is necessary if the horn is to produce the "big round sound." The curves in the trumpet, trombone or French horn are of minor importance compared to the calibration of the bore.

Valve bounce may seem a minor problem in designing a trumpet or cornet. But it's one of the gremlins that makes one note run into the next when the instrument is played. The exact amount of note slurring can be determined by taking high-speed movies at the rate of 2000 frames per second. Research personnel tested thousands of ideas and materials over a period of two years in order to reduce valve bounce 75 percent.

When each horn finally is assembled, polished and lacquered, it is passed along to a professional musician who tests it in one of several soundproof rooms. And the musician doesn't depend on his ears

(Continued to page 222)

*"I'm the only one in the family that can't use the **Dremel!**"*



It's a dog's life when you're left out of things — but not so with a Dremel Moto-Shop. Here's an exciting way the whole family can enjoy a woodworking hobby together. Teaches children to be creative and helps cut down the TV habit.

Not a cumbersome cast iron model, but sturdy, lightweight, portable — and safe. Unique blade guard protects even the littlest hands. Simple operation — make gifts, toys, furniture, practical items for the home.

Treat your whole family to a Dremel Moto-Shop. America's most popular and useful multi-purpose tool.

- Large capacity — Has 15" throat — cuts 1 1/4" wood, light metal, tile, plastics.
- Powerful ball bearing motor — not a vibrator, 3,450 strokes per minute.
- 4-way blade holder — saws in any direction.
- Lightweight, sturdy — easy to carry or store away.
- Tilting table — Tilts 45° for angle and bevel cuts.
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A complete power workshop in 1 compact portable unit. Two models to meet any family's need.

Model 571 Moto-Shop. Includes 15" Jig Saw with disc sander attachment only as shown above. . . \$33.95

Model 572 Deluxe Moto-Shop. Includes 15" Jig Saw with disc sander, grinding wheel and guard, wire and cloth buffing wheels, a 12 piece accessory set, and 30" flexible shaft (grinds, drills, carves, polishes, engraves, sands, sharpens) . . . \$49.95

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Imported briar bowl lined with real honey. Starts caking the instant you light up. Hence, no break-in.



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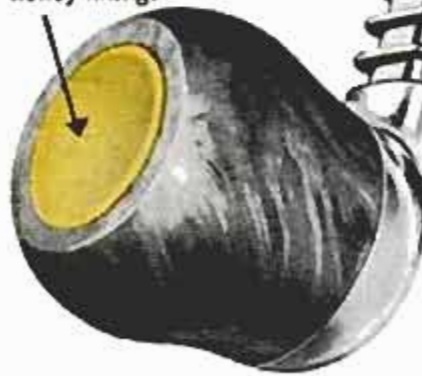
Metal grate condenses moisture, tars, nicotine. No wet heel.



3. Smokes cooler!

Air-vented chamber draws in fresh air. Aluminum fins and shank throw off heat, cool the smoke.

Famous honey-lining!



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Extra interchangeable bowls - \$1.50 each

"Icepak" Set—Airograte Yello-Bole Pipe plus two extra bowls, \$5.95

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NEW!!

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CRAFTSMAN WOOD SERVICE COMPANY, Dept. A-12
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Engraving intricate, fancy lines on surface of instrument is one of jobs that still must be done by hand

alone to tell him whether the instrument is in tune. Each room contains an electronic frequency-measuring unit, accurate to within $\frac{1}{100}$ of a semitone. If a trumpet tester sounds an "A" and the instrument is in tune, a pattern in the window of the device will remain stationary. If the tone is flat, the pattern moves to the left. If it is sharp, the pattern moves to the right. Turning a knob to stop the left or right drift of the pattern automatically tells the tester how flat or sharp the tone is, in hundredths of a semitone.

With their knowledge of musical acoustics, Conn researchers have assembled trumpets, Sousaphones and other instruments that do not look like anything you would find in a music store. One of the instruments, called a snorklephone, is a Sousaphone with part of the curve removed. Another is a trumpet that has neither curves nor valves. Dr. Kent, using the algebra and geometry of horns, has even tried to design musical instruments that have never existed. But the work so far has been strictly experimental. Although these scientists and engineers can make a trumpet that doesn't look like a trumpet, it might be hard to market such an instrument. It might be equally hard to convince the public that a "straightened out" Sousaphone can have the same quality of tone as a Sousaphone with all the curves in it.

(Continued to page 224)



Prevent bumping on driveways and all the other problems caused by overloading today's longer, lower cars.

Tail dragging?

*your car needs Load-Levelers**

Keep your car on the level with Load-Levelers*—Monroe stabilizing units with built-in ride control for a level ride under all road and load conditions. With Load-Levelers*, your car will always ride on an even keel . . . without "tail drag" or side sway. You'll like the way your car will take rough bumps and steep driveways without "bottoming" on its axles. You'll appreciate the extra stability on tight curves. And you'll like the improved steering and longer tire life you'll get with Load-Levelers.*

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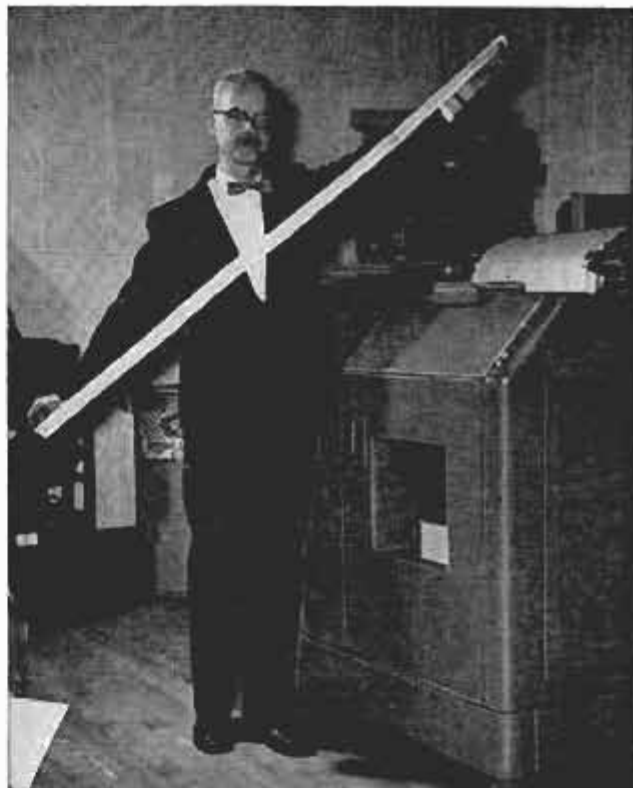
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Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.



