FEBRUARY 1954 35 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

Special AUTO SECTION

John Fitch and Phil Walters tell about the **WORLD'S GREAT ROAD RACES**

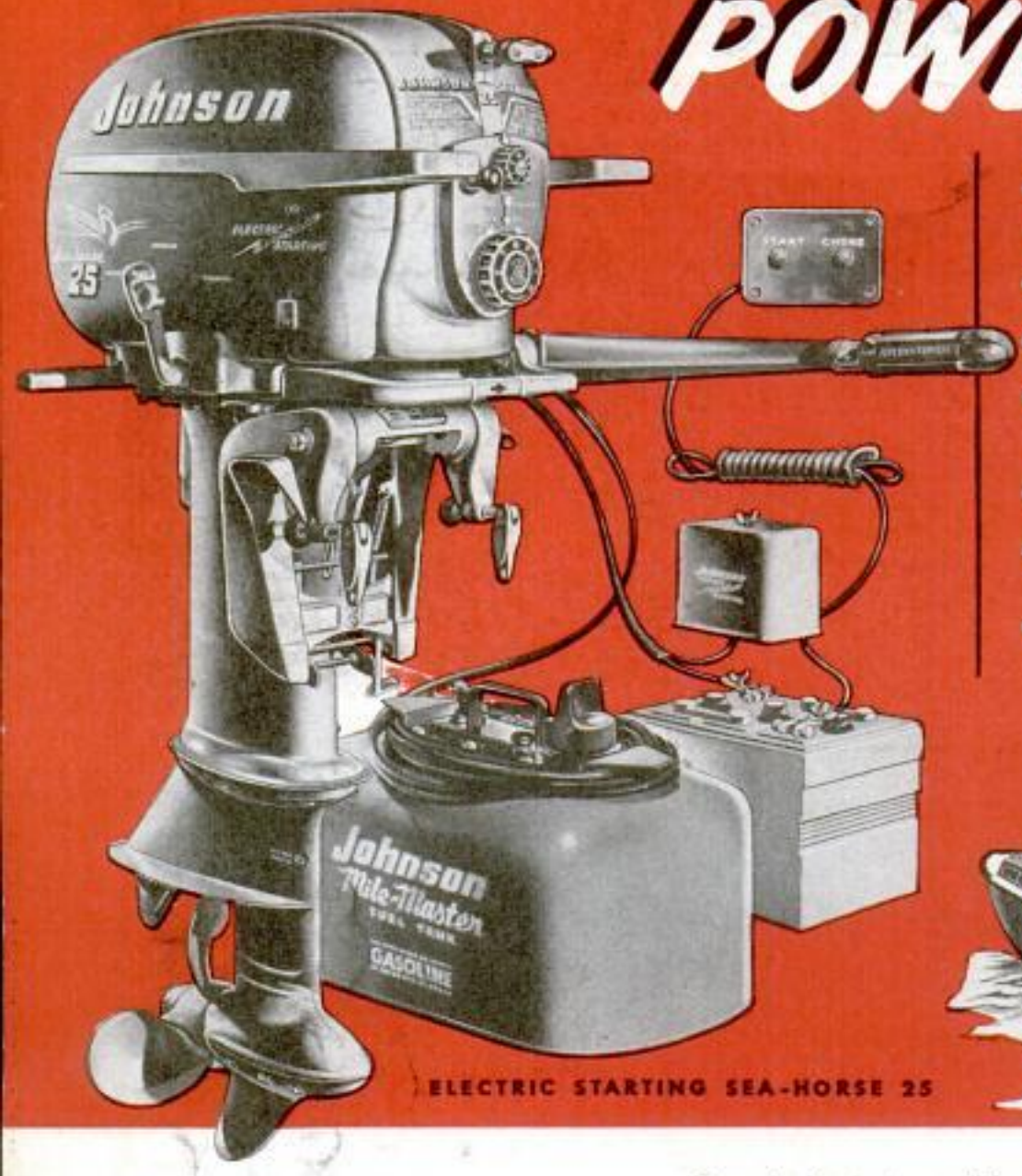
46 PAGES ABOUT AUTOMOBILES *including...*

- Parade of the '54 Models
- What Car Owners Want Next
- How to Buy a Used Car
- What Makes a Car Run

Recognize 1954's new "faces"?—See page 154

8-Page COLOR ALBUM of the Finest American Classic Cars

NOW! PUSH-BUTTON POWER!



- **Electric Starting!** (ALSO EQUIPPED FOR MANUAL STARTING)
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FREE! Write for the new Sea-Horse Catalog. Complete details on the 5 great motors of the 1954 Johnson line—including the revolutionary *quiet* Sea-Horse 5½ and the flashing, newly-styled Sea-Horse 10. Your copy sent free.

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FOR DEPENDABILITY

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THE NEW 1954 SEA-HORSES

SEA-HORSE 5½—5½ hp. Johnson's new "Suspension Drive" sensation. It's *quiet!* **$210.00***

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SEA-HORSE 3—3 hp. 32-lb. *twin!* Angle-matic Drive . . . **$145.00***

**F.O.B. factory, subject to change. Weight approx. OBC certified brake hp at 4000 rpm.*

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"We installed it ourselves—and look! ALL THROUGH IN TIME FOR SUPPER"

JEANNE and I had heard about the wonders of Goodyear VINYL·TILE flooring, and decided to take a try at installing it ourselves in our kitchen.

So on Saturday morning we went to work, and we were all through by early afternoon!

But Jeanne deserves the credit, for she was the one who stopped by the dealer's and picked up the handy, home installation kit and the "How To Install" folder put out by Goodyear.

After that, it was simple (except she did have trouble making up her mind about which of the 18 beautiful VINYL·TILE colors to use!).

And it's simpler still to keep VINYL·TILE clean and sparkling. You see, it is specially pre-polished at the factory to a natural, lasting luster.

A swish of a sudsy mop does the trick—we've found it unnecessary to wax it ever!

P.S. Goodyear VINYL·TILE comes in tiles and yard-wide rolls—flexes easily, is ideal for counter tops and contour coving. SEND FOR FREE VINYL·TILE "SELF INSTALLATION" BOOKLET—address a postcard to: Goodyear, Flooring Dept. N-8318, Akron 16, Ohio.

FLOR-MASTER INSTALLATION KIT provides the simple tools required to do a professional job in jig time. Available at all better dealers' — where Goodyear VINYL·TILE is sure to be a featured item.

GOODYEAR Vinyl·Tile

FLOORING, COUNTER TOPS, WALLS—BY THE YARD OR TILE

Flor-Master—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

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What you can learn from the airlines about CHAMPION Spark Plugs for YOUR CAR!

ALL OF THESE AIRLINES ARE CHAMPION USERS

Here's why the selection of Champion Spark Plugs by every major airlines is important to you.

They buy Champions because the airlines' own laboratory and flight tests prove Champions superior to all other aviation spark plugs. The same engineering, research and manufacturing skills that produce the world's best aircraft spark plugs produce the Champion Spark Plugs for your car.

That's why when you buy Champions you get spark plugs that combine peak performance and top dependability with maximum operating economy.

See your nearby garage or service station for Champions specially engineered for your car.

GET DEPENDABLE

CHAMPION

SPARK PLUGS

Allegheny Airlines
American Airlines
Braniff International Airways, Inc.
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Capital Airlines
Central Airlines
Colonial Airlines
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Pan American-Grace Airways, Inc.
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Pioneer Air Lines
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this month's cover

THAT'S A SUNBEAM ALPINE hurtling along a mountain road on our cover, and at the wheel is John Fitch, America's best-known sports-car racing driver. Fitch is the only American ever to win the coveted Coupe des Alpes in the Alpine Rally. In a special PM interview on page 178, he and Phil Walters, his teammate, give a fascinating picture of the great road races of the world. They describe Le Mans, Mille Miglia, the Tourist Trophy, the Mexican Road Race and all the other famous open and closed circuits. And they name the course which is the most challenging of all to the world's best drivers. This is just one of many auto stories in the special section which starts on page 144. You'll find a colorful album of the finest American classic cars and a "Report to Detroit" by the car owners, who turn designers themselves to tell the makers what they want

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IN THIS ISSUE

Guided Missiles on Leash - - - - - - - 97
Mr. Peepers Does His Homework - - - - 110
The Iron Road to Labrador - - - - - - - 118
Do It With Staples - - - - - - - - - 128
TV Joins the Air Force - - - - - - - - 134

Special Auto Section—
The Twelve Finest American Classics - - 144
Parade of New Cars - - - - - - - - 154
What's New in '54 - - - - - - - - - 164
Report to Detroit - - - - - - - - - 168
What Makes Your Car Run? - - - - - 174
The Great Road Races of the World - - 178

For the Craftsman

3 Sewing Cabinets From Single Design - - 185
Pull Toy in Eight Models - - - - - - - 191
Solving Home Problems - - - - - - - - 196
Buy Your Boat in a Package - - - - - - 205
Make a Model of the *Midway*—Part II - - 212
How to Buy a Used Car - - - - - - - - 222
Tips on Buying Used Electric Motors - - - 229
Know Your Metal Shaper - - - - - - - 234
Radio, TV and Electronics - - - - - - - 245

Other items, and manufacturers of available products described, are listed on pages 16, 20 and 22

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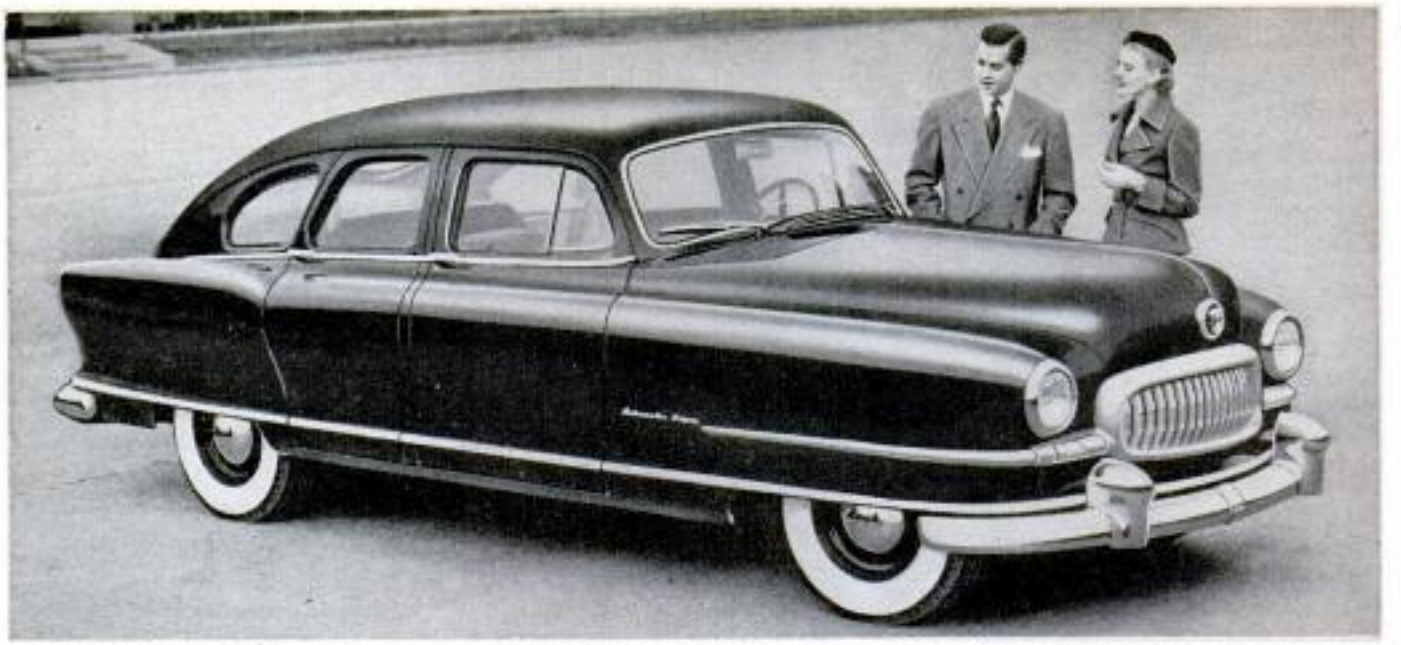

This 1951 Nash is typical of many fine, low-priced used cars on Nash dealers' lots right now!

Why are Nash cars more economical to run? Every Nash has a sealed-in Iso-Thermal Intake Manifold, and high compression to deliver *more power on less gasoline*, under all conditions. Every Nash engine has the vibration-free *smoothness* of a counterbalanced crankshaft. And every Nash engine today has a special oil-control ring employing a new principle to give low oil consumption over thousands of miles.

The car with the "Double Lifetime"

Drive your Nash as long as you want—as far as you like . . . you probably will never use up the reservoir of service—the "DOUBLE LIFETIME" that was built into it originally. That means, of course, it will be worth more when you sell it—you'll be money ahead when you pass it along to the next owner.

How exclusive Nash features Double your Travel Pleasure

Now let's forget the dollars and cents *you save*—and think about the pleasure *you gain* when you buy a used Nash.

You'll get extra room for passengers and luggage to make traveling so much more enjoyable.

Most Nash used cars have the famous Weather Eye Conditioned Air heating and ventilating system—and built-in beds for overnight sleeping!

So when you are looking for a good used car, remember these facts about Nash "DOUBLE LIFETIME" Value. You'll treat yourself to the finest buy you ever had in an automobile!

Nash ***The Car With The Double Lifetime . . . Built to Stay New Longer***

Select USED CARS

SEE A NASH DEALER FOR THE BEST USED CAR "BUY" IN TOWN

Nash Motors, Division Nash-Kelvinator Corporation, Detroit, Mich.

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USED CAR BUYERS!

Here's New Proof That Nash—

The "Car with the Double Lifetime"

—Is the Best Used Car You Can Buy!

IT JUST makes good common sense that the more quality and durability built into a new car originally, the more good miles you'll get from it as a used car. And Nash is the car with the "DOUBLE LIFETIME" built in—built to last twice as long as the average automobile—as so many owners will testify.

Read these paragraphs from a letter by enthusiastic Nash owner, Clyde H. Andrist, of Fort Collins, Colorado:

"*I have had extremely fine service from all my Nash cars . . . drove a 1941 Nash Ambassador 256,000 miles and had only one motor overhaul. Drove a 1948 Ambassador 89,000 miles and had no work done on it at all. Traded it in on a '49 Nash which still looked and performed like new at 134,000 miles when I again traded—for a new Nash.*

"My cars are subject to hard usage . . . averaging 60 miles per hour on long drives . . . I still average better than 22 miles per gallon and never add oil between changes . . . on all kinds of roads . . . plowing through heavy mud or deep snow . . . in temperatures as low as 54° below zero and up to 118°."

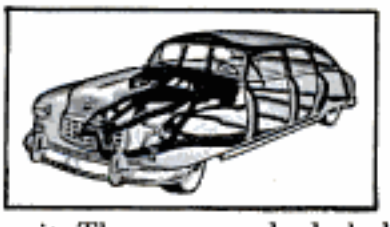
Think of it—134,000 miles on a '49 Nash Ambassador—and it still *ran like new—and looked like new!*

What this means to Used Car Buyers

When you buy a used Nash, you can look forward to more wonderful miles than you ever dreamed a car would deliver.

Because that's the way every Nash is built—built to give a "DOUBLE LIFETIME" of carefree motoring.

Why do Nash cars last longer? Because of exclusive Nash Airflyte Construction!



Instead of the ordinary body bolted to a frame, the structure of every Nash is a solid, welded unit. There are no body bolts to loosen, rattle or squeak. It is twice as rigid, stronger and safer—stays new years longer.

Why do Nash cars seldom need repainting? Unlike other car-makers that use quick-drying lacquers, Nash employs specially formulated enamels baked to a hard, porcelain-like finish. This durable finish is "anchored" to sheet metal completely treated with the famous Bonderite rust-proofing process to resist aging, cracking, rusting—to stay beautiful years longer.

This one
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Animals Protect Themselves

Normally of a very timid nature, a Doe will fight ferociously and effectively to protect its Fawn against attacks of Rattlesnakes and other natural enemies.

AC *ALUVAC* PROTECTS MORE NEW CAR ENGINES THAN ANY OTHER BRAND

Every car engine has its natural enemies too—the dust, dirt, grit and sludge that collect in motor oil—ready to attack smooth-surfaced bearings, pistons and other precision parts.

AC's *Aluvac* Element provides proved protection against these engine oil enemies. Its special accordion fold gives ten times the filtering area of ordinary elements, and its specially formulated filtering material screens out particles as fine as 1/100,000 of an inch.

Change your oil filter element at from 4000 to 6000 miles—and change to AC *Aluvac* to make your car's engine run better, longer.

AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION

in this corner..... THE EDITORS

FOR THE PIN-UP photographs of the great American Classic cars which we bring you in the color pages that open the special automobile section in this issue, our staff photographer and automobile editor traveled hundreds of miles.

The Classics they sought were found in family garages from California to New

England. The 1931 Duesenberg roadster, which was acclaimed as the greatest American Classic, is owned by William S. McKelvy of Pittsburgh, Pa., but Associate Editor Art Railton (shown lending a muscle at the rear fender) and Photographer Don Honick (who took this picture) found the Duesenberg in Jim Hoe's garage, seven miles off in the woods from Westport, Conn. At the moment it was undergoing an engine overhaul. Hoe is probably the nation's outstanding Duesenberg mechanic, and his garage was filled with Duesenbergs in various phases of repair. Hoe, incidentally, has a Duesenberg of his own which he races—and usually brings in a winner.

To the Editor:

What can be done to decrease the number of traffic violations on our streets and highways? We are firmly convinced that radar speed-control techniques can help in cutting down the number of violators of speed regulations and thereby reduce accidents.

Members of the staff of our Center for Safety Education at New York University have completed a 16-week study using radar in 11 eastern states from Maine to Maryland. This has involved hundreds of speed checks both within city limits and on rural highways. These studies were conducted at the invitation of state traffic authorities. On some highways we were

(Continued to page 10)

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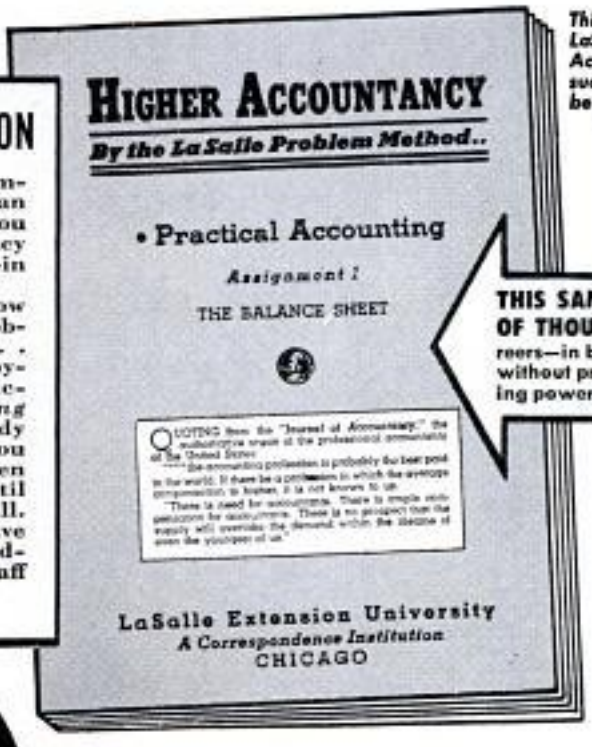
This *FREE SAMPLE LESSON*

will prove you can become an expert

BOOKKEEPER . . . ACCOUNTANT OR C.P.A.

This well-paid LaSalle-trained Accountant's success could be yours.



FREE SAMPLE LESSON

We offer you this free sample lesson so that you can *prove to yourself* that you CAN master Accountancy—quickly, thoroughly—in spare time at home.

You will see exactly how LaSalle's famous "Problem Method" works . . . how you are led step-by-step through actual accounting work—*learning by doing* and not by study of theory alone. First you tackle easy problems, then more difficult ones—until soon you master them all. And at every step you have the close personal guidance of LaSalle's large staff of C.P.A. instructors.

THIS SAME LESSON HAS STARTED HUNDREDS OF THOUSANDS toward well-paid accounting careers—in business, government, and as C.P.A.'s. Even without previous knowledge, progress is rapid—earning power climbs fast. This sample lesson shows why.

Nearly 10% of all C.P.A.'s in the U. S. have been trained by the LaSalle Problem Method

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Then let us send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand men and women toward successful accounting careers. We want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain . . . how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree of Certified Public Accountant if you so aspire.

It doesn't matter whether you've had previous bookkeeping experience, or whether you don't know a debit from a credit. Whether you wish to qualify as an expert bookkeeper, advanced accountant, cost accountant, auditor, government accountant, income tax specialist, or public accountant . . . you'll find in LaSalle's Problem Method the exact plan to prepare you rapidly and inexpensively—in spare hours at home—without losing a day from your present job.

So right now, today . . . if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions . . . send your name and address on the coupon below. We'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

GOOD-PAY JOBS IN 5 BIG FIELDS

If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Surveys show that accountants earn more than those in other major professions.

There are five big fields of opportunity open to Accountancy-trained men and women . . . opportunities that are wide open and highly inviting, offering maximum income and job security in good times or bad. And under LaSalle's "Problem Method" you can start earning while still learning—either in spare-time or full-time employment . . . or in business for yourself with no capital required.

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YES, I want to see how LaSalle's "Problem Method" works.. how I can qualify for high-pay Accountancy positions. Send Free Sample Lesson—also your 48-page book, "Accountancy, the Profession That Pays" ...all without cost or obligation.

Name ..... *Age* .....

Street Address .....

City, Zone & State .....

Present Position .....

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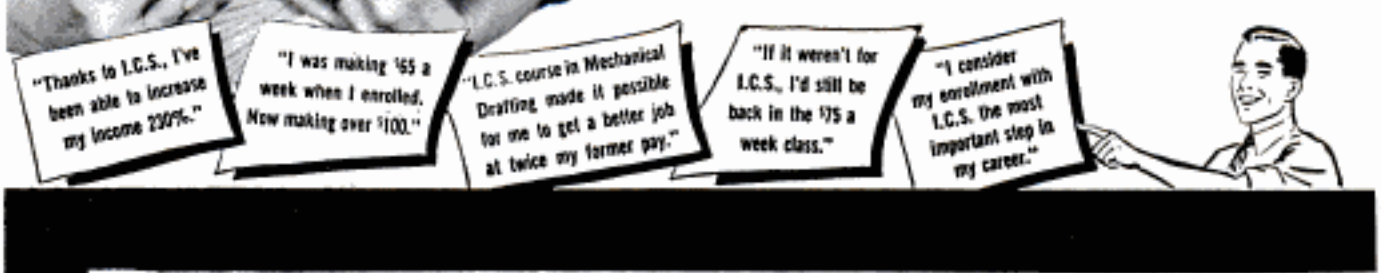
Here's proof you can

Here are the results of a recent survey conducted by I.C.S.—a sheaf of reports from I.C.S. 10-year graduates and non-graduates. This group alone shows an average pay increase of 103%. You can match this!



JUST imagine what you could do with twice your present income. While you're still young, you could enjoy a standard of living usually associated with success . . . $65 suits . . . an $18,000 home . . . security for your family . . . new respect from your friends.

If you're like the average I. C. S. graduate surveyed, you'll *actually be making twice your present income within 10 years.*

From $2,514.63 to $5,114.84

This is the jump made by the average I.C.S. student over a 10-year period. Average increase — 103%. You can expect I.C.S. to double *your* present salary *if you are an average student.* With a little extra effort, you can be even better off!

277 success-tested subjects

I.C.S. courses cover practical subjects in a practical way. You use your spare time—time that others waste—to acquire knowledge worth thousands of dollars to business and industry.

If you want to be twice as well off in just a few years as you are today, mark and mail the coupon at right.

Get Expert Guidance with 2 FREE BOOKS. By return mail, you get complete catalog on the career you check. Also 36-page pocket-size guide, "How to Succeed." Both FREE! Just mark the coupon.

NOTE: The *average* man or woman will put off mailing this coupon till later. Consider yourself *above average,* with a better-than-average chance of doubling your income, if you mail the coupon now.

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double your income

What's your income rating?

Returns from 21 states . . . from accountants, draftsmen, engineers, technicians . . . show the following important facts about your expected income over a 10-year period.

	Age 30	Age 40	% Increase
Average income for all U. S. men	$3,288.00	$3,617.00	10%
Average income for college graduates (men)	$4,227.00	$5,142.00	20%
Average income for 41 I. C. S. graduates and non-graduates surveyed, Jan. '53	$2,514.63 before I. C. S. training	$5,114.84 as of Jan. '53	103%

Source: 1950 Census

I. C. S., Scranton 9, Penna.

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ICS

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- ☐ Show Card and Sign Lettering

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- ☐ Auto Elec. Technician
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Diesel—Gas Engines

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- ☐ Carpenter and Mill Work
- ☐ Carpenter Foreman
- ☐ Reading Blueprints
- ☐ House Planning
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- ☐ Stenography and Typing
- ☐ Secretarial
- ☐ Federal Tax
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- ☐ Personnel and Labor Relations
- ☐ Advertising
- ☐ Retail Business Management
- ☐ Managing Small Business
- ☐ Ocean Navigation
- ☐ Sales Management
- ☐ Short Story Writing
- ☐ Creative Salesmanship
- ☐ Traffic Management

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- ☐ Chemical Engineering
- ☐ Chemistry
- ☐ Analytical Chemistry
- ☐ Petroleum—Nat'l Gas
- ☐ Pulp and Paper Making
- ☐ Plastics

CIVIL, STRUCTURAL ENGINEERING
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- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Structural Drafting
- ☐ Highway Engineering
- ☐ Reading Blueprints
- ☐ Construction Engineering
- ☐ Sanitary Engineering

DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting
- ☐ Sheet Metal Drafting
- ☐ Ship Drafting
- ☐ Mine Surveying and Drafting

ELECTRICAL
- ☐ Electrical Engineering
- ☐ Electrician
- ☐ Electrical Maintenance
- ☐ Electrical Drafting
- ☐ Electric Power and Light
- ☐ Lineman

HIGH SCHOOL
- ☐ High School Subjects
- ☐ Mathematics
- ☐ Commercial
- ☐ Good English

MECHANICAL AND SHOP
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(Continued from page 6)

able to run checks for two days. One afternoon, we clocked speeds for over an hour on a highway leading from an air force base. With the speed limit at 45 miles per hour, 59 violators were clocked doing from 60 to 75; they were stopped and given warnings. The next day this was repeated over a longer period; necessary warnings dropped to six.

While our radar car covered over 10,500 miles and ran hundreds of checks, a comprehensive study would require months in each state. There are certain observations that can be made:

1. The percent of violations on 25-miles-per-hour streets runs high, from 25 to over 90. In many cases, especially the outskirts of cities, this speed limit may be too low.

2. Speed violations are lower on 30 to 35-miles-per-hour roadways. On the other hand, on superhighways with a 50-miles-per-hour limit, violations run high, considerably higher than on two or three-lane main highways.

3. Motorists tend to drive too fast at night. The hours around midnight are now running second to the sundown period as the most hazardous.

4. Many motorists do not appear to heed important warning signs. It occurred to us that some roads may have too many unimportant signs. It might be worth-while if drivers apprehended for speeding were required to take a series of vision tests to measure acuity, depth perception, glare blindness and other aspects of vision.

5. We cannot put the blame for speeding on drivers of high-powered, modern vehicles, nor any particular age group, for example, younger drivers. Curiously enough, we caught a state highway-department employee and found that he was one of the crew that had recently erected the speed-zone signs!

Anyone who has had the opportunity of working with enforcement officers in the 11 states visited could not fail to recognize the intensive efforts being made to reduce accidents. How much can radar techniques aid in this work? Radar is another scientific

(Continued to page 14)

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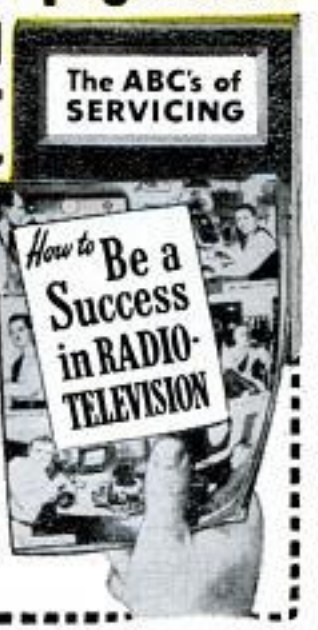

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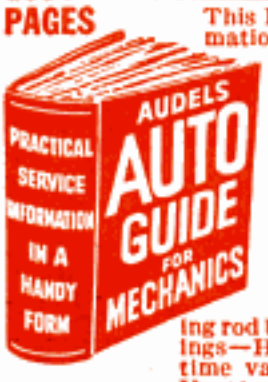

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(Continued from page 10)

tool that is now available to local enforcement agencies. It can be used to make speed studies and volume counts. When used with graphic recorders, permanent records can be made for courts and for selective enforcement. But radar is only a tool; it will not eliminate traffic problems. We believe that radar's chief value lies in educating motorists.

Herbert J. Stack, Director,
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New York University.
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Red Tails in the Sunset

When a French shepherd walked into a bicycle shop in Villebois-Lavalette and requested 130 red reflectors, the proprietor was a bit mystified. What kind of a fleet did he own? The explanation was simple. He

had lost nearly half his flock of sheep to motorists as he herded them along the road after dark. He fastened a red reflector to the tail of each sheep; any motorist discovering 130 sparkling red mirrors on the road in front was likely to slow down, he figured.

To the Editor:

During recent years, some of our automobiles have been fitted with a half-section horn ring. I happen to have one of them, a 1950 Chevrolet. I was dissatisfied with it the day I bought it and it has been a hazard ever since. I've wondered many times why a necessity on a car should be applied in such an unsafe way, until I read an article in *Popular Mechanics* April 1953 issue by Floyd Clymer, who said that it was too hard to watch the dials with a complete horn ring. (The poor dial watchers.) I've driven automobiles hundreds of thousands of miles during the last thirty years. We all know that all automobiles have blind front corners. It has happened to all of us, including myself, that while turning a corner a human being suddenly pops into view from around that blind corner. It's a funny feeling. The steering wheel being turned,

(Continued to page 304)

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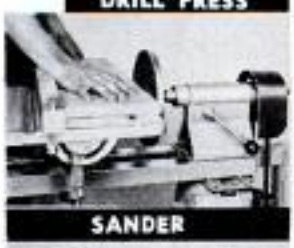
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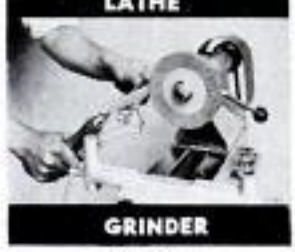
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Radio automatically times cars at Indianapolis speedway (Albert W. Bloemker, Indianapolis Motor Spdwy. Corp., Indianapolis 4, Ind.).....131
Tag-along trailer supports rear end of 88-foot load.....132
Ford gets an all new V8—and Mercury does too.....161
A trans-Atlantic view of Europe's 1954 models.....172
Hand-built car.....258

AUTOMOTIVE ACCESSORIES

Brake-fluid indicator (Formost Auto Specialty, 7559 S. Chicago Ave., Chicago 19, Ill.).....127
Light monitor warns driver (E. Edelmann & Co., 2332 W. Logan Blvd., Chicago 47, Ill.).....127
"Stop Space" speedometer shows minimum distance.....127
Variable-speed supercharger for stock cars boosts power (McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles).139
Hydraulic four-wheel drive operates German bus.....133

AVIATION

Guided missiles on leash.....97
Icebreaker carries helicopter for survey and rescue work.....104
Midget gas turbine helps run world's largest cargo airplane (Solar Aircraft Co., 2200 Pacific Highway, San Diego 12, Calif.).....133
Television joins the air force.....134
Two-foot-wide propeller blades to be turned by 5500 horsepower engine.....143
High living for mechanics.....302

CONSTRUCTION

Toy blocks teach farm construction.....102
Lightweight scaffolding goes together without nuts or bolts...103
Fireproof roofing of wood fibers also provides insulation.....109
College students build rig and drill well without expecting gusher.....132
Prestressed concrete girders cut building costs.....292

FARM

"Field hands" with wings keep cotton field clean.....105
Posthole digger makes square cut.....125
Snails enrich feed.....133

HOUSE AND HOME

Japanese telephone cord reel prevents line from snarling....105
Self feeding bird trough holds five day supply (Pioneer Pet Supply, 107 N. Cuyler, Oak Park, Ill.).....108
Musical slide rule aids composition and transposition (Prof. L. E. Woodman, Missouri School of Mines, Rolla, Mo.).....109
Cherry pitter.....116
Pat filter (Tricolator Co., Inc., 321 Jelliff Ave., Newark 8, N. J.).....116
Gem setter (Gem-Craft, 1813 East 13th St., Cleveland 14, Ohio).....116
Potato peeler (Hoffritz for Cutlery, 551 Fifth Ave., New York, N. Y.).....117
Round thermostat (Minneapolis-Honeywell Regulator Co., 2954 4th Ave., S., Minneapolis 8, Minn.).....117
Sprayer (Garden Hose Spray Co., Inc., 7 Upland Road, Cambridge 40, Mass.).....117
Vapor strip (L. S. Root Laboratories, Inc., 1049 45th Road, Long Island 1, N. Y.).....117
Quickly donned plastic coveralls protect clothes from grease (Car-Blair, Ltd., 43 W. 57th St., New York 19, N. Y.).....125
Race-car decals (Palm Bros. Decalcomania Co., Box 26, Cincinnati 7, Ohio).....127
Do it with staples (Bostitch Co., Westerly, Rhode Island; Heller Co., 2135 Superior Ave., Cleveland 14, Ohio).....128
Automatic "sniffer" detects leaking gas.....138
Radiant-glass heating panels.....258
Interceptor waste trap (Mfr.: C&H Plumbing Specialties, 3148 Bruckner Blvd., New York 61, N. Y.).....300

(Continued to page 20)

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(Continued from page 16)

INDUSTRIAL

Fire recovers oil....103
Cartridge prevents rust in fuel oil tanks (Sudbury Laboratory, South Sudbury, Mass.)....125
Expansion plug seals end of open tube (Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.)....278
Plastic tool pulls fuses (Star Fuse Co., 235 Canal St., New York, N. Y.)....286
Chemical rust-cutter (James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.)....302

SCIENCE

Massive iron ball at center of earth....104
"Scanar" finds submerged objects with bouncing beam of sound (Minneapolis-Honeywell Regulator Co., 2954 4th Ave. S., Minneapolis 8, Minn.)....115
Doped and frozen fish withstand transfer to new home....131
Electronic "nose"....131
Engineer is safe in steel wire cage charged with 300,000 volts..131
X Ray pictures in color....143
Eye-movement glasses (Audio-Visual Research, 531 S. Plymouth Court, Chicago 5, Ill.)....274
Light-powered clock....300

MISCELLANEOUS

Armor for hunters....22
Paint-saving chemical (Maymac Co., 79 W. Grand St., Mt. Vernon, N. Y.)....103
Stilt-legged cyclist draws attention of Berliners to circus....104
Fly your boat to the fishing hole....106
Mobile traffic signal is powered by battery....108
Suspension camera nearly 10 yards long is operating in Tokyo.108
Vacuum-canned milk retains fresh taste....125
Mold-making machine cuts costs 30 percent....138
Elaborate mechanism works and works to do nothing well....139
Ivan, the retroactive inventor....140
Pump moves water in ship from side to side to minimize roll.143
Oklahoma drive-in library features curbside service....256
Bidding wheel....256

Craftsman and Shop Notes Index

FARM

Self feeder gives shelter and storage space....220
Double field gates used on farm accommodate machinery....221
Planks chock light tractor for belt work....221
Gate speeds up stock handling....241
Heavy iron floor stand steadies farm grinder....244

HOUSE AND HOME

Three sewing cabinets from single design....185
Dog bed provided by old tire....190
Auto trunk brackets used as folding table braces....194
Nails to hang pictures on wall driven with hand drill....194
Rubber hose over pliers handle prevents hand chafing....194
Night flying insects controlled by use of proper lighting....195
Shellac preserves ball bat....195
Solving Home Problems....196
Glasses stuck together....198
Removing wax from wallpaper....198
Modern table lamps....199
Clothespin used to retrieve articles....202
Converting vase into lamp base without drilling for pipe or wire....202
Stove mats protect walls and furniture tops....204
Baby's dressing table and chest made from second hand desk.204
Cotton packing in bottles removed by wood screw....204
Screening frayed at edges nailed to new support....204
Baseboard light in closet aids selection of clothes....210
Cupboard latch improvised from spring clothespin....210
Phonograph needle protected by cellulose sponge on arm....210

(Continued to page 22)

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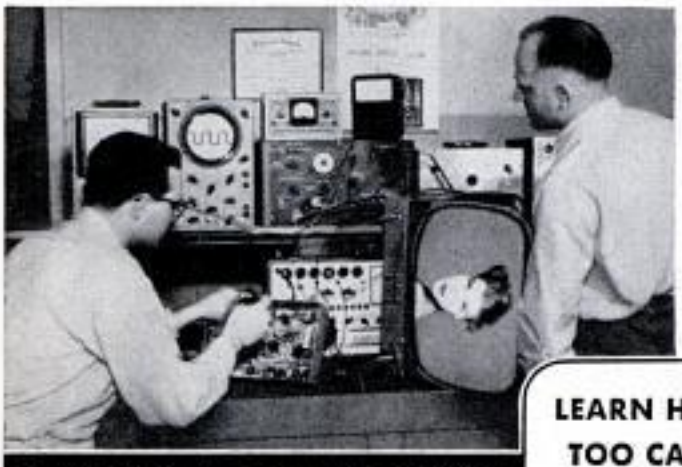

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(Continued from page 20)

Lightning bug night light....211
Inexpensive way to coat nails for use on special jobs....233
Novel blueprint lamp shade for den or workshop....240
Clinic for Homemakers....252

PHOTOGRAPHY

Don't let dusty holders spoil your negatives....195
Full-color image projector made in a few minutes....198
Air condition your darkroom....203

TOOLS

Adjustable drafting curve from hacksaw blade....194
Kinks in copper tubing removed with aid of wooden paddle....198
Grinding lathe bits of shaper....228
Internally threaded sleeves knurled on special mandrel....228
Modified portable hand router cuts accurate circles....233
Work mounted on steel balls prevents wear of centers....241
Shopping for Tools....242
New life for socket wrenches....244
Padlock tool-cord plug....244

WORKSHOP HINTS

Caliper made from broken rule....190
Jigs for holding frames needs only one clamp....190
Slotted sanding block provides better grip....190
Wheel disks for model cars are furniture gliders....198
Grooved wooden shoe polisher used as sanding block....203
Porcelain cemented on metal with glycerine-litharge paste....204
Utilizing old paintbrushes as glue applicators....210
Threading holes in plastics with regular metal-cutting taps....217
Insert washers make adjustable wobble saw....219
Heated steel plate used to temper small coil springs....219
Chamois washed in machine cuts cost and labor....219
"Rockers" support engine head to ease bench handling....228
Clock spring renews oil can....240
Pressman's nonslip finger "cot" is worn without discomfort....240
Long level improvised from straightedge....244

MISCELLANEOUS

Simple toy teaches child to differentiate shapes....190
Pull toy in eight models....191
Vapors of solvents utilized for more economical use....194
Painting over varnish or enamel with oil-base paint....198
Plan of the Month....200
Lawn spreader containing sand used to treat icy sidewalks....210
New uses for disk cement....217
Oil-drum cooler for stationary engine control temperature....221
Baffle cast in concrete chute checks drainage-ditch flow....228
Draftsman's perspective liner from yardstick....233
Glass cover protects price list....240
Pipe-joint sealing compounds....240
Coupling and extension help thread short pipe nipples....241
Grooved sawhorse permits easy cutting of building paper....245

Radio-Television-Electronics

TV Electronics Today....245
Superfidelity home phono has back-loaded cabinet....246

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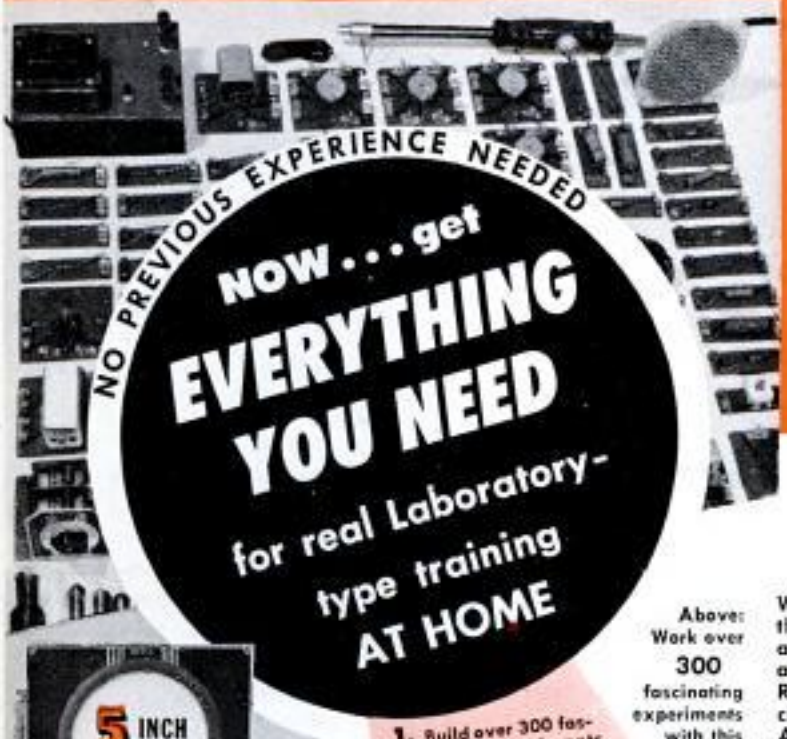

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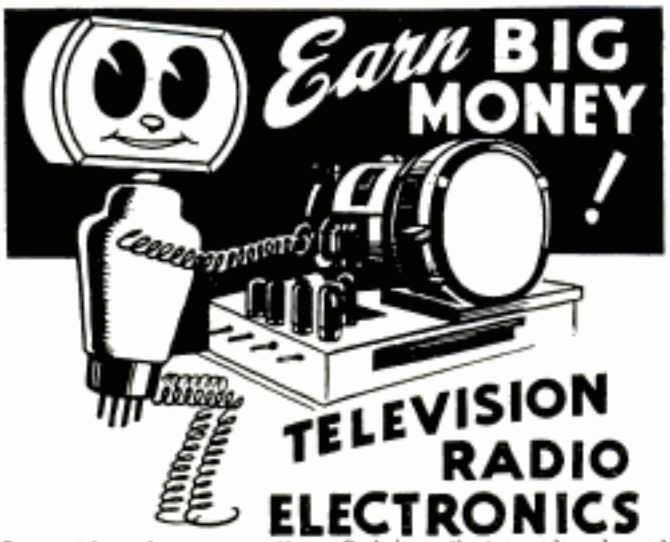

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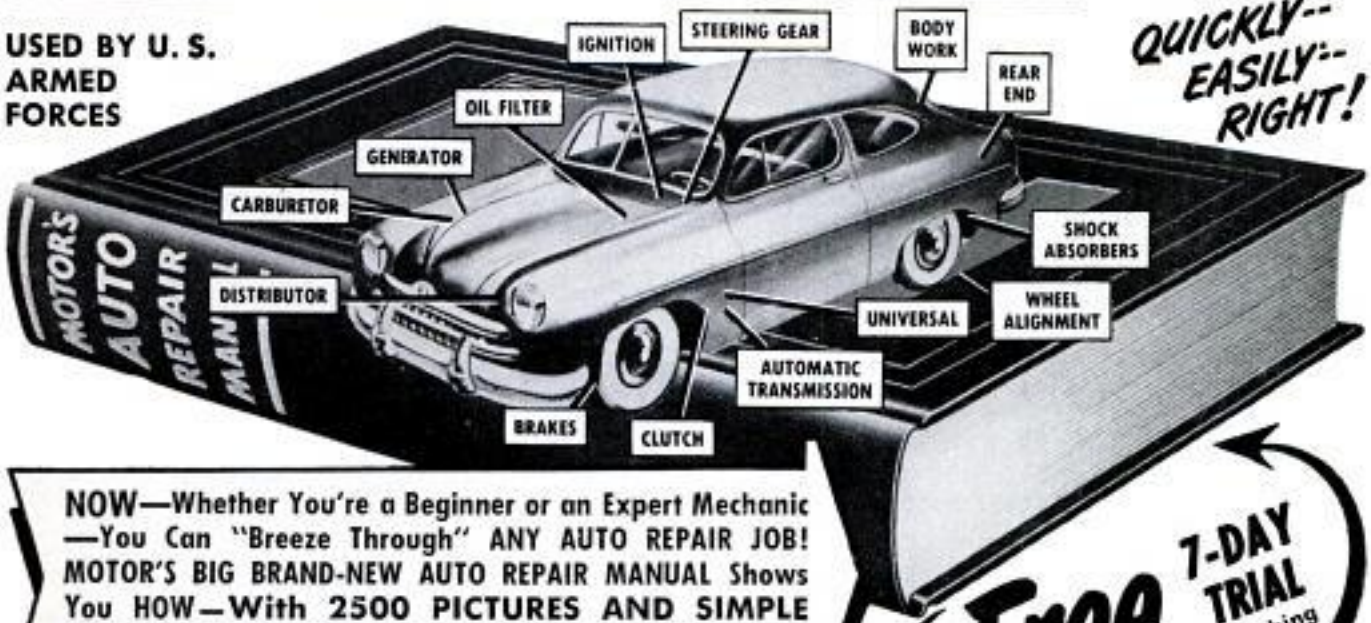

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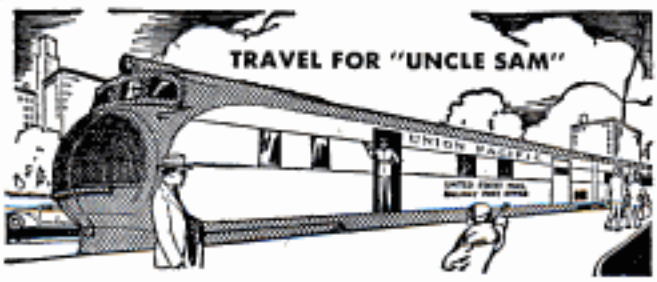

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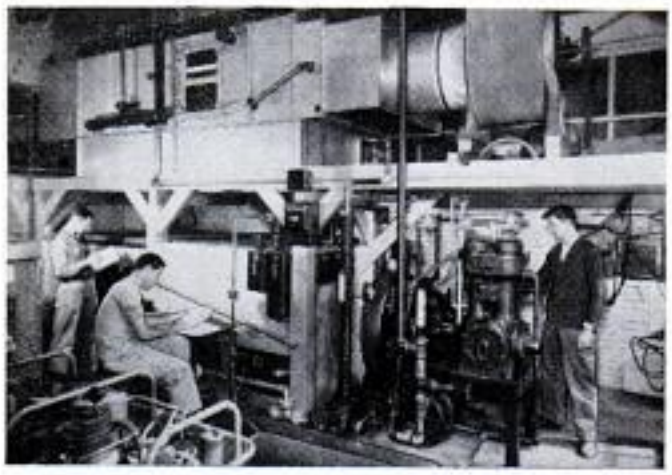

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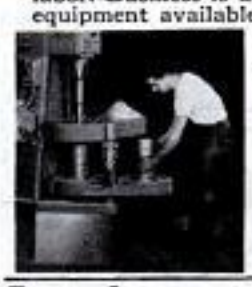

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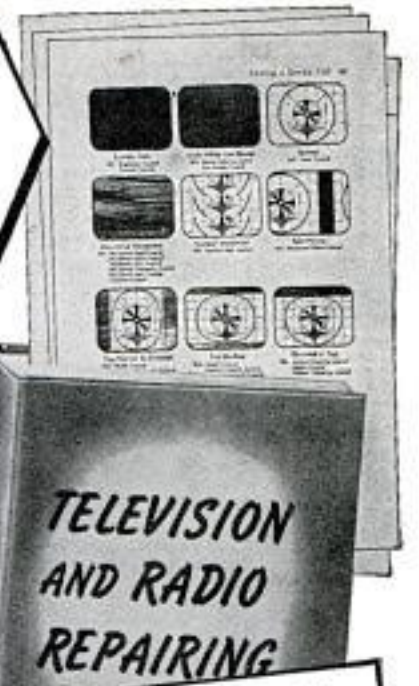

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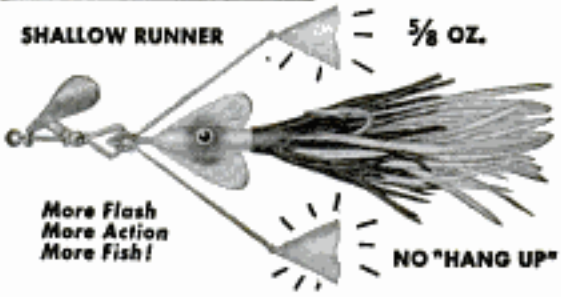

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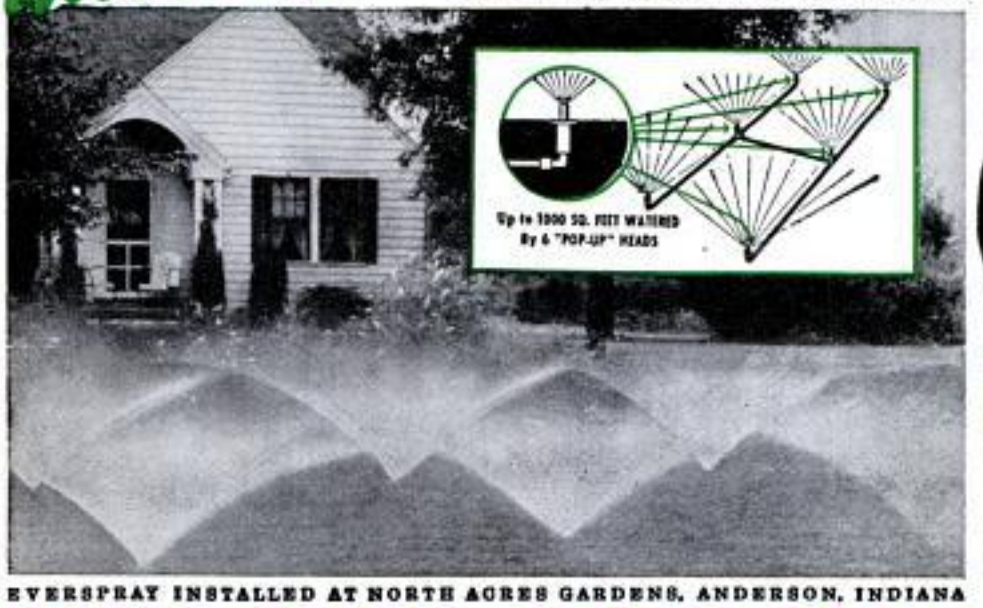

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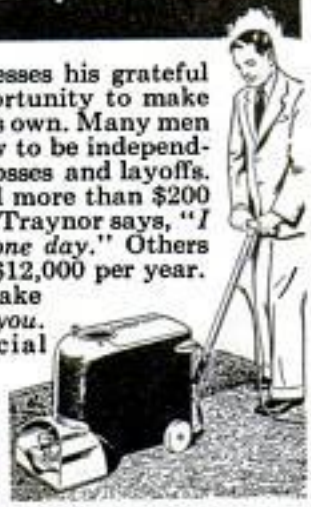

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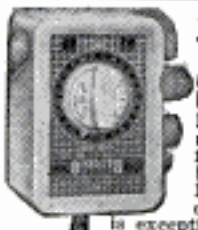

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We think we have another best seller in *Dorsey Connors' Book: Gadgets Galore!* Miss Connors has written an excellent book, hard to label except by the blanket term, "Ideas." Some of them represent the best that she has presented on her television show over WNBQ-NBC (Channel 5). Others are brand new. Altogether they make up a collection of intriguing ideas for household short cuts, homemade gifts, etc. In an ordinary wire coat hanger, Miss Connors sees: a mail caddy . . . an earring bar . . . a rack for cups . . . a beverage holder for garden parties . . . an extra shelf . . . a newspaper or book rack . . . an outdoor grill fork . . . an omelet stirrer . . . a muffin toaster. In her capable hands an aspirin tin, a stone from discarded jewelry and a little gilt paint become a Marie Antoinette pill box; while four handkerchiefs and a length of bright ribbon work into a fancy party apron. *Gadgets Galore!* is an excellent gift for any woman, whether bachelor girl or homemaker. And the handy man of the house will find much to interest him, too, in this fascinating book.

Another television star who's doing a book for us is Walt Durbahn, genial proprietor of "Walt's Workshop," a program which has a large following among home-workshop craftsmen. Walt's book, *Carpentry for the Home Craftsman*, is eagerly awaited by this group.

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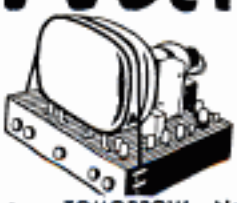

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How to Make Novelty Jewelry—126.
Working with Plastics—61: Novelties, etc.
25 Shelves You Can Make—64: Wall shelves, etc.
Novelties Turned on Lathe—62: Dishes, etc.
Projects in Plastics—112: How to use.
Inlay Pictures—Veneering—63.
Whittling and Wood Carving—65: Methods.
Action Toys—66: 21 easy-to-make toys.
Marionettes—113: How to make and use.
High Flying Kites—67: How to build.
Windmills & Weathervanes—68.
Lamps in Wood, Metal, Plastic—69: Several.
Bows and Crossbows—115: How to make.
Playground Equipment—73: 8 projects.
Metal Craft—28: Simple instructions.
Weaving and Recaning—37: Full details.
Gem Cutting—42: How to cut and polish.

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Successful Wood Turning—32.
How to Read Blueprints—71: Tells you how.
Metal Turning Lathe Kinks—99.
Operating a Metal Turning Lathe—100.
Heat Treating and Case Hardening—102.
Working with Glass—103: Cutting, etc.
Using Basic Tools—120: Tips and hints.

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Rewinding & Servicing Electrical Motors—75: Repairing and rewinding motors.
Electrical Appliances, How to Fix—111.
Electromagnets & Solenoids—44.
Transformer Construction—41: Directions.
The Boy Electrician—43: Five projects.
Soldering & Brazing—17: Tells how to.
Arc & Spot Welders—5: How to use & build.
Build Your Own Relays—123: Instructions.
Home Burglar Alarms, Secret Locks and Time-Setting Systems—128.
Welding with Arc and Gas—134: Tips.

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Automobile Kinks and Shortcuts—10.
Building Trailers—Small Teardrop and Utility—27: Can be built in your spare time.
Motor-Driven Midget Car & Scooter—34.
Curing Auto Electrical Troubles—95.

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Rowboats, Bicycle Boat, Small Dinghy—83.
Small Sail Boats—84: For young sailors.
Two Outboard Runabouts—85: 14 ft. & 12 ft.
Build Your Own Canoe, Kayak, Surfboard—30: Complete building details.
Fast Class-E Ice Yacht—22: Build your own.

GARDENING HELPS

Lawn and Garden Equipment—124.
Handy Farm Implements—114: How to build.
Tractor Attachments—116.
Backyard Gardening—39: Helpful hints.
Lawn & Garden Novelties—72: Easy to build.
Trellises, Pergolas, Fences—76.
Lawn & Garden Furniture—77.
Colored Concrete Garden Furniture—6.
Farm & Garden Tractors — 8: How to build.

PHOTOGRAPHY

Home Movie Equipment—118: How to use.
Photo Lighting—119: Helpful information.
Photo Enlargers—1: Complete plans.
Photo Printers & Dryer—25: Describes three.
Photo Darkroom Equipment—96.
Picture Projector, Trick & Table Top Photography—97: Tips on how to make.
Photo Kinks—98: Money-saving ideas.

FURNITURE MAKING

Furniture Upholstery and Repair—122.
Rustic Furniture—18: How to build.
Children's Room Furniture—51.
Book Ends—52: Good selection from 10 designs.
Small Tables—54: Interesting styles.
Desks—53: Many varied designs.
Smoking Stands—56: Seven designs given.
Plain & Novelty Wood Finishing—40.
Book Cases—59: Eight designs.
Magazine Racks—49: Ten attractive racks.
Clock Cases—50: Several types.
Serving Trays for Every Occasion—53.

MISCELLANEOUS

Cleaning Formulas—11: Make your own.
Re-Silvering Mirrors—70: How to do it.
How to Build a Concrete Block Machine—110: Make your own block machine.
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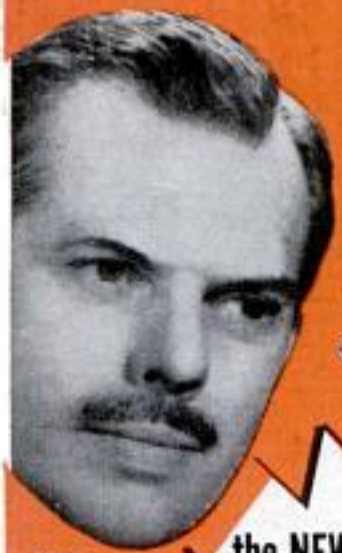

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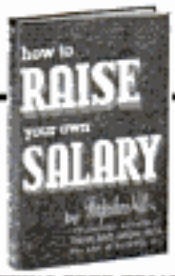

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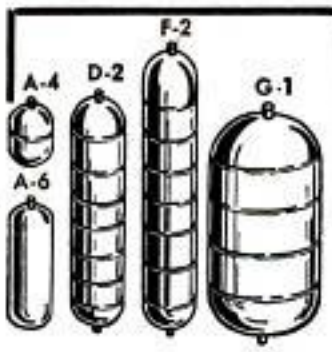

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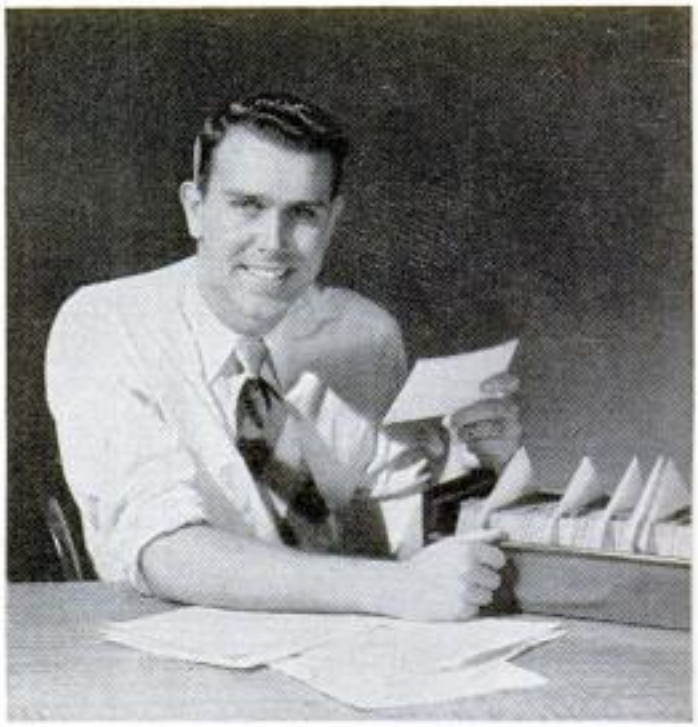

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. . . and cuts costs in half! This photo was snapped during a shirt-wrapping race between two girls at Kent Stores, the world's largest laundry and cleaners.

With a Bostitch stapling plier and paper bags, the girl at left was able to wrap 4 times faster, averaging better than 3 packages a minute.

The other girl wrapped with paper and tape, the method Kent discarded. For her to draw the tape, tear it, position it, and press it—while the first girl did the same fastening job with a simple click-click of the Bostitch stapling plier—was hardly a race at all! With a 4 to 1 speed advantage, the new wrapping method cut time-and-material costs in half.

Stapling is more secure, looks neater, is immune to heat and humidity. Usually the delivery slip is attached with one of the same staples that *close* the bag.

Over 800 kinds of Bostitch staplers trim time and costs on *thousands* of fastening jobs. To help you fit the right stapler to the job, 325 Bostitch Economy Men work out of 123 cities in the U. S. and Canada.

Check over your own fastening methods with your nearest Bostitch Economy Man. There's no obligation. He'll be glad to tell you honestly if and how stapling can save you money.

Look up "Bostitch" in your phone directory or write us.

Fasten it better and faster with

BOSTITCH®

STAPLERS AND STAPLES

BOSTITCH, 542 Mechanic St., Westerly, R. I.

☐ Would like an Economy Man to analyze our fastening problems.

☐ Would like to have FREE BULLETIN telling how stapling can cut costs on fastening jobs checked below.

I want to fasten:

☐ packages ☐ plastics ☐ wood ☐ leather
☐ rubber ☐ light metals ☐ fabric ☐ cartons

Name _____

Company address _____

City _____ *Zone* ____ *State* _____

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It's here...

fingertouch **Electric**

FREE! Send for big new catalog of the complete Evinrude line for '54. Striking full-color action pictures of all models. Write for it today!

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Starting...

on America's finest outboard motor!

Skipper, step aboard! Slip behind the wheel... press the starter button... shift gears and streak away... *all without going near the motor!* Now a finger touch whirls your Big Twin to life, as easily and surely as starting your car. Now *full remote operation* becomes a reality! With Evinrude electric starting and Simplex controls you lounge in comfortable forward seat in complete command. You start your motor—choke it—shift it—"gun" it—troll it—idle it—all with finger tip ease! Anyone—your wife or youngster—*anyone* can start and run the new electric Big Twin.

Enthusiasts have looked forward to the time when electric starting would do for outboard boating what the electric starter did for the automobile. Now it's here—from Evinrude—giving you handling ease to match expensive inboard runabouts and cruisers—*at modest cost!*

SEE YOUR EVINRUDE DEALER! Look for his name under "Outboard Motors" in your phone book. See the complete line of Evinrudes for '54. BIG TWIN, 25 HP,* in electric starting and standard models. *Super* FASTWIN, 15 HP, most versatile performer in its field. The revolutionary FLEETWIN *Aquasonic,* 7.5 HP, whisper quiet, smooth as sailing! LIGHTWIN, 3 HP, with famed Fisherman Drive. For free catalog write **EVINRUDE MOTORS,** 4277 N. 27th St., Milwaukee 16, Wisconsin.

IN CANADA, Mfd. by Evinrude Motors, Peterborough

*All power ratings are O. B. C. certified brake HP at 4000 R.P.M.

Evinrude BIG TWIN

with Electric Starting

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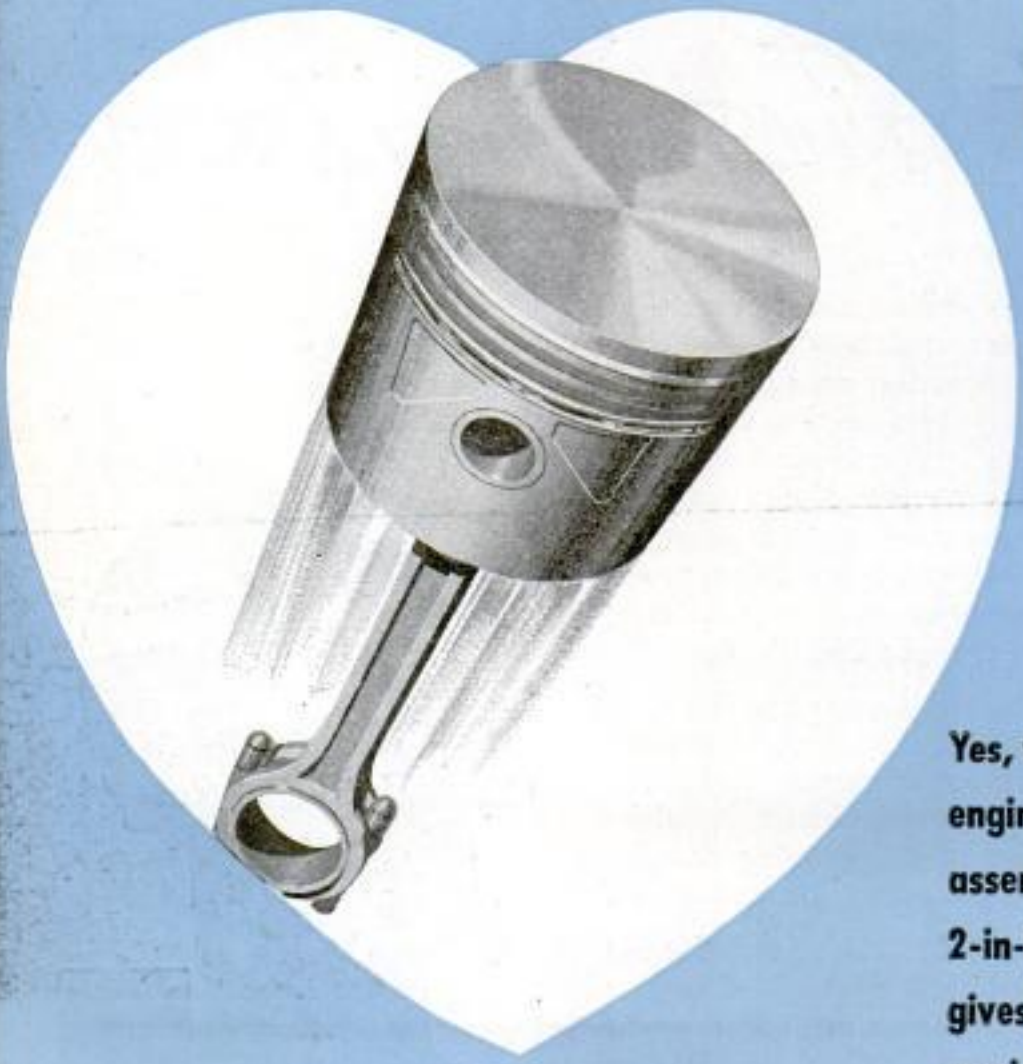
Chrome

is where the heart is!



Yes, the heart of any engine is the piston and rod assembly... and Perfect Circle's 2-in-1 chrome piston ring set gives complete protection against wear where the power is produced!

No chrome piston ring set can really give *complete* wear protection in the "heart of the engine" unless it provides a chrome-plated TOP ring, as well as a chrome-plated oil ring. For the top ring operates where heat is highest, pressure is greatest, and lubrication is poorest!

That's why Perfect Circle's 2-in-1 chrome piston ring set has established new standards of ring performance . . . why it seals compression and controls oil for *over twice as long as old style sets!* And only 2-in-1 furnishes an alternate HiPressure spring with each oil ring, for positive control even in badly worn engines!

Perfect Circle Corporation, Hagerstown, Indiana;
The Perfect Circle Co., Ltd., Toronto, Ontario.

In the 2-in-1 set, solid chrome plating on these ring surfaces resists wear over entire area of ring travel. Cylinders, pistons, and rings are assured double life.

Perfect Circle

PISTON RINGS • The Standard of Comparison

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POPULAR MECHANICS
FEBRUARY 1954
WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 101 NO. 2

North American Aviation photo

Dramatic night scene shows rocket engine being fired in horizontal position at test stand in California

GUIDED MISSILES ON LEASH

By Thomas E. Stimson, Jr.

ROCKET MOTORS powerful enough to drive a space ship to the moon can receive their trial runs in some enormous test stands recently built into the side of a granite ridge near Edwards Air Force Base in California.

Moon rockets aren't contemplated this year or next, of course; the purpose of the new experimental rocket-engine test station is to prooftest the motors, fuel systems and other components of big guided missiles being developed for the Air Force.

"If a rocket motor goes bad after a missile is launched, there's no way of learning what caused the failure," explains Richard F. Gompertz, chief of the Edwards Rocket Branch. "But if a new kind of motor malfunctions while it's on the test stand, the trouble can be found and corrected."

Today, the design and manufacture of guided missiles is one of the largest, and most secret, industries in the United States. The Army, Navy and Air Force are making expenditures at the rate of more than a billion dollars a year. The new Edwards installation is only one of more than a half dozen research centers including those at Banana River, Fla., Redstone Arsenal, Ala., Point Mugu and Inyokern, Calif., and White Sands, N. M.

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Some of the rocket motors that are to be tested at Edwards are so powerful that extraordinary precautions must be taken against blast and possible explosion. Even the most ordinary of liquid rocket fuels have greater energy than TNT.

At Edwards, the main machine shops and laboratories are located in a "safe" area on the far side of some rolling hills that serve as a "generally safe" buffer zone. Small machine shops in the "very hazardous" area adjacent to the test stands have roof and wall panels that are attached to their steel frames by shear bolts. If a violent explosion from a test stand strips the roof and sides from a building the panels can be brought back and reattached to their frames.

In addition to sirens that warn research personnel when a firing is scheduled, traffic on the service roads is brought to a halt by barrier gates and by traffic lights.

The only people allowed in the "very hazardous" zone while a big motor is being tested are the technicians who are stationed inside a million-dollar control center that is partly buried in the rock between the two test stands. This building has thick reinforced double-concrete walls separated by an air space as a precaution against explosions that could level an ordinary structure. From inside the station you can watch a firing by means of periscopes that project through the roof, or from viewing ports that consist of five layers of armored glass separated by air spaces. During tests of a high-thrust motor these ports are covered by steel plates.

The test stands themselves project out from the top of the granite cliff. Below them are the concrete spillways that serve as flame deflectors and that also channel away any propellant that spills from a stand. When a rocket motor is to be fired it is mounted in a thrust cradle built into the stand. It can be turned to various angles to simulate various attitudes of flight. Fuel tanks for thousands of gallons of WALC (water alcohol), LOX (liquid oxygen) and other propellants are located in and behind the stands, as is a high-pressure water-deluge system that can flood a test stand if an uncontrolled fire breaks out.

Guided missiles comprise a large and diversified family of aerial "vehicles," not all of which are powered by rocket motors. Some are true rockets, some are actually pilotless high-speed aircraft powered by pulsejet, turbojet or ramjet engines. About the only things that all guided missiles have in common are a warhead and a robot-guidance system of some kind.

Powerful exhausts lift the Douglas Nike skyward in test firing. This missile is a surface-to-air type

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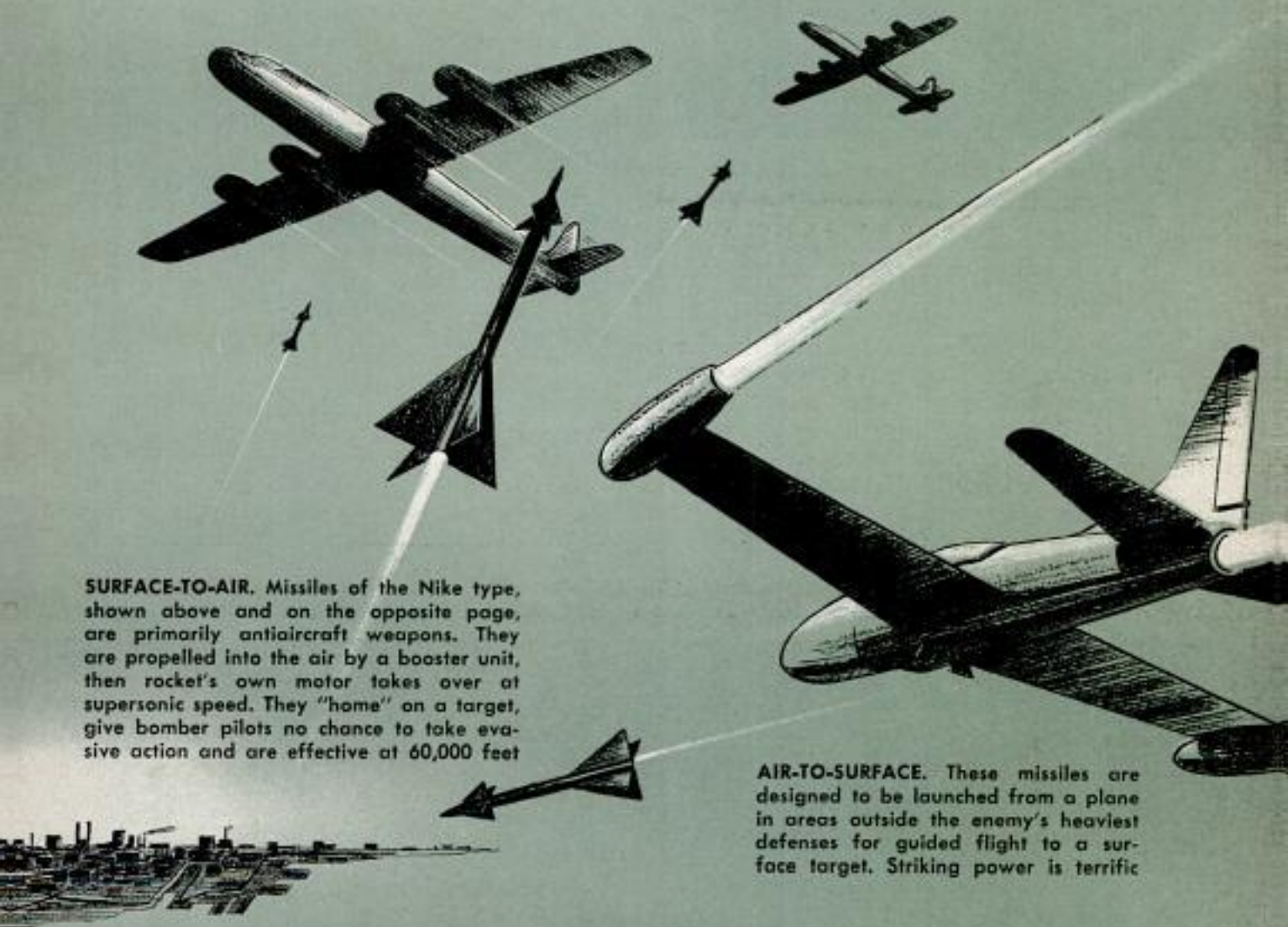
Four Basic Types Of Guided Missiles

SURFACE-TO-SURFACE. The Matador above may be fired from a roadable launcher as it needs no special launching equipment of permanent type. It is aimed at surface targets and uses a rocket for the take-off and turbojet engine in flight



SURFACE-TO-AIR. Missiles of the Nike type, shown above and on the opposite page, are primarily antiaircraft weapons. They are propelled into the air by a booster unit, then rocket's own motor takes over at supersonic speed. They "home" on a target, give bomber pilots no chance to take evasive action and are effective at 60,000 feet

AIR-TO-SURFACE. These missiles are designed to be launched from a plane in areas outside the enemy's heaviest defenses for guided flight to a surface target. Striking power is terrific

AIR-TO-AIR. These guided missiles are expected to replace guns and the small rockets now carried by defensive aircraft. They "home" on targets by built-in radar sets and will revolutionize future air battles

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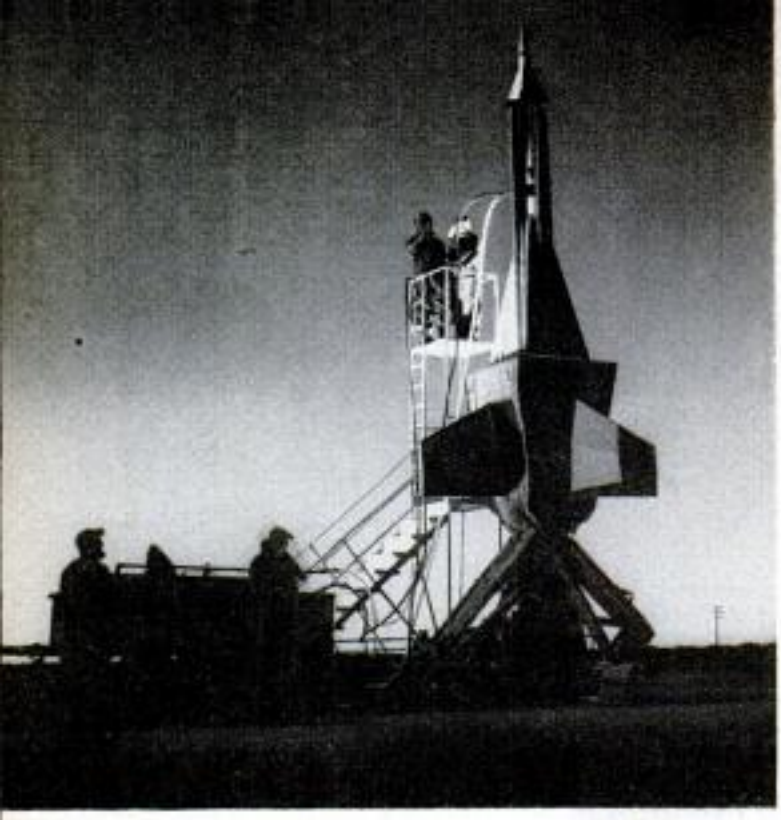


Being fueled for a dawn launching, the Nike missile is handled by men (at top) wearing antiacid gear

Surface-to-air missiles (SAM) eventually will make up our last line of defense against enemy bombers. They are antiaircraft rockets fired from ground launchers and usually are propelled into the air by a booster unit that falls away when its power is exhausted. Then the rocket's own motor takes over and drives it at supersonic speed. These missiles "home" on bombers so rapidly that the pilots have no time to take evasive actions. The best known of the current SAM missiles is the Nike, reputed to have a range in excess of 30 miles and the ability to knock out a bomber as high as 60,000 feet. Nike battalions, now being trained, will augment our radar-directed Skysweeper antiaircraft guns around important areas.

Air-to-air missiles (AAM) soon may replace the small rockets, now carried by defensive aircraft, that must be aimed to intercept an aerial target. The new missiles do their own aiming, once they have left their mother aircraft, and they home on their targets by means of built-in radar systems.

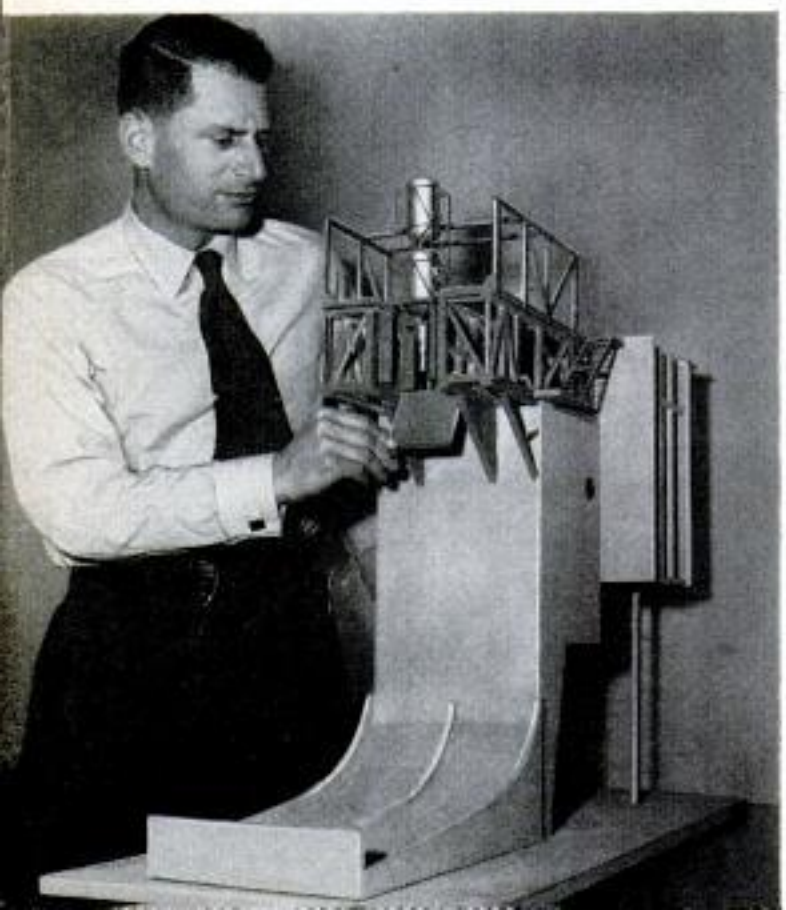
Surface-to-surface missiles (SSM) include rockets fueled with solid or liquid propellants and that have ranges of from a few to a few hundred miles. Various types of pilotless aircraft can go farther. In a general way, the short-range missiles are comparable to artillery and the longer-range missiles will do the jobs now assigned to bombardment aircraft.

The Army's big Corporal is an example of an artillery type of rocket that has been developed to the stage where guided-missile battalions are now being trained to fire it.

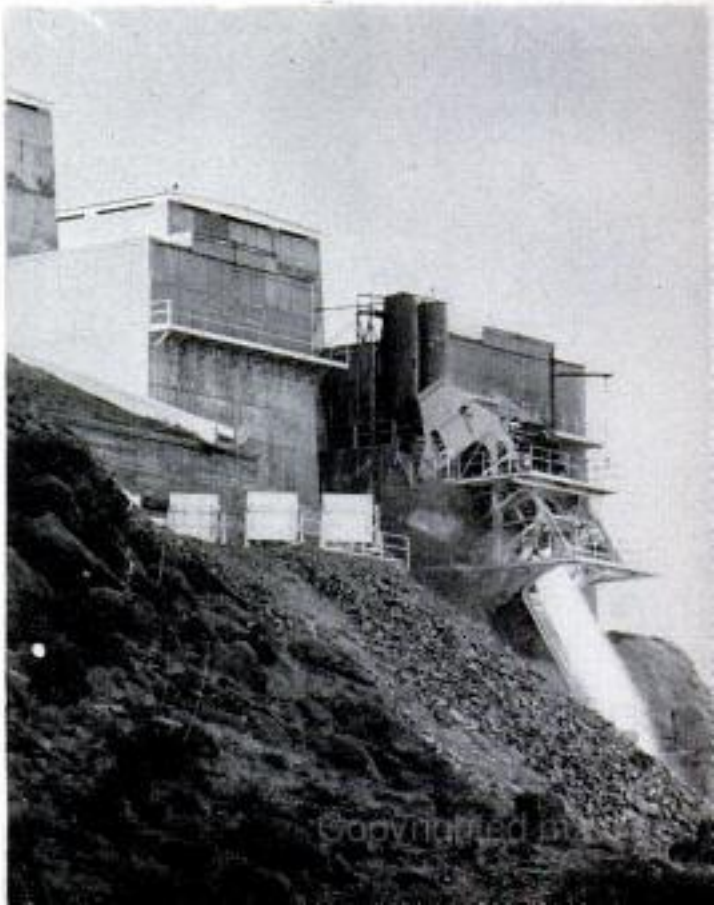
One of the goals in this new kind of armament is to develop a true intercontinental guided missile. By definition such a missile should be able to carry a heavy warhead to a selected target as far as 4000 miles away. Undoubtedly, the only kind of warhead that a transoceanic missile would carry would be an atom bomb because of the tremendous cost involved in the project.

Missiles like this have existed on paper

Richard F. Gompertz, chief of rocket branch at Edwards Air Force Base, with missile test stand model



Spillway shown in model at left is designed for the 500,000-pound thrust (below) of a missile in stand

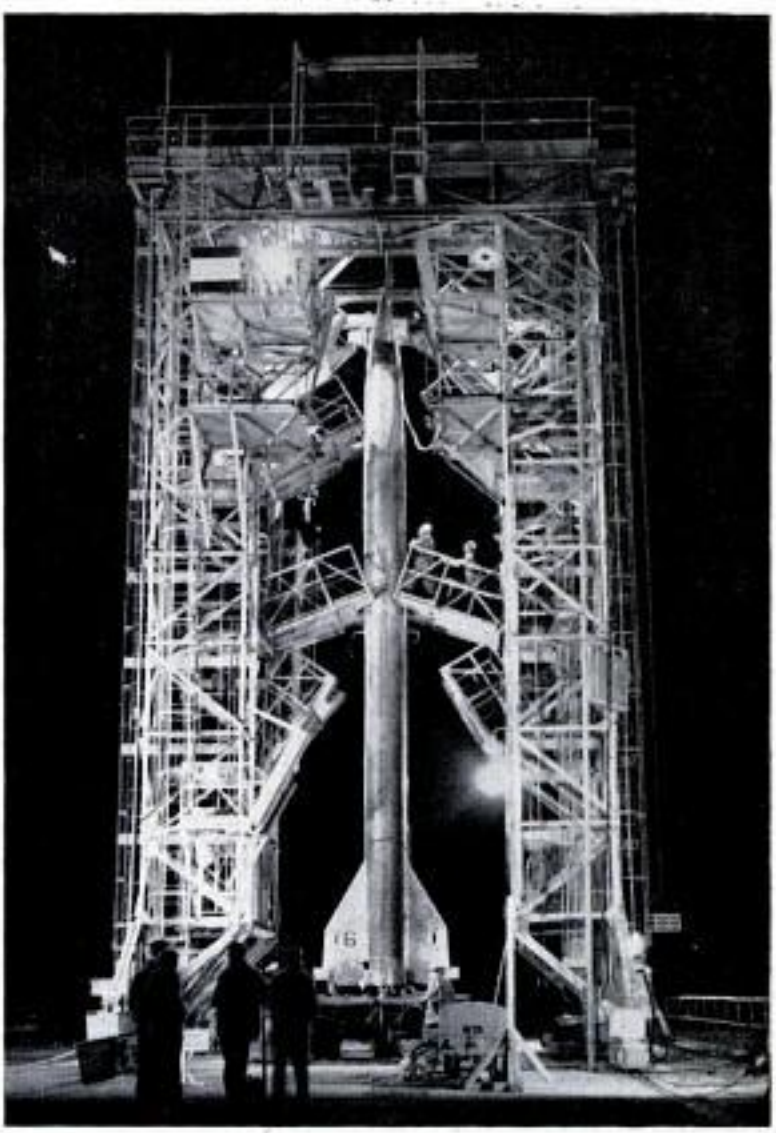


for some time and by now some of their components have been tested. Northrop's Snark project is in this long-range category. Presumably the Snark is an uninhabited bomber having transsonic or supersonic speed and equipped with a guidance system, possibly using automatic celestial navigation, for steering itself direct to its target.

There are many advantages in using a guided missile to do the job of a bomber. A missile doesn't carry a human crew nor does it have to make a return trip. All the weight and space now devoted to landing gear and to crew safety and crew comfort can be dispensed with. Training schools for crews are no longer needed. An uninhabited missile can be built cheaper than can a comparable aircraft, uses cheaper engines and can be launched from a small unimproved field.

On the other hand, a missile can never return to haul another load of explosives against an enemy. The biggest difficulty of all, however, is in devising a sensing system and brain to take the place of a human crew. This problem is being solved, slowly, though it is complicated by flight conditions including the extremely high temperatures that

(Continued to page 276)



Elaborate scaffolding is required for launching of Viking high altitude research rocket at the White Sands Proving Ground, N. M.

Engineer, left, is ready to throw switch in control room at Edwards which will fire experimental rocket

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Concrete block toe wall, which is helping an Illinois farmer control erosion, was first modeled in toy blocks

Toy Blocks Teach Farm Construction

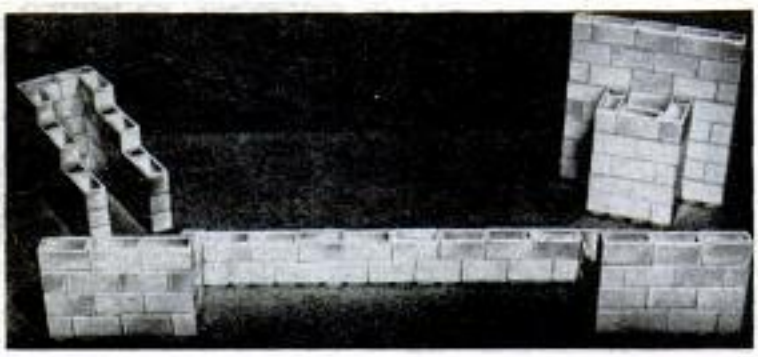
TOYS CAN DO a man's work on the farm. That conclusion was reached one Christmas day by Leland A. Ford of Lawrenceville, Ill., as he watched some children playing with small plastic blocks.

Ford, a U. S. Soil Conservation Service engineering aide, had been searching for a simple method of showing farmers how to build concrete masonry structures. Because technical details on a blueprint were difficult for some men to understand, ordinary plans didn't seem to be the answer. But the toy building blocks were.

Concrete and masonry structures are often needed on farms to control water runoff and erosion. Because some farmers aren't accustomed to building such structures, they need the assistance of Soil Conservation Service technicians.

Ford concluded that a model of a structure—a drop spillway, a toe wall or a box inlet—made from the blocks would give the farmer more help than any design or blueprint. The toy blocks are scale models of commercial concrete blocks. They are interlocking, make a rigid model and are available at most toy counters.

Engineering aid of Soil Conservation Service explains construction details to farmers. Below are models of typical structures



As a result of Ford's idea, the five farmer-directors of the Lawrence County Soil Conservation district purchased a set—400 full-size blocks and 50 half-blocks. The blocks worked out so well that directors of six other districts in Illinois have bought sets for their own technicians.

Use of the plastic-block models has cut in half the supervision time of technicians, who no longer need to remain on hand while the farmer begins construction. Ford, for example, makes a model of the structure and explains it to the farmer. In some cases he leaves the model for a few days while the farmer builds the structure. If it is a reinforced structure, he goes back only to show him how to place the steel.

The method caught the interest of farmers immediately and has been credited with a sharp increase in the number of erosion and water-control structures built in the Wabash Valley. In 1949, a total of 15 structures were completed by farmers. In 1951 the toys were put to use, and the following year the number jumped to 43, and in 1952 it rose to 84.

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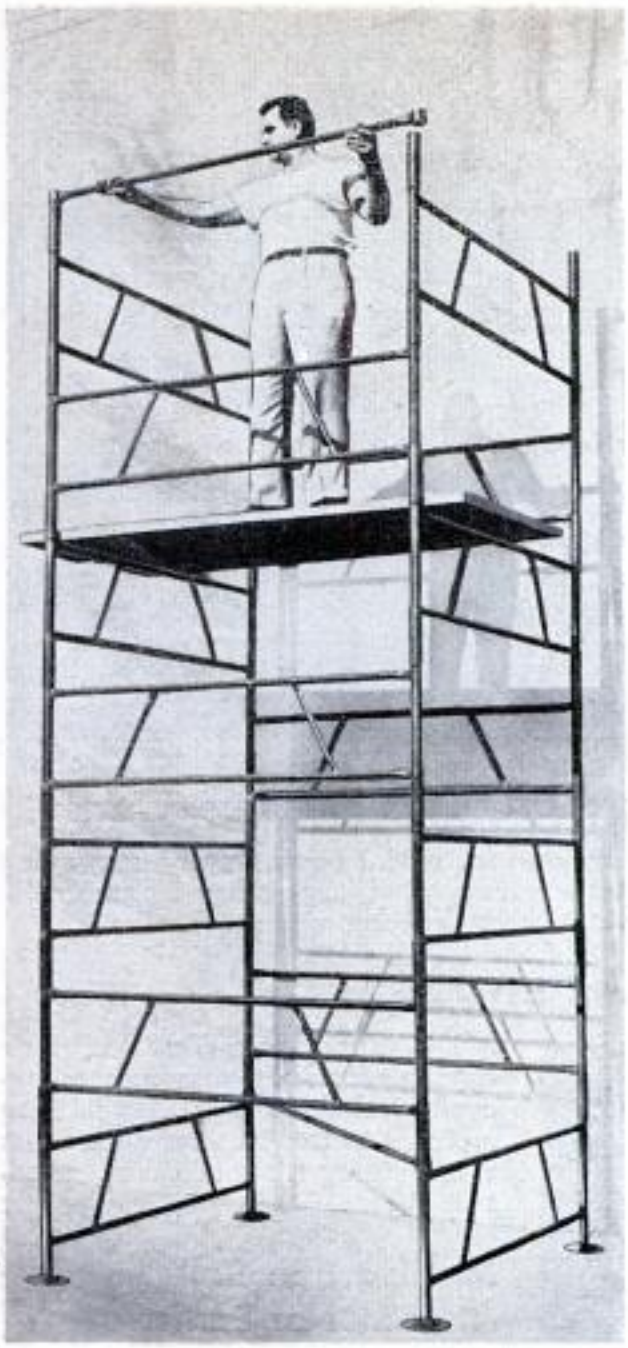
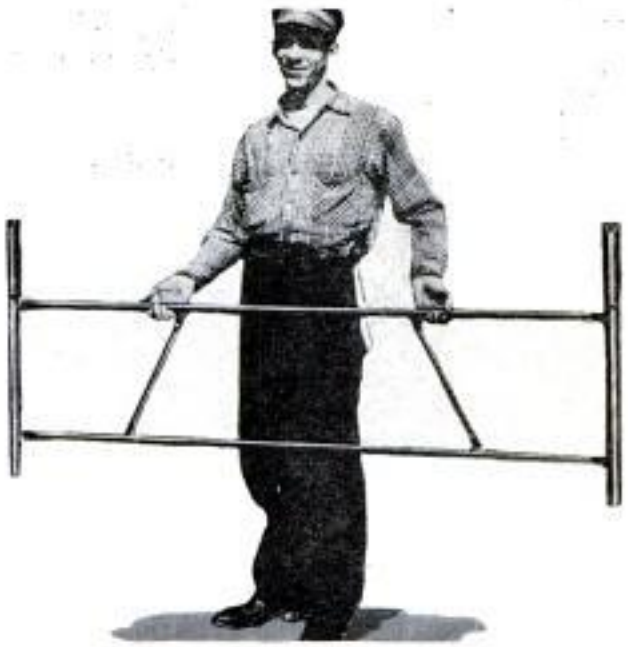
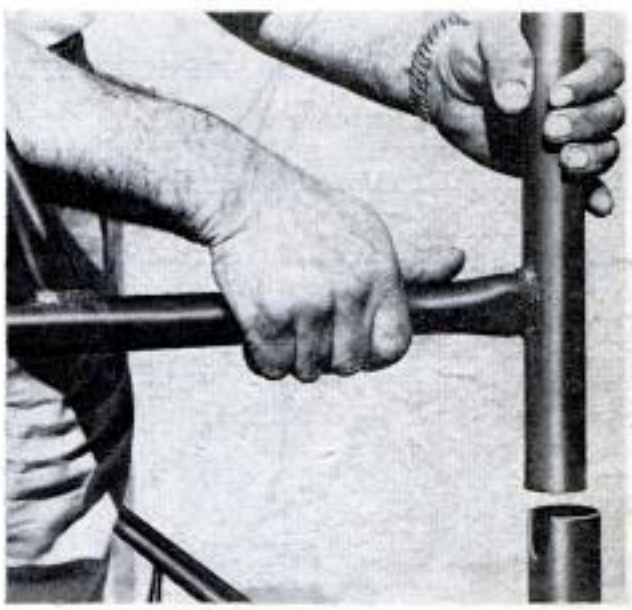




Above, 24-pound frame is basic unit of scaffolding. They slip into each other, below, to form tower, left



Lightweight Scaffolding Goes Together Without Nuts or Bolts

Slipping together without fasteners of any kind, a lightweight tubular-steel scaffolding is said to cut erection time and labor in half. There is only one basic part to the system—a five-foot frame with two diagonal braces. These frames are stacked to form a hollow square. All are interchangeable. The lower ends of the vertical member slip snugly into the upper ends of the vertical members beneath them. Various other accessories are available, including cross braces, sidewalk frames, base plates, outriggers and putlogs. Each basic frame weighs only 24 pounds.

Paint-Saving Chemical

Stored paint is kept fresh and smooth for months with a chemical which prevents wasteful skin formations. Colorless, it will not affect even delicate pastel shades, and does not change the drying rate of the paint. Enamels, varnishes, putty and calking compounds also retain their original qualities if the chemical, an antioxidant, is mixed with them.

Fire Recovers Oil

Exhausted oil sands are set afire in a method to recover some of the 4,000,000,000 barrels of crude oil that cannot be removed by normal methods. Heat from the underground fire thins the oil so it can be pushed out of the well by air pressure. Laboratory tests have shown less than 15 percent of the oil is actually consumed by the fire. Field tests are now underway in Oklahoma.

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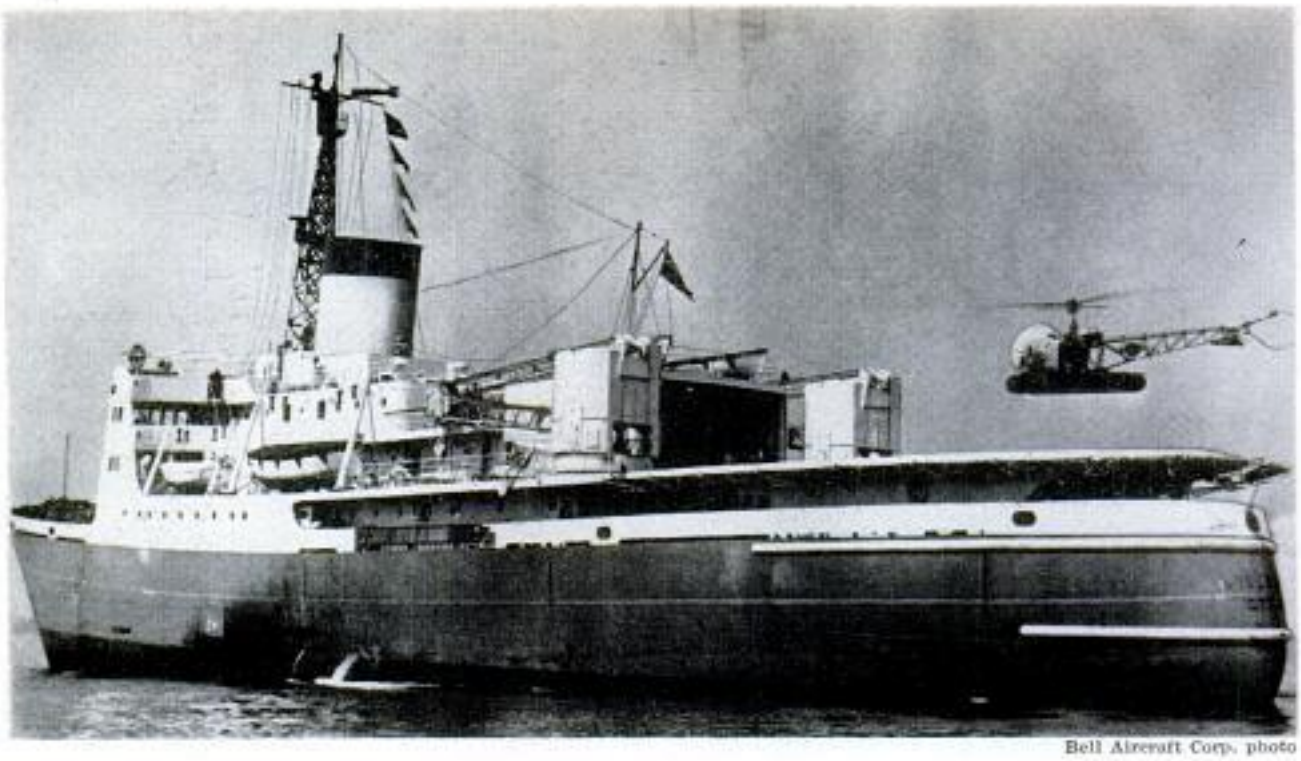

Bell Aircraft Corp. photo

Icebreaker Carries Helicopters for Survey and Rescue Work

Two Bell helicopters will operate from a specially built hangar deck on the new Canadian icebreaker, *d'Iberville*. They will be used for aerial photography, surveying and rescue work, as well as to guide the ship through dangerous ice masses.

Stilt-Legged Cyclist Draws Attention of Berliners to Circus

You can follow a West Berliner's example if you have a high motorcycle and short legs. Advertising a circus in the city, he wore stilts while riding his more than twice-size "bike."

Massive Iron Ball At Center of Earth

If you could sink a shaft to the center of the earth, a core of solid iron would be found there, according to Dr. J. A. Jacobs of the University of Toronto. The solid core begins at a depth of 3100 miles and is surrounded by a thick layer of hot molten iron. It is believed that solidification occurred from the center outward and that the molten metal remained in that state due to the insulation above and below. As the earth cooled, the rocky layers on the outside solidified, not from the surface of the earth but at the bottom junction between the liquid mantle and the iron core. Earthquake waves had indicated previously that at least part of the earth's core is liquid because no transverse waves pass through the center of the earth.

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Geese enter a cotton field. Each will likely find an individual row and work across field, nipping weeds

"Field Hands" With Wings Keep Cotton Field Clean

Cotton and geese go together in New Mexico's Pecos Valley, where 30,000 feathered workers clean the Johnson grass from cotton rows. Shade is placed at one end of a field, and water at the other to keep the fowl moving back and forth along the rows. The geese love the grass but have no taste for cotton plants, work from dawn to dusk and do a cheaper and better job than manual labor. One to three geese per acre are required in fields mildly infested with Johnson grass; cultivation controls other weeds and grasses. In near-by Mesilla Valley, a thriving business has sprung up in dressing and quick-freezing the birds for market, but most Pecos Valley farmers hold their geese over from one season to the next. As one farmer explained it, "I'm not one who enjoys eating his hoe hands."

Prize "hoe hand" is exhibited by Artesia grower.→ Weeders are lighter, more active than barnyard type

Japanese Telephone Cord Reel Prevents Line From Snarling

Telephone cord is kept tangle-free by a spring-wound reel inside a telephone holder. The telephone is simply placed on the holder, and the cord to the handset wound around the reel. The cord unreels when the telephone is used and snaps back into its container upon the completion of a call. The device is manufactured in Japan.

Smaller and 110 pounds lighter than previous models, a Westinghouse direct-current arc welder owes its light weight chiefly to the use of aluminum instead of copper coils in the transactor unit, which controls voltage and current.

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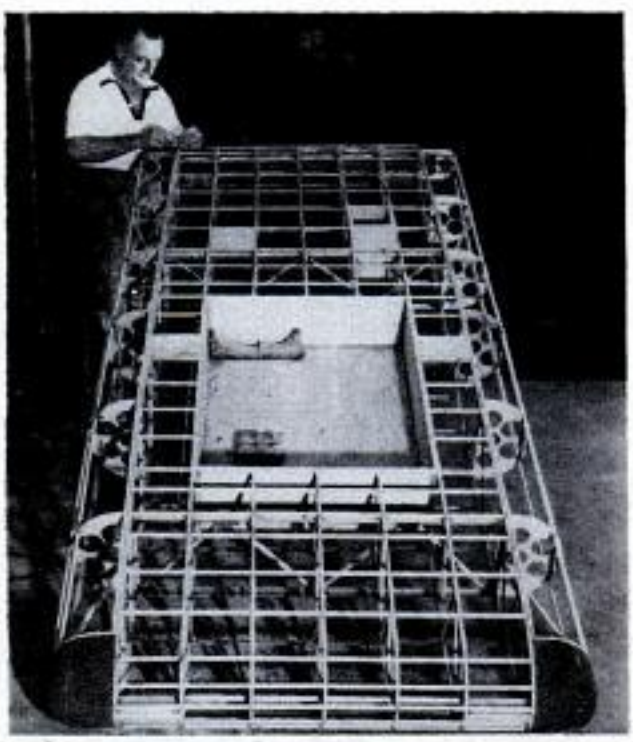
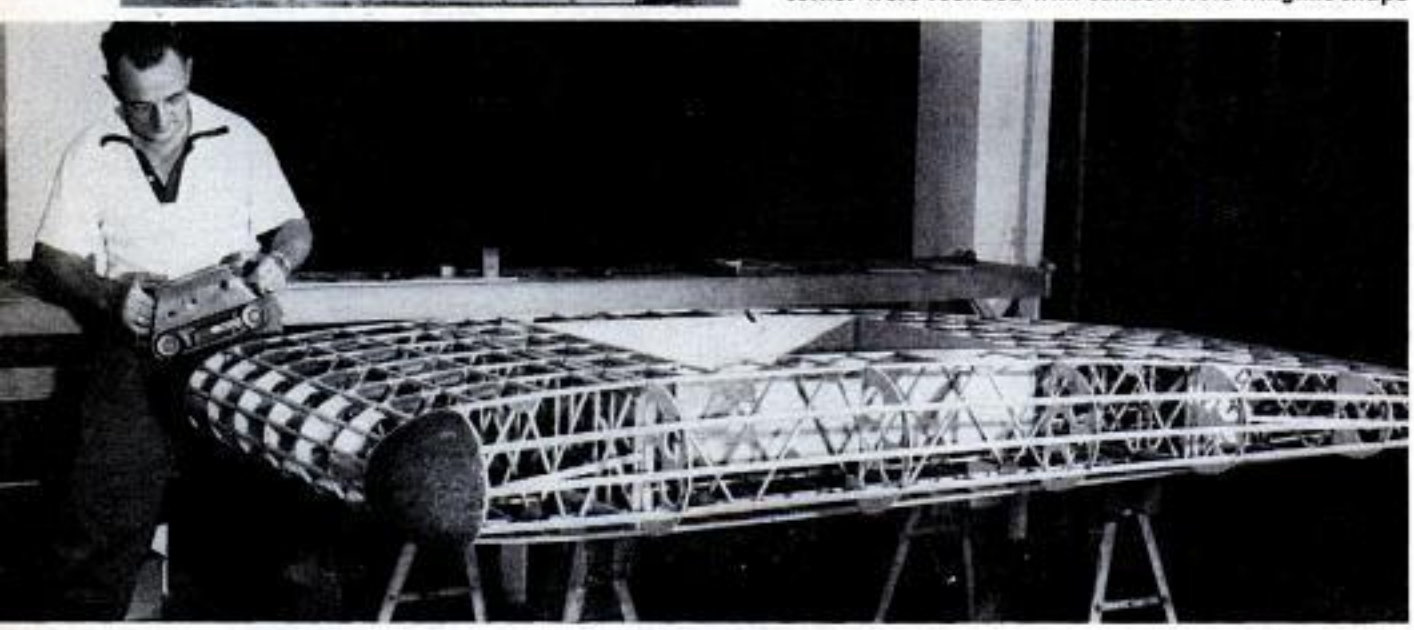
Boat is quickly detached from plane. Shaped like an airplane wing, it provides added lifting force in flight



FLY YOUR BOAT to the FISHING HOLE

Strong, lightweight structure was made from quarter-inch-square fir ribs and marine-mahogany plywood bracing sections. Below, cork blocks glued to each corner were rounded with sander. Note winglike shape



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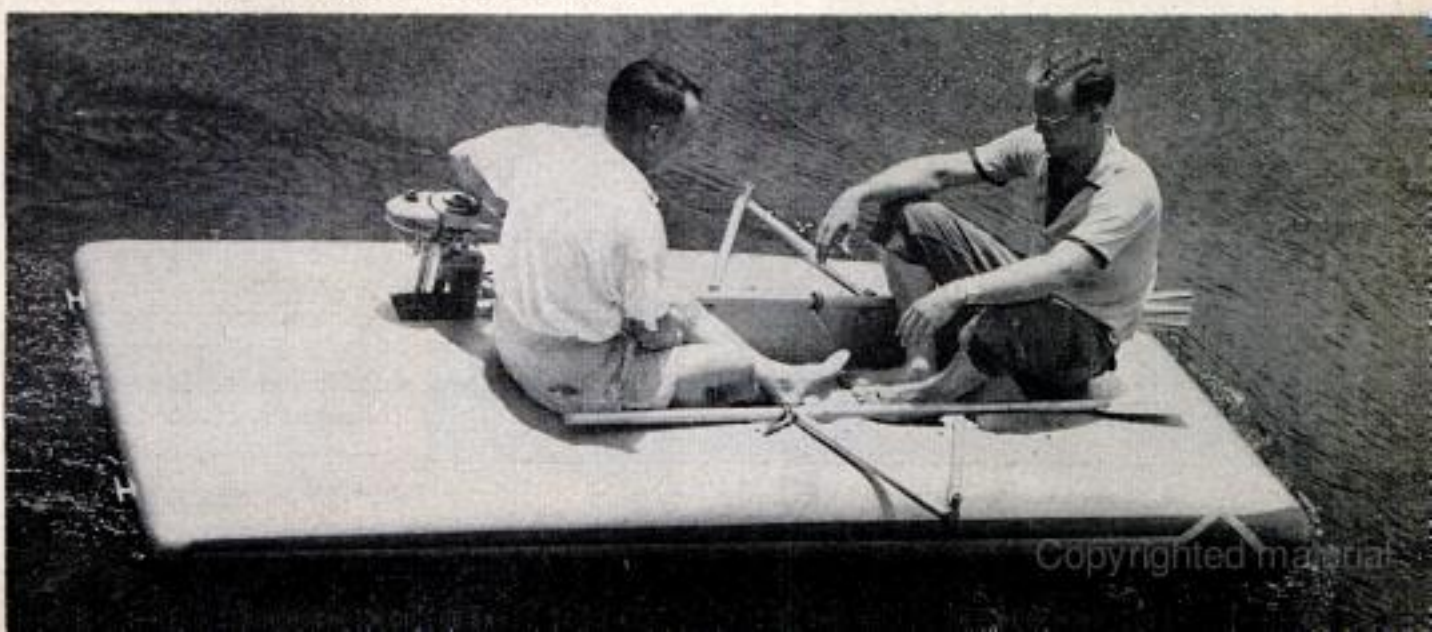
Highly maneuverable, boat weighs only 90 pounds complete with small motor and collapsible aluminum oars

WITH A streamlined motorboat slung beneath his Luscombe seaplane, Florida doctor Benjamin Bond swoops down on a favorite fishing spot minutes after leaving his office. Bond built the boat in the shape of an airplane wing. As a result, it offers minimum drag and provides added lifting force when the plane is in flight. Resting on the two main stringers that hold the pontoons, it is attached firmly fore and aft to the main float brace. The framework is built of thin lightweight fir strips, stapled and glued into place. Three-ply marine-mahogany plywood supporting sections brace the spars and ribs. The hull is plywood covered with glass-fiber sheeting and coated with plastic cement. A half-horsepower outboard motor fits into a small shaft open at top and bottom. Lightweight aluminum oars are also used. ★ ★ ★

Right, outboard motor, oars and oarlock fixtures are stowed in hatch for transit. With oars shipped, below, boat accommodates two passengers. Nine-pound motor fits into small open shaft, gives a speed of 5 m.p.h.



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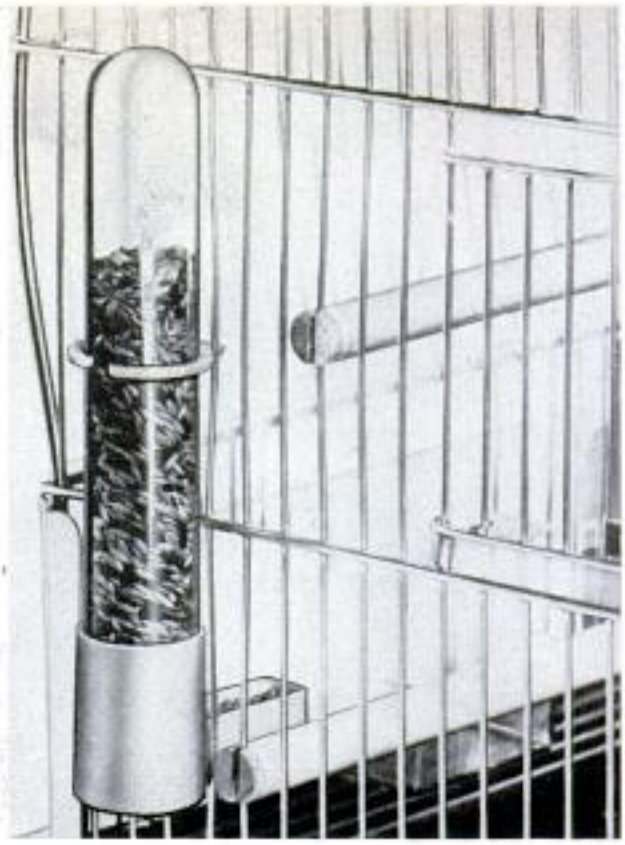
Mobile Traffic Signal Is Powered by Battery

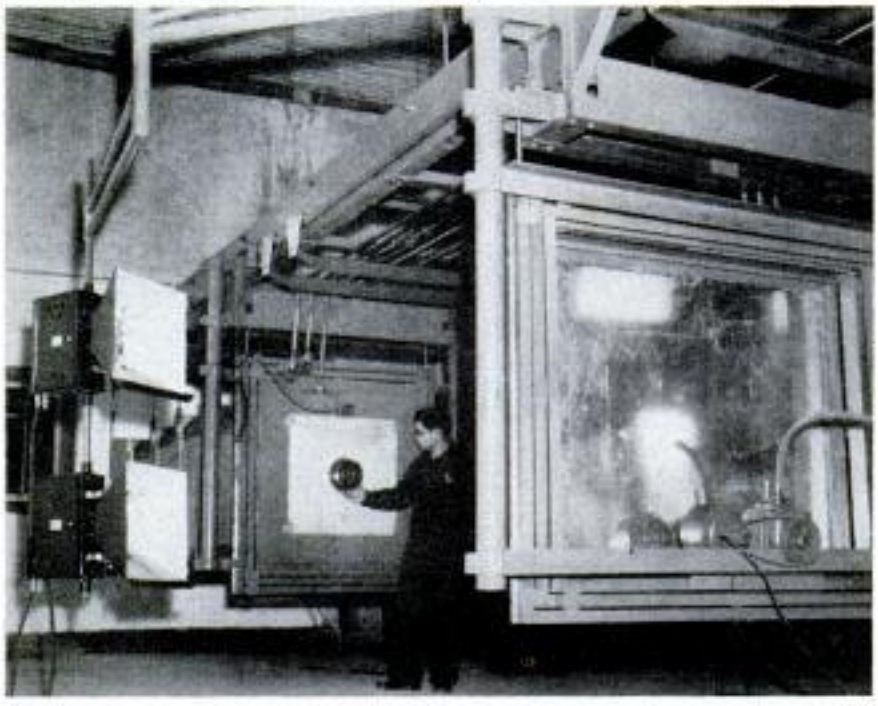
Traffic snarls are reduced to a minimum at a Texas drive-in theater by means of a portable traffic light developed by a San Antonio constable. The light unit is mounted on wheels and stands about 8½ feet high so it can be seen from a distance. The operator uses the light to direct outgoing cars onto the highway. A six-volt storage battery provides the power.



Self-Feeding Bird Trough Holds Five-Day Supply

Now your canary or parakeet can feed himself for five days while you're out of town. Two small fountains, one filled with water, the other with seed, are fastened to the side of the cage with small clips. Each consists of a glass tube resting upside down in a plastic case and trough. As the bird empties the trough, the seed or water feeds down without waste.

Suspension Camera Nearly 10 Yards Long Is Operating in Tokyo



Believed to be one of the largest in the world, a suspension-type camera in a Tokyo government office is nearly 10 yards long. It has interchangeable lenses of 1800, 900 and 170 mm. The camera can be automatically operated from within a darkroom with an exposure meter, a flash eye and an automatic-shutter mechanism.

◧Despite their fragile appearance, the thin wings of one modern jet fighter could easily support two fully loaded four-engined airliners, almost 150 tons of dead weight.

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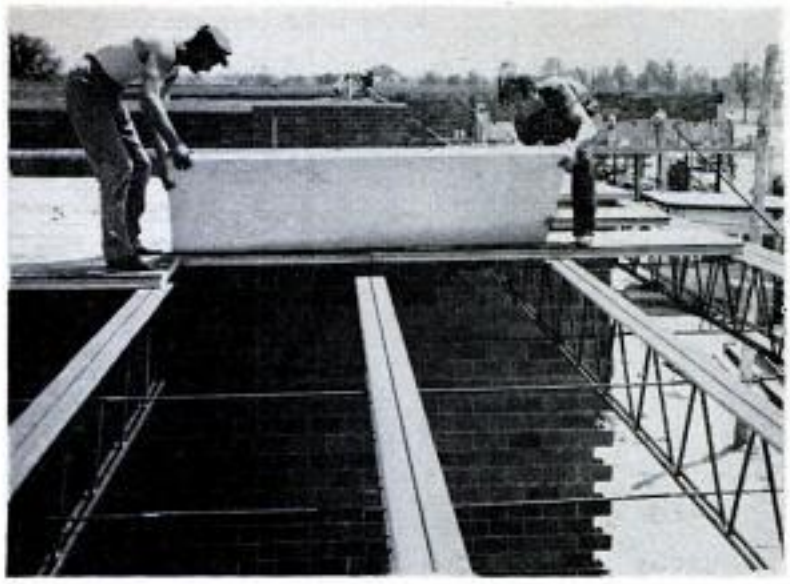


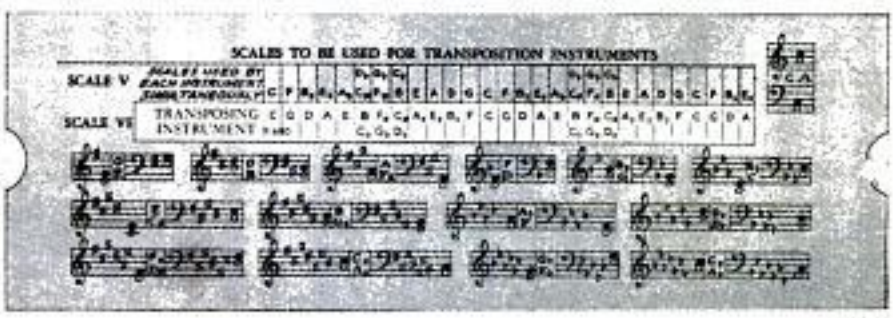
Left, torch has little effect on fireproof roofing material. Right, covering roof with wood-fiber planks

Fireproof Roofing of Wood Fibers Also Provides Insulation

Buildings covered with fireproof wood-fiber planks or tiles cost less to heat in the winter and to cool in the summer. The new roofing material, made of wood fibers bound with cement under heat and pressure, also has high insulating value. A plank, 2 inches thick, is equal to 1½ inches of cork in insulating value. The roof-deck material weighs only 2 pounds to the square foot for each inch of thickness. The cement joining the fibers makes the material fireproof. Installation of the planks or tiles eliminates the need for acoustical material. The dimensionally stable material can be sawed, kerfed, routed, drilled or mortised and nailed. A saturated-roofing felt applied to one side in the factory cuts hours of construction time. The other side has an interesting swirling effect design in off-white and does not require painting.

Musical Slide Rule Aids Composition and Transposition

Anyone can write major and minor scales, chords and transpose music from one key to another with a new musical slide rule. A fixed pattern of Xs is moved along a rule representing the black and white keys of a piano. At any position, the note above the first X is the key signature. The notes above the other Xs are the notes in that scale. A similar method is used for obtaining major and minor chords. This time, a rule representing a piano keyboard is moved into position below rows of Xs representing the spacing of different chords. Directly below the Xs for a given chord are the notes you should play in the chosen key. The fixed keyboard rule and the movable keyboard rule are used in transposing music from one key to another. The key note of the music as written is moved into position above the new key note. Under each note as written in the selection, found on the movable rule, will be the corresponding note in the new key. Especially useful to arrangers of orchestra music are two sliding scales which give directly the corresponding keys for all instruments in the orchestra when the key for any one instrument is given. A book of exercises is included.



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David Pickoff photo

Wally Cox, the Mr. Peepers of television, hones a woodcarving tool at his workbench where he spends hours

Mr. Peepers Does His Homework

Wally uses razor-sharp tool to carve mahogany bust

By Fred Marshall

YOU CAN MAKE a fine lamp out of a sculptor's mallet. It's a truncated cone —perfect for lamps. Just bore a hole up the middle, pull a wire through, fasten a socket to the end and there's your lamp. The tapered cylinder makes the base, the handle forms a stem on which you hang the shade. Sculptor's mallets usually are made of lignum vitae—a very heavy wood that comes from a tropical hardwood tree."

My education in the matter of sculptors mallets and what you can do with them, besides pound clay, came from a slight, friendly young man with thick-rimmed glasses and a somewhat studious manner. He sat at a cluttered workbench in a shop off the living room of his three-room New York apartment. As he talked he was busy reaming a hole in a piece of bamboo from which he assured me a shepherd's pipe would emerge in a few minutes. In the

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background, a blowtorch gas jet hissed blue flame, warming up for a little silversmithing job he had in mind.

Wally Cox, known to Sunday-night TV fans on the NBC channel as "Mr. Robinson Peepers," timid general-science teacher at Jefferson Junior High, is more famous for his two-suit wardrobe, baggy pants and for "being just like Mr. Peepers" (which isn't exactly true) than for being a remarkably original and painstaking craftsman (which is an understatement).

His shop is a clutter of delicate handmade silver and gold chessmen; wood carvings of hands, figures and boats; bamboo pipes and odd appliances. Despite an income that will be greater than $100,000 this year, he's building a house with his own hands (and those of any friends he can snag) on a two-acre tract in Rockland County. His motorcycle, which he prefers to automobiles, was hopped up by Cox to increase its speed and efficiency.

Anyone, Wally feels, can do the same, given the desire and ability to experiment. To help spur those interested in producing shepherd's pipes, custom-built shoes, silver trinkets and "souped up" motorcycles, he agreed to give *Popular Mechanics* some of the formulas and techniques employed in his projects.

Nearly everything Wally Cox turns out is unique. There's the simple shepherd's pipe for instance. It's a plain piece of bamboo, about an inch in diameter and 14 inches long, drilled straight through the natural joints. Six or seven "stop" holes are drilled up the side (depending on desired range), positioned so the fingers fit over them naturally. "The first one you make will be a total failure," he predicts calmly. "But don't give up."

Each hole is drilled with a ⅛-inch bit, then reamed out until a true tone is reached. Most important is the first hole at the bottom. "You drill the hole, put the pipe in against half

David Pickoff photos

Wally explains to Pat Benoit (Nancy Remington of the Peepers show) how he rebuilt motorcycle engine. Below, actor demonstrates its improved performance

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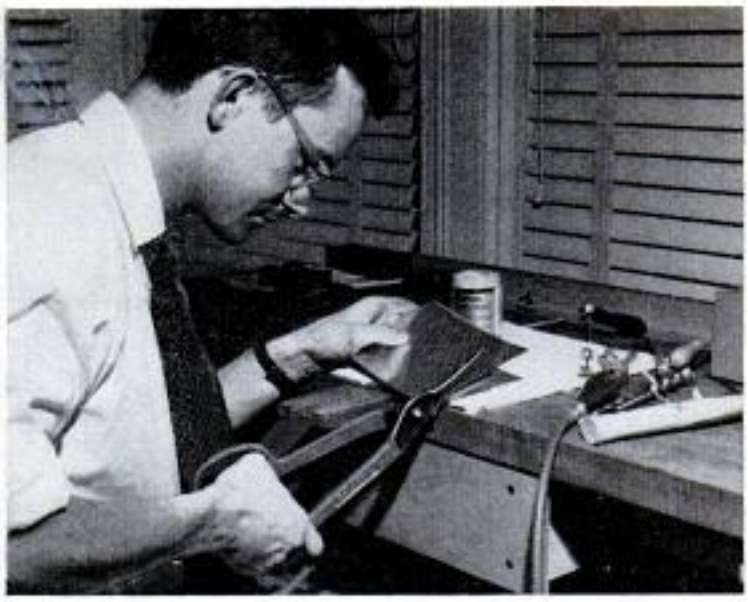

First step in making a silver ring is to snip a ⅛-inch band of silver from sheet. Cox worked as silversmith before TV

Second step in making ring is shaping silver band in circle and soldering at the joint with silver solder as shown here

Final shaping of ring is accomplished by slipping it over a mandrel and hammering into a perfect circle before polishing

your mouth, covering most of the top of the pipe. Then blow gently across the opening until you get a sound," says Wally. "It won't be right at first, so you ream the stop hole a little at a time, testing until it sounds just right. The rest of the stops are drilled the same way, until you can go right up the scale in perfect tune. That's all there is to it. You can make one in 30 minutes."

The finished pipe looks mighty unimpressive. But, lying on the lounge in his living room, Wally can pull hollow, haunting melodies from it with all the soulful nostalgia of a burnoosed Arab tending flocks along the River Jordan. "Takes some practice," he admits. "I've seen expert woodwind musicians who couldn't blow anything out of it but gusts of air. You've got to kind of tilt it against half your mouth and breathe across it."

Not everyone would think of making a shepherd's pipe. But for Wally it was a natural. He happened to read about one in an old book and decided that if a shepherd could make one and play it, he could. So he did. Its utter simplicity and the eerie music it produces, make it a useful and satisfactory project, he feels.

Usefulness, comfort and expediency are the keynotes of Wally Cox's approach to everything in life. He has no time for what he considers the hidebound nonsense and fripperies demanded by a spoiled, twentieth-century American society. He's not sure, for instance, that inside plumbing will be necessary for his Rockland County house. There are no ashtrays in his apartment. He doesn't smoke, but even if he did there probably wouldn't be any. "Try a frying pan," he told one guest who'd been desperately balancing a long ash on the end of a cigarette. "There's one in the stove."

One writer, waiting to interview Wally in his dressing room when the 28-year-old actor was playing in *Three Men On a Horse* at the Westport, Conn., County Playhouse last summer, got the start of his life when Cox came in through the window instead of a door the fellow had been watching. Wally smiled, shook the writer's limp hand, and explained: "Coming in this way saves me exactly one minute and fifteen seconds walking

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Wally tests shepherd's pipe he made for accuracy of tone. It's made of a stick of bamboo open at ends

David Pickoff photo

Stops in Shepherd's pipe are reamed until correct tone is achieved. Holes are made with ⅛-inch bit

time from the parking lot. I timed it."

This type of practical unconventionality is strictly Wally Cox. It goes into the character of Mr. Peepers in every show, and it goes into the things Wally invents and builds. It explains how he happened to make a pair of incredible shoes.

"Rehearsing eight hours a day five days a week calls for a lot of standing around, which is hard on the feet," he points out. "Ordinary shoes don't give support all around. So, I decided to make a pair that would. They look absolutely terrible, but they're the most comfortable shoes in the world. Easy to make, too."

Wally Cox shoes are simply built right over a pair of socks on your own feet. "Put on two pairs of socks," he warns, "otherwise, there won't be space to wear socks under them when they're finished."

The outer pair of socks is completely coated with molding latex, built up layer after layer until proper thickness is attained for uppers and sole as well. Bits of sponge rubber can be pressed into the sole to help build up its thickness. "To get a perfect fit," explains Wally, "you should stand on a foam rubber mat while the latex hardens and sets. That way the sole will be pressed upward and molded to the contours of your foot."

Standing on a foam-rubber mat for three hours while the latex "sets" may be somewhat gruelling, he admits, but the end result will be satisfying if you can take it. "I found it was possible to shift my weight occasionally," he says. "And, of course, you can read a book or something. That's what I did."

When the latex is firm, the outer socks (now actually rubber shoes) are slipped off the feet carefully. "Uppers" are covered with kid, which sticks beautifully to the still tacky latex, Wally reveals. Then just run a slit down the instep, punch some holes down each side of it, and string your shoes with laces. "Since the latex impregnates the sock, and molds into every hollow of your foot," says Wally, "the shoes really fit and support your feet. They can be used like sneakers, but they're much better."

Wally Cox's off-trail approach to things like shoes and people bears a startling resemblance to the whimsies of the character he portrays on the TV screen Sunday nights, and is probably why some people have tabbed him as an actor who just "acts himself." Actually, the resemblance between Cox and Peepers shears off somewhere along here. Peepers might stumble into a fortune without knowing how it happened, and would be utterly dazed and confused about what to do with it. Wally Cox who will make $1,000,000 in the next few years, knows exactly how it happened, and he is fully aware that he's worth every penny of it. "People who cry about not getting any place make me sick," he says. He beat on nightclub doors and pounded pavements, scrounging bit parts in small shows for years before he finally hit big time in TV. While he hasn't much use for the material gewgaws like big cars, dazzling homes and important clubs that most people find essential (he prefers bird-watching, nature study and tinkering), he has sound channels for his money. He just

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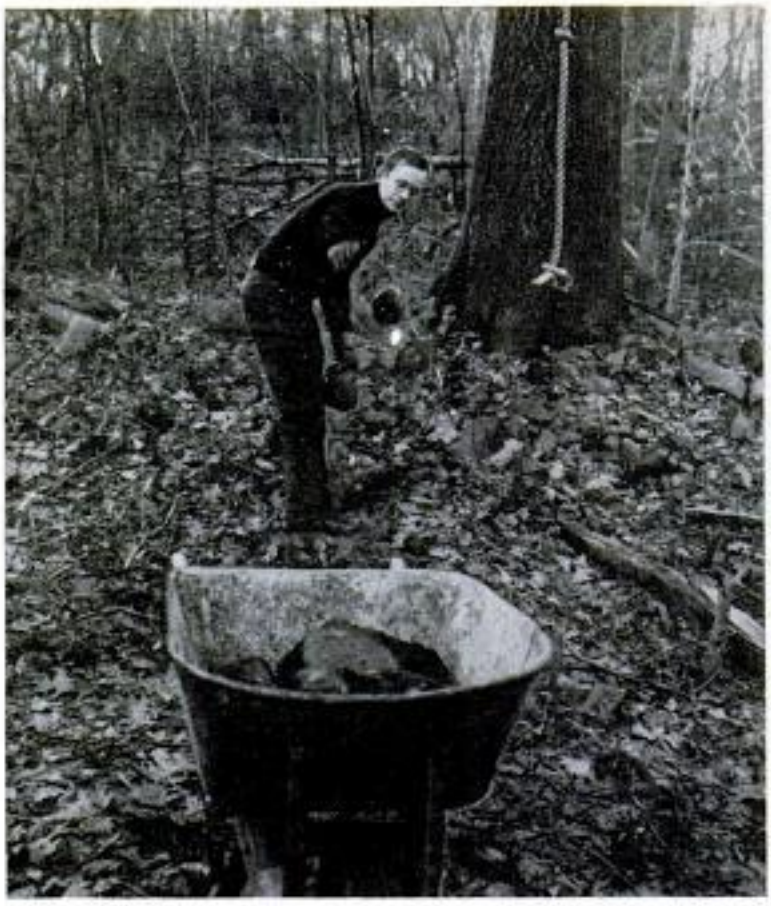

Wally puts finishing touches on silver badge with raised gold letters which he made for the TV producer of Mr. Peepers

Left, Cox starts work on his biggest project—clearing the ground for house he is building in Rockland County, N. Y.

bought a huge successful farm that will be operated for him on a business basis, for instance. He has a canny, un-Peeperish awareness of the value of a large following of loyal fans, and an un-Peeperish determination that neither they nor anyone else shall change his way of life.

Biggest clue to the un-Peeperish drives that propel Mr. Cox, however, is the souped-up motorcycle that he prefers above all other means of transportation. On it, he roars (with considerable abandon, according to friends who've ridden the buddy seat) between his Rockland County foundation hole and the New York NBC studios. Hopping up the motor was not necessarily just to squeeze more speed out of the thing, he claims, but simply because the engine annoyed him by being less efficient than it might be.

"You can do the same thing to any factory-made engine," he points out. "Makes a big improvement, and anyone can do it. My motorcycle engine was designed so the gasoline comes through the intake ports at 200 feet per second. Unless these ports are glass-smooth—which they never are—there's a lot of skin friction. So all you do is remove the head, take the burrs off the intake ports with a fine file, then polish the walls down with a grinding wheel, and finish them with a rubber wheel. There's all the difference in the world."

This done, Wally installed dual carburetors, put in high-compression pistons and he was "off to the races." "Boosted performance 20 percent," he claims.

By all odds, the most painstaking and craftsmanlike work performed by Wally in his spare time is the metalwork he turns out. Long before 1948 when he took to yodeling, whistling Bach fugues in a plaintive manner and rendering ludicrous monologues to entertain people, Wally Cox earned a $50-per-week living by making silver jewelry that he sold to Fifth Avenue stores. Through several years of this work, he achieved a remarkable degree of perfection in it and he still indulges the craft as a pastime. Right now, he's making a silver-and-gold badge for Fred Coe, producer of Mr. Peepers. Across its hand-hammered front are raised gold letters "Producer." Gold moons and stars are soldered to the shield. Tiny signatures of everyone in the cast have been scribed on a thin silver sheet, and painstakingly cut through the precious metal with a jeweler's scroll-saw. This will be soldered to the back of the shield after it has been oxidized to make it black so the signatures will stand out.

The more intricate the work, the more intensely Wally goes at it. Hunched over his workbench, he twists tiny hairs of silver wire into perfect chain links so small you can barely put a pin through one. His set of silver-and-gold chessmen, made of square silver wire and sheet silver, have

(Continued to page 272)

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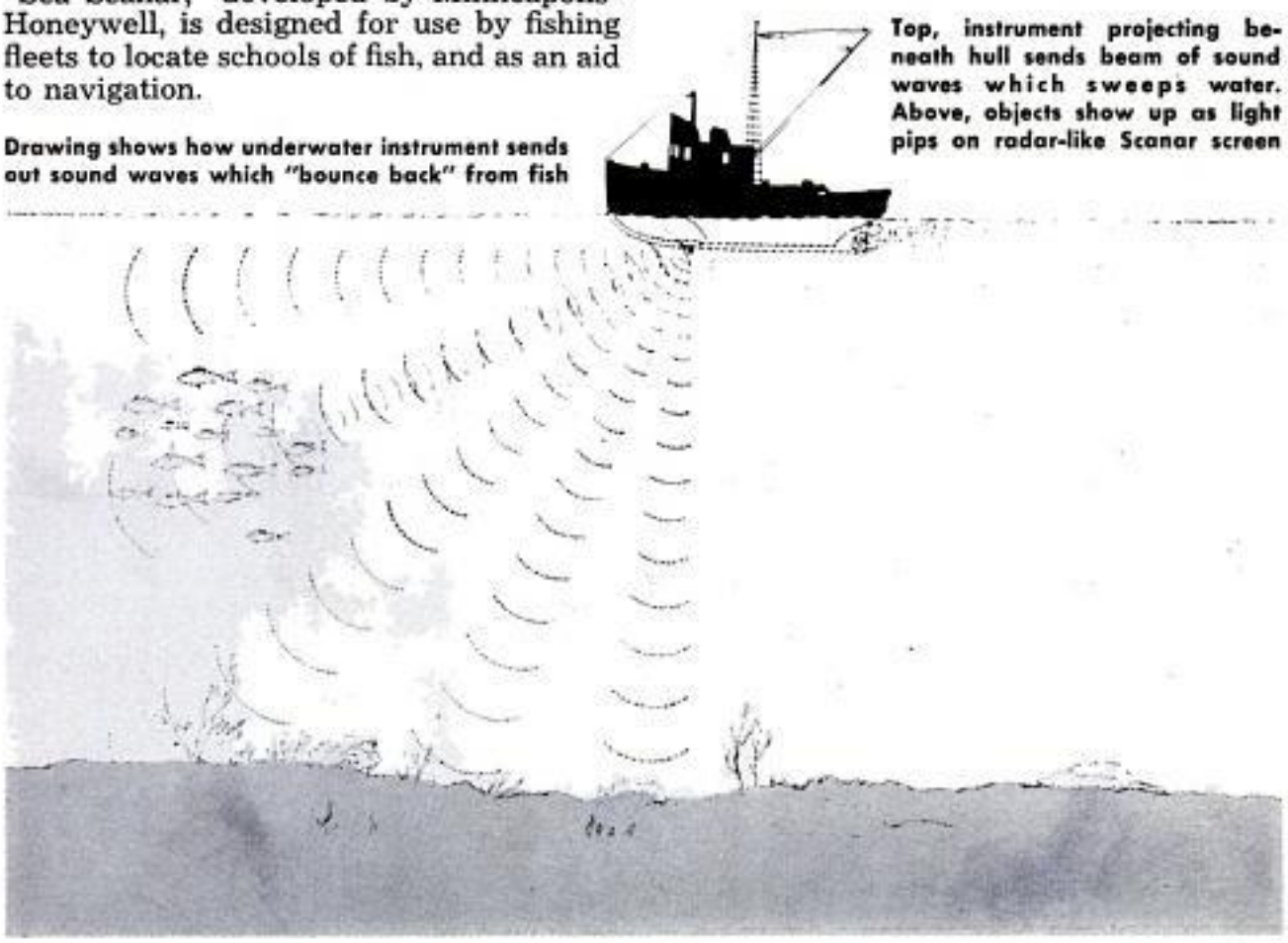
'Scanar' Finds Submerged Objects With Bouncing Beam of Sound

FISHERMEN and marine pilots can "look around" underwater through a new instrument using sound waves in the same manner that radar uses radio waves. The instrument, projecting beneath the ship's hull, sends out sound waves in a series of "pings" that bounce back from anything beneath—or even above—the water. The echoes are "painted" on a cathode tube to give a radar-type image. At the same time the sound of the echoes comes in over a tiny loudspeaker. An experienced man, by watching the shape and character of the light patterns and listening to the echoes, can identify objects above and beneath the surface. He can locate objects on the surface around the ship, examine the sea bottom and even identify types of fish. Herring, for example, make a football-shaped spot of light while salmon produce a very sharp and brilliant spot. In the case of fish, their air sacs, bounce back the sound waves in identifiable patterns. The new system, based on sonar, is valuable because it operates like a powerful searchlight to scan both above and below the water. Radar operates only above the surface and conventional sonar beneath the surface. The new instrument has a range of 1600 feet. "Sea Scanar," developed by Minneapolis-Honeywell, is designed for use by fishing fleets to locate schools of fish, and as an aid to navigation.

Top, instrument projecting beneath hull sends beam of sound waves which sweeps water. Above, objects show up as light pips on radar-like Scanar screen

Drawing shows how underwater instrument sends out sound waves which "bounce back" from fish



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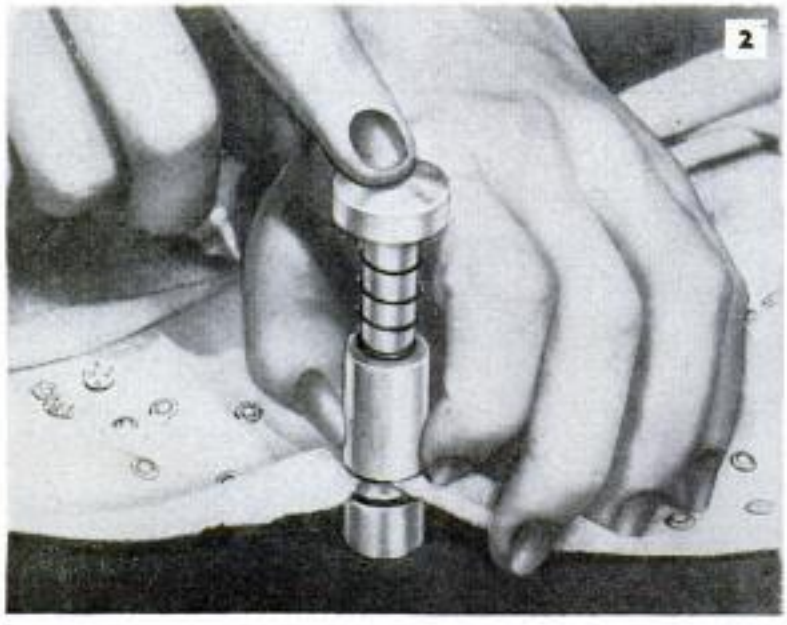
WHAT'S NEW FOR Your Home

1. FAT FILTER purifies and freshens cooking grease for repeated use. The filter consists of an aluminum unit that fits over shortening containers, and a chemically treated filter. The chemical counteracts fatty acids which cause fats to turn rancid. The filter is finely woven to trap all foreign particles

2. GEM SETTER that works like a stapler permits anyone to set rhinestones or pearls in fabric. Easy and economical to use, the device works on the same principle as professional machines. A dozen complete sets of rhinestones and settings are included, and refills of rhinestones or pearls are also available



3. CHERRY PITTER removes stone from cherry at the push of a button. No hands touch the fruit, which is fed from a hopper. Sharp blades at the end of the pestle cut open the fruit and a rubber device lifts out the pit. Stones and juice fall into a glass container and the pitted cherries drop onto a plate

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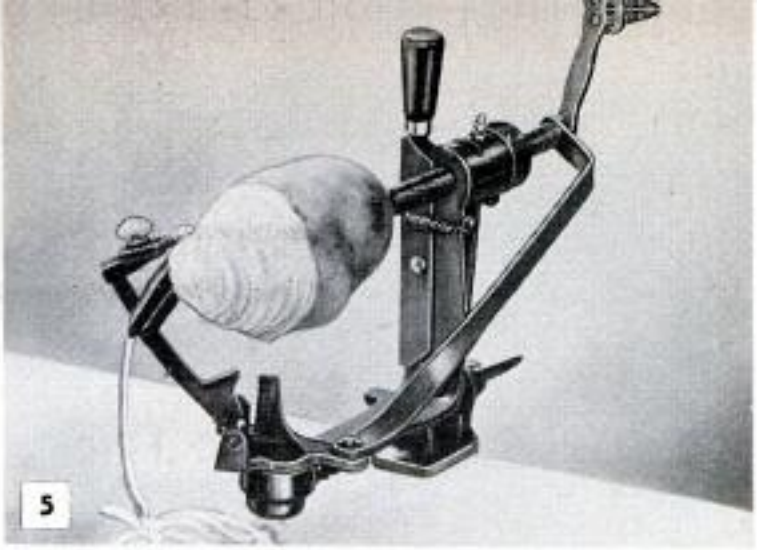
4. VAPOR STRIP that is fastened to an electric light bulb discharges colorless insecticide when bulb heats up, keeps area free of insects. A single strip lasts for several days. Adhesive on the back of the paper strip results in quick application. The vapor is stainless and will not harm clothing, furniture, carpets or woodwork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5. POTATO PEELER strips skin from bumpy tubers, apples, pears and hard fruit of any size. You just spear the potato on the sharp prong, turn the handle and the peeler does the rest. A strong clamp lock holds the machine firmly to the table top. Fine or coarse parings can be secured by an adjustment of the sharp cutting knife

6

6. ROUND THERMOSTAT can be painted or wallpapered to blend with background. Dustproof plastic cover is quickly removed. One pointer on the easy-to-read dials indicates room temperature, the other regulates the thermostat. Attractive appearance of the compact instrument allows it to be mounted at most effective position in room

7. SPRAYER which fits on the end of a garden hose dissolves a cartridge of soap or insecticide to clean the family auto or rid the garden of insect pests. Various kinds of insecticide cartridges are provided to meet particular spraying needs. Range of the sprayer is from 3 to 25 feet. A shut-off valve is mounted on the hose end

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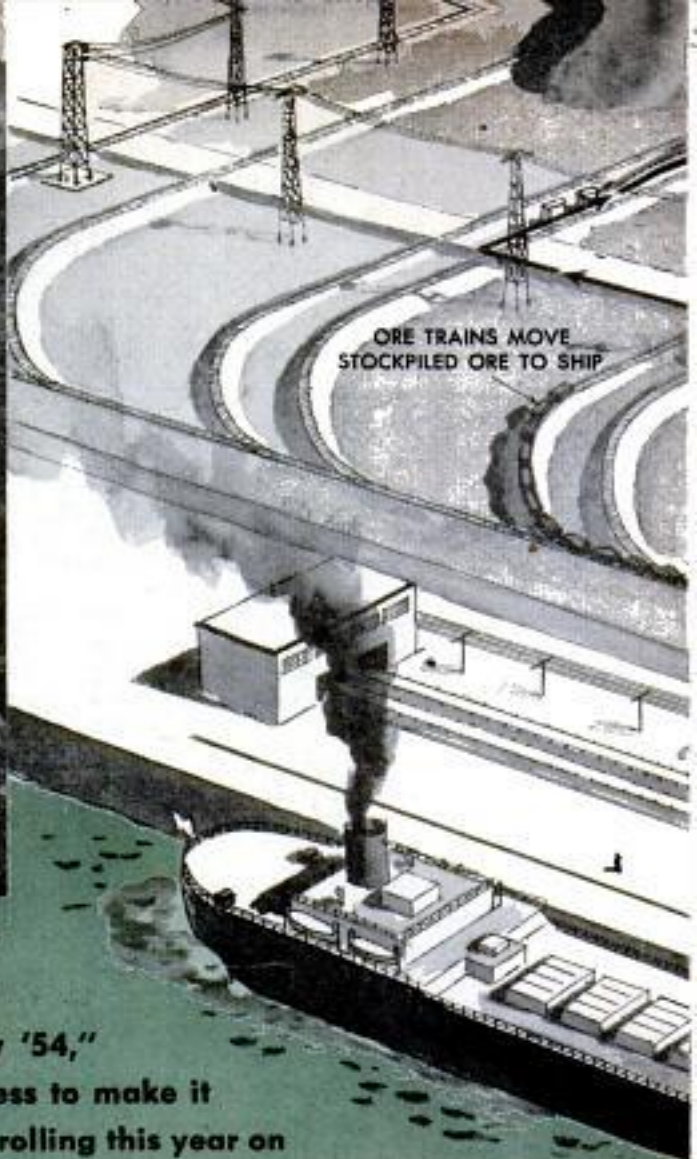
Railroad leaps across chasms, through mountains, along cliffs



For six years the cry has been "Ore by '54," and 6000 men have battled the wilderness to make it come true. Ungava's fabulous ore will be rolling this year on

The IRON ROAD *to* LABRADOR

By Richard F. Dempewolff

GIANT "CATS" are roaming the forests and lake-strewn wilds of Labrador. They're gouging the muskeg, toppling the stunted spruce trees and pounding the thick moss carpet to a pulp.

They have carved a 360-mile gash from the boom town of Seven Islands on the St. Lawrence River to a bleak campsite at Knob Lake, between Hudson's Bay and the coast. The bulldozers are grading a right of way for the biggest railroad-building project this continent has seen in nearly half a century.

Since 1950, an army of 6000 men has battered its way northward through a land so inhospitable that, until they came, only a handful of Indians prowled the shores of its myriad lakes to hunt bear and caribou, or set traplines for mink, marten and muskrat. But by last July the steel had reached Mile 140. Farther up the line, graders were pushing past Mile 185.

Behind them lay the rugged mountains through which they drilled and blasted their way via two tunnels—one 2200 feet long, the other 760 feet. At Mile 12 they'd carved grading from the sheer granite sides of towering cliffs, sent steel girders leaping 708 feet across a deep gorge over the Moisie rapids where seals bask and preen their whiskers.

Ahead lay the goal—a bleak tableland of jagged rock swept by Arctic winds whistling down from Ungava Bay. Cinnamon-red hills surround a large campsite of log buildings on a dirt street called Burnt Creek. Jeeps whine and pitch over roads that disappear in the bush. In this terrain, a Jeep is a wreck at 10,000 miles. Mobile churn and diamond drills—some of them riding weird, marsh buggies to support them on the soft muskeg—tower against the sky, their bits probing for the rich iron ore that is the reason for all this activity.

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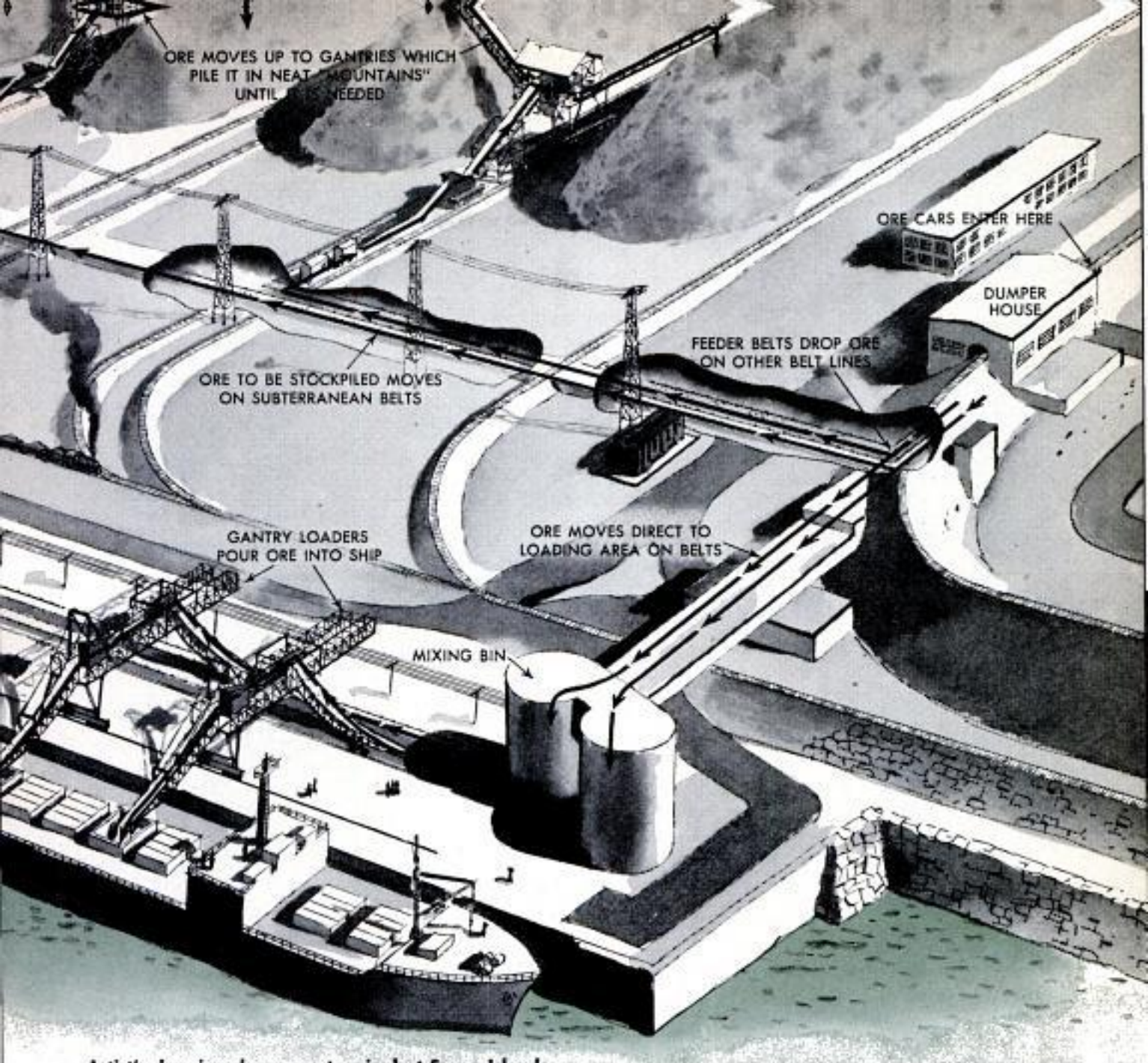

Artist's drawing shows ore terminal at Seven Islands. Ore moves on subterranean belts to ship or stock piles. Right, map shows location of ore zone and railroad

Since 1890, geologists have known of iron in Labrador. By 1929 a few hardy expeditions had probed the vast region and found deposits of fairly good ore. Then in 1936 an Indian walked into the camp of a geologist named Joseph Retty with a piece of jagged rock he'd picked up in the far north. It was all over the top of the ground, he reported. Retty assayed the sample and found it was better than 65 percent pure iron. That was the beginning of painstaking exploration by Retty and Dr. Albert Moss. In Jeeps, swamp buggies and on foot they prowled an ancient precambrian trough, folded by prehistoric upheavals, eroded by glaciers and arctic water that had laid bare long outcrops of incredibly rich ore. "Like raisins in a gigantic fruitcake," is the way Retty described it.

Shrewd mining men studied the reports

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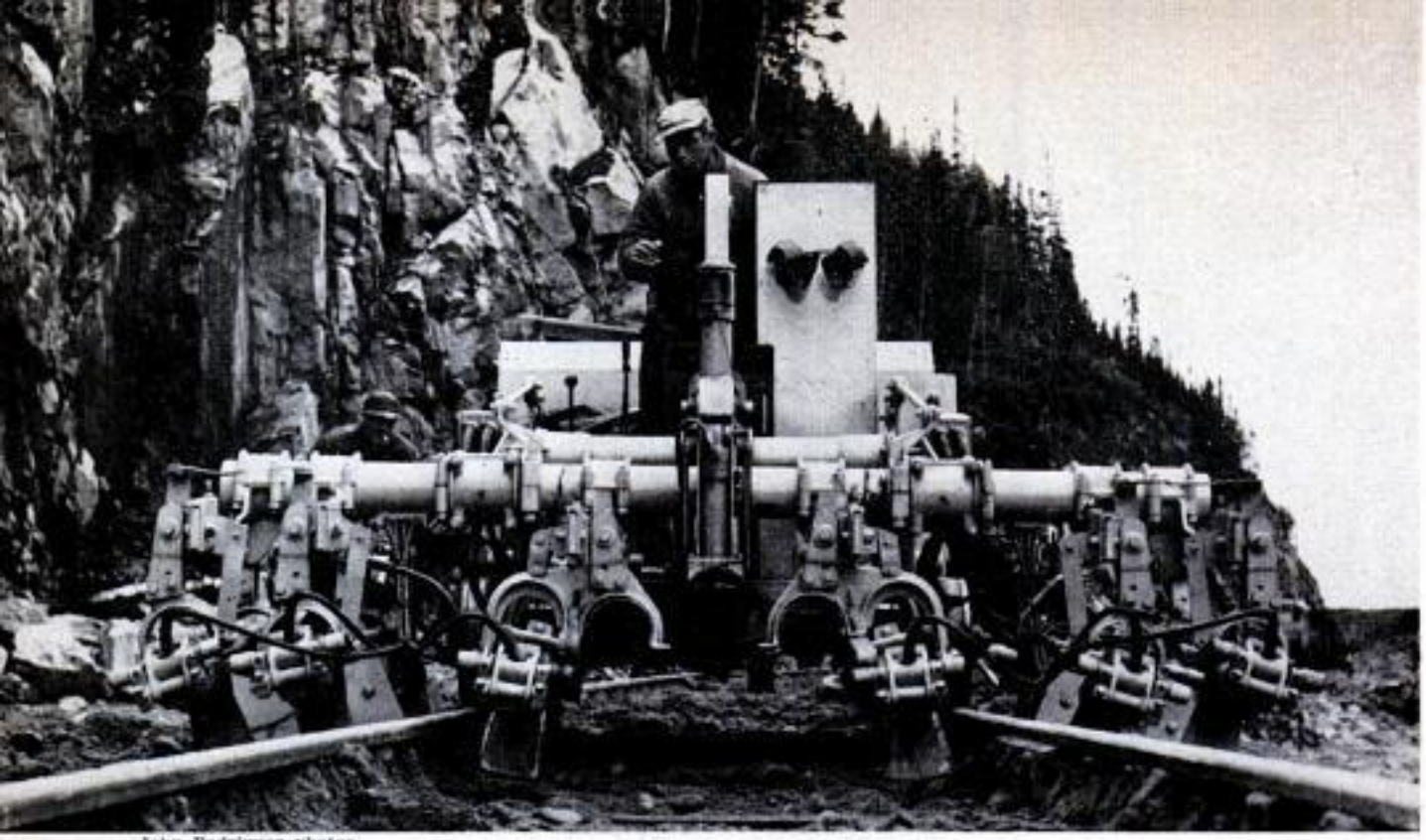


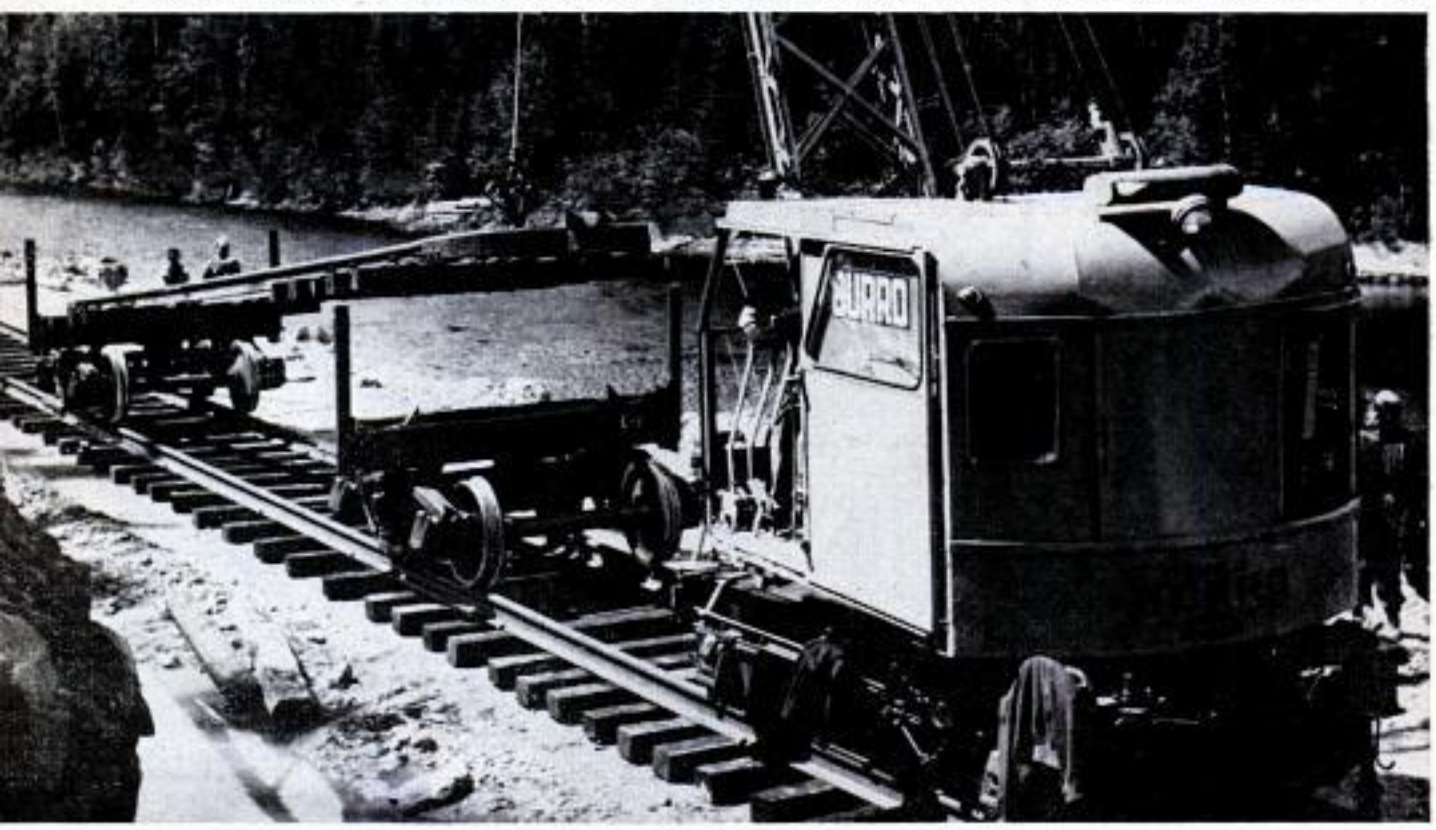
John Rodriguez photos

Steel teeth of this big ballaster pound gravel between the rail ties to give the track a firm footing

and put their heads together. The Mesabi Range had been worn thin. The United States gulps 100,000,000 tons of ore each year. In event of war, this new deposit would be more strategically located than the new iron discoveries in Venezuela. Its rich ore could be railroaded 360 miles south from Ungava to the St. Lawrence, and shipped by river and canals to Great Lakes smelters or up river to Canadian ports.

To reap the iron harvest, Canada's Hollinger Consolidated Gold Mines joined with the M. A. Hanna Company of Cleveland and five United States steel companies, forming the Iron Ore Company of Canada. So far, IOC's drill bits at Ungava have proved up 500,000,000 tons of ore running 65 to 67 percent pure. Cautious experts now estimate they'll find a fantastic jackpot of 2,000,000,000 tons before the roving drill rigs have wheeled their fat, five-foot tires across the last, long stretch of desolate

Sections of track are prefabricated, rolled to the end of the line on railroad trucks, dropped into position



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muskeg and probed the last "raisin in the fruitcake."

And, if all goes well, the first of that ore will twist its way down on a 13-hour run from Knob Lake to Seven Islands this June.

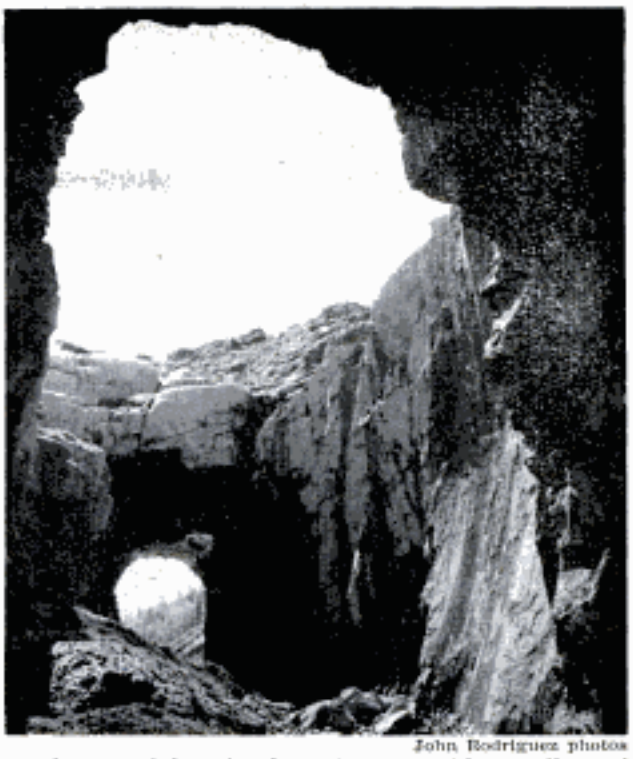
The sturdy, 54,000-pound, 30-foot carriers are one solid piece with no chutes or doors to jam in icy Labrador winters. Each will tote 95 tons of ore. In 1954, 2000 cars, hauled by 53 diesel units will carry 10,000,000 tons of ore to the push-button terminal that is nearing completion at Seven Islands.

Glenn Hornke, who worries about these facilities, explains the tricks with considerable enthusiasm. "Trains will roll into the yard and move over the hump at two to four miles per hour," he says. "An electronic scale will weigh each car in. Electronic brains will do the work. Cards will slip into the scales and get punched. All grading, in five-car samples, will be made at the mines and recorded on the card for each car before it comes in."

Rolling on, cars enter a concrete dumper house, two at a time. Here a massive rotating dumper will grab them, flip them upside down in tandem, rotate them right side up again and send them rolling out the other end toward the yards. "She'll handle 45 dumps, or 90 cars, per hour," says Hornke.

What happens to the ore couldn't be duplicated in a Coney Island fun house. From the overturned car, it drops deep into the 90-foot hollows of the dumper house through a pair of concrete funnels the size of a three-story home. "The dumper house goes down 19 feet below the mean water table," Hornke points out, "so we had to build her like a boat hull."

From the chutes, ore falls on a short, endless belt feeding out to a maze of caverns and tunnels. It may drop off one end of the



John Rodriguez photos

Work was delayed when dynamite blast collapsed roof of tunnel. Mountain washed down through hole

Engineers invented the ingenious, four-tracked "muskmobile," but even it bogged down in mushy muskeg

Thundering spring flood washed out a concrete bridge here, leaving the rails high, dry and unsupported

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John Rodriguez photos

Experimental "steel sled" is swung into position. It will be slipped under the jacked-up tracks

"Sled" then is pulled along for miles, lifting the rails and ties and allowing ballast to drop through

belt and fall onto other belts that will carry it thousands of feet underground, then up to stock piles where huge gantries will pile it in neat "mountains" until it's needed. But supposing a ship is already waiting for it? When the endless belt is reversed, the ore drops to a second series of belts on the other side that carries it up through long subterranean tunnels to mixing bins, where various grades of ore are blended to any degree of purity needed. The blended ore feeds from the bottom of the mixers onto belts that rumble out along the docks to gantry loaders. The gantries, riding back and forth on wide-spaced tracks, pick up the ore and feed it into the hold of the ship at a total rate of 8000 tons per hour.

Building a fancy modern port that one day may funnel 40,000,000 tons of ore a year from the wilderness was no easy job. When C. E. McManus, rugged project manager for the job, and Jack Little, field boss

All over the Labrador wilderness diamond drills on half-tracks bore through muskeg to locate new ore bodies

Canadian Film Board photo

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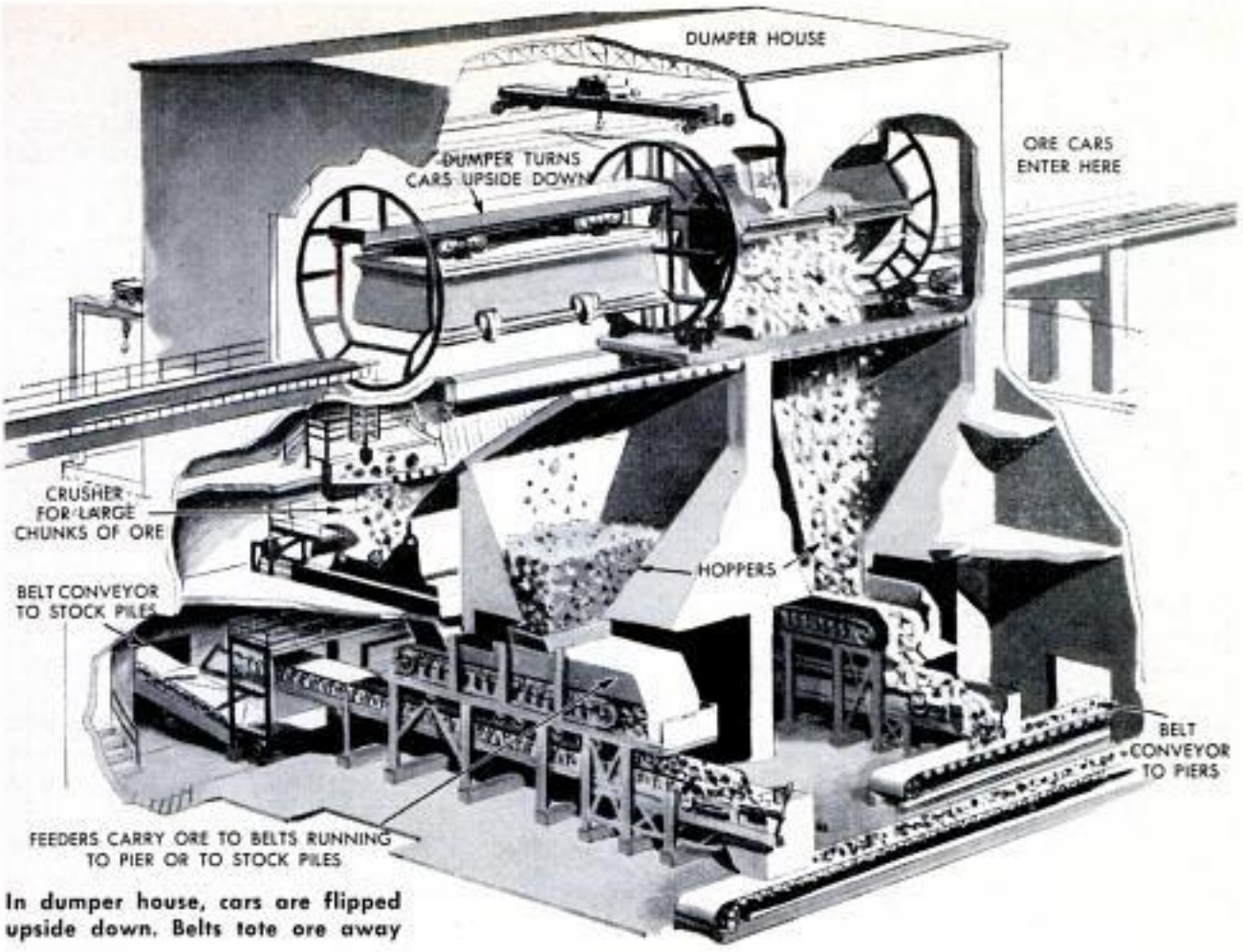

In dumper house, cars are flipped upside down. Belts tote ore away

of the project, first arrived at Seven Islands they found a tiny village of 350 fishermen. It was the last northeastern outpost of civilization this side of Goose Bay. Ships unloaded right on the ice. Weasels and tractors towed initial supplies of steel and cement ashore to build piers.

But the gargantuan task was not at Seven Islands. How do you get heavy mining equipment and materials nearly 400 miles deep in a no man's land of lakes, swamps and deep muskeg incapable of supporting a bicycle?

IOC's general manager, William Durrell, hired a big, square-jawed airman named Charlie Hoyt. Durrell and Hoyt had

Trucks roll up the spongy highway carrying prefabricated houses. Tractor stands by to pull them from mud

John Rodriguez photo

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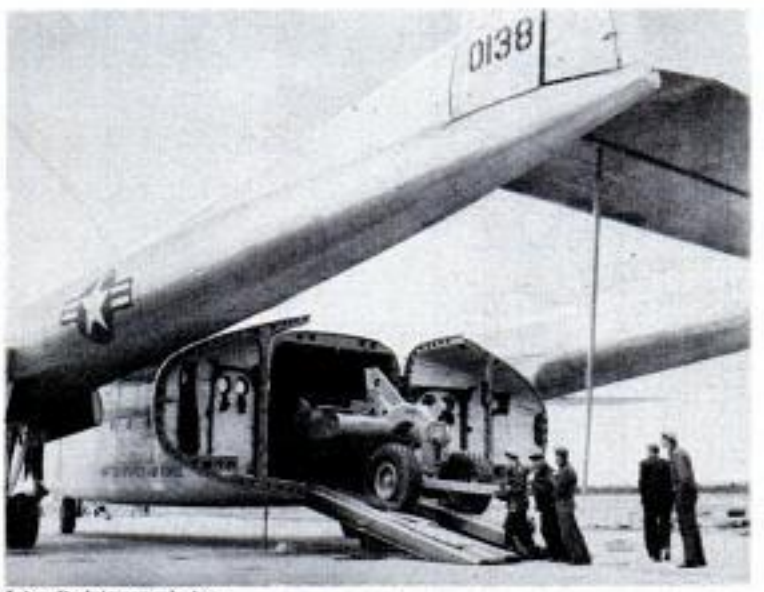
Huge machine used for spreading ballast along the tracks doubles in winter as railroad snowplow, cutting through 10-ft. drifts with steel "wings" that stretch out 25 feet on either side



John Rodriguez photos

Big scraper is loaded aboard a Flying Boxcar at Seven Islands for a flying journey to the railroad builders far up the line

worked together flying in the materials that built Goose Bay during the war. Now they were teaming up again to turn the same trick on a railroad. Within weeks, Hollinger Ungava Transport—biggest, most sustained civilian airlift in history—was born. Hoyt's planes, carrying men and monster machines, began to roar out of Seven Islands to the hinterlands. First to fly were PBYs that could land on the lakes until strips were built. Giant "cats," hauled up in parts and reassembled in the bush, gouged 10 4000-foot landing fields from the muskeg at about 30-mile intervals along the proposed right of way.

At Wacouna (Mile 100), men faced a raging blizzard to build a strip in exactly 10 days. During this operation, Hoyt's pilots flew ceaselessly through fog, sleet, snow and rain, carrying 2,400,000 pounds of fuel, food, Caterpillars, graders, scrapers and prefabricated housing to the frigid site. The strip, built in a deep valley, requires an S-curve approach.

"We added an extra item to the landing check list here," one pilot reveals; "Wheels down, wing tips clear of mountain." Planes generally scoot up the Moisie River Valley for the first 100 miles, peaks towering above them on each side. Appropriately, the pilots call it "submarine flying."

Today the airlift is still roaring up and down the line between Knob Lake and Seven Islands. From his headquarters field at

(Continued to page 260)

Camp at Burnt Creek is a row of log buildings on a dirt street. At left is big outcrop of rich iron ore

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Quickly Donned Plastic Coveralls Protect Dress Clothes from Grease

Vinyl-plastic coveralls that don't let grease penetrate to clothes beneath are ideally suited for the home mechanic. Quickly slipped on, zipped up the front and belted, the coveralls protect dress clothes from all dirt and stains. The material is light, strong and impervious to chemicals.

Vacuum-Canned Milk Retains Fresh Taste

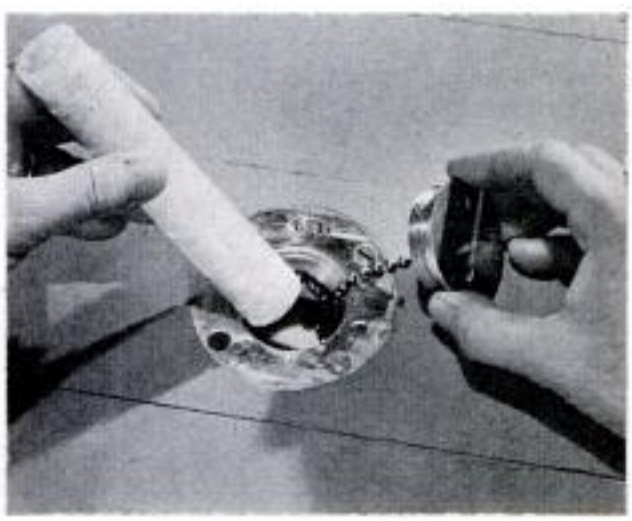
Through a new process, whole fresh milk can be canned without giving it a cooked taste. The process involves keeping the milk at various temperature levels for specified periods of time. The milk is pasteurized, then homogenized at 163 degrees F. It is poured into cans at the pasteurization temperature. When the cans are almost full, jets of dry steam are directed against them. This puts a vacuum in the cans, which are immediately sealed. The temperature then is raised to about 240 degrees. The process, according to the inventor, avoids cooking the milk while raising its temperature to destroy bacteria.

Posthole Digger Makes Square Cut

Want a square hole dug? Then you'll be interested in a device recently shown at the London Inventors' Exhibition. Used mainly when fencing land, it can cut holes from 4½ to 18 inches square.

Cartridge Prevents Rust In Fuel-Oil Tanks

Rust can't occur in a fuel tank into which has been dropped a plastic cartridge which contains acid-neutralizing crystals. Neither the plastic shell nor the crystals are soluble in any petroleum product so they cannot affect the burning of the fuel. The crystals neutralize the dilute sulphuric acid which results from the combination of water and petroleum. One cartridge will neutralize the contents of a 1000-gallon tank for a year. In addition to use in oil-burner fuel tanks, the neutralizer is also used in automobile, truck and boat gasoline tanks.



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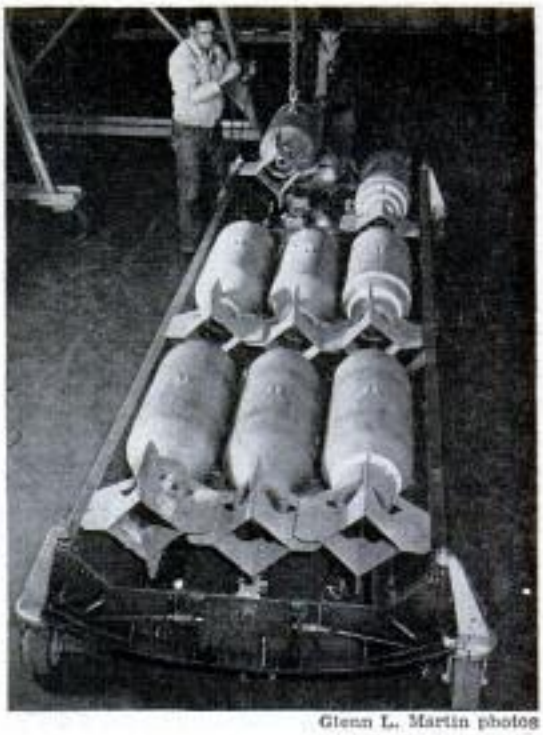

Glenn L. Martin photos

Pivoting Bomb-Bay Door Permits Accurate Drops at High Speed

Use of a new pivoting bomb-bay door may enable jet bombers of near-sonic speeds to make their target runs without slowing down. Opening the present style doors at high speeds leaves the entire bay area a yawning chasm, causing severe buffeting from gusts and making the airplane unstable as a bombing platform. Turbulence has caused the bombs to fail to fall, presenting a hazard to the aircraft as they "float" in the bay cavity. Developed by the Glenn L. Martin Company, the new door rotates 180 degrees just prior to the bomb release and leaves no open bay space for buffeting winds. The door is preloaded and fitted into place so that it revolves on trunnions at the front and rear ends. Two air-actuated plungers thrust each bomb or cluster into the airstream in normal dropping position. If 4000-pound block-buster bombs are used, two can be carried externally on the bottom of the door. After they are released the door can be rotated to release smaller bombs carried internally.

Doorless German Car Features Tip-Up Top

Doffing its top to allow its owner to enter or leave, an automobile built by German mechanic Gustav Weinert is the last word in simple design. Absence of doors and similar items makes for light weight (770 pounds) and low gasoline consumption. Product of a year's work, the eight-foot car is powered by a rear-mounted motorcycle engine and runs on motor-scooter wheels. The top is lifted manually by handles at the rear or by a foot lever under the dash.

Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11

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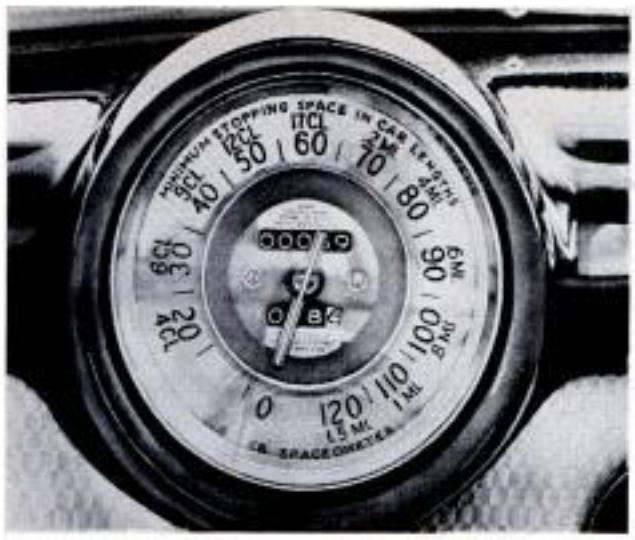
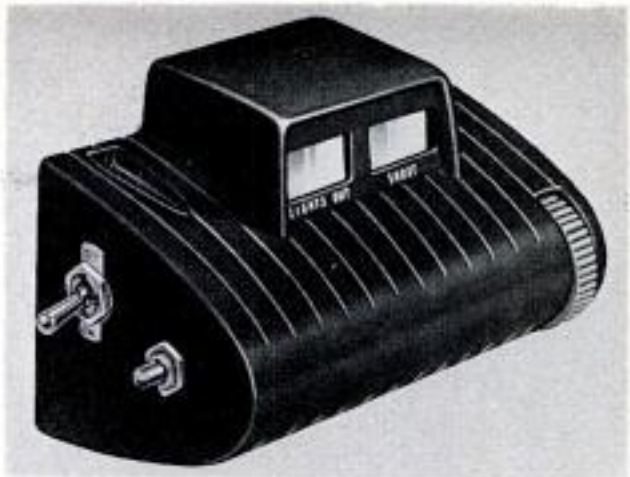


"Stop Space" Speedometer Shows Minimum Distance

Drivers can see how much distance is required for stopping at whatever speed they are driving when they have a new speedometer dial in their car. The usual miles-per-hour numerals are retained and above each figure is given the minimum stopping distance in car lengths. Starting with 70 miles per hour, the distances are given in miles. For instance, at 110 miles per hour, it will require a full mile to stop the car under normal conditions. At 50 miles per hour, the car will travel 12 car lengths before coming to a complete halt. Invented by a Baltimore man, the Spaceometer, as it is called, is designed to show drivers the hazards of high speeds.

Race-Car Decals

Full-color decals of famous race cars and drivers offer a new way to decorate glassware and furniture. Big track cars, sprint cars, midgets, stock cars and sports cars are included in two separate sets of six decals each. Each decoration is about four inches long, easy to transfer and washable.

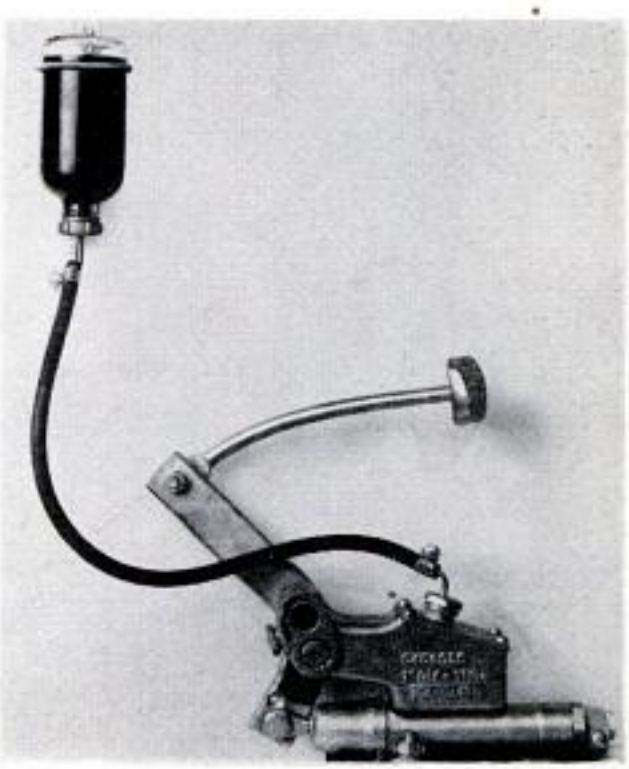


Light Monitor Warns Driver

When trouble develops in marker lights on trucks, trailers or buses, a dashboard device warns the driver. A single red flash when the marker lights are turned on indicates perfect operation. Red and amber lights signal if a short circuit develops or more than one light fails, and a red floodlight beneath the truck turns on. A manual switch operates the floodlight during fog. A second switch controls a light which tells other drivers that it is safe to pass.

Brake-Fluid Indicator

Hydraulic fluid in automobile brake systems is checked at a glance with an indicator that looks like an upended fruit jar. Mounted beneath the hood of an autobile, the jar is connected by a hose to the master hydraulic cylinder and acts as a reservoir for the fluid. When fluid level in the jar drops, it's time to inspect for leaks.



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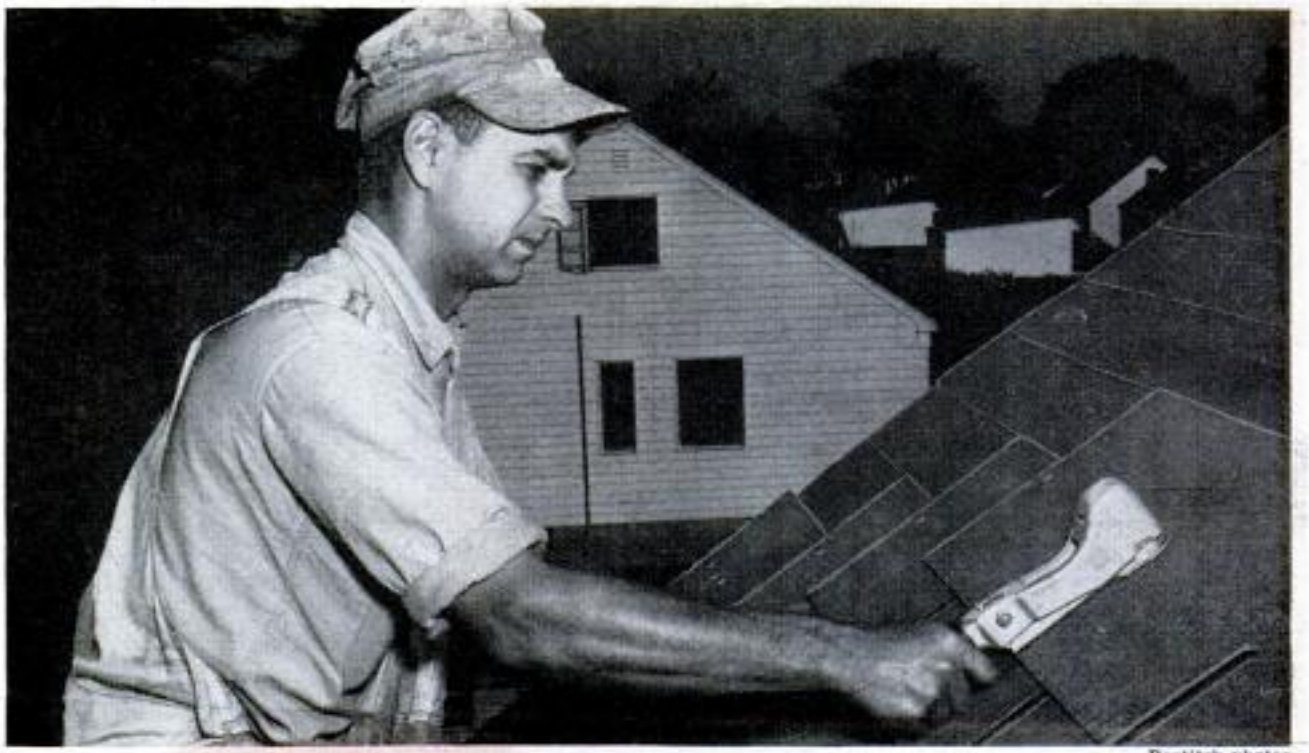


Boutitch photos

Stapling hammer used by roofer speeds job by driving a three-quarter-inch galvanized staple with each blow

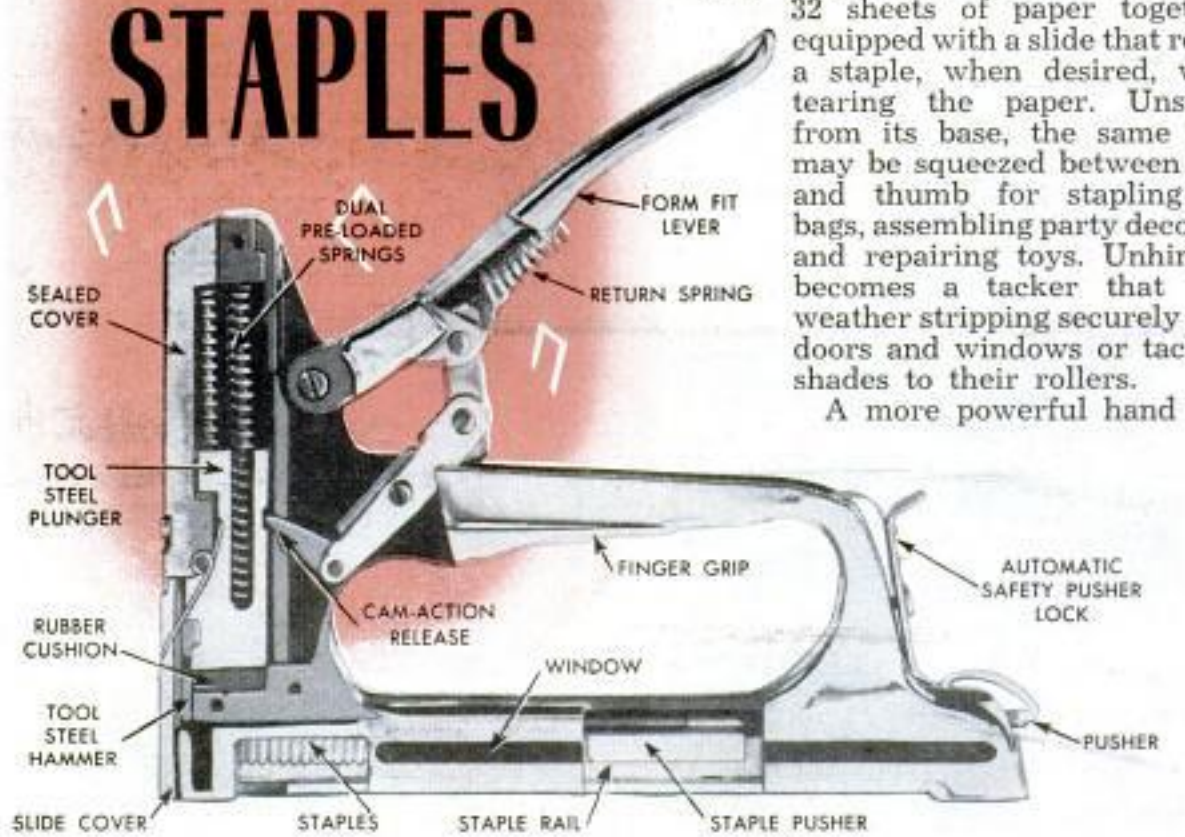
DO IT WITH STAPLES

By Thomas E. Stimson, Jr.