Design for horn starts with formula $5\frac{1}{2}$ feet long. Computers solve and check its problems within seconds

But the time will come, Dr. Kent believes, when band instruments will be even more unconventional. Some day in the hazy future you may be sitting in a football stadium between halves listening to a rendition of *The Stars and Stripes Forever* played on portable electronic instruments. Dr. Kent already has some ideas along this line. ★ ★ ★

Telephone Cable to Europe Carries 36 Voices at Once

Voices of 36 persons are carried at the same time over the first telephone cable system to link North America directly to Europe. Two deep-sea cables span the 2200-mile distance from Clarendville, Newfoundland, to Penmarch, France. One carries the speech of 36 persons to Europe and the other the same number from Europe. The system links U. S. telephone networks to France, Germany, Belgium, The Netherlands, Switzerland and Italy. Thirty-six other areas can be reached through the European points. The system is owned by American Telephone and Telegraph Company and the French and German telecommunication ministries.

☞ To find paths of ocean currents, men of the Coast and Geodetic Survey, U. S. Department of Commerce, are tossing 2000 soda-pop bottles into the Atlantic off the New England coast; each bottle holds a card for the finder to send to Washington.

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carburetors

ROCHESTER **CARBURETORS**

GENERAL MOTORS

Those Little Things Count

(Continued from page 143)

designed unit, a major repair—or even replacement—is called for. But before you resign yourself to such an expense, try the following quick cure: Using carbon tetrachloride, clean the inner rim of the record player's turntable and the rubber idler and drive wheels. Use a bit of elbow grease, if necessary, to rub off any shiny areas on the rubber drive parts and carefully check these for flat spots. Unless they are perfectly round, replace them with parts obtainable from your dealer or from the factory. If the record player uses small drive belts, inspect these for deterioration or cracking. Consult the manual for proper lubrication.

Barring some major defect, these measures will usually correct any speed-variation tendencies.

Though some of the above troubles may seem minor compared with the more spectacular electronic gremlins that sometimes infest hi-fi systems, they are just as often responsible for the loss of quality. The occasional few minutes of time spent, and the almost negligible cost of pampering your records and record player will be well repaid in greater listening enjoyment and longer life for your equipment and record collection. ★ ★ ★

This Month's "Great Pioneer in Science"

(Page 18)



Marie Curie (1867-1934)

Buy this Tape and get a present for HER at no extra cost!

SAVE 99¢! BUY THE LUFKIN Banner 50' tape and get a 6' tape rule for your lady at no extra cost!

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And that companion steel tape rule will be a treasure to any woman. No bigger than a compact, so it fits in handbag or sewing kit. And there's a handy calorie counter on back of blade!

Pick up a set next time you're in a hardware store.



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NEW! No. 3512 Operating Fireman-and-Ladder Car—As train moves, fireman swivels with nozzle, light rotates. Ladder can be extended, raised, pivoted. Operates anywhere on track. \$9.95

NEW! No. 3435 Operating Aquarium Car—Within the illuminated interior rare tropical fish appear to be swimming. Off-on switch on car controls the swimming action. Operates anywhere on track. \$12.95

NEW! No. 3419 Operating Helicopter Launching Car—Wind the spring in the launching platform and set the 'copter in position. By remote control, the "whirlybird" soars into the air. \$7.95



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I've got work to do!"



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The PM Houseboat

(Continued from page 170)

and aft. Stagger the screws where the panels butt so they are not in line. Apply a double row of screws along the chine and across the bottom and up the sides of the bow and transom frames. In planking the starboard half of the hull bottom, cover frames 3 to 6 first, then frames 4 to 7 inclusive on the port side, allowing the panels to center midway on the frames as well as the keel. After this cover the remaining areas, gluing and screwing the plywood to the frames. An oak strip, Fig. 9, covers the planking joint along the sides at the chines. Bed this member in compound before attaching with brass screws.

As a final step to turning the boat right side up and removing the building form, three members, called skegs, are bolted to the bottom planking. One bolts through the keel, the other two through battens as shown in Fig. 7. You will note in Fig. 1 that each skag is formed from three pieces of 3 x 6 yellow pine and spliced together. The center section is a straight member 11 ft. long, whereas the outer sections are bandsawed to match the curvature of the hull. While shown tapered, Fig. 7, the skegs can be left straight to save considerable work. Carriage bolts spaced 20 to 24 in. apart anchor the skegs in place, after which a 1/8-in. steel band, called a chafing iron, is screwed to the edge of each skag and allowed to extend across the planking and up the bow and transom for about 2 in.

Before you turn the hull right side up it should be cross-braced inside to provide additional rigidity during the flip-over operation. Once right side up, the bracing is removed with the building form.

(To be continued next month)

Do You Know This Old-Timer?

(Answer to quiz, page 14)



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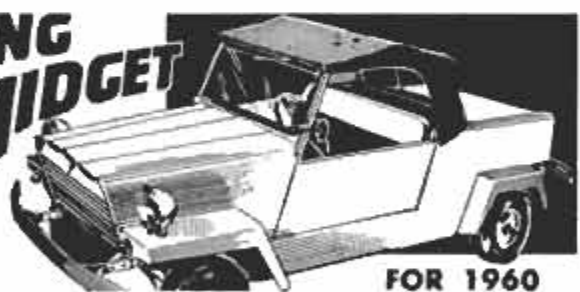
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Bulls-Eye Tuning

(Continued from page 145)

transformer-operated receivers where this voltage is available from the filament winding of the power transformer. For AC-DC sets, an inexpensive 6.3-volt filament transformer can be separately installed.

No modifications or changes in the receiver circuit are required. It is merely necessary that the tuning-indicator leads be connected to the correct points within the set. The red wire, from the target of the 6E5, goes to B-plus (any value of filtered d.c. voltage between 150 and 250 volts will do) and the black cathode wire goes to ground (the chassis in transformer-powered sets—the negative lead of the filter capacitor in AC-DC receivers).

The yellow wire from the grid of the 6E5 triode section must be connected to a point in the receiver which provides a negative d.c. voltage, varying in accordance with the strength of the received signal. In AM receivers, Fig. 2, this is the top (ungrounded end) of the volume control; in FM sets with ratio detectors it is the negative terminal of the electrolytic capacitor shunting the detector load resistor, Fig. 3.

Fig. 4 shows the use of a s.p.d.t. switch to connect the tuning indicator to either the AM or FM section of a combination FM-AM receiver. The switch may be mounted directly on the receiver chassis.

Some of the more expensive FM receivers use a discriminator circuit rather than a ratio detector. Such a circuit is always preceded by one or more limiter stages. In such sets the yellow wire is connected to the R-C filter network in the grid circuit of the last limiter stage, Fig. 5. If in doubt as to the kind of detector used in your FM set, consult a schematic diagram.

Normally, the yellow lead from the tuning indicator can be directly connected to the proper point in the receiver. In some cases however, the addition of a 100K, 1/2-watt isolation resistor, as shown, will give a sharper indication, though it is not absolutely essential. The 1-megohm resistor shown between triode plate and target of the 6E5 is already wired in place in the Amphenol mounting assembly. This resistor need not be installed separately.

Properly wired, a pie-shaped shadow of about 100 deg. will appear on the indicator tube when the receiver is turned on but not tuned to a station. As a station is tuned in, the "eye" will close. Correct setting is indicated by maximum closing of the "eye."