GROWN-UP VERSIONS of the same stapler you use for fastening together a few sheets of paper are now performing a thousand and one jobs. Within limits, the new stapling devices are replacing glue, nails, tacks and other fastening methods for many tasks at big savings in time.

One small desk stapler that can tie 32 sheets of paper together is equipped with a slide that removes a staple, when desired, without tearing the paper. Unsnapped from its base, the same stapler may be squeezed between fingers and thumb for stapling lunch bags, assembling party decorations and repairing toys. Unhinged, it becomes a tacker that fastens weather stripping securely around doors and windows or tacks new shades to their rollers.

A more powerful hand stapler



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Versatile desk stapler performs all the jobs shown on this page. Above, tacking paper to kitchen shelf

Making party decorations, such as decorating paper plates above, is a cinch when you use desk stapler

Anybody who has ever tried to tack a new shade to a roller will find the operation easier with a stapler

Removed from its base, the desk stapler can be used like a pair of pliers for fastening the lunch bag

The small stapler is also handy for making repairs to furniture. It will also fasten screen to a frame

Bostitch photo

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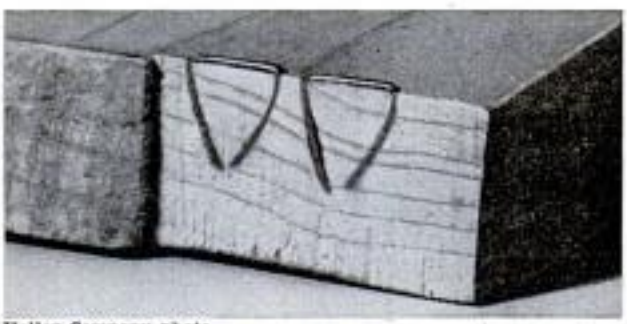
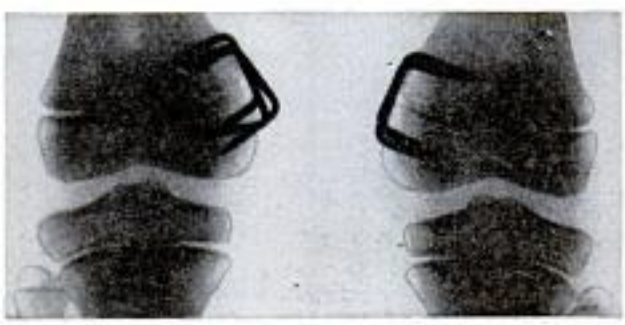
Hand stapler with cutout nose is used for training vines along a wall without injury to the plant



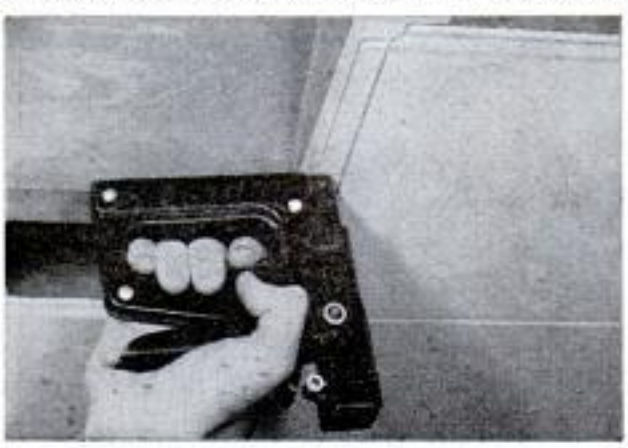
Heller Company photo

Chisel points on staple legs bring legs together with a tight clinching action as they enter work



Bone surgeons have used stainless steel staples to hold fractured bones together as shown by X ray

When it comes to fastening ceiling tile in place, a stapler does a neat job without marring surface



tacks screens to doors, insulation to ceilings, shrubs to walls, plywood subflooring to its stringers and fastens metal lath. This "gun" type of tacker contains a powerful spring that is compressed as you tighten your grip on the handle, thus moving the operating lever. At the end of the squeeze the spring is released, driving down a plunger that forces the staple into the work.

Staples up to half an inch long embed themselves so firmly in wood that they are difficult to remove. Even this grip is improved in special designs that use chisel points so that the legs of the staple are driven together, or apart, as they enter the material. Some staples are shaped like a heart, open at the bottom. The top flattens out when it is driven and the points at the bottom come together.

One design of stapling tacker has a cutout nose and is used for installing telephone and other low-voltage wiring. Its wide, decorative staples are easily driven into wood, plaster or stucco. Another type drives diamond points instead of staples and is used for securing window glass in wooden sash. Still another type is used by florists in assembling bouquets.

Staplers that are built on the "wrap around" principle form the wire rings used in assembling automobile seats, mattresses, wire pens, tying necks of plastic bags for frozen-food storage and binding assemblies of loose wiring.

One manufacturer has designed a tiny stapler, enclosed in a jeweled container, for emergency repair of clothing. At the other end of the stapler line are big automatic high-speed stapling machines that assemble shipping cartons or stitch together some of the subassemblies of stoves, automobiles and aircraft. Some 800 different designs of stapling machines are manufactured and it is estimated that a billion staples a day are used in fastening together the things that America uses.

Some high-carbon staples can be driven through a half inch of hardwood or a lesser amount of metal. One favorite exhibit of some manufacturers is five copper pennies fastened together by a single staple.

Modern stapling devices trace their origin to an improved wire-stitching machine called the Boston wire stitcher that was developed by Thomas A. Briggs around the turn of the century. These stitchers, still widely used today, form their own staples from a spool of wire. The pages of this magazine are bound together by staples produced in this way.

Already tried on an experimental basis is the idea of fastening fractured bones together with stainless-steel staples. Other staples eventually may tie up blood vessels during an operation. ★ ★ ★

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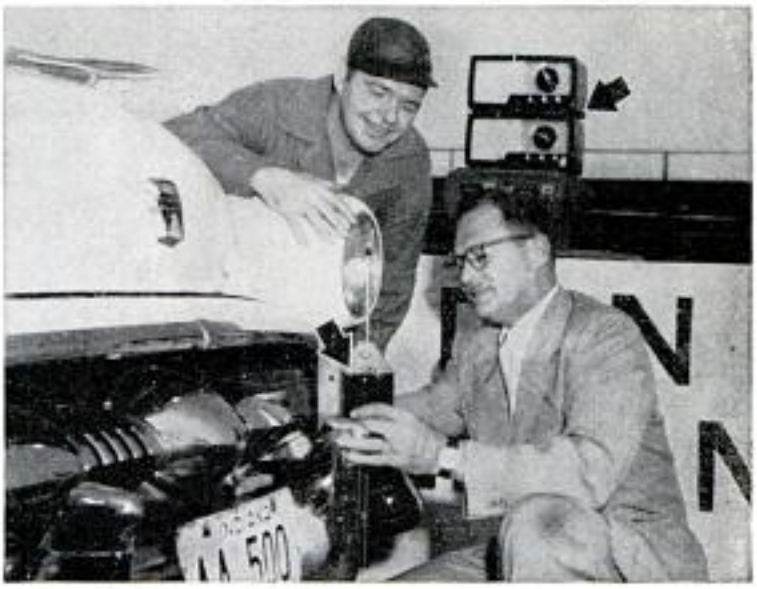
Radio Automatically Times Cars at Indianapolis Speedway

Race cars may soon be equipped with a miniature radio transmitter that provides a foolproof and precise means of clocking speed and elapsed time. The unit, recently tested at Indianapolis Speedway, eliminates all chance of human error. There are two components involved. The basic unit is a receiver which operates a recording device and is mounted at the finish line. In addition, each car carries a tiny transmitter that sends out a signal on its own individual frequency. Every time the car passes the finish line, the transmitted signal actuates a recording machine that counts the number of laps and records the elapsed time of each. On the original trial runs, the equipment was fairly cumbersome, but a new design has been developed with a transmitter for each car no larger than two packs of cigarettes and requiring no protruding antenna. The trackside receiver can be built into a box only four inches on each side, states the designer, Lee Evans.



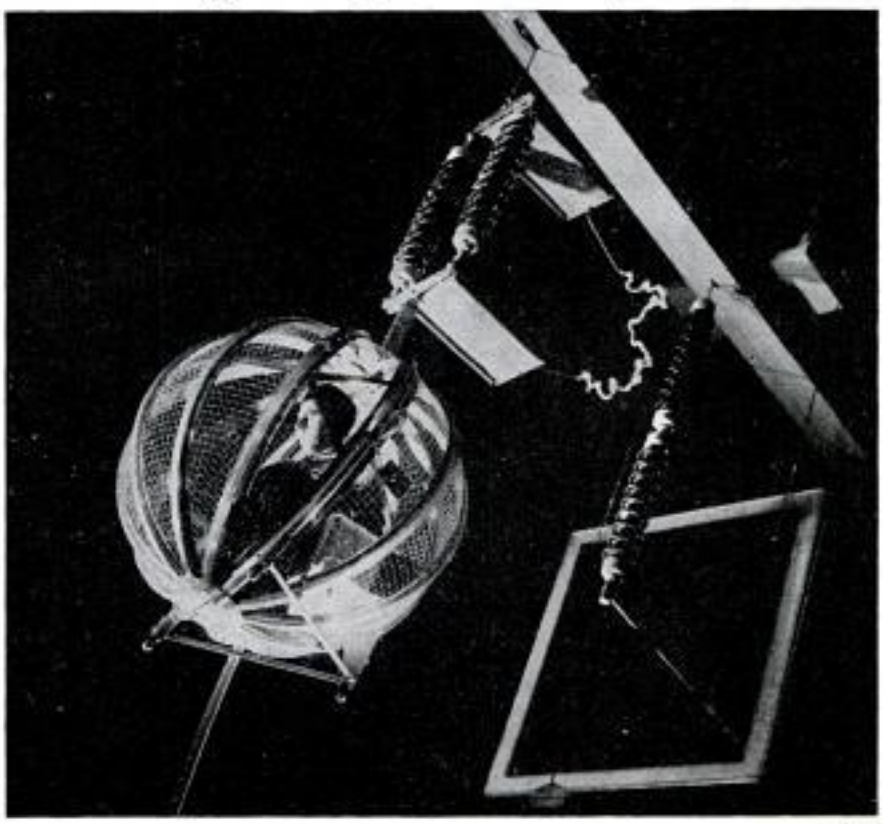
Mounted on bumper is the test transmitter of timer unit (arrow). Top arrow points to receiver unit. New design is much smaller

Doped and Frozen Fish Withstand Transfer to New Home

Drugs and chopped ice helped solve a transportation problem when 1110 lake trout were flown to an isolated lake in Canada's Prince Albert National Park. Because it was not practical to carry the lively five-pounders in sloshing tanks of water, they were first placed in water containing an anesthetic, then packed in wooden boxes and covered with ice. Loaded aboard a plane and flown to the lake, they were left in a floating reservoir from which they escaped as they recovered.

Engineer Is Safe in Steel Wire Cage Charged With 300,000 Volts

Even though a 300,000-volt electric current surges through the steel-wire ball which encloses him, an engineer in a Munich museum demonstration remains unperturbed. The so-called "Faraday's cage" protects its passenger even though he's in the midst of a powerful electrostatic field. The electricity spreads harmlessly around the ball and is then grounded via a cable.



Electronic "Nose"

With a sensitivity far greater than that of the human nose, an electronic sniffer can detect sulphur in concentrations as low as one part to 10,000,000 parts of air.

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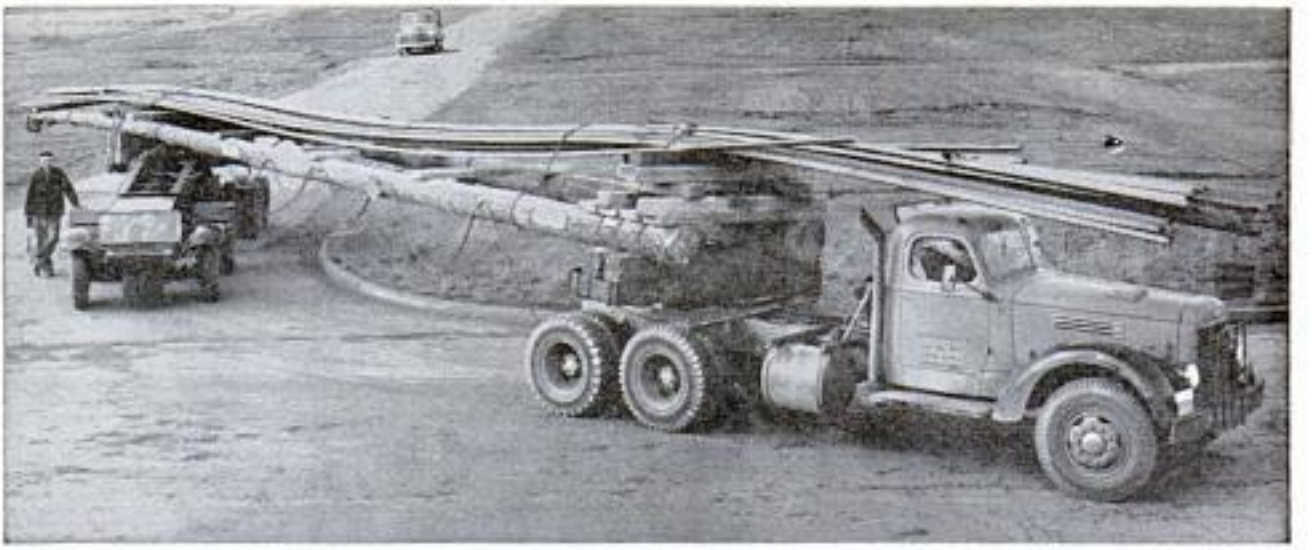


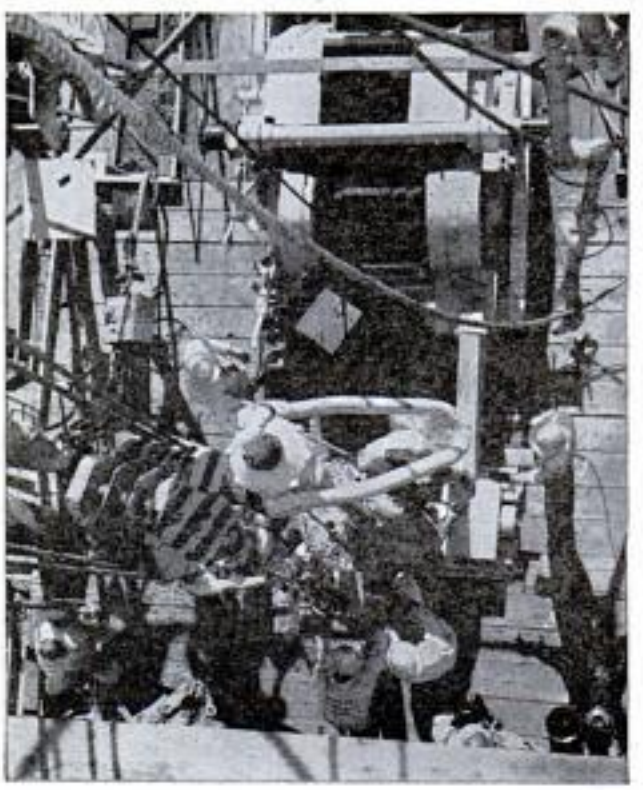
Tag-Along Trailer Supports Rear End of 88-Foot Load

When a Portland, Ore., concern was given the job of hauling 88-foot lengths of heavy reinforcing steel over the highways, it neatly solved the problem of getting the lengthy cargo around corners. Sixty-eight-foot-long poles, to support the steel, stretched from the tractor to a separately steered trailer made up for the job from an old truck. Poles and steel were lashed to the pivoting beds of the tractor and trailer and together acted as a tow bar. The trailer driver was 40 feet behind the truck.

College Students Build Rig and Drill Oil Well Without Expecting Gusher

Petroleum engineering students at Orange Coast Junior College, Costa Mesa, Calif., have built their own oil rig, complete with drills, pipes, blocks, a mud pump and other items of drilling equipment. The idea behind the rig is that students can't learn to drill oil by reading books. The school is planning to tear down, move and rebuild the rig each year to give every class a chance to drill a well. The class is incorporated under state laws, not only to drill but also to go through the financing of an oil company. According to plans, a thousand-foot hole will be dug each year. It will be only a practice run—no one really expects to hit a gusher.

Experience is the best teacher: Students swarm over their rig in learning to handle the oil-drilling equipment



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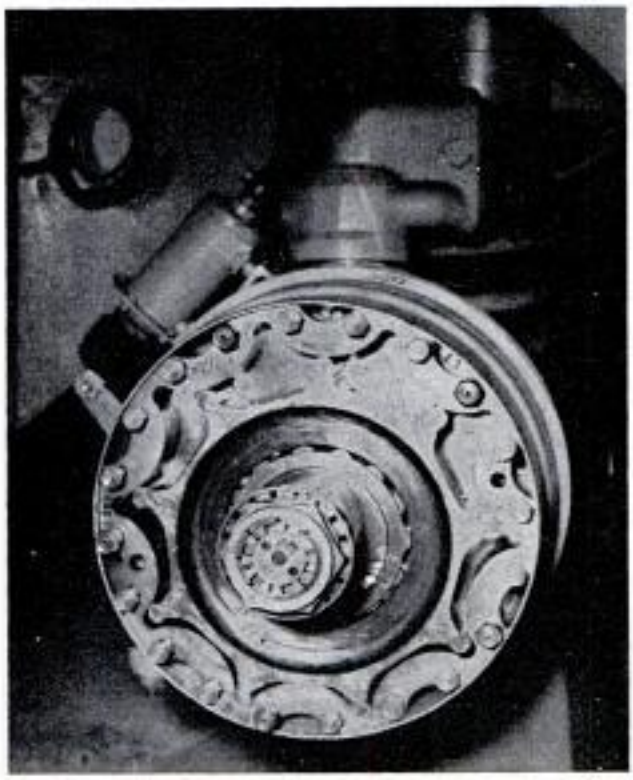
Midget Gas Turbine Helps Run World's Largest Cargo Airplane

Weighing less than 100 pounds and about two feet square, a gas turbine engine that delivers 50 horsepower provides power for generator sets in the giant Globemaster transports. The sets supply auxiliary and emergency power, either on the ground or in flight. The engine is the world's smallest of its type and the Globemaster is the world's largest cargo and troop-transport airplane.

Douglas Aircraft Company photo

Snails Enrich Feed

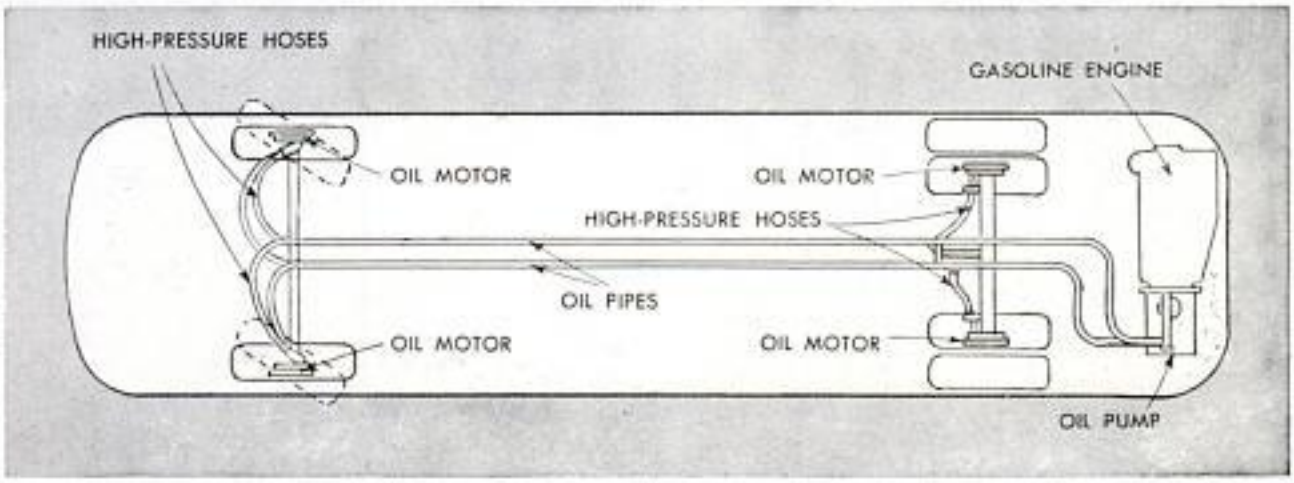
Giant African snails, major pests in warm parts of the world, may prove useful after all. Dehydrated and reduced to a powder, they boost the protein content of livestock feed.



Hydraulic Four-Wheel Drive Operates German Bus

For more than two years, a bus company in the American zone of Germany has been operating a bus without a transmission, differential or drive shaft. All four wheels of the bus are power driven. Oil is the propelling medium and it is piped under pressure into separate "oil motors" in each of the wheel hubs. A large oil pump, attached to the engine, provides the pressure and the oil does the rest. There are several advantages to this method of drive: The oil motors can be used as brakes by reversing the valves, converting them into pumps. A trailer can be powered simply by the use of a flexible-hose connection between the tractor and trailer. In addition, engine and pump can be put anywhere in the vehicle without loss of efficiency.

Oil motor, left, encircles axle. Oil surging through pockets between inner and outer cog wheels causes inner wheel to spin. Below, diagram of the system



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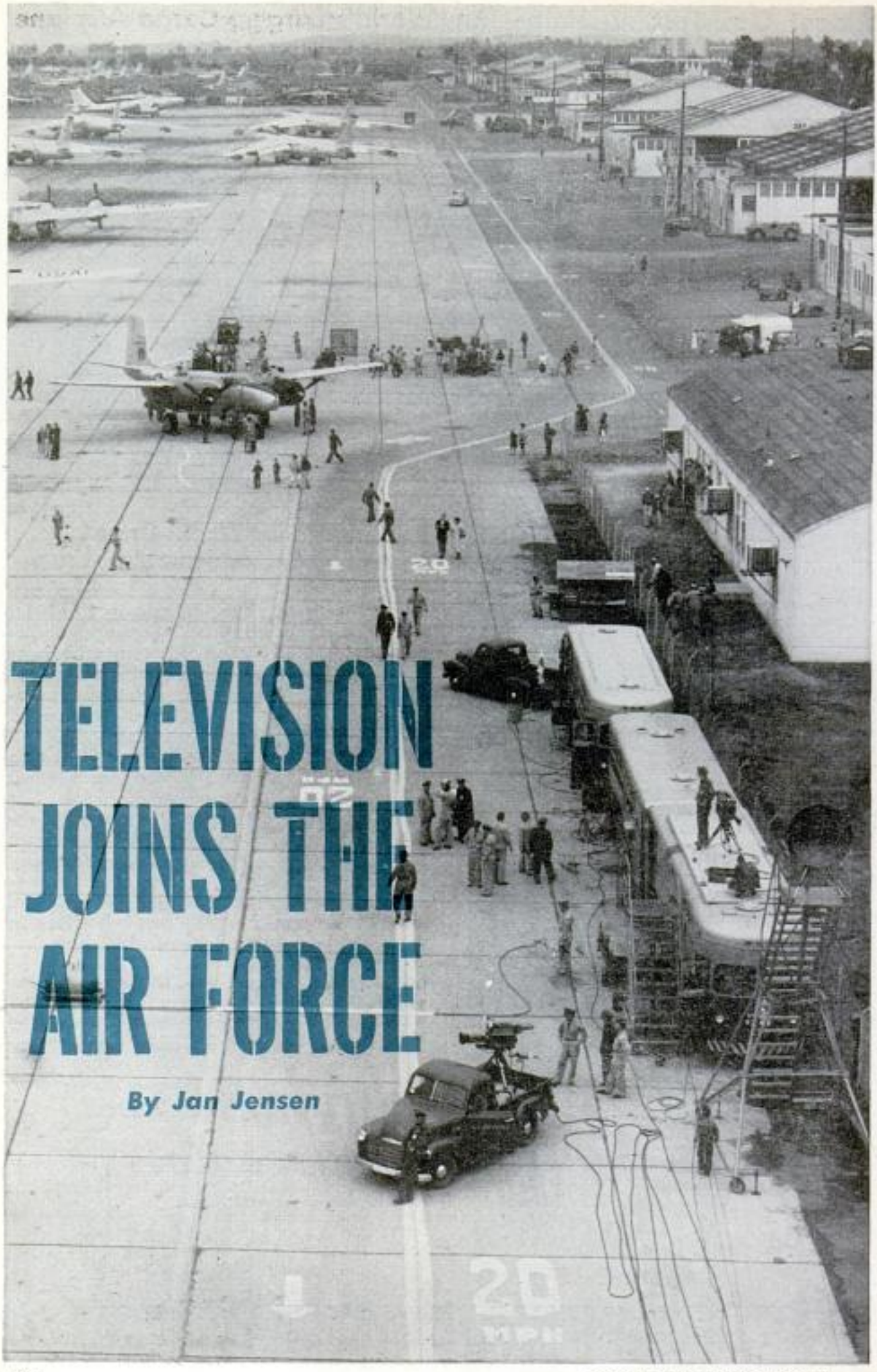

TELEVISION JOINS THE AIR FORCE

By Jan Jensen

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ALTHOUGH THE AVERAGE TV fan may be of the shirt-sleeve variety, settling down to watch the fights after the kids have relinquished the set for the evening, at a special experiment not long ago at Hamilton Air Force Base in California, the viewer wore a pilot's blue uniform and the program was a command performance exclusively for him. A preview of what may soon be normal procedure, this first tactical use of television in the United States Air Force was made by broadcasting weather briefings to seven different points on the base and, with the aid of a microwave-relay link, to a radar center 10 miles away along the Marin County coast.

So successful were these tests that soon a pilot may seat himself in the alert room at the end of the runway, call the base weather operations a mile away and say, "Give me a winds-aloft report. How does it look between here and Portland?"

Then, as a weather map and a forecaster appear on the screen in the television receiver before him, he will scrutinize each chalked arrow and follow the moving pointer designating various areas as they are explained. "It's pretty solid at 4000 here over Spokane," he may be told. "Better take it at 8000, but after that, through this coastal area, you'll find there's a better tail wind around 6500."

During the several weeks in which the televised weather briefings to pilots were demonstrated, it was proved that 30 minutes in time was gained over telephone, teletypewriter and radio. The 1354th Video Production Squadron established the weather station at the San Francisco base. Since July 1952 when it was organized, this mobile unit, the only one of its kind in the Air Force, has been busier than a three-minute car wash. Its shiny silver and gold-trimmed trucks, the Air Force insignia encircling a TV camera on their sides, called the Lockheed Air Terminal at Burbank, Calif., their home diggings for the first year.

As a grand finale to their stay on the Pacific Coast before rolling forward to new tactics in Florida, the squadron pulled its three huge

U.S. Air Force photos

During a telecast, the audio engineer is in the foreground and the video engineer and technical director are seated at the video console. Equipped with a Zoomar lens, camera mounted atop a truck provides wide-angle or close-up views of action

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Robert R. Jensen photo

Four TV cameras on rolling casters shoot on-the-spot kinescope of an aircraft fire-fighting demonstration

vans into the lower concourse of CBS in Hollywood and proudly showed the visiting convention from the Society of Motion Picture and TV Engineers what they had accomplished in one short year.

"The unit," announced a smartly uniformed WAF, "is made up of three 35-foot motor vehicles, one of which is the engineering bus, another for power and the third for personnel."

Climbing the steps of the engineering truck, a visitor is impressed with the elaborate video and audio-control system installed in its compact interior, so complete it would do credit to a major network. At a control console there are the master video and four camera monitors. Directly to their left are the distribution amplifiers used to feed a composite picture as well as the driving pulses, created by a synchronizing generator, to the cameras, all the picture monitors and other equipment used in the television system.

"Above the amplifiers," pointed out the guide, "is the video patch bay, consisting of short pieces of flexible 'coax.' To the left is a very accurate cathode-ray oscilloscope, which is used to measure the magnitude and shape of the picture and 'sync' pulses. Here, in this bay, the video man manipulates the intricate controls and creates a television picture by adjustment of various picture shading, focus, gain, beam and target controls. An interesting feature is the flying-spot scanner-projection equipment located here, which converts a still slide or motion-picture film back into a video signal which may be faded into or mixed with another TV picture. It permits titles to be superimposed over live pictures."

In the center of this truck is the tape recorder, directly behind the audio-mixer console. Most of the programs are recorded on 16-mm. motion-picture film with an optical sound track and magnetic tape used for an audio-protection copy. The tape machine is driven by selsyn motors coupled to the kinescope camera. After the film is exposed in the special camera, focused on a high-brilliance television-kinescope-picture tube which is at the rear of the truck, instead of winding up on a take-up reel, it is transferred directly through a light-tight tube to the rapid film-processing machine, which develops and dries the film as fast as it comes from the camera.

Within 60 seconds after a scene is televised, it emerges from the processor as a dried, ready-to-project motion-picture film.

Two giant, gas-driven 25 and 15 kilowatt generators, capable of producing 40,000 watts of power, provide all the electricity needed for a television production, with enough storage space for cable, microwave, lighting and other portable TV equipment. The microwave transmitter and receiver, which are used for field pickups where coax cable is not feasible, are huge parabolic "dishpans" with wave-guide buttonhooks in their centers. They operate in a frequency band between 7100 and 7150 megacycles.

A personnel mobile unit carries production crews, with a compartment that may

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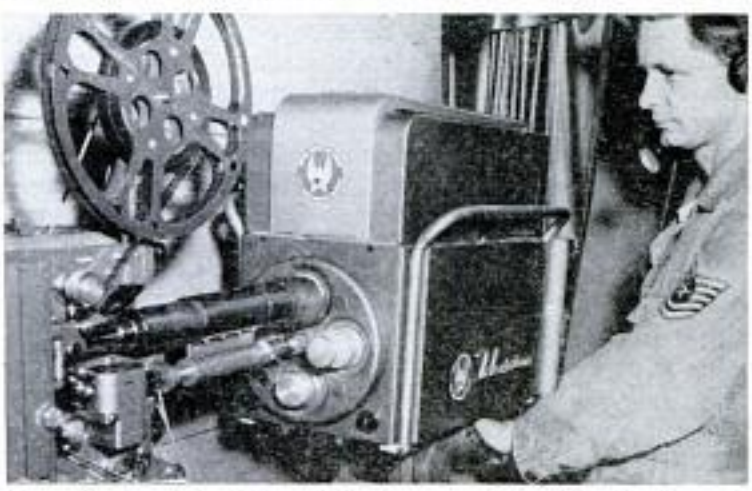
With the camera in for a close-up, an instructor explains the workings of an airplane engine to a TV audience

be used as a small studio, writers' office or a conference room.

The 1354th Video Squadron has delved into every remote possibility of their over-all mission, which is to provide any television services that may be required by the United States Air Force, until its 42 officers and 62 airmen are as familiar with each part and technique of the unit as old-timers are with local history.

"At present," says Lt. Col. Mel Williamson, commanding officer of the squadron, "our purpose is more for training and education. We have found in the groups we have tested, instruction by this method chalks up 85 percent as efficient as the best face-to-face teaching. The average 18-year-old enlistee is more accustomed to watching TV than the movies and is more attentive to this medium. Another, it saves time and money to assign a television mobile unit to one basic-training school, obtain the very best instructor possible, and either feed live TV programs of the curricula by use of the coax cable to an unlimited number of groups, or else make kinescopes to be used over and over again anywhere at other training posts. Kinephoto recordings are much cheaper than films

(Continued to page 268)



Reproduction of a 16-mm. film is accomplished by feeding the projector into a TV camera. Below, a pilot receives weather information and flight instruction by television during the experiment at Hamilton Air Force Base. Tests proved method is at least 30 minutes faster than teletypewriter, radio or telephone

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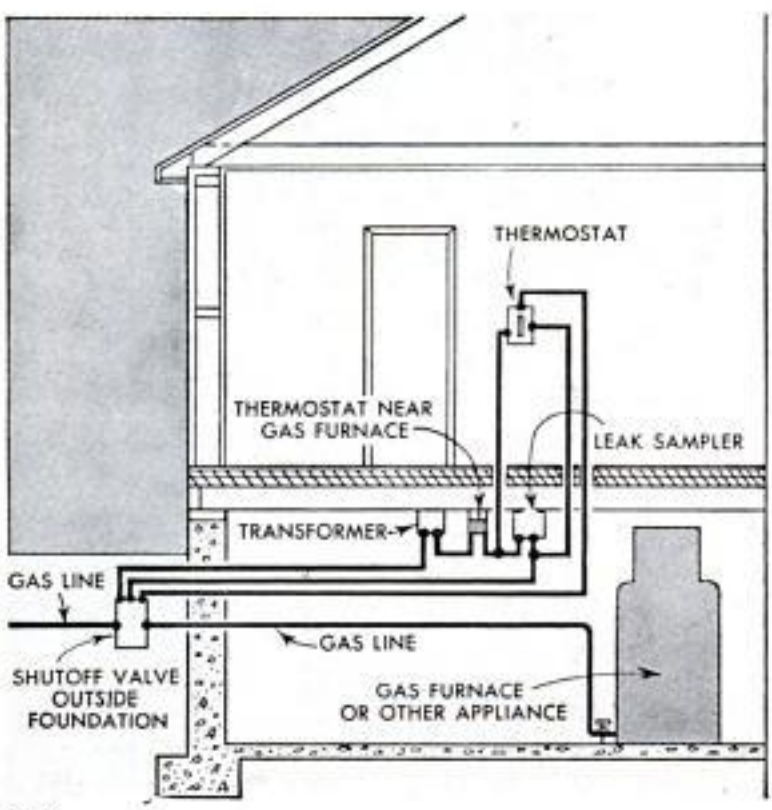
Left, new shell mold is taken from machine. Right, casting from matched plastic molds is clean and smooth

Mold-Making Machine Cuts Costs 30 Percent

By refining a process developed in Germany, a group of graduate students at Stanford University turn out shell molds at 30 percent less cost than the old way and castings made in the molds are cleaner and have closer tolerances. The method involves a sand-and-plastic mold that has been successfully used in large production runs, but had never been considered practical for small foundries. The molding machine has a hot oven at one end and a bin containing sand and a thermosetting plastic at the other. The metal pattern from which the mold is to be made is heated in the oven, turned upside down and then clamped to the open top of the sand bin. The whole bin is then inverted and the sand-and-plastic mix falls on the hot metal pattern. Heat from the pattern sets the plastic and causes a layer of the mixture to stick to the pattern. When the bin is inverted again, the mold is lifted off.



Automatic "Sniffer" Detects Leaking Gas

Gas leaks inside the home are quickly detected by an automatic "sniffer." The detector is located in the basement or any room where a leak might occur. An electric pump samples the air at regular intervals, and if any trace of gas is present the system immediately sounds an alarm. In event of a fire it closes a shutoff valve in the underground gas main outside the foundation as soon as the temperature reaches 110 degrees.

Sources of available products described in this issue are listed on pages 16, 20 and 22. Sources of further information on other articles are given in the WHERE-TO-FIND-IT LIST, available from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11

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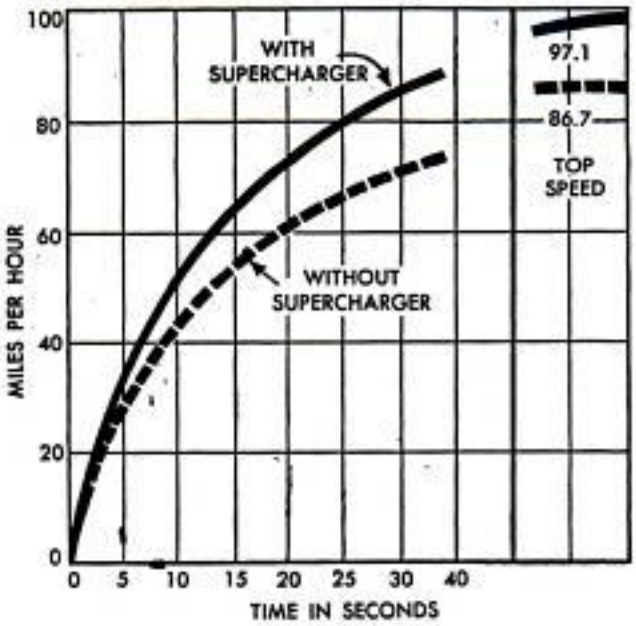


Curves mark acceleration and top speed of Mercury test car before and after supercharger was added

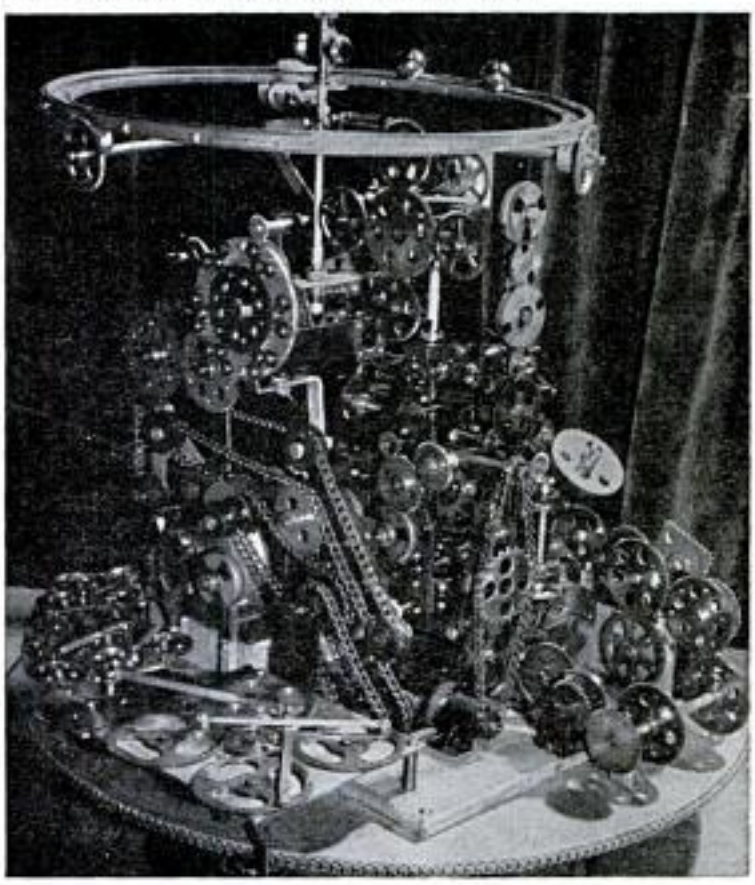
Unit is mounted ahead of carburetor and driven by fan belt. It is assembled from kit, quickly installed

Variable-Speed Supercharger for Stock Cars Boosts Power

You can make your stock automobile perform like a hot rod by installing a variable-speed supercharger that is said to add as much as 40 percent to engine power. Acceleration and top speed are materially increased. The unit is also useful in high-altitude areas as it provides sea-level performance at mile-high elevations. It is of the centrifugal type, driven by the fan belt and mounted ahead of the carburetor. A variable-speed feature permits the unit to stand by until the throttle is depressed. Said to be virtually silent in operation, it comes complete with an installation kit and can be installed in the average car in a few hours.

Elaborate Mechanism Works and Works to Do Nothing Well

We all know someone who works harder doing nothing than most of us work doing something, but we can't possibly know anything that works harder at nothing than a machine built by a California hobbyist. The machine has over 700 working parts that rotate, twist, oscillate and reciprocate—all for no purpose except movement. It is the brainstorm of Lawrence Wahlstrom, a landscape artist, who calls it a flying-saucer detector. The machine not only accomplishes nothing, it is never completed—it has been under construction seven years. Each year Wahlstrom adds 50 or more moving parts to it so it can do nothing more efficiently!



◐Motorists will get 40 percent more miles per gallon in the near future when engines with 12-to-1 compression ratios requiring 100-octane gasoline become available, predicts Dr. Gustav Egloff, noted petroleum scientist.

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IVAN, THE RETROACTIVE

Busiest inventor behind the Iron Curtain, we think, is the fellow who invents Russian inventors who beat our Benjamin Franklins and Thomas A. Edisons to the bright idea. This article, based on items in the soviet press, was compiled by Crusade for Freedom correspondents. Through the Crusade, millions of private Americans support Radio Free Europe and provide information and leadership to the peoples of Czechoslovakia, Poland, Hungary, Romania, Bulgaria and Albania. We hope there is a sense of humor left in Moscow.

A NEW RACE of supermen has been invented: men of such fantastic intellectual capacities that they do rocket research at the age of eight. This race is Russian and anyone who doubts it just hasn't been reading his *Pravda* lately. For if he had, he'd know that almost everything ever invented —except, to date, man and the wheel and fire—was the sole product of the Russian state.

Nobel had nothing to do with dynamite, the soviet press assures us. He only stole

the patent from Messrs. Zinine and Petrusevski, who invented it, along with nitroglycerin, in 1863. Marconi stole the radio from Popov, and Ben Franklin, that sly thief, never invented the lightning rod at all. Professor Lomonosov patented it much earlier and Franklin stole the patent in 1752. Lomonosov, a real producer, also invented the first helicopter model, later developed by Zhukovsky in 1912. The Wright brothers were more than 25 years late with their airplane, for Alexander Mozhaisky patented that in 1875, developed a steam-propelled airplane in 1882 and also was the first to develop amphibious aircraft and the aileron.

Television was first invented in 1907, when Russia's Boris Rosing invented cathode telescopy. Cyrus H. McCormick had little to do with the combine and harvester, for a Russian agronomist named Vlasenko developed one "20 times better 11 years earlier." Sir Arthur Fleming, a British fuddy-duddy, the soviet press assures us, was a full fifty years late with penicillin when he invented it in 1928. As a matter of fact, the anonymous Russian scientist who invented penicillin based his discovery on a "near-penicillin" of two Russians in 1870. This 19th century penicillin was "so excellent" that another Russian scientist (also strangely unnamed) used it on a couple of unprotesting chickens in 1904. What happened to the birds is not revealed in the report.

The soviets don't blink an eye at some puzzling facts. For example, the Russian "inventor of the airplane," Comrade Mozhaisky, isn't even listed in the first *Great Soviet Encyclopedia* and the latest edition of the *Short Soviet Encyclopedia* still credits the Wright brothers with the invention. Similarly, the *Soviet Encyclopedia of 1928* says "the bicycle is the invention of the following 19th century inventors: Dreis, Dalselle, Lallemand and Michelin. The pedals were invented in 1885 by the Frenchman Micheaux." Without even blushing, the 1949 edition claims the bicycle as an invention of the "Russian worker Artamanov." This intrepid fellow, listed as stemming from the Ural Mountains, bicycled 1000 miles to Moscow in 1801—84 years before inventor Micheaux climbed onto his French contraption.

The Western countries, filled with "thieves and pilferers," stole practically every single Russian invention, says Radio Moscow. Michael Lomonosov, not only the "inventor" of the lightning rod but also of the periscope, atomic energy, cosmic-ray research, the kinetic theory of gases, the mechanical theory of heat, the Law of Conservation of Energy and the use of the microscope in chemistry, would be more widely known today if it weren't for "foreign thieves of Russian inventions and pilferers of Russian glory," complains the Soviet Academy of Sciences.

If it hadn't been for these "thieves," then we might realize that it was a Russian, Fedor Abramovich Blinov, who developed the Caterpillar tractor in 1879 and that it was an American firm which "stole" his patent. We might realize that two Russians,

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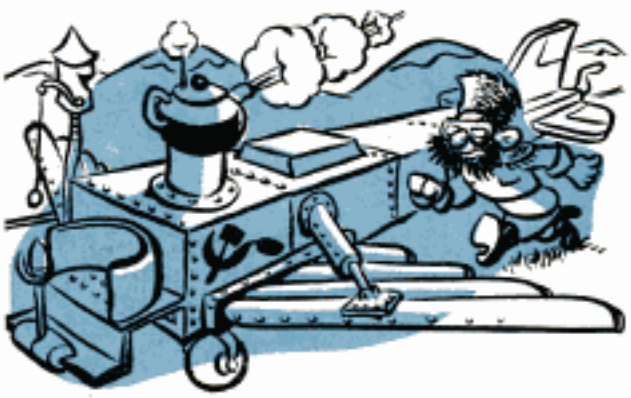
INVENTOR

Gauzei and Brazhnikova, developed antibiotics in 1942, that an unnamed Russian invented DDT, that it was Czar Peter I who invented the world's first floating dry dock and the first device to measure the ocean depths, and that the Russians invented radio broadcasting, radio-sounding devices for the atmosphere, the teleprinter, telegraph poles, telegraph equipment, sound movies, movie film, photolithographic machinery, Technicolor, 3-D movies, radio location techniques, radio navigation, radio acoustics, the use of high-frequency current in industry, and vitamins. All these, of course, long before the doddering Western scientists even thought of them.

Not only are the Russians showing that they can "scoop" Western inventors; they even scoop themselves. Just a short while ago Radio Moscow announced that "until recently it was thought that the first rockets had been manufactured in Russia in 1680 when Peter I founded the rocket in-



stitution. Materials found in the U.S.S.R. recently proved that the first rockets had been made in Russia at least 60 years prior to that time." It's probably just as well that they got Peter off the hook. In 1680, when he was supposed to have been vitally interested in rocket research, he was only eight years old, having been born in 1672.

Having invented almost every machine worth inventing, the Russians recently started claiming that they invented things like the "art of warfare." Statistics? The Russians were tabulating statistics back in 1727. Shakespeare? Only in the U.S.S.R. is Shakespeare performed as he was intended to be performed, says a Baku newspaper. Evolution? "Progressive Russian scientists" developed that many years before Charles Darwin, says *Pravda*. Relativity? Despite the fact that the theory of relativity is not considered correct from the Marxist point of view, *Pravda* says that a Russian named Lobachevsky stumbled onto rela-

tivity long before Professor Einstein did.

And as for the incandescent lamp, Moscow reveals that Edison is a plain and simple liar. It was the Russian, Ladygin, who developed it in 1877, despite the fact that the 1937 *Great Soviet Encyclopedia* still gives the Americans credit for it.

Lately the Russians, thinking of their satellites, have become generous. Directives must have gone out to the captive states of Eastern Europe, telling them that it would be quite all right now for them to claim a little invention or two. The Czech Reds were so happy that they threw all caution to the winds. They promptly staged an exhibition named "What Czechoslovak Technicians Have Given the World" and placed among the "discoveries"—the lightning rod.

We wonder whose head rolled when that reached Moscow. Hadn't the Czechoslovak Reds ever heard of Russia's Lomonosov?

It has become a battle royal and the field still seems wide open. Recently, Hungarian Communists insisted that the dynamo, the telephone switchboard, the telephone, the Zeppelin and the first internal-combustion engine were all invented by Hungarians.

Why all this frenzied search for scientific glory?

As *Questions of History*, a Moscow publication, recently said: ". . . the more rapacious and piratic the imperialism of a given country, the more insolent and crude is this (ascribing) as many scientific discoveries as possible to scholars of one's own nationality and race at the expense of all other nationalities and races." ★ ★ ★

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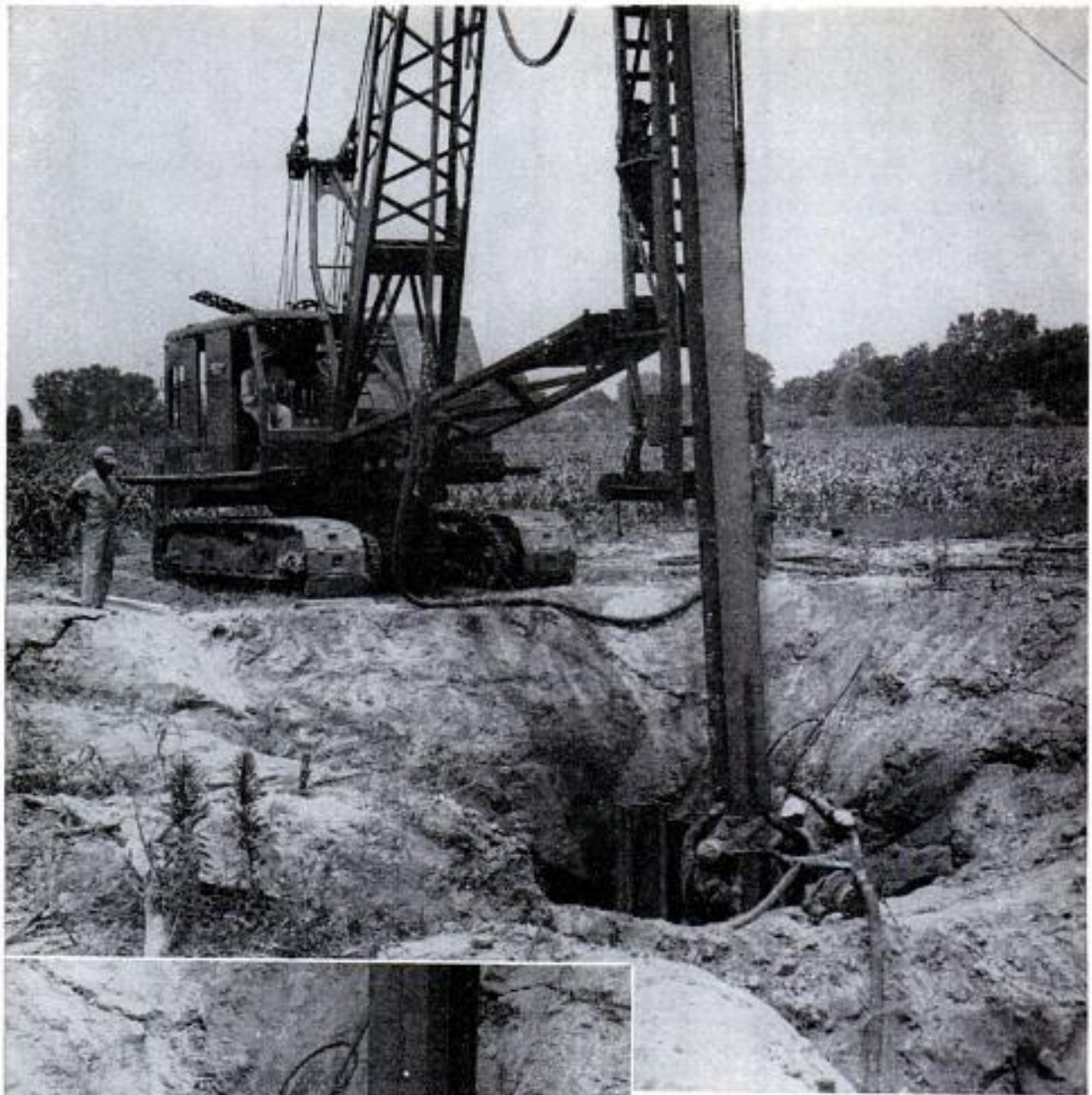

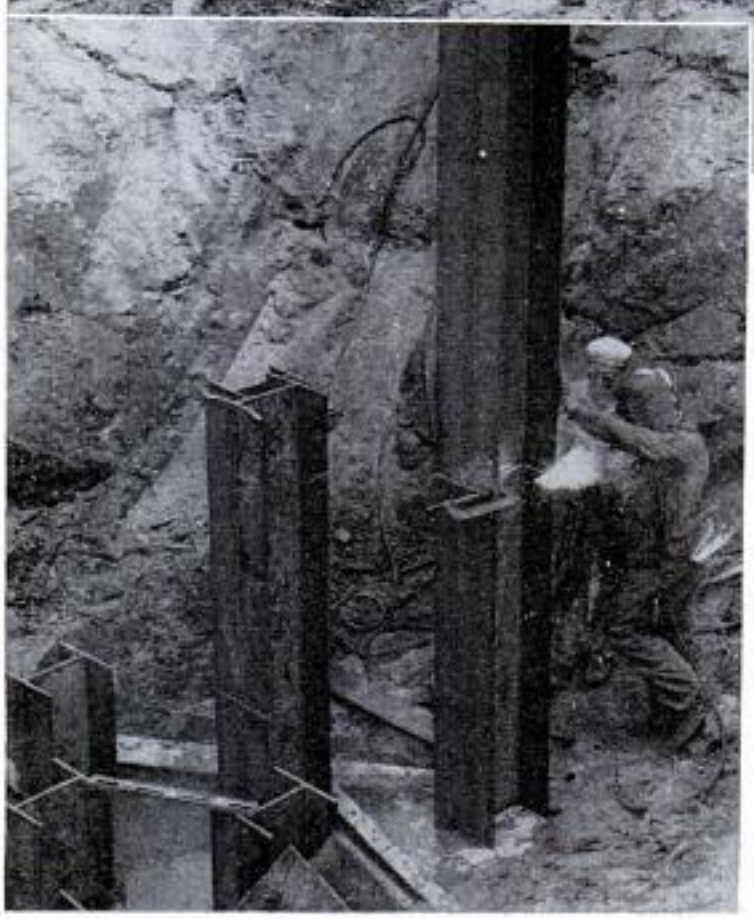

Lincoln Electric Co. photos

All the Way to China?

BY WELDING STEEL beams on top of each other, construction engineers can drive piles to any depth to reach bed rock—theoretically all the way to China if necessary! A length of H pile is driven into the ground by a pile driver until only a few feet remain above the surface. Another length of piling then is swung into position and welded atop the driven one. What is believed to be the deepest pile ever driven supports a highway bridge near Meadville, Pa. It reaches a depth of 304 feet. The same pile-driving technique can be used on standard I-beam piles and pipe piles. The corrosion of piles in the ground is negligible.

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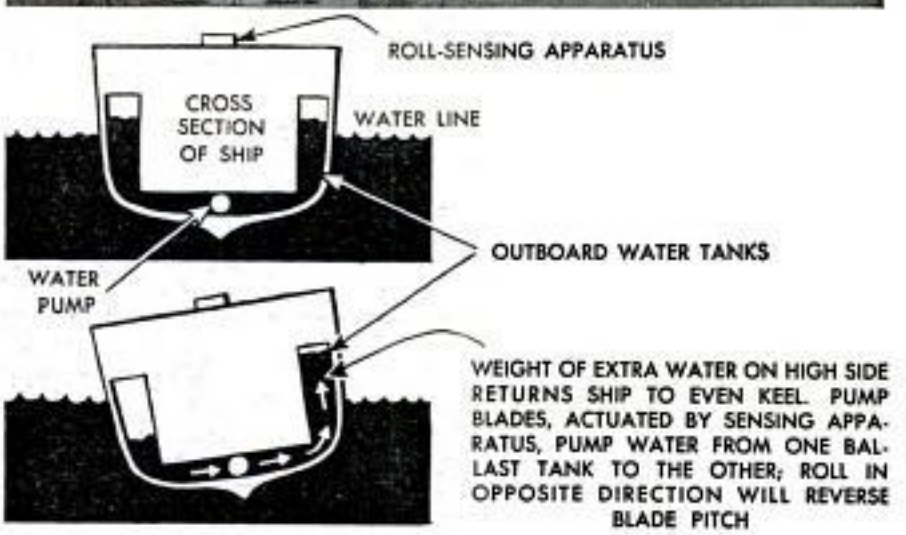
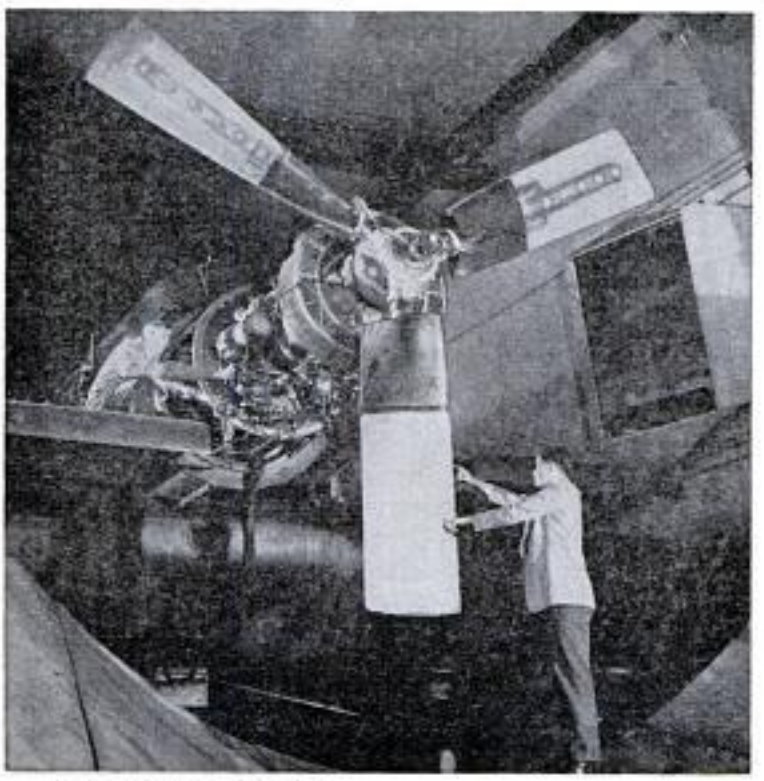
Pump Moves Water in Ship From Side to Side to Minimize Roll

Up to 90 percent of the roll in ships can be eliminated by an improved ballasting system devised at Stanford University. The heart of the system is an apparatus that senses the roll, and rapidly transfers water to a tank on the rising side of the ship. Weight of the water cancels the force that causes the roll, keeping the ship level. The method was devised with the aid of an unwieldy teeter-totter apparatus that represents a Navy destroyer plowing through a hurricane. Motorized springs rock the apparatus to simulate the roll of the ship and the stabilizer system quickly stops the ship's motion. The system has a pump with reversible and variable-pitch blades that transfer water from one ballast tank to another. Now ready for testing on an ocean-going vessel, the system promises more comfortable voyages and easier aircraft landings on carriers.



Two-Foot-Wide Propeller Blades To Be Turned by 5500-Horsepower Engine



As added propulsive thrust for take-off, two-foot-wide propeller blades are being produced for Pratt & Whitney's 5500-horsepower T34 turboprop engine. The hollow steel blade is braced by a steel core, with synthetic sponge filling the air spaces to provide additional support of the shell. The widest blade previously made by Hamilton Standard was 17½ inches.

X-Ray Pictures in Color

X-ray pictures in color may soon help doctors spot slivers of glass and other nonmetallic particles embedded in the flesh. Certain commercial color films which change the invisible energy of X rays and selected alpha, beta and gamma rays into bright visible colors would be used. The color difference makes the foreign body easy to locate.

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ON THE FORTY PAGES which follow, we present a Special Section devoted to the automobile. It begins with a glimpse into a glorious past—the age of the Classic Cars, portrayed in full-color photographs and sketches worthy of framing. There follows a review of the 1954 models just introduced in America, their specifications and a pictorial commentary on the novel mechanical and style changes appearing in the new lines. Other notable articles in this section are a "Report to Detroit" on a survey conducted by the Editors of *Popular Mechanics* of what the American motorist wants in the car of the future, a graphic presentation of the basic facts of automobile mechanics and an interview with two great American drivers on the world's greatest road races. In the Craftsman Section appears another article on "How to Buy a Used Car." We present this Special Section with great pride.

THE TWELVE FINEST American Classics

A Portfolio of Ageless Cars

BY ARTHUR R. RAILTON, *Automotive Editor*

Color photographs by Don Honick

IN THE EIGHT PAGES which follow, *Popular Mechanics* salutes the Classics among the Classics—12 American automobiles chosen as the finest produced in that golden era defined as the period from 1925 to 1942.

Ranked in the order of their selection, the Classics are portrayed here in true color by *Popular Mechanics* photographs and sketches. The roll of honor:

1. Duesenberg 1931-J Roadster-Murphy.
2. Duesenberg 1931-J Victoria-Rollston.
3. Lincoln 1932-KB Phaeton Dual Cowl.
4. Packard 1929 Sport Phaeton.
5. Pierce Arrow 1933 Silver Arrow V12.
6. Stutz 1932 Super Bearcat.
7. Cord 1937 Convertible Coupe.
8. Packard 1930 Speedster.
9. Kissel 1927 White Eagle Speedster.
10. Auburn 1936 Supercharged Speedster.
11. Marmon 1931 V16 Club Sedan.
12. Lincoln 1941 Continental Convertible.

The years 1925 to 1942, in the minds of Classic Car fans, delineate the era in which the motor car had attained mechanical excellence, having thrown off all the heritage of the horse-drawn buggy, and had not yet passed into the hands of the stylist.

These 12 cars, honored here as pre-eminent among their kind, are no museum pieces. Proud owners still operate and maintain them, some in their original paint, certainly most in their original hue, and as much as possible in their pristine operating condition—without the multiplicity of gadgets and chrome and automatic mechanisms of present-day cars.

What is a Classic Car? It may have a thousand definitions in the minds of the Classic cultists. Surely it is not merely a "middle aged" car—something between an antique and a modern! Simply expressed, it is an automobile of enduring beauty to which is harnessed a surplus of power.

(Continued to page 153)

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FIRST:

Duesenberg Roadster-Murphy 1931-J

Owner: William S. McKelvy, Pittsburgh, Pa.

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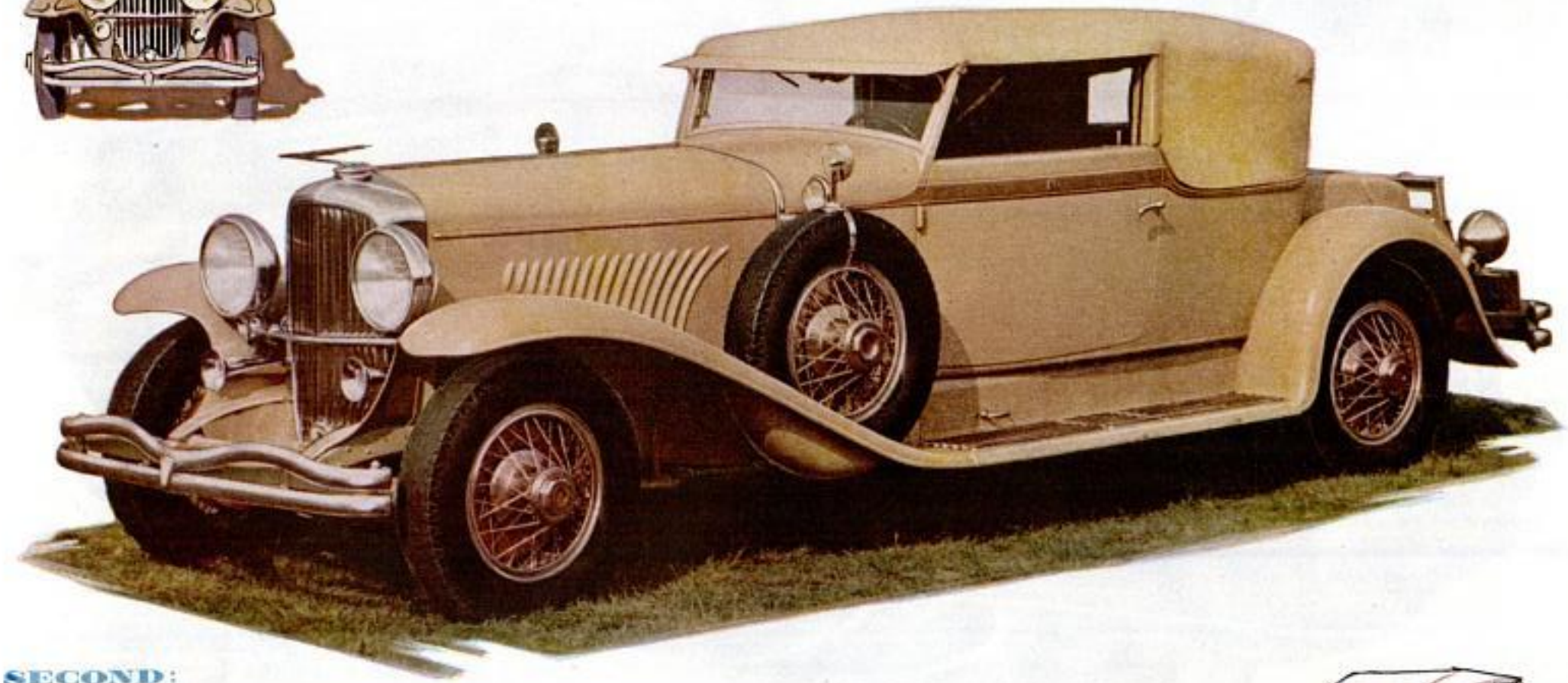

SECOND:

Duesenberg Victoria-Rollston 1931-J

Owner: Dr. A. S. Fisher, Bergenfield, N. J.

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THIRD:

Lincoln Dual-Cowl Phaeton 1932-KB

Owner: S. Prestly Blake, Long Meadow, Mass.

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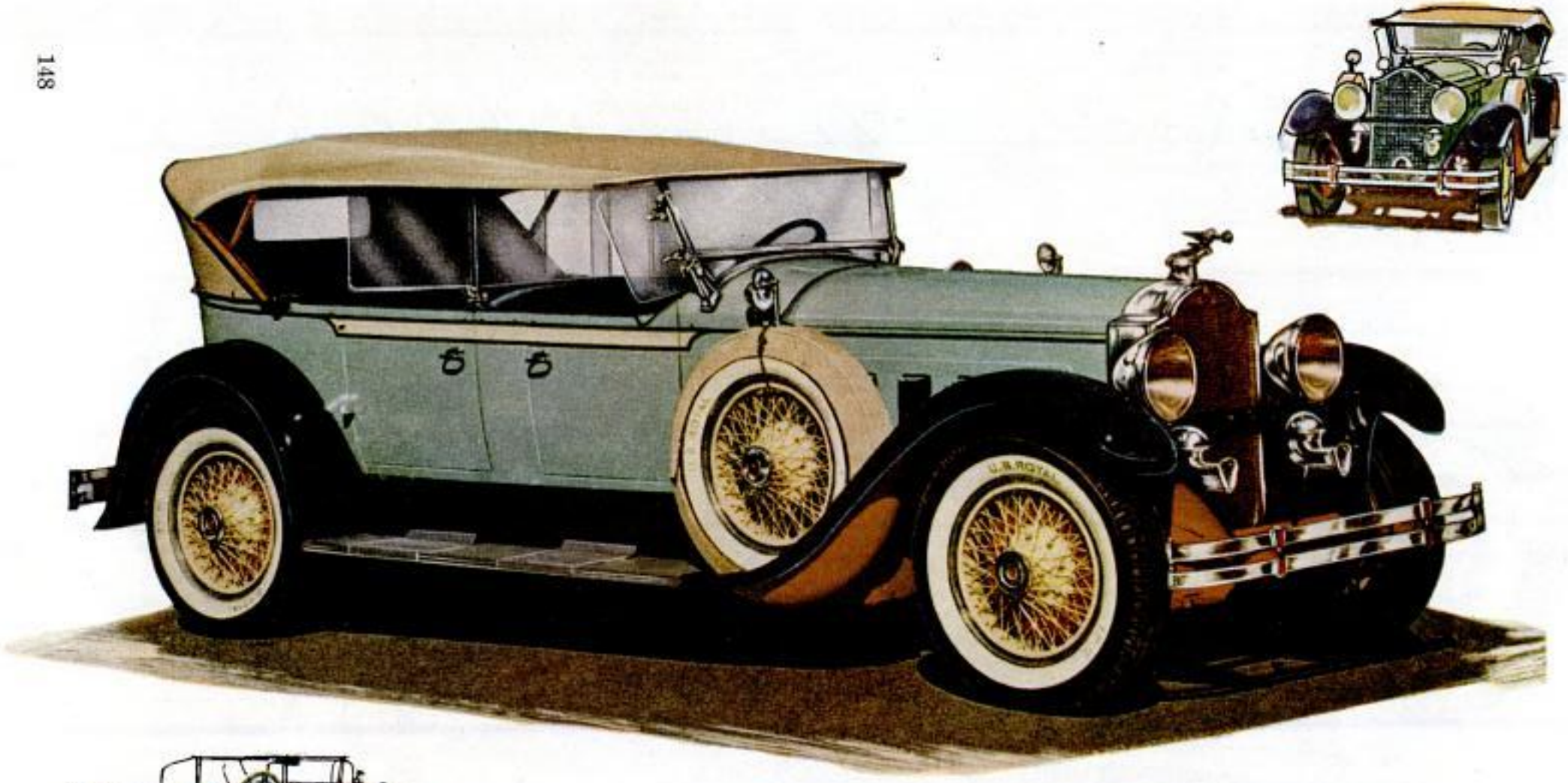

FOURTH:

Packard Sport Phaeton 1929

Owner: J. A. Coletti, Flint, Mich.

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FIFTH:

Pierce Silver Arrow V12 Sedan 1933

Owner: Henry Austin Clark, Jr., Glen Cove, N. Y.

SIXTH:

Stutz Super Bearcat 1932

Owner: Don Jackson, Lindsay, Calif.

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SEVENTH:

Cord Convertible Coupe 1937

Owner: Dr. Anthony Simeone, Philadelphia, Pa.

EIGHTH:

Packard Speedster 1930

Owner: George K. Jepson, Hillsdale, N. J.

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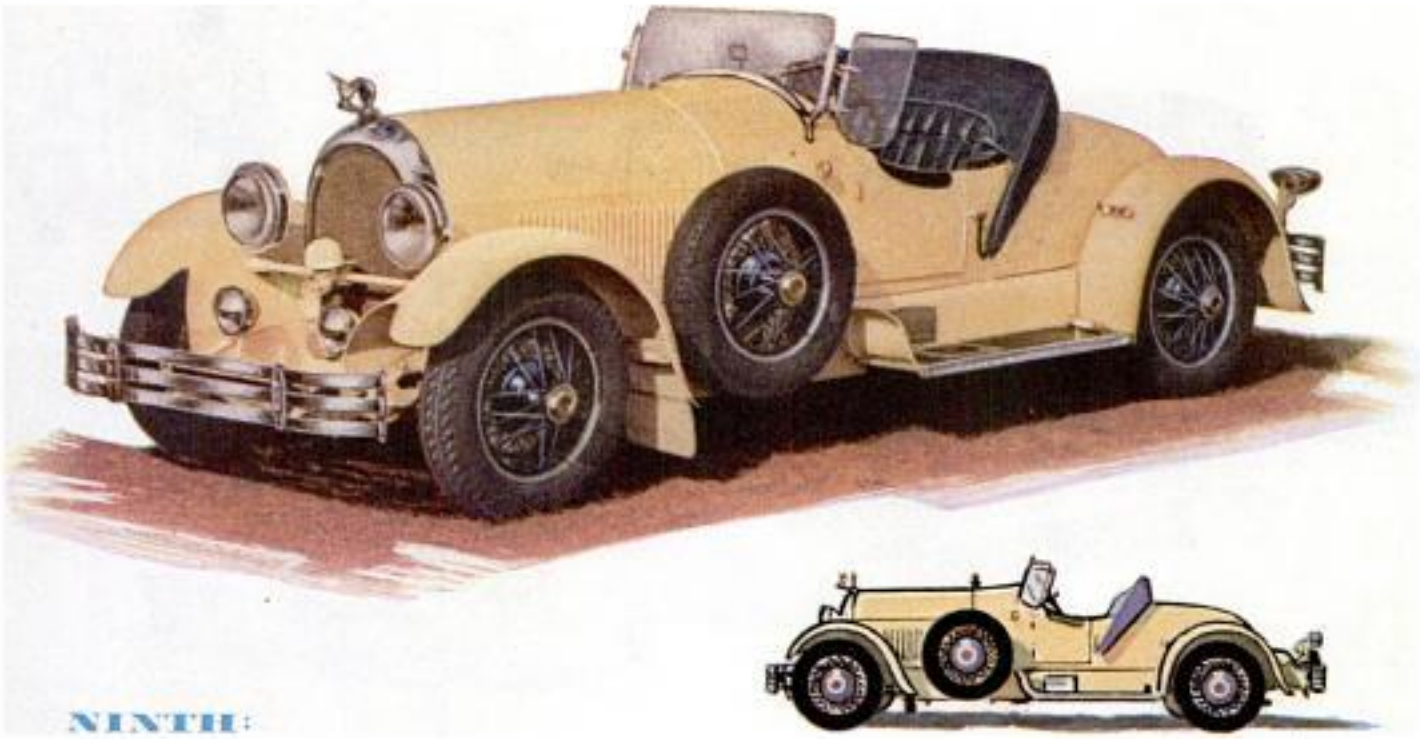

NINTH:

Kissel White Eagle Speedster 1927

Owner: Sidney Stein, Kew Gardens, N. Y.

TENTH:

Auburn Supercharged Speedster 1936

Owner: Harry Denhard, Greenville, N. Y.

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ELEVENTH:

Marmon V16 Club Sedan 1931

Owner: Arthur G. Rippey, Denver, Colo.

TWELFTH:

Lincoln Continental Convertible 1941

Owner: Warren A. Custer, Newtown, Pa.

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THE TWELVE FINEST American Classics

(Continued from page 144)

In the chosen years there are many great cars which might qualify. To choose the Classics among the Classics, the Editors turned to The Classic Car Club of America, whose 700 members devote themselves to preserving and cherishing the hundred and more models they dignify by the name. Officers of the Club accepted our bid for cooperation with enthusiasm. As a preliminary, the Board of Directors of the Club, whose national headquarters are at 122 Cedar Street, New York City, narrowed the field of Classics from scores to 27 American-made cars built in the Classic period. While Classic owners include some famous European makes in their roster—notably the Rolls-Royce, the Bugatti Royale, the Bentley, the Mercedes-Benz and Isotta Fraschini—it was determined that only the American-made Classics would be considered in this special honor roll.

The names of the 27 nominees for fame were submitted by *Popular Mechanics* to the entire membership of The Classic Car Club, whose votes determined the first 12 Classics as shown here. Moreover, their answers to our questions and their wealth of comments attested to their enthusiasm —and to their variety of opinions on what constitutes a Classic.

For the most part they agree that the period from 1925 to 1942 embraced "The Golden Age of Automobiles." As one member wrote, it was the period when custom cars were the "automobilist's ideal, not a sales manager's compromise."

And how, from those 18 model years, do they select the Classic from the less distinguished? The test or definition is almost as varied as the number of members. But, while mechanical qualities are generally mentioned in the comments, it is obvious that body design is the primary concern of the classicists. The ideal, of course, combines both appearance and performance in the highest degree—as embodied, for example, in the magnificent Duesenbergs that won both first and second honors on the list.

Among the standards applied in judging these Classics, in the words written to us by the owners and admirers of the cars, are these:

"It must be clean, pure in line and a work of art to look at."

"It never goes out of style. Its body lines are still beautiful today because of its enduring beauty."

"A classic has body styling of grace and beauty without excessive ornamentation."

"It has dignity, good taste and simplicity. It is restrained with no overplay. It is not high fashion."

All of which is agreeable, but scarcely specific. What is good taste and beauty to one may not please another. Not many agreed on the exact ranking of the first 12 as they appear here; their places result from a cumulative vote. Yet, while styles and designs and mechanics of these topmost Classics differ, they have some characteristics in common. Witness these comments from the Classic owners:

"It must look like an automobile." Unquestionably the winners do. They have graduated from the surrey and sulky stage. They have not yet adopted the lines of the airplane and yacht. Hood, wheels, headlights, doors, taillights are well defined entities.

"A long hood is essential." The select 12 all qualify. From the lean, tense-looking Duesenbergs to the relaxed, luxurious Continental, all have long hoods that cover big engines.

"It is big, racy and expensive." By the dollar standard of their day (or, for that matter, of ours), the leading Classics all meet the test of "big . . . expensive." Finish and materials have improved the luxury of modern automobiles, but the Classic fans will argue that no 1954 automobile can match the 1937 Cord or the 1930 Packard Speedster, for example, in raciness and costly style.

"Tends toward massive style—a luxury car." There is plenty of evidence to support this definition among the 12 winners. The two phaetons, the Lincoln Dual Cowl 1932 and the Packard 1929, are huge. In both of these, the rear seat is a comfortable vastness. You can straighten your legs out and still not touch the front seat. And yet the passenger area occupies only about half the car's over-all length. These cars are truly massive. The Marmon 1931 with its 145-inch wheelbase is another that more than meets this qualification.

"Should have a surplus of power." Generally, the Classics are powerful even by today's standards. The most classic of all, the Duesenbergs, have a straight-8 overhead-valve engine that develops 265 horsepower. The Marmon V16 (yes, that is 16 cylinders) produces 200 horsepower and the Auburn Supercharged Speedster of 1936 develops 150 horsepower.

"The Classic is custom bodied. It is not a stock factory model nor a family car. It has a body built for a particular function." All the Classics in the select 12 were of

(Continued to page 284)

Copyrighted material

CADILLAC

CHRYSLER

NASH

PONTIAC

LINCOLN

BUICK

FORD

MERCURY

HUDSON

PLYMOUTH

STUDEBAKER

OLDSMOBILE

PACKARD

DESOTO

CHEVROLET

DODGE

PARADE OF 1954 CARS

Introduction by Leo Donovan, PM's Automotive Correspondent

THINGS to remember from 1953:

At long last, the end of the seller's market! At midyear, production was in full swing. Ford made a run for it, producing on a six-day-week schedule with overtime shifts. In some areas Ford began to catch up with Chevrolet sales in September, but the year's total was far below Chevrolet (see chart, page 160).

Competition returned and brought inflated allowances on trade ins and whopping discounts by dealers. The buyer began to get the breaks.

Experimental cars of tomorrow (the so-called dream cars) made their first widespread appearance as manufacturers found a new merchandising technique of introducing in such cars the future styling they couldn't yet incorporate in current models.

General Motors, Chrysler and Ford all came forward with such cars (which, except for the Chevrolet Corvette, you couldn't buy). Hudson joined up with its beautiful Italia. Packard showed the Balboa and Kaiser the DKF plastic convertible.

Mass production of the plastic-bodied Corvette was a milestone in the industry even though the quantity produced was microscopic by industry standards.

The multimillion-dollar fire in GM's Detroit transmission plant in suburban Livonia, Mich., was the most disastrous in industry history. It completely destroyed the only source of Hydra-Matic transmissions. But GM staged a miracle to get back into mass production in less than three months.

Price cuts began to appear in Kaiser, Chrysler, Dodge, DeSoto and Plymouth and in the fall-introduced 1954 Hudson and Nash lines.

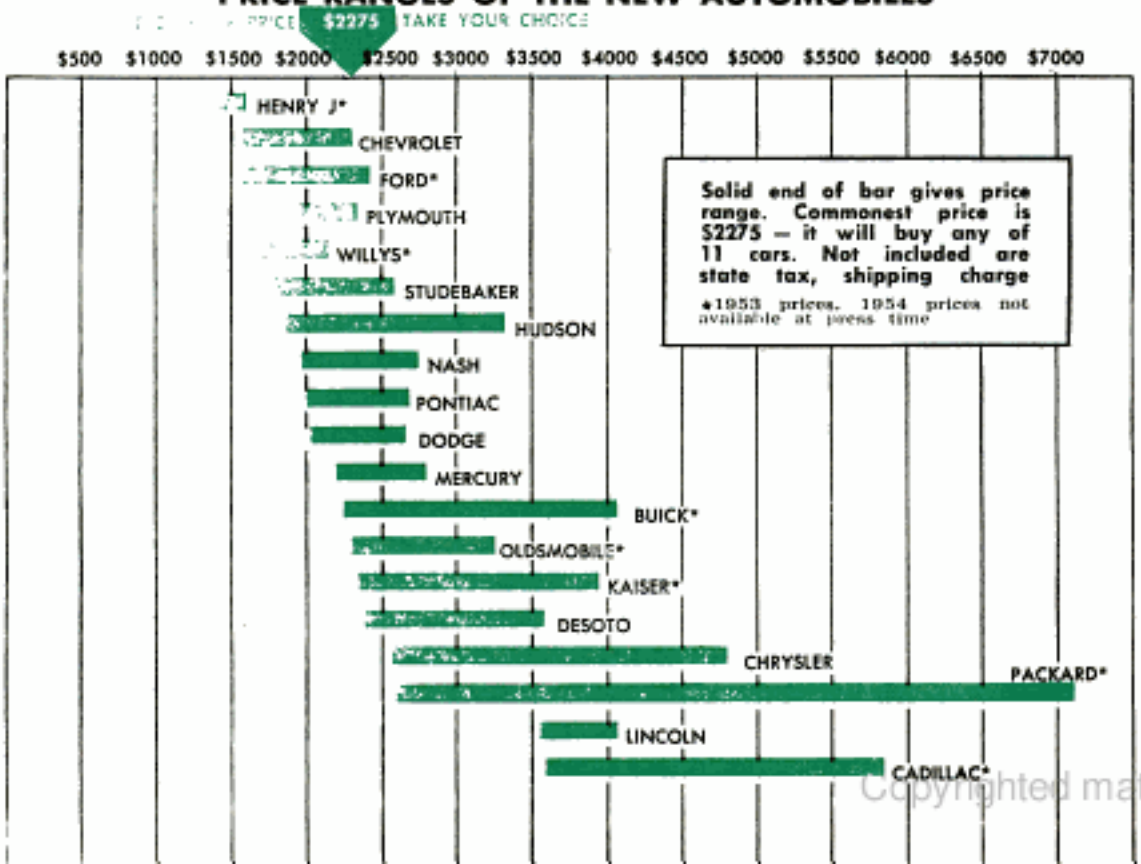
It was the second-highest production year in history, hitting a new high in wholesale value of its products—an estimated $11,440,000,000. Vehicle registrations soared to 54,745,000 in the country.

Kaiser-Frazer merged with Willys to become the Kaiser Motors Corp., and moved from Willow Run to Toledo, Ohio.

Garage mechanics, searching for space beneath the hoods of expensive cars with air-conditioning units, wondered how much more complicated their jobs could become. Some forward-looking mechanics began asking how the man in 1960 who buys a 1953 car (then seven years old) will be able to pay him the tremendous labor charges required to work in an engine compartment so cluttered with "extras" that it takes hours of labor just to uncover a cylinder head.

(Continued to page 306)

PRICE RANGES OF THE NEW AUTOMOBILES



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BUICK

All-new bodies are featured by Buick. Riviera hardtop, above, sports full rear-fender wheel openings. Also new: V8 engine in Special, lower body, finlike rear fender, less chrome, wrap-around windshield, more horsepower, a Century series combining Roadmaster engine and Special chassis for top performance. Improved power brakes have an electric vacuum pump so you still have power assist when engine fails

CADILLAC

Cadillac also has a new body. Lower by 1½ inches, longer by 3½, the car has the panoramic windshield, accented but recognizable rear fins, extended headlamp visors and a lower hood. Exhaust ports in rear bumper are round. Interior room is greater. Power steering standard on all cars. Horsepower is now 230

Chevrolet has made slight style changes: New taillights, headlight rings, parking lights and bumpers. Powerglide transmission is now available on all models. With it comes a 125-horsepower engine. Handshift cars have 115 horsepower. Power accessories are: Power seat, windows, brakes and steering

CHEVROLET

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CHRYSLER

Body lines are unchanged on the 1954 Chrysler, but under the hood the big V8 engine now has 235 horsepower. Bold horizontal bars give lower appearance to the car. Changed are grille, headlight trim, taillights and bumpers. PowerFlite automatic transmission has highest torque multiplication ratio in industry

DESOTO

Style changes, minor though they are, make the '54 DeSoto appear longer. Grille is less emphatic and slants forward, as does the bumper. Horsepower is now 170 in the V8 with 7.5:1 compression. Interiors are more lush and colorful. PowerFlite transmission is water cooled in the V8 model, air cooled in the six

New is Dodge's Royal V8—a super-de luxe series. All Dodges have greater over-all length, lower and more massive grille and new chrome moldings. Interiors are new also. Top of dash has textured paint to eliminate sun reflection. Horsepower on the V8 engine is 150, compression ratio 7.5:1. The six develops 110 hp.

DODGE

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FORD

Big news at Ford is its new V8 engine (see page 161). Bodies have only slight changes. Extended headlights and redesigned grille are most obvious. Ball-joint front suspension improves steering and roadability. the '54 Six has a larger bore and horsepower is 115. V8 horsepower is 130. Both have 7.2:1 compression

HUDSON

Rear fenders on the 1954 Hudsons go straight back to triangular taillights. The lower hood has a big, functional air scoop. Front grille is simplified. Most powerful Hudson is the Twin-H Hornet with its 170 horsepower. The Jet has a new two-door model and all Jets now have an extra two inches rear legroom

KAISER

Not yet announced, the 1954 Kaiser is expected to have additional horsepower. Basic bodies will be the same, but with new fenders, windows and front grille. Advance reports also state that the 1954 Henry J will be virtually unchanged

Biggest styling change in Lincoln is a front bumper with three vertical bars that form an air intake. Vacuum-controlled four-barrel carburetor assures extra power when needed without unnecessary gasoline consumption. Other changes: Magnetic fuel-pump filter, 12-inch brake drums, improved hydraulic tappets

LINCOLN

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MERCURY

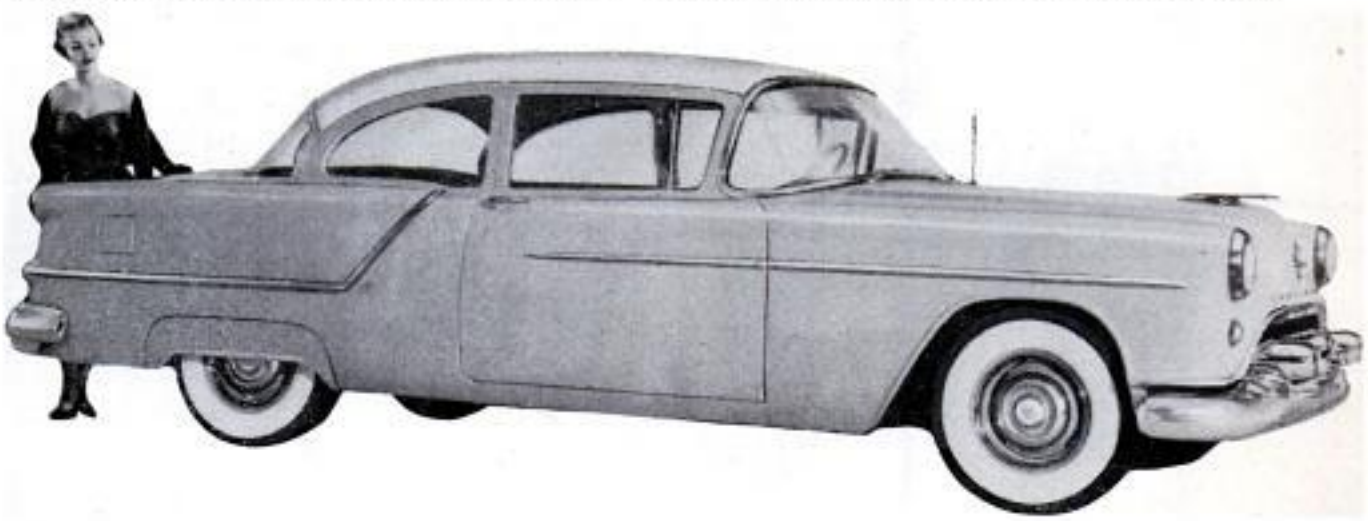
As with Ford, the big news at Mercury is under the hood—an all-new, overhead-valve V8 (see page 161 for details). It puts out 161 horsepower. Also new are ball-joint front suspension, a stronger frame and, stylewise, a longer rear fender that extends over the taillight, new front grille and brightwork

NASH

Continental spare tire is standard on many 1954 Nash models. Style changes are few. The grille is concave. Statesman has dual-carburetor, aluminum head, 110-horsepower engine with 8.5:1 compression. Ambassador has 130 horsepower (140 optional). Rambler has a four-door sedan on 108-inch wheelbase for first time

OLDSMOBILE

Another all-new body is Oldsmobile's. Longer and lower, it has little chrome decoration. All fenders are higher, hood flatter; wrap-around windshields on all models. Engine has more displacement and horsepower is now up to 185. Compression ratio is 8.25:1. Redesigned power brakes retain vacuum if engine dies



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PACKARD

With new rear fenders that merge into the taillights, the Clipper series gets individual styling to distinguish it from the big Packard. New this year is the Clipper Panama hardtop. The big Packard straight-eight engine has a nine-main-bearing crankshaft, an 8.7:1 compression ratio and develops 212 horsepower

PLYMOUTH

Plymouth has new model names this year: Belvedere (the most de luxe), Savoy and Plaza. Basic bodies are unchanged, but extensive trim redesigning makes the cars look longer and more luxurious. Over-all, they are 3½ inches longer. Grille, headlights and taillights are new. Interiors feature colorful fabrics

Pontiac's grille is oval in design and the chrome stripes on hood are more widely separated. Padded instrument panels and a mechanical four-way front seat are new for '54. Also new is the Star Chief (not shown) with 127 horsepower, a 124-inch wheelbase and 11 inches more over-all length than other Pontiacs

PONTIAC

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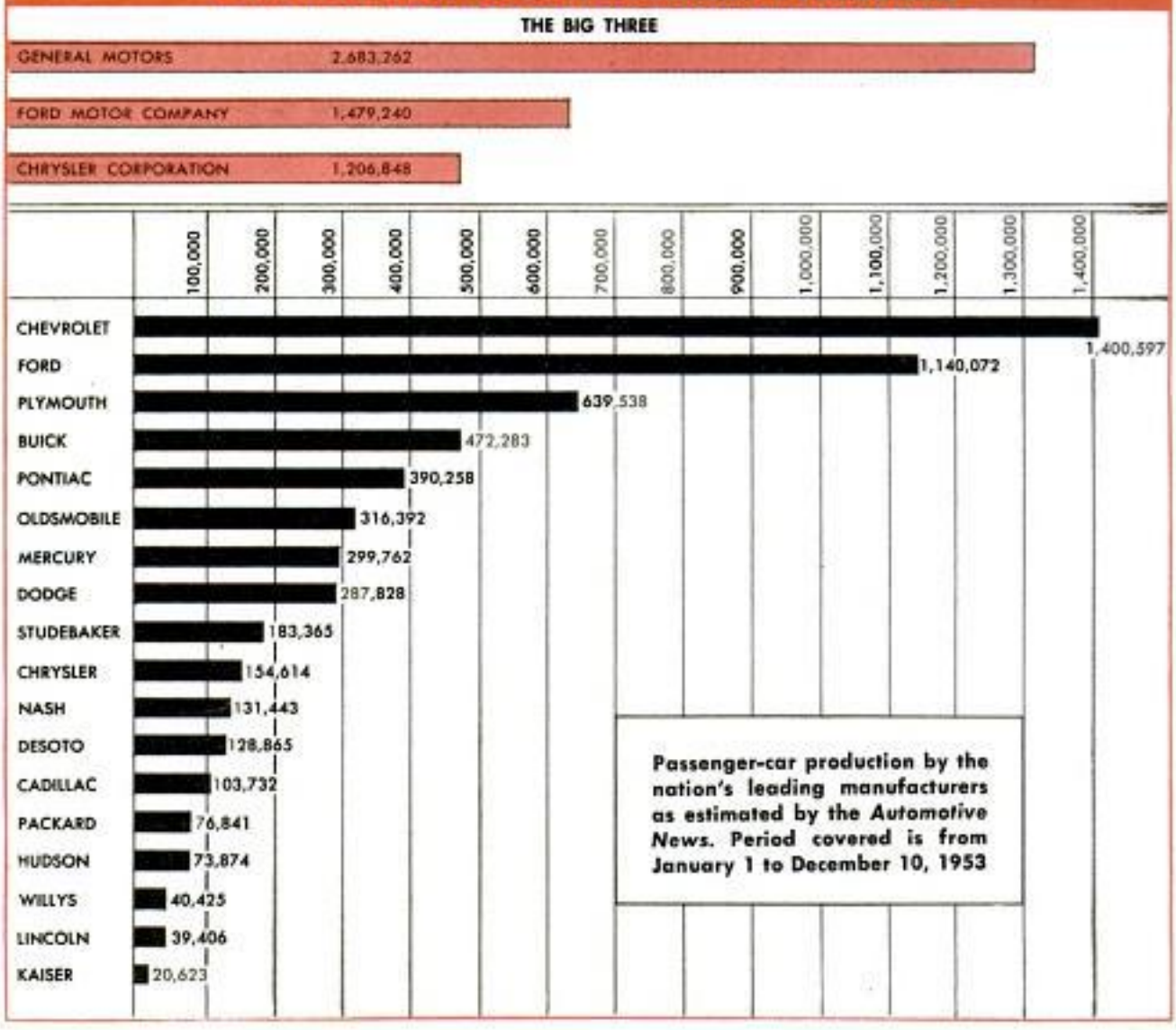
STUDEBAKER

Continuing the sleek design of last year, Studebaker emphasizes colorful interiors, a new grille and bigger bumper guards. Increased compression (7.5:1) on all models improves performance. Brakes are larger. Low-gear start on Champion's automatic transmission increases pickup. New this year is a station wagon

WILLYS

The 1954 models had not been released at press time. Advance information is that there will be important engine changes, but only minor body restyling

Scoreboard of 1953 Automobile Production



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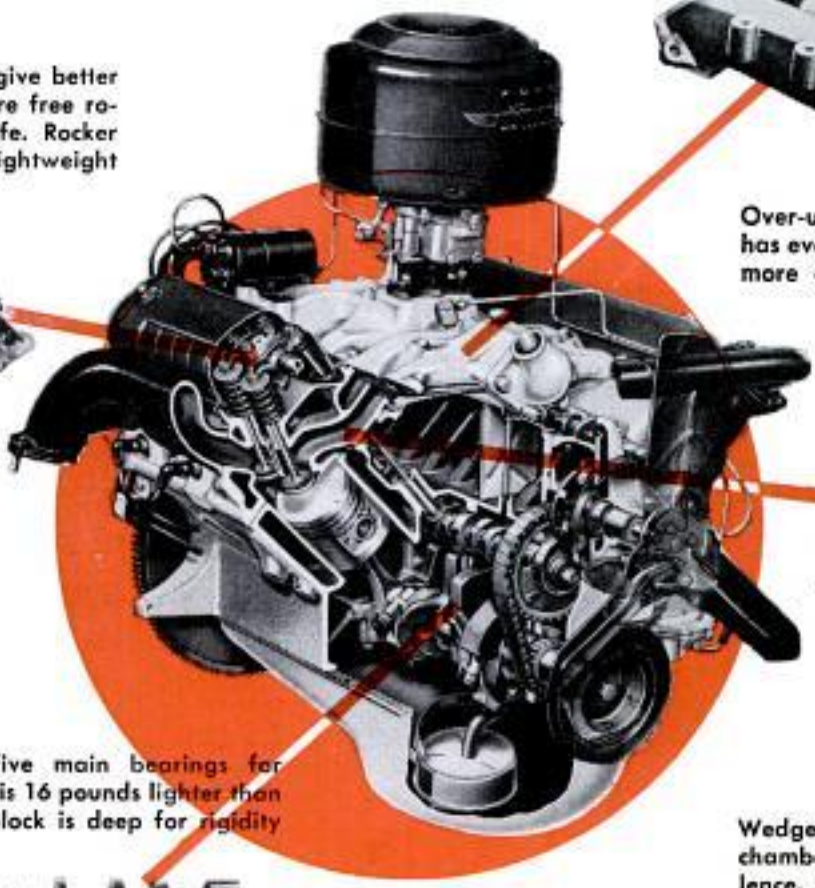
FORD GETS AN ALL-NEW V8

IN 1932 FORD introduced its first V8. Since that time, it has built and sold 16,000,000 such engines—a world's production record. Now, after six years of tests with 640 experimental engines, Ford offers an all-new 130-horsepower V8—the first major change in its basic engine since 1932.

Over-under intake manifold has even-length passages for more even fuel distribution

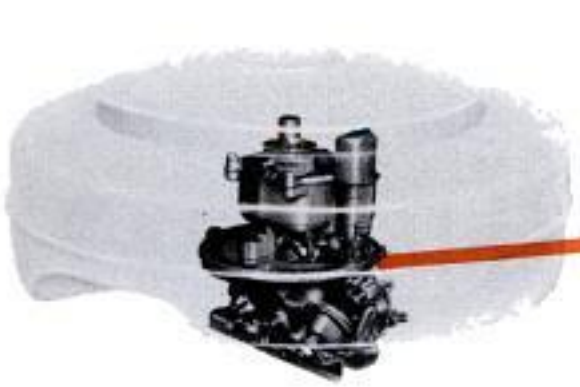
Overhead valves give better breathing. They are free rotating for long life. Rocker arms are short, lightweight

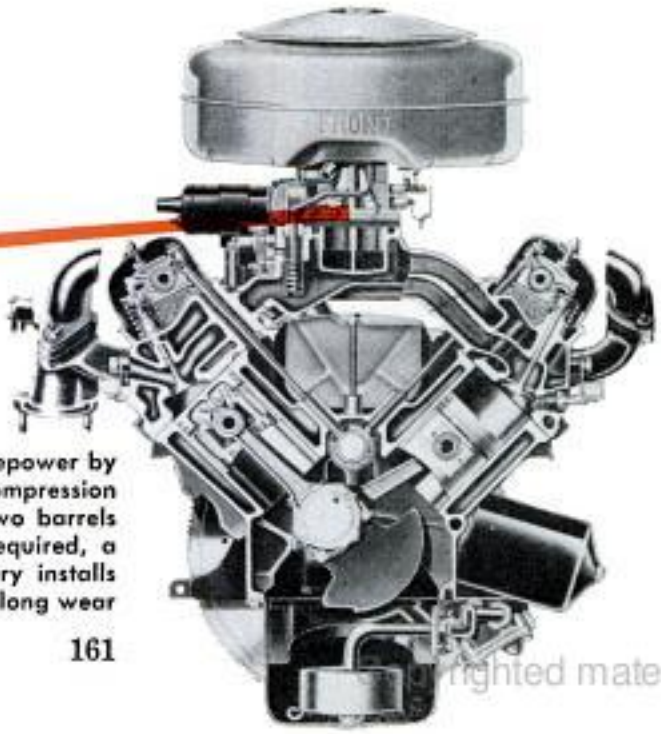


Wedge-shaped combustion chambers give high turbulence. Compression is 7.2 : 1

Crankshaft has five main bearings for greater rigidity. It is 16 pounds lighter than previous design. Block is deep for rigidity

And Mercury Does Too





Mercury has the same basic engine, but gets 161 horsepower by an increased bore for more displacement, a higher compression (7.5:1) and a four-barrel carburetor (above). Only two barrels operate in normal driving. When extra power is required, a vacuum control opens the secondary venturis. Mercury installs chrome-plated top compression rings on its pistons for long wear

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SPECIFICATIONS OF THE 1954 CARS

	PRICE 4-DOOR SEDAN	SHIPPING WEIGHT	WHEELBASE	DIMENSIONS: OVER-ALL LENGTH	OVER-ALL WIDTH	■ FRONT-SEAT HIPROOM	■ REAR-SEAT HIPROOM	■ FRONT-SEAT HEIGHT	■ FRONT LEGROOM	■ REAR LEGROOM	STEERING: OVER-ALL RATIO	TURN-CIRCLE DIAMETER	ENGINE: DISPLACEMENT	BRAKE HORSEPOWER AT R.P.M.	BORE AND STROKE	COMPRESSION RATIO	TORQUE RATING AT R.P.M.
CHEVROLET				●	●	●	●		●	●		●					
Hand shift	$1680	3210	115.0	196	75	60	61	13.5	43	41	23.1	38	235.5	115 at 3700	3.56x3.94	7.5	200 at 2000
Powerglide	1857	3335	115.0	196	75	60	61	13.5	43	41	23.1	38	235.5	125 at 4000	3.56x3.94	7.5	200 at 2000
FORD																	
Six	N.A.	3155*	115.5	198	74	59	59	13.0	43	42	25.3	41	223.0	115 at 3900	3.62x3.60	7.2	193 at 2100
V8	N.A.	3276*	115.5	198	74	59	59	13.0	43	42	25.3	41	239.0	130 at 4200	3.50x3.10	7.2	214 at 2000
PLYMOUTH																	
Six	$1765	3036	114.0	194	74	60	59	14.4	44	44	21.1	39	217.8	100 at 3600	3.25x4.38	7.1	177 at 1600
STUDEBAKER																	
Champion 6	$1801	2765	116.5	199	70	60	57	13.0	43	40	19.0	39	169.6	85 at 4000	3.00x4.00	7.5	138 at 2400
Commander V8	2179	3105	116.5	199	70	60	57	13.0	44	40	20.0	39	232.6	120 at 4000	3.38x3.25	7.5	190 at 2000
Land Cruiser V8	2438	3180	120.5	203	70	60	59	13.0	43	41	20.0	41	232.6	120 at 4000	3.38x3.25	7.5	190 at 2000
HUDSON																	
Jet 6	$1858	2675	105.0	181	67	58	58	13.3	42	40	20.0	40	202.0	104 at 4000	3.00x4.75	7.5	158 at 1400
Wasp 6	2256	3440	119.9	202	78	64	64	12.1	43	38	20.2	41	232.0	126 at 4400	3.56x3.88	7.0	178 at 2400
Super Wasp 6	2465	3525	119.9	202	78	64	64	12.1	43	38	20.2	41	262.0	140 at 4000	3.56x4.38	7.0	214 at 1600
Hornet 6	2768	3620	123.9	209	78	64	64	12.1	43	38	25.6	42	308.0	160 at 3800	3.81x4.50	7.5	264 at 1800
NASH																	
Rambler 6	$1995♦	2650	108.0	193	74	60	60	12.0	44	40	19.5	42	195.6	90 at 3800	3.13x4.25	7.3	150 at 1600
Statesman 6	2178	3045	114.3	202	78	65	65	12.3	43	40	24.0	45	195.6	110 at 4000	3.13x4.25	8.5	155 at 2000
Ambassador 6	2595	3430	121.3	209	78	65	65	12.3	43	40	25.5	46	252.6	130 at 3700	3.50x4.38	7.6	220 at 1600
PONTIAC																	
Chieftain 6	$2027	3381	122.0	203	77	60	61	13.9	43	43	25.1	41	239.2	115 at 3800	3.56x4.00	7.0	193 at 2000
Chieftain 8	2102	3456	122.0	203	77	60	61	13.9	43	43	25.1	41	268.4	122 at 3800	3.38x3.75	6.8	226 at 2200
Star Chief 8	2301		124.0	214	77	60	61	13.9	43	43	25.1	43	268.4	127 at 3800†	3.38x3.75	7.7†	234 at 2200†

DODGE																
Six	$2024	3235	119.0	206	74	61	61	14.3	44	41	21.1	41	230.2	110 at 3600	3.25x4.63	7.3	190 at 1600
V8	2244	3425	119.0	206	74	61	61	14.3	44	41	22.2	41	241.3	150 at 4400	3.44x3.25	7.5	222 at 2400
MERCURY																	
V8	$2251	3450	118.0	206	74	59	59	13.0	43	42	25.4	41	256.0	161 at 4400	3.62x3.10	7.5	238 at 2500
BUICK																	
Special V8	N.A.	3714‡	122.0	206	77	62	63	12.8	43	42	26.7	41	264.0	143 at 4200	3.63x3.20	7.2	228 at 2400
Century V8	N.A.	3786‡	122.0	206	77	62	63	12.8	43	41	26.7	41	322.0	195 at 4100	4.00x3.20	8.0	302 at 2400
Super V8	N.A.	4020‡	127.0	217	80	65	66	13.5	43	44	26.7	43	322.0	177 at 4100	4.00x3.20	8.0	295 at 2400
Roadmaster V8	N.A.	4212‡	127.0	217	80	65	66	13.5	44	44	24.1▲	43	322.0	200 at 4100	4.00x3.20	8.5	309 at 2400
OLDSMOBILE																	
88 V8	N.A.	3692‡	122.0	205	78	62	62	13.2	43	44	27.5	43	324.0	170 at 4000	3.88x3.44	8.3	300 at 2000
Super 88 V8	N.A.	3734‡	122.0	205	78	62	62	13.2	43	44	27.5	43	324.0	185 at 4000	3.88x3.44	8.3	300 at 2000
98 V8	N.A.	3846‡	126.0	214	78	62	62	13.1	43	44	27.5	43	324.0	185 at 4000	3.88x3.44	8.3	300 at 2000
DESOTO																	
Six	$2385	3590	125.5	215	78	62	60	14.9	44	42	23.0	42	250.6	116 at 3600	3.44x4.50	7.0	208 at 1600
V8	2673	3750	125.5	215	78	62	60	14.9	44	42	25.8	42	276.1	170 at 4400	3.63x3.34	7.5	255 at 2400
CHRYSLER																	
Windsor 6	$2562	3685	125.5	216	78	62	60	14.6	44	42	25.8	42	265.0	119 at 3600	3.44x4.75	7.0	218 at 1600
New Yorker V8	3228	3955	125.5	216	78	62	60	14.6	44	42	25.8	42	331.1	195 at 4400	3.81x3.63	7.5	320 at 2000
New Yorker Deluxe V8	3433	4060	125.5	216	78	62	60	14.6	44	42	25.8	42	331.1	235 at 4400	3.81x3.63	7.5	330 at 2600
Custom Imperial V8	4259	4345	133.5	224	78	60	60	14.3	45	46	25.8	N.A.	331.1	235 at 4400	3.81x3.63	7.5	330 at 2600
PACKARD																	
Clipper Deluxe 8	N.A.	N.A.	122.0	215	78	63	62	14.0	44	44	27.3	43	327.0	165 at 3600	3.50x4.25	8.0	295 at 2200
Cavalier 8	N.A.	N.A.	127.0	216	78	63	62	14.0	44	48	30.9	45	327.0	185 at 4000	3.50x4.25	8.0	310 at 2200
Patrician 8	N.A.	N.A.	127.0	216	78	63	62	14.0	44	48	30.9	45	359.0	212 at 4000	3.56x4.50	8.7	330 at 2200
LINCOLN																	
Cosmopolitan V8	$3522	4135	123.0	215	77	62	62	13.5	44	43	26.1	46	317.0	205 at 4200	3.80x3.50	8.0	305 at 2600
CADILLAC																	
Series 62 V8	N.A.	N.A.	129.0	216	80	64	65	14.8	43	46	21.5▲	47‡	331.0	230 at 4400	3.81x3.63	8.3	332 at 2800
Series 60 V8	N.A.	N.A.	133.0	227	80	64	65	14.8	43	46	21.5▲	49‡	331.0	230 at 4400	3.81x3.63	8.3	332 at 2800
Series 75 V8	N.A.	N.A.	150.0	237	80	64	59	14.6	43	N.A.	21.5▲	54‡	331.0	230 at 4400	3.81x3.63	8.3	332 at 2800

● Dimensions in this column rounded out to nearest whole number. ■ See diagram at right.
N.A. Not available at press time. * Approximate. ♦ Price includes radio, heater and cigar lighter. † HydraMatic models only.
‡ Estimated. ▲ Power steering standard equipment.

A — Front-seat height
B — Legroom
C — Hiproom

Specifications are for four-door sedans. Measurements are in inches except: Weight (pounds); turn-circle diameter (feet); torque (pound feet). Prices are for lowest-price four-door sedan in each series and include all charges except shipping, state and local taxes, and optional equipment. Specifications of 1954 Willys, Henry J and Kaiser not available at press time.

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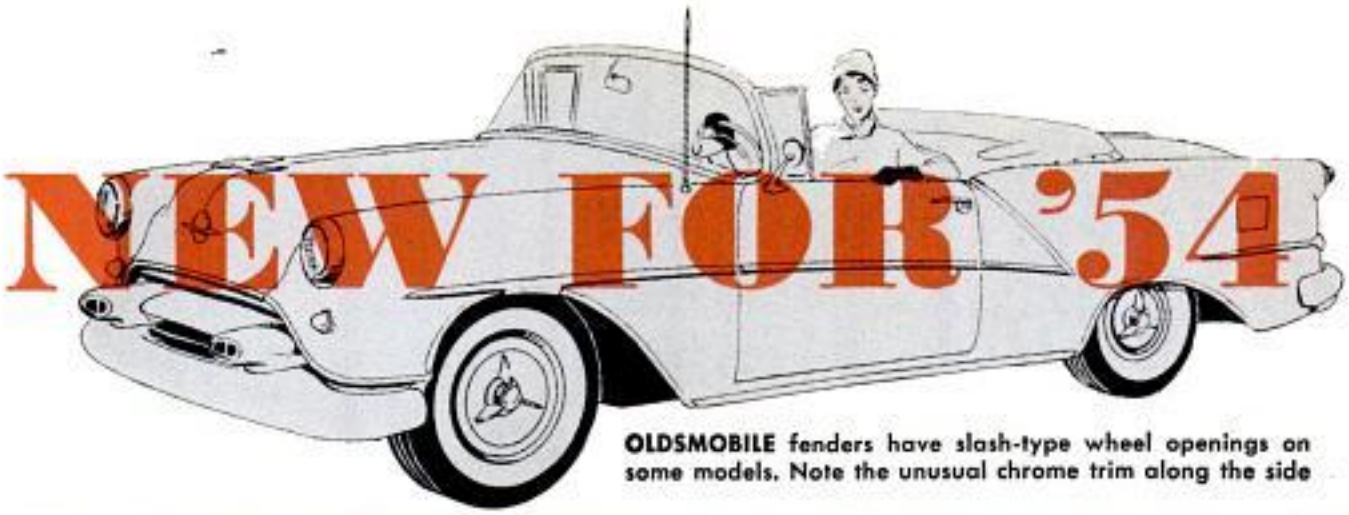
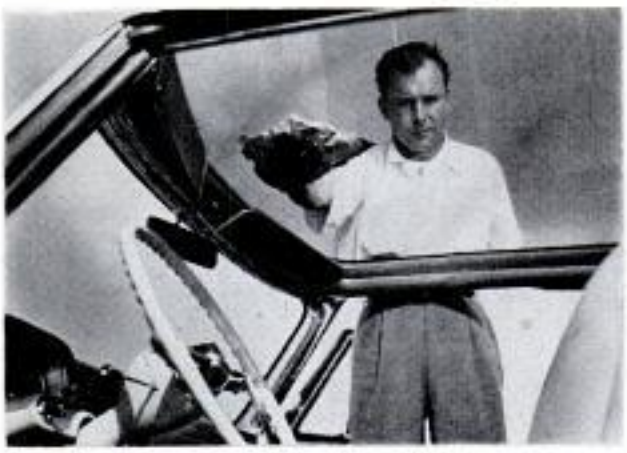
NEW FOR '54

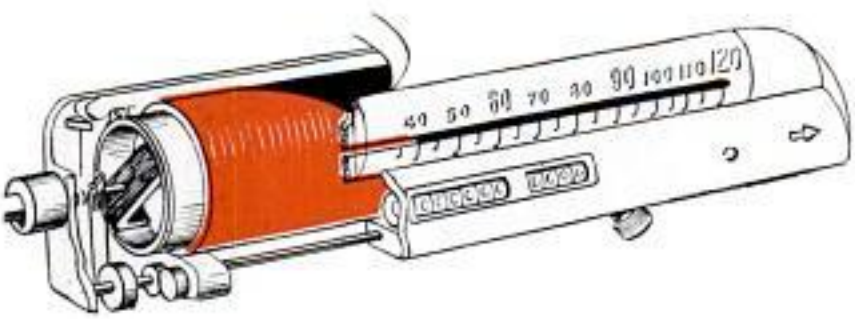


OLDSMOBILE fenders have slash-type wheel openings on some models. Note the unusual chrome trim along the side

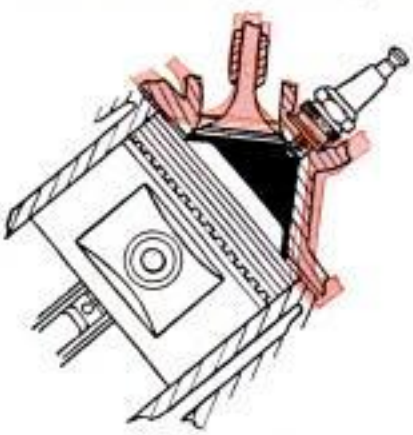


MERCURY has a hardtop with a transparent-plastic roof section. The Ford Skyliner has the same feature

STUDEBAKER added vertical bars to its grille, bumper guards and hood ornament are bigger this year



BUICK Roadmaster speedometer reads like a thermometer. Cutaway shows red advancing as drum turns



BUICK also redesigned its combustion chamber to add power. Red sketch shows 1953 design for comparison

NASH Rambler has a four-door sedan for first time. Its front seat swings down to make a comfortable bed

CADILLAC has enlarged the "eyelid" over its headlight, forming it with the top part of the fender

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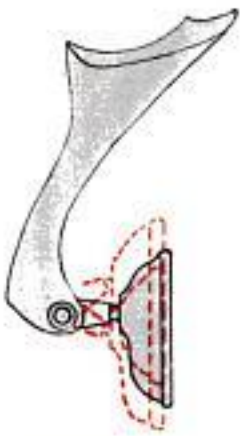
DESOTO has an instrument panel made up of perfect circles. Each instrument has a separate dial face for maximum clarity and visibility

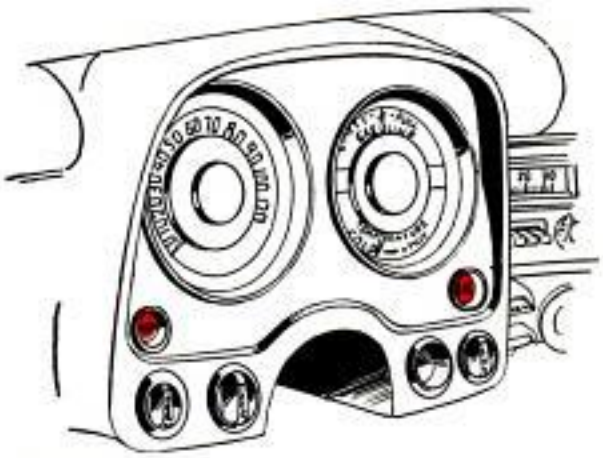
MERCURY extended its rear fenders over the top of the taillight unit

LINCOLN increased brake-drum diameter to 12 inches (1953's was 11), reducing braking effort 25 percent

HUDSON Jet has a removable rear seat. With it out, trunk divider wall drops to make huge loading area



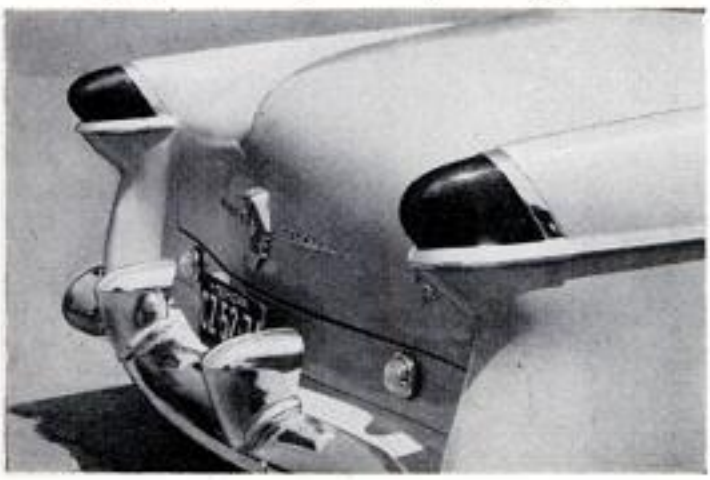
PLYMOUTH's rear-view mirror adjusts vertically



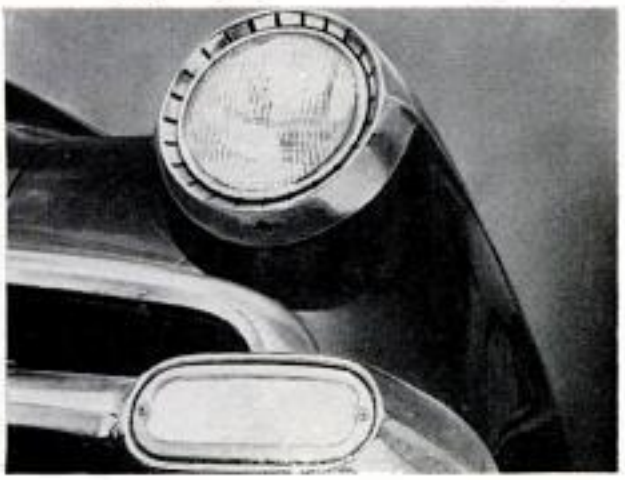
CHRYSLER also has a new instrument panel. Indicator lights (red) show oil pressure, amperage

CHEVROLET's new 125-hp. engine has high-lift cams

PACKARD Clipper introduces a new rear-fender styling with taillights that jut sharply rearward



CHEVROLET headlights have a novel chrome ring. The oblong parking light is on outer edge of grille



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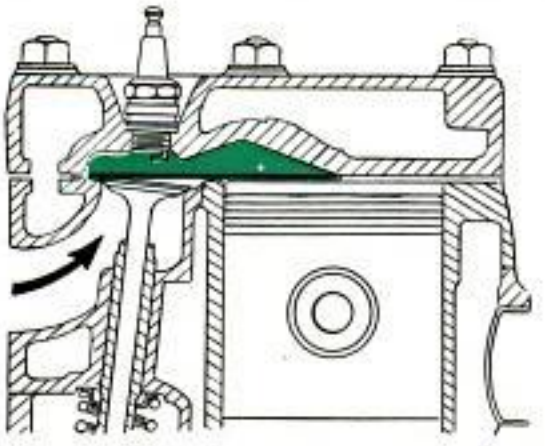
NEW FOR '54

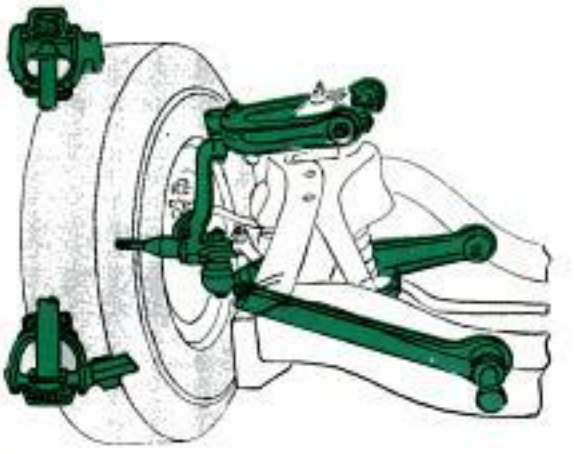
PONTIAC drivers can adjust their seat up or down, tilt it forward or backward. It is manual, not motorized

CADILLAC has a narrow chrome visor over its wrap-around windshield below which is the heater intake

FORD has a raised speedometer with a plastic top through which daylight enters to brighten numerals

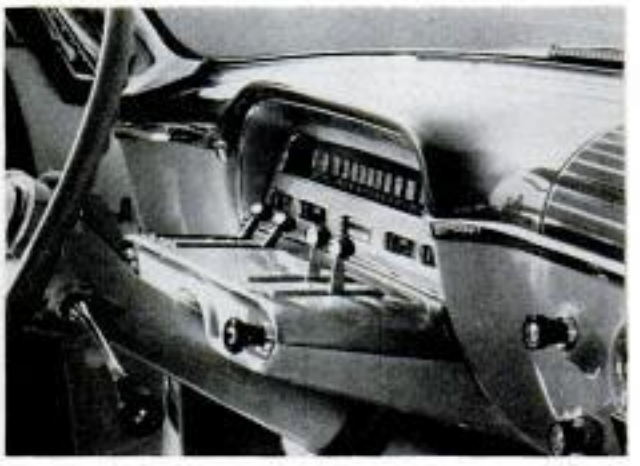


PACKARD redesigned the combustion chamber in its big straight 8 to boost its output to 212 horsepower



FORD has ball-joint front suspension which eliminates conventional kingpin, improves ride and steering

MERCURY retained the lever-type heater controls in its new dash that has more instrument visibility



PLYMOUTH's low-priced Plaza has a handsome two-spoke wheel. All models have nonreflecting dash panel

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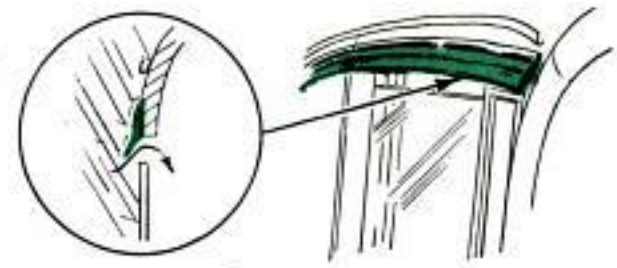
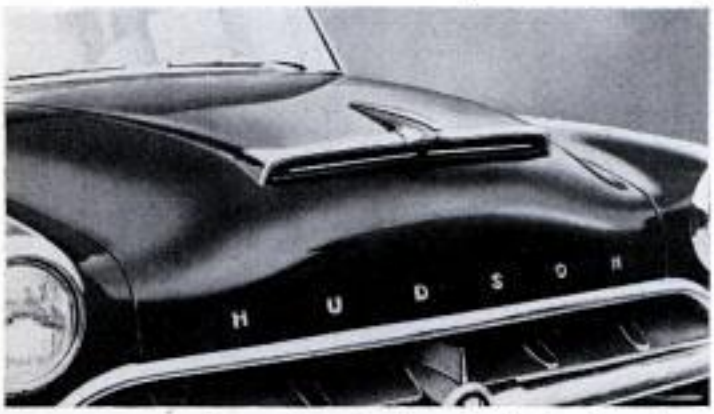
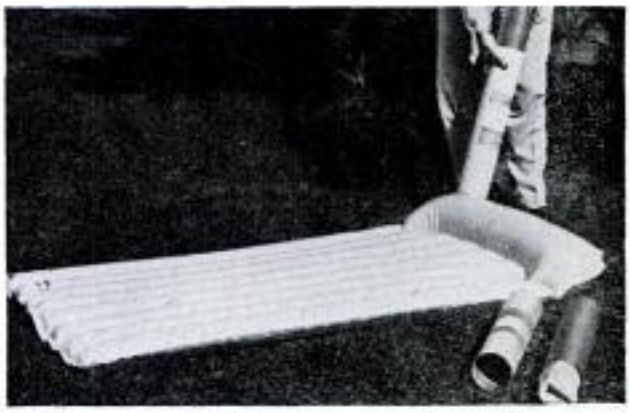
BUICK front corner pillars are vertical (left) on Super and Roadmaster, slanted on Special and Century



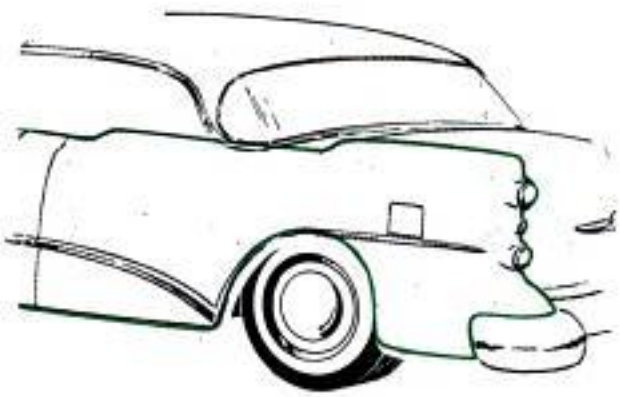
BUICK has a wide chrome molding above doors. It serves as an awning and keeps rain out of windows



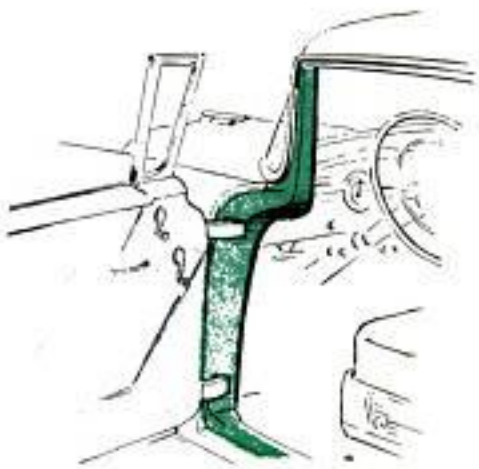
HUDSON lowered its hood and added a broad air scoop that admits air into top of engine compartment



NASH owners can buy a mattress for car bed. Cardboard container becomes a pump to inflate it easily



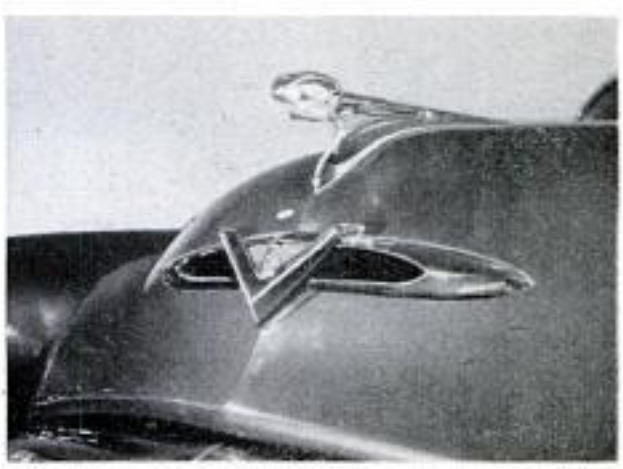
BUICK has a double "kick up" on its rear fenders. On hardtop models the wheels are entirely uncovered



OLDSMOBILE doors have "notched" leading edge that increases opening size, making it easier to get in

HUDSON lengthened its rear fenders and put taillights in them. Backup lights are just above bumper

DODGE clipped the horns of its ram hood ornament to make it streamlined. Trim on hood vent is larger



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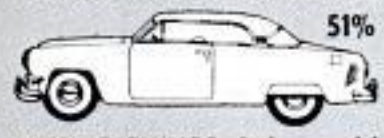
STYLING

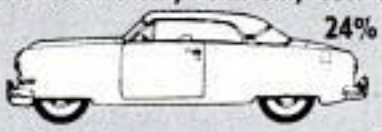
13%

49%

38%

STEERING WHEELS: The horn ring seems here to stay with only 13% of the owners not wanting any at all


51%


24%

25%

WHEEL OPENINGS: It is surprising to note that so many owners would like full openings in front and rear

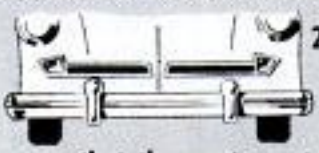
27%

59%

14%

HOOD ORNAMENTS: The ornate swan appealed to very few; less than one percent wanted no ornament at all

63%

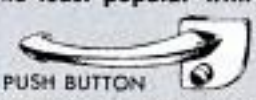

21%

16%

FRONT GRILLES: Surprising result here was that the most ornate grille was the least popular with owners

8%

24%



68%

DOOR HANDLES: There's no doubt about the popularity of the push button; the turn handle seems to be out

38%

44%

18%

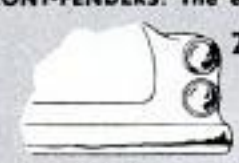
OVER-ALL SILHOUETTES: Owners still prefer the squared-box outline to the sleeker "continental" look

47%

40%

13%

FRONT-FENDERS: The extended front headlight, common on 1954 cars, is favored by owners, the poll shows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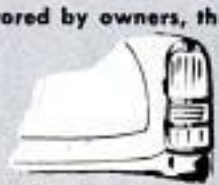
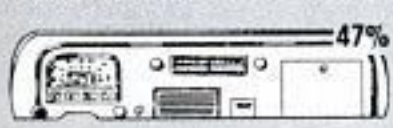
13%


62%

TAILLIGHTS: There is no doubt among owners about taillights: they want them large and in one grouping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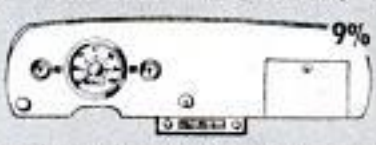
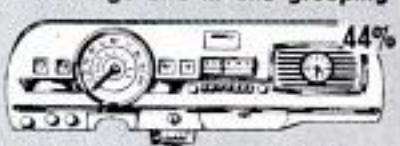

9%


44%

DASHBOARDS: Few owners want the simple, uncluttered dash; a large number want it loaded with everything

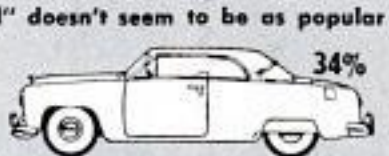
57%

23%

20%

REAR FENDERS: The upturned "fishtail" doesn't seem to be as popular as a simpler design, the poll shows

13%


34%

53%

CHROME: Owners are definite about chrome; many don't like it at all, most want it used with moderation

HERE IS THE BALLOT → **HERE IS THE RESULT**

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Owners Turn Designers in This

REPORT TO DETROIT

A Nationwide Survey of What Car Owners Want

Is Detroit making the kind of automobile the public wants? To find out, Popular Mechanics *asked 5000 owners of all makes what they want in a car. This is their reply.*

By Floyd Clymer

LISTEN, DETROIT, the public is talking about your product—the American automobile. This article was written by the men and women who own and drive automobiles — all makes and styles of automobiles.

Popular Mechanics asked 5000 owners what they think about the cars Detroit is building. Their responses brought out some amazing points.

Apparently, the manufacturers and the owners don't agree on some important matters. For example, the owners don't want more horsepower! Yet there is hardly a 1954 model on display today that isn't bragging about its increased power.

The survey shows that 70 percent of the owners were emphatically against continuing "the trend toward greater horsepower." Only 19 percent —less than one in five— approved of the trend. The other 11 percent were noncommittal.

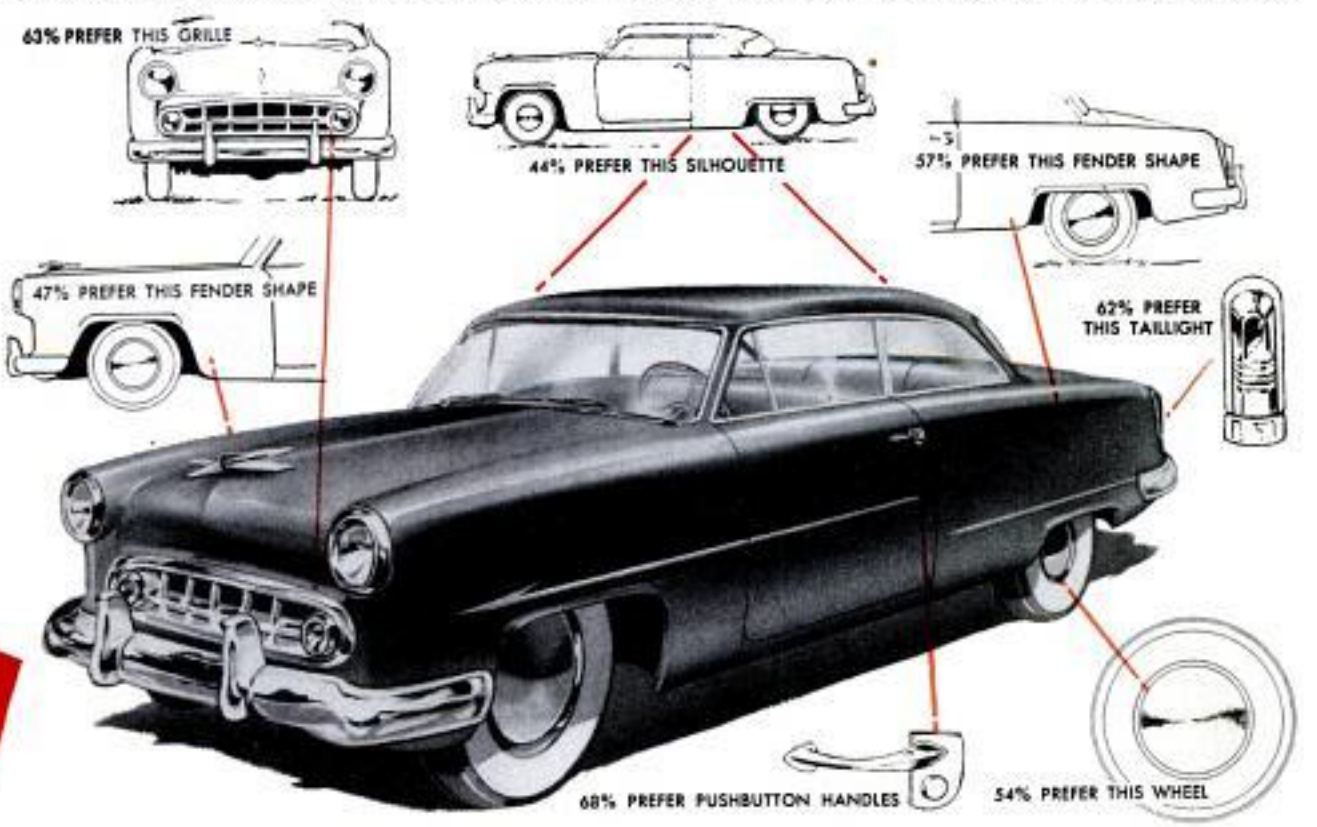
"I believe they have gone too far overboard with this horsepower race. Cars are too powerful to be safe these days." —Jonesboro, Ark., coach.

"I do not agree with the race for more horsepower. The human element in drivers certainly cannot safely handle the speed which the high horsepower produces."—Portland, Ore., engineer.

"Pure nonsense. If a person wants horsepower he should drive a truck. Performance, in my estimation, does not depend upon horsepower." — Casper, Wyo., oil worker.

"It's suicidal. We are all too brave behind the wheel."—Barrington, Ill., advertising director.

Here is the composite automobile that American motorists "designed" for themselves—its body features combined by our artist from the choices marked on the style ballots (opposite page) sent to 5000 car owners



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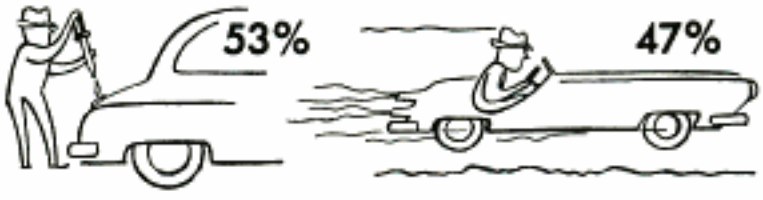
WHO IS THE AVERAGE OWNER?

He drives 15,480 miles a year, takes four long trips averaging 1200 miles each. His car is fully loaded only 20% of the time.

He buys a new car every three years. The most frequently given reason for trading is the mechanical condition of his old car. Only 1 owner in 10 trades because his old car is "out of style."

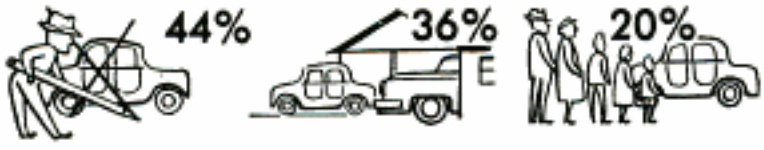
He would like the car manufacturers to stop the horsepower race and to put additional emphasis on building safety into his car

WHAT DOES HE WANT IN A NEW CAR?



53% say economy of operation is more important than power and performance, but 47% put performance first in selecting a car

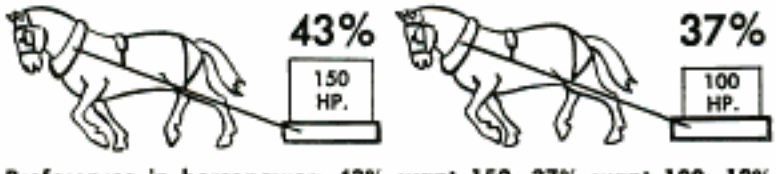
76% want comfort first, styling second. Only 24% are willing to sacrifice comfort for style or appearance, the poll shows



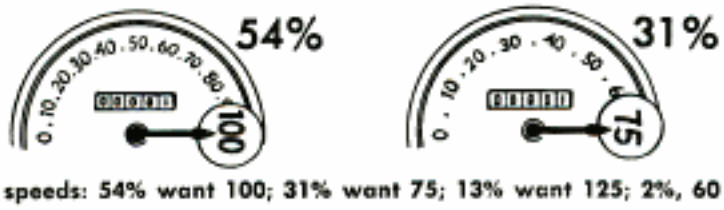
Would the average owner buy a basic car (one without frills or luxuries) for $1000? 44% said they would not. 36% would buy it as a "second" car. Only 20% would buy it for use as a family car

WHAT WOULD HE LIKE IN AN ENGINE?

Preferences in engines: 45% want a V8; 32% want a straight 6; 13% want a straight 8; 8% want a V6; and 2% want 4 cylinders



Preferences in horsepower: 43% want 150; 37% want 100; 12% want 200; 4% want only 60; and there are 4% who want over 200



Top speeds: 54% want 100; 31% want 75; 13% want 125; 2%, 60

"Asinine. Greater horsepower serves only to tempt fools to step on it."—Lewiston, Idaho, employment manager.

There were many, many equally emphatic statements that Detroit has gone far enough in the horsepower race and should be doing more about safety. That feeling among car owners was apparent from the responses to the question: "If you could make one suggestion (disregarding price cuts) to the men who design and build American automobiles, what would it be?"

By a wide margin the most frequently given suggestion asked for more safety rather than more power. In fact, a number of owners even asked that maximum-speed controls be built into the cars at the factory to protect themselves against their own bad driving habits. Here are some of the changes the owners want: Stronger roof structure, including roll-over bars; lower horsepower; governors or some type of speed control; better brakes and vision; and better handling and roadability.

There is no doubt that if owners have to choose between speed and safety, they will take safety—that is the most emphatic finding in our nationwide survey.

And yet when it comes to seat belts, the owners seem to take a different viewpoint. Only 14 percent of the owners said they would wear seat belts at all times if such belts were provided as original equipment in their cars. A surprising 45 percent said they wouldn't wear the belts at all, even if car manufacturers provided them. The other 41 percent said they would wear them during high-speed driving only.

There are points where the owners agree wholeheartedly with Detroit, and current body styling is one of them. A high 69 percent are pleased with the trends in styling today, while only 16 percent disapprove. The others made no statement for or against.

As the percentages on the styling ballot (reproduced on page 168) show, generally, the owners prefer the middle-of-the-road design. No extreme or radical innovations for them. The com-

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posite car (page 169), based on the owners' selections, is certainly not revolutionary in styling. Its basic shape is similar to that of millions of cars on the road today. Apparently Detroit is providing the public with what it wants in the styling department, although there are a few interesting upsets as will be noted in the percentages.

The majority also likes the trend toward power accessories. More than half, 53 percent to be exact, said one or more of the power accessories, such as brakes, steering, seats and windows, was worth its cost. Disagreeing were 29 percent, with 18 percent registering no opinion.

"Power steering and power brakes should be standard equipment." — Klamath Falls, Ore., school supervisor.

"Power accessories mean greater safety and convenience for feminine drivers." — Poughkeepsie, N. Y., engineer.

"For town driving, power steering is all right. I don't like it on the open road."—Springfield, Mo., policeman.

"Power steering is especially bad if used to cover up or camouflage defects in weight distribution or faulty steering-gear geometry."—Cedar Grove, N. J., engineer.

"I do not approve of power steering. A sudden swerve may cause the car to turn over."—writes an Alton, Ill., service-station operator.

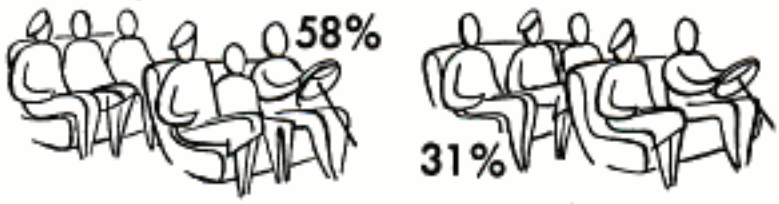
"If they keep up with these power accessories the fun of driving will be gone."—North Stratford, N. H., mill worker.

It looks as though Detroit is right in assuming that America has outgrown the "basic transportation" market. Despite the oft-heard remark that what this country needs is a $1000 automobile, only 20 percent of the owners said they would buy a $1000 vehicle as their family car, if it was a basic car without luxuries or conveniences. Another 36 percent, however, would be interested in it as a second car. The remaining 44 percent would not buy it at all, apparently preferring to spend more for the luxury and comfort to which we

(Continued to page 294)

WHAT ELSE DOES HE WANT?

How many seats?



58% want 6 seats; 31% want 5; 6% want 4; 3% want 8; 2%, 3

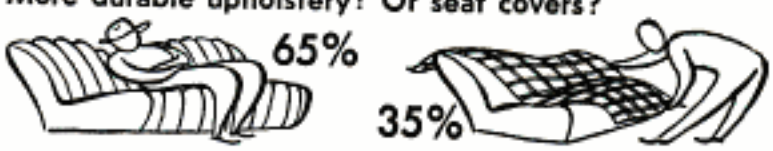
How long a wheelbase?

115 and 125 inch are most popular; 6% want 130; 5% want 100

Would he wear a seat belt?

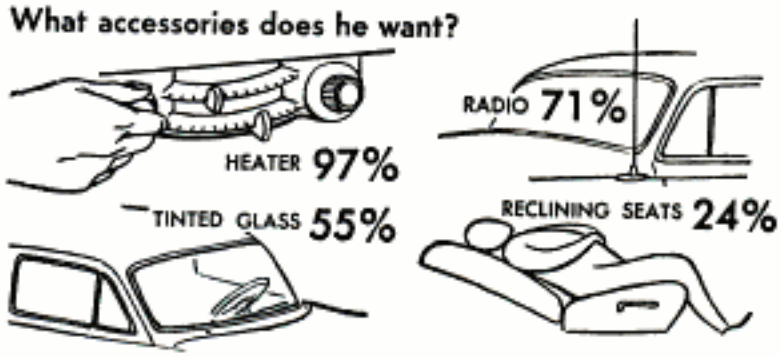
45% would not; 14% would all the time; 41% would at high speeds

More durable upholstery? Or seat covers?



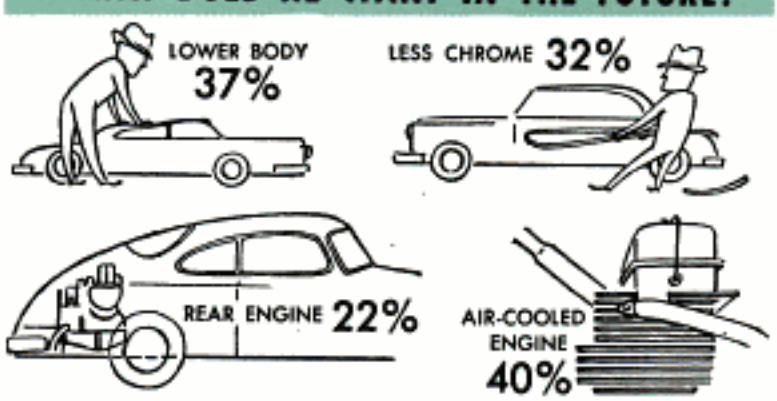
65% would pay extra for plastic or leather; 35% prefer seat covers

What accessories does he want?



Also: Automatic shift 50%; power brakes 33%; power steering 22%; headlight dimmer 14%; air conditioner 6%; and power windows 5%

WHAT DOES HE WANT IN THE FUTURE?



Other changes: 16% of owners want shorter bodies; 9% want front-wheel drive; 12% want longer bodies; 9% want more chrome

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AUSTIN offers a new two-door sedan, left. It is just over 11 feet long, four feet less than the shortest U.S. car, and is built for economy. Its engine is an overhead-valve four

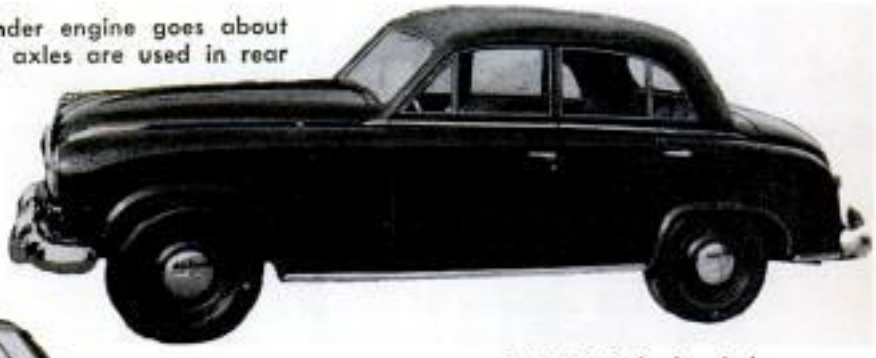
FORD introduces a new Anglia in England for '54, below. It has 4 cylinders, unitized body, gas tank in rear fender

STANDARD'S new economy model is a four seater, above. It has a large trunk accessible from the rear seat. It too has four cylinders

A TRANS-ATLANTIC VIEW OF

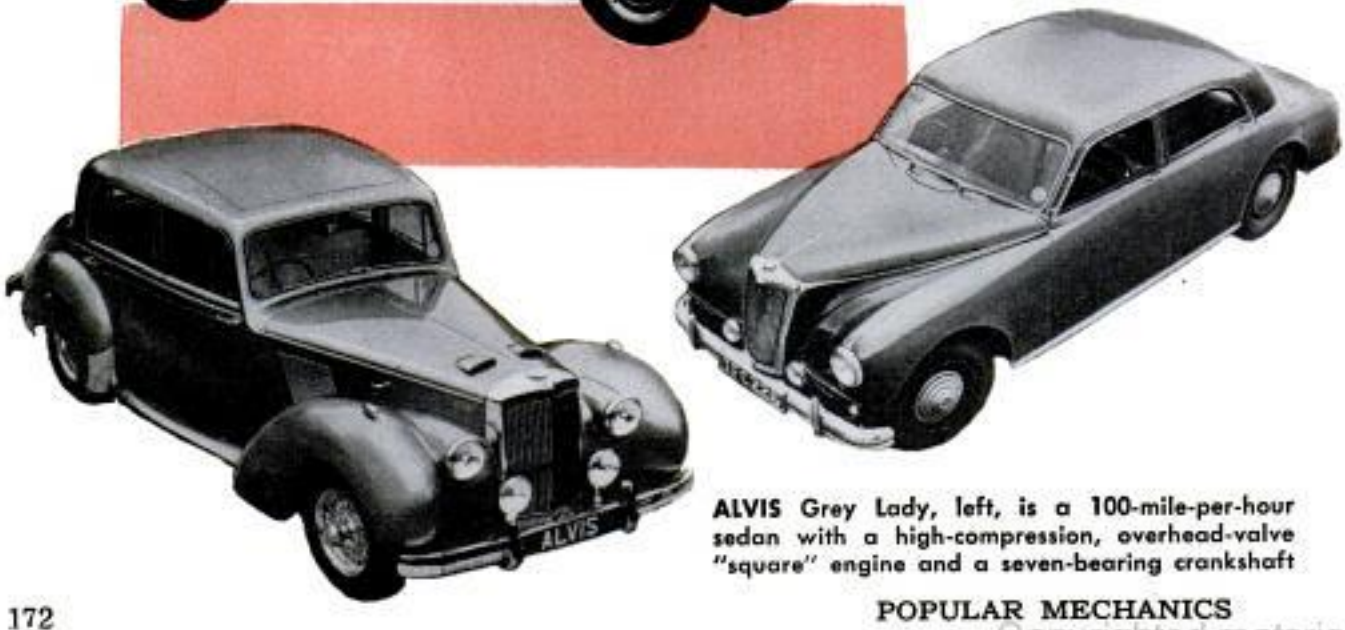
EUROPE'S 1954 MODELS

HANSA DIESEL is German. Its four-cylinder engine goes about 40 miles per gallon of diesel oil. Swing axles are used in rear



LAGONDA, below, is among the world's most advanced cars, with independent suspension on four wheels, inboard rear brake drums, built-in jacks and an entirely flat floor. It has six cylinders

RILEY Pathfinder, below, seats six, has four cylinders, two camshafts, hemispherical combustion chambers, a torsion-bar front-suspension system



ALVIS Grey Lady, left, is a 100-mile-per-hour sedan with a high-compression, overhead-valve "square" engine and a seven-bearing crankshaft

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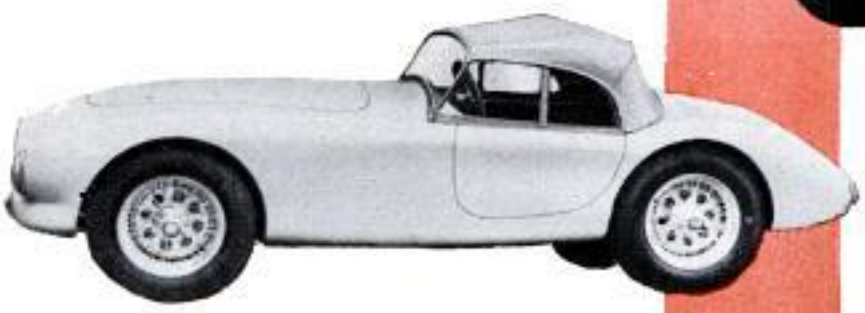
AUTO SECTION

DAIMLER Conquest roadster, right, has aluminum-alloy frame and body. Other features include twin carburetors, air scoops in front and rear fenders to keep the brakes cool, and torsion-bar front-wheel suspension

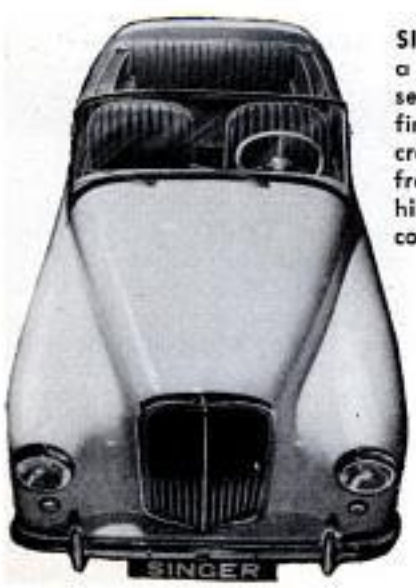


A.C. ACE, left, is a speedy two-seater that easily hits 100 m.p.h. Engine is an overhead-camshaft six with three carburetors. Frame is formed of two straight steel tubes. All wheels are independently sprung

BRISTOL 404, right, has carefully designed aerodynamic body shape. Rear springing is by torsion bars, front by leaf springs. Brakes are exceptional with light alloy drums. Car will easily exceed 100 miles per hour

JOWETT Jupiter, left, a competition two-seater has four horizontally opposed cylinders, an 8.5:1 compression ratio. Engine fan is driven by thermostat-controlled electric motor for perfect cooling at every speed

ASTON MARTIN DB2-4, right, is a fast, 110-mile-per-hour touring car. Its inline six has twin overhead camshafts, inclined valves, hemispherical combustion chambers. Rear window opens for access to luggage space



SINGER is making a plastic-bodied 4-seater. Luxuriously finished, it is a rich cream plastic. Entire front body section hinges up to uncover the engine

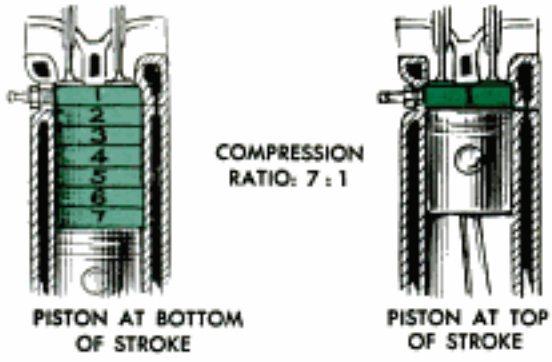
LANCIA Gran Turismo, below, has the famous Italian styling and the fine V6 engine that won the 1953 race in Mexico. All wheels are independently sprung. Clutch, gearbox, differential are a rear-mounted unit

What Makes Your Car Run?

ITS POWER PLANT

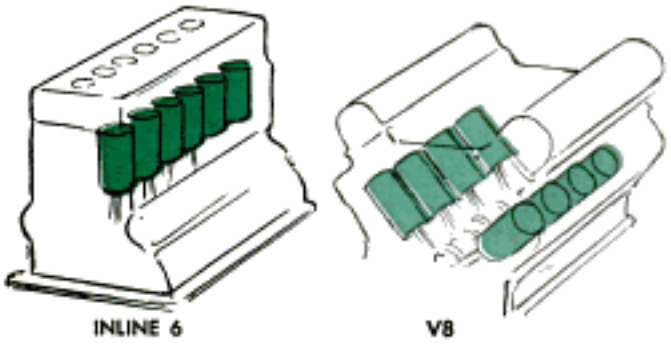
YOUR CAR is driven by a series of explosions. The more powerful the explosions and the closer together they occur, the faster your car can go and the better its acceleration. The smaller these explosions and the less frequently they occur, the greater your car's economy.

The total number of explosions required to move your car a given distance depends upon its transmission, rear-axle ratio and tire size. The strength of each explosion depends upon engine size and design. Involved are displacement and compression ratio. The higher the compression, the more power a given amount of fuel is able to deliver.

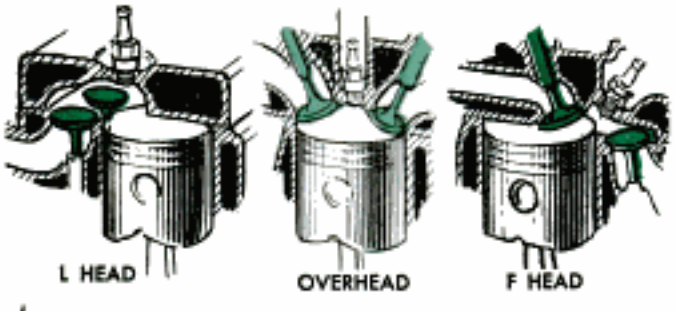


● Compression ratio is the ratio between the volume of the cylinder when the piston is at the bottom of its stroke and the volume when it is at the top. It is the number of times the fuel mixture is compressed before ignition.

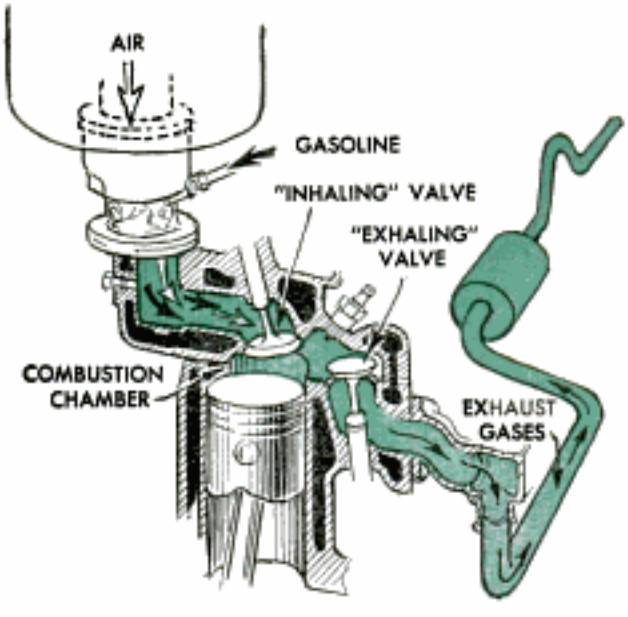
Displacement is the difference between these two volumes—or the amount added as the piston moves to the bottom of the cylinder. To get the engine displacement you multiply this amount by the number of cylinders.



● Engines are classified according to cylinder arrangement. Inline engines have their cylinders arranged one behind the other in a row. V-type engines mount the cylinders in two rows, tilted at an angle that forms a vee. Today's trend is definitely toward V engines.



● Engines are also classified by valve position. The L-head engine has both intake and exhaust valves in the block. The overhead-valve engine has both valves in the head above the cylinder. A combination of the two, the F head, has one valve (usually the intake) in the head, the other in the block.



● The function of the engine is to burn a mixture of air and gasoline efficiently. Therefore, an engine must inhale, burn and exhale the mixture many times a minute. This makes engine "breathing" important. Your engine breathes about 9000 times as much air as gasoline. To move such tremendous volumes quickly requires a high volumetric efficiency—the engineer's term for free breathing.

Engine breathing has been improved greatly in recent years. In fact, many recent boosts in horsepower are due almost entirely to this improvement. Intake manifolds are smoother and more direct, speeding the passage of the fuel mixture to each cylinder. Twists and turns in the manifolds have been minimized. Valves are larger, lift higher and stay open longer for the same reason—to get more fuel in and out of the combustion chamber faster.

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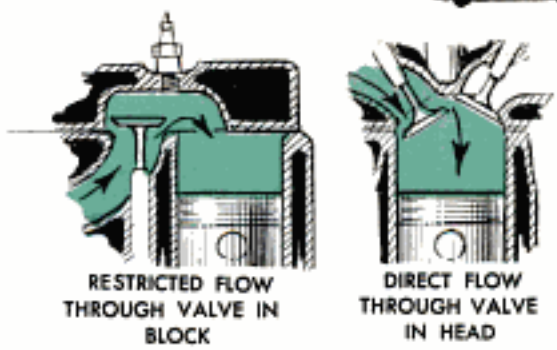
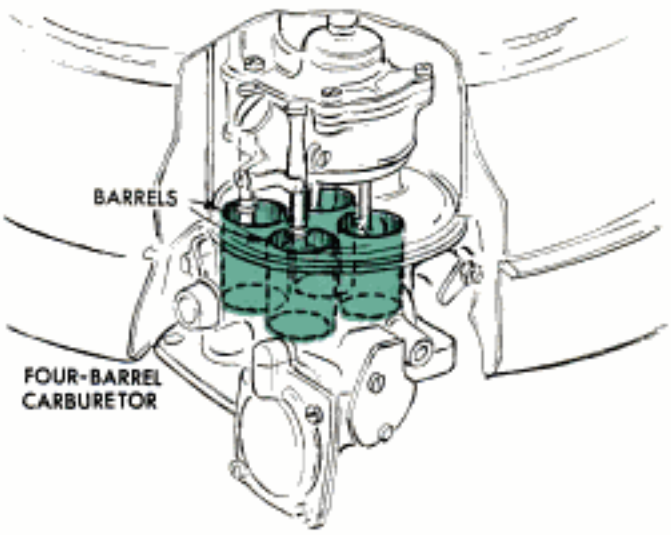
● Overhead valves are being used more frequently because (among other reasons) they open directly above the piston, permitting better breathing. Exhaust manifolds, mufflers and exhaust pipes are less restricted, larger in diameter, to offer little resistance to the flow of the burnt gases. The result is better exhaling.



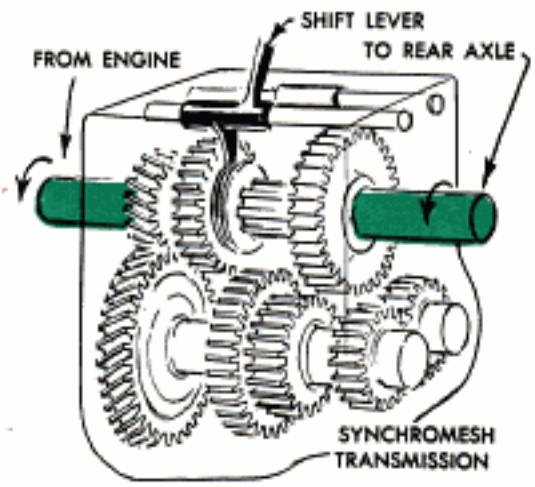
● Four-barrel carburetors are becoming common on the more powerful engines. The reason: To bring in more fuel mixture when the throttle is wide open, as in acceleration or at high speeds. Only two barrels work most of the time, the other two opening when you call for extra power by flooring the accelerator.



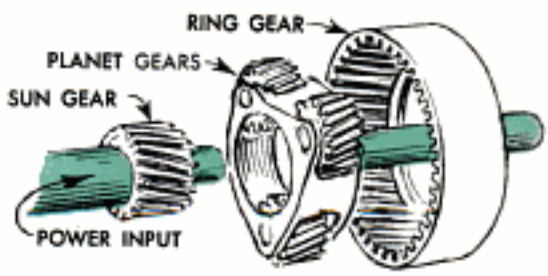
ITS TRANSMISSION

Although a gasoline engine is powerful, it doesn't produce much power until it is turning over fairly rapidly. It doesn't even have enough power to keep itself running at very low speeds. Beginning drivers often stall the engine when they fail to give it enough throttle to produce sufficient power to start the car moving. To make it possible for the engine to turn over rapidly while the car is just starting to move or is moving slowly or is climbing a hill, a transmission is required. Its function is to provide suitable gear ratios (or leverages) between the engine and rear wheels so the car will operate under all driving conditions.

● The synchromesh transmission is the standard hand-shift unit in use today. It consists of various sized gears on separate shafts. The gears mesh as you move the shift lever. The transmission eliminates any grinding or clashing of gears by synchronizing the speeds of the mating gears before they engage.

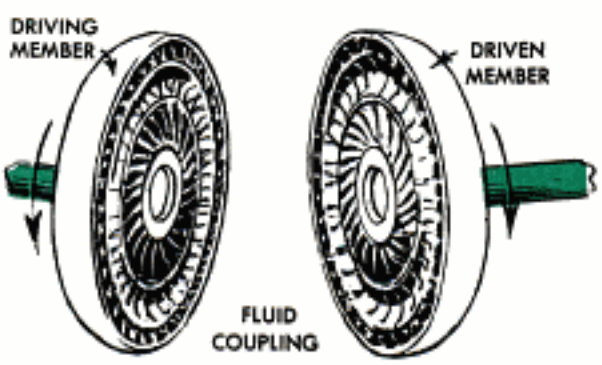


● The planetary-gear train is a simpler, more compact and convenient method of changing gear ratios. It has a center or sun gear, planet gears in a carrier and a large ring gear. Used singly, it does not have the range of synchromesh, but in groups of two or three or when coupled with a torque converter, it is excellent. The unit controls torque and speed, reverses direction or acts as a direct-drive coupling. Being always in mesh, it is ideal for automatic transmissions. The planetary is also used in overdrive where it provides gear ratios of less than 1:1, enabling your car to go farther on each engine revolution.



PLANETARY-GEAR ASSEMBLY

● A fluid coupling consists of two parts called torus members and shaped like a doughnut split sidewise. Each half is attached to a separate shaft and immersed in an oil-filled housing. As one member is rotated by the engine, its vanes force the oil to move, which in turn rotates the other member as wind spins a windmill. Used with a conventional transmission, the fluid coupling serves as a cushioning connector between the automobile's engine and transmission.



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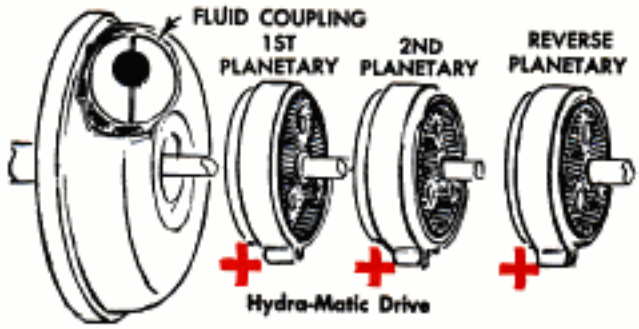
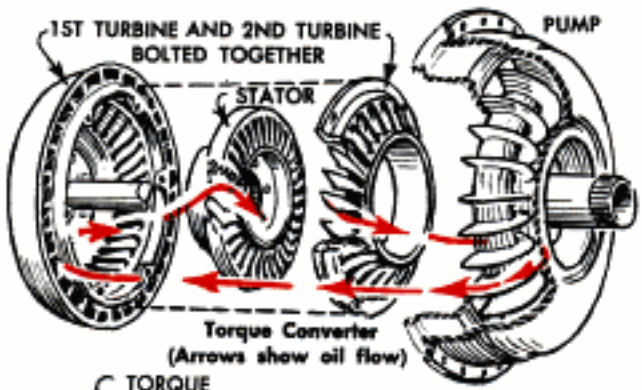


● In Hydra-Matic, an automatic transmission, the fluid coupling is the clutch, permitting the engine to idle while the car is standing still. It has no torque multiplication (or leverage). Two planetary units (plus a third for reverse) provide the multiplication and give four forward speeds. Gear changes are made automatically by a system of brake bands that locks the elements of the planetaries to change ratios.



● The torque converter is basically a fluid coupling plus an additional bladed ring called a stator (because it remains stationary when in operation). The oil, set in motion by the pump, comes off the turbine blades with some of its power yet unspent. The stator blades deflect this oil against a second set of turbine blades and thus make use of its unspent power. This added thrust gives a "lower gear" effect. The lower the car speed, the more unspent power is in the oil when it leaves the first turbine. When the car hits about 40 miles per hour or when the speed of the turbine matches that of the pump, the deflected oil can no longer provide added thrust. Then the stator revolves with the turbines and has no function and the converter is a simple fluid coupling.

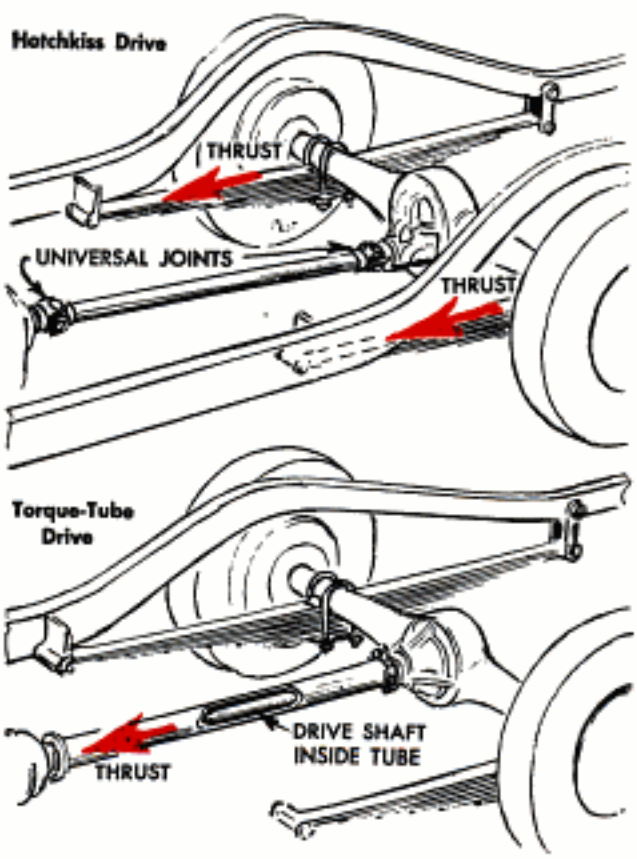
Like the fluid coupling, the converter is a clutch at idling speed so no clutch pedal is needed. It has limited torque multiplication and is usually used with planetary gears for acceleration and hard pulls. A second planetary provides reverse gear. When it becomes a fluid coupling, the converter has some slippage. To eliminate it, some transmissions bypass the converter at highway speeds. However, most use the converter at all times, locking out only the planetaries for cruising.

Plymouth's HyDrive is unique—a torque converter plus a synchromesh transmission. The added "gearing" of the converter enables the car to start from a standstill in high gear.

Schematic sketch of Chrysler's torque-converter transmission. Direct clutch locks the planetary units out of use during normal highway driving. For fast pick-up, the low planetary cuts in. Most torque-converter transmissions are similar, differences being in controls

ITS DRIVE SHAFT AND REAR AXLE

From the transmission, the turning force or torque goes to the rear wheels via the drive shaft. Two types are used in this country: The Hotchkiss and the torque tube. Most current U.S. cars have Hotchkiss drive.



● With Hotchkiss, two or more universal joints are used. As the drive shaft starts to turn the rear wheels, a tremendous torque or twist is transferred to the axle housing. The rear springs absorb this force. Forward movement of the car comes from the thrust on the front end of each rear spring.

● The torque-tube drive shaft is enclosed in a steel tube, bolted at the rear to the axle housing, at the front to the transmission. Only one universal (at the front) is used. This tube absorbs the twist from the axle housing, relieving the springs of that job. Forward movement of the car comes from the thrust of the torque tube on the transmission case.

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● In the center of the rear axle is the differential with its ring gear. The differential permits one rear wheel to go at a different speed from the other so the car will go around curves without tire scuff. The ring gear and its pinion provide the rear-axle ratio that determines how many revolutions your engine must make to move the car a given distance. A ratio of 4:1, for example, gives better pull and acceleration, less economy and top speed. A ratio of 3.5:1 sacrifices pull and getaway for higher top speed and economy.

ITS SUSPENSION

To keep your car on the road, to make it ride comfortably and steer safely, a well-designed suspension system is necessary. Springs, shock absorbers, stabilizers and frames make up the suspension system.

● Front-wheel suspension is independent on all American cars today. Either front wheel can go up or down when it hits a hole or bump without disturbing the other. No continuous axle connects the front wheels, each wheel being fastened to the frame individually. Most front springs are coil and, in many cases, the shock absorbers are mounted inside the coil.

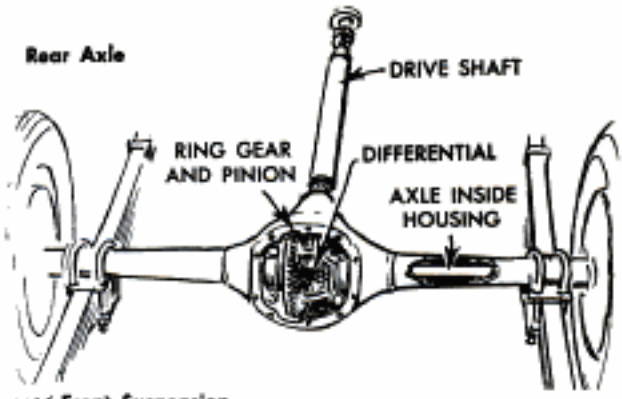
Rear-wheel suspension is nonindependent on American cars. The rear axle is inside a solid, continuous housing that makes independent wheel movement impossible. Leaf springs are most common in the rear, but coil springs are used occasionally.

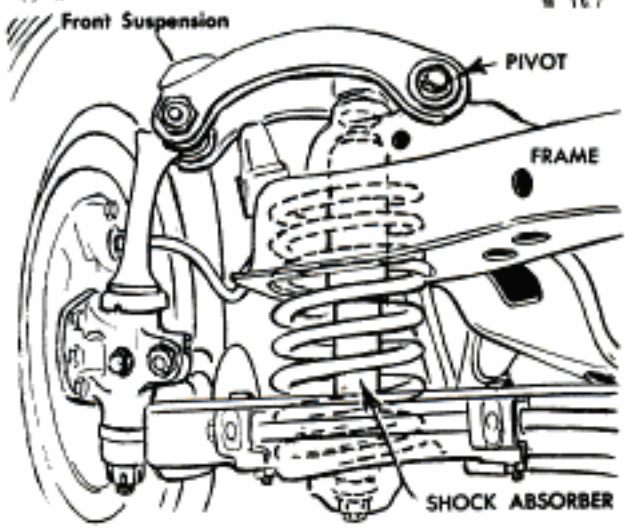
ITS BODY

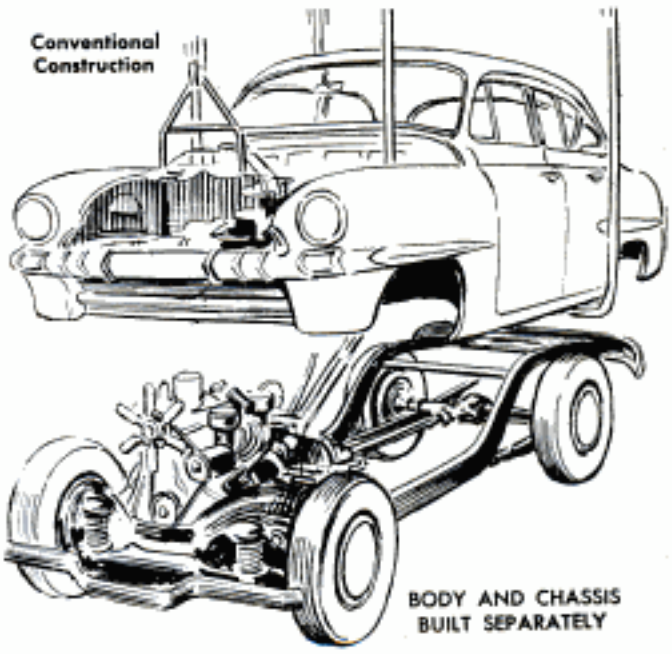
Finally, there must be a place for the driver and his passengers to sit, protected from weather and other hazards. The body provides this protection and, at the same time, performs other functions. It gives the car a streamlining to lessen wind resistance at high speeds. It also provides a medium for styling the automobile —of giving it an attractive and distinctive appearance.

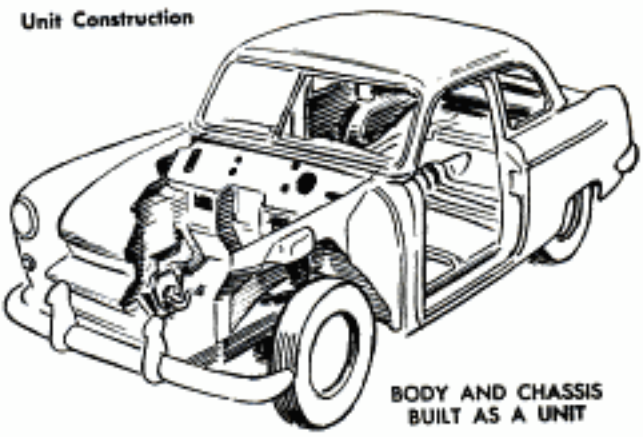
● There are two different types of body construction. In the conventional method (used by the vast majority of American automobile companies), the body is built separately and then at the desired moment in the assembly operation, it is lowered on the chassis. (The chassis consists of the frame and the running gear such as wheels, engine and drive line.)

● The second and less common method is known as unit construction. In this type the body shell and chassis are built as a unit and the entire assembly serves as a frame for the running gear. ★ ★ ★









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John Fitch, left, and Phil Walters, center, point out some interesting features on a map of Le Mans race course to *PM*'s automotive editor, Art Railton, during their interview

For a first-hand account of an exciting sport, we asked the famed sports-car racing team of John Fitch and Phil Walters about . . .

The Great Road Races of the World

QUESTION: As two of America's top sports-car drivers who have raced often in Europe, what do you consider the world's most challenging race?

WALTERS: I have never raced there, but from what I have heard about it from Fitch and others, I would say the Nurburgring in Germany.

FITCH: Yes, I agree. It is a driver's course—a course where a good driver can be outstanding. The driver's importance is greater there than on any other course, I believe.

Q: Will you describe it?

FITCH: the Nurburgring is 14 miles of winding road in the Eiffel Mountains of Germany—more or less a series of mountain passes. It is almost always in motion—

Fitch drives a Sunbeam Alpine up Stelvio Pass in the Alpine Rally. That zigzag line in valley is the road

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uphill, downhill, turning right or left. Often both at once!

Q: How many turns in the circuit?

FITCH: I have heard anywhere between 178 and 184—my guess would be 180 curves in the 14 miles! Last year the sports-car race was 1000 kilometers long (that is 621 miles).

Q: Is the driver more important there than the car itself?

FITCH: In no race is the driver more important than the car. He has to have something to work with. But the driver is more important at Nurburgring than at Le Mans, for example.

WALTERS: In all these races, you are working against 99 percent good drivers so the car becomes the thing.

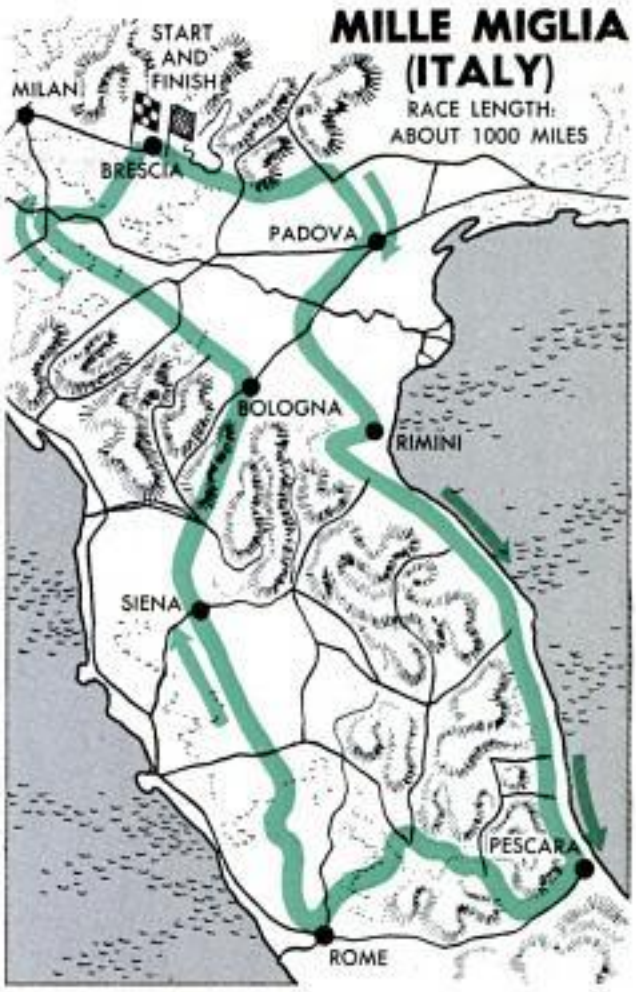
Q: Which race is the toughest on the car?

WALTERS: The French race at Le Mans, I think. It is also the one I would most like to win because it is the Indianapolis of sports-car racing. It is definitely the prestige race.

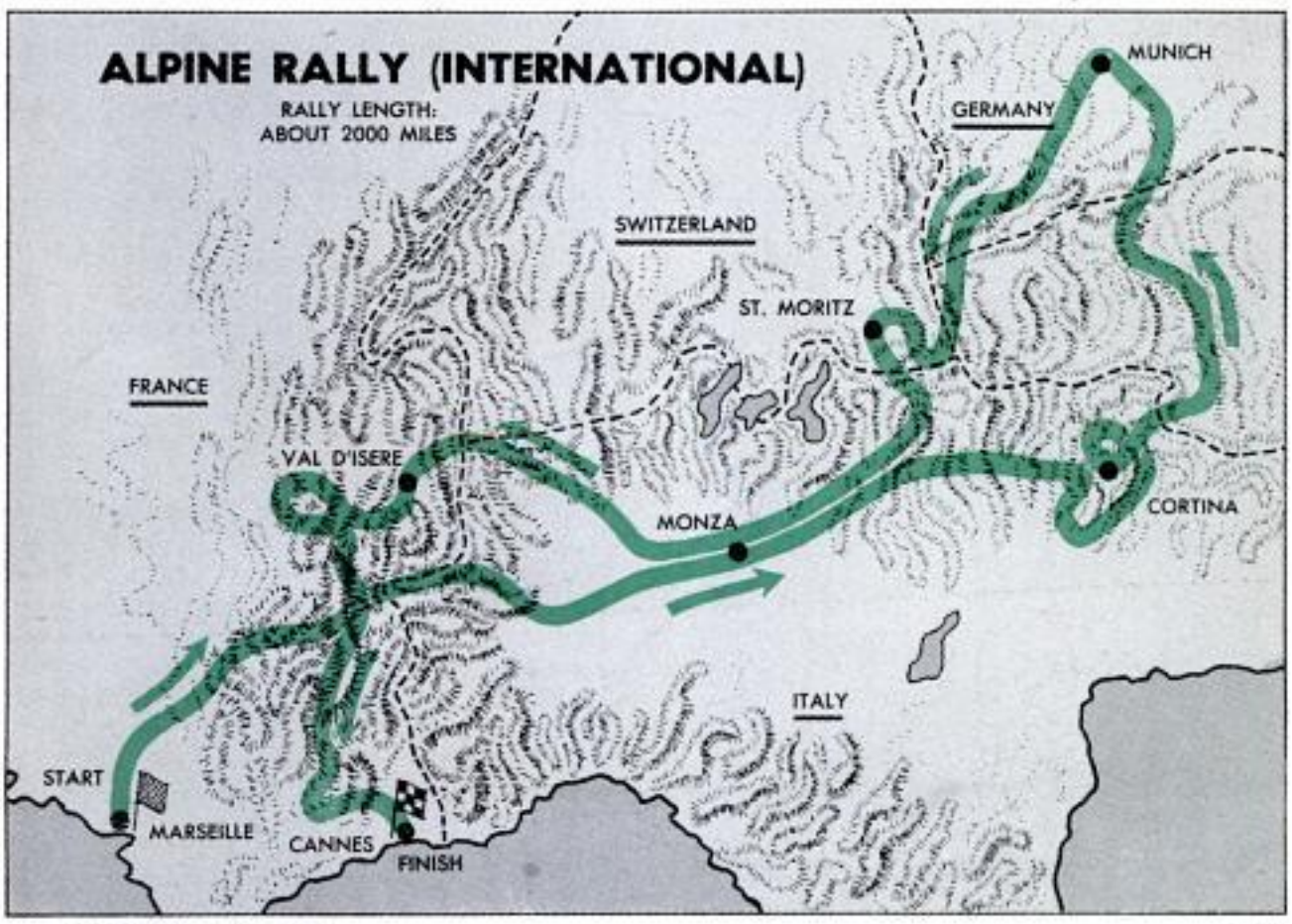
Q: What makes it the tough race it is?

WALTERS: The course is very smooth, the road is excellent and per mile there aren't too many turns so it doesn't present the challenge to the driver that other courses do. But the car takes a beating because you are running at very high speeds most of the time.

FITCH: There is a 3½-mile straightaway that just kills off cars right and left.