By providing a visual indication of signal strength, the tuning indicator greatly simplifies tuning and makes radio listening far more enjoyable. ★ ★ ★

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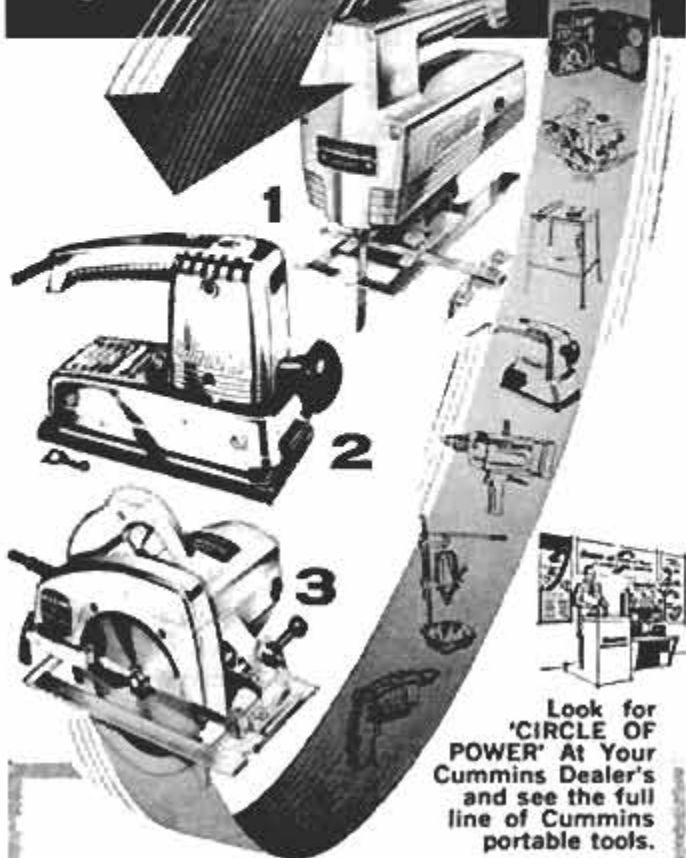
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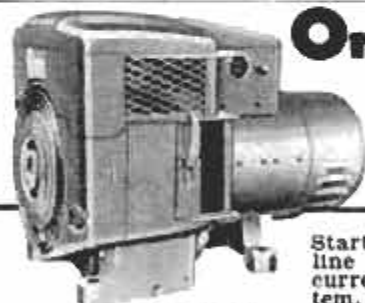


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Hollywood Spricht Deutsch

(Continued from page 69)

and Margot Leonard, Marilyn Monroe, Clark Gable, for the past 20 years, has been Siegfried Schuremberg.

While the actors are doing their stuff in the studio, technicians are hard at work behind the scenes. Every take is first spliced into a "start strip"—the 1, 2, 3, 4 that alerts the actors. It's also spliced into a blank strip of film so that it forms a circular piece and can be run again and again through the projector without rethreading.

Two sound systems are used. In the more widely adopted system, all dialogue is recorded on a tape recorder. The voices can be erased repeatedly, and only the perfect take is allowed to remain.

After all takes are completed, both the pictures and the sound (now on a sprocketed half-film) go back to the cutting room. Here, a technician uses a cutting table to do the actual synchronizing. The apparatus resembles the moviola in that the film is seen on a small screen and can be run through at any speed. But it also can accommodate the separate sound track.

The picture and sound track are "synched" by means of "pipes"—small V-shaped marks contained in every start strip. The little pipes also show up in the recorded sound track immediately before the dialogue. It's a simple matter to match the marks so that the actors in the picture and the German voices speak as one.

When the sound track is perfectly synchronized, it's re-recorded on a continuous strip of sprocketed magnetic film. The picture film is likewise respliced into one film and copied.

Final Step Is in Mixing Room

Now comes the last step. Both sound and picture go to the "mixing room," a room filled with assorted projectors and sound equipment. The picture film, a working copy without sound, is put on a special projector. The German sound track goes on an amplifying apparatus. And the ME—music and effects shipped from the United States with the original film—is set on a large tape recorder.

The whole works is fed into a small projection room where the sound director, sitting at a control board, views the picture and proceeds to "mix." Here, picture, German-language dialogue, music and effects are all blended into the final product.

Another sound system, used in Paris and in Munich's Riva and Mondial studios, follows the same principles. But there's one great difference. Instead of recording all

(Continued to page 234)



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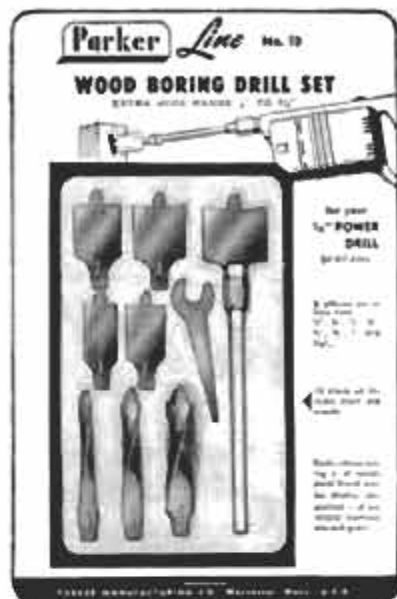
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dialogue on a single tape, each take is recorded on a regular piece of magnetic film that's exactly the same length as the corresponding picture strip.

Each piece of magnetic film is spliced onto blank film just as the individual picture takes are. They run simultaneously so that when all takes are finished, it's a simple matter to cut out the blank film strips and splice both the pictures and the sound track together. The result is an exact matching of sight and sound that does away with the necessity of re-recording and further cutting. With this latter system, though, every take has to be absolutely perfect. In the former process, there's some latitude for correction in the cutting room and the original recording doesn't have to be so exact.

The entire dubbing operation, from start to finish, costs about 25,000 deutsch marks (\$5950) an average film. About one quarter of the cost is taken up by actors' salaries, another quarter by the writers and directors, and the rest by technical costs. Expenses in the United States would be multiplied many-fold—the main reason why foreign movies in America often still appear with subtitles.

Officials of the various synchronization firms look on subtitled films with a dim view. They say that it's difficult for the average viewer to read subtitles, watch the picture at the same time and still enjoy the movie. Consequently, practically all foreign pictures in Germany are dubbed.

Synchronized Films Are Popular

Crowded theatres all over Germany attest to the popularity of synchronized films—especially American films. Attendance figures not only from Germany but from throughout the world warm the hearts of Hollywood executives. Since television started cutting deeply into attendance receipts in the United States, the export market has become more and more vital.

The 275 to 300 U. S. feature films sent overseas yearly are estimated to earn approximately \$200 million annually for the American motion-picture industry. Adding to this healthy total is the booming export of filmed U. S. television programs, dubbed in with foreign-language dialogue exactly as the major films are. It's expected that syndicated, half-hour TV movies will generate another \$125 million for Hollywood studios this year.

Even more important, the foreign voices who speak for the stars enable many millions all over the world to enjoy the products of America's entertainment industry, and in a small way bringing us all closer together.