Above, the Mille Miglia runs 1000 miles on "narrow, winding roads through mountains." Below, Fitch was the first American to win a cup in the Alpine Rally



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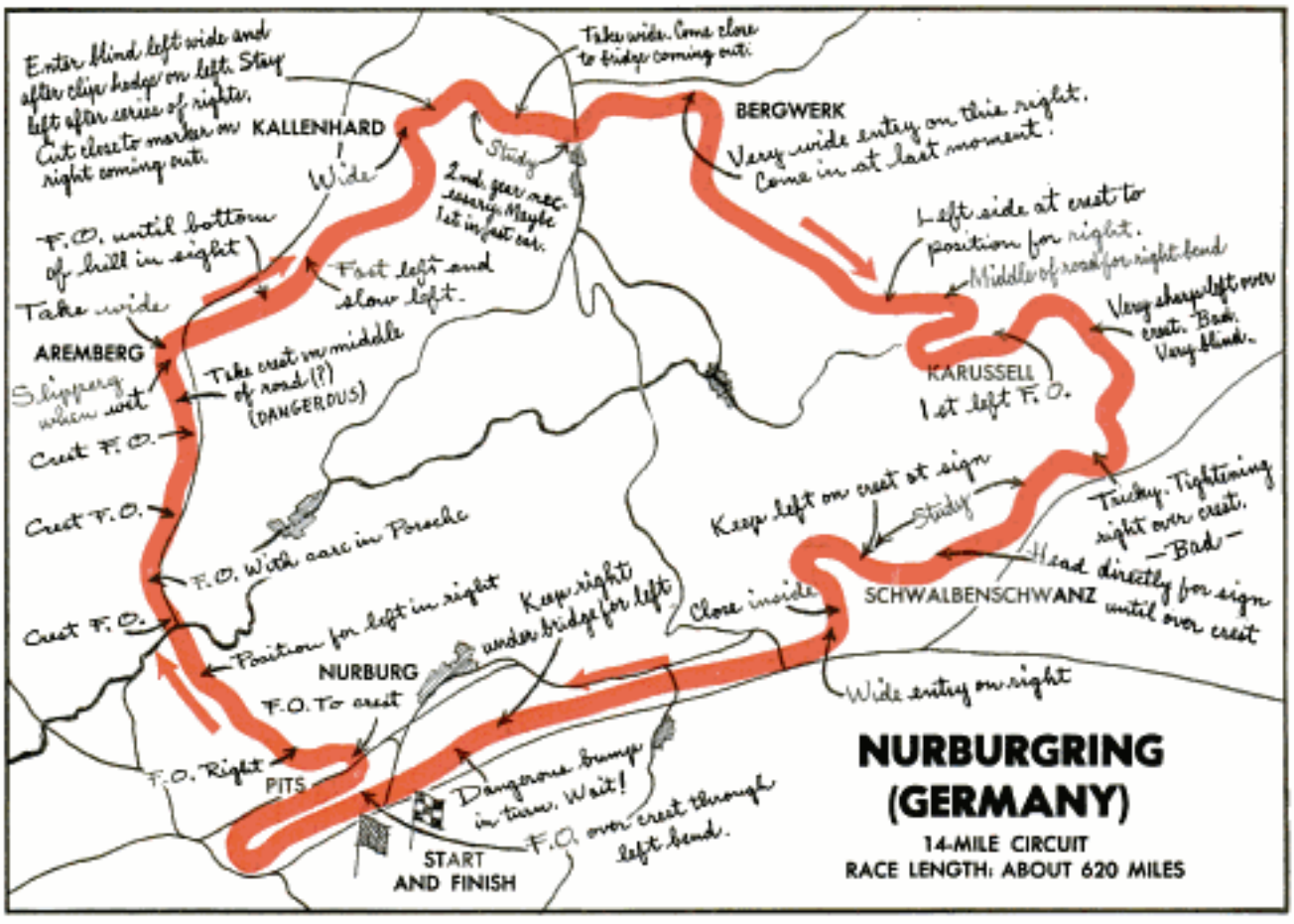
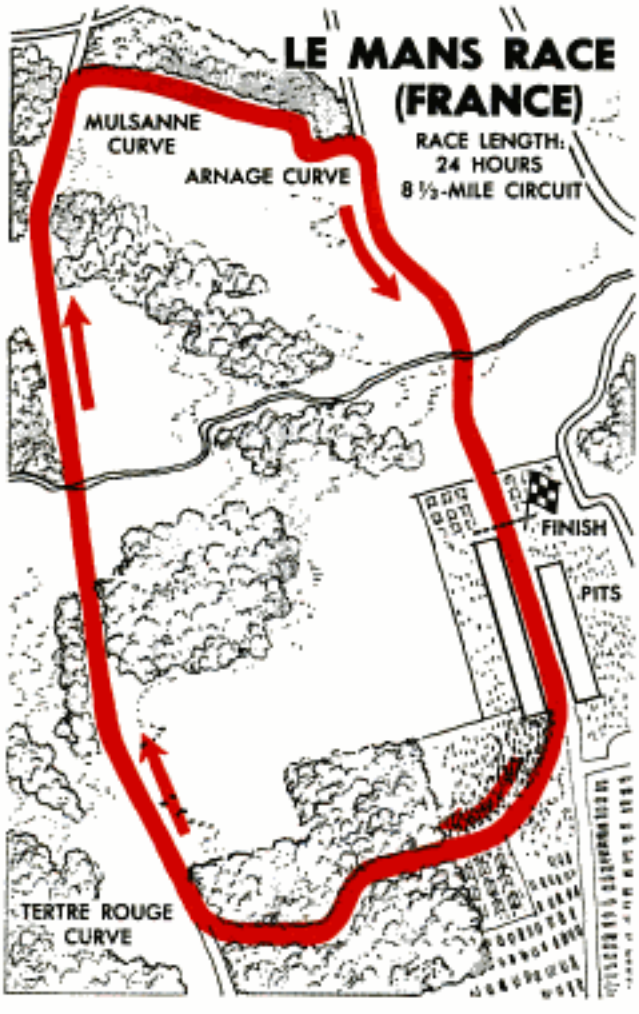


Above, most challenging race is Nurburgring, say both drivers. Notations were written on map by Fitch for study before race. F.O. means "full out" (wide open)

Below, hardest on the car is the 24-hour race at Le Mans, says Walters. It is also the one he "would most like to win . . . definitely the prestige race"



WALTERS: On the straightaway you can go as fast as any car can go. You hit speeds of 160 miles per hour. At the end of the straightaway there is a corner which you take at about 25!

Q: How long does it take you to slow down that much?

FITCH: As little as you can do it in. The short distance that the Jaguar needed to come down from its top speed is what won the race for it last year. It was the new spot brake that did it.

Q: Weren't there other changes as well as the brakes on the Jaguars?

WALTERS: Yes, but I would say that even without these other changes they would have won just on the basis of the new brakes.

Q: How long is the Le Mans circuit?

WALTERS: About 8½ miles around. It is a somewhat-better-than-normal French highway used the rest of the year for regular traffic. The crowds are tremendous, about 400,000, I believe. There is one very small main grandstand and temporary grandstands at various points around the course. There is standing room around most of the course.

Q: Do these Frenchmen stand up all night?

WALTERS: I imagine that no one person

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stands there for the whole night, but at almost any time during the night you can look at the fence and see them five deep.

Q: The length of the Le Mans race varies, doesn't it?

FITCH: Yes. It is a 24-hour race and the faster you go, the longer the race is in miles. Last year, the Jaguars went about 2500 miles.

Q: Can a driver drive the entire 24 hours or not?

WALTERS: The most any one driver can drive is 18 hours and no more than six hours at one time. That's a new rule.

FITCH: Le Mans is the great race it is because of certain restrictions, like the one that requires you to carry all repair parts in the car—everything but tires, wheels and liquids, that is. You can't stop for fuel, oil or water until you have gone 28 laps or about 230 miles.

Q: Can you stop for repairs before that?

WALTERS: You can stop for repairs provided they can be accomplished with the parts and the tools you are carrying.

FITCH: Except for the jack and wheel hammer.

Q: Both Le Mans and Nurburgring are closed circuits; what are some great cross-country road races?

FITCH: The Mille Miglia, Italy's 1000-mile race, is one of the world's greatest and, of course, the Pan American Race in Mexico. These are the two best known, I suspect.

Q: What is the difference between a closed-circuit race and a cross-country race—the difference to the driver, that is?

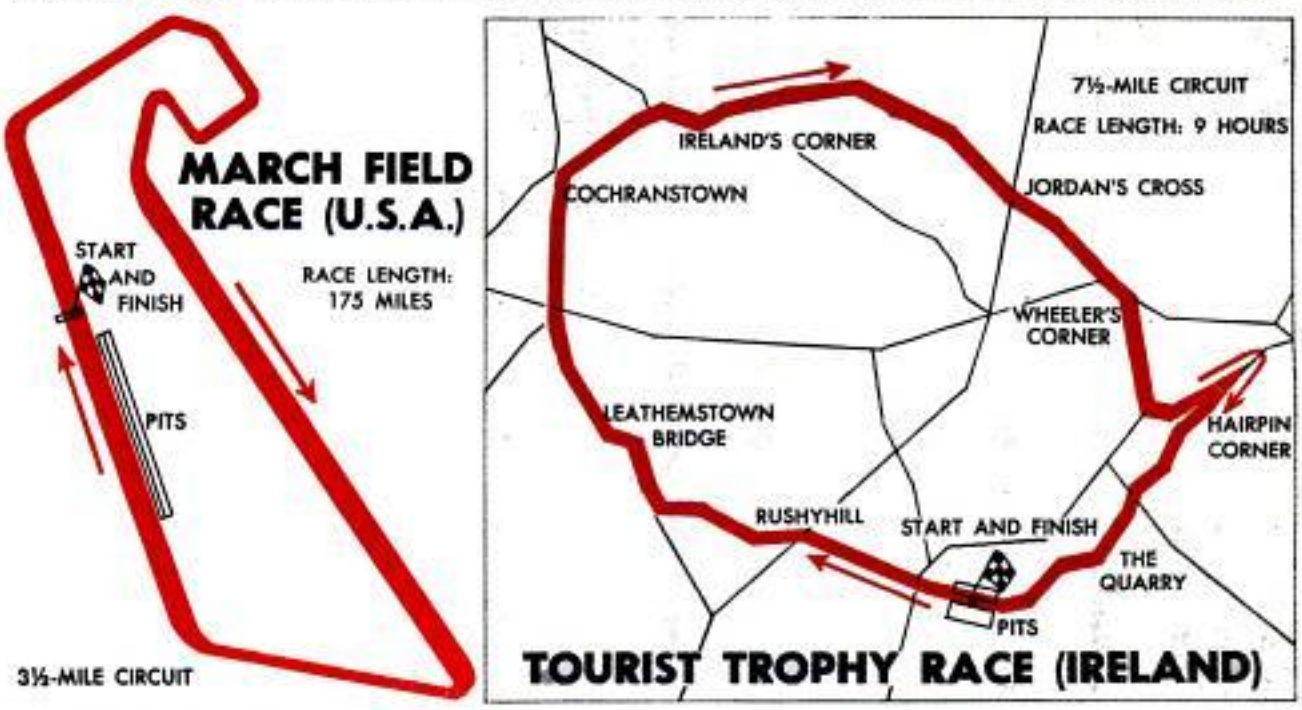
WALTERS: There are two differences as far as the racing driver is concerned.

FITCH: "I went off the road at 140 miles per hour . . . thought I would never stop bouncing. The Cunningham went end over end once and I don't know how many times it rolled."

Even on the longer closed-circuit races, with laps 25 miles long, you get to know the course. You can memorize the course, so that you are going into every corner right up to the maximum. You know exactly where to brake for each corner. You know all about the road. However, on the cross-country race, particularly the Mexican race, it is impossible to memorize the course and you are driving below the maximum for each given situation because you don't know what it is until you get there. The second difference is that on a course like Le Mans it is, at the most, eight miles to the pit where you can get the help of a mechanic. On cross-country races, if any repairs are needed between the start and finish of a leg, they can be done only by the driver.

FITCH: I think pertinent to this difference between the Mexican race and a race like Le Mans is the nature of the road. In the Mexican race the car runs through a hairpin turn at 30 miles per hour, then goes straight for a hundred yards or maybe a mile to get up to 160 miles per hour or more, depending on the tightness of the pass or where the car happens to be in the pass.

Left, a typical airport course. Right, Tourist Trophy is a "wild, seven-mile circuit circling the top of a mountain."



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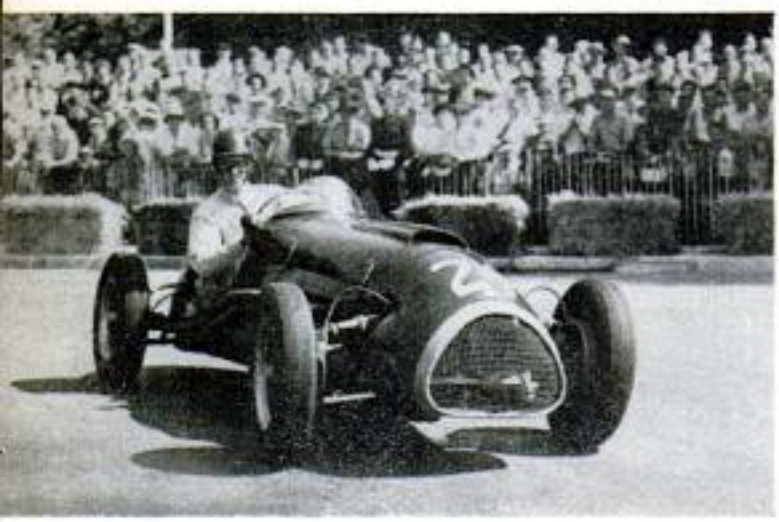
Start of the 1953 Tourist Trophy. Fitch is driving car at right. He didn't finish. The car lost a wheel

Above, the wrecked Cunningham at Rheims. Driver Fitch was slightly hurt. Teammate Walters is at right



Above, Fitch drives a Cooper-Bristol Grand Prix car at Aix les Bains in France. He finished fourth. Below, Walters takes a curve at Sebring, Fla., airport in a Cunningham. Fitch was his teammate. They won

Also there is high altitude there and that has a secondary effect in that the surface of the road is very hot, being a heat-absorbing black, and therefore extremely hard on tires. Also in Mexico the road is repaired up until the race runs over it, so you can find at any time newly paved sections or a corner with loose gravel where you least expect to find it. In the first day's run, the route crosses two high mountain ranges with very winding roads and sharp turns. You run for an hour at a time climbing or descending, punishing engine and brakes severely.

Q: What is the Mille Miglia like?

FITCH: Well, it paralyzes Italy for a day —the time of the race that is. About 20,000,000 persons watch it, making it the biggest spectator event in history.

Q: How long does the 1000-mile race last?

FITCH: The winning car did it in less than 11 hours last year. But there were about 600 entries in the race and since the slowest cars start first, it takes much longer than that, about 22 hours in all. It is arranged so that just about the time the slow cars are getting into Brescia at the finish, the fast cars have worked through the whole pack and finish at about the same time.

Q: What is the route, mountainous or level?

FITCH: A combination. It goes across the Po valley, down pretty fast along the straight Adriatic coast where the leader averaged 112 miles per hour last year. Then across the mountains to Rome, up to Florence through the mountains again to Brescia where it both starts and finishes.

Q: What kind of road is it?

FITCH: A narrow, winding macadam road, which is the most vicious in the world when wet. It goes through some stiff mountain ranges, too. The Mille Miglia is almost impossible for a non-Italian to win. Last year's winner had courted his bride in Rome while living in Milan. For a couple of years he went back and forth so many times he learned every stone in the road.

Q: Tell us about the Tourist Trophy in Ireland.

FITCH: It is a wild, seven-mile circuit circling the top of a mountain outside Belfast and is one of the most difficult road circuits in the world. On each shoulder of the road there is an earthen bank about a foot or two high and there is just no place to go. You can't go off the road. If anything goes wrong, you just bounce around from one side to another until you finally stop, blocking the road. The high banks and hedgerows block the driver's vision, making lots of practice necessary to learn the road.

Q: How long is that race?

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FITCH: In 1953, it was nine hours long. The winner completed more than 1000 kilometers, the F.I.A. requirement for being included among the world's sports-car championship races.

Q: Would you rate the Mexican race among the top two or three races?

FITCH: It is certainly one of the major races in the world.

Q: Does it need stricter regulation?

WALTERS: I feel that a Le Mans type of regulation, whereby the only parts that could be used (outside of liquids, wheels and tires) have to be carried on board, would make it a more interesting race. Something should be done to make it easier for the private entry. As it is, the team that comes down with the most parts and the most mechanics is more likely to win because they can do more in the three-hour work period permitted under the new rules. That gives the factory teams an edge.

Q: In addition to sports-car road races, there are also Grand Prix races. What is the distinction?

FITCH: The Grand Prix car is closer to the Indianapolis-type car, in looks at least. In fact, the Indianapolis cars are running today under an expired Grand Prix formula. The rest of the world has gone on to other formulas, but Indianapolis still retains the formula that was used in 1939, I believe.

WALTERS: The main difference is that an Indianapolis car has to accelerate well from 130 to 160 and it has to turn left well. A Grand Prix car has to accelerate well from 25 to 160 miles per hour, to stop well and to turn left or right well.

WALTERS: "The team that comes down to Mexico with the most parts and mechanics is most likely to win because they can do more in the three-hour work period . . ."

FITCH: On every kind of road surface. The races have every surface from cobblestones to billiard tables. It is the essential difference between road racing and track racing.

Q: But how does the Grand Prix car differ from the sports car?

WALTERS: A Grand Prix car is restricted only by rules limiting the engine displacement, whereas the sports car has many other restrictions. It has to be able to be licensed in most parts of the world.

FITCH: It is a legitimate road car with fenders, lights and so on.

Q: But these sports cars that win the big championship races aren't standard production models, are they?

WALTERS: No, most of them are prototypes, rather than production models. Suspension, weight, brakes and engine output are refined for competition. They eliminate all the comforts and niceties that you would require for road use. That saves weight. They wind up with an engine that is rough and won't idle. The car has a very poor ride. They eliminate upholstery, radio and heater, of course. It is nothing but a thinly disguised Grand Prix car—it is certainly not the same sports car you see driving along our highways today.

(Continued to page 286)

Mexico has one of the two outstanding cross-country races in the world. It has stock and sports entries

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THIS CAR COSTS $2175.75

THIS CAR COSTS $3910.80

LOOK CAREFULLY at the two cars above. Both are 1954 Dodge V8s. Both are four-door sedans. Except for the paint, you might have trouble telling them apart. Yet, the price difference is $1735.

The top car is a Dodge Meadowbrook V8. It is exactly what you get for the factory-delivered price—it has no extras.

The lower car is the new de luxe line introduced this year by Dodge, the Royal V8. A de luxe car to start with, it has everything added that Dodge offers.

Below are the various items that make the Royal V8 worth over $1700 more than the Meadowbrook V8. Those marked with an asterisk are standard on every Royal; the others are available at the buyer's option. Prices include federal excise tax, which amounts to $272.90 on the Royal V8. Dodge is used here as an example; the "extra" situation applies to all makes.

For the average buyer, it is hard to say no to such extras; it is no wonder he is often surprised at the bill. Looking over this layout may help him realize he gets more than mere glitter for the extra money.

HERE'S WHAT YOU GET FOR THAT EXTRA $1735.05

X600

the POPULAR MECHANICS CRAFTSMAN

3 SEWING CABINETS from SINGLE DESIGN

By John Bergen

ANY ONE OF THESE modern, good-looking sewing cabinets will do wonders to organize the clutter in the sewing room—and they make an ideal gift for the woman who likes to sew. Where space is at a premium, the attractive units serve a dual purpose as lamp or bedside tables. All three styles are adapted from a single basic design, each cabinet containing three convenient drawers and a pair of swing-out storage racks for thread spools and odds and ends.

The difference between styles A, B and C is merely in the design of the legs and exterior trim. The construction details of the style-A cabinet on the following two pages show how the cabinet itself is built for all three units. The changes in the legs and trim for styles B and C are given on page 189. Walnut, oak, mahogany or other hardwood may be used for the legs and apron, with matching plywood for the panels and drawer and door fronts.

The bottom of style-A cabinet consists of a panel of ½-in. plywood set in a rabbeted frame, or apron, of ¾ x 1¾-in. stock. The legs of this cabinet are splayed by attaching them to the corners of the apron with cleats as in the upper right-hand detail on page 186. The ends of the cleats must be cut at a compound angle to fit between adjacent sides of the apron and attain the 2-in. pitch of the legs.

The ½-in.-plywood side partitions are grooved for the drawer guides and rabbeted along the front edges to fit grooved posts of ¾ x 1-in. stock. The rear edges of the side partitions are set in vertical grooves

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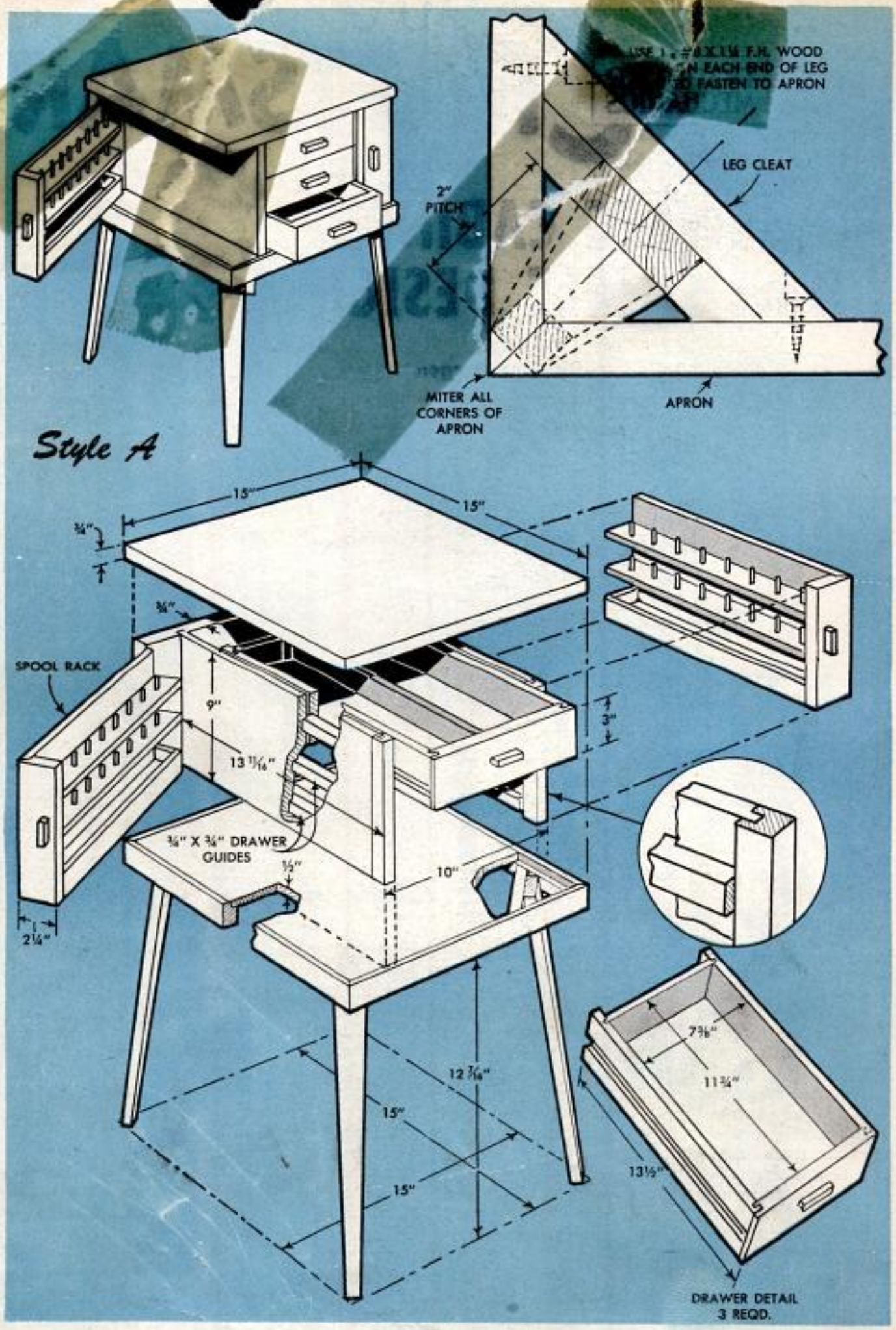

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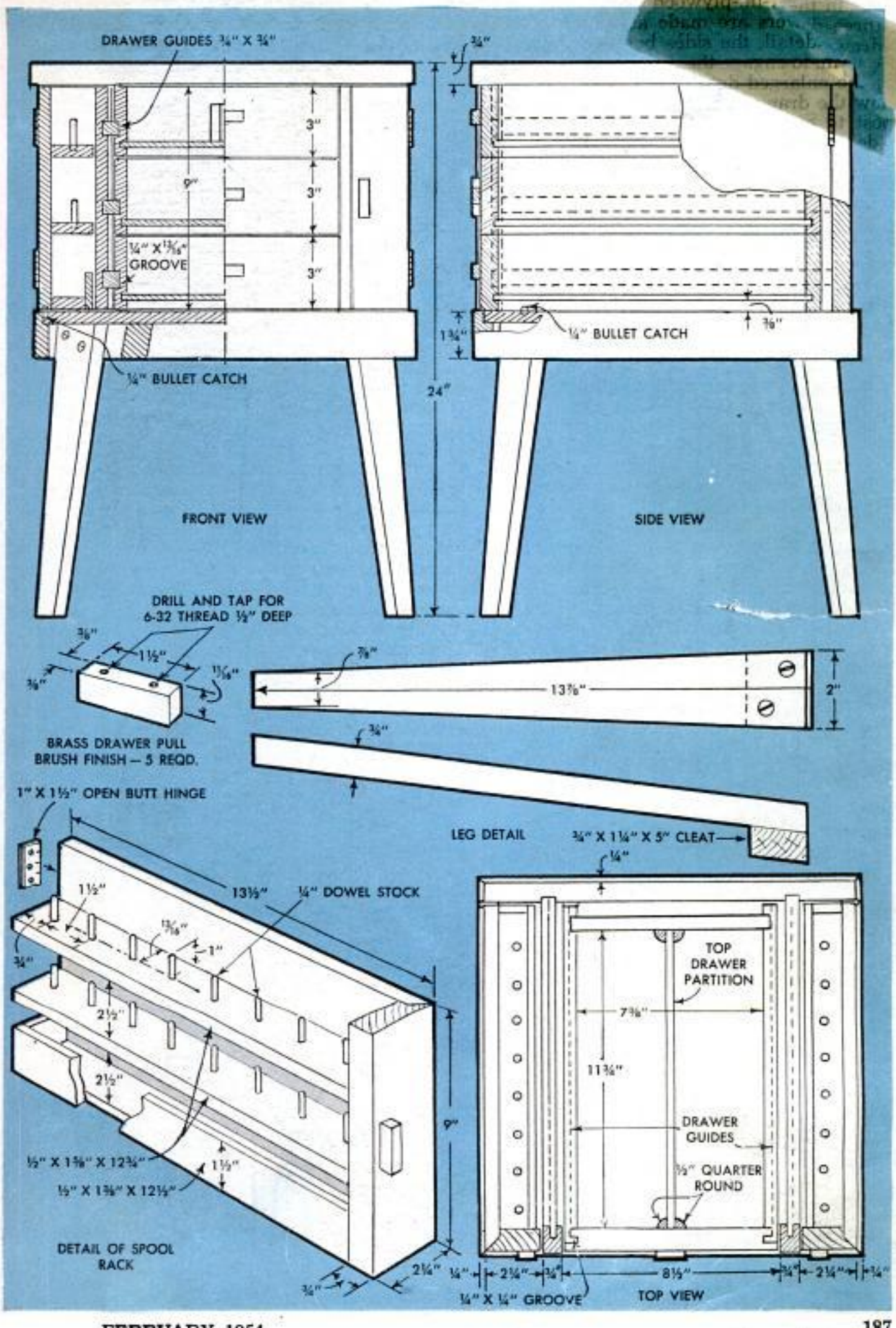

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cut in the ¾-in.-plywood back panel. The three drawers are made as shown in the drawer detail, the sides being grooved ¼ x 13/16 in. to engage the drawer guides. Note in the enlarged detail of the drawer posts how the drawer guide extends beyond the post to engage the groove in the drawer side. The drawer fronts are of ¾-in. plywood, the sides and backs of ½-in. plywood and the bottoms of either ¼-in. hardboard or plywood.

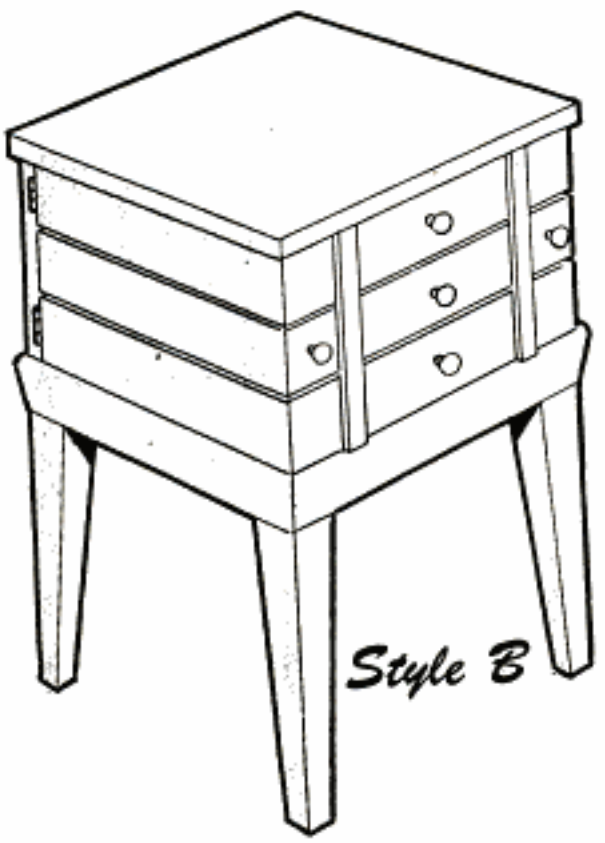
The swinging spool racks are made as in the lower left-hand detail on page 187, each one being hinged to the back panel with a pair of butt hinges. The front of each rack is of ¾-in. plywood, with the other parts of ½-in. plywood. Drawer and door pulls are made of brass as shown in the detail, and the spool racks are held in the closed position with bullet catches.

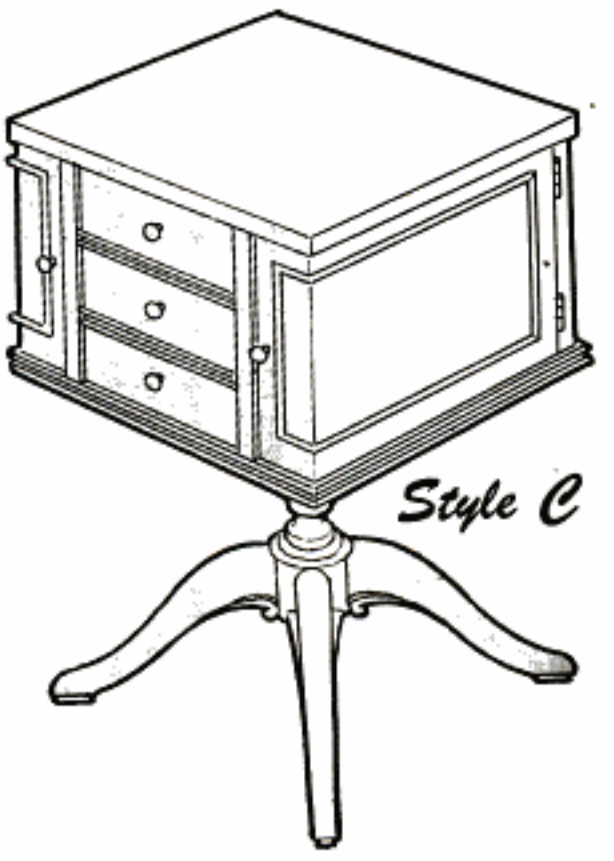
Note in the style-B cabinet, detailed on the opposite page, that the top portions of the legs are shouldered for the apron. This, like the apron in style A, is of ¾-in. stock. However, the upper corner of the apron is rounded to a ¼-in. radius and the outer surface of the stock is planed to a ½-in. thickness at the lower edge. The sides and fronts of the hinged spool racks are grooved as indicated, and purchased brass knobs form matching door and drawer pulls.

The style-C cabinet differs from the others in its pedestal base and beaded inlay molding. The latter is 3/16 in. wide by 3/16 in. deep and is set in 3/16 x 3/16-in. grooves so that it projects ⅛ in. above the surface of the cabinet. In order to achieve the double-strip effect across the cabinet drawers, the molding is glued in rabbets cut in the top and bottom edges of the center drawer. Antique-finished knobs are used on the drawers and doors of this cabinet.

The pedestal base of the style-C cabinet consists of a 3-in.-dia. turning and four curved feet which are doweled and glued to the turning. The base is mounted on the underside of the cabinet bottom panel with a 1¼-in. length of 1-in. dowel and a 6-in.-sq. cleat. The latter is made from ¾-in. stock by rounding the edges and drilling the center for the 1-in. dowel. The cabinet bottom is drilled for the other end of the dowel. The cleat is fastened first to the end of the pedestal turning and the dowel is glued in the center hole of the cleat. After the base is completely assembled, it is fastened to the cabinet bottom with glue and countersunk screws.

The four feet are bandsawed from 1½ x 4 x 12¼-in. stock and then worked to shape. The general contour of the feet can be determined from the cross-hatched sections shown in the detail, the upper portion being rounded at the top with the sides flat and brought gradually to the sectional shape shown for the portion of the lower curve. The upper end of each leg is sanded concave to match the radius of the pedestal turning and drilled for two ⅜-in. dowels. The legs are doweled and glued to the turning. Although the cleat is shown in correct relation to the cabinet in the front-view detail, the legs have been drawn 45 deg. out of position for clarity. ★ ★ ★





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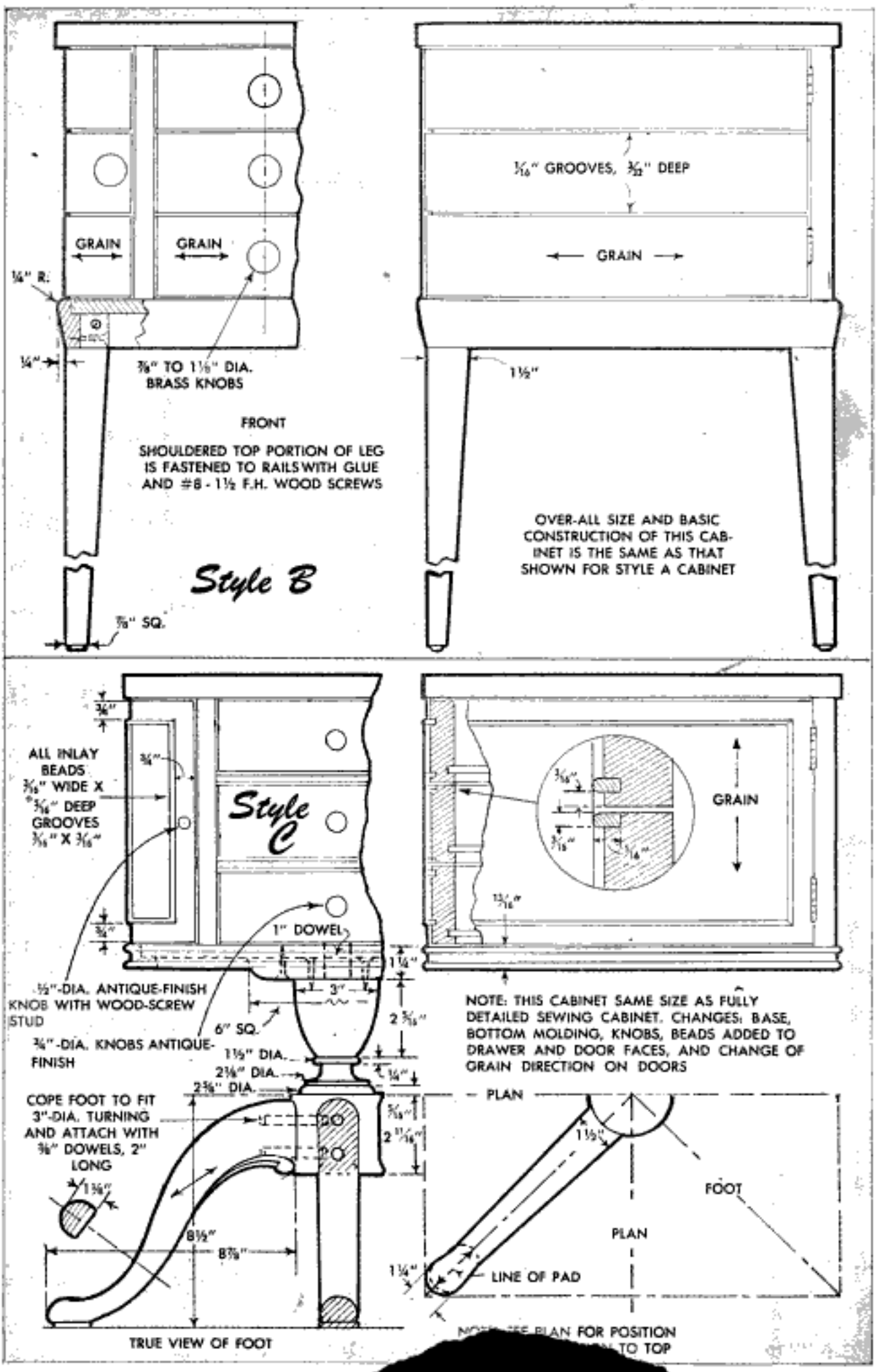

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Jig for Holding Wooden Frames Needs Only One Bar Clamp

With a number of identically shaped wooden frames to be glued and clamped, one craftsman used a jig fastened to the workbench to supplement his only bar clamp. The jig, made of hardwood strips, was accurately laid out and fastened securely to the bench top with large wood screws. The bar clamp was cradled beneath the bench in two U-shaped wooden brackets. The jig, being 1 in. shorter than the frame, permits the clamp to hold the joints tightly together.

Charles Mencio, San Antonio, Tex.

Caliper Made From Broken Rule

A comparative caliper, useful for both inside and outside rough measurements, may be quickly shaped from a section of a broken folding rule. Two 6-in. sections are cut to the shape shown in the sketch, by cutting on a jigsaw or by filing. A discarded rule will supply a number of these calipers.

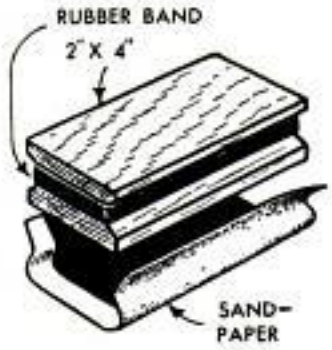
George T. Hillman, Park Ridge, Ill.

Dog Bed Provided by Old Tire

Needing a temporary bed for a mother dog and her pups, I simply placed an old automobile tire on the floor and [illegible] discarded garments in the center to furnish a pad. Both the tire and pad were then covered with an old woolen blanket and pressed down in the center so the tire formed sides of the bed.

Charles Rodrigues, South Carver, Mass.

Slotted Sanding Block Provides Better Grip



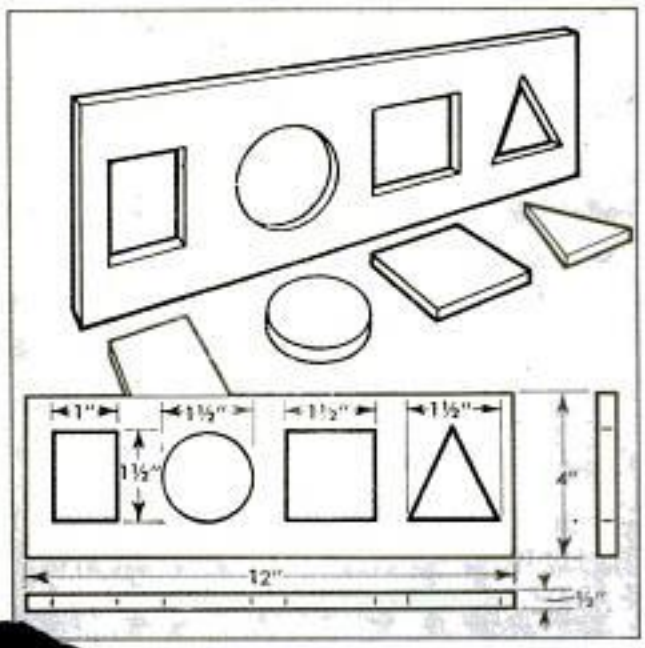
A sanding block that is easily gripped can be made in a few moments by cutting slots in opposite edges of a short length of 2 x 4. Sandpaper is wrapped around the block and held in place by a heavy rubber band in the slot. In use, the fingers rest on the band in the slot, permitting a good grip and giving more control over the block than would be had otherwise.

G. E. Hendrickson, Argyle, Wis.

Simple Toy Teaches Child To Differentiate Shapes

Simple toy that will teach a child to differentiate between shapes, as well as give him pleasure, can be cut from a piece of wood or plastic 4 x 12 in. The stock should be at least ½ in. thick as it is easier for a child to handle. Lay out the puzzle according to the dimensions given and drill a hole in the corner of each shape for inserting a saw blade. A jigsaw or keyhole saw may be used. Sand the pieces smooth and finish with a nontoxic paint or stain.

I. M. Fenn, Chicago.



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WTM '53

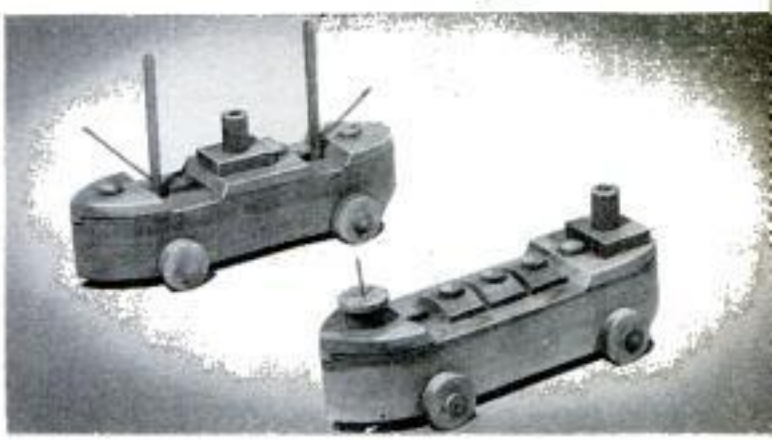
PULL TOY
in eight models

By Hi Sibley

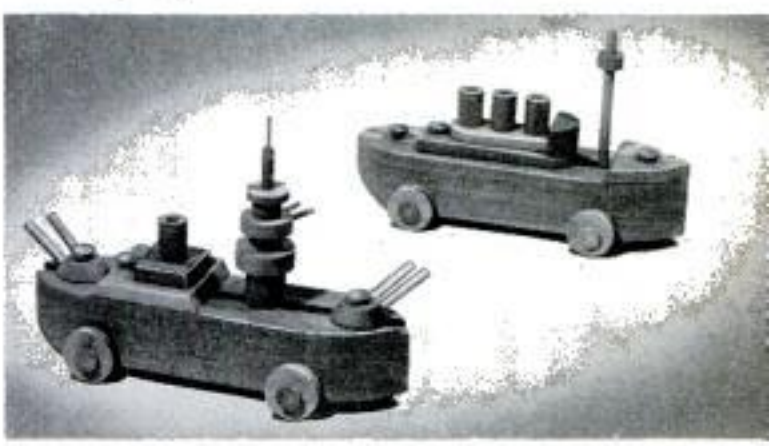
YOUNGSTERS WITH a liking for boats won't let Dad rest until he has collaborated with them in the making of this novel ship toy. There are eight ships to choose from, any one of which can be assembled on the same hull by means of interchangeable parts. That makes the job easier as only the parts of the upper structure are interchanged to make a freighter, ore carrier, liner, battleship or any of the four types of sailing vessels pictured in the lower photo. Certain parts such as the wheels, deck hatches, decks fore and aft, and the gun turrets are readily removable and replaceable on the hull by means of simple push pegs. The latter form axles for the wheels.

Before you make the hull, take time to go over the details on page 192 and also the various assemblies on page 193. Note that the parts have been dimensioned and keyed alphabetically, the letters running from A to X inclusive with the exception of the letters I and O, which have been purposely omitted. Note also that the part L is not indicated on the assemblies on page 193. Part L is a short length of dowel which holds the stacks in place on the freighter, liner, battleships and ore carrier. Parts for sailing boats, page 193, are lettered A to F inclusive.

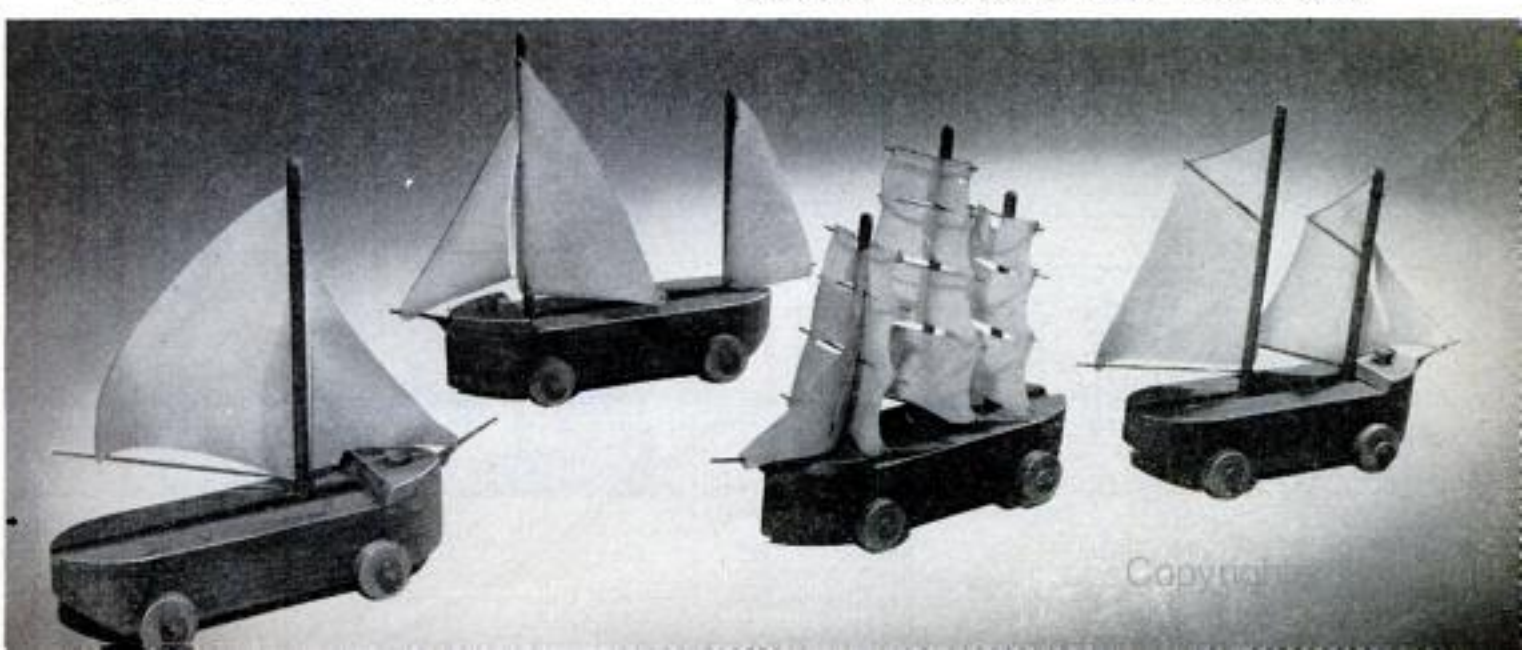
For greatest durability make all parts of a hardwood such as maple or birch, and finish in the natural color of the wood. If you do use an opaque finish in color be sure that it is a nonpoisonous enamel or lacquer of the type made especially for finishing toys. The hull can be made from 1¾-in. stock as in the plan, side and end

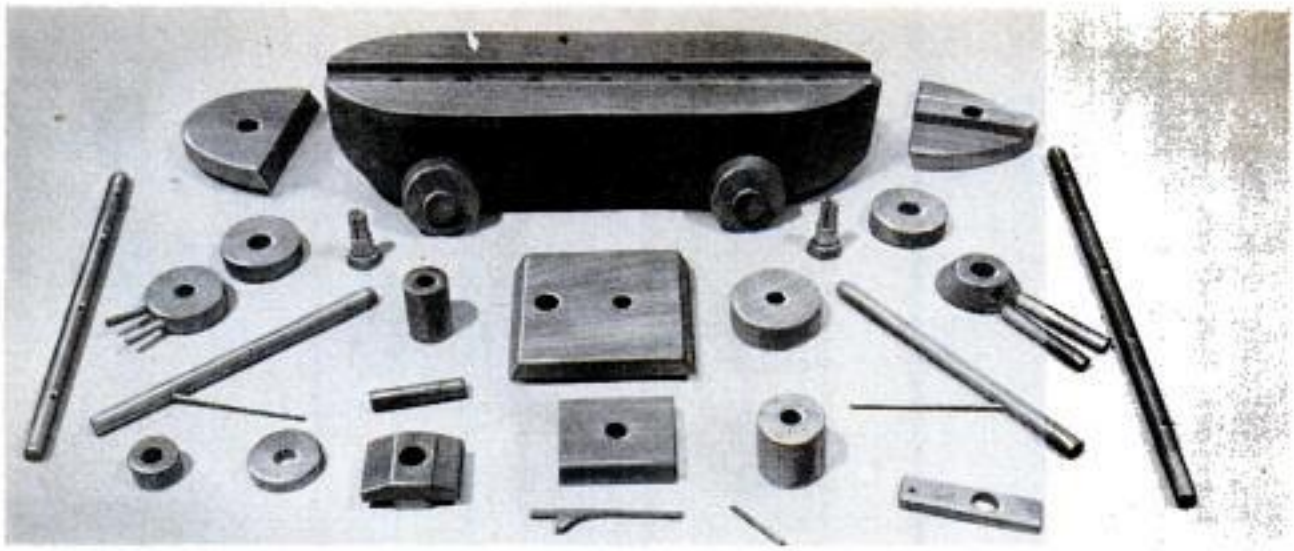


Two of eight types which can be built on same hull

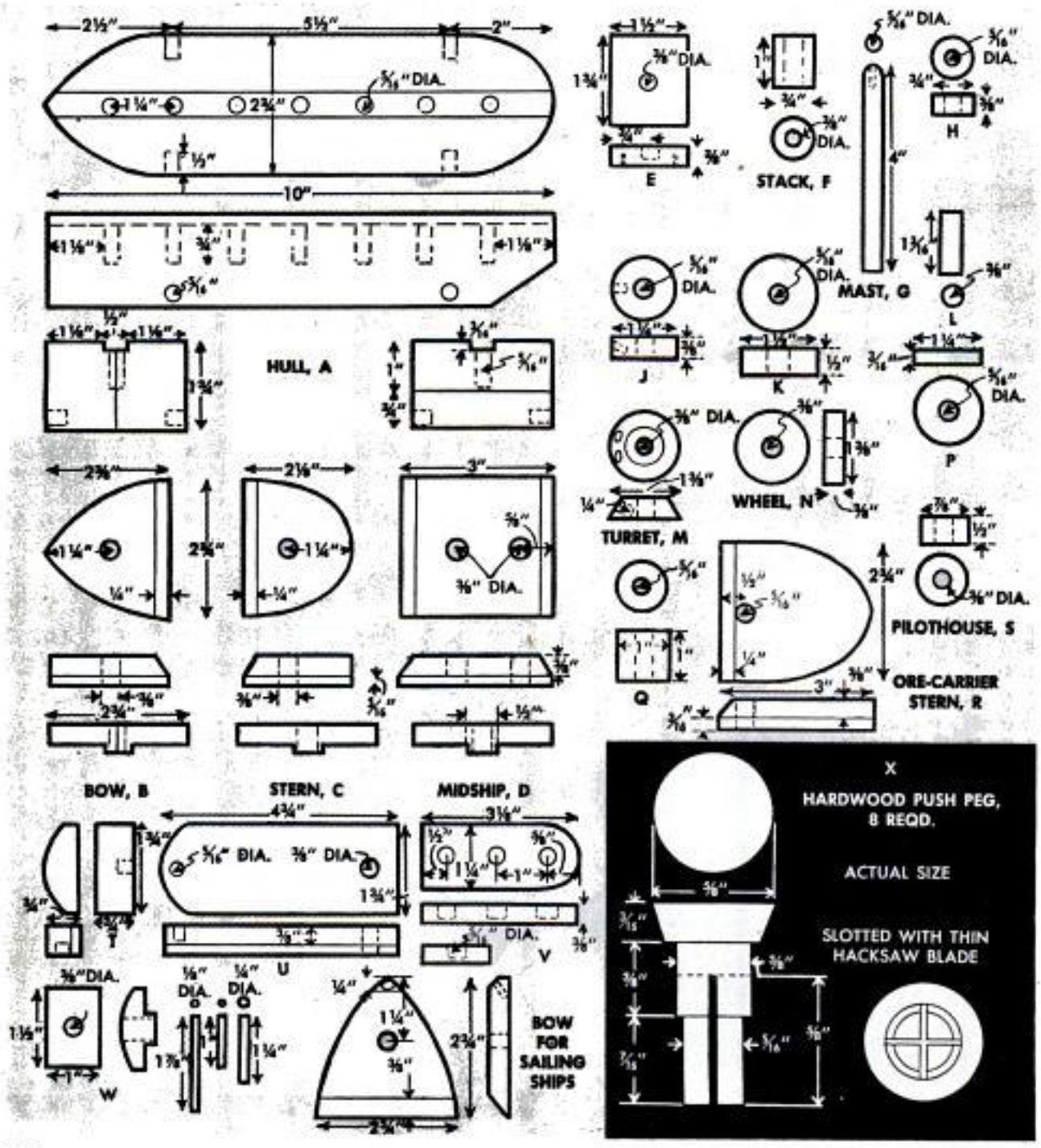


Above, battleship and liner are made with interchangeable parts. Below, four types of sail rigs can be set up on a single hull if desired. Note deck piece





Completed hull with its interchangeable parts can be assembled into eight ship toys of the popular pull type



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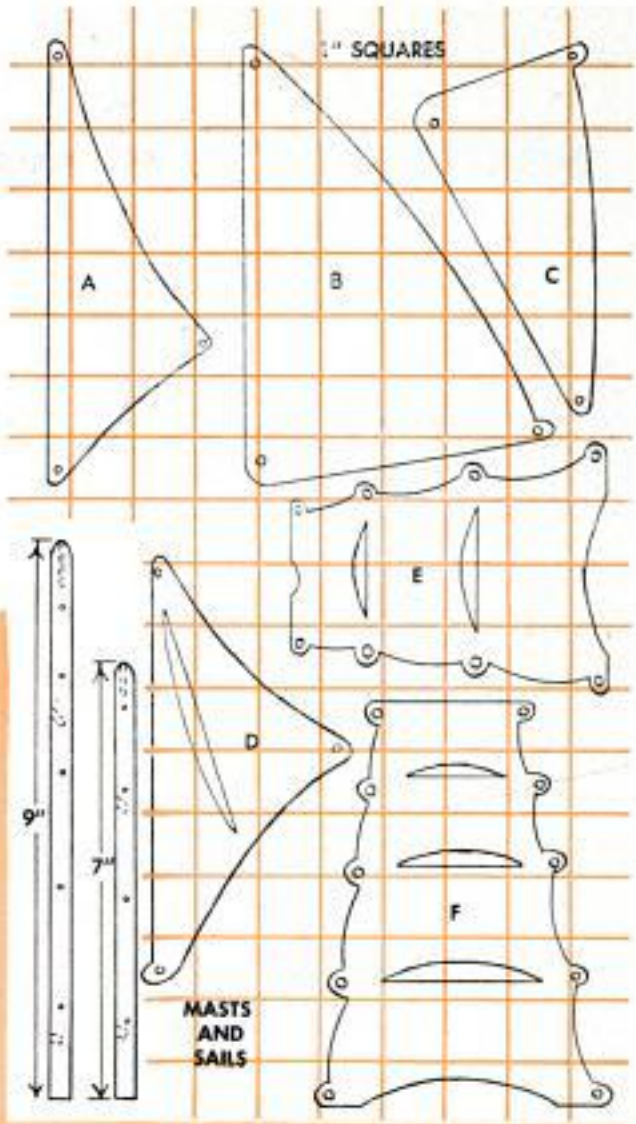
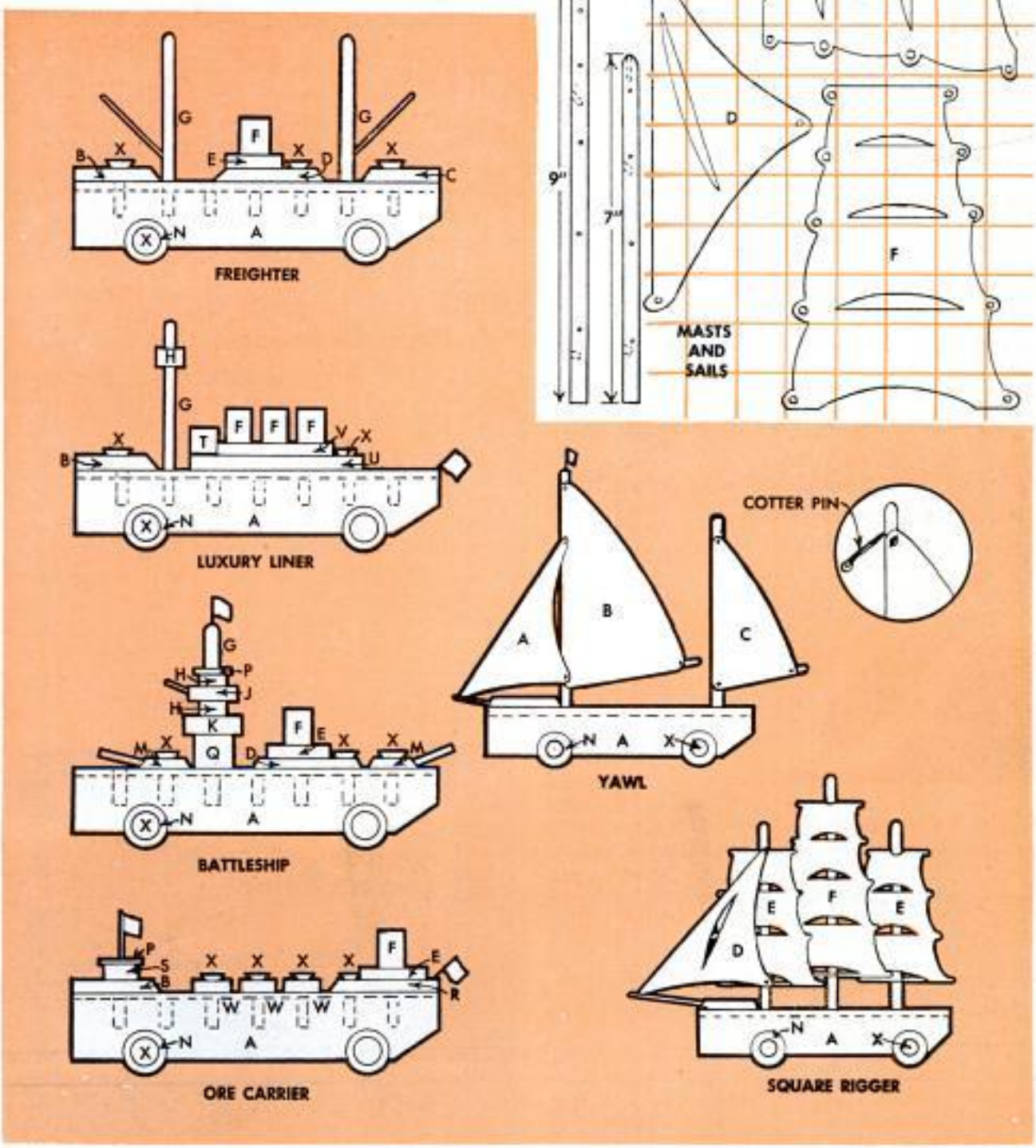
views, details A on page 192. Note that the bow, stern and midship deck pieces are rabbeted to form a tongue which fits into the groove cut lengthwise in the hull. This provision serves to automatically align the parts as they are placed in position on the hull. Also it will be noted that in turning the pegs, lower right-hand detail on page 192, they are shouldered to three diameters and are slotted at right angles to a depth of 5/8 in. from the small end. Although the diameter of the tenon at the end is given as 5/16 in., it is well to caliper this slightly over when turning to size so that it will fit snugly in the 5/16-in. holes drilled in the hull. Masts are 5/16-in. dowels rounded at one end and 1/8-in. dowels form booms, bowsprit and crossarms. ★ ★ ★





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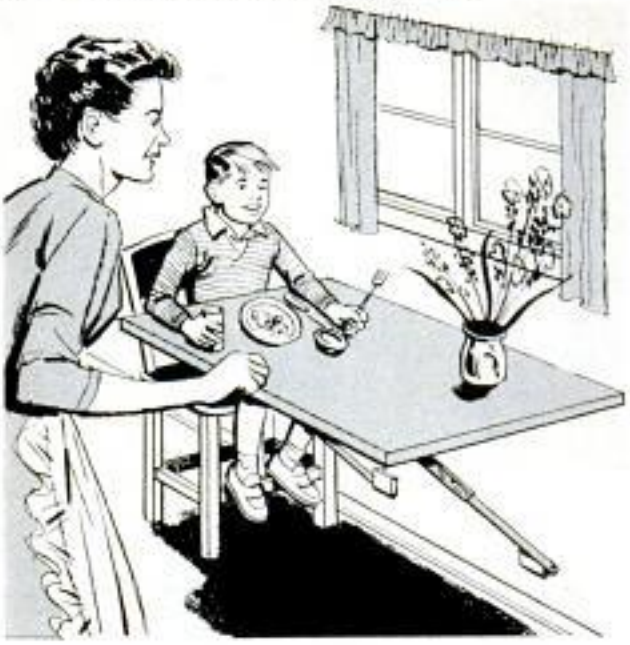
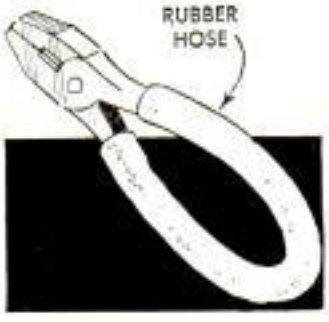
Automobile-Trunk Brackets Used As Folding-Table Supports



Seeking a more rigid method of support for his folding wall table than was possible with conventional wooden braces, one homeowner utilized the brackets from an automobile trunk. The brackets, taken from an old junked car, were modified by bending the upper ends to fit flush beneath the table top. The lower ends were fastened to wooden blocks which were screwed to the wall. Raising the table top slightly unlatches the trunk braces.

Richard Hamann, Fort Dodge, Iowa.

Rubber Hose Over Pliers Handle Prevents Hand Chafing



To prevent his hand from becoming chafed due to the repeated use of a pair of pliers, one home craftsman slipped a length of rubber hose over the handles. Besides protecting the hand, the hose allows the pliers to be removed from a deep tool pocket without the handles snagging the inside of the pocket. The rubber hose also insulates the pliers.

R. R. Rundell, Miami, Fla.

Nails to Hang Pictures on Wall "Driven" With Hand Drill

To provide "hooks" for hanging pictures on plaster walls without damaging the plaster, first clip off the head of a nail, file off any burrs that remain and chuck the point in a hand drill. Then drill the nail into the wall at a 45-deg. angle and release when it extends about ½ in. As an added precaution, a strip of cellulose tape applied over the spot to be drilled will help reinforce the plaster as the nail is turned in place.—Martin Mantell, Hazleton, Pa.

Adjustable Drafting Curve From Hacksaw Blade

Utilizing the flexibility of a hacksaw blade, this adjustable drafting curve will be found handy by the home craftsman for laying out patterns. The blade is held at the desired curve by an adjustable wire handle. The teeth of the hacksaw blade grip the ends of the handle to prevent slipping. To make a compound curve or parabola, increase the bend in one end of the handle over the other.

Carl S. Bates, Chicago.

Vapors of Solvents Utilized For More Economical Use

Solvents, such as lacquer thinner, may be used more economically by utilizing their vapors to remove paint from objects small enough to be placed in an airtight container. The example in the picture shows the paint being removed from the spots on a set of dominoes, preparatory to respotting them. The dominoes were placed in a coffee can, a tablespoonful of lacquer thinner was added and the lid placed on tightly. After 24 hours the paint was soft enough to be wiped off. Other highly volatile solvents may be used in the same way.

Walter E. Burton, Akron, Ohio.

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PhotoKinks 58

DON'T LET DUSTY HOLDERS SPOIL YOUR NEGATIVES

By Donald F. Honick

Before loading your film holders, spend a few minutes cleaning them with a soft brush and a syringe, to assure clean, dust-free negatives. The required tools are a clean ¾ or 1-in. camel's-hair paintbrush and a small ear syringe, the latter being obtainable at most drug stores. First, remove the film-holder slide and use it to tap lightly along the front edge of the holder, Fig. 1, to dislodge dust and dirt particles. Then, with the ear syringe, Fig. 2, blow air through the felt light-trap to remove dirt not loosened by the tapping. Make sure the felt is thoroughly clean, because dirt from it will drop down onto the surface of the negative when the slide is inserted into the holder. Next, blow out the inside of the holder, Fig. 3, to remove the dust. Finally, brush the holder with the camel's-hair brush, Fig. 4. Cleaning the holders should be done, of course, in a location that is as dust-free as possible. A darkroom, equipped with an air conditioner that filters and dries the air, would be ideal. For most satisfactory results, film holders should be cleaned just before loading.

Night-Flying Insects Controlled By Use of Proper Lighting

Because night-flying insects are color-blind—their eyes being sensitive only to blue and near ultraviolet light—it is actually a simple matter either to attract or keep them away, by using the correct color of light bulb. However, most bulbs, whatever their predominant color, produce a mixture of colors which includes blue. Although red or orange-colored bulbs would be just as effective, yellow is the color used in noninsect-attracting bulbs, because human eyes find the color pleasant. All fluorescent bulbs, except the gold-colored, are attractive to insects, and both blue and black-light fluorescent bulbs have so much appeal that they are used as bait in insect traps. Florists, gardeners, farmers and other professional growers use these light traps to attract and destroy insects as a means of protecting their plants and trees.

General Electric News Bureau.

Shellac Preserves Ball Bat

Baseball bats can be given a very durable finish by applying several successive coats of shellac. Sand each coat lightly after it has dried and buff to a high gloss.

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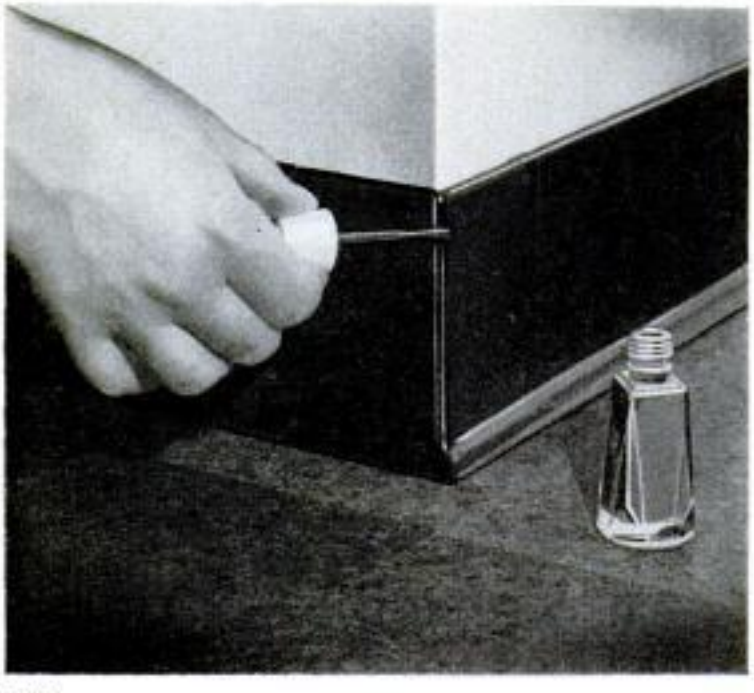
Solving HOME PROBLEMS

CARRY YOUR CLOTHESBASKET in the baby buggy to make the work easier when hanging the clothes out to dry. As a laundry cart, the buggy will hold the basket at a convenient height and can be moved along as the clothes are hung up or taken down

WHEN PAINTING door jambs, baseboards and other often-abused surfaces around the house, save a bit of the paint in an old nail-polish bottle. This will provide a color-matched, touch-up kit that is easy to use for covering up marks and scratches



KEEP A SMALL TOOTHBRUSH in the kitchen specifically for cleaning the beaters of your electric or hand mixer. With it you easily can reach all those hard-to-clean surfaces of the beaters in a short time

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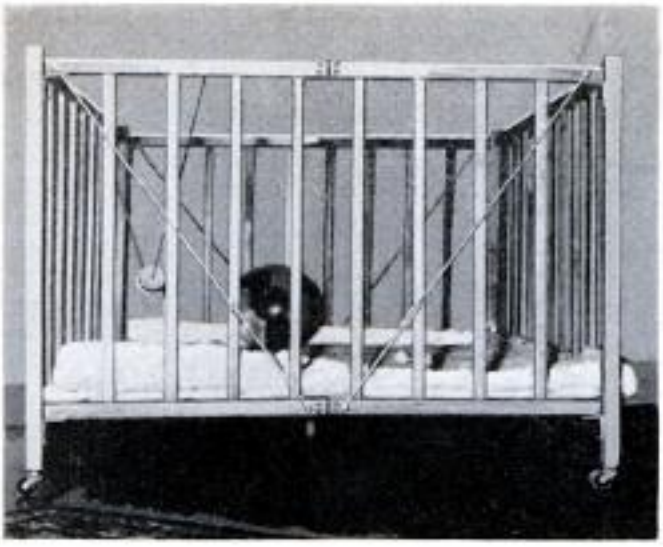

SCREEN-DOOR BRACES can be used to provide additional support for the floor of a folding playpen if they are attached as shown. Four braces, which will also give strength to the sides, are needed

MOTH CRYSTALS placed inside an empty adhesive-tape spool as shown, and slipped over a clothes hook in the closet will keep the moths out and yet last a long time due to slow evaporation

A STICK OF BLACKBOARD CHALK kept in your jewelry box will help prevent tarnish from forming on your costume jewelry. The same idea can be used in chests of silverware and other cabinets where metal objects subject to tarnish are stored

PIVOTED ON A NAIL or wood screw, a pie plate or cake pan can be made into a handy revolving tray for storing spices. Mounted on the kitchen shelf with a washer between the pan and shelf, it is allowed to overhang the shelf edge for easier pivoting

FADED AND DINGY CARPET can be restored in color if it is sponged, a small portion at a time, with hot water to which a little ammonia has been added. Rub the area of the carpet dry after sponging

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Make Full-Color Image Projector Using Ordinary Camera Lens

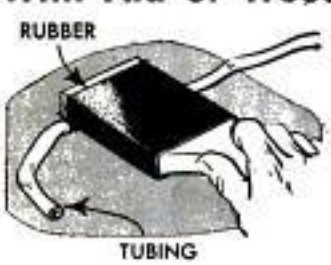
Capable of producing full-color, larger-than-life-size images, this projector can be constructed in a matter of minutes. A large cardboard box, a portable extension light and the lens from a camera are the essential parts. A hole is cut in the bottom of the box, into which the lens is fitted. The light, which must be of the type that has a shield on one side of the bulb, is fastened inside the box with the shield toward the lens. The object to be projected is placed in the box and then a dark cloth is used to close the open side of the box. The image is focused by moving the object toward or away from the lens, while the size of the image is governed by the distance from the lens to the surface used to show the picture. The object should be placed upside down in the box.—Frank Maxlin, Azusa, Calif.

Removing Wax From Wallpaper

To remove candle wax from wallpaper, scrape most of it off with a dull knife and then place a blotter over the remaining spot. Press the blotter with a warm iron. This will soften the wax, which will then be absorbed by the blotter.

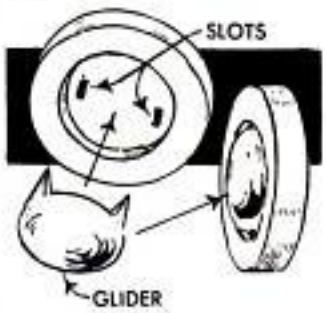
Sam Fenn, Chicago.

Kinks in Copper Tubing Removed With Aid of Wooden Paddle



To facilitate the removal of kinks and bends from a length of copper tubing, use a wooden paddle covered with a wide band cut from an inner tube as shown. Use the paddle to apply pressure to the irregular portions while rolling and working the tubing back and forth on the bench.

Wheel Disks for Model Cars Are Furniture Gliders



One modelmaker solved the problem of finding suitable wheel disks and hub caps for the wheels of his model cars by using furniture gliders. The dome-shaped gliders come in several sizes to match various wheel diameters. To install the gliders, cut slots in the wheels as shown, insert the prongs of the glider and clinch the ends.

H. Radzinsky, New York City.

Painting Over Varnish or Enamel With Oil-Base Paints

When applying oil-base paint over varnish or enamel, the job of sanding the surface or washing it with sal soda, can be eliminated by adding benzol to the paint. Two ounces of benzol added to each gallon will allow the paint to be applied directly to the old finish without prior preparation. The benzol is used on the first coat only. Subsequent paintings are done with the regular paint. *Caution*: Benzol is highly flammable and should be kept away from fire and heat.—O. A. Nelson, Seattle, Wash.

¶Two glasses that are stuck together can be separated by placing the outside glass in warm water and at the same time pouring cold water into the inside glass.

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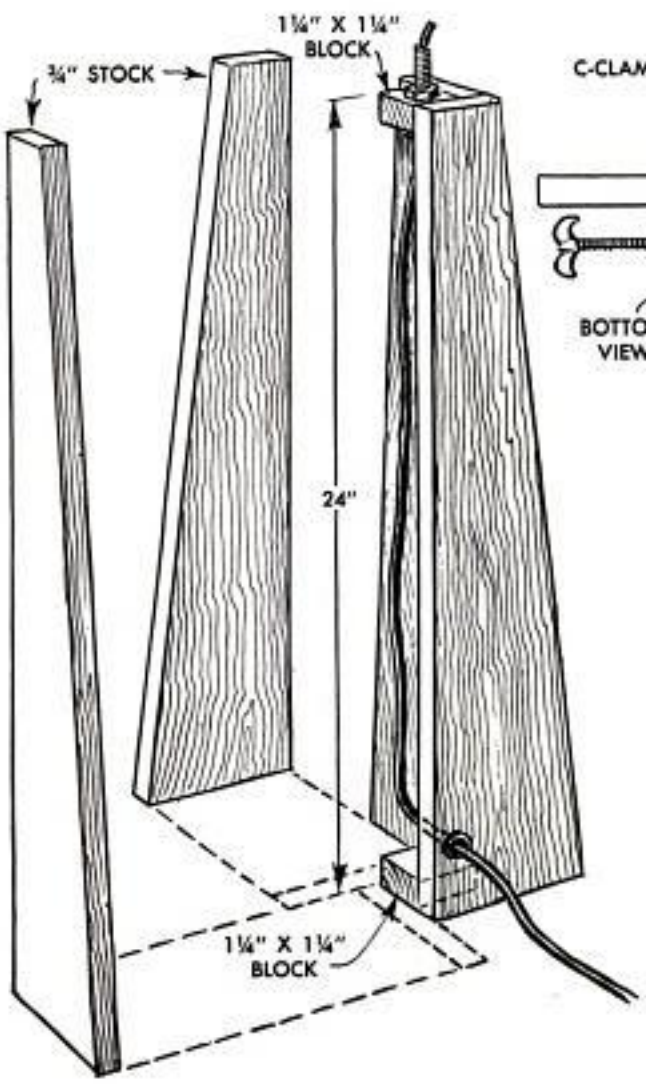
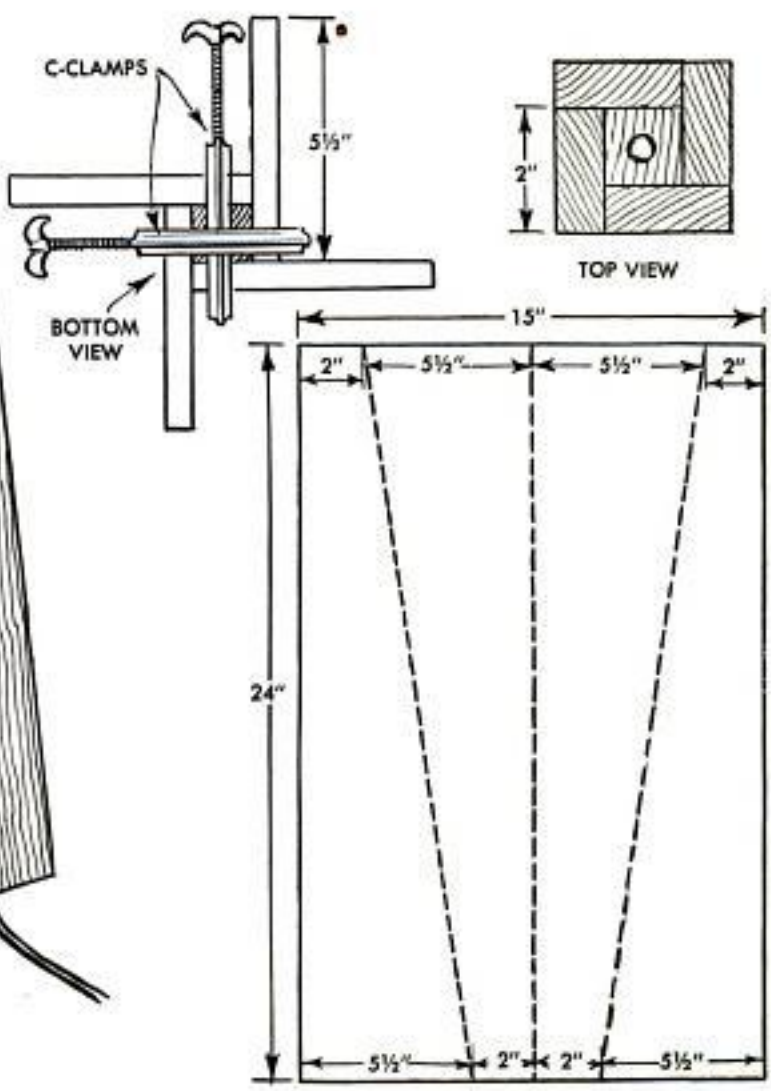
Modern Furniture WTM '55

MODERN TABLE LAMP

By Bert Goldrath

THIS MODERN table lamp, tall enough to be used for reading even when placed on a fairly low table, may be made completely from one length of 1-in. lumber. If 1 x 16-in. stock is not available, a 4-ft. length of 1 x 10 may be used. Cut out the pieces of the lamp according to the dimensions given. A 1¼-in.-square block, cut from 1-in. stock, is fitted at the top and bottom of the lamp. The top block is drilled to receive a ⅛-in. pipe nipple, 2 in. long, which is held to the block with locknuts. The lamp is assembled without screws. After applying the glue, use two C-clamps at both bottom and top of the lamp. When the glue is dry, fasten a pull-chain socket and shade holder onto the pipe nipple. Before assembly, run a wire from the socket down through the lamp column to a hole drilled two inches from the bottom.





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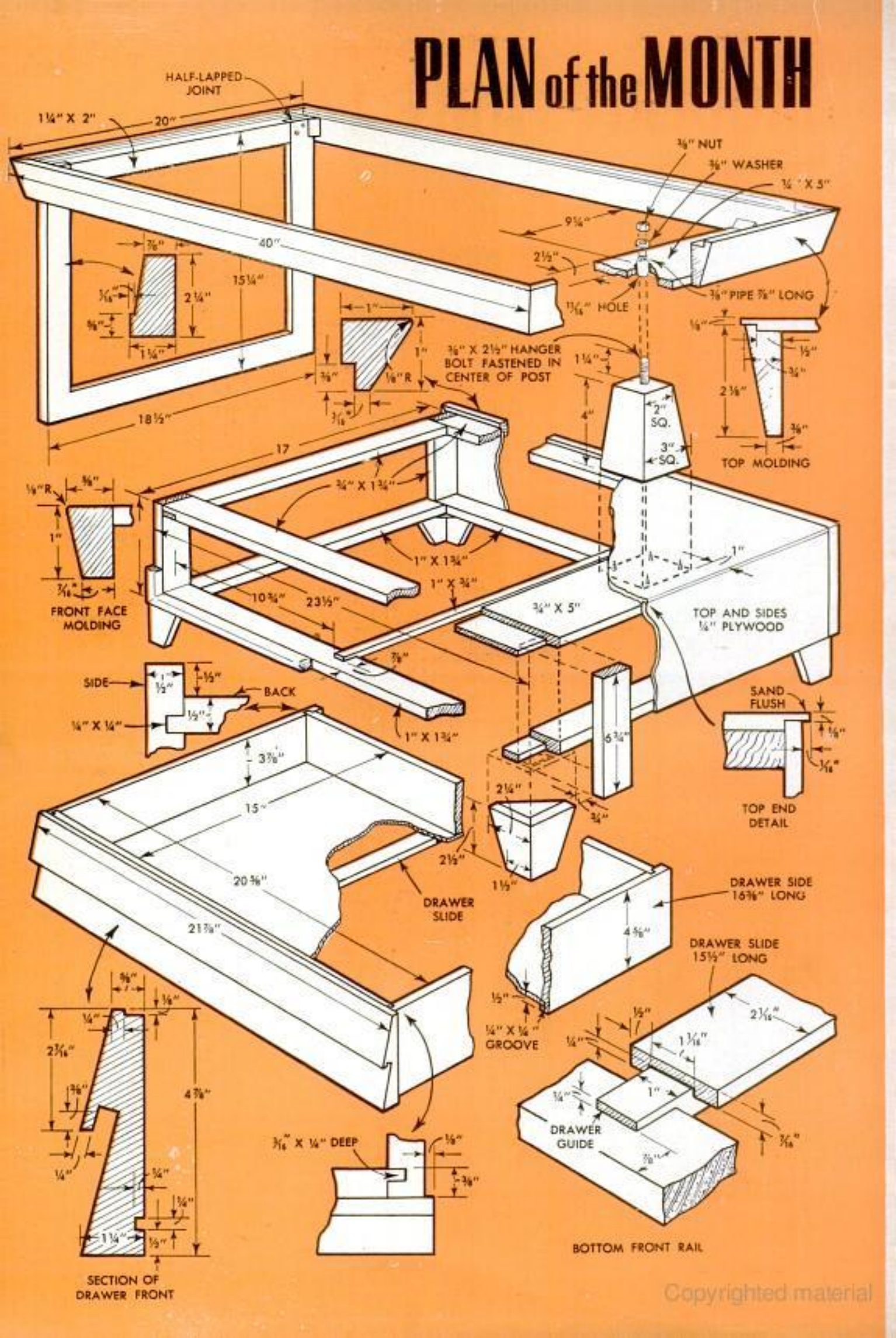
PLAN of the MONTH



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Cocktail Table

WTM'55
Modern Furniture

Three-in-one functional design adapts readily to suit varied furniture arrangements. Features pivoted base containing roomy drawer

MATERIAL LIST

WTM'55

Cabinet plywood

1 pc.—¼"x20⅛"x40⅛"—Top
1 pc.—¼"x17"x24⅛"—Cabinet top
2 pcs.—¼"x17"x6⅞"—Cabinet back
1 pc.—¼"x22¾"x5¾"—Cabinet back

Plywood or hardboard

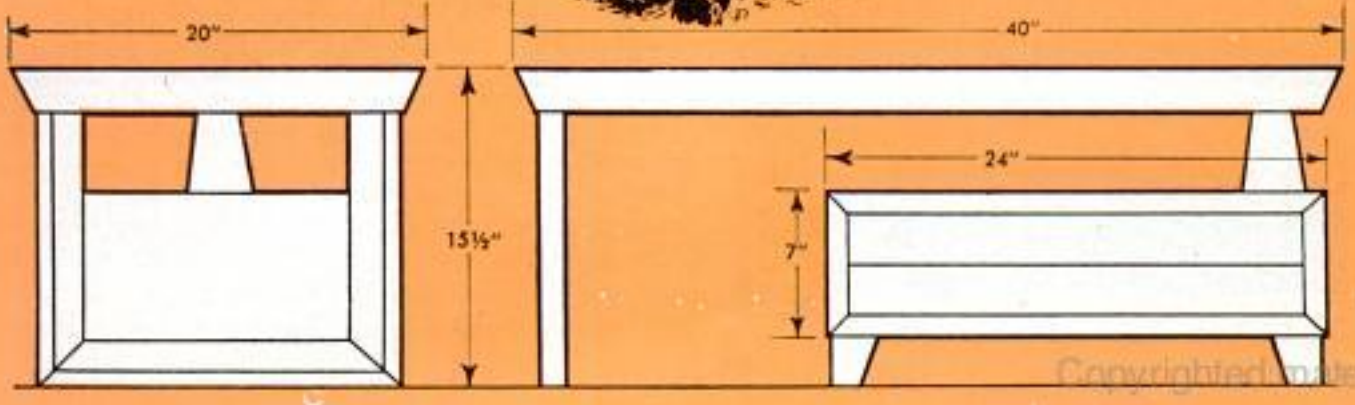
1 pc.—¼"x21⅛"x15¾"—Drawer bottom

Cabinet lumber

2 pcs.—¾"x2⅛"x40"—Top side rails
2 pcs.—¾"x2⅛"x20"—Top end rails
1 pc.—1¼"x2¼"x18½"—Bottom end frame
2 pcs.—1¼"x2¼"x15¼"—Side end frame
1 pc.—1¼"x2"x18½"—Top end frame
1 pc.—3"x3"x4"—Post
4 pcs.—¾"x1"x24"—Top and bottom cabinet frame
4 pcs.—¾"x1"x7"—Ends, cabinet frame
8 pcs.—¾"x2¼"x2½"—Leg sides
1 pc.—1¼"x4⅞"x21⅞"—Drawer front

Lumber

1 pc.—¾"x5"x18½"—Top support
2 pcs.—¾"x1¾"x23½"—Front and back rail, top cabinet frame
1 pc.—¾"x5"x17"—End rail, top cabinet frame
1 pc.—¾"x1¾"x17"—End rail, top cabinet frame
2 pcs.—1"x1¾"x23½"—Front and back rails, top cabinet frame
2 pcs.—1"x1¾"x17"—End rail, bottom cabinet frame
4 pcs.—¾"x1¾"x6¾"—Cabinet posts
1 pc.—¾"x1"x16⅛"—Center drawer
2 pcs.—7/16"x2-1/16"x15½"—Center drawer slide
1 pc.—½"x3⅞"x21⅛"—Drawer back
2 pcs.—½"x4⅝"x16⅜"—Drawer sides
4 pcs.—1¼"x1¼"x2½"—Leg corner blocks
1 Hanger bolt and nut, ⅜"x2½"
1 Pipe, ⅜"x⅞" long
1 Washer, ⅜"
6 Furniture glides, ⅝" dia.



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Chrome-Plated Mats Protect Walls Against Grease Spatters and Stains

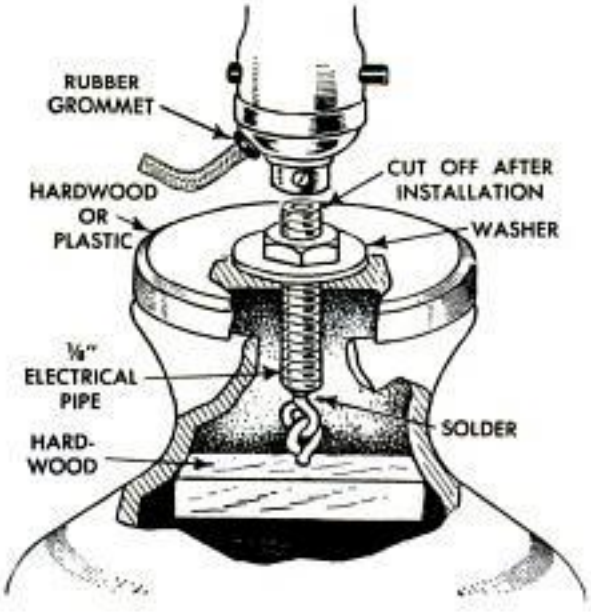
Photo by Phoenix Table Mat Co.

Protecting the walls behind the range from grease spatters and cooking stains, two of these new 17 x 19-in. chrome-plated mats are tacked to the wall to form a shield. The mats, which also insure stove tops and other fine surfaces complete protection from scratches, burns, stains and nicks, are made of heavy-gauge steel, chrome-plated over four undercoatings of copper and nickel. Their rounded corners prevent cuts and snags, and the asbestos-cushion backs protect surfaces against heat and sharp blows. Available in a wide variety of designs, including an old fashioned sampler design and floral pattern, the mats add brightness as well as practical durability to any kitchen. Matching 9-in. round hot pads may be used as unusual place-mats or as coasters under hot or iced drinks. A damp cloth or sponge occasionally wiped over the surface is all that is required to maintain the finish.

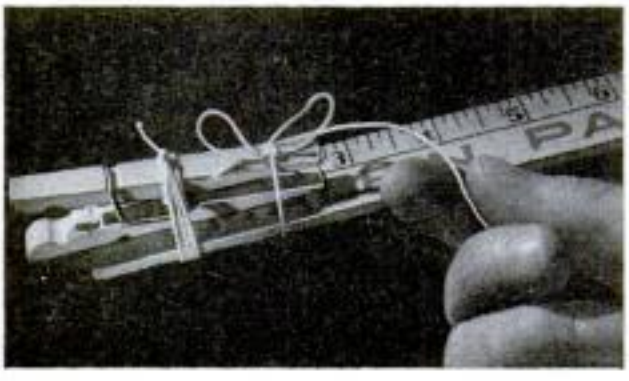
Converting Vase Into Lamp Base Without Drilling for Pipe or Wire

Many small-neck vases and fancy bottles can be converted into beautiful lamp bases. The problem generally is how to attach the lamp socket to the top without drilling a hole in the bottom of the bottle for a pipe and locknut. Here's a way that works perfectly. Cut a hardwood strip about ½-in. square, just long enough to catch inside the vase shoulders. Insert a screw eye in the middle and solder another screw eye into a length of electrical pipe, making sure the pipe is long enough to allow sawing off after assembly. Spread one of the screw eyes and hook the block to the pipe, then insert the wooden strip into the vase. The vase is capped with a plastic or wooden disk which has a hole drilled in the center. This disk is now slipped over the pipe and held by a washer and locknut.

Art Trauffer, McClelland, Iowa.



Clothespin Used to Retrieve Articles in Inaccessible Locations



A spring-type clothespin tied to a yardstick can be utilized to retrieve small objects dropped into inaccessible locations, such as between the cooking range and the wall. After it is fastened to the end of the yardstick, the clothespin is tied open with a bowknot. A piece of cord about 4 ft. long is used. To retrieve an object, the open jaws of the clothespin are slipped over it and the bowknot is untied by pulling on the cord. The clothespin will clamp on the object allowing it to be lifted.

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PhotoKinKs 58

AIR CONDITION YOUR DARKROOM

INSTALLING an air conditioner in your darkroom will solve several problems that are inherent in the operation of all photo-developing equipment. First, an air conditioner of the proper type will bring in fresh air and exhaust the stale air from the darkroom. Because the darkroom must be sealed against light, it is often almost airtight. No operator can work efficiently in a stuffy, airless location. An air conditioner will cool the room in hot weather. Besides the definite comfort provided to the operator, keeping the temperature down will also maintain a lower humidity. Some air conditioners have a built-in dehumidifier. The liquid developing solutions, water used for washing prints and even perspiration from the body tend to cause a condition of high humidity. This moist air is detrimental to sensitive chemicals and is definitely destructive to metal equipment and to the wooden structure and furnishings of the darkroom. If the air conditioner is equipped with filters, as most of them are, the resulting clean, dust-free air is an obvious advantage. The small, room-size air conditioners are fairly reasonable in cost and will efficiently condition the air of the average home darkroom. Their cost is comparable to the price of other major pieces of darkroom equipment. Depending on the size of the darkroom and pocketbook, the units run from about $250 to $400. Their installation is simple because they do not require any plumbing connections. They are just plugged into any 110-volt outlet. If there is a blacked-out window in the darkroom, the air conditioner can be fitted into the window with a minimum of work. Once in place they are light tight. If no window is available, an opening in the wall will, of course, require some carpentry work. Another way of improving your darkroom, at less than the cost of an air conditioner, is to install a dehumidifier. Although it will not change the air of the room, nor cool it, the resulting dry air will protect the equipment. Dry air also seems cooler than moist, because body perspiration is absorbed more rapidly into the dry air, allowing the body to adapt itself to a higher temperature.

Grooved Wooden Shoe Polisher Used as Sanding Block

A discarded shoeshine brush makes an excellent sandpaper block. Remove the old wool covering, cut deep grooves in the end of the wooden block and insert the ends of the sandpaper into them. Heavy wire wrapped around the block, or wooden strips wedged into the grooves, will hold the sandpaper in place. The padding under the wool is left on the block to cushion the sandpaper and make it last longer.

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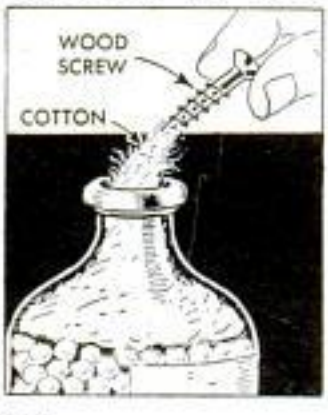
Baby's Dressing Table and Chest Made From Secondhand Desk

This baby's chest of drawers, which features a chest-high dressing table, helped one young couple solve the space and storage problem in their small apartment. The chest, purchased at a secondhand store, was originally a drop-front desk. The drop-front writing surface was removed, new hardware was used on the drawers and the whole chest painted a color to match the decor of the room. A piece of ¾-in. plywood, 16 in. deep, and as wide as the chest, was screwed to the top for the dressing table. Then it was covered with quilted plastic to make a sanitary, easily cleaned surface. The open space under the top, and the inside of the drawers, was covered with a contrasting color of wallpaper which was sprayed with clear lacquer to make it washable.—Maurine M. Remenih, Arlington Heights, Ill.

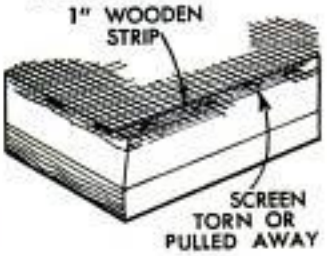
Cotton Packing in Bottles Removed by Wood Screw



The hard-to-reach cotton wad often used in bottles containing pills and capsules to protect the medicine in transit, can be removed quickly and easily by means of a long slender wood screw. After uncapping the bottle, twist the screw slowly into the cotton, allowing it to wind on the screw. Then gently pull the cotton wad out of the bottle.

John Edwin Hogg, Alhambra, Calif.

Screening Frayed at Edges Nailed to New Support



I recently had the problem of repairing a number of screens where the copper screen wire was in good condition but pulled away or broken from the frames in some places, making it difficult to retack. I solved the problem by cutting 1-in. strips of wood, painting them beforehand, and then nailing them to the inside of the screen frame as new supports. By thus increasing the thickness of the frame, I was able to tack the screen wire in place, putting the tacks through the unfrayed portion. The appearance of the screen was almost unchanged by this alteration.

J. Howard Cooper, Philadelphia, Pa.

Porcelain Cemented on Metal With Glycerin-Litharge Paste

A paste made from glycerin and litharge makes an excellent adhesive for attaching porcelain handles to metal fittings. The liquid glycerin can be purchased at a drugstore, while most paint stores carry litharge paste. Mix the glycerin with the litharge until a fairly heavy paste is made. Fill the depression in the porcelain handle about half full of the paste, then press it on the metal fitting. Wipe off the excess paste that oozes out. About 24 hours is required for the cement to harden.

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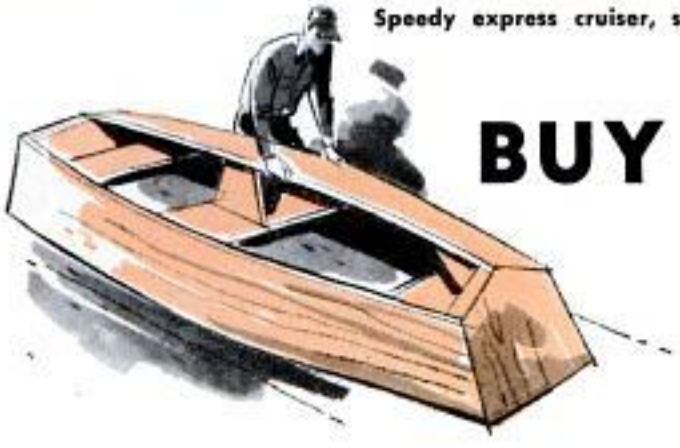
Outdoor Sports manual

Speedy express cruiser, shown above, is the ultimate in boat-kit building



BUY YOUR BOAT IN A PACKAGE

EVERY YEAR, more and more amateur boat builders are assembling a wide variety of craft from packaged boat kits. These kits, which are manufactured by some of the finest boat-building firms in the country, have been designed by top naval architects for easy construction by the average person. Full step-by-step instructions have been prepared for each kit, and all the difficult work of laying out and building the frames, stem and transom has been eliminated. The job is simplified to the point where the boat can be assembled with ordinary hand tools and requires no previous boat-building experience or technical knowledge.

In addition to simplicity, there are several reasons for the increasing popularity of these kits. For the man who wants a boat for his personal use, the kits afford a considerable savings over buying a completed craft and, of course, the pleasure and satisfaction of building his own boat. Also, with the improvement of outboard motors in recent years, he can get a reliable, high-performance outboard boat at comparatively low cost. The kits are an advantage to those who prefer a fairly large boat, since a larger boat in kit form can be bought for the same amount of money ordinarily needed to purchase a smaller craft already assembled.

Most of the boats made from packaged kits are somewhat similar in construction. They consist primarily of marine-plywood bottoms and side panels laid over prefabricated frame sections. The advantages of marine plywood over standard planking are its light weight, fewer seams and the fact that no calking or swelling are necessary before the hull becomes watertight. The latter feature is important when the boat is carried around on the car top or trailer.

Packaged kits are available for rowboats in sizes from 8 to 14 ft., for outboards from 12 to 21 ft. in length and for inboards from 16 to 31 ft. Specialty boats, such as hydroplanes, duck boats, prams and kayaks also are available in kit form. The kits may be purchased directly from the manufacturer, mail-order dealers and from local marine-supply dealers.

The standard kit includes fully assembled frames, which are notched and beveled to fit the curvature of the planking, fully

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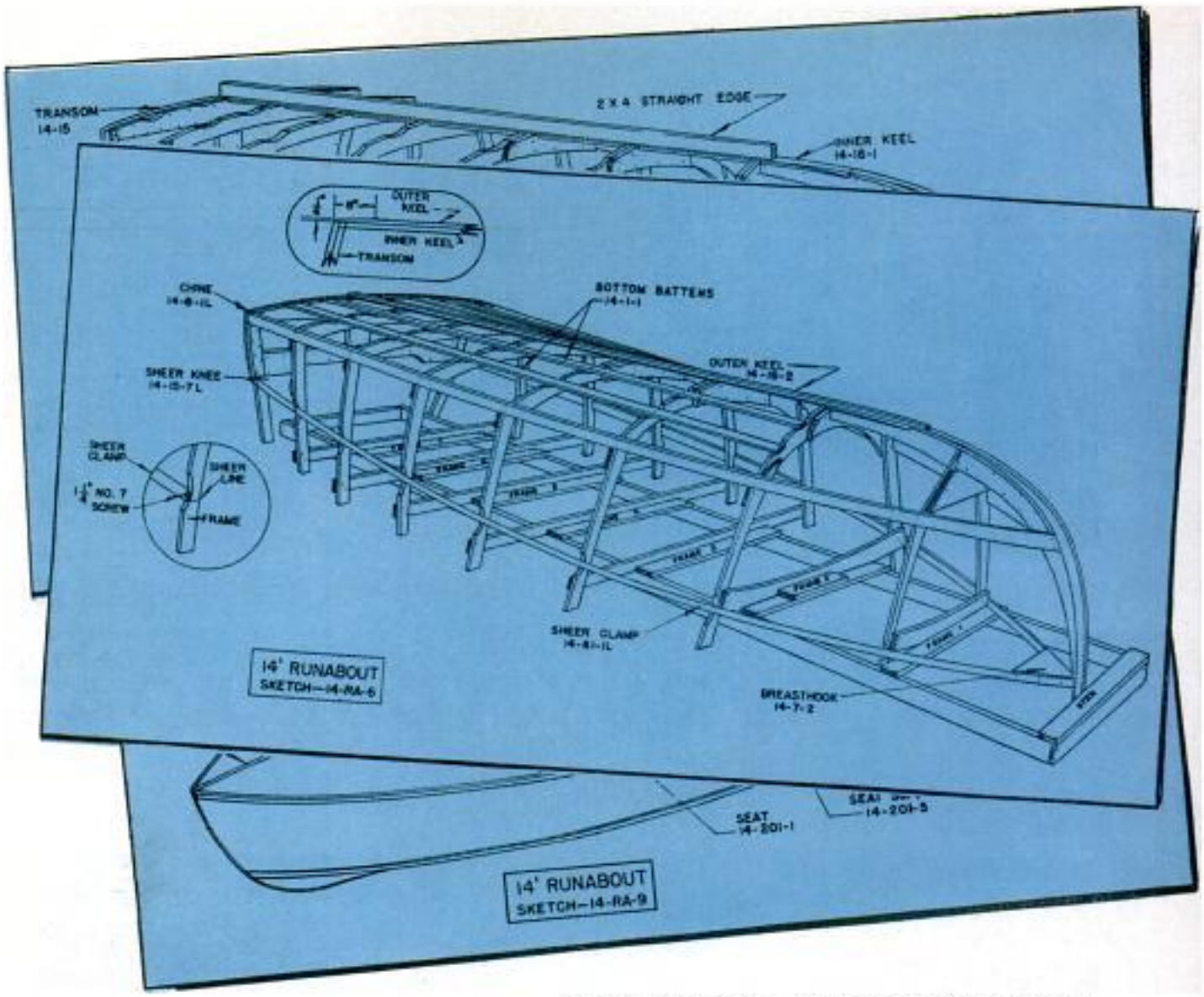

Sample plans, above, give you an idea of the detailed assembly instructions that accompany the boat kits. These, together with precut and prefabricated parts, mean surprisingly easy construction

Assembled quickly from packaged kits, the skiffs shown below are ideal for the fisherman. They are available in 12 and 14-ft. lengths and combine sturdiness with light weight for easy transporting

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assembled transoms, formed and shaped stems, all lumber needed, marine plywood, marine glue, bedding compound, screws and nails. The plywood parts are cut to shape a little oversize to allow for trimming. Some manufacturers require a mold board for building the boat. This can be made or purchased extra. Other firms include a building platform, when necessary, while still others require neither a building platform nor a mold board in assembling their boats. Normally, the only extra material that must be purchased is trim hardware, motor and, in some cases, paint. Oarlocks are furnished for rowboats.

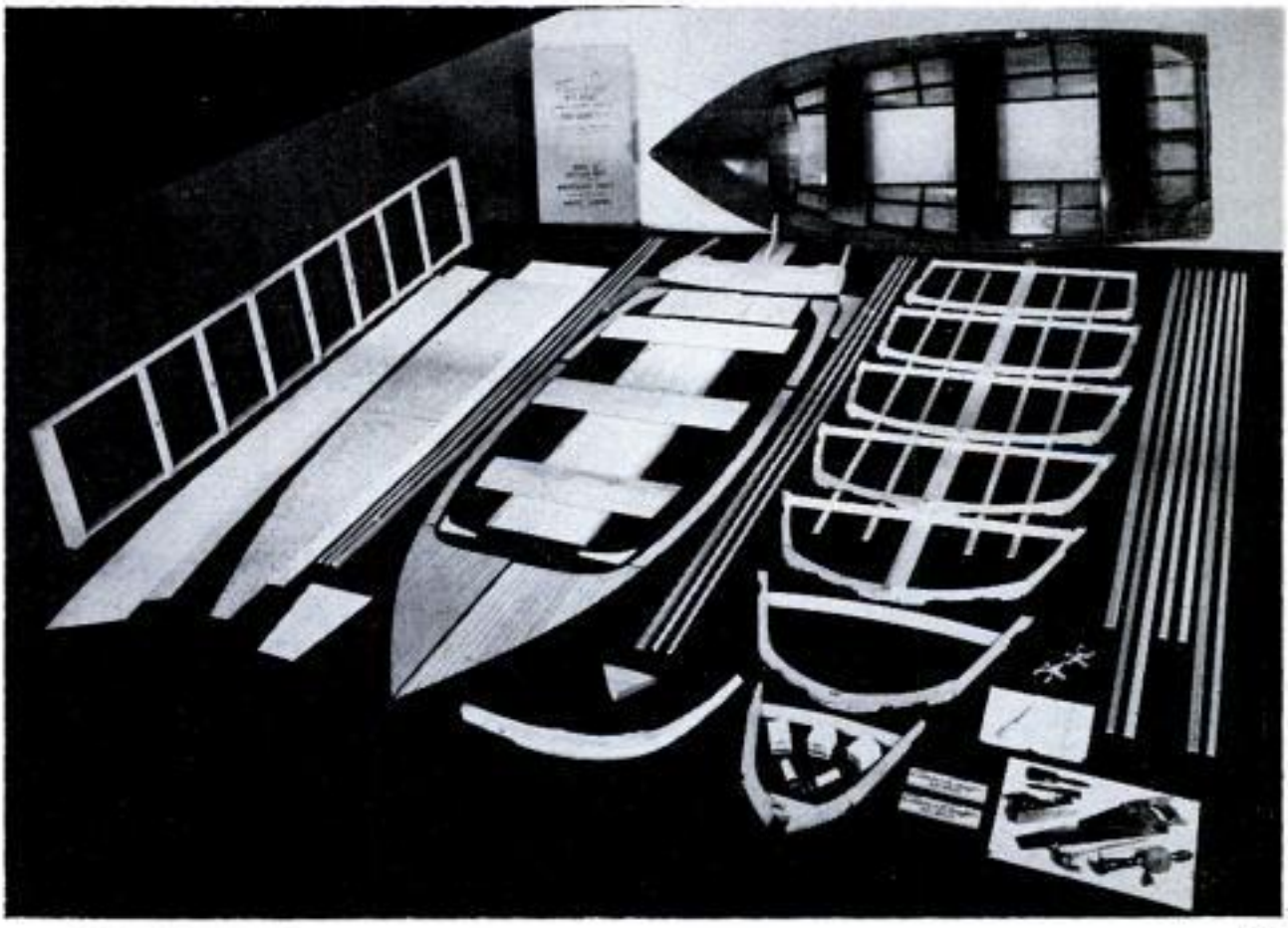
The man with the necessary know-how can make the same 40 to 60-percent savings that the kits offer by building his boat from stock plans. However, it often is difficult to obtain locally the lumber and plywood necessary. Many boat builders have run into trouble because of difficulty in obtaining air-dried lumber of the size and variety needed without buying more material than necessary and, possibly, paying extra for having the lumber cut to size. Purchasing the packaged kit saves the time and effort necessary in shopping for the right material and the added expense of getting the right boat material cut to the proper sizes.

In order to get the most satisfaction from boating, selecting just the right boat is as important as the care used in building the

Whether it's for fishing or "water taxi" service, you'll find this little pram most useful of boats

craft. If you've decided that you're in the market for a boat, obtain catalogues from several firms and try to select a boat that fits your requirements as closely as possible. Outside of personal tastes, there are two main things to keep in mind in deciding on the boat you want—the uses to which you intend to put the craft and the type of water on which the boating will be done. On protected waters, an open boat often will serve the purpose, but if you're heading out on open water you'll want a larger, sturdier craft with a forward deck. If you know on which body of water you intend to do your boating, observe the type of

Except for the hand tools, here's what you get with the typical boat kit. Completed boat is in the background



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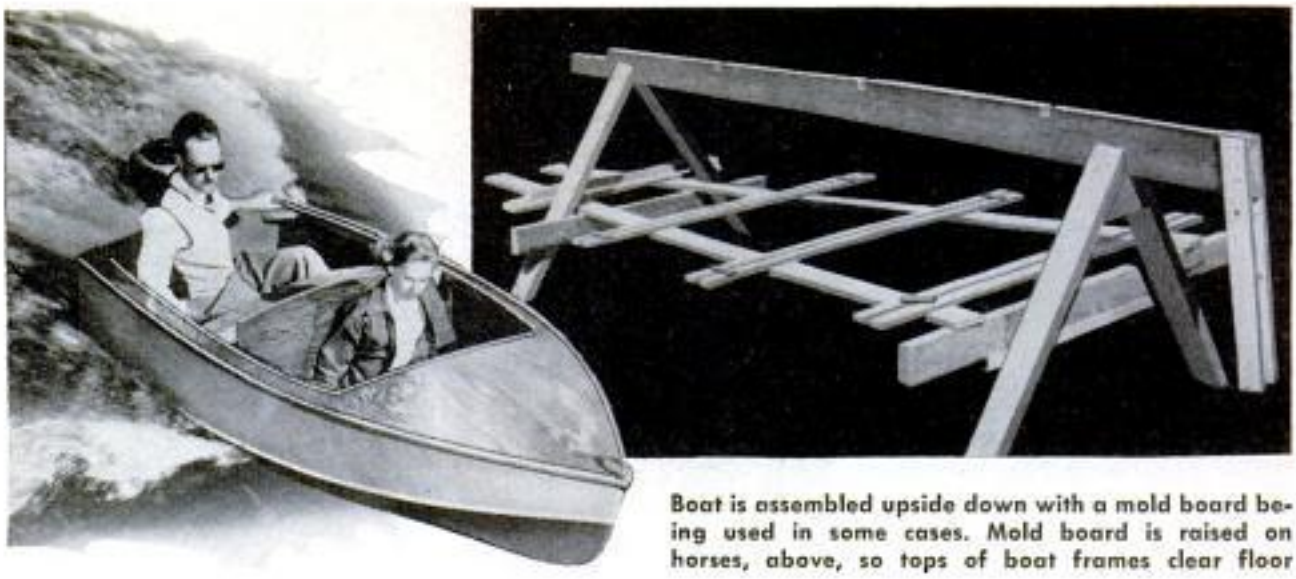

Boat is assembled upside down with a mold board being used in some cases. Mold board is raised on horses, above, so tops of boat frames clear floor

craft used in that particular locality.

When a boat is kept in or near the water during the greater part of the boating season, its size and weight are of little importance. However, if the boat must be hauled to and from the water, its size and weight become well worth considering. For car-top carrying, one person can handle a boat that is no more than 12 ft. long and weighs less than 125 lb. Two people are able to handle a boat weighing up to 145 lb. Boats over 14 ft. long and heavier than 145 lb. should be carried on a small trailer. In most states, speedboats and cruisers 18 ft. long, 7 ft. wide and weighing less than 1800 lb. can be carried on car-towed trailers. However, it is best to check state regulations before attempting to haul boats larger than these dimensions.

The fisherman who likes to go out alone in protected water usually can get by with a 10-ft. open rowboat. However, if he takes passengers along with him, the boat should be larger in proportion to the number of people to be carried. On open water, the lone individual would require a minimum-sized boat of 12 ft. with a closed forward deck. For speed or water sports, such as aquaplaning or skiing, the boat should be one with a closed forward and center deck and large enough to take an outboard motor of 10 hp. or more. Of course, an inboard boat can be used, but in either case, the hull should be of the round or V-bottom planing type.

Before selecting an inboard or outboard boat for competitive racing, it is best to obtain the rules and regulations from the American Power Boat Association, 700 Canton Ave., Detroit, Mich.

A 16 or 18-ft. outboard cabin cruiser is ideal for those who do not live near the water but enjoy weekend cruising. These boats are carried easily on a small trailer and may later be converted to inboards if desired. Where the boat can be kept in the water the greater part of the boating season, an inboard cruiser over 18 ft. in length should be considered, as this type of craft offers more stability and greater cruising range than the smaller boats.

When possible, it is better to purchase

Speeds above 35 m.p.h. are possible with this 8-ft. pram. Boat takes outboard up to 7½ hp.

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a boat that is larger than you believe you might need than a boat that is liable to be too small and unsafe for the purpose. Also, it is important to match your outboard motor to the boat. Outboards of less than 3½ hp. should be used on boats under 10 ft. in length and only in sheltered water. For fishing, an outboard motor of 5 to 10 hp. on a 12 to 16-ft. boat is excellent. Speedboats and hydroplanes should have outboard motors of 10 hp. or more and outboard cruisers should carry a 25-hp. motor or a pair of twin 25's.

The tools necessary for building a boat from a package kit include a hammer, drill, saw, brace and countersink, rasp, screwdriver and hand plane. A portable electric drill will do wonders to speed the work. In many cases, clamps will prove helpful.

As the frames, stem and transom of the packaged boat are shaped and machined to size, it is unnecessary to lay out the boat in full-size plan and elevation. When a mold board is used in building the boat, the board should be laid out carefully and cut to shape. Then it is mounted on horses so the frames will clear the floor. If a building platform is used, it should be leveled with wooden wedges nailed both to the floor and the building platform to prevent slippage. In cases where neither a mold board nor a building platform is used, and the frame tops are placed directly on the shop floor, it is necessary to check the floor for level. If the floor is not level, blocks must be tacked to the tops of the frames to bring each frame level with the other frames. The complete assembly instructions furnished with the kit should be followed carefully. Clamps and chines of the boat should be put on both sides of the frame temporarily and the frames checked for squareness to the keel before final fastening. The clamps and chines can be tied in place while checking the frames.

As most boat kits utilize fir plywood, a fir sealer should be applied to prevent hairline checks from occurring in the coats of paint. For boats used in salt water, all fittings should be brass and the bottoms of the boats coated with antifouling paint. ★ ★ ★

Some boat kits are assembled directly on floor. Unless floor is level, frames and stem must be leveled with blocks, above

Inboard cruiser, above, is fine boat for family cruising and fishing on open water. Note that the outboard utility boat below has a planing-type hull which skims on top of the water

Photo below shows outboard runabout in final assembly stage with the forward and center deck panels being applied

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Baseboard Light in Clothes Closet Aids Selection of Garments

Installing a wall outlet at the rear of a clothes closet just above the baseboard permits you to illuminate the lower portion of the closet to help in selecting clothes. Use an ordinary night light or a plug-in adapter along with a low-wattage bulb. The light will be more convenient if it is wired to a wall or door-actuated switch.

Jerry Dunham, Chicago.

Phonograph Needle Protected By Cellulose Sponge on Arm

A cellulose sponge will prevent damage to the permanent needle on a phonograph while it is being carried to a repair shop for service, or when packed for shipping. Wrap the sponge tightly around the pick-up end of the arm and hold it in place with a rubber band. Be careful when removing sponge not to catch the needle point in it.

Hugh Lineback, Stillwater, Okla.

Common Sense Afloat!

If you are one of the thousands who will take to outboard boating next summer, you'll be eager to read the two-part story beginning next month which tells you how to care for, select and handle your outboard motor for the most fun and safety

Lawn Seeder Containing Sand Used to Treat Icy Sidewalks

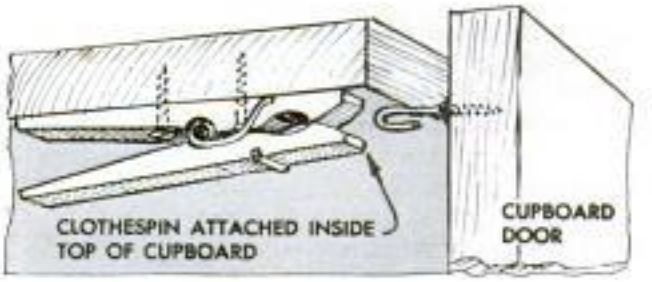
Instead of storing my lawn seeder for the winter, I use it for spreading sand, salt or sawdust over icy sidewalks and driveways. The implement does the job evenly, while a control lever permits the flow to be regulated when passing between patches of ice. It permits an even distribution that is not otherwise possible.

Fred Lettino, Astoria, Long Island, N. Y.

Cupboard Latch Improvised From Spring Clothespin

A simple yet effective latch for cupboard doors can be made from a spring-type clothespin and a screw hook. Disassemble the clothespin by sliding it apart, drill two small holes in the half with the spring still attached, and then fasten this half to the inside of the cabinet with small wood screws. Reassemble the clothespin, and drive the screw hook in the door, with the hook portion turned so that it is flat when engaging the jaws of the clothespin.

Robert E. Damm, Englewood, Colo.



Utilizing Old Paintbrushes As Glue Applicators

When a paintbrush has been discarded because of hardened paint near the ferrule, there will still be enough free bristles to make small brushes. Remove the bristle part from the ferrule and cut it into a number of small sections. Cement, tie or tape the sections to small wooden handles. The resulting brushes can be used for glue, paint remover and other liquids, then discarded.—Ken Murray, Colon, Mich.

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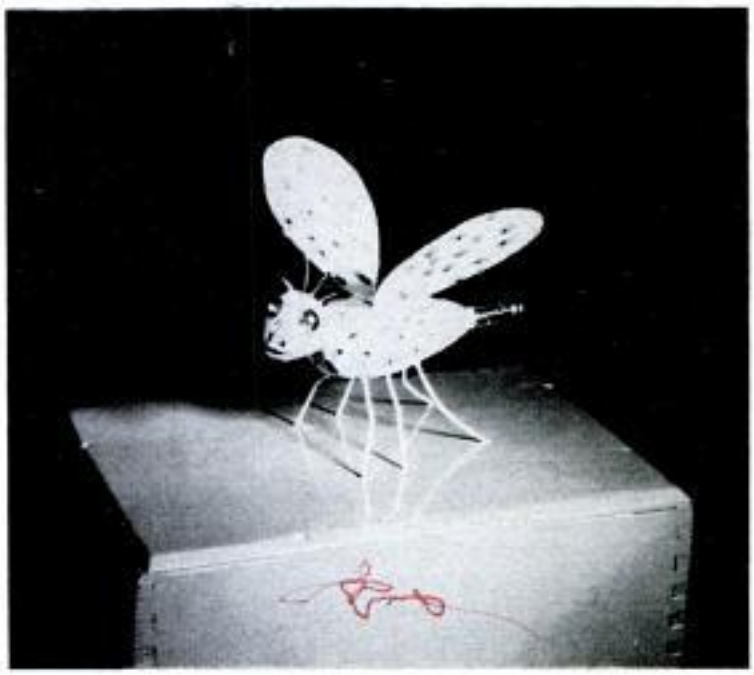
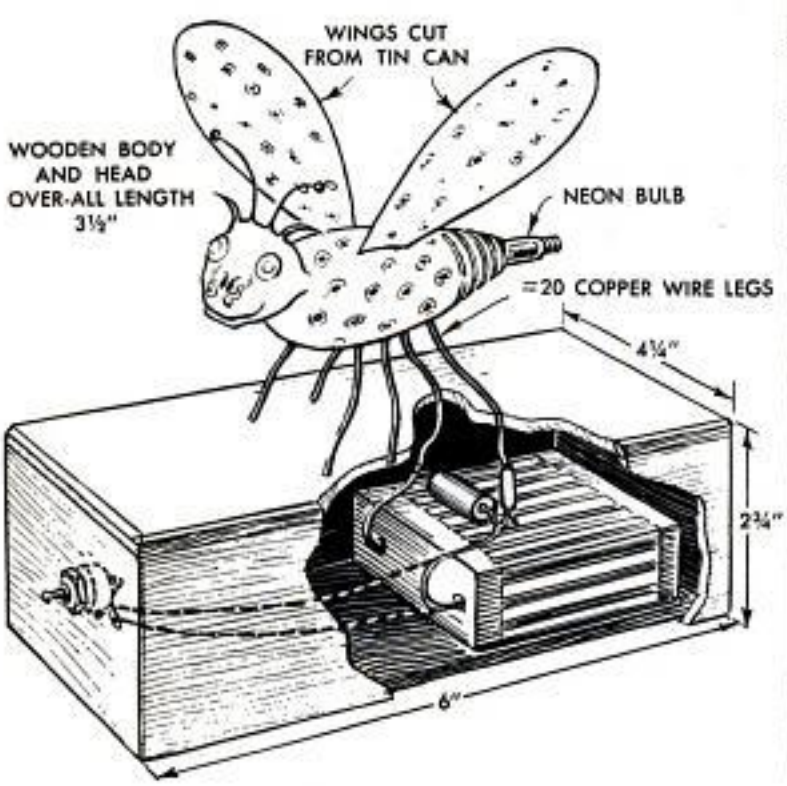
LIGHTNIN' BUG NIGHT LIGHT

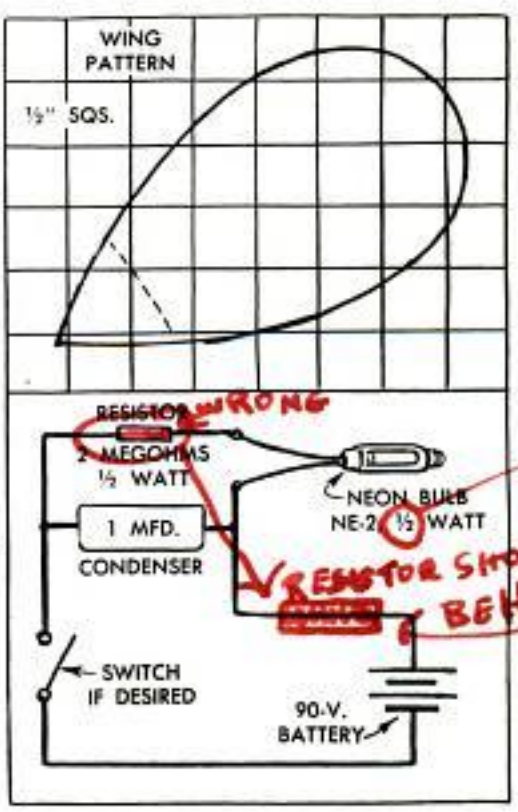
By Kenneth M. Doolittle



FIREFLIES always fascinate children and this giant captive of the species is no exception. The steady blinking of this colorful electronic pet in a child's bedroom seems to help bring on the sandman. The basis of the bug's operation is a small oscillator of very low frequency. The tiny neon bulb serves the dual purpose of the bug's light and as a control for the oscillator. The current consumed by the bulb is so minute that there is hardly a measurable drain on the battery, so the bug may be left on continuously and still run many months. However, a switch may be installed to turn him off during the day if you so desire. To protect the battery, the bug must be kept away from heat and kept dry.

The base of the bug, a wooden box 2¾ x 4¼ x 6-in., contains the battery, condenser and resistor. The bug stands permanently on this box on legs made from No. 20 solid-copper wire. The shape of the bug's head and body is not important, but should have a resemblance to the real thing. They are made from balsa or some other easily worked wood, while the wings are cut from a tin can. A small hole is made in the tip of the tail to take the base of the neon bulb. The two wires of the bulb are brought forward along the bottom of the body and soldered to the rear legs at the point where they join the body. The front and middle legs are cemented in holes in the top of the box, while the rear legs pass through the top to the interior, where they are connected into the battery circuit as shown. Paint the bug in bright colors. The one pictured was painted bright yellow and decorated with red stripes and dots while the box was left a natural wood color.





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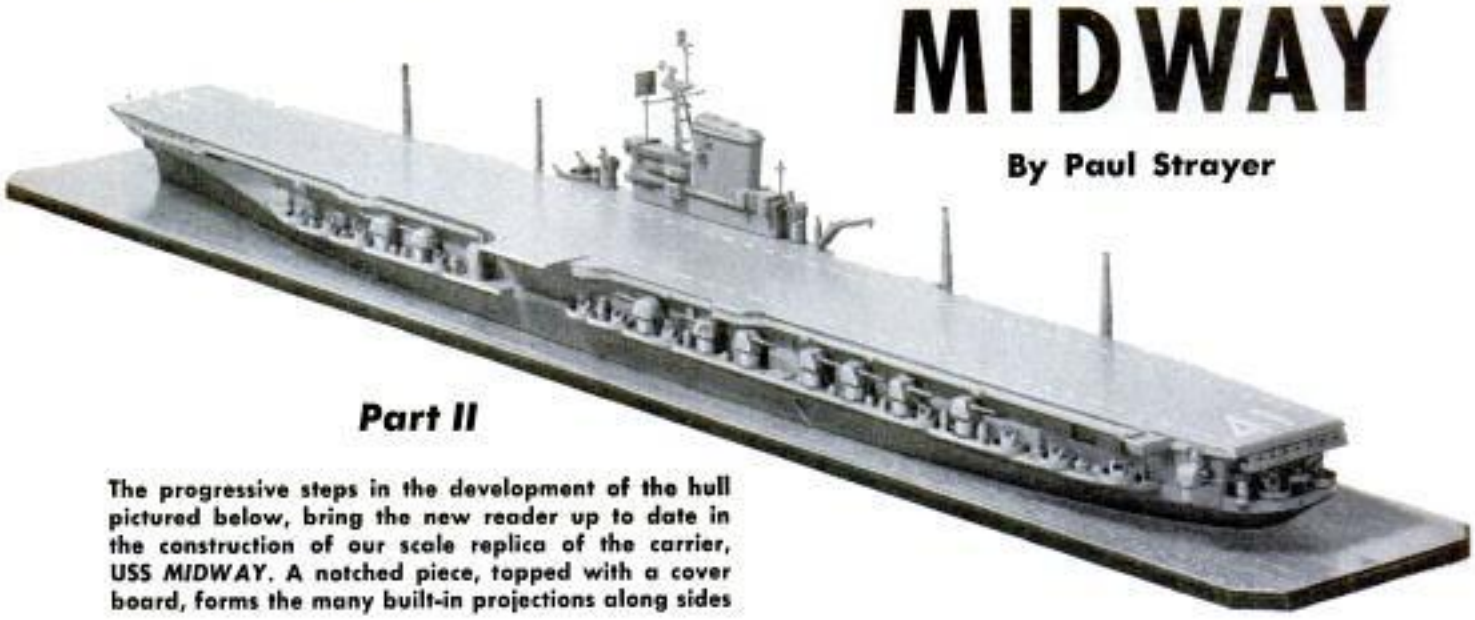
TRY YOUR HAND AT MODELING THE MIDWAY

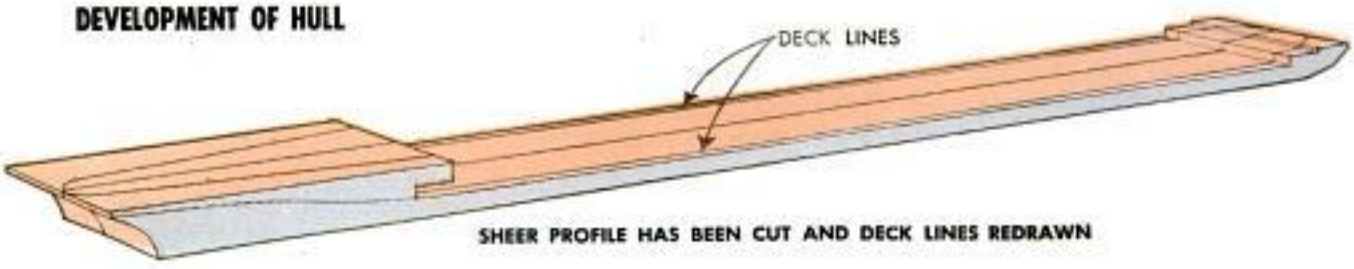
By Paul Strayer



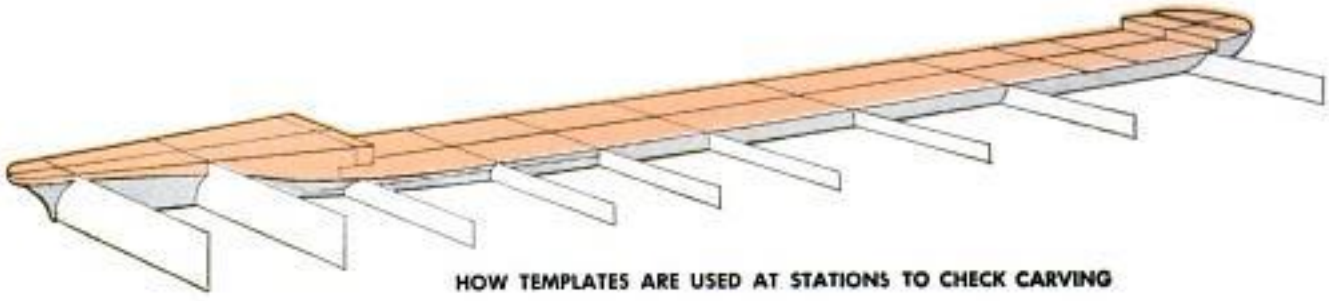
Part II

The progressive steps in the development of the hull pictured below, bring the new reader up to date in the construction of our scale replica of the carrier, USS *MIDWAY*. A notched piece, topped with a cover board, forms the many built-in projections along sides

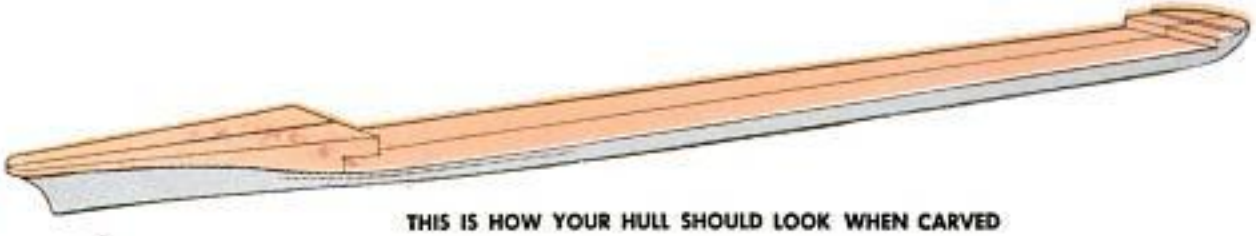
DEVELOPMENT OF HULL



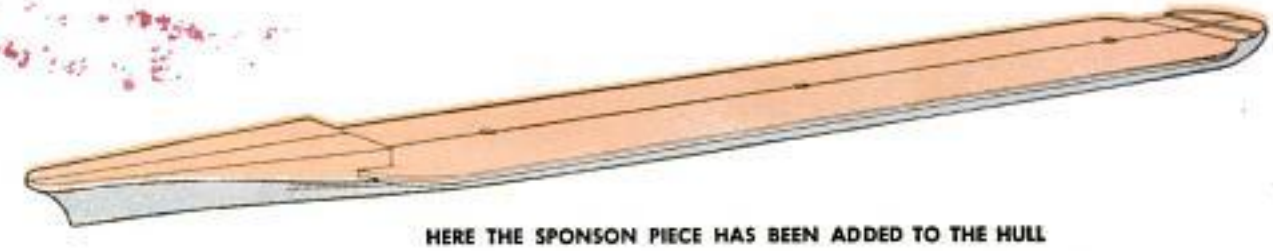
SHEER PROFILE HAS BEEN CUT AND DECK LINES REDRAWN



HOW TEMPLATES ARE USED AT STATIONS TO CHECK CARVING



THIS IS HOW YOUR HULL SHOULD LOOK WHEN CARVED



HERE THE SPONSON PIECE HAS BEEN ADDED TO THE HULL

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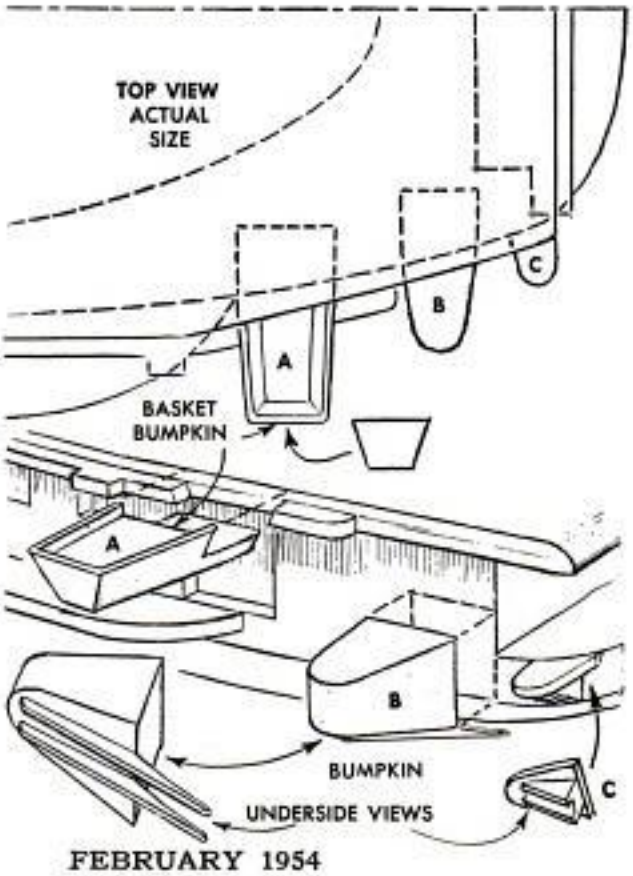
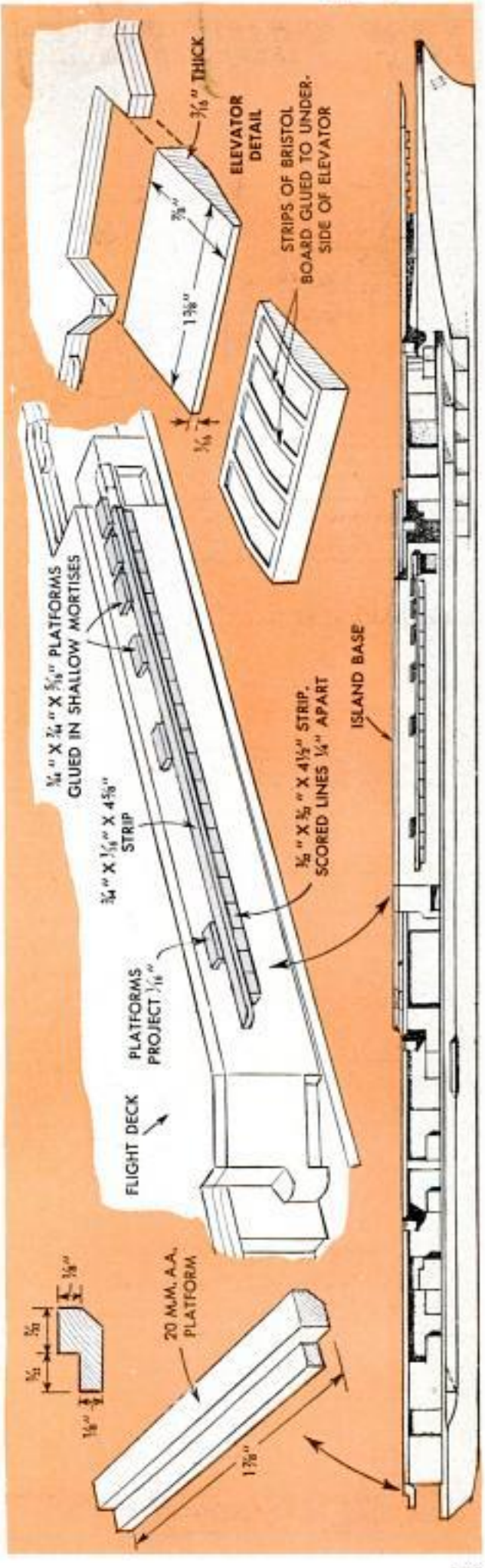
WTM·55

LAST MONTH you were told how to lay out and carve the hull for your scale model of the mighty USS *Midway*. This covered sawing the sheer profile and deck lines, carving the sleek lines of the hull, fitting the sponson and cutting the notched piece and cover board. The progressive steps pictured on the opposite page serve to orient new readers on what has gone before.

The island base: Before getting into the actual superstructure of the *Midway*, your next step is to install the projection, or base, on which the "island" rests. Located on the starboard side of the ship, the projection rests on the overhanging ledge provided by the sponson, and is brought flush with the edge of the sponson and the surface of a hull lift, called the gallery piece, yet to be fitted. The general shape of the projection piece is shown in the perspective drawing at the right. It measures 5¾ in. long, but the actual shape of it is more easily taken directly from the full-size plans which are available. You'll note in the drawing at the right, that there are a series of tiny platforms fitted to the face of the projection piece. The six small platforms spaced along the upper edge of the projection piece are glued in shallow mortises, or slots, the platforms projecting 1/16 in. Below these platforms is located a 3/64-in.-thick shelf which, in turn, rests on a slightly thicker one immediately below it. The latter is scored vertically with a knife blade at ¼-in. intervals to represent life-saving equipment. Note the deep recesses





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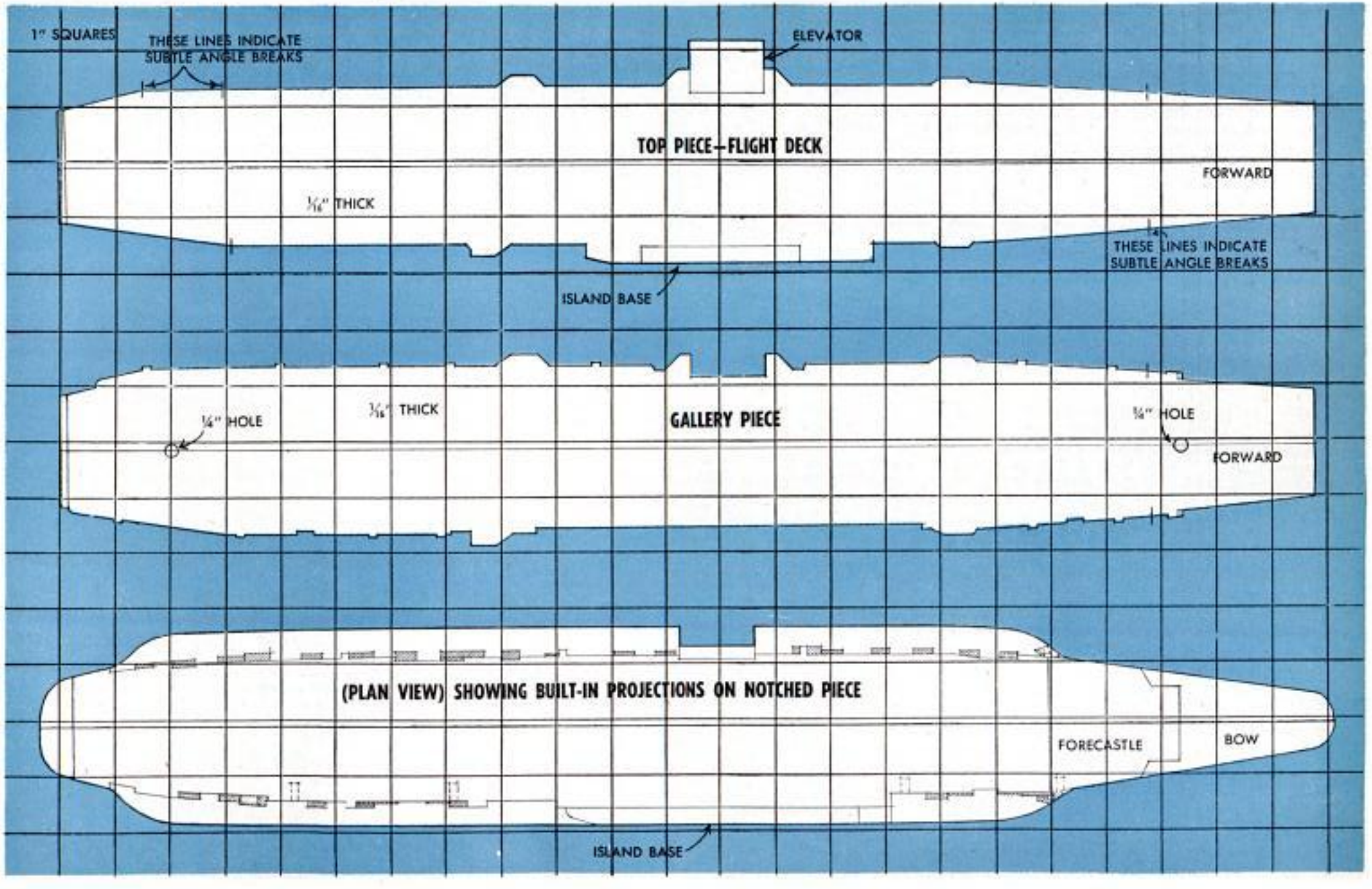

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Portside view of hull shows sponson, notched piece, island base, forecastle, tower bases and stern bumpkins

fore and aft in the projection piece. These are cut before the block is glued in place.

The deck assembly: The deck assembly consists of three parts, namely, the cover board, described in Part I, the gallery piece and the flight deck proper. Patterns for the gallery piece and the flight deck are given on page 214. Unless you are working with full-size plans, these patterns will have to be enlarged to the proper size on 1-in. squares. The gallery piece, which is placed on top of the cover board, is cut from a piece of clear white pine, 1/16 x 4 x 24 in. Mark a centerline completely around it, top, ends and bottom, and drill a 1/4-in. hole at a point 3 in. from each end. These holes serve as "peepholes" to let you see the centerline drawn on the cover-board piece when centering the gallery on top of it. Dowels are used as before to register the gallery on the cover board. These are driven into holes drilled 1/8 in. deep in the cover board and sanded off flush with the surface of the gallery piece. Use a jigsaw or a sharp knife to carefully cut the thin gallery piece to shape. It is important that the edges be finished squarely. The flight deck is also made from 1/16-in.-thick pine. You'll note in looking at its pattern that the particular shape of the flight deck is such that it overlaps the top of the island base. In placing it in position on top of the gallery piece, be sure that it is centered so that an even margin is maintained along both sides of the flight deck. Here again, a registering dowel at each end of the flight deck is used to position the piece.

Now you are ready to glue the three members together, the cover board, gallery and flight deck. Use a slow-setting adhesive and clamp the pieces together, taking care that the surface of the flight deck is protected from clamp marks with a scrap of wood. Let the glued-up assembly dry for at least 24 hr. Wipe away any excess glue along the joints at the edges. After the glue has dried, the ends of the built-up piece are shaped according to the profile view. A small upward-curving recess, 1/32 in. deep, is carved on each side at the very forward end of the flight deck. Make sure that the recess for the elevator on the port side of the ship registers exactly with the door of the hanger deck below it, and that the sponson piece is recessed to align exactly with both the door and the elevator.

Your model now consists of two separate units, the top assembly being held to the bottom assembly by the small snug-fitting registering dowels previously installed. This permits the flight-deck assembly to be lifted off whenever you wish and thus makes it easy to install the various fittings along the sponson.

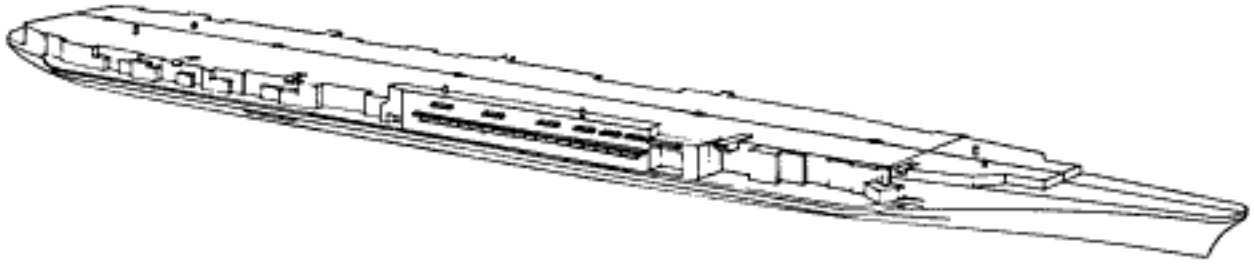
The elevator: The elevator fits in place flush with the flight deck. The detail on page 213 gives the size and shape of it, and shows how reinforcing ribs are represented by gluing tiny strips of Bristol board to the underside. After the elevator is glued in the recess provided for it, a line is scribed around it with an awl or a phonograph needle held in a pin vise to form a separation line. This makes the elevator appear as if it operates.

Next, a platform for 20-mm. A.A. guns is fitted to the aft end of the flight deck. The size and shape of this piece is detailed on page 213. This platform butts against the end of the cover board and is glued to the underside of the overhang of the flight deck. On the port side, aft, three bumpkins are glued in place as shown in the details

FULL-SIZE PATTERNS

Actual-size patterns of the various lifts that comprise the hull of the *Midway*, as well as patterns for the fittings, are available for tracing directly on your wood to simplify construction of your model. A set of five sheets, at $2.50 per set, may be had by sending your remittance to our blueprint department

This view is from the starboard side which shows the island base in place. Note the registering dowels



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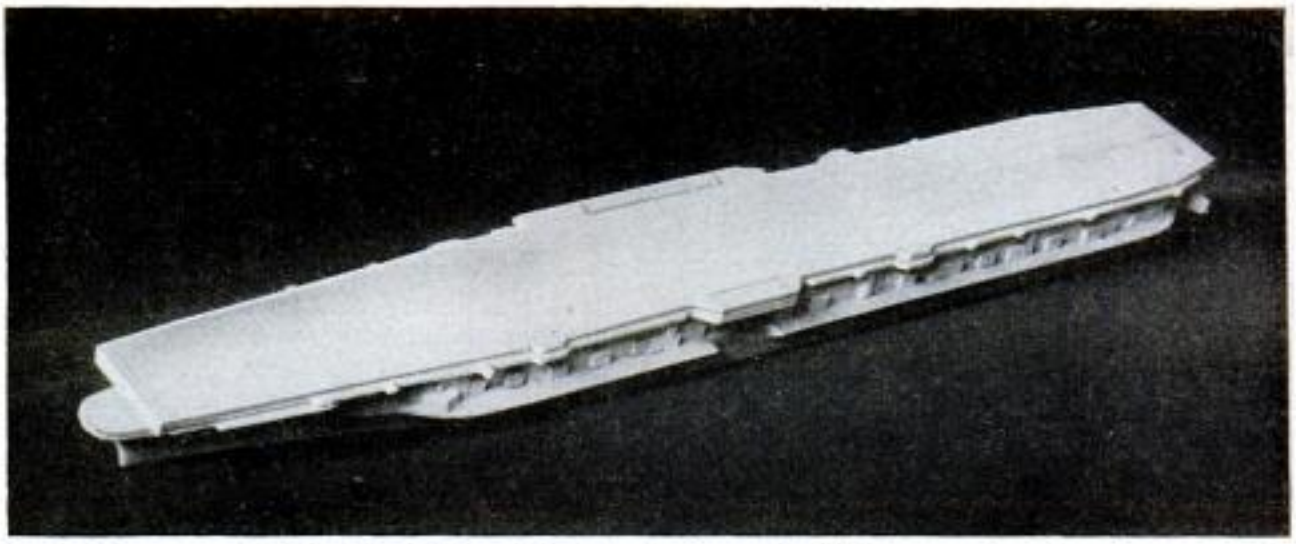

Here's what your model should look like at this point of construction. Hull now consists of two separate units

at the bottom of page 213. Bumpkins B and C support range finders which are to be described later. The plan view shows these parts actual size for tracing. You'll note that the basket bumpkin is rabbeted to fit a notch cut in the edge of the gallery piece and extends back under the overhanging deck. Use bits of hardwood to make these parts and work them to shape with a fine file. The supporting ribs on the underside of bumpkin B are faired into the lines of the hull with a file after they have been glued in position.

In addition to the many built-in projections formed by the notched piece, there are others that are glued on separately. These are tiny little blocks that are half the height of the projections formed by the notched piece, and a plan view to be presented in Part III shows where these are located in relation to the projections.

Next month you will be shown how the island superstructure is built up and how the various individual deck fittings and gun emplacements are simulated from bits of wood and brass. ★ ★ ★

Popular Mechanics Bookshop

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MOST OF US, when we approach a used-car lot, feel helpless. We don't know much about checking used cars, so we find ourselves at the mercy of the salesman. *How to Buy a Used Car*, written by C. E. Packer, one of America's top automotive authorities, can save you many times its price on your first purchase. It tells you what to look for in a used car and how to check a car before you invest your money. On sale at your newsstand. The price is 75 cents

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SHOP NOTES

SN 56

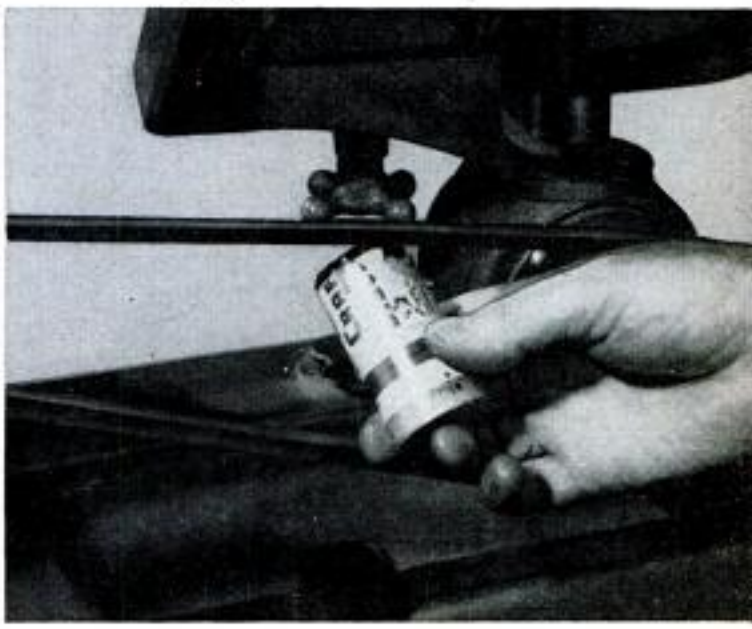
New Uses for DISK CEMENT

By Kenneth Murray

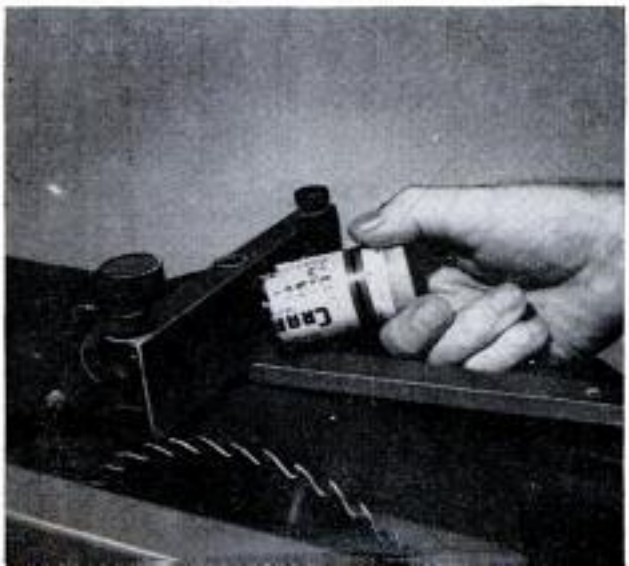
UNLIKE MOST ADHESIVES which harden on drying, cement supplied in stick form for attaching abrasives to sanding disks has the unusual property of remaining tacky for an indefinite period. This quality of stick adhesive can be utilized in a number of ways in the home and shop. The accompanying photos suggest eight ways the cement can be used for purposes other than that for which it was intended. For example, it will hold thin sheet-metal strips or squares together for jig-sawing in duplicate. Simply warm the pieces, coat

Disk cement will hold thin squares of sheet metal when stacked for jigsawing duplicate patterns. Warm the metal and apply cement to the edges as shown

Above, applying cement to the threads of a wood screw eases it into hardwood and at the same time adds to the holding power of the screw. Below, cement applied to face of miter gauge prevents stock from slipping sidewise when making miter cut



Above, use cement to prevent slipping of either flat or V-belts. Apply to the sides of a V-belt as indicated. Below, loose tires on bandsaw wheels are easily recemented in place by applying cement diluted with alcohol. Remove excess cement with turpentine



Screws often become loose and will no longer hold fine adjustment. Apply cement diluted with light oil

Gummed labels will not stick to bare metal for long. Apply them with disk cement and they'll stay put

In an emergency you can improvise a good electrical insulating tape by coating a cloth strip with cement

with cement and then press the pieces tightly together. Coating the threads of wood screws with cement eases them into hardwood and at the same time adds to their holding power. It also will prevent any type of belt, flat, round or V-type, from slipping. In each case, simply apply the cement to the glazed sides. Only a small amount is required.

When cutting grooves and especially miters, trouble is sometimes experienced with the stock sliding sidewise when held against the miter gauge. A thin coating of disk cement applied to the face of the gauge will hold the work securely in place. The cement is removed easily from the stock with turpentine. It's a good idea to examine the rubber tires on the wheels of your bandsaw occasionally and if a tire, or band, is loose at any point on the wheel rim, it should be recemented immediately. Disk cement is just the thing for this job. Dip a small brush in alcohol, pick up a small quantity of the cement from the stick and apply to the wheel rim under the band. Wipe off any excess cement from the rim with a cloth dipped in turpentine.

Slow-motion screws, such as those on a thermostat, sometimes become loose and fail to hold a fine adjustment. Disk cement diluted with light oil and applied to the threads creates just sufficient "drag" to permit the required adjustment to be made. Note the procedure pictured in the upper left-hand photo. Ordinary gummed labels frequently loosen and drop from metal surfaces. To assure that the labels will stay in place indefinitely, use softened disk cement as the adhesive, applying it as in the right-hand photo above. In an emergency, a good electrical insulating tape can be made by coating closely woven cloth with disk cement. Heat the cement and cloth as in the lower left-hand photo and apply the softened cement to only one side of the cloth. ★ ★ ★

Threading Holes in Plastics With Regular Metal-Cutting Taps

It is possible to thread holes in plastics with regular metal-cutting taps, but coarse threads should be used whenever possible. The plastic is easily fractured when cut to a thin section, as is the case when cutting a fine or S.A.E. thread. Where there is to be considerable wear, shock or stress, special inserts are available. A mild soap solution makes a good lubricant when hand tapping. When machine threading, it is recommended that the tap or die be operated at 25% slower speed than is used for brass or aluminum. Taps should be backed out frequently and the excess material removed to avoid jamming. The work should be constantly flooded with lubricant when it is being machine-threaded.

L. E. Abell, Columbus, Ohio.

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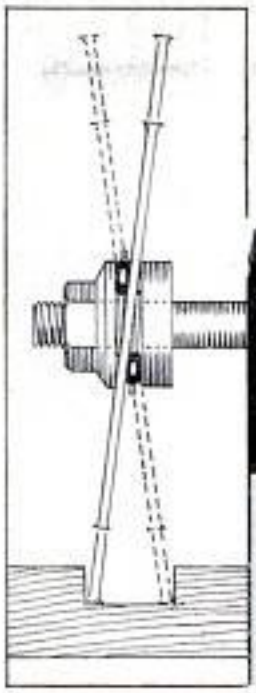
Insert "Washers" Make Adjustable Wobble Saw

Grooves of varying width are cut easily with an ordinary circular saw blade by placing insert washers on the arbor, one on each side of the blade, to incline it at an angle with the arbor as in the detail. The washers are shaped like a staple from heavy wire (about 1/16 in. in dia.), each having a rubber band or a length of rubber tubing looped tightly over the ends as pictured. To assemble for use, remove the blade and slip one of the washers over the arbor with the rubber winding down. Replace the blade and slip the second washer over the arbor with the rubber winding up. Then replace the regular arbor washer and run up the nut finger-tight, making sure that the insert washers are in the correct position. Tighten the nut lightly and turn the blade by hand. The extent of the wobble in the blade will be the width of the groove cut. This width can be varied simply by tightening or loosening the arbor nut.



Heated Steel Plate Used to Temper Small Coil Springs

The difficulty of tempering small coil springs, which burn away when heat is applied in the usual manner, can be overcome by using a piece of 1/4-in. steel plate. Heat a 3 x 4 in. piece of plate until it is red-hot, then allow it to cool until the red disappears. Holding the spring on a piece of wire that allows it to turn freely, lay it on the hot steel and roll it until the colors start to run. First will come yellow straw, then dark straw, spotted purple and finally the temper color of blue. The instant the blue shows, quench the spring in a container of rain water. If there is no rain or distilled water available, tap water may be used. The steel wire in the spring must be clean and shiny to show the colors.

E. J. Gilkerson, Columbus, Ohio.

Chamois Washed in Machine Cuts Cost and Labor

When a service station operator needed a new tub and wringer for the chamois skins used for car washing and polishing, he bought an old trade-in electric washing machine from a near by appliance dealer The washer, though old, was in working condition. In the morning before business begins for the day, the chamois are thoroughly washed in the machine in a car-wash soapsuds solution. The washing machine is then drained and the tub filled with clear water. The rest of the day, as they are used to dry the washed cars, the chamois are rinsed in the clear water and run through the powered ringer. Besides saving time and labor, the machine-washed chamois last much longer than before.

W. C. Vanderwerth, Norman, Okla.

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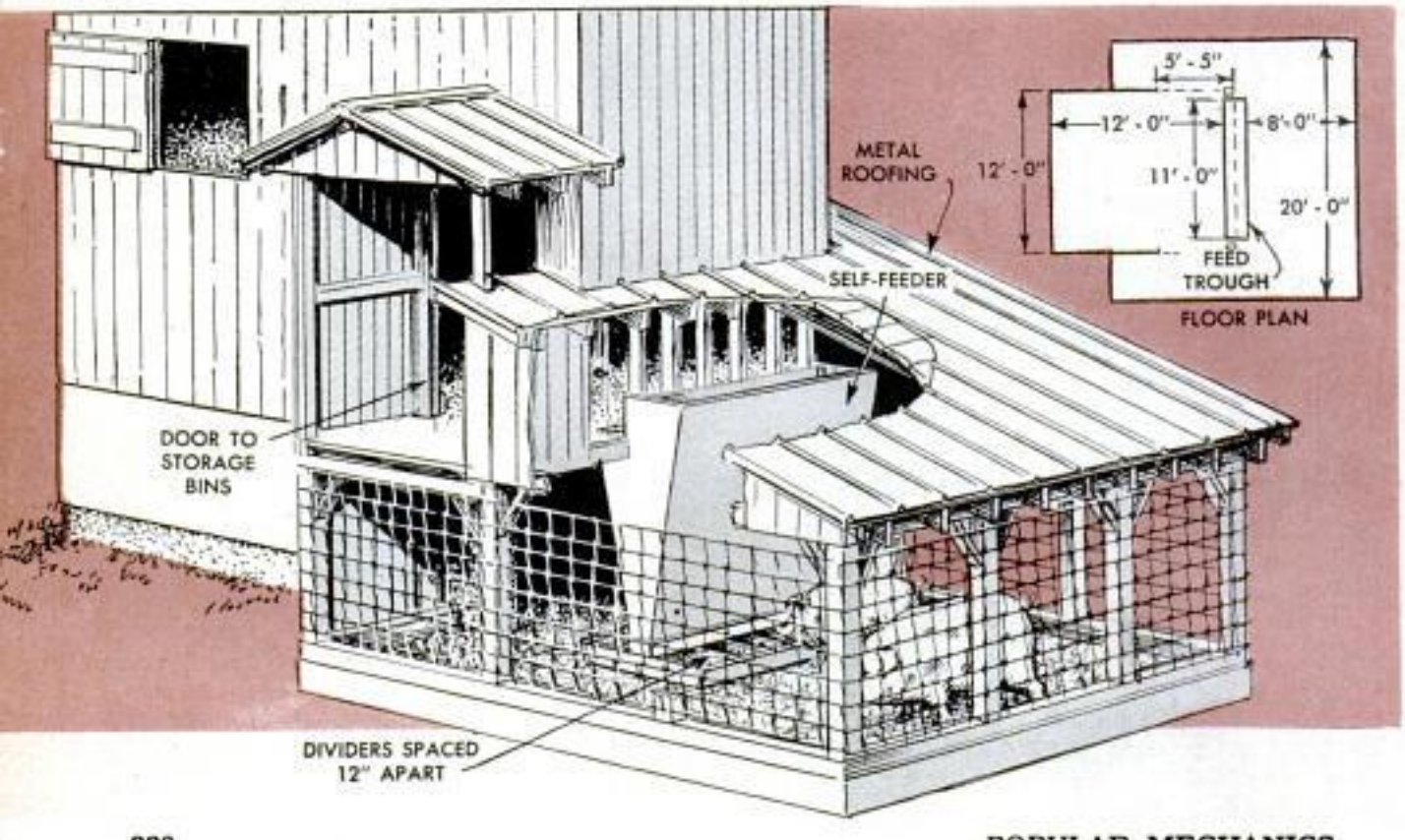
WTM '55

SELF FEEDER GIVES SHELTER AND STORAGE SPACE

By George Laycock

TO ASSURE a constant supply of feed for hogs on distant pasture, one farmer built this permanent structure which combines a shelter, storage bin and self-feeder in one unit. Ear corn, whole grain or concentrates can be fed separately or in any mixture desired. A concrete slab, with offsets as in the floor plan, provides a foundation for the entire structure, and a dry feeding floor that prevents waste. The shed, or lean-to roof housing the self-feeder, is supported on 6 x 6 x 48-in. uprights angle-braced to 4 x 6-in. plates. The lower ends of the uprights are pinned to 4 x 6-in. sills bolted to the foundation. The floor of the storage bin extends to the hopper of the self-feeder as in the cutaway detail below. The height of the bin structure above the floor should be at least 6 ft. at the eaves to give headroom. Of course, the roof can be made higher at the eaves and the bin space partitioned if desired.

Note that the full-height door to the bin is protected with a canopy and that a second smaller door closes the opening into the bin through which the feed supply is shoveled from a wagon or trailer. If desired this opening can be cut in the adjacent wall of the bin. When cattle are run in the same lot, the lower portion of the structure can be enclosed with woven-wire fencing and a sliding door fitted to form a creep admitting only hogs. As pictured, the original structure was covered with metal roofing and the area under the bin was enclosed with cement board.



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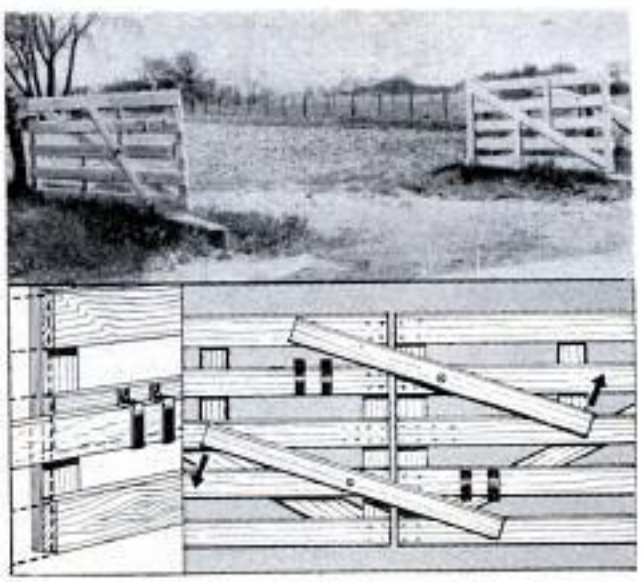
Oil-Drum Cooler for Stationary Engine Controls Temperature

This stationary-engine cooler is used in place of a radiator and fan to maintain the water automatically while the engine is operating. The two hose connections from the engine are connected to a 55-gal. oil drum which is used as a tank. Water from the regular city supply is fed to the oil-drum tank and is controlled by a float valve. The discharge line in the bottom of the tank leads into a floor drain, and is opened or closed by an ordinary thermostat from an automobile cooling system. When the temperature of the water rises to the proper point, the thermostat opens, allowing the hot water to flow down the drain. The lowered water level in the tank opens the float valve and causes fresh cold water to flow in from the top. As soon as the water in the tank cools sufficiently, the thermostat closes the drain. And finally, the float valve cuts off the intake of cool water when the original level in the tank has been restored.—L. H. Houck, Jefferson City, Mo.

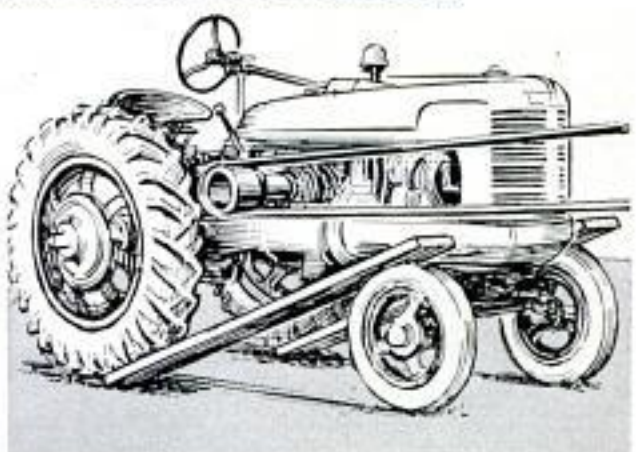
Double Field Gates Used on Farm Accommodate Large Machinery



By installing double field gates in his fence, one farmer is able to pull large machinery, such as several sections of a harrow, through the gate at one time, without a need for changing the hitch or dragging the units through sideways. The gates are held closed by means of two heavy swinging bars, each of which pivots on a bolt that passes through a horizontal member of each gate, as shown in the detail. One end of each bar, extending beyond the end of the gate to which it is attached, drops into a pair of flat-steel brackets bolted to the opposite gate. For maximum strength, use bolts in place of nails when assembling the gate. When stock is in the field, the gates can be locked by chaining and padlocking the bars in place.

Planks Chock Light Tractor to Overcome Undue Belt Slapping

When a light tractor is used on heavy belt work, the tendency of the front end to rise or vibrate and cause belt flapping can be eliminated by chocking the tractor with two planks as indicated. This method of chocking the rear wheels throws weight on the front wheels, thus steadying them against the ground.



Finding that the underseat heater in a station wagon didn't provide enough heat, one motorist mounted a standard heater on the fire wall, replacing the fittings in the block and water pump with pipe tees and running hoses from them to both heaters.

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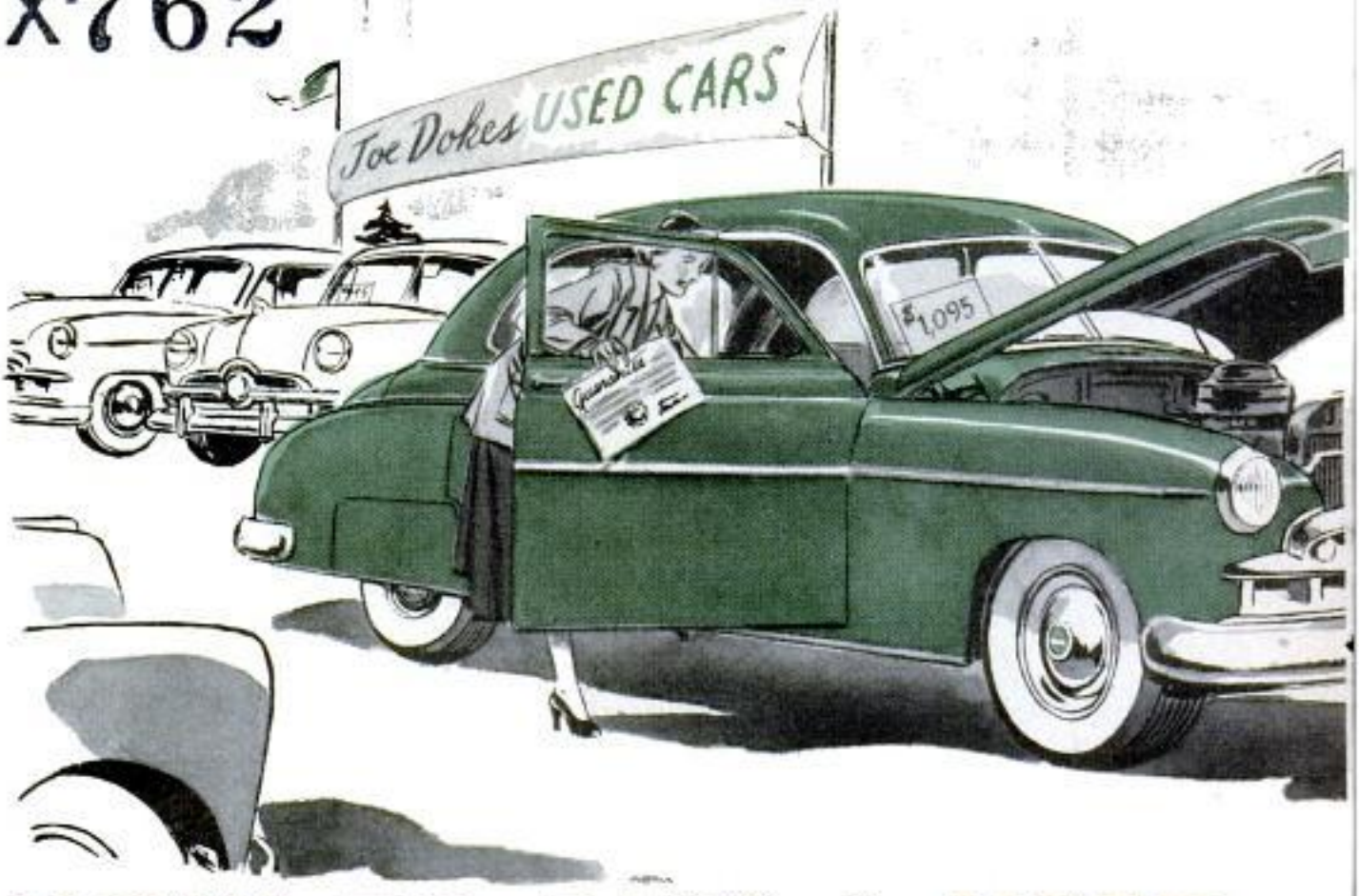

HOW TO BUY A USED

BUYING A USED CAR need not be a gamble, for even the most inexperienced person can take steps to assure himself of a reasonably safe buy. Your best bet is to patronize a local dealer with a good reputation, who has been in business in your area for a number of years. Beware of so-called "sensational bargains," remembering that a legitimate dealer must make a profit to stay in business. Be cautious about warranties and guarantees. Space does not permit a lengthy discussion about these widely advertised documents, but be sure to read them carefully and analyze the wording thoroughly. In many cases they actually mean very little, and sometimes obligate the car purchaser to assume costs for repairs that should have been reflected in the purchase price. This is another excellent reason for being very careful of bargains. Though the original price is low, in the long run the car will cost more than one with a higher selling price. Do not make a hasty purchase, but shop around for a few days to get an idea of the market value of the car you want. Once you have located the make and model you desire—it is better to have spotted three or four—hire a good mechanic to look over the car. He will know how to pick a car that is in good condition, and his fee may be one of the best investments you ever made.

However, if you must depend on yourself to make the selection, here are some simple checks that will help you to avoid buying a car that has been abused, wrecked or is otherwise not a desirable automobile.

Except for automatic transmissions on many of the later models, the checks for quality in a used car are still much the same as always. Don't let a dazzling paint-and-polish job fool you. It might, indeed, be used to cover extensive damage. Banged fenders, rusted doors and other fairly minor items, properly repaired, are not things which should stop you from buying. But look behind the sheet-metal damage and check the frame. If the chassis shows signs of having been heated and straightened, or if there are welds evident, pass up the car, even at a bargain. Although the tires and running gear do not at this time show signs of wear from misalignment, eventually there will be trouble.

While checking the running gear, take a look at the front end. The independent suspension is an expensive unit to have repaired. If the front wheels are spraddled, with the bottoms out farther than the tops, leave that car alone. And if the wheels are properly vertical or slightly out at the top, check to see that the wheels haven't been

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By Jay W. Hedden

CAR

toed-in excessively to get them to look right. With the front edges of the wheels too close together, the tires will wear rapidly. If possible, jack up one of the front wheels and rock each wheel to check for wear in the kingpin and spindle-support bushings. If it is excessive, it will cost around a hundred dollars to have the front end rebuilt. Wobble the wheel in the other direction to check for worn tie-rod ends. This is not a major fault, but should be corrected immediately for good steering and to prevent undue wear on the front tires. Front-wheel tires that are cupped or worn at an angle definitely indicate something wrong with the front suspension. With the car on the ground, stand on the front bumper and rock the car with your weight. If the front end bounces easily, the shock absorbers are worn. On many cars the shock absorbers are an integral part of the front suspension and it requires overhauling most of the suspension to replace them. Good shocks will snub a car's roll after one or two bounces. The rear shocks may be tested in the same way. Assure yourself, also, that neither rear spring is weak or broken.

Check all the door latches to make sure the doors close properly and stay shut. Do the locks work? With children this is an important item. Roll the windows up and down to make sure the cranking mechanism is in working order. With the door open, compare the paint color on the edge with the color on the body. A different color here will show a repaint job. Good condition of the upholstery and floor mats generally indicate that the former owner took good care of the car, but it is possible also that seat covers have been stripped off and inexpensive floor mats installed. If the car has conventional transmission, new pedal pads might also indicate that the old pads showed excessive wear because the car had been used extensively for stop-and-go driving. This type of driving is much more destructive than high-speed, long-distance driving, when the motor is at operating temperature and the oil is properly circulating.

Turning on the key will check the gas gauge and ammeter. Start the engine and

Jack up the front end and rock the wheels to check for wear in the kingpin and spindle-support bushings

Sheet-metal damage that has been properly repaired should not keep you from buying a used car

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Stand on the bumper and rock car with your weight to check the shock absorbers. If the car bounces easily, the shocks are worn and will need replacing

Check the camber and toe-in of the front wheels. The wheels should be vertical or slightly out at the top. Toe-in should be very slight or zero

watch the oil pressure. It will run high at first, then as the engine warms up, will drop to normal. Covering the radiator with a blanket will quickly bring the engine up to normal operating temperature. If the oil pressure drops too far below normal, then the bearings are badly worn. To correct this will require a complete overhaul. While sitting in the driver's seat, test the brake pedal. It should be fairly firm and have about ¾-in. of play. If the pedal goes lower than this, but can be brought up by one pump, it is probably the adjustment. Twist the steering wheel to feel any slack in the steering-gear box or linkage. If it is excessive it should be adjusted. Get the dealer to make all the necessary adjustments and corrections before you buy any car. It is a lot easier before than after he has the money. Snap on the lights to make sure all the bulbs are good. High and low filaments in the headlights, stop and taillights in the rear. If there are directional and back-up lights, check these.

Raise the hood and inspect the engine. Here, again, cleanliness does not mean as much as it might. The engine can be steam-cleaned and painted. This does nothing for the efficiency of the inside of the engine. Pull out the dip stick and note the condition of the oil. If it is heavy, it could mean that the engine is noisy and needs heavy oil to quiet it. Or it might use too much oil of a lighter viscosity. Either way, the engine will require an expensive overhaul.

When testing an engine be sure to bring it to operating temperature. This is important because some modern engines with cam-ground pistons and extreme cold clearances will be noisy until the engine is completely warmed up. When the engine is warmed up, race it and check for noise. In a flathead (L-head) engine, any loud clunks or continuous raps mean something is badly worn. On an overhead-valve engine, some noise can be tolerated because it is difficult to keep tappets and rocker arms absolutely quiet. If the motor is quiet, but seems sluggish, have the timing checked. If the spark is greatly retarded, it can hide a connecting-rod knock or other noise.

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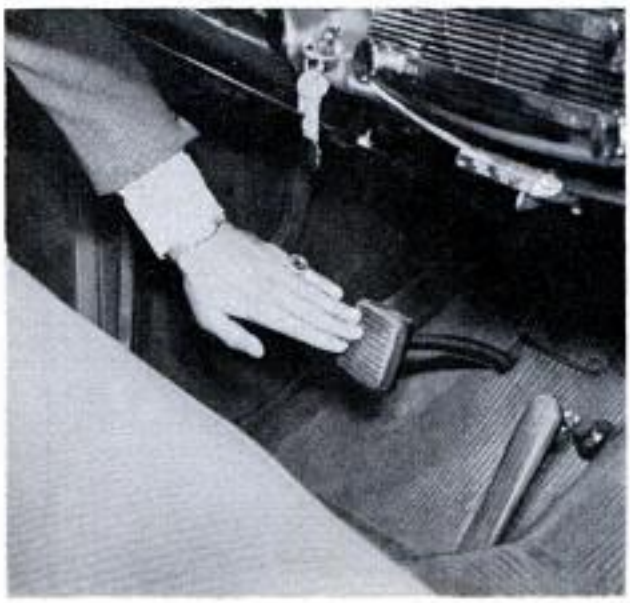
Battery and cables should be free of corrosion



Brake pedal should have a maximum play of ¾-in.

While gunning the engine, look out the back at the exhaust. A cloud of blue smoke is the giveaway of an oil-burning, badly worn engine. Black smoke shows that the engine is running on too rich a mixture of fuel. Usually a carburetor overhaul by a competent mechanic will cure it.

Examine the battery. New batteries are guaranteed from one year to about three. The age of the car subtracted from the original life expectancy of the battery will not give it too much time. It is a sensible precaution to get a new battery for any used car you buy that is much more than a year old. If, however, the battery case is clean and the battery cables and clamps are not badly corroded, there is usually a fair amount of life left in the battery. Follow down the cables to see that they are not loose or corroded on the starter and ground. The wiring to the coil and distributor, as well as to the spark plugs should not be oil-soaked or rotten. Shorts anywhere in the wiring can cause poor engine performance and low mileage, and will cause an excessive drain on the battery.

Does the radiator show signs of leaking? Excessive loss of water or antifreeze will badly damage an engine in a matter of minutes and a new radiator is an expensive item. Soft or rotten radiator and heater hoses may burst at any time. An old hose sheds small particles of rubber and fabric that can clog a radiator.

Test-drive the car. Accelerate in all three gears, if the car has conventional transmission. In each gear listen for a growling or grinding that would indicate worn gears in the transmission or differential. If the car has an automatic transmission, run in all ranges on the indicator, and out on the highway, use the passing gear a time or two to see that it functions properly. With any automatic transmission the engine must be properly tuned to get smooth performance. So, before driving any car equipped with an automatic transmission, listen to the engine while it is idling to see if it runs evenly. Accelerate the engine suddenly. Does it hesitate a

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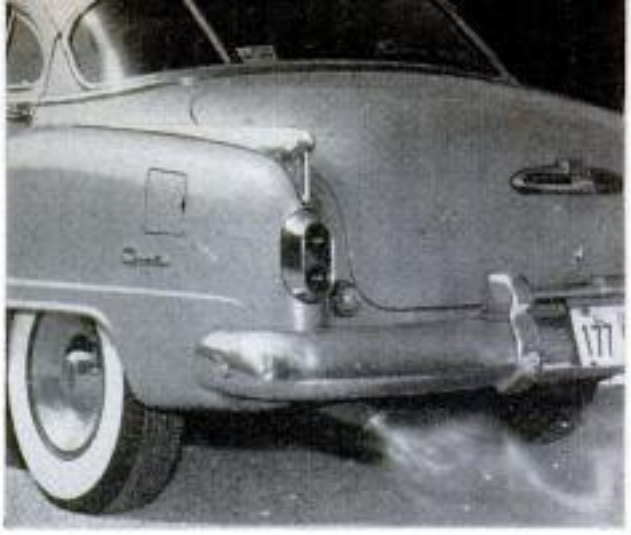
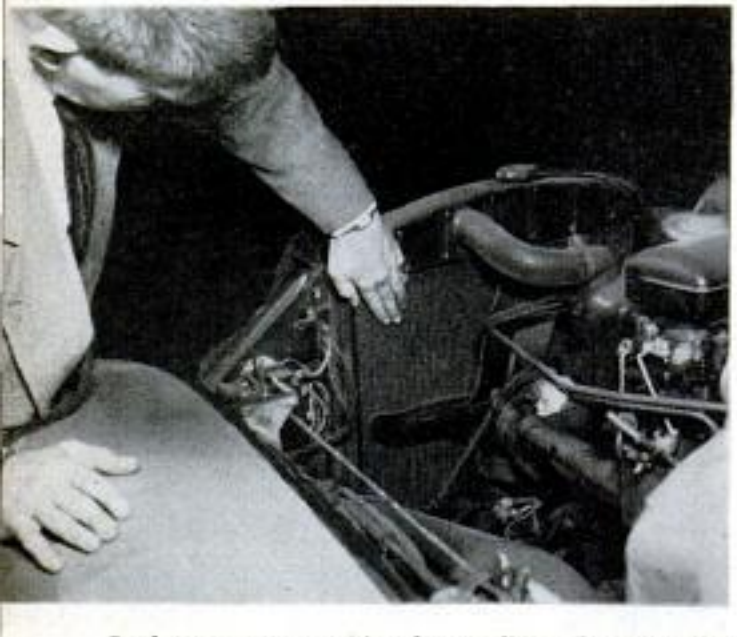
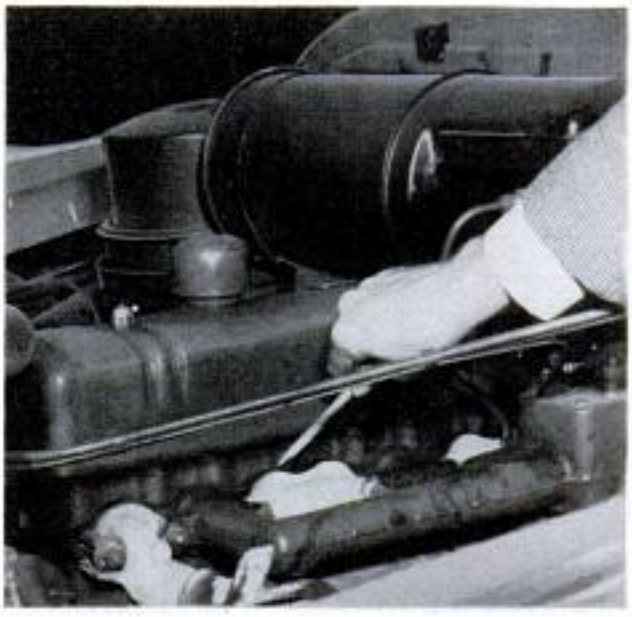
The motor oil tells a story. Heavy oil indicates that the engine is noisy and needs to be quieted or that the car uses too much of a lighter oil



A cloud of blue smoke from the exhaust shows that the car is an oil-burner. Correcting this condition requires a complete engine overhaul which is costly

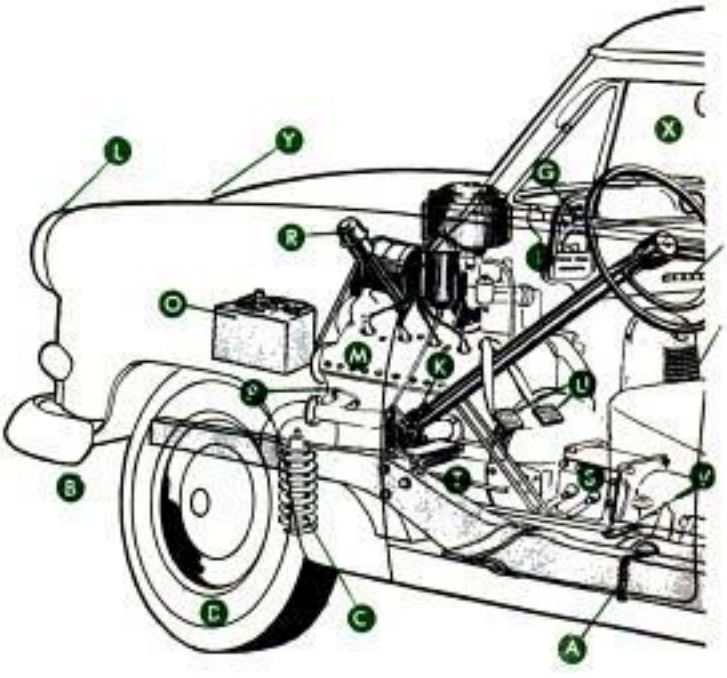


Replacement or repair of a radiator is expensive. Leaks around soldered joints are easily repaired

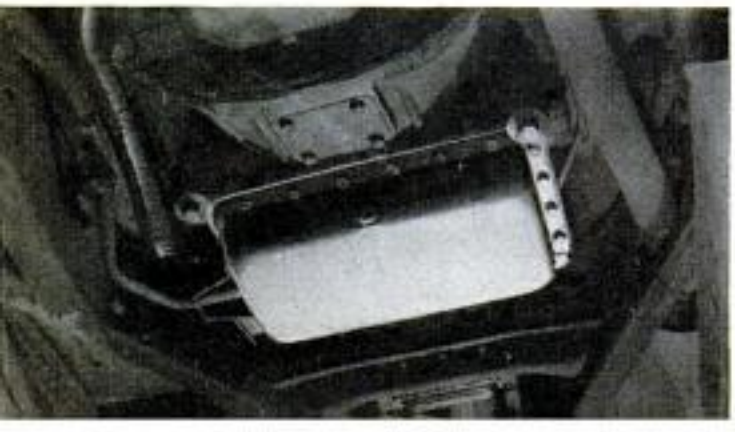


Leaking gaskets around the exhaust manifold may allow deadly carbon monoxide gas to enter car

Indicated mileage can be misleading. Long trips at high speed will cause less wear than many short trips at low speed when the engine is not completely warmed up



If the oil pan on the bottom of the automatic transmission shows oil leakage, future trouble is indicated



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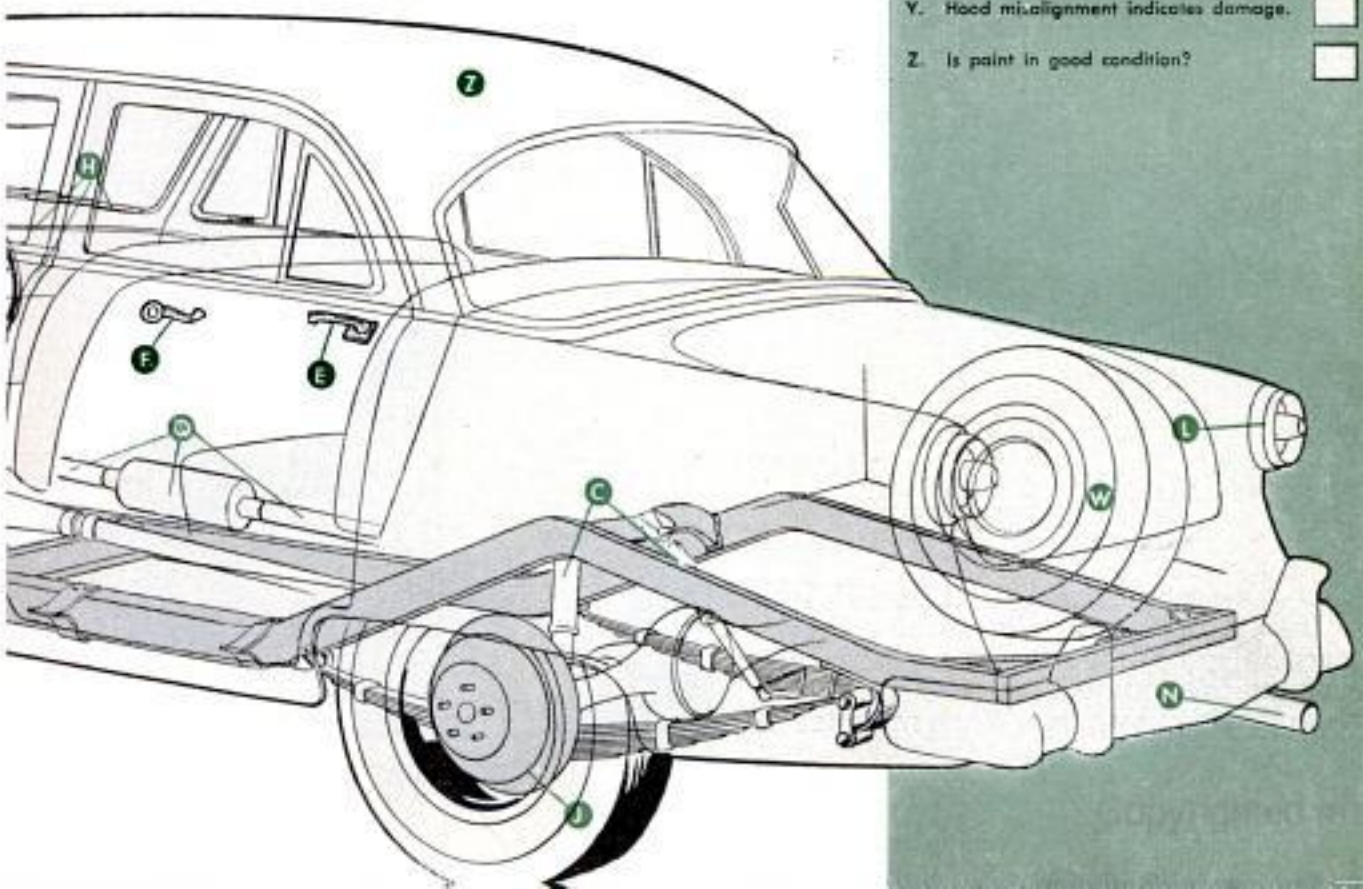
moment before "revving" up? It might be carburetor trouble, possibly the accelerator-pump system. In some cases a worn distributor or burned points will give this effect. Too wide a gap in the spark plugs will do it. Drive along at about 10 m.p.h. in high gear, then suddenly floor the gas pedal. If the motor shakes badly, vibrating the whole car, the valves will need regrinding. With any of these engine troubles, the automatic transmission cannot function properly. If you think you'd like to buy the car, have the dealer properly tune the engine, then road-test it again to make sure the rough engine did not conceal a faulty transmission. One of the biggest problems with automatic transmissions is that they will leak oil. A look under the car will show an oil pan bolted to the bottom of the transmission. If this pan shows oil leaks around the pan gasket or at either end where the drive shaft and engine connect, the oil seal should be replaced or the gasket renewed. Be sure this condition is corrected.