★ ★ ★

Good advice to Car Owners...

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Now three new Casite products reduce friction, keep your car's engine and automatic transmission clean and at peak operating efficiency.

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You probably are aware of the damaging effects of modern stop-and-start driving on high compression engines and automatic transmissions. In our own engine testing laboratories, we've seen how acids, rust and corrosion—from condensation caused by fluctuating extremes in operating temperatures—cause poor performance and deterioration of engine parts.

Utilizing the latest proved chemical discoveries, Casite technicians have developed and perfected scientific correction *and* protection for the three vital areas of car performance—the firing zone, the friction zone, the transmission zone. Each requires specific treatment to keep your car's "power plant" clean, at top operating efficiency, with minimum friction.



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You can use them without mechanical labor costs or expensive parts dismantling or replacement. In a few minutes you're on your way, with noticeable results.



This is the Improved Casite Tune-Up, for the firing zone. It's the nation's favorite "tune-up in a can," now greatly improved with spark plug and carburetor cleaner and acid inhibitor.

It is recommended for use in the gas tank or carburetor air intake to free valves and rings, and clean carburetor and spark plugs.



Also, for use in the crankcase oil for quicker starting, less start-up wear, and to break in new or rebuilt engines. The price is only \$1.25.

For a quiet smooth engine, you'll want Casite 3-C, with Barimen. This is a new heavy duty crankcase concentrate developed for the friction zone. Added to motor oil, it gives you a tougher oil that won't thin out—oil that cushions the load on every working part, cuts friction and wear, reduces oil consumption, too! Casite 3-C stops hydraulic lifter noises, quiets and smooths the engine. Cleans the engine, and keeps it clean—protects against acid, rust and corrosion. Costs only \$1.50.

Casite "Smooth-Seal" is the latest scientific development for automatic transmissions. It reduces jerks and roughness, assures smooth, quiet operation.

It stops and prevents leaks due to hardening or shrinking of transmission seals. Also reduces shock and wear, enables parts to last longer. Only \$1.95.

Most service stations have a supply of Casite products to protect your engine—or can get them in a hurry.

Just ask for Casite Tune-Up, 3-C and "Smooth-Seal." Use them with confidence. If you're not entirely satisfied with the results, let us know. We'll promptly send you double-your-money-back. That's how strongly we feel (and millions of car owners do, too) that Casite products will solve many of your engine problems, reduce repair bills—and keep your car rolling for many thousands of carefree extra miles!



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Casite, Piston Rings, Oil Filters, Spark Plugs

Skiing Is for Everyone

(Continued from page 90)

along without too much speed. You have better control while traveling slowly. Later, much later, you can try making high-speed runs straight down the hill. The unofficial world speed record on skis is 109 miles per hour, made in Chile several years ago by Ralph Miller. Miller wore special clothing that couldn't be torn off by the wind and he crouched as low as possible on his skis to reduce wind resistance.

If you are an average beginner you will have had a few spills by now. If a fall is inevitable, do your best to land on one side and on your hips. Keep your arms up so you won't land on your hands, and keep your legs straight to avoid falling on your knees. If you remember these points you'll avoid most of the sprains and twisted muscles that some people seem to collect.

Once you have fallen you have the problem of getting up again, and skis are slippery on the snow. The best way is to bring the skis parallel and close together, then draw up your knees to get your feet close to your hips. Now you can use your poles to push yourself up onto your feet again. If you lost a ski in the spill, get up first and put it on afterward.

Always tramp over the hole you made in

the snow by sidestepping on it, removing a hazard that might trip other skiers. It's a standard rule, too, never to walk on ski slopes without skis. Otherwise your feet can leave dangerous holes.

Varying Snow Conditions

Snow conditions can vary from an almost icy crust to fresh, deep, powder snow. I don't advise beginners to take their first lessons when conditions are icy; the crust is just too slippery. Later on you'll find that you have best control on icy snow if you lean farther forward than usual and apply more edge than normal. In deep fresh snow it's best to do the opposite: Lean back a bit, keeping your weight equal on the skis and keeping them fairly flat to prevent their diving deeper.

By the time you have progressed to this point you'll have seen more experienced skiers descending the slopes in a series of linked turns, their feet always held tightly together. This is the modern parallel downhill turn and is a controlled curving skid. This turn is now your goal.

First, you must become familiar with a plain skid or sideslip; that is you move sideways down the slope by releasing the edges instead of digging them in. This develops lateral balance and control of the edges.

(Continued to page 238)

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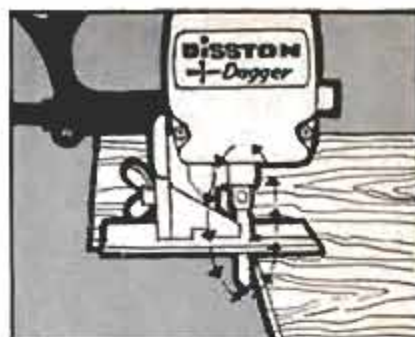
Home improvement projects come easy . . . are finished faster with this all-purpose, power cutting tool. A Disston "Dagger" handles every cutting job needed to finish a game room or an attic. With a "Dagger" you can build kitchen cabinets, bookshelves, dividers, fix the stairs or do any one of a hundred fix-up jobs. It's fast, easy and convenient.

Disston's "Dagger" cuts wood (45° through a 2 x 4), plywood, pipe, plastic, formica and sheet metal. It'll cut through heavy house wiring and conduit . . . even frozen meats, bone and all.

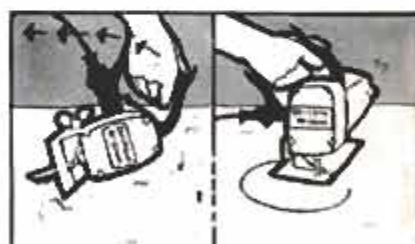
"Dagger" is a rip saw, crosscut saw, hack saw, coping saw, hole saw, back saw and more . . . all rolled into one, with power added. You carry the lightweight Disston "Dagger" anywhere, to do any job, conveniently. And even an "all thumbs" beginner is right at home with the "Dagger." See a Disston "Dagger" at your hardware dealers', now, while stocks are still on hand. Disston Division, H. K. Porter Company, Inc., Philadelphia 35, Pa.

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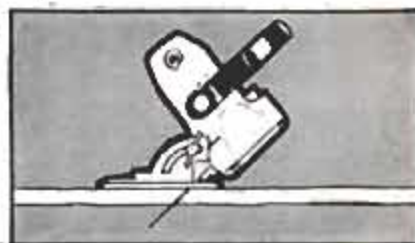
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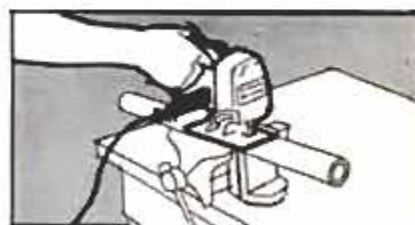
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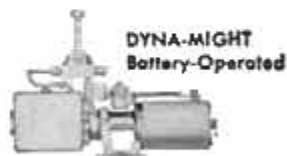
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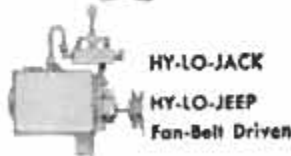
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Once this skid is mastered it must be converted into a curving diagonal skid. This is done by applying a small amount of edging and leaning forward at the same time. The edging causes a diagonal slip and the forward lean helps the front of the skis to grip while just the tails slip. The combination produces a simple uphill turn. You can facilitate the turn by a down-up "unweighting" movement. Start across the slope in a traverse, crouch down and then quickly raise your body at the same time that you partly release the edges to start the skid. Then lean forward to complete the turn with just the tails skidding.

Now you are ready for the downhill turn itself. While traversing a slope, "unweight" the skis with the down-up motion of your body and at the same time change to the downhill edges and start the skid by twisting the legs and feet in the desired direction. Once the skid is started, the rest of the turn is similar to the technique of an uphill turn, with tips gripping and tails slipping. Planting the inside pole momentarily at the time you make the "unweighting" movement is a big help. If you make a wide turn you will pick up speed, while a short turn starts you on the next traverse at a slower pace. In fact, you can come to a complete stop easily enough by remaining in the turn until your skis are pointed somewhat uphill.

Jump Over Bumps

When moving across bumpy terrain you can try jumping over the worst bumps. There's nothing tricky about this; you simply crouch, spring up, and tuck up your feet to clear the bump, landing on smooth snow. You must keep the skis parallel while in the air, of course.

What you have read so far is the equivalent of a week of instruction at the rate of two lessons per day. With practice you should soon be able to handle yourself safely on most slopes and enjoy yourself as well. Then you will be ready for more advanced instruction.

I suggest you take lessons from an instructor even though you become fairly proficient. You can't see your own mistakes, while an instructor can spot them, correct you, and teach you additional technique as well. The better you become, the more fun you'll have. ★ ★ ★

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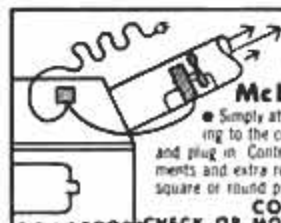
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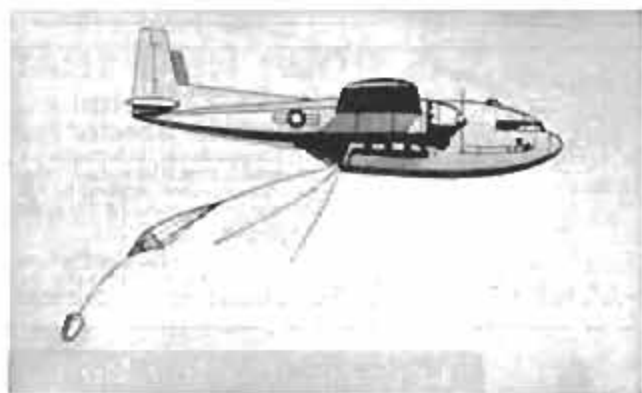
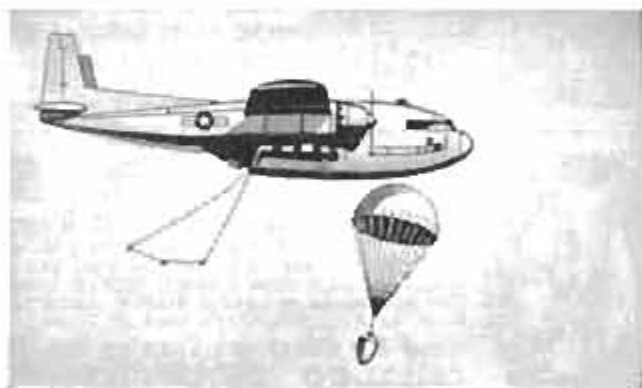
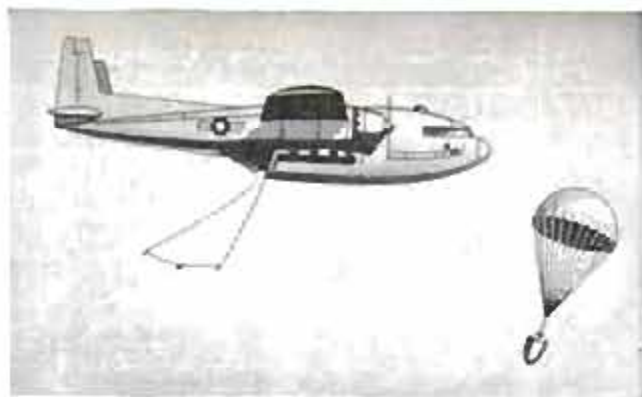
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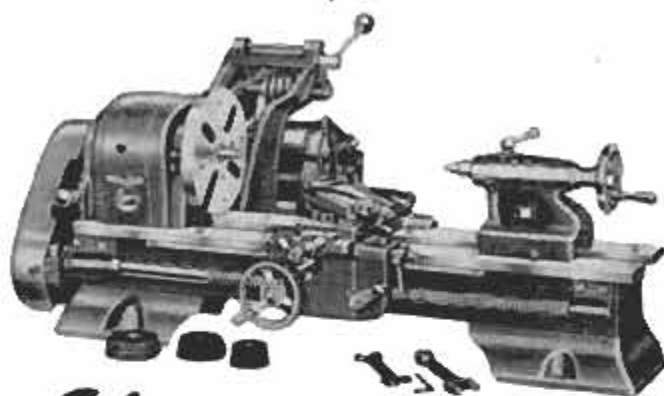