Although many of the items mentioned are, in themselves, minor, a number of them can add up to an expensive, unreliable means of transportation. And a number of visible defects indicating that the car has not been properly cared for by its previous owner, are an assurance that there are many other faults which you cannot see. Next to a home, the average man pays more for an automobile than for anything else he buys. Keeping this fact in mind, investigate carefully, for when spending so large a sum of money you are entitled to know that you are getting your money's worth. If the salesman does not want to let you check thoroughly, you can assume that something is wrong with the car. Buy only when you are absolutely sure. And finally, when deciding on the maximum amount you can safely spend for a used car, deduct fifty to one hundred dollars for possible repairs, even on the best car selected from the stocks of a reliable dealer.

★ ★ ★

CHECK LIST

- A. Frame damaged or welded? ☐
- B. Front wheels properly aligned? ☐
- C. Shock absorbers badly worn? ☐
- D. How good are the tires? ☐
- E. Door latches and locks work? ☐
- F. Window-raising mechanism work? ☐
- G. Do all the instruments function? ☐
- H. Heater, defroster and radio operate? ☐
- I. Oil pressure stay constant? ☐
- J. How good are the brakes? ☐
- K. Slack in the steering gear? ☐
- L. All lights operating? ☐
- M. Engine noisy when warmed up? ☐
- N. Oil smoke from exhaust pipe? ☐
- O. In what condition is battery? ☐
- P. Exhaust manifold gaskets leak? ☐
- Q. Leaks in exhaust system? ☐
- R. The motor oil tells a story ☐
- S. Transmission noisy—leak oil? ☐
- T. Clutch slip or grab? ☐
- U. Worn brake and clutch-pedal pads? ☐
- V. Front-seat mechanism operate? ☐
- W. Good spare tire and wheel? ☐
- X. Indications of leaks in windshield? ☐
- Y. Hood misalignment indicates damage. ☐
- Z. Is paint in good condition? ☐



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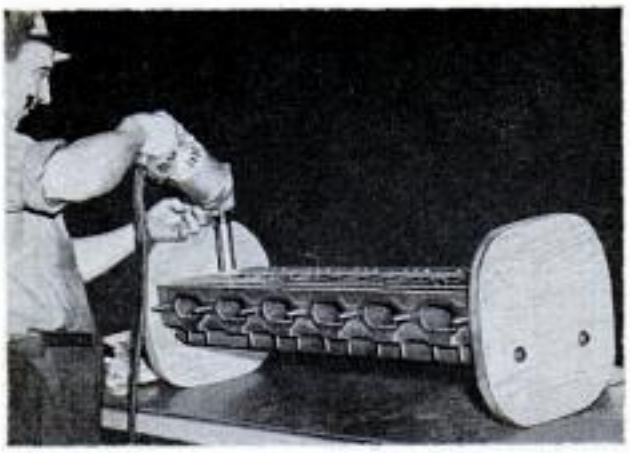


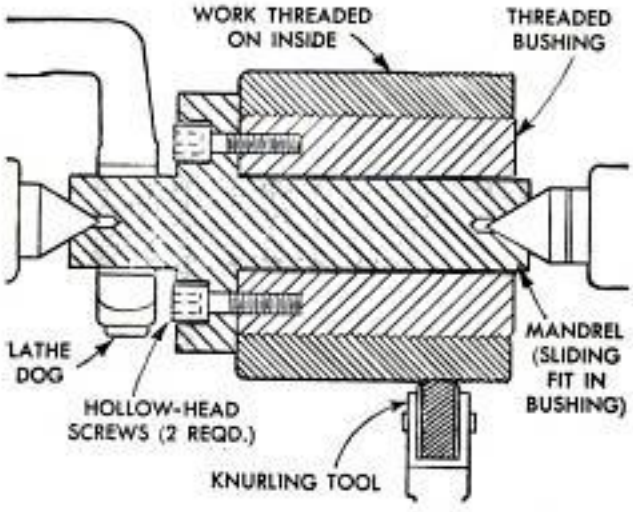
"Rockers" Support Engine Head To Ease Bench Handling

The head from an overhead-valve engine can be handled easily on a workbench when grinding valve seats or reassembling valves by bolting it to wooden supports, or rockers, having rounded corners as shown. The ends permit turning the head over without having to lift it, and also support the head firmly in any one of four positions.

L. H. Houck, Jefferson City, Mo.

Internally Threaded Sleeves Knurled on Special "Mandrel"

Confronted with the problem of running a deep, sharp knurl on a number of internally threaded thin-walled sleeves which were machined to close dimensions, one machinist came up with this unusual two-piece mandrel. The mandrel consists of a flanged spindle and an externally threaded bushing which is bored to a sliding fit on the spindle. The bushing is held in place with two machine screws passed through the flange with the heads in countersunk

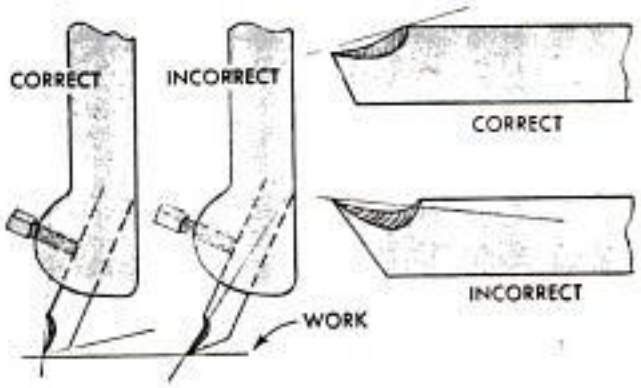


holes. In use, the work is threaded onto the bushing and run up until the end contacts the spindle flange. Then the whole assembly is mounted between lathe centers and driven by a dog. When mounted in this way, the work cannot "freeze" on the mandrel, and the thin walls are supported adequately under the heavy thrust of the knurling tool. The same mandrel can be used on other similar types of work.

C. W. Woodson, Chicago.

Grinding Lathe Bits for Shaper

When using lathe-tool bits in shapers, the cutting action is likely to be jumpy with the result that the bit often digs into the work and chatters along the surface. This can be eliminated to a great extent by reducing the positive rake of the cutting edge almost to neutral as indicated.



Baffle Cast in Concrete Chute Checks Drainage-Ditch Flow

Roadside ditches along a new highway in the Southwest frequently carry off large volumes of water due to heavy rainfalls. To prevent the formation of a sand bar where the ditches drain into larger ones running parallel or at right angles to the road, concrete chutes are installed, each having a partial dam formed across the mouth as shown. Directly in front of the opening in the dam, a concrete baffle is cast on the bottom of the chute to divide the flow into two streams, thus forming an eddy which lowers the velocity of the stream. Sides of the chute are sloped so the action of the diverted water also prevents any sand and soil in the water from collecting behind the baffle and in front of the dam.—Elton Sterrett, Houston, Tex.

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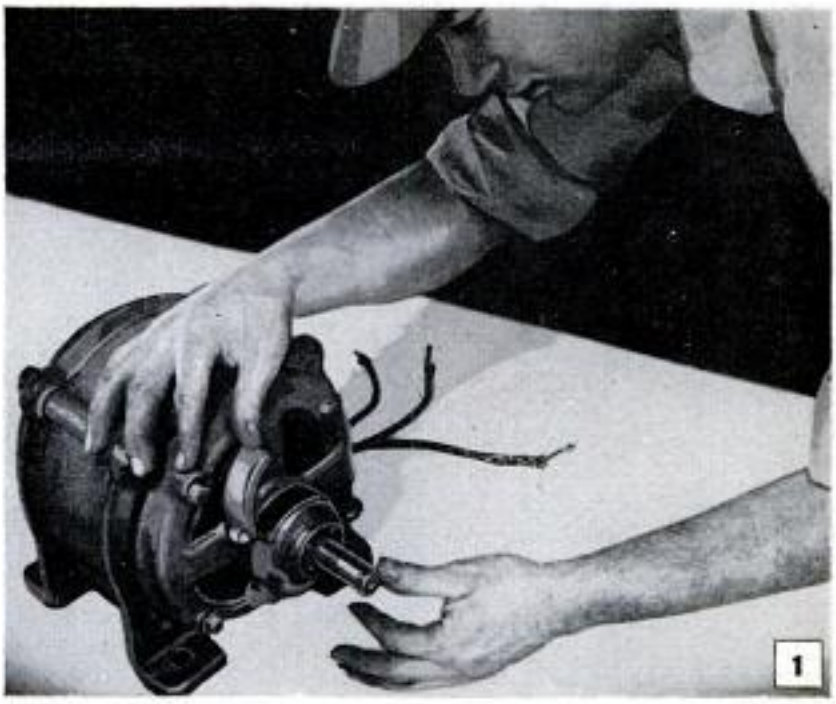
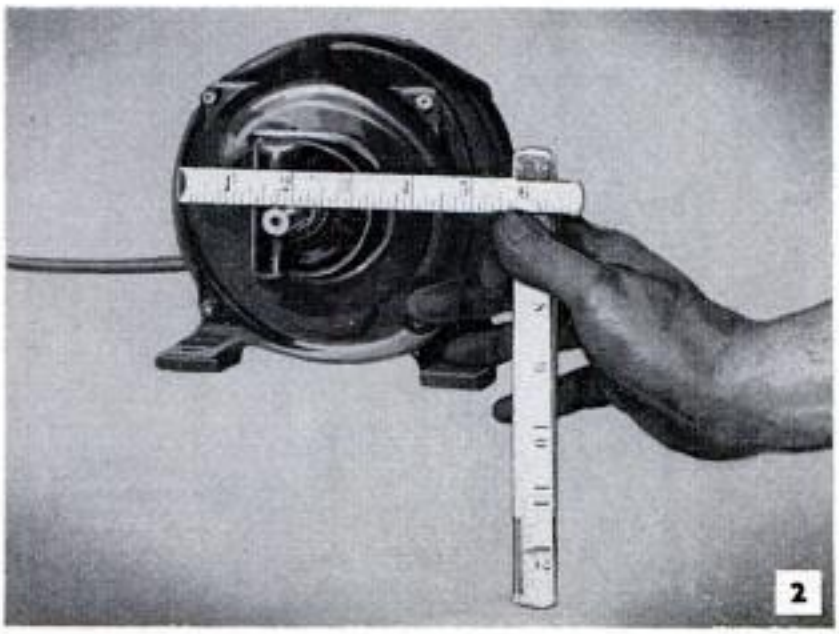


Tips On Buying Used Electric Motors

By Max Alth

A FEW SIMPLE on-the-spot checks will tell much about the electrical and general mechanical condition of a used electric motor. Also the prospective buyer must determine whether the current characteristics, type and size of the motor make it suitable to his use. For example, if the motor is intended for use on a drill press with the shaft in the vertical position, it should be equipped with ball bearings which take thrust in two directions. Manufacturers do not recommend the use of sleeve-bearing motors in angular or vertical positions. Sleeve-bearing motors, Fig. 1, usually are provided with wool-packed bearing housings, or journals. In some cases, older type motors are fitted with chain or ring oilers which carry oil from a reservoir to the bearing when the motor is running. Some ball-bearing motors are provided with a means of greasing the bearings at intervals, others are fitted with sealed bearings which never require lubrication. In sleeve-bearing motors there is a slight end play in the shaft, but there should be no end play in a ball-bearing motor. If the shaft can be moved appreciably endwise or sidewise, the ball bearings



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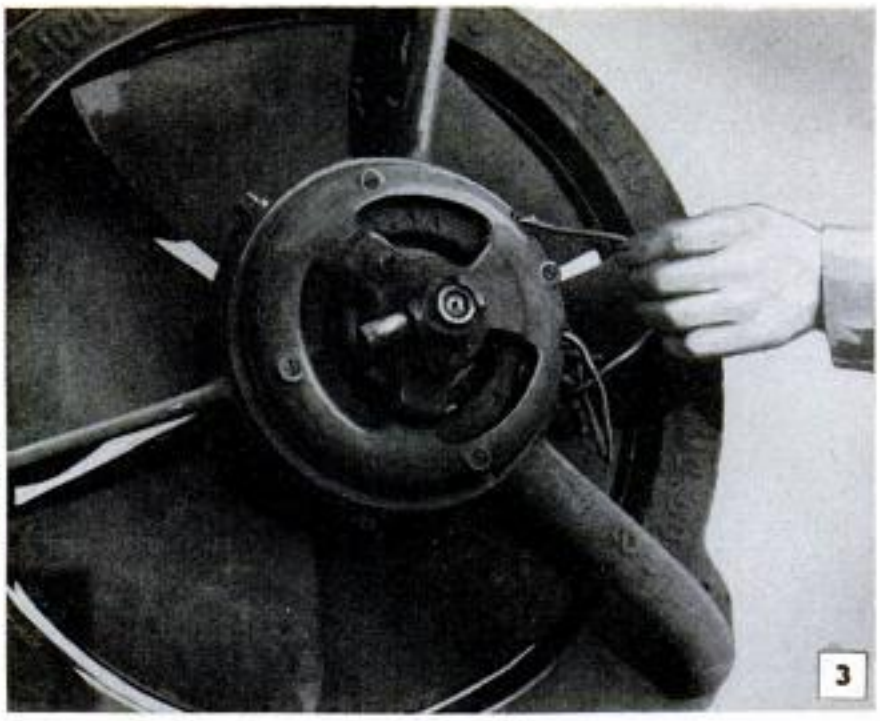
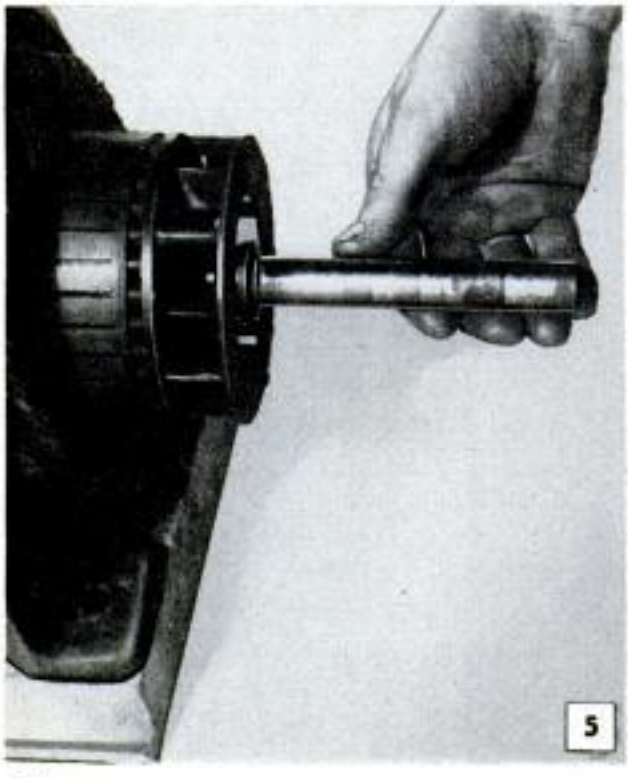


Only careful examination will reveal the two defects on this fan motor. Brush caps are missing and a part of bearing housing is broken away, exposing sleeve bearing to abrasive dust. Shaft may also throw oil depleting lubricant supply

Right, never accept a motor with missing or mutilated name plate. It gives the data you need to know before purchasing a used motor. Below, remove rotor so parts can be examined in detail



are either excessively worn or damaged and will require replacement. Side movement of the shaft in sleeve-bearing motors indicates a badly worn or scored bearing sleeve. Spin the motor shaft by hand several times. If it is a brush-type motor, the friction of the brushes on the commutator will offer some resistance to turning, but this will be uniform throughout a complete revolution of the armature, or rotor. However, if there is greater resistance to turning at any point, it can be suspected that the armature shaft is sprung slightly, or that the armature is striking the stator bars. Only by dismantling the motor is it possible to determine positively what is wrong. Don't purchase a used motor in this condition.

Always measure the diameter of the shaft, the diameter of the motor frame and

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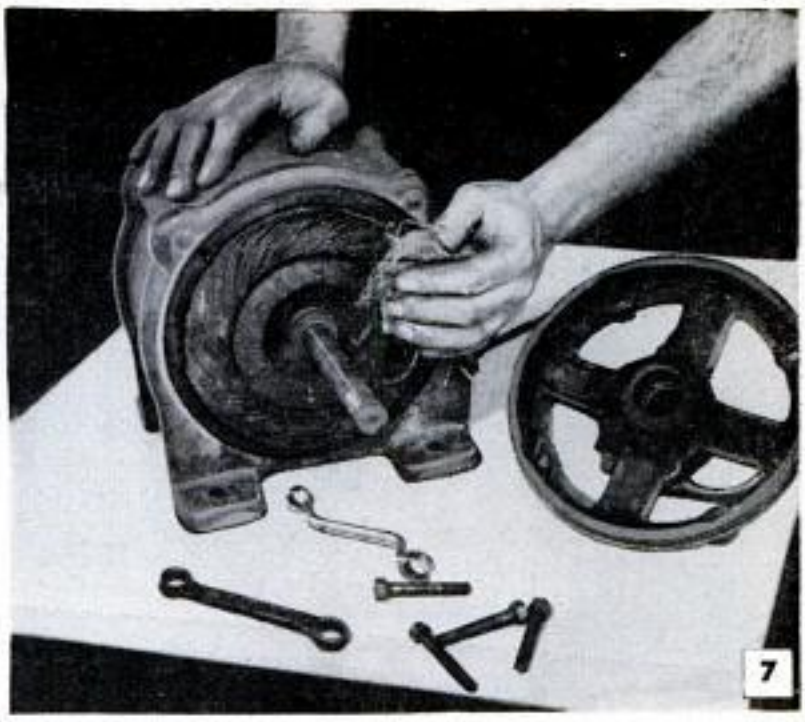
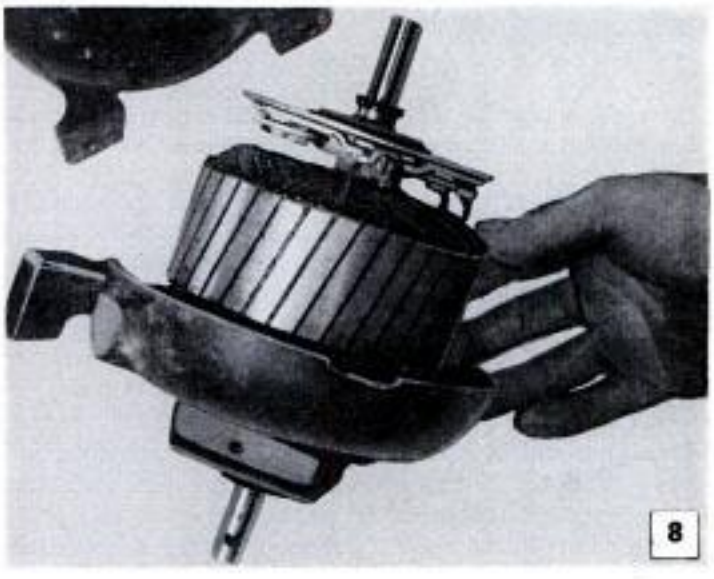
Above, run thumb along edges of keyway to detect nicks or dents in shaft. Defects must be eliminated by filing before bearing and end shield can be removed. Right, clean insulation with solvent. Below, check condition of rotor and especially starting switch, which may be defective





the distance between mounting holes in the base, as in Fig. 2. Then examine the motor frame and end shields closely for cracks or other exterior defects. The fan motor pictured in Fig. 3 is an example. Note that the brush caps are missing and that a part of the bearing housing has been broken away, exposing the bearing to abrasive dust. Also the exposed shaft may throw oil when the motor is running, thus rapidly depleting the normal supply of lubricant. Sooner or later a fairly expensive repair will be necessary to keep this unit in service.

It is never advisable to purchase a used motor with the name plate missing or mutilated so that certain entries cannot be read with certainty. The plate, Fig. 4, will give the name of the manufacturer, the type and number of the frame, horsepower, speed, all the current characteristics and, on certain types of motors, will include wiring diagrams showing how to connect to the line for operation on 115 or 230-volt current. Check all entries on the name plate so that you will know what type and size of motor you are buying and on what current it is designed to operate. If the name plate states that the motor will operate on either a.c. or d.c., the motor is the universal or series-wound type used in portable drills, saws and similar power tools. As a rule such motors are not suitable for stationary machines which must be driven at constant speed. The speed of the universal motor tends to vary with the load, the no-load speed being much higher than the load speed.

Where it is possible to remove the end shields and examine the rotor and stator, Fig. 5, be sure to first run the thumb along the edges of the keyway as in Fig. 6. A nick or dent here will have to be removed by filing before you can slide the bearing off over the shaft. If the motor is of the brush

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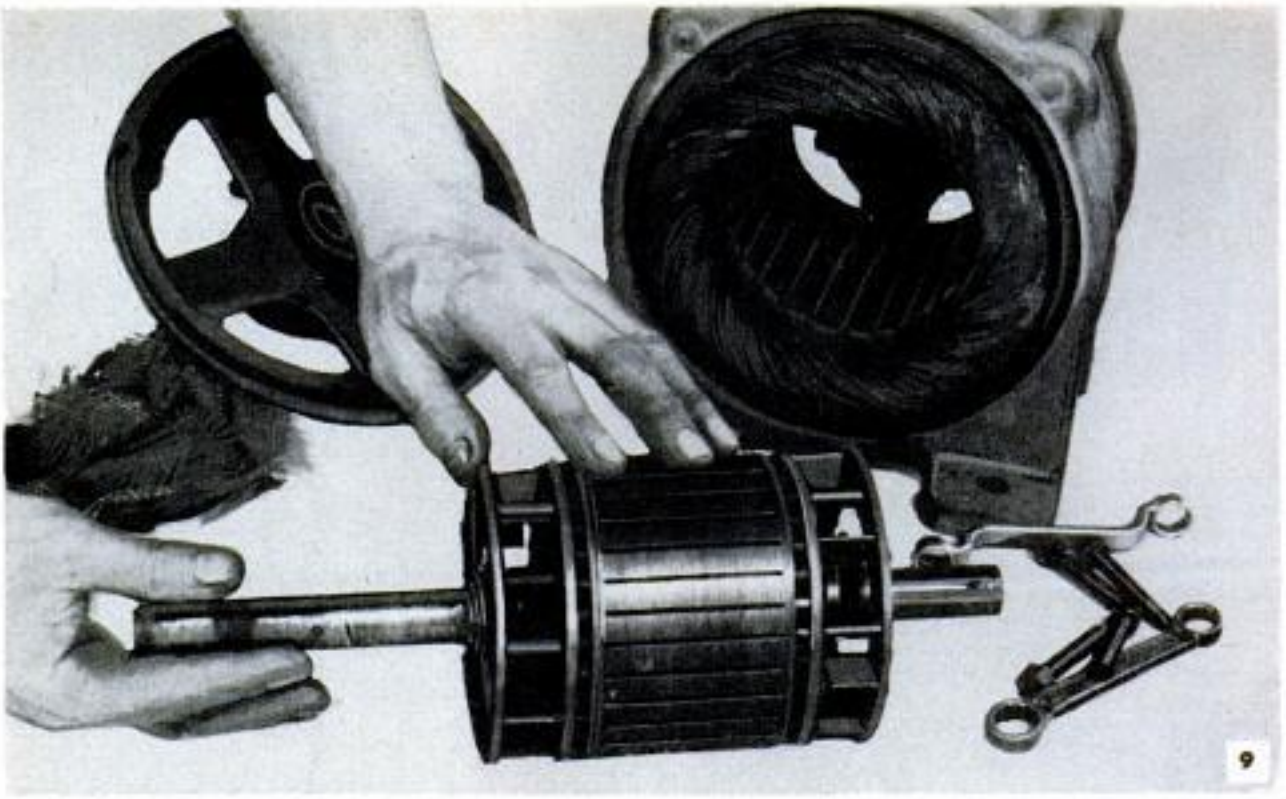
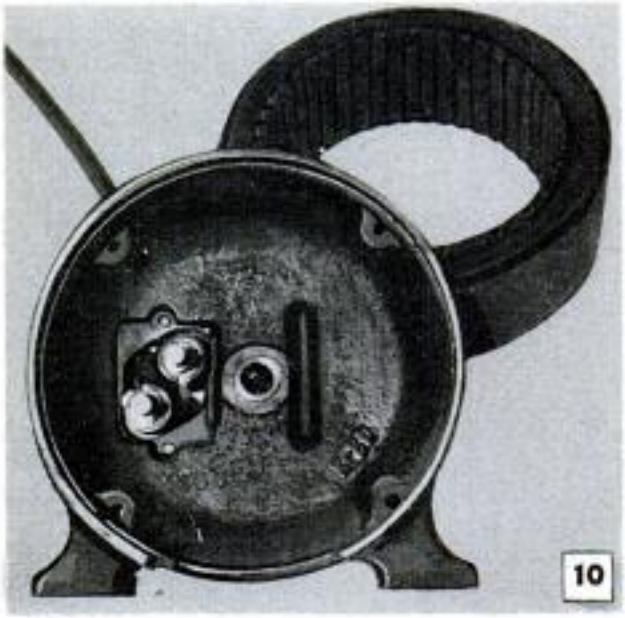


When cleaning an old motor it pays to dismantle it entirely and do a thorough job. Use a harmless solvent such as carbon tetrachloride. Don't use flammable solvents such as lacquer thinner or naphtha

type, then remove the brushes before withdrawing the rotor. When removing the brushes be sure to keep them in order so that they may be replaced in the same positions as they were originally. While the motor is open examine the insulation closely. Remove the dust and accumulated grime with a cloth dipped in carbon tetrachloride, Figs. 7 and 9, so that you can see the insulation clearly. On some older-type motors the exposed loops of the coils are coated with a special varnish. Examine this coating closely for breaks or evidence of charring. If it appears to be intact and the insulation on the leads is in good condition, then it probably is safe to assume that the motor still is in serviceable condition. Examine the commutator or the starting switch, Fig. 8, depending on what type of starting mechanism may be employed. If the brush track on the commutator is rough, pitted or grooved, it may be necessary to true up the surface in a lathe and also undercut the mica separators between the copper bars of the commutator to put the motor in condition.



Single-phase motors of the capacitor type in fractional-horsepower sizes are almost universally used on home-shop machines. Capacitor motors are fitted with special starting windings or starting coils which have the effect of reducing current requirements during the starting period and at the same time enable the motor to start medium loads. On equipment having a heavy starting load, such as an air compressor, repulsion-induction motors generally are used. The repulsion-induction motor starts as a series-wound motor and runs as an induction motor, the change being effected during the starting period by a centrifugal device which short-circuits the commutator before the armature, or rotor, reaches normal operating speed. These motors develop more than their rated hp. during the starting period and will start exceptionally heavy loads. Both types of motors are designed to operate at a constant speed. Fig. 10 pictures an older motor with brushes mounted to contact a disk-type commutator. ★ ★ ★

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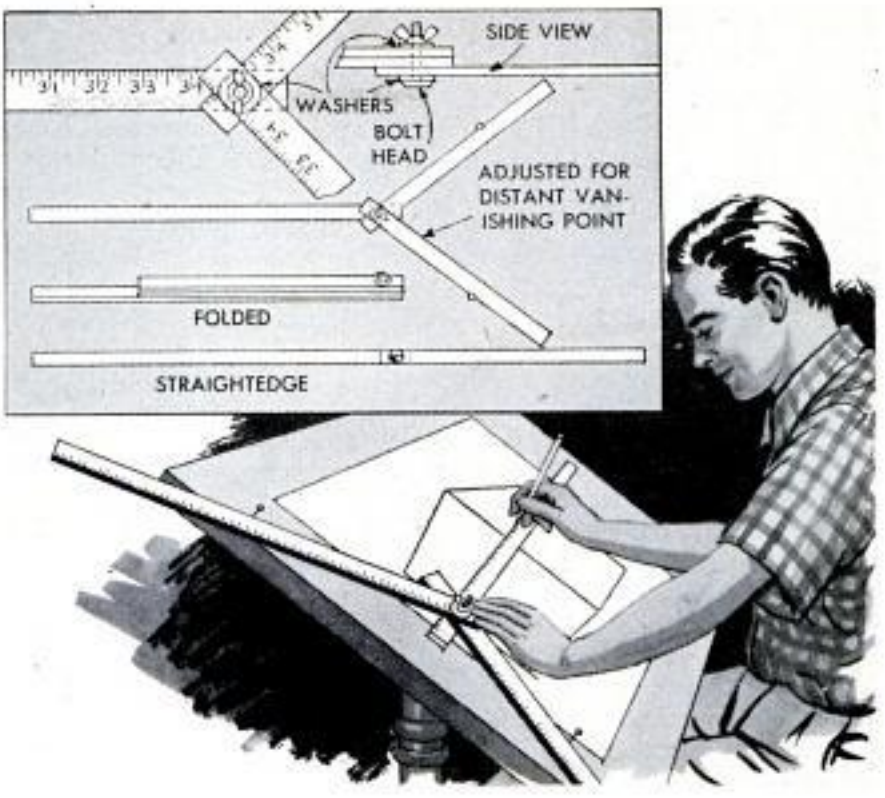
Draftsman's Perspective Liner From Yardsticks

A draftsman's perspective liner can be made easily from three yardsticks. The sticks for the two shorter legs are cut to 27 in., and the three pieces are pivoted together near the ends with a small bolt and wing nut. Thin washers are used to prevent the bolt head and wing nut from sinking into the wood, and the head of the bolt is filed as flat as possible so the liner will lie close to the work. When the liner is adjusted to show the vanishing point to be somewhere beyond the edge of the board, two push pins are pressed into the board to support the two short legs. — Walter L. White, Chicago.



Modified Portable Hand Router Cuts Accurate Circles

Round table tops, pedestals and other circular shapes can be accurately cut with a portable hand router, if it is modified by means of a simple attachment. First, remove the two bars on which the fence slides. In their place, fasten an L-shaped piece made of lengths of 1-in. stock, as shown in the illustration. In the middle of the foot of the L, secure a length of ½-in. hardwood, in which a series of 5/16-in. holes have been drilled. In use, a 5/16-in. hole is drilled in the center of the work and a 5/16-in. dowel is slipped through the hole in the arm of the jig, and into the hole in the work.—M. B. Birge, Hinsdale, Ill.

Inexpensive Way to Coat Nails for Use on Special Jobs

If you have a job where coated nails, because of their greater holding power and rust resistance, are required, ordinary self-polishing floor wax can be used to make your own coated nails. Place the nails in a clean tin can, cover them with the floor wax, and then pour the wax back into its own container. Allow the nails to dry before removing them from the can. Small amounts can be economically treated.

¶In laying out accurate holes to be drilled in wood or metal, make a ring of center-punch marks on the circumference of the hole. This will aid in relocating the center if the drill slips to one side when starting.

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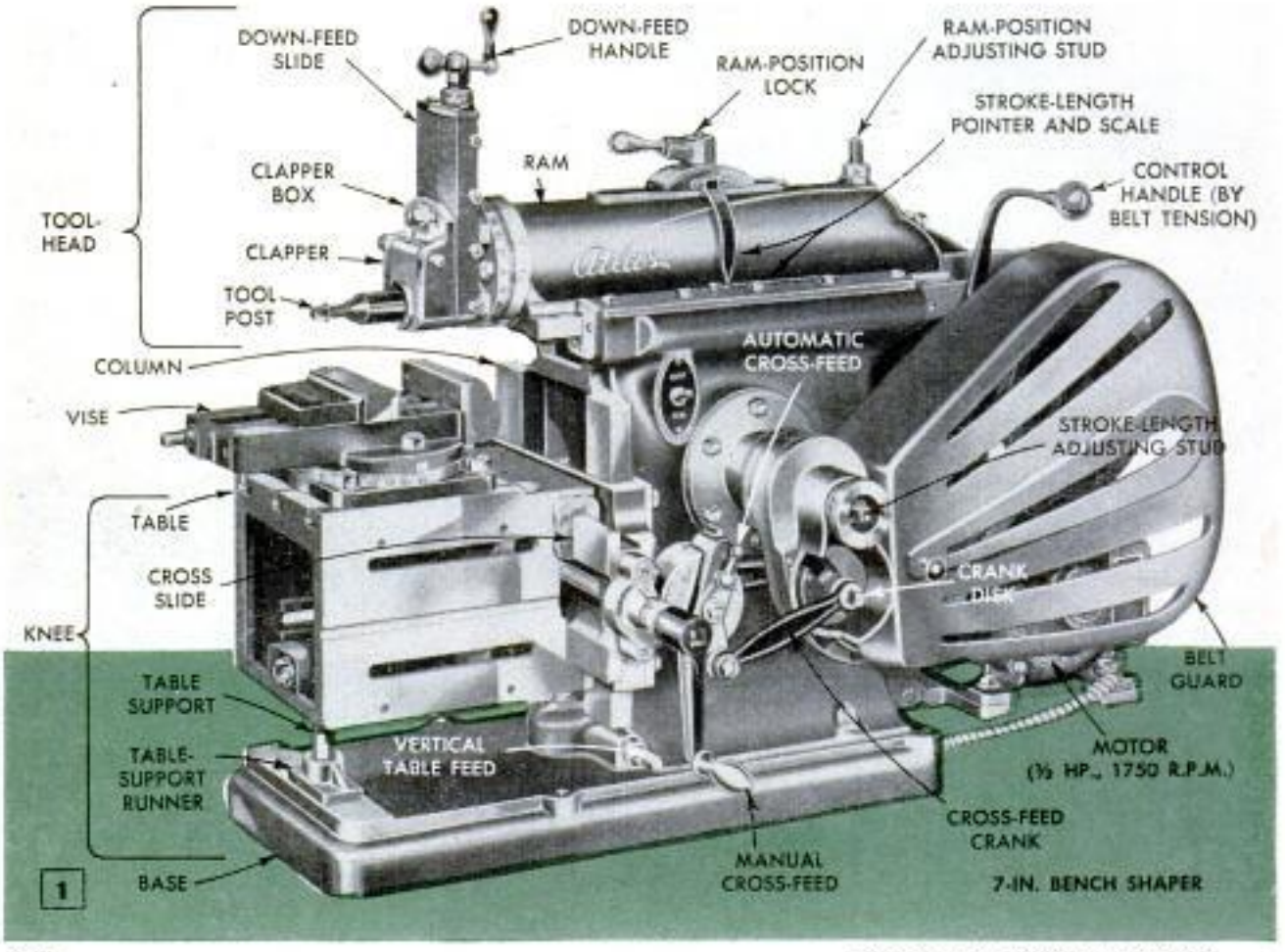
Know Your Metal Shaper

By Sam Brown

MILLING MACHINES and metal shapers do similar work in the machine shop, but in entirely different ways mechanically. A milling machine removes metal from the work by means of a rotating, multiple-toothed cutter mounted on a spindle, the speed of which is variable through a cone pulley and back gears. On the shaper, the cutting tool is carried on a ram which is driven back and forth, moving the single-point cutting tool across the surface of the work in a straight stroke. The single-point tool is one of the advantages of the shaper as it is inexpensive and permits fast setups on nearly all ordinary jobs. On a basic shaper operation, such as that in Fig. 5, the single-point tool removes metal faster than a milling cutter.

Bench shaper: A 7-in. shaper—one with a 7-in. maximum ram stroke—is a common choice for home model shops and small machine shops. Its main operating parts are shown in Fig. 1. The length of the ram stroke is easily adjusted by turning a crank on the side of the machine until the pointer is opposite the required stroke length indicated on a scale. The stroke of the ram also can be positioned front or rear with relation to the table, Fig. 2. This is done by means of an adjusting stud on the top of the ram. Where the work will permit, always set the rear limit of the stroke as near the column as possible to avoid overhang of the ram. Most small shapers have four speeds ranging from 50 to 200 strokes per minute (average values). The machine table is fitted with power feed which can be set to feed from .005 to .030 per stroke, Fig. 3, the values varying with different makes of machines. The feed is reversible, right or left, and is timed to occur on the noncutting backstroke. The tool post is mounted on a swiveling clapper box, Fig. 4, which permits it to swing free on the backstroke. This prevents scoring the work, which would be likely if the tool were mounted rigidly.

Planing a block: Surfacing all six sides of a steel block is a typical shaper operation and as time is saved by working the cutting stroke the long way of the block, this job is carried out by turning the vise sidewise, Fig. 7. After the No. 1 side is planed, Fig. 6, it is placed against the fixed



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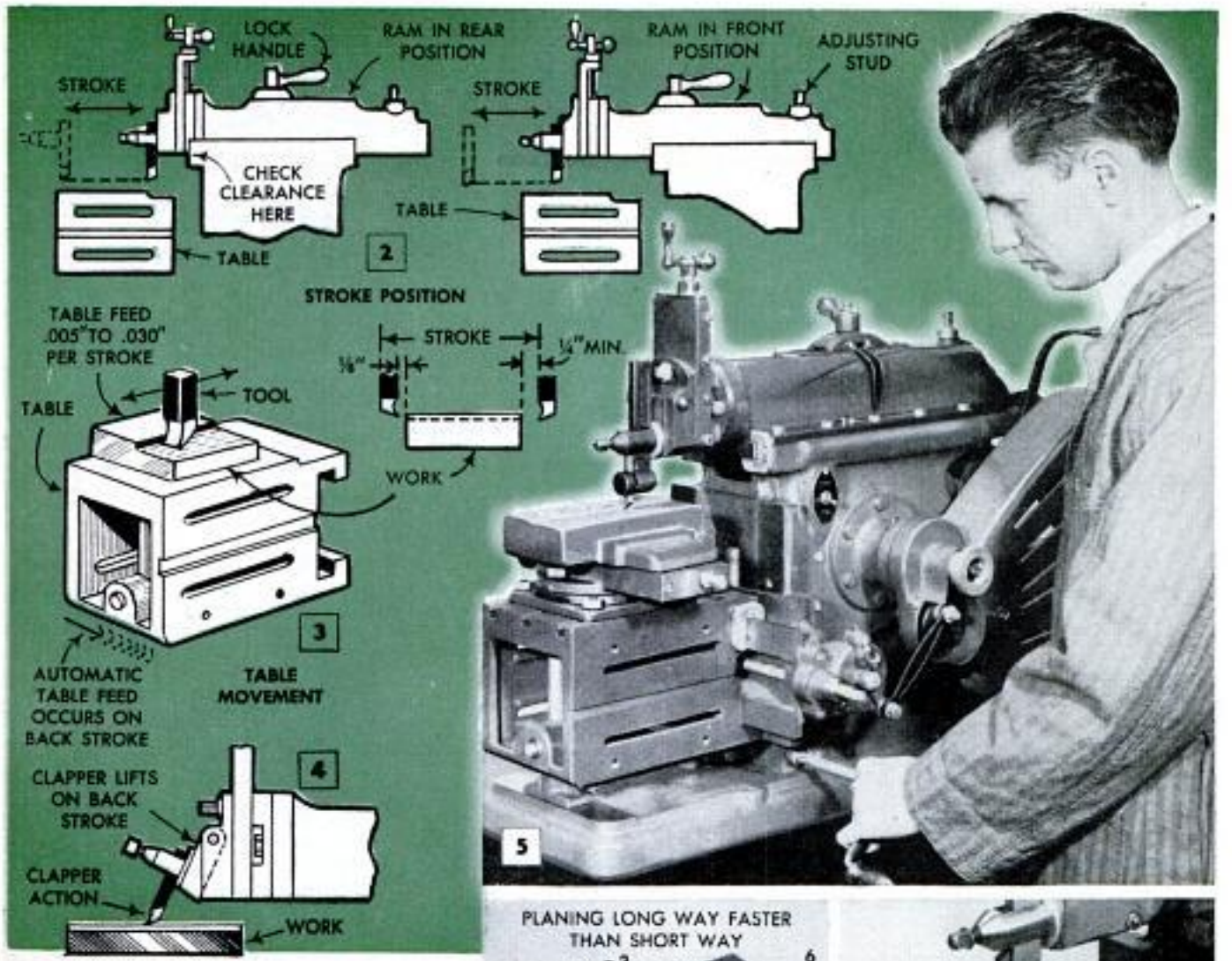
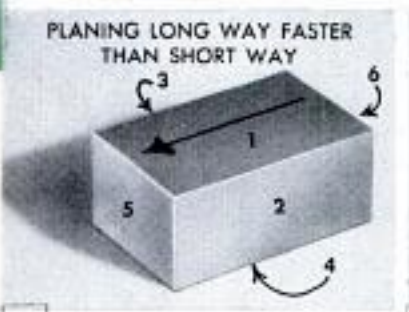
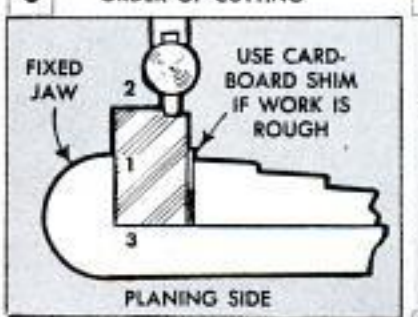


jaw of the vise as in Fig. 8. Side No. 3 is worked the same as side No. 2. It's important in such operations to keep the work seated true in the vise. This usually is done by tapping the work with a soft hammer as the vise is tightened, Fig. 9. Never strike the work a hard blow while it is on the machine table; a light tap does it. Where direct miking is required, Fig. 10, the work should be arranged to overhang the vise. The block shown is short enough so that ends numbered 5 and 6 can be worked with the piece held upright in the vise, Fig. 11. All surfaces are planed with the automatic feed, .010 to .015 being a good working value. Most operators prefer to cut from right to left, Figs. 5 and 7, as this allows the best view of the tool. Successive cuts are set by cranking the table back by hand.

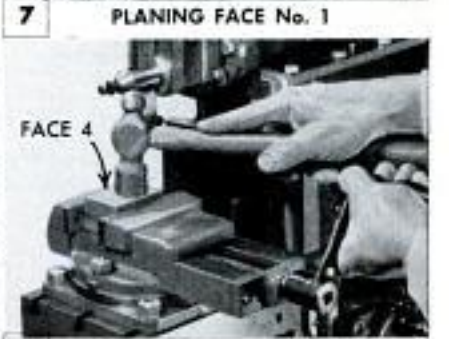


6 ORDER OF CUTTING

7 PLANING FACE No. 1



8 PLANING SIDE No. 2



9 SETTING UP FACE No. 4

10 POSITION FOR MIKING

11 MAKING THE END CUT

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12 Recommended SHAPER SPEEDS

MATERIAL	F.P.M.
ALUMINUM	100 TO MAX.
SET PLASTICS	100 TO MAX.
THERMO PLASTICS	60 TO 120
YELLOW BRASS	80-100
CAST IRON	50-80
SOFT STEEL	40-70
MACHINE and LOW-CARBON STEEL	30-70
HARD STEEL	20-50

40 to 60 F.P.M. is practical working range for all machining materials

13 FEET PER MINUTE SPEEDS

Length of Stroke	NUMBER OF STROKES PER MINUTE							
	45		78		122		186	
	Forward Travel	Cutting Speed	Forward Travel	Cutting Speed	Forward Travel	Cutting Speed	Forward Travel	Cutting Speed
1"	4	7	7	13	10	19	16	30
2"	8	14	13	24	20	38	31	59
3"	11	21	20	36	30	57	47	86
4"	15	27	26	48	41	74	62	113
5"	19	34	33	58	51	91	78	139
6"	22	40	39	69	61	107	93	164
7"	26	45	46	77	71	121	108	184

Light-face figures are net feet cut per minute, calculated by multiplying length of stroke by number of strokes per minute.

Bold-face figures are cutting speeds in feet-per-minute — the same valuation which is used in pacing other machine tools.

14 INCHES PER MINUTE TABLE FEED

FEED PER STROKE	STROKES PER MINUTE			
	45	78	122	186
.005"	¼"	⅜"	⅝"	"
.010"	½"	¾"	1¼"	1⅞"
.015"	"	1 "	1⅞"	2¾"
.020"	⅞"	1½"	2½"	3¾"
.025"	1⅛"	2"	3"	4⅝"

Figures are approximate. Use this table to determine time required to traverse any specific width.

In some instances it is practical to make a cut with the table traveling in two directions. Work reversal is accomplished simply by shifting the reversing lever on the machine.

Down-feeding: Not all types of work can be mounted upright for surfacing cuts. In this case the tool is down-fed by hand, using the toolslide as in Fig. 15. In the work example shown in the detail, Fig. 15, sides numbered 1 to 4 are worked as in Figs. 6 to 11, but the ends 5 and 6 are worked by down-feeding. The cutting edge of the tool should incline away from the work as in the center detail, Fig. 15. Manual down-feeding on the shaper is perhaps the only operation where the hand remains on a moving part of the machine. It is quite safe if you use a slow ram speed and keep your eye on the job. A few minutes' practice will be required to get the feel of the moving ram. After that timing of the manual feed is easy, although it is advisable to use the slowest ram speed in the beginning, as the feed cannot be maintained at a precisely uniform rate.

Clapper position: When down feed is used it is necessary to swivel the clapper box, Figs. 16 and 17. The correct position of the box is shown in the center detail, Fig. 16. In this position the tool will swing outward and away from the work on the backstroke. The tool can be worked as in the left-hand detail but there is some danger of scoring the work. Note, Figs. 16 and 17, that the tool swings out in the same direction as the top of the clapper box is inclined. Thus, if you are cutting the right end of work the clapper box must be swiveled to the right, Fig. 15, and if the cut is made to the left, the box is swiveled as in Fig. 16. Swivel the clapper box for all angular cuts, Figs. 27 and 28. Clapper-box swivel is sometimes used on flat surfacing jobs to clear the shoulder of the cut, Fig. 25.

Shaper tools: Cutting tools are similar to lathe tools and have a similar cutting action. Usually the tool bit is mounted in a holder, but larger tools are mounted directly in the tool post. The holder ordinarily is mounted with the tool at the front, but a reversed position, Fig. 18, is often useful when making finishing cuts. Tool shapes are variable, you can use almost any shape having clearance behind the cutting edge. Many shaper operators like the all-purpose tool detailed in Fig. 19. A side-rake tool, it cuts only to the left, the table moving to the right. It can be ground with both side rake and back rake. The round-nosed tool, Fig. 20 cuts right or left, while the finishing tool, Fig. 21, normally a square-nosed tool, is detailed with the edge ground for cutting to the left. Note that this is opposite to the angled edge of the all-purpose tool. The finishing tool makes a wide cut and will give a smooth finish with feeds up to maximum if you use a shallow cut not over .010.

Internal cuts: Various solid tools and

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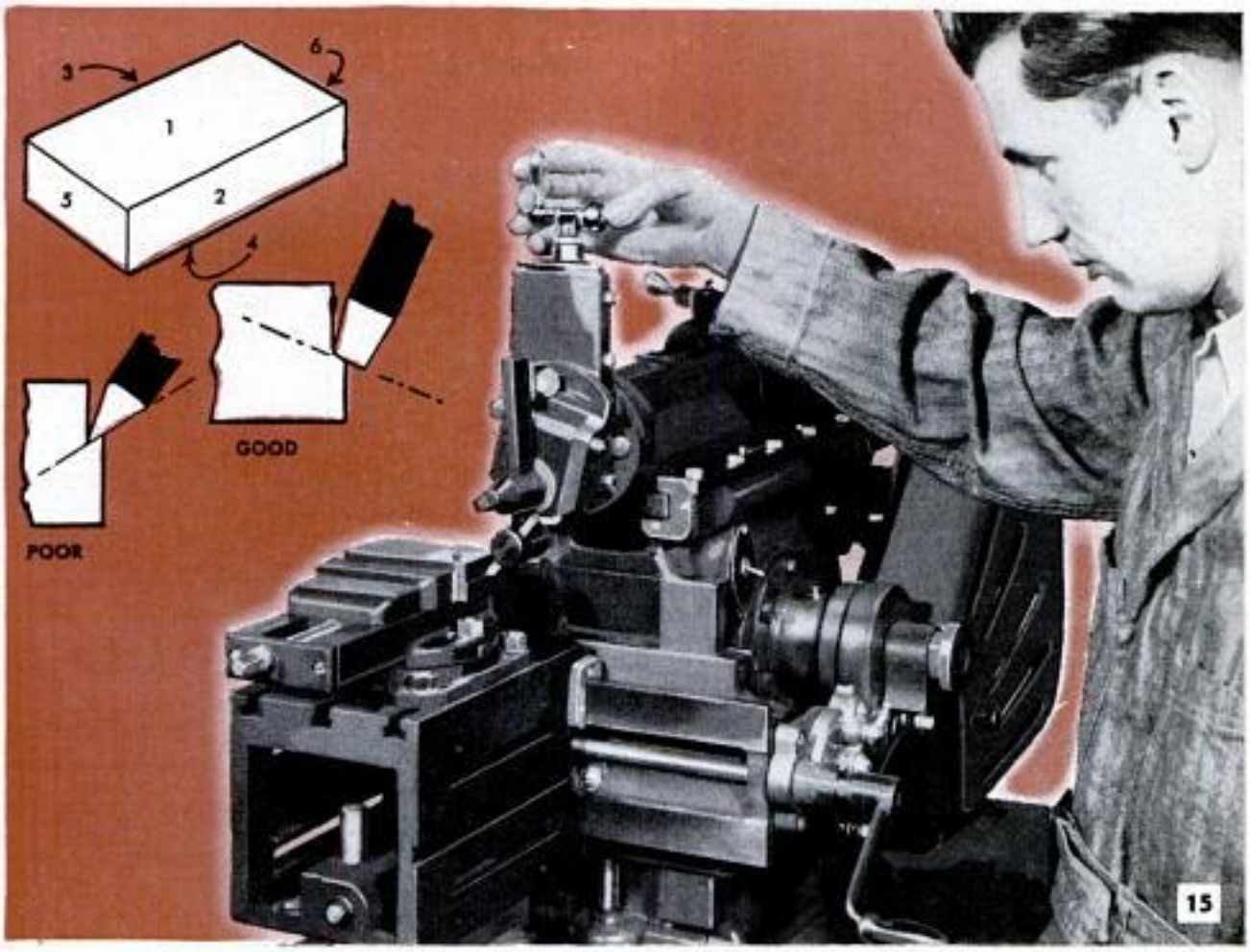
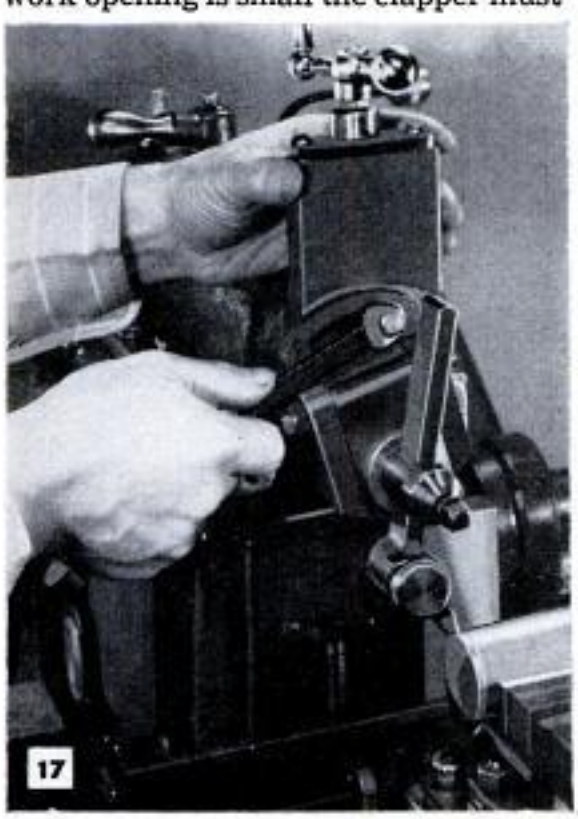
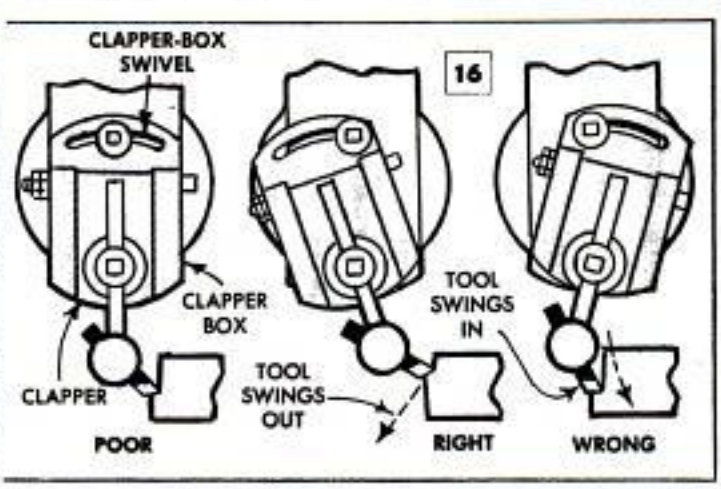


bars with inserted cutters are used for internal work, the general type of these accessories being the same as that used for boring in a lathe, Fig. 24. A common internal job is cutting a key seat, or keyway, Fig. 29. When the work opening is small the clapper must be locked by fitting a metal bar behind the tool post as in Fig. 23. Down feed must be timed so that the tool clears the work, Figs. 22 and 24.



Speeds: The tables, Figs. 12, 13 and 14 will be useful in determining speeds for the common metals, feet-per-minute speeds and also determining the time required to traverse work of a given width. The typical jobs pictured and detailed in Figs. 25 to 29 inclusive, are good examples of the range of ordinary shaper work, but, of course, do not include special setups for machine and model parts. The shaper does excellent work on plastics and can even be used on hardwoods where cuts can be made with the grain.

Operating Pointers: In order to get the most out of the bench-type shaper in performance



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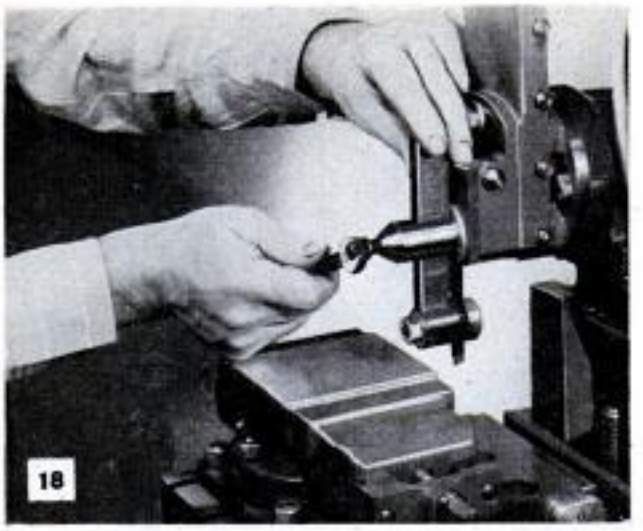
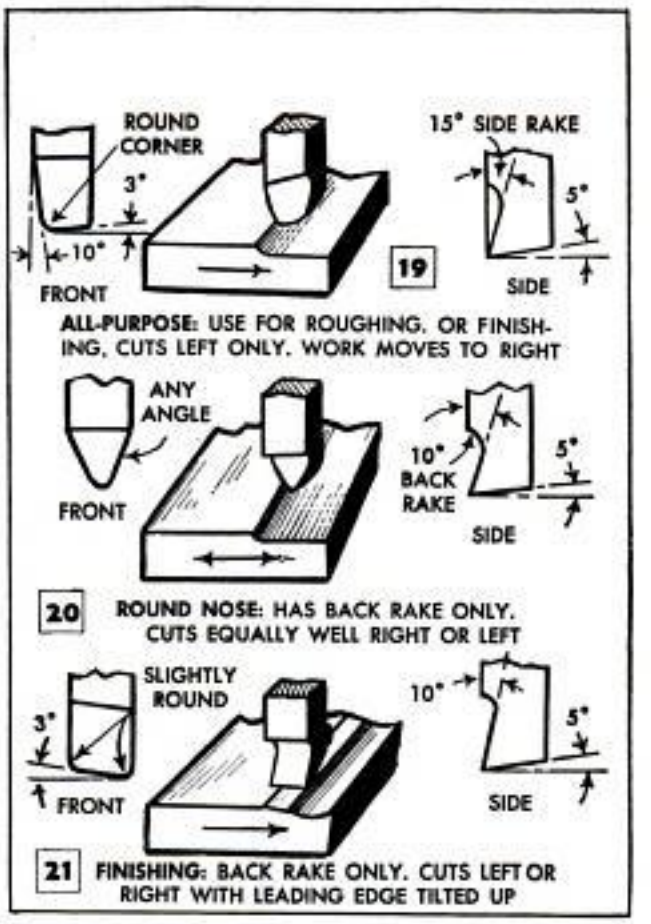
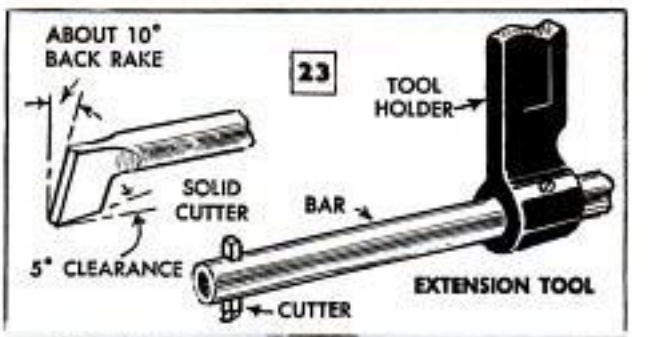


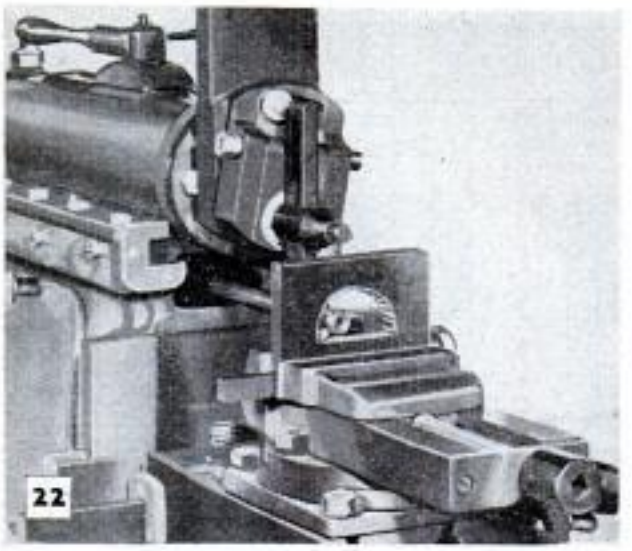
and accuracy, good practice requires that it be mounted on a rigid bench, or stand, with the table at a convenient height for mounting the work and making adjustments. The machine will not operate satisfactorily on an unstable bench or stand, especially at the higher ram speeds. When setting up the work and checking the operation of the ram, be sure that it is adjusted so that the cutting tool clears the work on the back stroke and that there is ample time at the end of the stroke for the clapper to drop before the tool again engages the work on the cutting stroke. Otherwise the clapper may not fully drop before the tool engages the work. The tool should just clear the work at the end of the cutting stroke. In most cases a longer stroke is unnecessary, except possibly in certain finishing operations. When grinding a round-nosed tool be sure that the cutting edge is ground and honed to a true radius. It is especially important when grinding to avoid the formation of tiny Vees in the cutting edge as a Vee may produce scores in the surface that are difficult to remove without remachining the entire surface. When bringing nonferrous metals to close dimensions, take light cuts. ★ ★ ★

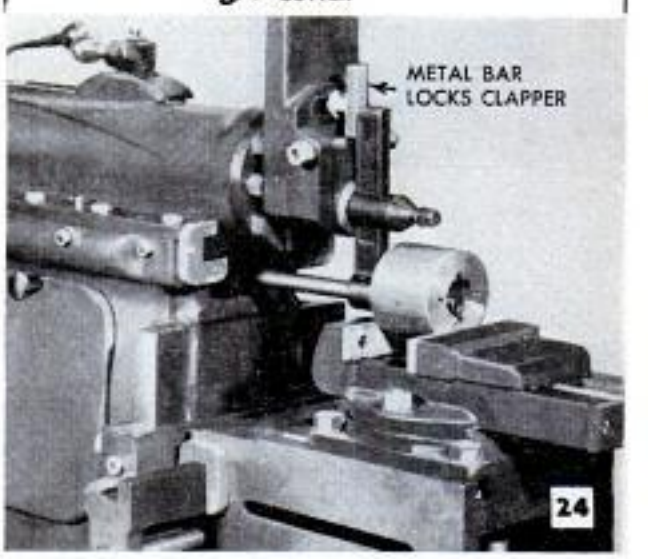


Cutting tools used in shaper are similar to lathe cutting tools. Reversed position of holder, above left, is often useful when making finishing cuts

Internal cuts require extension bar and holder similar to that used in lathe. Typical setups are shown in lower photos. Note metal bar locking the clapper







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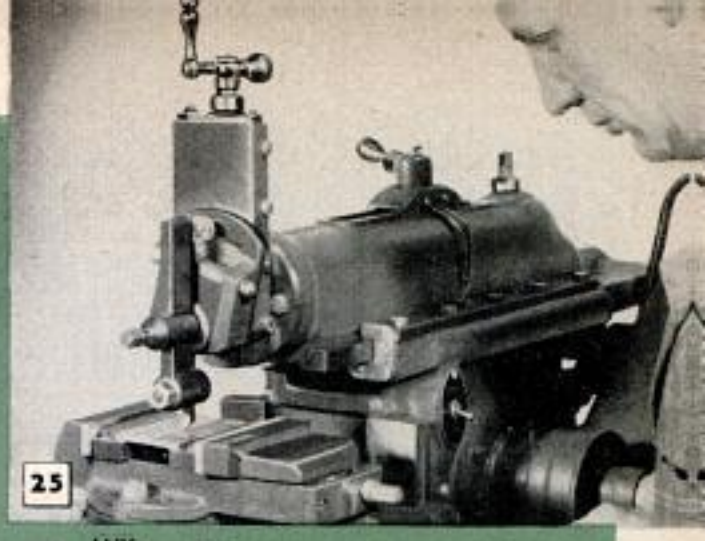
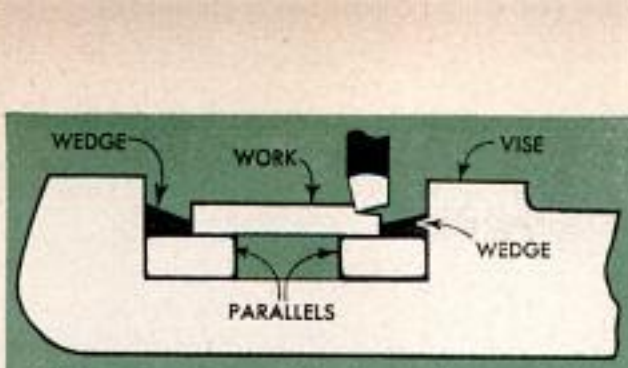
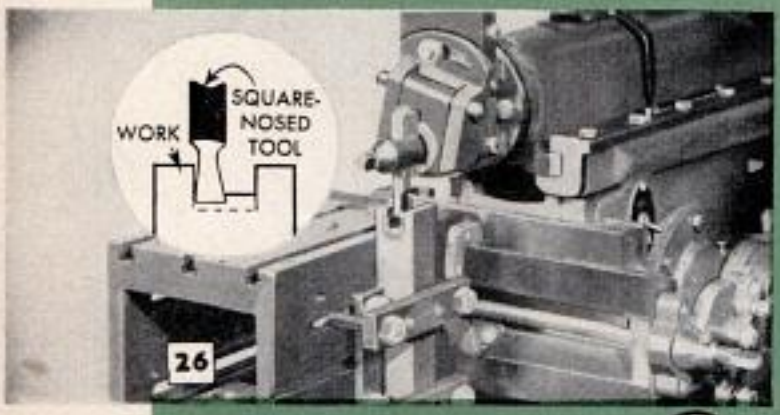
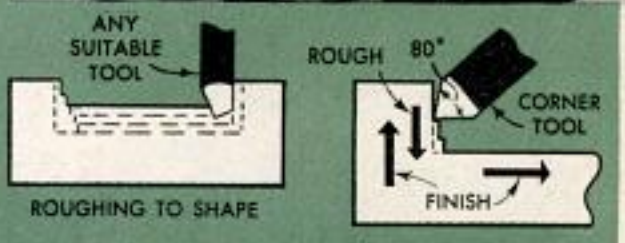


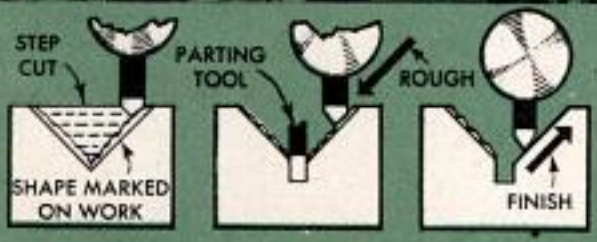


Thin work is mounted in vise with wedge blocks having one edge thinner than work for clearance. Direct mounting on machine table is practical. Plywood base is used under work to permit edge cuts

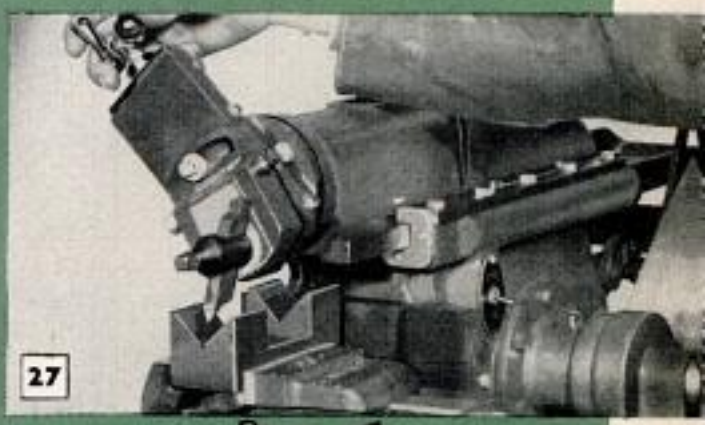


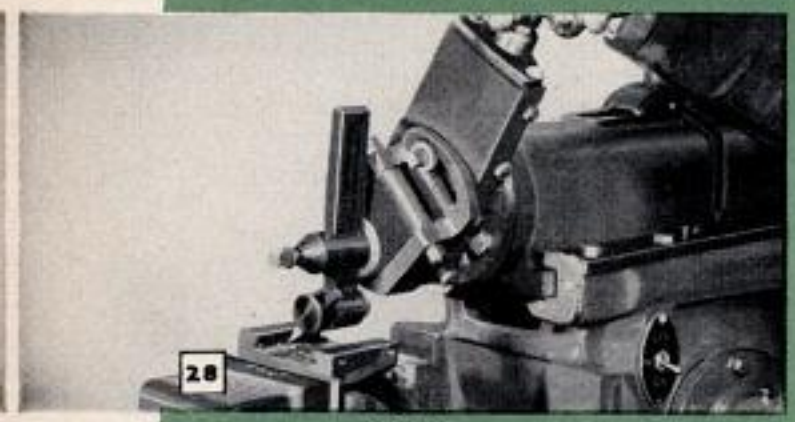


Right-angle corner is worked with square-nosed or corner tool. With edge slightly inclined tool will cut a very smooth surface with upfeed. Use down feed for the roughing cuts



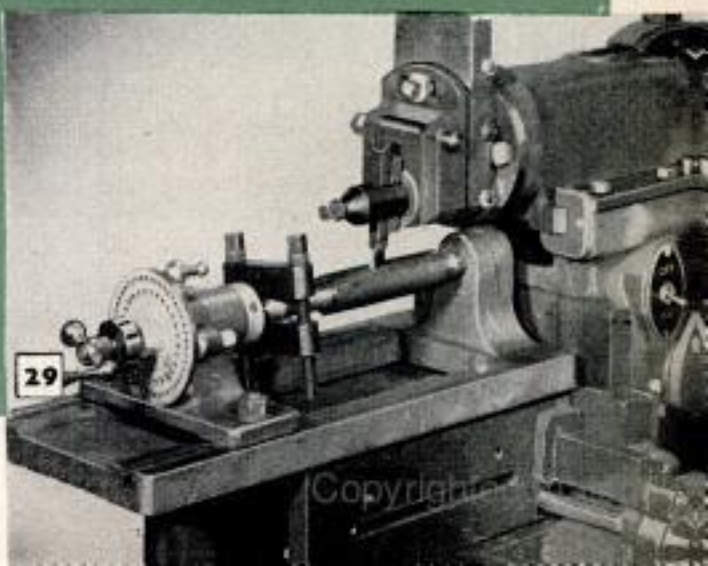
A V-block is cut with the swiveling toolhead set at 45 deg. Work can be reversed in vise to finish second side rather than swinging toolhead. Automatic feed is used for roughing cuts





Dovetailing usually requires 60-deg. angle of swiveling head and is cut with tool ground to 50 deg. Roughing is done with forward edge of tool and finishing cuts are made with the side

Keyways are cut with square-nosed tools. Blind ends require drilled holes for clearance. Heel of tool, A, may require grinding to clear. Reversed toolholder helps to prevent chattering



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Novel Blueprint Lamp Shade For Den or Workshop

An old blueprint, perhaps of your own house, makes an attractive lamp-shade covering for a man's den or workshop. Use the type of shade that has the top and bottom loops fastened together with corner wires. Strip off the old shade, use it for a pattern and cut the new cover from the blueprint. It can be fastened to the frame with glue or cellulose tape.

L. C. Auer, La Porte, Tex.

Glass Cover Protects Price List

When price lists or buyers' quotations must be kept outdoors or on an open warehouse scale, they can be protected from weather and dirt by a glass cover. Ordinary adhesive tape is used to hinge the glass and form a tab, so the glass can be lifted to change lists.

Pipe-Joint Sealing Compounds

A knowledge of the various kinds of commonly used pipe-joint compounds will aid in using the correct type for a specific job. White lead, carbonate of lead ground in boiled linseed oil, is durable, but should be given sufficient time to harden properly. Red lead, oxide of lead ground in boiled linseed oil, hardens quickly and is preferred where pressure is to be applied soon after the pipe fitting is finished. Red lead is not as durable as white lead. A graphite compound is excellent on brass piping. Its low coefficient of friction allows the joints to be made up more tightly and aids the natural seating properties of brass. Litharge is lead monoxide, made by heating lead in a current of air and is a quick-setting compound, useful for higher pressure installations. It is used in several mixtures for application on poorly fitted joints where extreme service conditions are expected.

W. F. Schaphorst, Newark, N. J.

Pressman's Nonslip Finger Cot Is Worn Without Discomfort

Pressmen operating platen-type presses often improvise a friction finger cot from a narrow strip of sandpaper and a rubber band to facilitate lifting printed sheets from the press. Although efficient for the purpose, such a cot often causes marked discomfort after a short period of use due to the necessary tension of the rubber band. This problem is easily solved by utilizing a finger band cut from a plastic thimble of a size to fit the middle finger loosely. In use the strip of sandpaper is looped over the end of finger and the plastic ring pressed lightly over it. The sandpaper does not smear type impressions when lifting sheets from the press, and the cot can be worn for long periods without discomfort.

Clock Spring Renews Oil Can

When the bottom of an oil can has lost its tension and will no longer snap back when depressed, it can be renewed by using a length of heavy clock spring. A small bracket is shaped from sheet metal and soldered to the bottom of the can. A length of clock spring, measured to fit across the bottom of the can, is cut by bending sharply and then slipped under the bracket.

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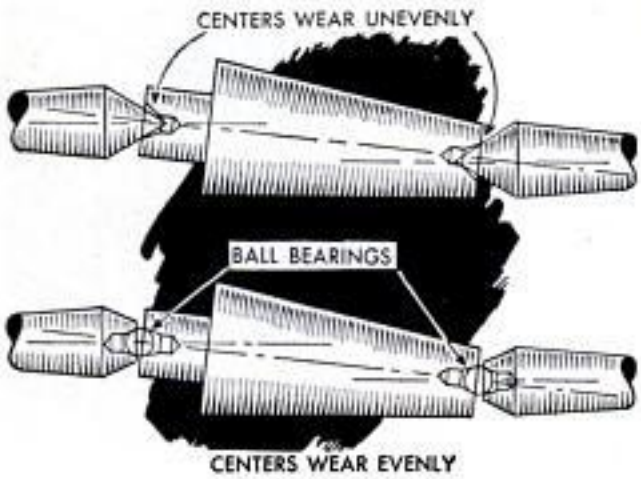
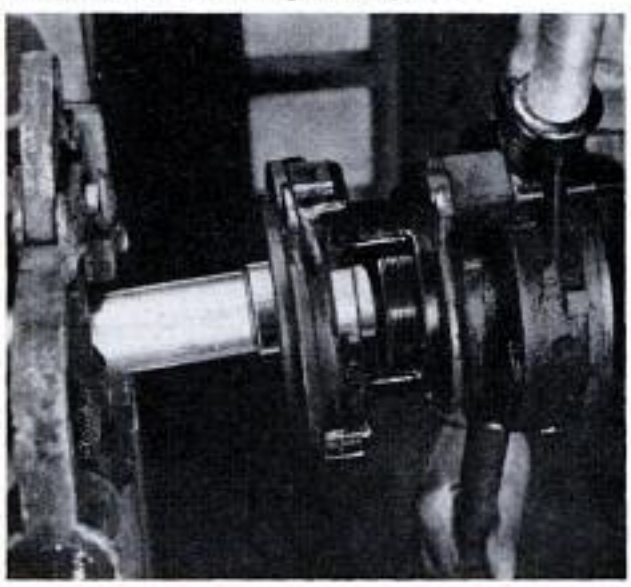
Work Mounted on Steel Balls Prevents Wear of Centers

Where necessary to taper-turn stock with an extreme setover of the tailstock on a metal-turning lathe, one machinist mounts the work on steel balls as shown, to prevent wearing and scoring of the centers. This is done by grinding off the points of two live centers (not heat-treated), and then center-drilling the ends with the same center drill as the one to be used for the work.—Milton Wittner, Brooklyn, N. Y.



Coupling and Extension Help Thread Short Pipe Nipples



To thread a pipe nipple which you know will be too short to be held in a vise for threading, use the method shown. Thread one end of a piece of pipe and cut the nipple to length. Screw this into a coupling, which is in turn screwed onto a piece of pipe long enough to be held in the vise. From this point thread the nipple in the usual way. In the illustration shown, the collar of the ratchet is set over the coupling to get the threading close enough to cut a full thread.—Michael Ligocki, Gary, Ind.

Gate Speeds Up Stock Handling

In order to speed up handling and shipping of livestock, one farmer installed a two-way gate leading to his loading chute that could be swung to close either of two adjacent pens. The loading chute is permanently located in the feed lot and centered on a line with the gate. I-beams salvaged from an old platform scale were set vertically in concrete and the side boards of the chute were bolted to the flanges. The chute floor can be adjusted to equal the height of the particular truck bed and is swung up when not in use.

Arthur Trauffer, Mt. Pleasant, Iowa.

Masking Tape Covering Can Rim Prevents Filling With Paint

If you dislike having paint collect on the can rim, and perhaps run down the sides, cover the rim with a strip of tape as indicated. Masking tape is best for this purpose, but any tape that will adhere to the can may be used. If tape is not available, try using a strip of aluminum foil, crimping it down over the rim on both sides of the can. When replacing lid, remove tape or foil.

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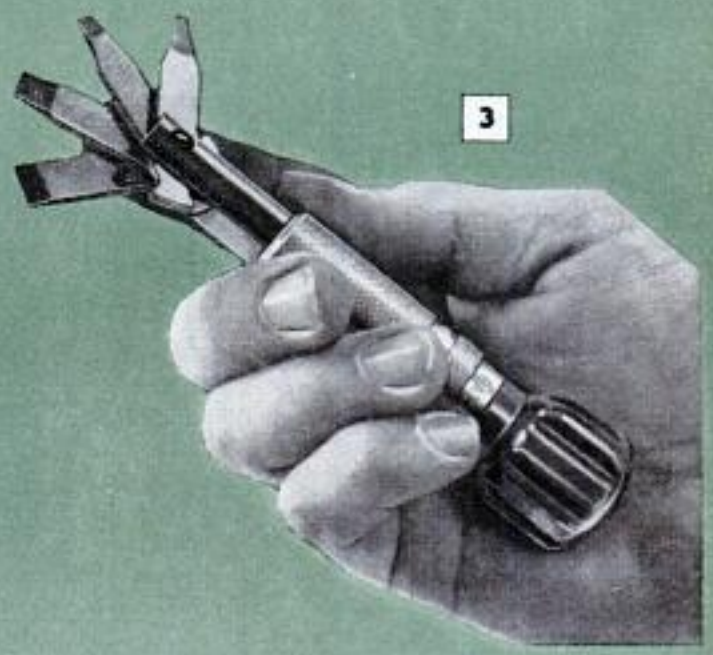
SHOPPING FOR TOOLS

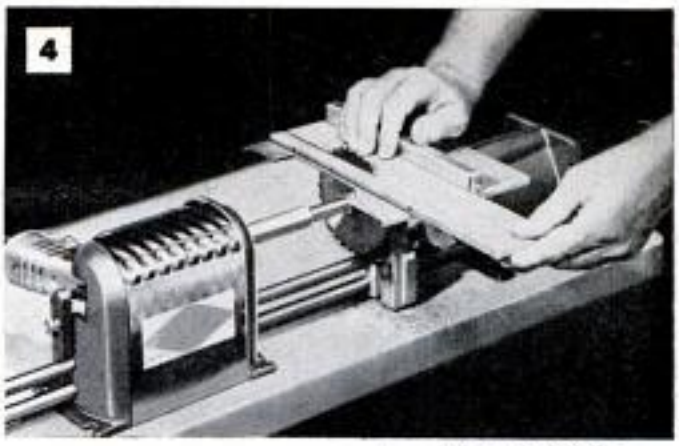
1. TABLE-TOP WORKSHOP is powered by a portable electric drill of ¼-in. capacity. Shop includes lathe, circular saw, disk and drum sander, vertical drill press, horizontal drill and router-shaper. A jigsaw is available as an accessory. Compact design enables owner to work in limited space—the whole unit sets up ready for work on a kitchen table or small workbench. A simple change of parts converts the unit to a lathe, circular saw, or vertical drill press. When set up as a lathe it has a capacity of 24 in. between centers

2. ELECTRIC CUTTER for plastic tile makes clean, sharp cuts, either curved or straight. Cutting point, or "chisel," is hook shaped, is electrically heated and easily manipulated in much the same manner as a pencil. Unit also is supplied with special welding points for welding the tile joints after placement

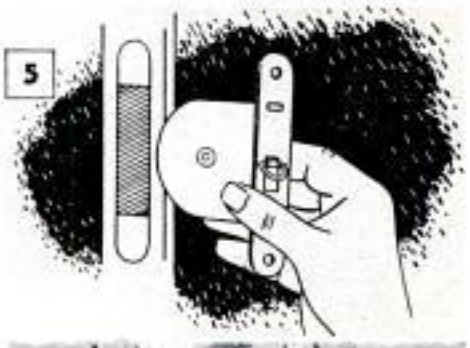
3. SCREWDRIVER has four swiveling blades pivoted in a sliding shank. Blades nest into a slot in the shank in such a way that when the latter is pressed back into the handle none of the blades project and tool is reduced in length so that it is easily carried in the pocket. Driving bits fit four sizes of screw slots



4. PORTABLE ELECTRIC DRILL powers this combination unit which converts to lathe, grinder, sander-polisher, vertical drill press and circular saw. Performs all the common woodworking operations on stock of small dimensions with an ease and speed that outstrips handwork and gives greater accuracy



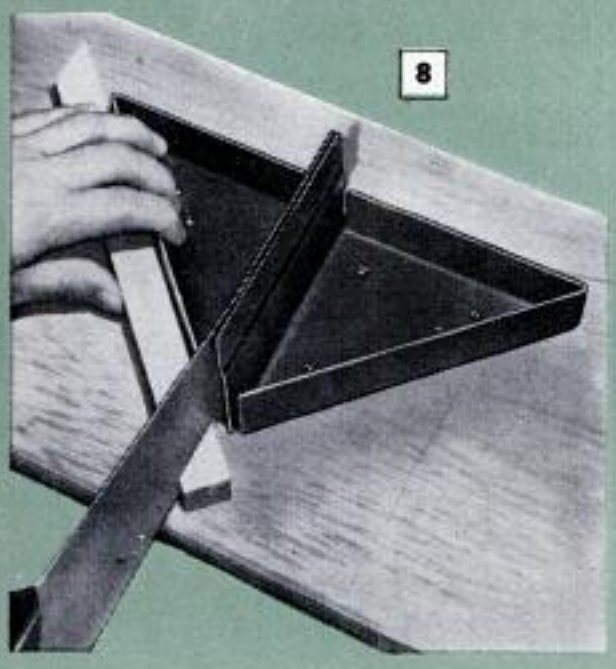
5. SPRING SASH BALANCES designed for easy installation enable the homeowner to replace sash cords with modern spring balances with a minimum of time and effort. Remove old pulley and slip new spring unit in its place, fastening it with screws furnished. Then attach tape to sash with bracket



6. CAM-ACTION SCREWDRIVER is fitted with a cross pin near the upper end of blade. Pin engages V-notches formed at lower end of handle. In use, driver is placed in screw slot and handle is turned slightly so that pin engages sides of V-notch. Hammer blow on handle tightens or loosens screw

7. TUNING-SLUG RETRIEVER has nonmagnetized holder which enables TV repairmen to withdraw slug without removing chassis. When contact is made with screw slot in slug, pressure on handle of tool seats locking pin, enabling operator to withdraw slug and relocate it in proper tuning position

8. MITER BOX for carpenters and hobbyists consists of two triangular members formed from heavy-gauge steel. One extended side on each member has a die-formed offset, the two sides forming a guide for the saw blade when the two parts are screwed to a board or bench top as shown in photo



9. LUBRICATING KIT contains applicators designed to reach tiny bearings with either oil or grease. Three pencil-size "guns" are supplied, two for light oils, one for grease and also an adaptor which may be screwed onto tubes of cement, glue, grease or other materials for application to small parts

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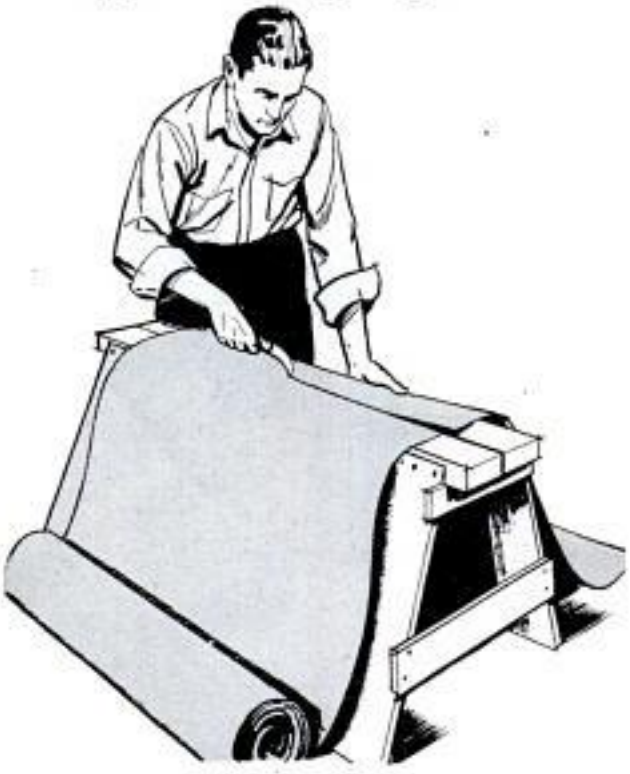
Grooved Sawhorse Permits Easy Cutting of Building Paper

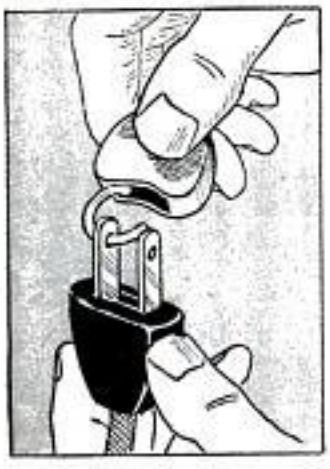


One contractor found that a deep groove, cut lengthwise in the top of a sawhorse, would speed up the job of cutting building paper. The heavy paper, used over sheathing and subflooring, is unrolled and measured to length. Then it is pulled over the sawhorse and cut. The groove holds the knife to a straight line and assures a complete cut with one stroke.

New Life for Socket Wrenches

If a socket wrench wears so that it rotates on a nut, grind down the end of the socket to remove the worn portion. The recess in most socket wrenches is deep enough to permit this to be done several times and yet still handle most types of work.—Carleton Phillips, Corning, N. Y.

Padlock Tool-Cord Plug



To prevent the unauthorized use of special power tools and appliances which could not be locked up, one shop foreman used a small padlock on one of the blades of the power plug. The padlocks can be purchased at most hardware and dime stores. If the blades are solid, a small hole can be drilled to receive the loop of the padlock.

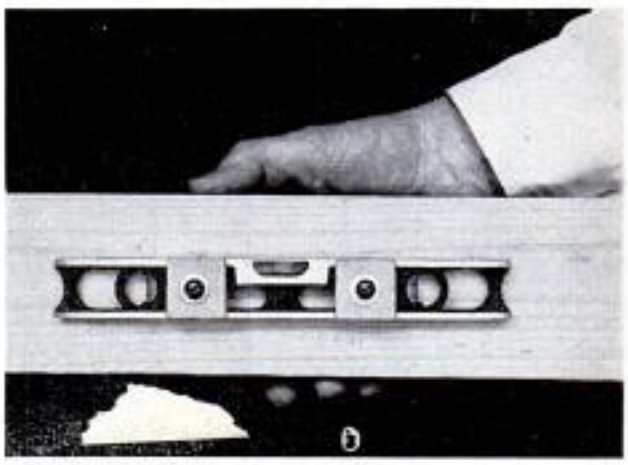
P. M. Ohlinger, Portsmouth, Iowa.

Heavy Iron Floor Stand Steadies Farm Grinder

To reduce vibration and minimize the tendency of a heavy grinder to "walk" on uneven floors, one farmer mounted the grinder arbor on a cast-iron floor stand salvaged from an old cream separator. The stand was bolted to two short hardwood planks which serve as skids and provide additional stability. The grinder arbor was bolted to the mounting pad at the top of the stand and the motor mounted below the head as pictured, the drive being through a V-belt and pulleys. The motor mount pivots on one bolt, so the weight of the motor maintains uniform tension on the belt. A flat pulley attached to the outer end of the grinder arbor permits the unit to be driven by a tractor for sickle grinding or other work where electric current is not available.—A. M. Wettach, Mt. Pleasant, Iowa.

Long Level Improvised From Straightedge

In truing-up fairly long pieces of work, as in form leveling and general remodeling, a level 4 to 6 ft. long is, in many cases, almost a necessity. One can be improvised by attaching a regular 2-ft. level to the side of a 1 x 4 straightedge of hard or soft wood. In fastening the level to the straightedge, it is important to set the level true with the straightedge. The level is fastened to the center with two wooden cleats.



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RADIO Television ELECTRONICS

TV and ELECTRONICS TODAY

SAILORS who built ship models in glass bottles would have qualified today for painting the electrical conductive coating inside large television picture tubes. The General Electric worker in photo A is using a knuckle-handled brush which slides through the neck of the tube and then bends to apply the conductive coating. The technician needs less than two minutes to coat a 21-in. tube.

TV-antenna arrays are now designed for trailers. The one shown in photo B provides the mobile homeowner with a permanent installation which is ready for use at any time. When the trailer is to go on the road, the Trailer-Tenna can be lowered and anchored 2 in. above the trailer roof. Mounted on a telescopic mast, the antenna may be elevated to 7 ft. above the coach top, practically one minute after the parking area is reached.

Using a tape 3 in. wide, the magnetic recorder, photo C now available for commercial use provides continuous recording for periods up to 48 hr. It is expected that it will be employed for radio-program monitoring, police-broadcast and fire-alarm recording. Automatic in operation and unattended, it sounds a buzzer when the tape nears its end.

Personal TV listening is demonstrated in photo D. An ear-type speaker device on a thin 25-ft. cable enables the wearer to view TV and listen to the program on any TV set without disturbing others in the room who prefer to read, sleep or study.