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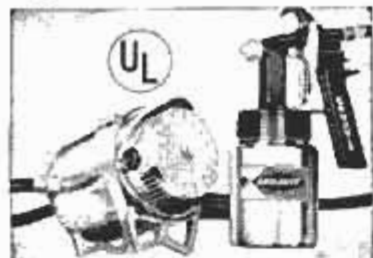
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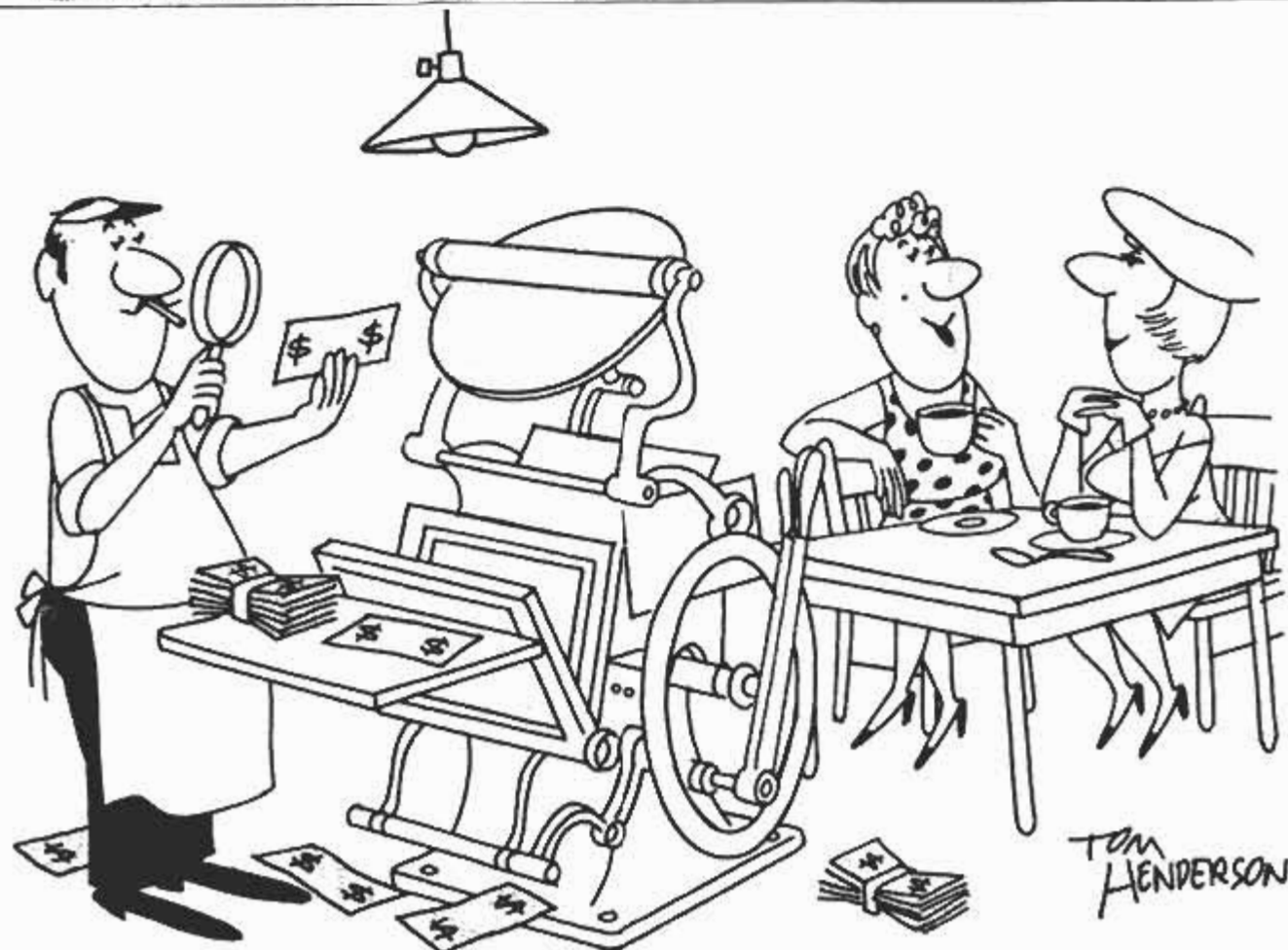
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I Lived With the Astronauts

(Continued from page 79)

gyroscopic theory and similar highly technical subjects delivered by specialists from the Langley Research Center. These are usually scheduled every Monday morning.

Briefings on activities in areas where they are concerned . . . e.g., Atlas firings.

Lectures on specific problems of Project Mercury. There were several of these a day when the program started, but they have largely been completed and are now reduced to a few each month.

Practice flights on equipment at Langley which simulate some of the conditions they will encounter in space.

Flying jet aircraft from Langley Field. Two F-102's have been assigned for the exclusive use of Astronauts, and they strive to put in at least 20 air hours a month per man to maintain their flying proficiency. Later, this flying will be done in pressure suits to help them adapt to long periods in this encumbering type of equipment. All of the Astronauts complain they don't get enough time in the air—which they don't. Above all, these men are dedicated pilots. They love to fly, and look forward eagerly to leaving the classroom for the flight line.

Not Much Leisure

Individual study of technical reports. More and more, lectures are being superseded by technical reports which the men can read and assimilate during leisure moments—of which there are far too few.

Free time for athletics and recreation.

And finally field trips to (1) make test flights in equipment not available at Langley and (2) consult with manufacturers on the equipment the Astronauts will be using in their space flights.

The two most important training facilities away from Langley are the weightlessness tests at Wright Field in Dayton, Ohio, and the centrifuge at Johnsville, Pa. To familiarize the Astronauts with the sensation of weightlessness, they are tumbled in the cargo compartment of a C-130 transport which pulls abruptly out of a steep power dive and provides about 15 seconds of weightlessness for its occupants at the top of the climb. This is the most difficult element of space flight to simulate—particularly for a period long enough to give the Astronauts any real feel of the problems involved in exerting hand controls in a weightless state.

A new effort to breach this gap is underway at Langley now. Still in the development stage, it will consist of a barrel-shaped device filled with water. The Astronaut will be inside the barrel, completely sub-

(Continued to page 254)

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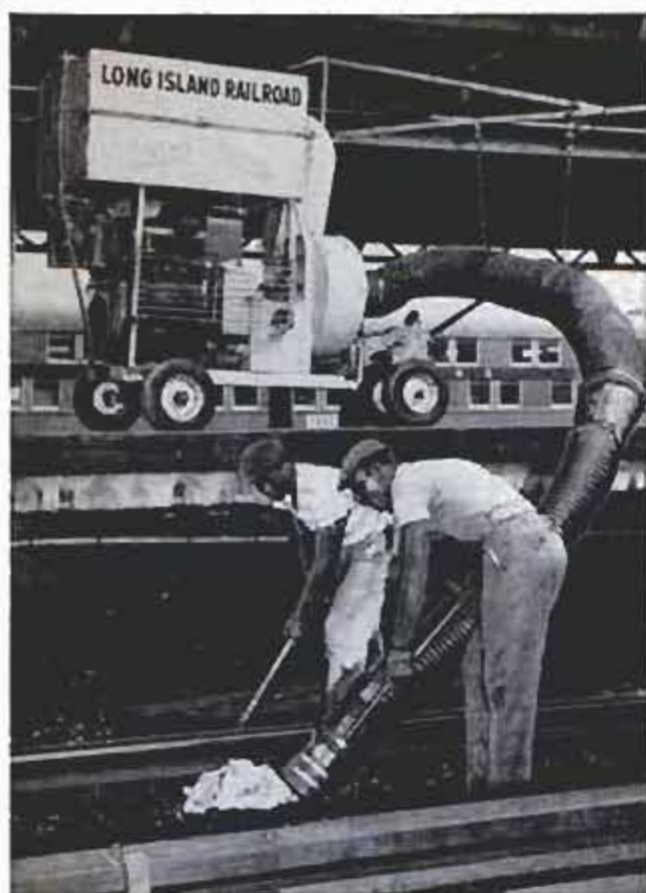
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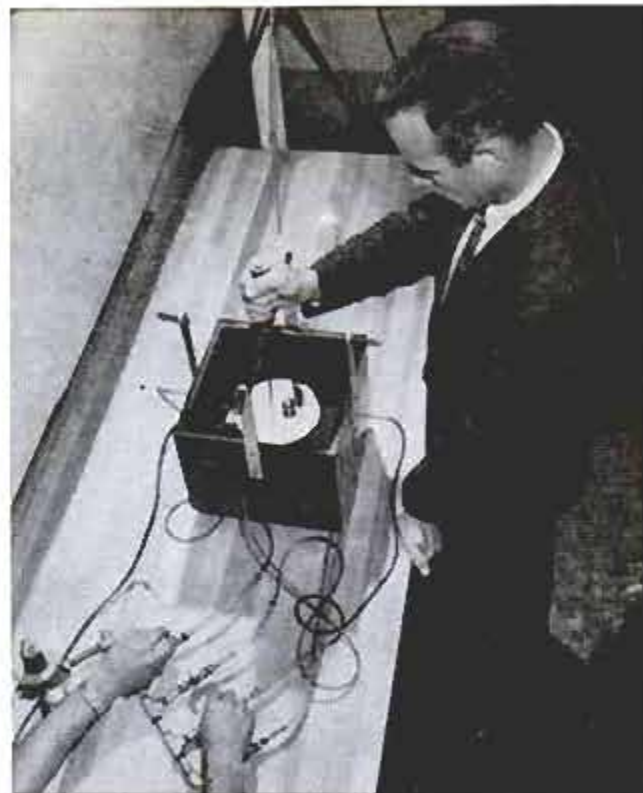


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Carpenter attempts to keep ball bearing on plate while operator tilts the plate with jets of air

merged. In this state, he will have to operate controls similar to those in the space capsule.

This device illustrates the extreme efforts being made to develop training machines to simulate conditions man has never experienced. The trainers will probably be modified drastically once a trip into space has actually been made and the pilot can report accurately what he encountered. But lacking this information, the ingenuity of the NASA engineers and scientists must substitute as effectively as possible for exact knowledge. So far it has been impossible to develop any one training device which duplicates all of the problems—atmospheric and mechanical—that the Astronaut will face. Probably the closest thing is the centrifuge at Johnsville, Pa.

Here, the Astronauts are strapped into a cockpit, faced with a battery of complicated instruments, and whirled about to give them a taste of the tremendous forces that will be exerted on them. During the launch trajectory, the Astronaut will have to take about 8.6 Gs, and again during the re-entry. The time at these peak Gs will be only a fraction of a second, but he will probably be above 5 Gs for a half-minute to a minute. The Johnsville centrifuge can duplicate and greatly exceed these pressures.

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(Continued to page 256)

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and its attendant equipment—limits the speed at which the program can progress. The size of the capsule is dictated by the size of the Atlas on which it will hitch a ride; presently it is about 10 feet high, 6 feet in diameter at its broadest point, and shaped very much like an oversized TV tube. Since at this stage the Astronauts can't make test flights in the capsule itself, NASA engineers have had to substitute various simulators to reproduce partial problems the Astronauts will have to meet. Two in particular at Langley merit special mention. One—just now being completed—simulates orbital flight dynamics in a frictionless system for tracking and navigation control. The Astronaut reclines on a couch and must make altitude and navigational corrections on his controls through visual reference to a projected picture of the earth which he can see through the periscope in front of him. The machine "floats" on a powerful air jet, and smaller jets—controlled by the Astronaut—will change the attitude of the trainer. The other simulator combines the Mercury control panel with a stationary F-100 trainer in the Langley Research Center to provide the Astronauts control problems which are fed into the simulator through a computer.

Simulators Very Important

Other simulators have been considered and abandoned. Among them was a proposal to take a capsule aloft to 100,000 feet under a balloon. Now most efforts are channeled toward combining as many space conditions as possible in a single simulator. Most of the men helping to train the Astronauts (particularly the medical people) submit to the same tests—as far as their physical equipment will permit—so they can better understand the problems of the Astronauts.

In general, throughout the time I spent with the Astronauts, their mornings were taken up with lectures and briefings, and their afternoons with work on the flight simulators, proficiency flying, conferences with engineers and scientists on problems in each man's specialty area, and some exercise to keep in shape. Beyond the normal working day, their time is their own, and they live a reasonably normal sort of life with their families. Two of the Astronauts—Cooper and Carpenter—live on the base at Langley. Glenn still maintains a home in Washington, D.C.; Shepard lives about an hour's drive away at Virginia Beach, and the other three Astronauts live in a new subdivision near Langley.

A number of rather widely held misconceptions have grown out of the avalanche

(Continued to page 258)



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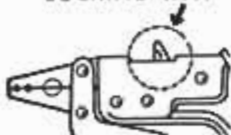
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of publicity around the Astronauts. Here are a few of the most common:

1. *The Astronauts are the world's greatest physical specimens.* John Glenn told me: "Sometimes I think people expect us to sprout wings and take off. This business of us being the greatest physical specimens in captivity is badly overstated. We're as healthy as any group you could find, but we aren't supermen. There are plenty of other people just as healthy."

Being a test pilot is a rigorous profession. The Astronauts had to be in top physical condition to ply their trade, and they still are. But there are probably thousands of other men—the Navy's frogmen for example—in other rigorous pursuits who would have been physically qualified for the space program. Again, the primary qualifications of the Astronauts were technical. Along with the technical background, they of course had to have the intellect (all of them have IQ's in excess of 130) to grasp the engineering problems implicit in flying the Mercury capsule.

Not a Suicide Mission

2. *There's an odds-on chance that Mercury will be a suicide mission.* Quite the contrary is true. Every possible caution and precaution is being taken to insure the safe return of the Astronauts. These young men have no vainglorious desire to kill themselves in the interests of space travel. But as experienced test pilots, they are familiar with the dangers of unknown and untested aircraft. They regard the Mercury capsule simply as an extension of the work they were engaged in before Mercury existed.

3. *Once the first man is put into space, the Mercury program will be over.* Obviously this program is not aimed at putting a man into space once and then quitting. Eventually all of the Astronauts will go, and quite likely many more men whom they will train. For this reason, the Astronauts are impatient with all the emphasis being put on the first man into space. Several of the Astronauts—and possibly all of them—will take the short ride on a ballistic missile into space before the first man is orbited.

On this point, John Glenn said. "This business of being first is badly overdone. The individual isn't all-important here; it's the big job that's important. People have dreamed about this for thousands of years, and it's so much bigger than individual names. This program opens up whole new worlds, and we're just lucky—as individuals—to be part of it. Sure we all want to be first. Any guy who didn't really want to go first shouldn't be in this program. But

(Continued to page 260)

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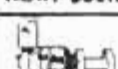
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we also realize that the second and third guys up will probably be much more important from the standpoint of information obtained."

4. *Project Mercury is a crash program geared to a race with the Russians to put the first man in space.* If Mercury is a crash program, it's doing a lot of creaking at its financial joints. A few weeks ago, the Astronauts spent the better part of a day sitting around airports waiting for commercial flights. They've traveled in buses and creeping trains on field trips because there is no provision in the Mercury program for government air transportation for them. The space budget was pared some \$68 million last year, and every activity has to be carefully considered in the light of hard budgetary facts. Even the Astronauts are acutely conscious of budgets; Alan Shepard told me that lack of sufficient funds was holding up the production of equipment for tracking stations for the space capsule. As for racing with the Russians, the Astronauts are divided on this point; the majority of them emphasize that under no circumstances are we cutting any corners to beat the Russians at getting a man into space—that not even a minute safety element will be sacrificed to attain this objective. But while granting this, several of the Astronauts feel that the competitive challenge can hardly be avoided—budget or no. One of them told me: "Sure we're in a race with Russia. That's no way to run a technological program, but that's the way it is and we can't change it."

Don't Know When

5. *Space flights will be made on a schedule already established but not released.* Probably no comparable program in history has ever had more scheduling fluidity than Project Mercury. Each step in putting a man into space depends entirely upon the successful completion of the previous step as well as production of the necessary "hardware." As a result, it's impossible to set any sort of rigid schedule. When officials say they don't know when the first space flight will be attempted, they're stating a simple and irrevocable fact.

6. *The Astronauts are kept on a rigid program of diet and exercise.* Quite the opposite is true. The Astronauts have no formal program of either diet or exercise. When Project Mercury started, the Astronauts were asked if they wanted regular calisthenics. Being experienced military men, they said "No" emphatically, and that was that. The Astronauts' only group physical training has been a course with Navy frogmen, which ended with them

(Continued to page 262)



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swimming a thousand yards under water using an aqualung and flippers. This is not to say that they don't keep in good physical condition. But as Scott Carpenter pointed out: "We don't need any formal health or physical conditioning program. We're big boys now, and know how to take care of ourselves. Besides, this thing is important to us, and we're not going to let ourselves get out of shape."

All of the Astronauts enjoy water sports and indulge in them whenever possible. Only Glenn played college football—at Muskingum College in Ohio. Glenn tries earnestly to run two miles every morning before breakfast—and does most of the time. At the start of the program, three of the Astronauts didn't smoke. Now all of them have quit—but strictly on their own and under no duress. The Astronauts office at Langley has a hand-lettered sign stuck to the door which reads: "No Smoking in This Room Please." and it's signed "Three Ex-Smokers."

But the Astronauts are in superb physical condition. One of the NASA engineers stumbled on Gordon Cooper the other day playing with a group of 50-pound weights; he lifted four of them rather easily. Another saw Scott Carpenter climb a 40-foot rope hand-over-hand in a friend's back yard, just for exercise.

The Astronauts are all highly motivated young men going about a logical extension of their business which is test piloting. For many years they've worked at a hazardous occupation, and they have no personal fear. Their main concern is with getting the job done.

John Glenn said: "This project is comparable to the Wright brothers at Kitty Hawk, with Orville and Wilbur pitching a coin to see who was going to shove the other one off the hill. I think we stand on the verge of something as big and expansive as that was 50 years ago."

(Continued next month)

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● Item #715. Modern hi-efficiency attractive dial phone. Use for extension to main line on private system. Use several for complete private system, etc. Complete. Work on any system. Govt. cost \$25. SALE..... **\$9.95 Ppd.**

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● Item #1315. Deluxe ball and needle bearings heavy duty gear reducer. Ratio 86-to-1. Protective Clutch, etc. Input Shaft 3/4" diam., Dual Output Shaft 1" diam.
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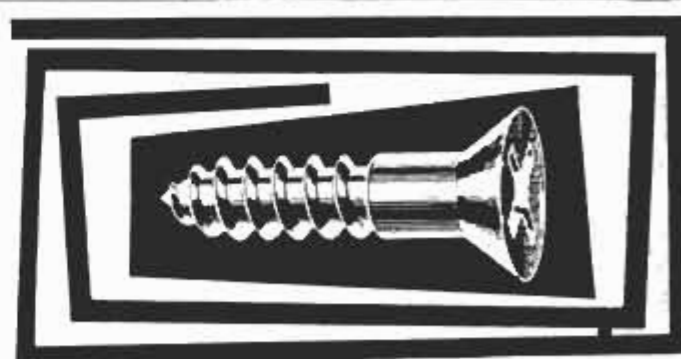
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- Architecture
- Arch. Drawing and Designing
- Building Contractor
- Building Estimator
- Carpenter Builder
- Carpentry and Millwork
- Carpenter Foreman
- Heating
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

ART

- Commercial Art
- Magazine Illus.
- Show Card and Sign Lettering
- Sketching and Painting

AUTOMOTIVE

- Automobile
- Auto Body Rebuilding and Refinishing
- Auto Engine Tuneup
- Auto Technician

AVIATION

- Aero-Engineering Technology
- Aircraft & Engine Mechanic

BUSINESS

- Accounting
- Advertising
- Business Administration
- Business Management
- Cost Accounting
- Creative Salesmanship
- Managing a Small Business
- Professional Secretary
- Public Accounting
- Purchasing Agent
- Salesmanship
- Salesmanship and Management
- Traffic Management

CHEMICAL

- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- Elements of Nuclear Energy
- General Chemistry
- Natural Gas Prod. and Trans.
- Petroleum Prod. and Engr.
- Professional Engineer (Chem)
- Pulp and Paper Making

CIVIL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Professional Engineer (Civil)
- Reading Struc. Blueprints
- Sanitary Engineer
- Structural Engineering
- Surveying and Mapping

DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Drafting & Machine Design
- Electrical Drafting
- Mechanical Drafting
- Sheet Metal Drafting
- Structural Drafting

ELECTRICAL

- Electrical Engineering
- Elec. Engr. Technician
- Elec. Light and Power
- Practical Electrician
- Practical Lineman
- Professional Engineer (Elec)

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(Partial list of 258 courses)

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- High School Mathematics
- High School Science
- Short Story Writing

LEADERSHIP

- Industrial Foremanship
- Industrial Supervision
- Personnel-Labor Relations
- Supervision

MECHANICAL and SHOP

- Diesel Engines
- Gas-Elec. Welding
- Industrial Engineering
- Industrial Instrumentation
- Industrial Metallurgy
- Industrial Safety
- Machine Shop Practice
- Mechanical Engineering
- Professional Engineer (Mach)
- Quality Control
- Reading Shop Blueprints
- Refrigeration and Air Conditioning
- Tool Design
- Tool Making

RADIO, TELEVISION

- General Electronics Tech.

- Industrial Electronics
- Practical Radio-TV Eng'g
- Practical Telephony
- Radio-TV Servicing

RAILROAD

- Car Inspector and Air Brake
- Diesel Electrician
- Diesel Engr. and Fireman
- Diesel Locomotive

STEAM and DIESEL POWER

- Combustion Engineering
- Power Plant Engineer
- Stationary Diesel Engr.
- Stationary Fireman

TEXTILE

- Carding and Spinning
- Cotton Manufacture
- Cotton Winding and Weaving
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