A

B

C

D

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SUPER-FIDELITY HOME PHONO

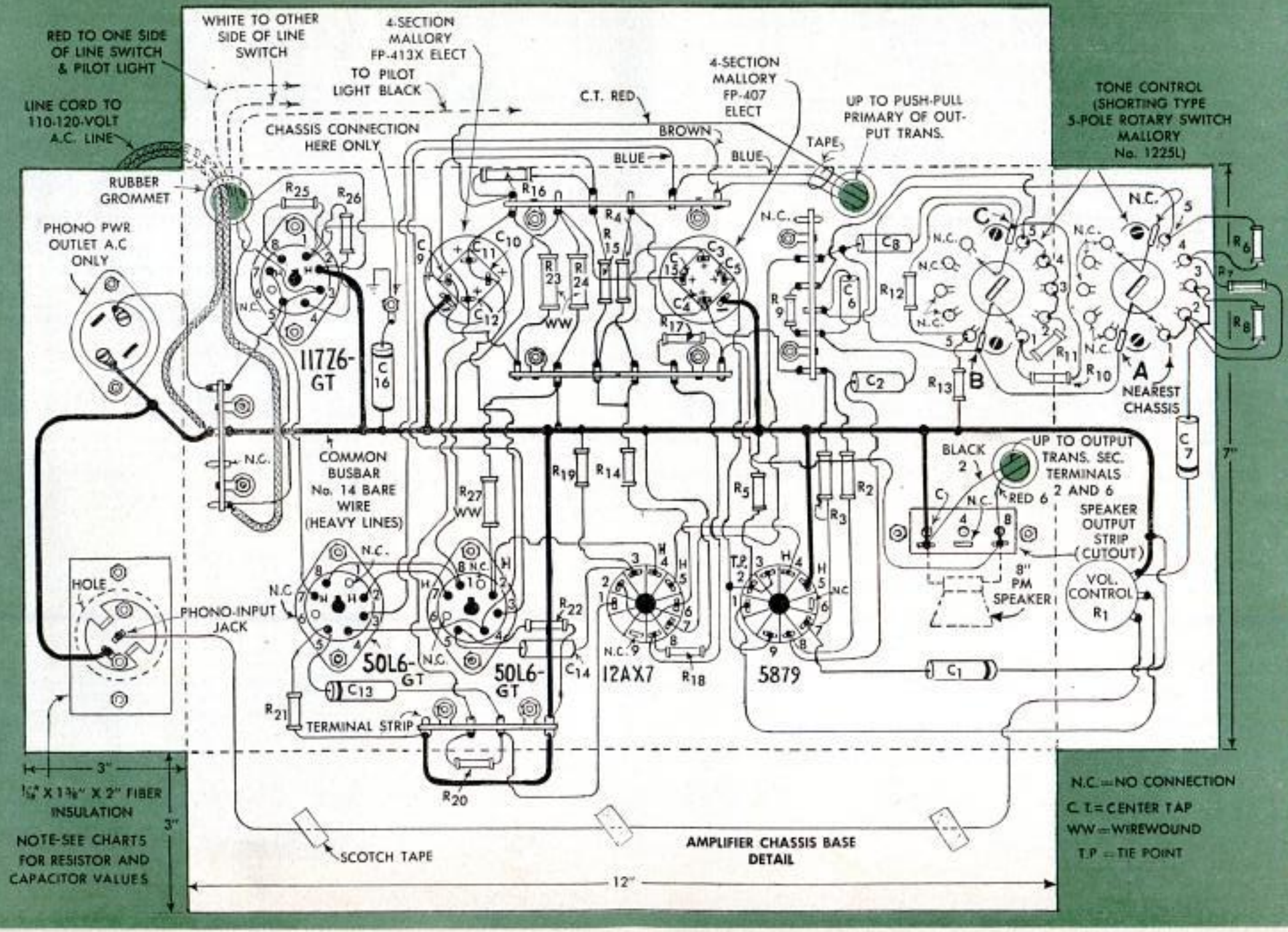


FIG. 1

HAS BACK-LOADED CABINET...

By Dr. Richard C. Hitchcock

ANSWERING numerous requests for a complete phono system using the super-fidelity principle employed in former *Popular Mechanics* construction articles, this easy-to-build circuit has push-pull output tubes, negative feedback and low distortion at 2 watts output. The tone control is especially versatile and the cabinet is designed so that almost all of the audio energy of the massive 8-in. extended-range PM speaker is actively used. The treble tones come by direct radiation and the bass tones are back-loaded. This feature increases the sound output to more than twice that obtained from enclosed speaker boxes. No sound-absorbing material is used, or needed, in the structure.

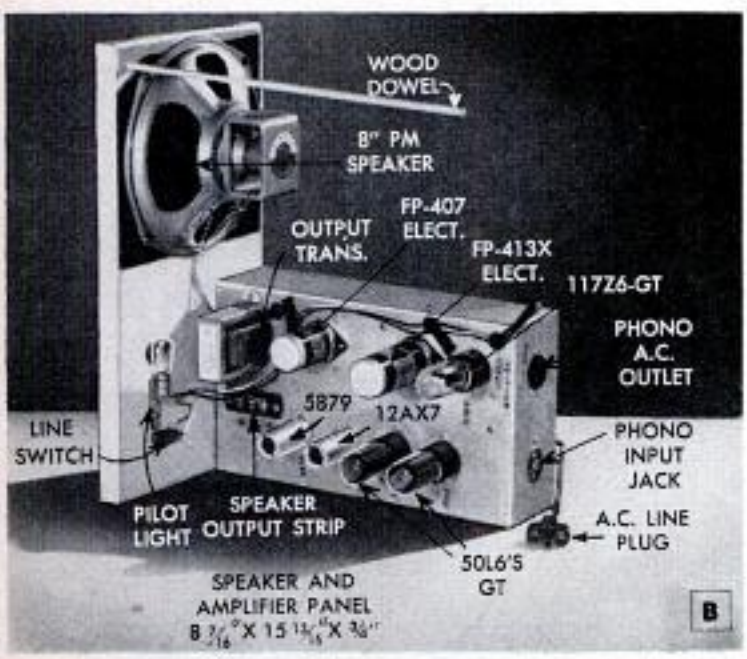
This phonograph can be used on a low table or it can sit on the floor as shown in photo A. The height with the lid closed is 26 in., width 17 in., depth 15 in. Made of birch plywood, the complete unit weighs 40 pounds. Using white-pine plywood, it is 30 pounds. The speaker and amplifier are mounted on a single panel as shown in photos B and C. This is easily removed for access to the underside of the amplifier chassis, but all tubes can be changed by

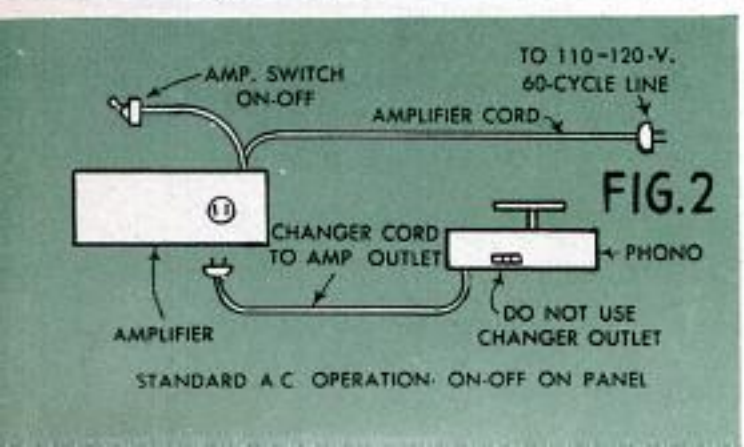
RESISTORS

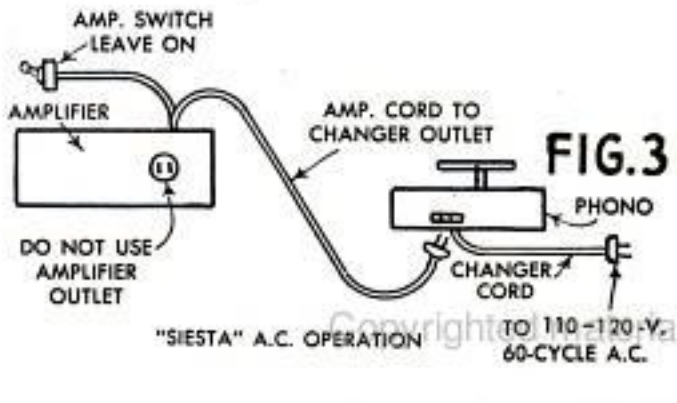
1—½-MEGOHM (LOGARITHMIC) VOLUME CONTROL PQ-TYPE, IRC OR SIMILAR
2—100,000-OHM, ½-WATT CARBON (R2, R9)*
4—220,000-OHM, ½-WATT CARBON (R3, R6, R7, R8)*
1—10,000-OHM, 1-WATT CARBON (R4)*
1—2,200-OHM, ½-WATT CARBON (R5)*
2—270,000-OHM, ½-WATT CARBON (R10, R11)*
1—10,000-OHM, ½-WATT CARBON (R12)*
2—4,700-OHM, ½-WATT CARBON (R13, R18)*
1—330,000-OHM, ½-WATT CARBON (R14)*
2—4,700-OHM, 1-WATT CARBON (R15, R16)*
1—15,000-OHM, ½-WATT (R17)*
2—100,000-OHM, ½-WATT CARBON (R19, R20) (MATCHED OR 1% CARBON)
2—470,000-OHM, ½-WATT CARBON (R21, R22)*
2—100-OHM, 5-WATT WIREWOUND (WW) (R23, R24)
1—2,000-OHM, 5-WATT WIREWOUND (WW) (R27)
2—47-OHM, ½-WATT CARBON (R25, R26)
NOTE — * 10% INSULATED-TYPE RESISTORS

CAPACITORS

1—0.1 MFD. 200-V. PAPER TYPE (C1)
5—.05 MFD. 400-V. PAPER TYPE (C2, C8, C13, C14, C16)
1—MALLORY 4-SECTION ELECTROLYTIC TYPE FP-407, 30-MFD. 150-V; 20/20 MFD. 150-V.; 200-MFD. 10-V. (C3).....(C4 & C5).....(C15).....
1—.001 MFD. 600-V. PAPER TYPE (C6)
1—.01 MFD. 400-V. PAPER TYPE (C7)
1—MALLORY 4-SECTION ELECTROLYTIC TYPE FP-413X 40 MFD. 450-V.; 40/40 MFD. 300-V.; 20-MFD. 150-V. (C9).....(C10 & C11).....(C12).....







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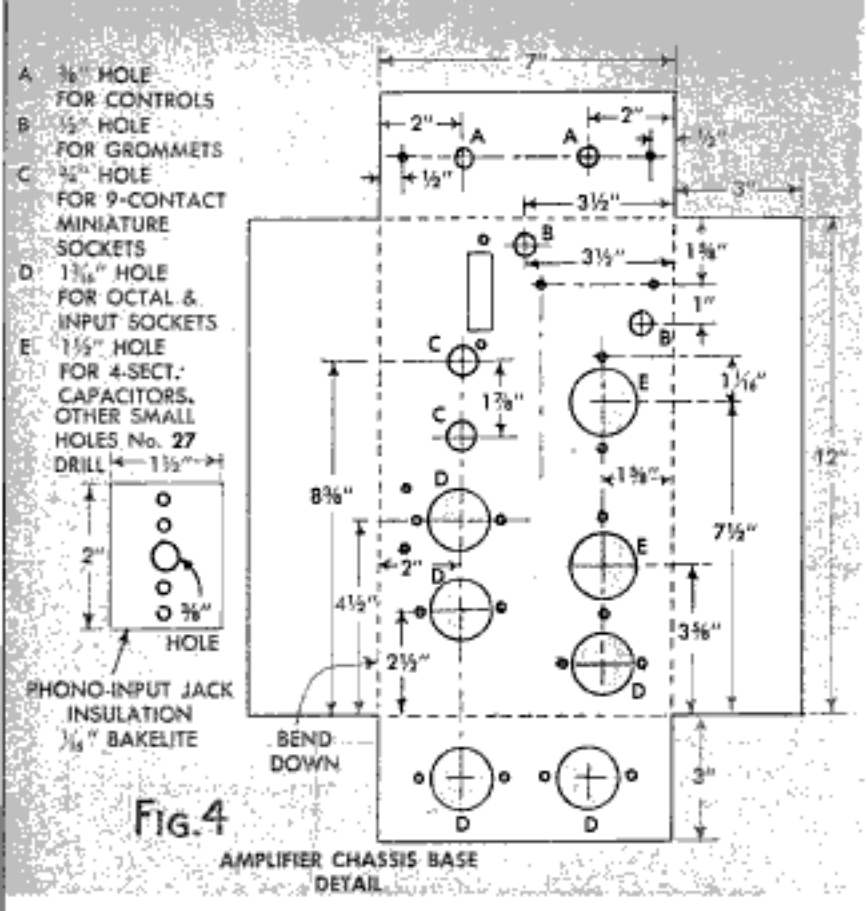
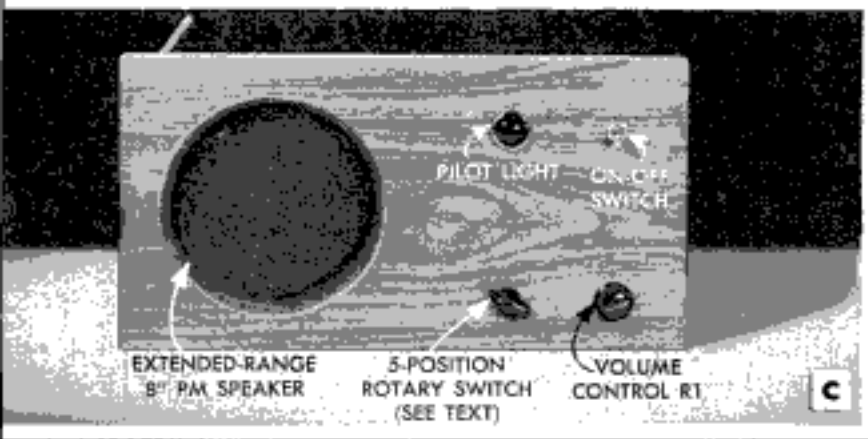


FIG. 4
AMPLIFIER CHASSIS BASE DETAIL



reaching in at the back, as illustrated in photo E.

At 2-watts output the intermodulation output of the amplifier is only 2.8%. An expert can just about detect 5% intermodulation distortion. The tone control has 5 steps: No. 1 is standard bass and standard treble (high fidelity). No. 2 provides bass boost and standard treble; No. 3 bass boost and treble cut (juke-box effect). Step No. 4 will, in most cases, be the favorite as it provides bass boost and treble boost (super-fidelity). No. 5 step is a brand new feature, it provides bass boost, treble boost, plus a cut in middle tones. This is the "conversation" setting. When trying to talk, the loud playing of a phonograph is often annoying. With step No. 5, not only the low and high tones are retained, the middle tones that interfere with conversation are reduced. This is a very desirable feature, one that you will enjoy.

The pictorial wiring diagram, Fig. 1, will aid the inexperienced builder; however, both this diagram and the schematic circuit diagram, Fig. 5, should be checked as the wiring progresses in order to avoid errors. Both diagrams match in every detail. Four audio tubes and a rectifier tube are used. The push-pull output tubes are

(Continued to page 280)

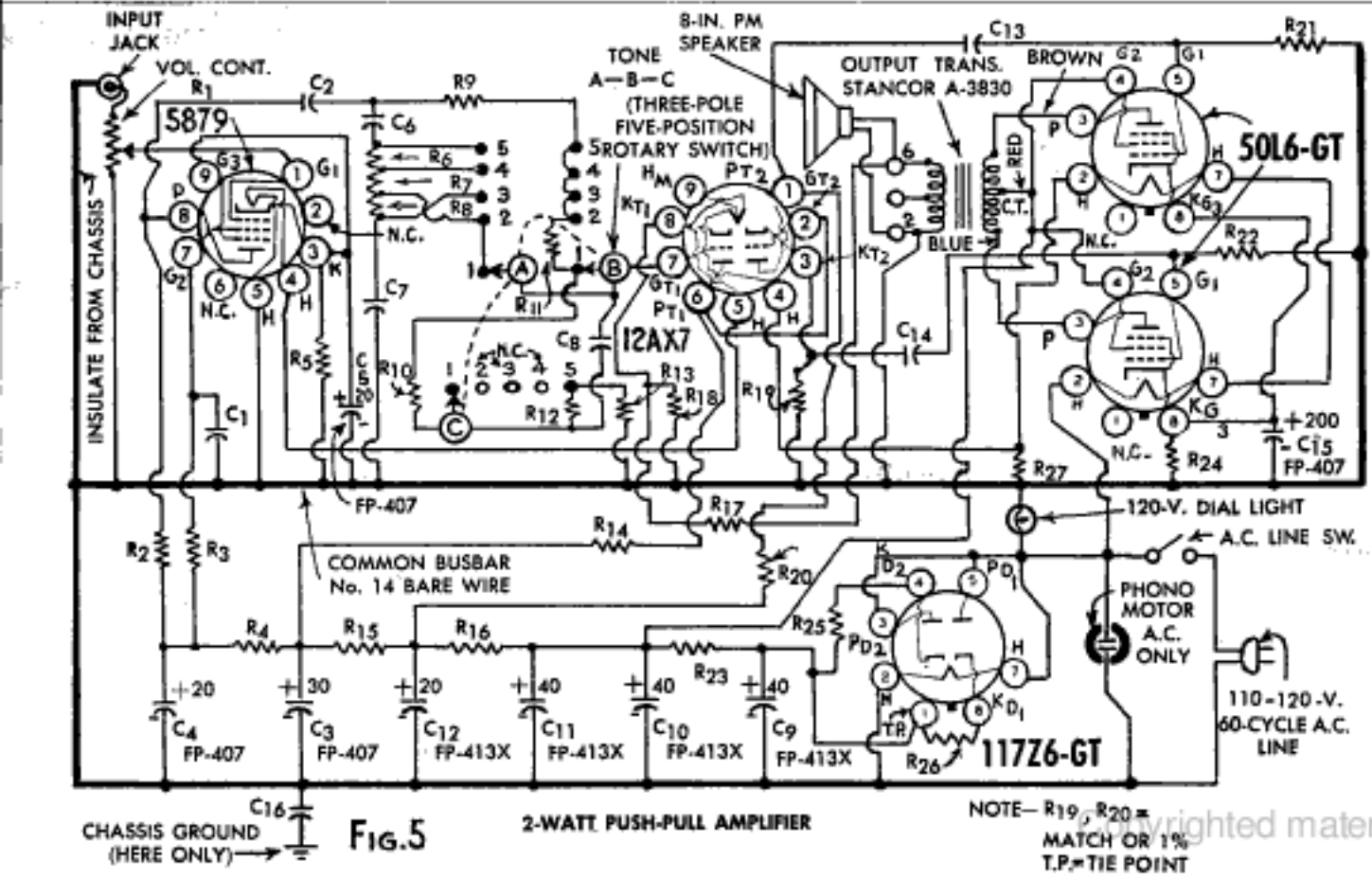


FIG. 5
2-WATT PUSH-PULL AMPLIFIER

NOTE— R19, R20 = MATCH OR 1%
T.P.=TIE POINT

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One sign, one name,

identifies the right parts for your Plymouth, Dodge, De Soto, Chrysler, Dodge Truck

The MOPAR sign means genuine Chrysler Corporation parts and accessories

Chrysler Corporation provides parts and accessories for all its cars and trucks under one name—MoPar. This name is your assurance of getting parts that fit right, work right, last longer and give greater satisfaction. That is because all MoPar parts are precisely like parts for new cars and trucks—designed by the same Chrysler Corporation engineers, to meet the same high standards.

You can get any MoPar parts you need from thousands of Plymouth, Dodge, De Soto and Chrysler dealers and from many general service and repair shops. Look for the MoPar sign—always ask for MoPar parts. It pays to be *right!*

PARTS DIVISION

CHRYSLER CORPORATION

DETROIT 31, MICHIGAN

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B-C Flash makes sure he gets the picture

B-C stands for battery-condenser. You know what a battery is, of course. *But why the condenser?*

First, let's assume that most of your flash pictures have come out great. But perhaps occasionally a few were *under-exposed* (or didn't come out at all). A weak battery most likely was the cause. It was just weak enough to fire the lamp a fraction late (or not at all, after a few shots had momentarily drained it).

Now—to avoid such possible waste of bulbs and pictures, a *condenser* is substituted for one of the batteries. With this dependable Battery-Condenser system the battery itself doesn't fire the lamp. What the battery does is to feed power to the condenser. The condenser stores the power . . . always a *full charge* of power . . . and it is the condenser that fires the lamp at just the right instant.

The battery can even become weak: yet you'll get your flash picture. Because the power stored in the condenser does the firing, the battery can be used for a much longer time. B-C is extra-dependable, extra-economical flash. It's a system you'll want to own, whether you've taken flash pictures before or are just about to start.

On the opposite page you see the latest Kodak B-C flash equipment. Your dealer will be glad to demonstrate the advantages of B-C. Be sure to see him soon. Make him headquarters for all your photo needs.

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NOW... an economical Kodak B-C Flasholder—$9.95

You get all these advantages . . . in a dependable B-C unit that fits most cameras with built-in flash shutters:

50% more light—New Lumaclad reflector allows you to stand back further, get more subject in picture.

Sturdy hand grip—Popular press-type, easy to grasp. Adjustable bracket quickly attached (or removed for off-camera shots).

Special lighting easy—Flasholder has connector for multiple lighting with one or two Extension Units (see below).

Cheap operation—Uses low-cost midget lamps in standard sizes: SM, SF, Nos. 5, 5B, 25, and 25B.

Easy-to-use lamp ejector—Simply press release, lamp pops out.

Handy exposure guide—On back of reflector, right before your eyes.

2-Way Flashguard included—Slips over reflector, gives either normal or "soft" light.

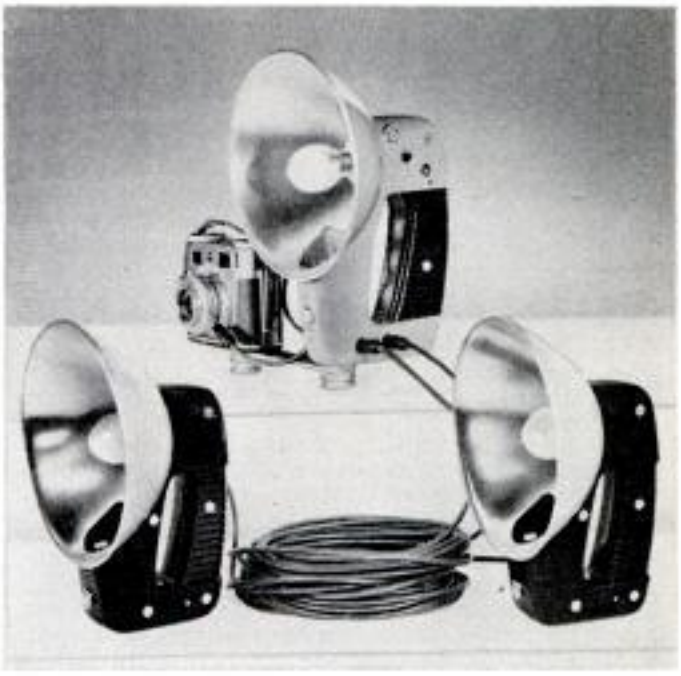
Special adapters available—For attaching Flasholder's ASA-bayonet connection to other type flash connectors.

Flasholder also available in Standard model without B-C. Uses "C" batteries; accepts B-C Flashpack (see below). $7.95.

For super-versatility with Kodak B-C Flash

The Kodak Ektalux Flasholder fits most press-type and roll-film cameras. Here it's shown at right with 2 extension units—used for special lighting effects (takes up to 6 units).

The Ektalux gives you many exclusive features: quick loading and ejecting for both midget and medium-base lamps . . . two-way focus of midget lamps for uniform or concentrated light . . . convenient exposure guide . . . comfortable pistol grip. You can trip camera shutter from the Flasholder—or convert non-flash shutters. The Ektalux (with magnesium die-cast body) is durable but light; easy to pack (reflector removable). Flasholder with standard bracket, $29.75.



Take large-area pictures—Kodak Flasholder Extension Unit, complete with Lumaclad reflector and 20-foot cord, gives extra light to cover large areas. **$11.00.**

Convert other flash units—Kodak B-C Flashpack replaces two "C" batteries (end-to-end type), converting to dependable battery-condenser power. **$2.95.**

Flash shots with simple cameras—Kodalite Flasholder for Brownie Hawkeye Camera has Lumaclad reflector. **$4.00.** Your dealer has other inexpensive Flasholders, too.

Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

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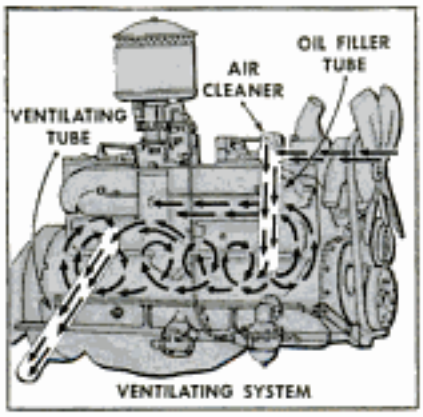
Care and Feeding of Engines

BY S. P. CORP

COLD WEATHER OIL CARE

Winter's shorter trips and slower speeds tend to keep down engine temperature. The engine doesn't get hot enough to vaporize water that has formed in the crankcase, and so sludge accumulates. Change oil more often, and be sure to check the ventilating system of the engine.



VENTILATING SYSTEM

Remove and clean the ventilating cap at the top of the oil filler tube, using kerosene to remove all dust and foreign matter which might obstruct free movement of air into the engine. There is also a ventilator tube at the rear of the engine, extending down below the engine and visible from under the car. Remove the clamp or bolt at the top of this tube, clean tube, and look to be sure it is not bent or damaged.

Proper ventilation depends on correct engine operating temperature. Therefore it is important to see that the gauge on your instrument panel shows 160 to 180 degrees. By warming the engine up to this temperature before starting out in cold weather, you will help keep condensation from forming in the crankcase.

FOR EASIER STARTING

Dirty batteries cause hard starting. Clean any white sulphate from connections by brushing with an ammonia or soda solution, washing battery with clean water after foaming has stopped. To delay further corrosion, spray battery terminals with Sealed Power Dry Film Lubricant. Be sure that water is above plates in each cell, then check charge with a hydrometer. All cells should read between 1.275 and 1.300. If all are down to 1.225, battery needs charging. If one cell is down more than .025 points, you may need a new battery. An open circuit voltage tester across the two terminals should read 6 volts plus.

WRITE FOR FREE BOOKLET

Insist on Sealed Power KromeX Ring Sets, with the famous MD-50 Steel Oil Ring, the only ring with the Full-Flow Spring. Invest two cents in a postal card to ask for your free copy of "MORE POWER, Less Gas, Less Oil." It may save you a lot of money. Address Sealed Power, Dept. G-2, Muskegon, Mich.

Clinic for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Waterproofing Wall

Q—I'm having trouble with water seepage through the concrete-block walls of my basement. The house is built in a low place from which there seems to be no natural drainage. Water comes through the wall only, not through the floor. Should I try an inside waterproofer or apply it to the outside of the wall?—C. C., Ga.

A—Judging from your description the problem seems to have no simple or inexpensive solution. Your question implies that the wall has not been waterproofed either inside or out and that there is no drainage tile at the footings. If this is correct, then it would seem the only procedure offering any possibility of a permanent solution is to dig down along the outside walls to the bottom of the footings and install draintile leading to a lower outlet, even though this requires ditching to a considerable distance from the building. After laying the tile, the wall should be waterproofed with cement plaster, or better, an asphalt impregnated membrane consisting of two layers of special felt mopped onto the walls with hot asphalt with the edges overlapped at least 4 in. Finish up with a final coat of hot asphalt mopped or sprayed on the surface. The lower edges of the membrane should extend to the bottom of the footing. There is one alternative which sometimes proves satisfactory. This is to lead the drain tile to what is known as a "dry well." In this case the well would have to be dug to a depth at least 4 ft. below the level of the drain tile. Ordinarily, dry wells are dug about 3 ft. in dia. and from 3 to 10 ft. in depth and filled with medium to coarse gravel or crushed stone. After filling, the top of the well is capped to prevent the entrance of surface soil and debris. However, we are doubtful if dry-well drainage would prove satisfactory in your case.

Filling Concrete Blocks

Q—I'm planning to build my own home and thought I would build the basement walls of concrete blocks to avoid the use of forms. I'm thinking also of filling the openings in the blocks with concrete as they are laid up. What is your opinion of this procedure? — V. R., New Hampshire

A—Yours is a rather novel idea, although, of course, the procedure is not unknown in building

(Continued to page 254)

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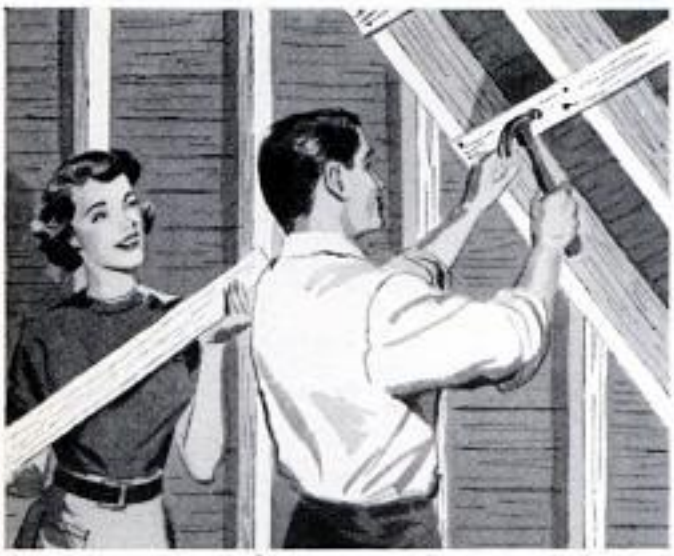
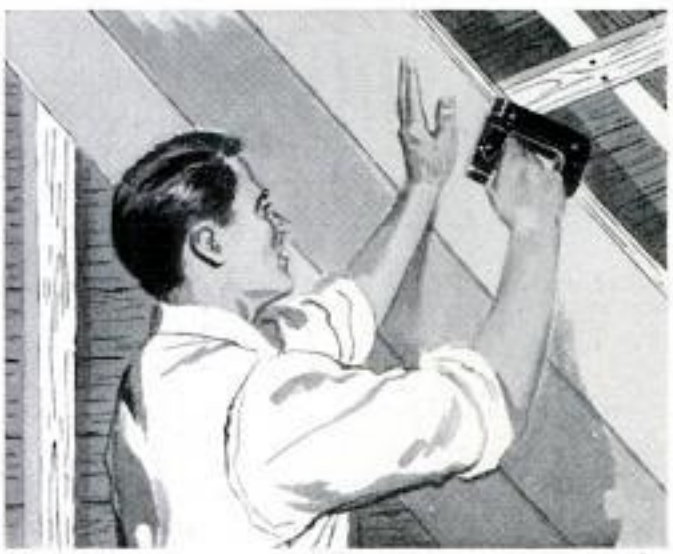
It's easy, inexpensive to fix up your attic with Armstrong's Temlok

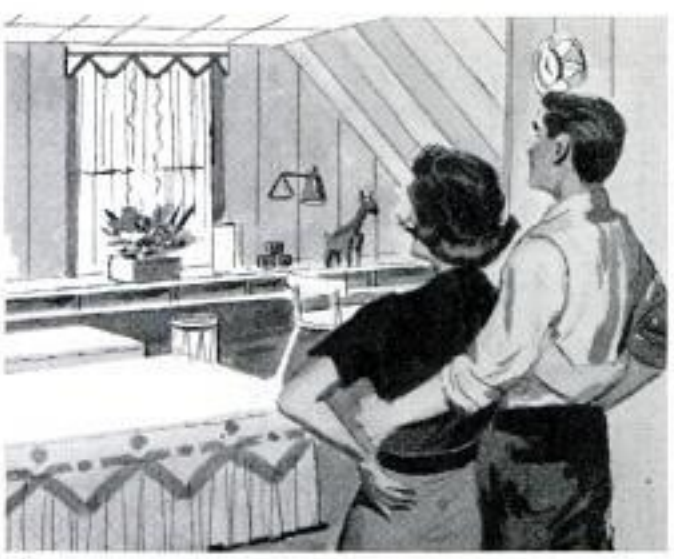


1. You can turn a dark, dusty attic into a cheerful bedroom in a few days with Temlok Tile and Plank. Temlok is a durable, inexpensive wood fiber material that builds, decorates, and insulates. First, nail 1"x3" furring on 12" centers to all framing members.

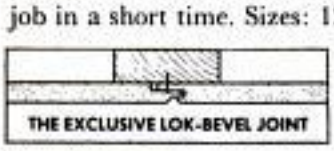


2. Walls go up fast with Temlok Plank. The smooth, long planks are easy to handle. Temlok's exclusive Lok-Bevel Joint makes nailing or stapling extra fast. Planks come pre-finished in "Suntan Blend," a random coloring. Sizes: 8", 12", 16" wide; up to 12' long.

3. Ceilings no problem with Temlok Tile. Comes factory painted in Snow White and Light Ivory . . . gives ceiling high light reflection. Lok-Bevel Joint hides all nails and staples, almost anyone can do a neat-looking job in a short time. Sizes: 12"x12", 16"x16", 16"x32".



4. Job done in a day or two. Once Temlok is up, move in the furniture, and you'll have a comfortable attic room at remarkably low cost. Your family will be after you to fix up the basement with Temlok next. Get Temlok at your lumber or building supply dealer.



For Free Booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3702 Watch Avenue, Lancaster, Pennsylvania.

ARMSTRONG'S TEMLOK®

Monowall® Cushiontone® Insulating Wool Hardboards Counter-top Cement

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"Handy" SANDY recommends

these fast,
GOOD
SHORT-CUTS
...save and use 'em!

Quick way to drill a series of holes to a given depth: measure on the bit the depth you want and wrap a few turns of FLEXBAC® Masking Tape just above that point. Drill to the tape marker. FLEXBAC Tape peels off clean when you're finished. Keep a handy roll in your shop . . . another in the house. It has dozens of uses.

Make a set of sanding boards for quick, easy finishing on small jobs. Cut five 9 x 12 pieces of plywood. Drill a ¼" hole about ½" from the end of each board — centered on the 9" width. Glue a sheet of CARBORUNDUM® Brand Emery Cloth on one side of each board — a different grit size on each, of course. Use a "peel-it-off" cement to make replacement easy. Do the same on the other side of each board, but use sheets of CARBORUNDUM® Brand Flint Paper for wood sanding. Hang 'em on nails near your workbench — you'll use them often. Emery Cloth and Flint Paper by CARBORUNDUM are sold by your hardware or lumber dealer in five handy grit sizes: Extra Fine, Fine, Medium, Coarse, and Extra Coarse.

Easy-as-pie way to store sanding discs: just "borrow" a pie tin from the kitchen. Cut it in half . . . tack the rim to a wall or the back of your bench, open end up. Return the unused half to the house, if you dare . . . on second thought, better make two storage "racks".

Or you can make a trade with your wife — the pie tin for a sheet of Fine Emery Cloth by CARBORUNDUM. Tell her a few stitches in it now and then with her sewing machine is the best way to keep the needle sharp and efficient . . . make sewing easier.

Make window screens this easy way: cut the screening to size and flatten as best you can. Then fold strips of FLEXBAC® Masking Tape evenly over each edge. Gives you an excellent grip for stretching the screen tight . . . holds better when you tack it. Molding will cover the tape. Ask for FLEXBAC Masking Tape by CARBORUNDUM . . . at your favorite hardware store or lumber yard.

Glue a strip of medium grit Emery Cloth by CARBORUNDUM to the straight-edge of your circular saw miter gauge . . . keeps wood from slipping while you're cutting.

If you'll send a postcard asking for it, I'll mail you a copy of my pamphlet, "HOW TO SAND", without charge. Tells how to do professional refinishing on furniture . . . has lots of good advice on sanding generally. Address your request to me—

"Handy" SANDY
CARBORUNDUM
REGISTERED TRADE MARK
Niagara Falls, New York
00-45

(Continued from page 252)

construction. We know of no reason why it cannot be carried out with concrete blocks of standard size, that is, if you wish to put in the extra labor and time it's going to take to build the wall in this manner. It would seem to us that one possible objection, especially if you work alone and intermittently, is the fact that you would have in effect several batches of concrete in each wall, each batch poured at a different time. As a result you would have new concrete poured onto that in a partially or fully cured state all the way up the walls. Of course, this would depend on how the walls were built. If you are situated so that the block walls can be laid up to a full height and then the openings filled at one time with a single batch of concrete, we believe this would be the best procedure. We think it would be advisable to plan carefully the construction so that pouring of the concrete can be carried out as rapidly as possible. One thing to keep in mind is that the footings must be of the size normally used under a monolithic (poured) concrete wall of the same height.

Loose Hinges

Q—The upper hinge in an outside door is loose, permitting the door to bind at the bottom. I've tried to fix it by driving wooden plugs into the screw holes, but they don't hold, even when I used glue. I can't use larger screws as they won't seat far enough into the hinge. Is there any other method?
R. P., Ind.

A—Have you thought of drilling holes into the edge of the jamb so that they cross the screw holes at right angles and then driving in short lengths of dowel? Usually this trick works satisfactorily and proves to be a more or less permanent repair. The first thing to do is remove the trim piece so that transverse holes for ⅜-in. dowels can be drilled at the center of the exposed edge of the jamb. Be sure that the holes you drill center across the screw holes. Then drive lengths of dowel in the holes and drill a small hole through each dowel to prevent splitting as the screw is driven in. Another way is to cut a piece of ⅛-in. soft aluminum to the same size as one leaf of the hinge. Using the leaf as a template, drill holes in the aluminum plate slightly smaller in diameter than the outside diameter of the wood-screw threads. Place the drilled plate on the back of the jamb. Then drive in screws of sufficient length to reach through the jamb and the plate. The screws will cut their own threads in the soft metal and draw the plate tight against the jamb, holding the hinge leaf securely in place.

Soundproofing Walls and Ceilings

Q—I want to soundproof walls and ceilings in two rooms of a house I'm building. The rooms are quite large and one wall in each room is an outside wall. I'm told that there is a special soundproofing tile that can be applied to walls and ceilings right over the plaster. However, I would prefer a smooth plastered wall. Isn't there some way that this can be done? — M. A., Kans.

A—Where the walls are yet to be built, it probably is best to install a more conventional soundproofing in the three interior walls of each room. Acoustical tile are quite effective in soundproofing a ceiling and the installation is considerably more economical. In planning, it should be remembered that the walls constructed with soundproofing will be about 3 to 3½ in. thicker than regular. In the installation, the studs are staggered on 16-in. centers, the offsets being about 1½ in. to permit a cellular-soundproofing material or a blanket-type insulation to be woven between them. The former is the best material to use, but the latter is a satisfactory substitute. This type of wall construction eliminates direct contact of the facing materials through the studs, that is, facing materials attached to alternate studs on one side of the wall do not contact the studs to which the facing materials on the opposite side of the wall are fastened. This construction prevents transmission of ordinary sounds through solid materials in the walls.

"We took a tip from the auto industry to give you a new kind of drill"

says Paul Jones, President, Cummins-Chicago Corp.

There's an amazing story behind Cummins Ball-Rite 44. It revolutionizes ¼" drill performance.

Until we invented the Ball-Rite principle the craftsman either had to pay a very high price for industrial quality drills—or buy low priced drills that did not meet the performance desired.

We knew that if industrial quality drills could be produced in volume and certain production and engineering prejudices eliminated, their price could be brought down so low that everybody could have their super performance and long life. The answer was to build a product that met industry's high performance standards and produce it at a price that everybody could afford.

The early automobile manufacturers had pretty much the same problem. It was the legendary Ford that combined in one automobile the stamina and durability required by business with a price level that made the automobile the every-day necessity of every family. When the tremendous sales volume of these two markets was combined in one product, sales soared and true mass production was born.

Now, that's exactly what has been accomplished with Cummins Ball-Rite drills. We designed the drill for industrial use and the Ball-Rite 44 today is being used in airplane, automotive and manufacturing industries side by side with drills costing one-third more. Then, by using continuous conveyor belt assembly (instead of the old bench method) we were able to rev production up to hundreds a day and produce the same drill within the price range of the ordinary home-type drill. Instead of having to sell this new Ball-Rite 44 above $40, we were able to price it at $29.95. Both industry and the home user benefitted.

Actually, Cummins took a tremendous gamble in setting up huge volume production lines, but we did it with the confidence that if it could happen in the automotive industry it could happen in the drill business. Our gamble paid off. Both you, the consumer, and industry, bought the Ball-Rite 44 because it gave you performance you would never have been able to touch before at the price.

Every Ball-Rite drill carries the Ball-Rite tag giving its basic industrial specifications. As far as we have been able to find out, it is the only drill on the market carrying a printed tag describing its basic qualities. Here's the tag:

WHAT BALL-RITE MEANS TO YOU

Ball-Rite Construction is a combination of the finest specifications in an electric tool and includes:

1. Ball Bearings in the right places.
2. Always Hardened Gears.
3. Always Double-Coil Motor (type always used in industrial drills).
4. Always Dynamically Balanced Armature for smooth flowing power.

So, before you buy any drill get a Ball-Rite 44 into your hands and switch it on. You will feel smooth, abundant power that can only be matched in $40 industrial drills. That power in the 44 drills ¼" in metal in its stride, handles 1" drilling in all kinds of wood, and with carbide tip drills, drives up to ½" holes in concrete.

Say, you know we even use this Ball-Rite 44 drill to power the famous Cummins **do-it Shop** ... that combines the 7 most wanted home workshop tools in one. The 44 is the only drill with enough power to handle all the jobs we ask it to do in the **do-it Shop!** To give you an even better picture of this drill's tremendous power, I will be happy to send you a free copy of the beautifully illustrated and interesting "Cummins **do-it Shop** Booklet." This will show you the many time and money-saving operations you can perform when you own a Ball-Rite 44 drill. Please write to me for your free copy today.

The Ball-Rite 44 is sold not only by industrial distributors selling to industry but in your local hardware store. We hope you will be one of the first in your neighborhood to own one of these amazing new drills, to learn the real satisfaction and performance you get from every one of Cummins popular priced, top quality tools.

Sincerely, Paul Jones

PRESIDENT

CUMMINS-CHICAGO CORP., 4740 N. Ravenswood Ave., Chicago 40, Ill. In Canada: 334 Lauder Ave., Toronto 10.
Makers of MAXAWS, MAXDRILS, BALL-RITE, PERM-ALIGN DRILLS, FIXMASTER KITS, DO-IT SHOP

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Now it's easy and economical to give your home the new beauty of modern oak floors . . . with all the glamour of nationally-famous Bruce Prefinished Hardwood! In only a few hours, your living room, bedroom, dining room—or that unfinished room upstairs—will glow with a style as modern as tomorrow. You can choose Block, Strip, or Ranch Plank design.

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Bridge players have the Goren system of bidding at their fingertips in a compact bidding wheel. The arrow on the wheel is set at the response you want to know. The correct bid is read in the window of the wheel. The Goren point count is listed on the back of the card.

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Texaco Tips on car care

How to get good automatic transmission performance

If the level of your automatic transmission fluid is below normal, you can't enjoy smooth, efficient motoring...and you may run into expensive repairs. See your Texaco Dealer for Texamatic Service. He has taken a special course in automatic transmission care. He will check the fluid level. If it is low, he will add the precise amount necessary. At the mileage specified by your car manufacturer, your Texaco Dealer will drain and refill your automatic transmission with Texaco Texamatic Fluid as required.

How to get longer engine life

Today's best motor oil is *made*...not born. Nature's finest oil failed to meet the tough requirements of today's high-horsepower engines. That's why Texaco engineers developed *Advanced Custom-Made Havoline*. Its Balanced-Additive formula gives your engine the all-around protection against wear that it needs. The results of rugged tests show that tappet "A" was "dished-out" after 100 hours of operation with a good heavy duty oil. Using *Advanced Custom-Made Havoline* for 500 hours, tappet "B" showed *no sign of wear*. Get *Advanced Custom-Made Havoline*—the great motor oil that protects against rust, keeps your engine clean, free from sludge and metal-eating acids . . . actually wear-proofs your engine for the life of your car. See your Texaco Dealer . . . *the best friend your car has ever had.*

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. . . the best motor oil your money can buy

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Hand-Built Car

Stepping to the front of American automobile designers is LeRoy Freck, a Hillsboro, Wis., man who has incorporated the latest automotive advances in a natty sport roadster. Freck's hand-built model features wire wheels, unhampered visibility on front and sides, and a turning radius smaller than the most maneuverable Continental cars. His answer to power steering is a simple hand tiller which does away with the conventional arm-wrenching steering wheel. The no-glare headlights, secured from a turn-of-the-century surrey, are fueled by kerosene. An added safety feature is the elimination of the windshield—Freck reasons that you're not likely to exceed the speed limit with a gale in your face. The excellent brakes, the steering gear and frame of the car were fashioned by hand. An old buggy top and war-surplus wheels helped to complete the custom model. The motor, taken from a power saw, has driven the automobile at speeds approaching 18 miles per hour. If the final result looks to you like a 1903 horseless carriage, Freck says, it's just because you're behind the times.

Radiant-Glass Heating Panels

Radiant-glass heating panels — glass plates with a metallic coating on their backs—solve a space problem in small bungalows. Operating on 115 or 230-volt household current, the panels are backed by reflectors and positioned beneath windows. Current flows through the metallic backing, generating heat which is thrown out into the room. A total of 10 1000-watt panels kept a four-room test house comfortable while outside temperatures hovered between zero and 32 degrees Fahrenheit. Cost, however, was more than heating by conventional methods.

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See Gravely's rugged, compact, completely functional design. Not merely assembled, but completely manufactured by specialists who make only Gravely Tractors and their attachments.

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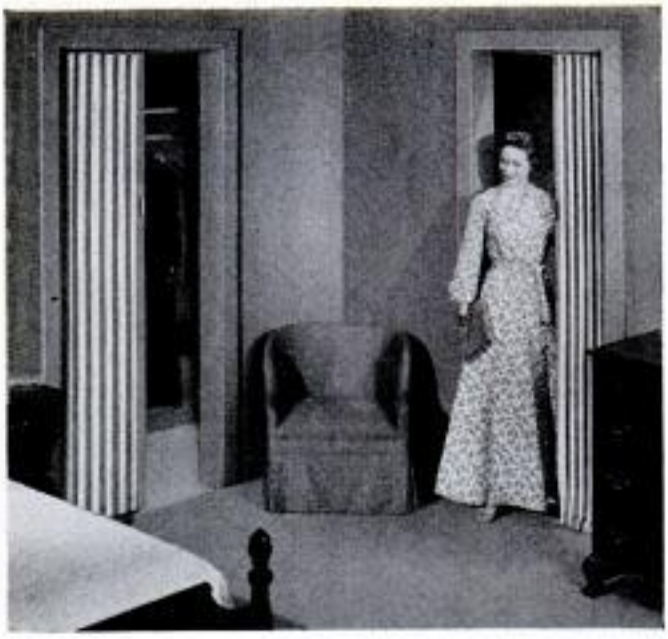

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with SPACEMASTER folding doors

only $24.95 2'6" x 6'8½" opening
$1.00 higher in far west

When you replace space-stealing hinged doors with a steel-framed vinyl-covered "Spacemaster" folding door, you actually make rooms larger. "Spacemaster" folds within the doorway...frees the area around the door...gives you extra room for a chair, table, cabinet or desk. And you can install "Spacemaster" yourself, in just 15 minutes.

Here's How Easy It Is

STEP 1. Slip door on head track, screw track onto header.

STEP 2. Screw 4 jamb clips to jamb and snap jamb post over them. That's all.

Nothing more to do. Door's in! No hardware to set. No painting or finishing—ever!

SIZES	
Full Opening Width	Opening Height
up to 2' 6"	6' 6" or 6' 8½"
up to 3' 0"	6' 6" or 6' 8½"
up to 4' 0"	6' 6" or 6' 8½"

Doors may be used in pairs.

Ask to see "Spacemaster" at your local lumber or building supply dealer's today.

SPACEMASTER folding doors by

NEW CASTLE PRODUCTS, INC.
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modernfold doors

Coyprighted New Castle Products, Inc., 1954

The Iron Road to Labrador

(Continued from page 124)

Mont Joli on the Gaspé Peninsula, Hoyt still flies back and forth, trouble shooting and "building fires" under people to "keep 'em loaded and keep 'em flying." The freight-switching point is now at Mile 134, where completed rails bring in carloads of everything from eggs to power shovels for the planes to tote the rest of the way.

The ready shack beside the strip is a madhouse of confusion. Pilots stand by waiting for regular crew shifts. Upstairs the radio crackles and squawks above the wind. Somebody at Knob needs a generator. Menihek is out of fuel oil. A 20-ton tractor broke down at Ross Bay (Mile 224). Clerks relay orders. The ETA board is in a state of continual revision. Outside, another thunderstorm is whipping the strip with an ice-water deluge. In a minute the sun will shine. Big planes roar in and out, heedless of the rain, filling special orders and running routine loads on ceaseless round-the-clock duty that stops only for repairs or regular check ups.

The planes have carried some notable loads. Into the maw of one went 41,000-pound track-driven loaders, 39,950-pound tractors, massive 2½-yard shovel scoops. Biggest load was a gigantic motor crane that weighed 60,000 pounds and had to be cut up and rewelded on the site in order to fit into the big ship.

Massive sections of machinery still fly this way out of Mile 134, under the watchful eye of Howie Robinson whose job it is to see that men and materials move out in a steady flow. Oddly, the cargo that crews hate most to carry sounds like a simple one —ordinary cast-iron pipe. "You can't tie it down," explains Robinson. "It shifts and slips." One of the two planes lost since the airlift began in 1948 was a DC3 with just such a cargo. Half the pipes slipped back from the middle of the load during take-off, dragged the tail to the ground and snapped the plane in two with a shattering crash. "Pipes spun and bounced all over the runway," the pilot recalls. The front end of the plane slammed down, went spinning along the strip to a grinding halt and the crew stepped out bewildered but unhurt. The only other plane casualty was a PBY that clipped a submerged rock on a lake landing and sank in 200 feet of frigid water up north. The men swam away from that one.

In spite of the hazards and problems Hoyt's HUT lugged 31,000 tons of freight and 47,000 passengers up and down the line last year. His veteran bush pilots logged some 20,000 hours of flight time. By last

(Continued to page 262)

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20" JIG SAW

With completely built-in motor. Table tilts to 45°. Built in blower. Blade turns to rip. Available with mitre gauge and rip fence..... **$41.50**

10" TILTING TABLE BAND SAW

All cast tool of rugged aluminum alloy. 10 by 10 table top. Has excellent locking mechanism..... **$49.95**

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Professional model with latest cutting head. Cuts ½ inch deep and 6 inches wide. Removable guard.. **$86.50**

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The Most Complete Line of Power Tools in America!

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Equipped with Jacobs Chucks, three-spoke feed wheel. Shaper attachments available..... **$49.95**

8" TILTING ARBOR SAW

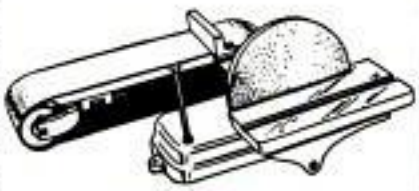
Heavy duty construction. Sealed-for-life ball bearings. Table size 13 by 16. Complete with mitre gauge and rip fence..... **$51.95**

9 IN 1 UNIVERSAL TOOL

Has sturdy workbench stand. Adapts quickly to Circle Saw, Drill Press, Sander, Shaper, Router, Lathe, Jointer, Grinder, or Buffer. All in one tool..... **$269.50**

DUAL CIRCLE SAW-JOINTER

New combination dual purpose tool, complete with motor that switches easily from one tool to other. Complete with motor..... **$154.60**



COMBINATION BELT AND DISC SANDER

Ruggedly constructed. Table tilts to 45°. Entire sander tilts to vertical position. Has belt tension knob and lock..... **$54.00**

Prices slightly lower in Zone 1

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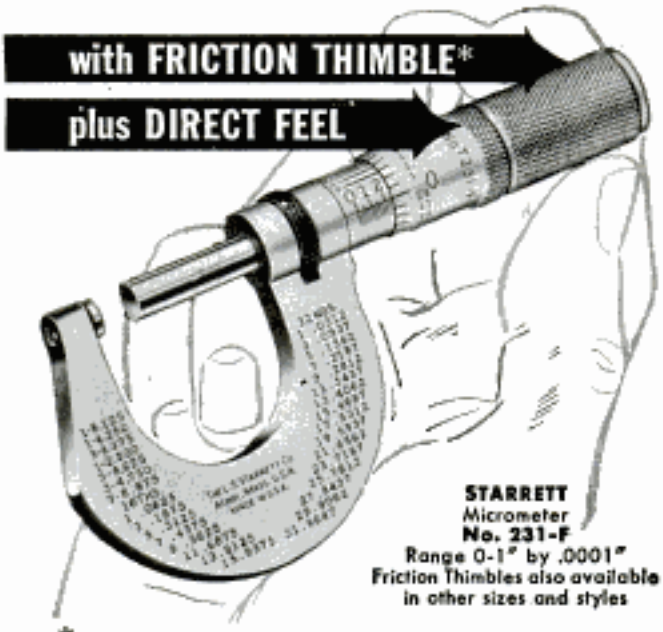

STARRETT
Micrometer
No. 231-F
Range 0-1" by .0001"
Friction Thimbles also available in other sizes and styles

***PIONEERED and DEVELOPED by The L. S. STARRETT COMPANY**

Starrett *Friction Thimble Micrometers* give you both *friction control* and *direct feel* in a micrometer designed for easy, one-hand use. An improved friction control mechanism built right into the upper portion of the thimble is "right under your thumb" for fast, accurate, repetitive measurements. Lower section of the thimble is integral with the spindle with location and large diameter just right for quick control and "direct feel" on critical measurements.

Only Starrett Micrometers offer you this modern convenience plus 12 other big features. Get them all by insisting on *STARRETT* Micrometers. Buy through your Industrial Distributor.

FREE STARRETT CATALOG FEATURING NEW TOOLS

THE L. S. STARRETT COMPANY
Dept. AP, Athol, Mass., U. S. A.

Please send Catalog 26A containing *New Tools* section plus 300 page display of the complete line of Starrett precision tools, dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground flat stock.

Name.....Position.....

Address.....

City.....Zone....State.....

July he could look back with satisfaction to a grand total of 13,000,000 ton miles flown since the lift began—at a cost that began at 73 cents a pound and is now about 4 cents.

Anything the planes can't bring to the work camps during the five months they operate is hauled in on a "winter road." In winter, with temperatures plummeting to 70 degrees below zero, the vast expanses of water freeze deep enough for three or four months so that mammoth trucks can rumble anywhere. Long trains of "cats" haul sledges carrying houses, rails, ties, drills and derricks up into the wilds. Some have plunged through the ice to be lost forever, but most come through. "Without a winter road," says Jack Little, "half the mines in Canada would never have begun production."

The biggest trouble is muskeg—a spongy mass of decomposed moss that goes down an average of five feet and covers the land like an immense blanket. A walk in the Labrador woods feels like a hike on an innerspring mattress. In summer, every step brings up a thousand more black flies to join the cloud around your head. Men wear head nets in self-defense. Jeeps and cars bog down in the muskeg and sink out of sight. Even in winter the organic decomposition keeps muskeg from freezing and "cats" plow snow into it to make a road.

To build a railroad over this stuff called for plenty of ingenuity on the part of contracted engineers. They solved it neatly. Skilled dynamiters plant charges in the muskeg. Then streams of 40-ton trucks dump the fill on top. Off go the charges, booming across the wasteland. The muskeg is blasted out from under the fresh soil, which then landslides down into the cavity to hard underlying precambrian rock.

Ingenious stunts are used by the contractors to speed the tracks through. Rails, instead of going all the way to the railhead on flatcars that would have to be shunted to a siding after unloading, are transferred to pairs of rail-car trucks unconnected by any bed, and pushed up to the railhead. Here a big self-propelled crane lifts the rail off the first load, whirls around, lays it on the previously placed ties for crews to bolt in place, and moves up over it. The train of track section moves up behind it. When a load of rail is gone, only a pair of trucks remain on the track immediately behind the crane. These are lifted off the rails, set to one side, and the rail train is pushed up to the crane. At day's end, another crane goes up the track, hoists the trucks back on the rails, they are hauled back to the flatcars for reloading.

(Continued to page 266)

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SCOTT-ATWATER

gives you the outboard that

bails your boat

Here's the most talked-about outboard improvement in years! The new Scott-Atwater with *Bail-a-matic* pumps your boat dry, keeps it dry . . . automatically!

And *Bail-a-matic* is just one of the exciting features of the 1954 Scott-Atwater line: *Aquablade* Lower Unit, a great new development in outboard engineering; *Pillowed Power* for quieter, smoother cruising; *Stowaway* Gas Tank; *Complete* Shift (forward, neutral, reverse); *Twist-Grip* Speed Control; Carburetor Drain; Remote Control Connections and many others.

Horsepower Certified by OBC. F.O.B. factory prices subject to change without notice.

FOUR NEW MODELS WITH

Bail-a-matic

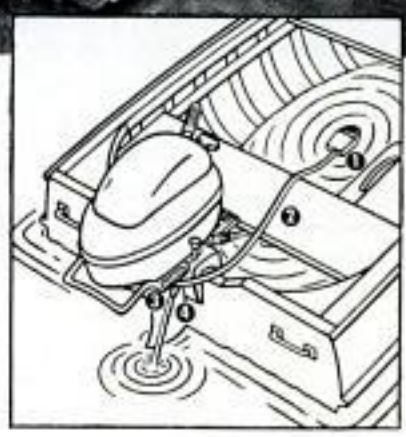
5 HP $209.50 · **7½ HP** $229.50 · **10 HP** $279.50 · **16 HP** $339.50

Also, 3.6 HP super single, a powerful, dependable lightweight, and a great value. Only $109.50.

HERE'S HOW *BAIL-A-MATIC* WORKS

Water is drawn into screened immersion unit (1), and flows through neoprene bilge hose (2) to vacuum-type *Bail-a-matic* pump (3). The water *does not* circulate through the cooling system; it is immediately expelled (4) via completely separate outlet.

The *Bail-a-matic* unit works at any motor speed, in or out of gear . . . bails more than 150 gallons per hour.



FREE 16-PAGE BOOKLET tells the whole story of the sensational Scott-Atwater for 1954. For your free copy, write Scott-Atwater Mfg. Co., Inc., Minneapolis 13, Minn., Dept. X-2.

Meanwhile, see *Bail-a-matic* in action at your nearest dealer's. Look for his name in the phone book classified section.

SCOTT-ATWATER

The first outboard in history that

bails your boat

SCOTT-ATWATER MFG. CO., INC., MINNEAPOLIS 13, MINN.

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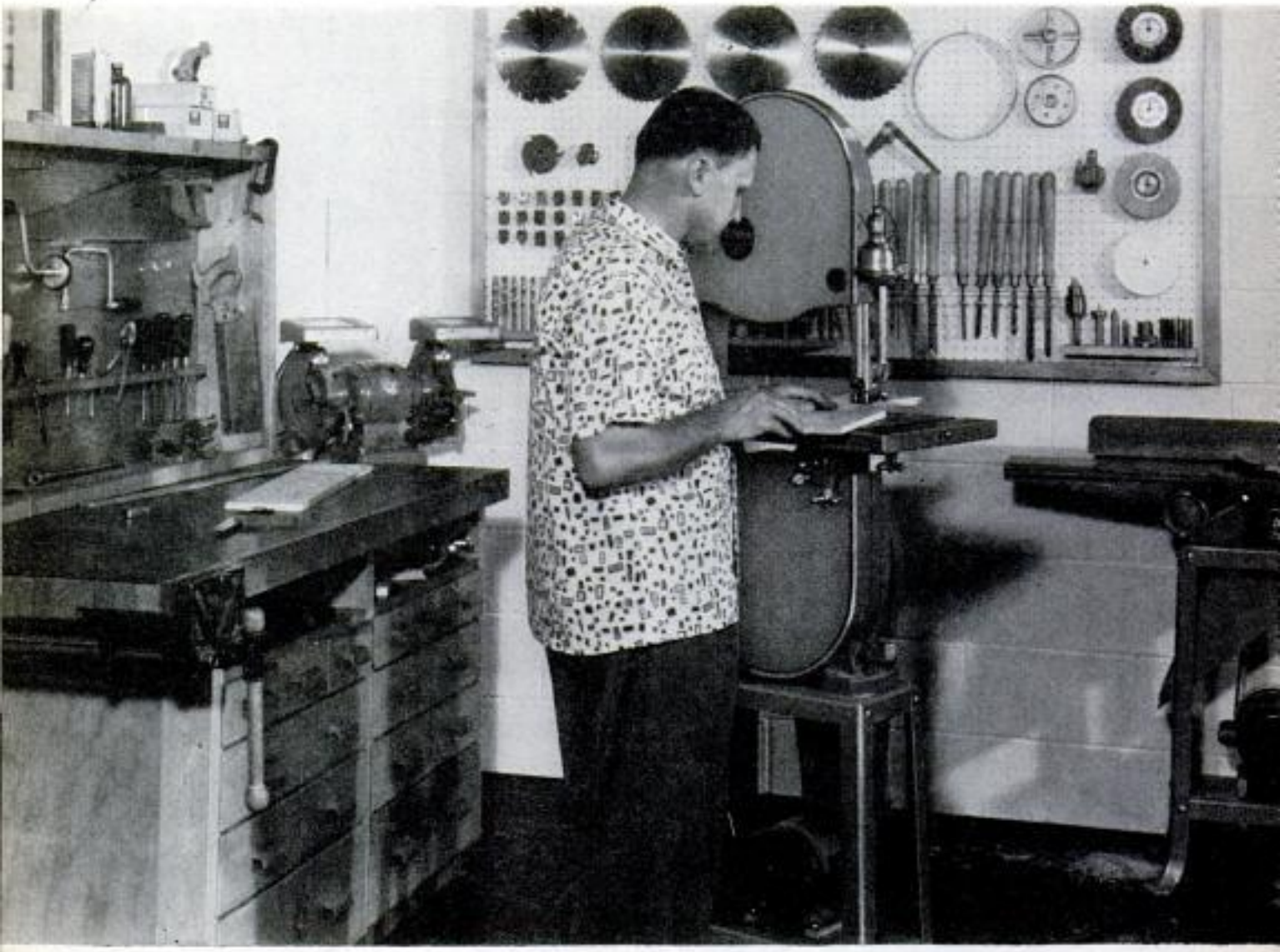
What You Could Do With



DELTA 14" BAND SAW—used in leading industrial plants for its accuracy, long life, and quick availability of parts and accessories. Built to high precision standards, but not high priced. See it demonstrated at your nearby Delta Dealer's.

Micrometer adjustments of blade guides make possible accurate work, yet allow blade to run free. Guides and blade supports adjust independently.

Big table tilts 45° right and 10° left. Braced by two massive trunnions for maximum rigidity to support heavy work—an exclusive Delta feature.

Height attachment accessory—exclusive with Delta—increases the capacity of your Delta 14" Wood Cutting Band Saw from 6¼" to 12¼" under the guide.

Delta Homecraft 10" Band Saw

Finest saw made for the smaller home shop. Rugged, accurate—cuts 6" in hardwood smoothly. See it at your Delta Dealer, or at leading department and hardware stores.

DELTA

DELTA QUALITY MAKES THE DIFFERENCE!

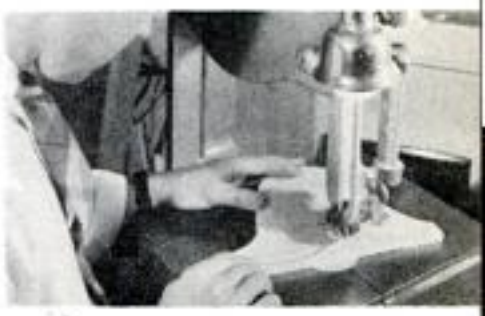
This DELTA Band Saw!

Make complicated curved cuts easily, in wood or plastic . . . re-saw accurately . . . rip, cross-cut, or miter-cut stock too thick or wide for your circular saw . . . do and make countless things that were before impossible! Once you own a band saw, you'll wonder how you ever got along without it—*if it's a Delta.*

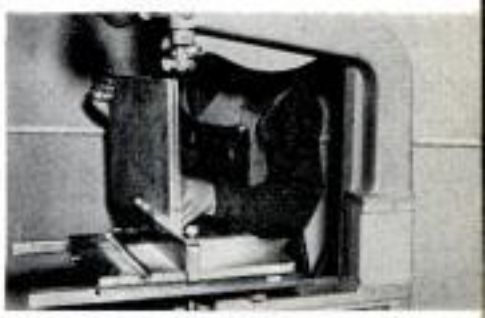
Delta Quality Makes The Difference

Into every Rockwell-built DELTA Band Saw goes all the experience, the precision-accuracy—all the solid quality—that have made Delta Power Tools leaders for exacting industrial use. In fact, the 14" Delta Band Saw pictured at the left is the same model used in countless modern production plants. It's built to last, simple to adjust, foolproof to handle—and *safe*. Delta-engineered accessories make the versatile band saw even handier to have around, add a lot to your fun and satisfaction, save you more money by allowing you to do more jobs.

Delta quality costs no more than "second best"—so why gamble your money? See the Delta Band Saw demonstrated; ask your dealer about his easy-pay plan. And send the coupon today for helpful Delta literature.



Make hundreds of different curved cuts quickly and easily for professional-looking furniture, toys, etc. Precision Delta workmanship makes it easy to follow lines on difficult cuts.



Re-saw accurately, rip and cross-cut stock too big for other saws. With Delta Height Attachment accessory you can increase capacity from 6¼" to 12¼" under the guide—an extra offered only by Delta!

Hard cuts are easy—on your Delta Band Saw

Make dozens of interesting new projects

Window Valances

Modern Chairs

Beach Shoes

Child's Sleigh Bed

With the handy Sanding Attachment—exclusive with Delta—it's simple to give that all-important professional finish to edges, roll curves and other hard-to-get-at places. Makes your Delta Band Saw more useful than ever.

DELTA QUALITY POWER TOOLS

Another Product by **ROCKWELL**

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Please send me:

- ☐ New Delta Homecraft Catalog
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- ☐ "Getting The Most Out of Your Band Saw" (50¢ enclosed)
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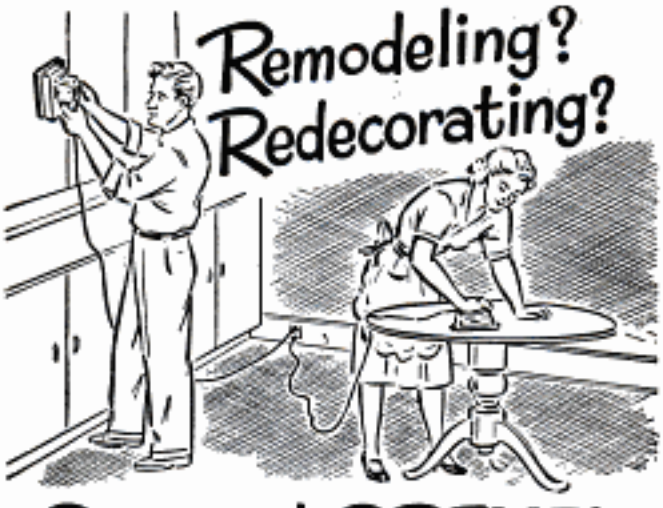

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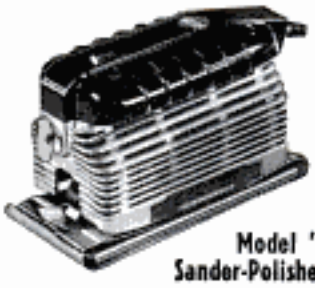
Straight-Line Action Sanders

For the finest finish sanding, take a tip from the professional craftsmen—insist on Dremel *Straight-Line Action* Sanders. They save you money when you buy them. They save time, labor, and expense when you use them. And they're guaranteed to produce finer finishes because straight-line action sands with-the-grain—prevents cross-grain scratches and orbital swirls. Hobbyist, jack-of-all work, or professional—there's a Dremel Sander for your needs.

Of the four common sanding actions, only Dremel sands 100% *with-the-grain* — the only guaranteed scratch-free action approved by finishing experts.

NEW MODEL "53"

This new sander is a real powerhouse, a professional tool kit at a handyman's price. The first ROTARY MOTOR (AC) sander of its kind to have straight line action. Weighs only 5¼ lbs., has 24 sq. in. sanding pad. Out-performs other makes selling for twice as much. Positively the best heavy-duty sander buy on the market. Complete with 2 detachable sanding pads..... **$34.85**



Model "2000" Sander-Polisher

Perfect for small shop, home use. Features Dremel "Straight-Line Action"; high speed reciprocating motor; 14,400 strokes per min.; wt. 5 lb.; 21 sq. in sanding surface.

Price includes: Sturdy, steel carrying case, Model "2000" Sander-Polisher, 1 polish pad, 25 asst'd abrasives..... **$24.50**

Model "A" Sander-Polisher-Massager

Three tools in one! Lighter capacity for general-purpose use. Features "Straight-Line Action"; high speed reciprocating motor; Wt. 2½ lbs.; 12 sq. in. sanding surface. Complete with 1 polish pad, 1 massage pad, 6 abrasives..... **$14.85**

SEE YOUR DEALER: If he cannot supply, order direct on 5-day trial, money-back guarantee. Remit in full for postpd. shipment; or send $2, pay postman balance plus postage and COD.

DREMEL MFG. CO., Dept. 114-B, Racine, Wis.

One experimental innovation was the ballasting sledge. After ballast is dumped on the track, rails must be lifted and the ballast tamped under the ties. Hydraulic jacks or big crews of men usually do this job. But on the Quebec, North Shore and Labrador Railway, some wizard invented a steel sledge with a front lip that looked like the end of an aircraft carrier's deck. This was slipped under the ties and pulled by a locomotive, lifting the entire track to the top of the ballast as it goes. "Unfortunately," says Little, "it is not adapted to making the first lift on grades as rough as ours, though it can be used under proper conditions."

Ideas like these, however, are pushing track through at more than a mile each day and are why, come spring, the line will reach Mile 330, where the track will shoot across the back of the 1200-foot Menihek dam. Menihek, which will supply power for the mines, is one of two 10,000-horsepower hydroelectric plants. The other, at Marguerite on the St. Lawrence, will feed electricity directly to the Seven Islands' terminal facilities.

Above Knob Lake, you can see the huge buildings of the new town which will house 500 men and families in neat duplexes. Shops, a big hospital, recreation hall, hotel and waterworks are already in place, ready for the big push in June.

Come June, Jack Little and his bosses can forget the catastrophes and heart-sinking delays that came with the project. Worst was when dynamiters blasting the tunnel through the mountain at Mile 12 blew through the rock roof. Half the mountaintop washed through the gaping hole and down the grade before they could cap it. Test borings had shown thick rock—but between the boreholes the rock took a deep dip no one could have guessed was there.

"Some things we can't do anything about," says Little. "The early breakup of ice at Menihek tore out all our cofferdams and we had to start building the dam all over again. Rock slides at Mile 65 keep busting up the rails, but that stuff has been falling off the mountain for a million years and what are you going to do about it? Spring floods took the entire grade out from under a long section of track last year, leaving the rails draped in midair."

Such are the hazards of getting iron out of Labrador. It's tough—and expensive—to pioneer. The first carload of ore that cascades down the chute in the Seven Islands' dumper house will have cost some $225,000,000. But IOC won't worry then. The long, winding trainloads of ore that follow will more than make up for it. ★★★

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Television Joins the Air Force

(Continued from page 137)

because editing and intercutting make the latter more expensive."

Col. Williamson is no amateur, having been in commercial radio and TV for many years before being recalled to active duty in the Air Force. He is as proud of the 1354th's accomplishments as a new father passing out cigars for the first time.

"There are unlimited fields of study," he continues with enthusiasm, "in medicine, surgery, dentistry, first aid and, of course, tactics of war. Without leaving the ground, it would be possible for a student to take a cross-country flight, experiencing vicariously all sorts of weather conditions.

"Teaching is by no means the limit of our potentialities. Through the aid of properly shielded TV cameras we can go into danger areas, physically impossible for the human body to enter, and make scientific studies of extreme heat or cold, of conditions at very high altitudes or in subterranean depths of the ocean. We would be able to creep in closer to an atomic explosion for technical information than man would dare venture. In actual combat, our unit could be used for reconnaissance or spotting enemy action, taking a commander right into the heart of battle scenes in progress. Pilotless planes could be used for photographing difficult terrain behind enemy lines as an aid to the intelligence department."

Outstanding among the "shakedown" projects was the kinescope made of a fire at March Air Force Base, which was not only newsworthy to an interested national-network civilian audience, but was also instructional for continued use in fire-prevention methods.

An old Lockheed T-33 fuselage, with a dummy-pilot victim, was set ablaze, and the waiting airmen in their asbestos suits moved in to demonstrate the latest Air Force fire-fighting techniques in putting it out. Four TV cameras, agile on their rolling casters, caught it all from the first burst of flame to the proposed rescue of the helpless pilot, while sprays of high-pressure carbon dioxide snow and foam iced the roaring inferno to oblivion within 30 seconds. Back in the blue engineering bus, fed by microwave link from the action scene, able technicians captured it all on the intricate, kinephoto recording machinery.

"We intended to rescue our fake pilot," laughs Col. Williamson, "but when one of the real firemen passed out during action, we placed him on the stretcher instead, producing a most realistic, unexpected

(Continued to page 270)

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THE NEW

Atlas WORKSHOP 9310

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You've never seen a saw with so many value-packed, quality features at anywhere near the sensational low price of the 9310. It gives you the SPEED, ACCURACY, SMOOTHNESS and EASE OF OPERATION that you'd expect only in a high priced saw. Yet it's yours at an almost unbelievable low price with all these important features —

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less motor, guard, stand . . . slightly higher west of the Rockies

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- **ATLAS DOUBLE-LOCKING LIFT-OFF FENCE . . . full length, with Vernier control.**
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- **POSITIVE LOCKING MITER GAUGE . . . accurate, convenient.**
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bore holes easier, faster, cleaner . . . even in hardest woods

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A practical investment for yourself. Makes a wonderful gift, too. Also available in 6 and 10 bit sets in hardwood chest, colorful plastic roll sets and individual sizes, ¼" to 1½". See your independent hardware dealer soon. The Irwin Auger Bit Company, Wilmington, Ohio.

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IRWIN the original solid center auger bit • screw drivers screw driver bits

touch. Now when some one says, viewing the start of the kine, 'Oh, that's a pretty obvious dummy,' I just wait for the camera to pan down to the live man being placed in the ambulance to make him swallow his words."

In the production end, skilled instructors have trained men to become expert directors, actors, writers, set designers and make-up artists. They even have a wardrobe department where a modest lieutenant may be changed into a German commander, or a captain returned to a civilian role without benefit of discharge. The special-effects boys are busy creating miniature villages and mountain ranges or pulling an explosion or a forest fire out of their versatile cuffs on short demand. In the converted barracks at Lockheed, artists lean over drafting boards, making story sketches, set designs or title cards.

The 1354th Video Squadron has ironed out all the "bugs" and is ready to crawl out of its hangar and set its camera sights on a man-size job. Whether it be routine weather briefings to pilots or behind-the-lines intelligence service from a drone plane over a battlefield, it is ready to take its place as a useful and unique unit in the United States Air Force. ★ ★ ★

Plastic Tool Pulls Fuses

Operating on a double-leverage principle, a newly introduced device exerts a powerful pull and holding power when removing fuses. It will pull fuses from the tightest clips without allowing the fuse to slip or twist. Made of a tough, moisture-resistant plastic, the puller has two operating ends to handle fuses up to 100 amperes. It measures 7½ inches and weighs 2 ounces.

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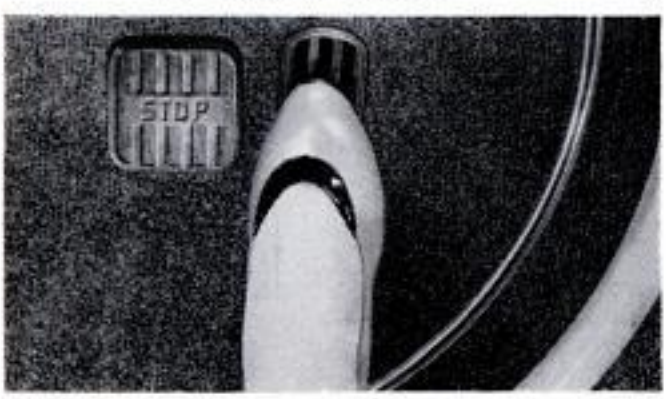
PRACTICAL IMAGINATION AT WORK FOR YOU

PowerFlite—incredibly smooth, delightful to drive, and a Chrysler Corporation exclusive

America's Newest Automatic Transmission



TO START—*turn on ignition switch key, select drive, then touch the accelerator and you glide forward. At the right moment, PowerFlite puts itself into "high" so smoothly you'll not notice.*

TO STOP—*simply touch the brake. There is no declutching or gear changing. If you stop on an incline, PowerFlite helps to keep you from rolling backward.*

PowerFlite

— *No other transmission can match its combined acceleration and smoothness.*

— *No other transmission can match its lightweight, rugged construction.*

This great development—*PowerFlite*—is yours in Chrysler Corporation cars exclusively!

Double action: smoothness and performance

All transmissions are smooth at certain stages. But PowerFlite is smooth at every stage. All the way from dead stop through cruising speeds. No other system can match PowerFlite's zip-charged breakaway. And none can match its performance in the highway cruising ranges!

We mentioned earlier that PowerFlite is rugged. Here's what we mean: during a road test, PowerFlite was jammed through 12,000 full-throttle starts. After 79,000 miles of severe testing—during which no servicing or repairs were required—the transmission was disassembled. Each part was examined minutely. But no appreciable wear could be found!

Pioneering background

PowerFlite grew out of Chrysler Corporation's pioneering work with transmissions. Today, the superbly engineered Chrysler Corporation cars offer you the choice of a variety of transmissions to suit your personal preference: the famous Synchro-Silent, Overdrive, Hy-Drive, and the brilliant new PowerFlite.

You'll enjoy the lithe beauty, the luxurious appointments and comfort, and the scintillating performance of the great new Plymouth, Dodge, De Soto, Chrysler and Imperial cars. The dealer near you will be pleased to put the model you select at your disposal—today, if you wish!

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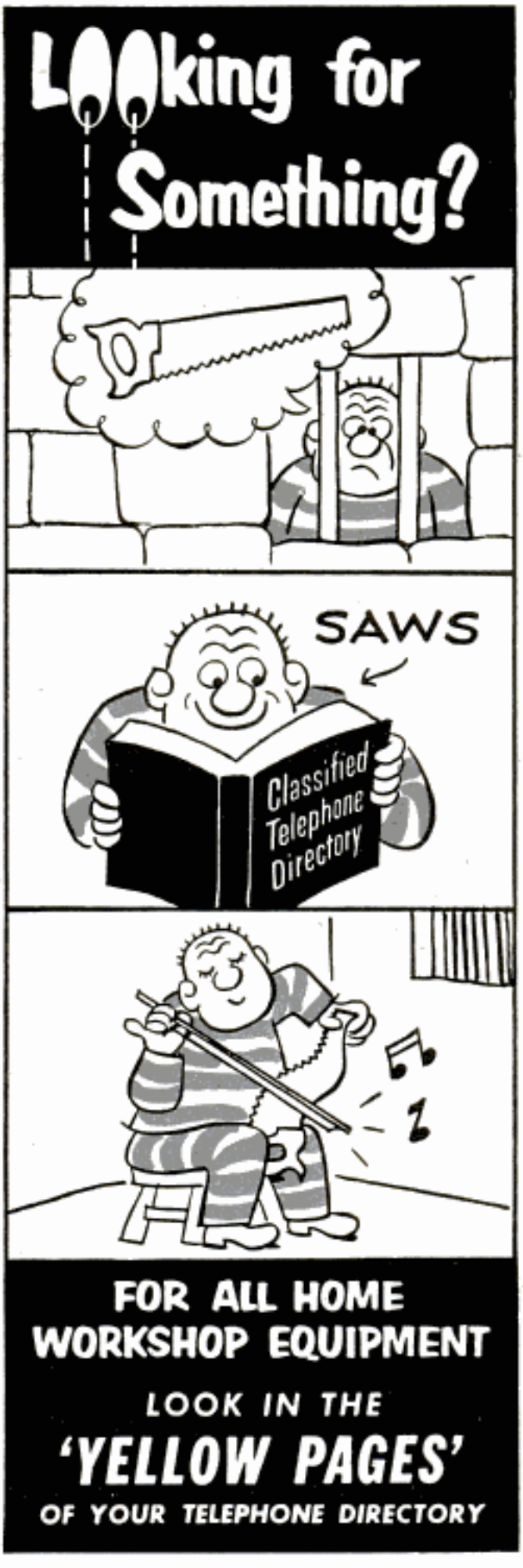

Mr. Peepers Does His Homework

(Continued from page 114)

been so skillfully soldered you can't find the seams. He still turns out expertly wrought tie clasps, rings, cuff links and similar items for favored friends.

Wally admits that it took him years to become really proficient as a silversmith, but insists that anyone can learn. And, unlike many avocations, it needn't cost much to start.

"For soldering, you can buy a gas torch nozzle and rubber hose that attaches to a gas stove for five bucks," he points out. "Instead of fastening the air-pressure tube to an expensive compressed-air tank, you make a wooden mouthpiece that can be held by your teeth. Blow your own pressure. That leaves both hands free to work on the piece."

Tools he advises for a beginner include long diamond tweezers with teeth in the nib, a jeweler's saw and blade, and soap to lubricate it. "You need two grades of jeweler's files, half round with pointed ends, and a set of needle files for notching wire so it can be bent at right angles and come out square instead of curved on the corner," he says. Liquid flux, low-temperature wire silver solder, metal shears, round and needle-nosed pliers, a ring mandrel, a ⅛-horsepower motor with grinding and polishing wheel, a rouge stick and fine emery complete a basic kit.

"The whole thing," Wally estimates, "should come to about $20, including enough sheet silver, square silver wire and 18-gauge round wire to turn out your first practice jobs."

A man should start by making chain, to practice soldering and filing each tiny link, until he can make a joint on every first try, and can handle a file like an artist whisks a paintbrush. "By that time," predicts Wally, "he'll have quite a chain. If he gets sick of making links, a finger ring is good practice and will give him something to show his wife."

If you haven't got a ring mandrel, the actor reveals, you still can make a ring. "Just take a strip of paper a quarter of an inch wide, wrap it tight around the knuckle you want it to fit over, mark it and add the width of the silver," he says. "That 'width of silver' takes care of the surface stretch and the inside surface crimp when you bend the band. It always comes out just right.

"Watch out for notch bend joints," he warns. "Press the surfaces together hard and the solder will run right in. Leave them open and it won't."

(Continued to page 274)

Big News.. for Bench Saw Owners

Now, you can joint, plane, and shape wood at home on your own bench saw!

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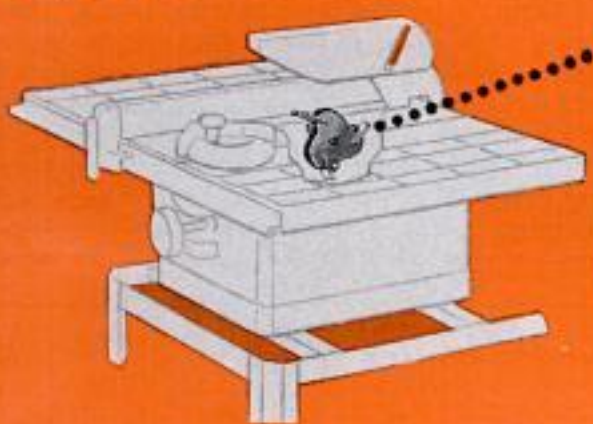
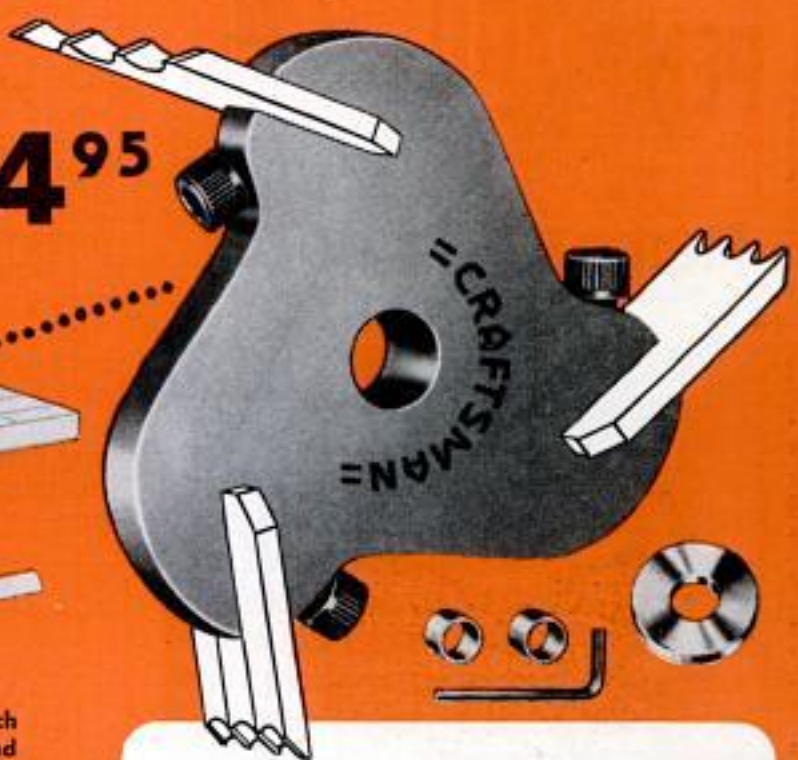
Molding Cutter Head $4.95





The CRAFTSMAN Cutter Head fits bench saws with ½, ⅝, or ¾-in. round arbors, and most dado inserts. Included are wrench, space washer, bushings, and instruction manual showing how to plan designs. A full selection of seventeen cutter bits are available at Sears stores everywhere.

1-inch planer and jointer . . for close tolerance work . .

Cutter Bit Sets

$2.50

3 Bits per Set

Bead cutter bits . . . for furniture trim, cabinets, etc.

Decorative molding bits . . for picture frames, trim . .

Cabinet door bits . . for decorative trim on cabinets, etc.

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Be constructive; save dollars! Make your own moldings, corner joints, baseboards, and panel frames. *Be creative; enjoy living!* Cut table top edges, picture frames, and picture moldings. You'll do these and many more useful, fascinating jobs with a CRAFTSMAN Molding Cutter Head and Bits.

You don't need expensive, specialized power tools. You don't need costly, pre-shaped lumber. Just attach cutter head to your bench saw, flick the starter switch, and ease rough lumber into the whirling bits. It's as simple as pushing wood across a table — and actually, that's just how it's done! Your work is cut cleanly, accurately. A few strokes with sandpaper for perfection's sake and the piece is finished.

Every cutter bit does a special job. With several sets you can combine cuts, make literally thousands of designs . . . The number is limited only by your imagination!

Why not begin now — shaping, jointing, and planing — with a CRAFTSMAN Cutter Head. Price, $4.95. Your Sears retail merchant will give you helpful pointers on bit selection. Visit him today!

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As big a difference as ever!

Most motor oils now contain detergents. A detergent's job is not to lubricate, but to improve conditions under which oil lubricates. Pennzoil, too, contains detergents, but its basic lubricating quality, resulting from superbly refined Pennsylvania crude, still provides an *extra* margin of safety.

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BETTER DEALERS IN EVERY STATE FEATURE
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Between Wally's work on the show, silversmithing, carving and constant experiments with new materials (one of the latest proved to him that plastic cement would mend rips and holes in his clothes much quicker and just as securely as needle and thread), all his evenings are taken up.

Week ends are reserved for house building in Rockland County. So far, the driveway is in, footings are dug and all that remains to be done is build the house. It's going to be of stone and mortar because, as Wally puts it in his practical way, "there are plenty of rocks in Rockland County." With all that natural material at hand, it would go against the Cox grain not to use it. Futhermore, masonry will take longer, and Wally is in no rush. The house is more than just a house—it's a plot to get away from bustling city crowds and to indulge his favorite pastimes—studying birds, bugs and plants. "I hunt wild flowers because there's nothing wild about hunting them," he says. "You just go out, sit in the woods and look around."

And, as he told one friend, "There's no one around to stop and ask me when Mr. Peepers is going to marry Miss Remington—or vice versa." ★ ★ ★

Eye-Movement Glasses

An extra pair of eyes seems to sprout beneath the cheekbones of a person using a new visual aid. The effect comes from inclined transparent mirrors attached to a pair of glassless spectacles. With the tool an observer can watch a reader's eye movements and discover the reasons for retarded reading rate or comprehension. It is possible to estimate the length and number of eye pauses, the number of backward eye movements, and the smoothness of eye movement rhythm.

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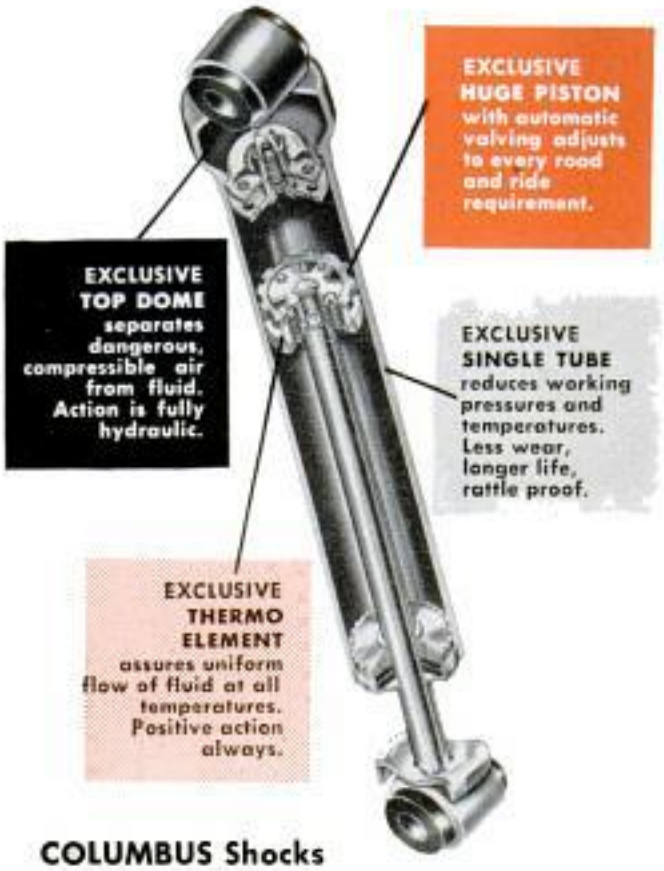

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Guided Missiles on Leash

(Continued from page 101)

build up in guided missiles at high speed.

Temperature problems are most acute in guided missiles of the rocket type, for these fly the fastest. Electronic circuits can go haywire when heated to several hundred degrees. Even precisely fitted mechanical parts no longer operate the way they should. If a missile is fired from a tropical location where the ground temperature is high, flight heat builds up even more. If fired from a polar location having a sub-zero ground temperature, the missile and all its parts are subjected to an extreme and quick change of temperature.

To study these problems, the Army has established a new climatic laboratory at its White Sands Proving Ground in New Mexico. Here a complete electronic circuit or a valve can be cooled to a temperature of 65 degrees below zero, then hit with a blast of air heated to several hundred degrees in a simulation of the conditions that could occur to rocket components when launched from a polar site.

The next step at White Sands will be to refrigerate an entire guided missile in a big mobile deep-freeze igloo, then immediately place the missile on a launcher and fire it. Eventually the climatic laboratory will build some enormous climatic chambers in which the biggest rockets can be frozen or heated, undergo atmospheric pressure changes and shaken in simulation of flight vibration all at the same time. By operating all of the missile's electronic circuits, servo mechanisms, pumps and hydraulic systems while it is being subjected to this treatment, any failures that are likely to occur in flight from these causes can be pin-pointed on the ground.

The proving ground has a separate laboratory devoted to shock and vibration tests. Here a missile is subjected to the shocks which it might receive while being transported part way around the world and here the damaging vibrations that can occur in flight are duplicated. Flight vibrations can be so severe as to destroy parts of a rocket structure. They can be so intense that electric circuits come apart. Vibrations at certain frequencies can stop the clockwork-timing devices sometimes used in a missile. At White Sands, the research people use an array of mechanical cam shakers, dynamic shaking tables and centrifuges for testing rocket components. The program includes the redesigning of faulty parts so that these components become vibrationproof.

The guided-missile field is so broad now

(Continued to page 278)

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REYNOLDS
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ALUMINUM
...steals the show in home improvement field!

Aluminum window screens that last a lifetime are easy to make with Reynolds *Do-It-Yourself* Aluminum, cost little. Mail coupon for free instruction folder.

Reynolds *Do-It-Yourself* Aluminum is so easy to use that even the most *amateur* home owners are becoming "professionals" overnight... and saving lots of money in the bargain. The secret? This new kind of aluminum is specially engineered for really astonishing workability. You can bend it, saw it, drill it, plane it, join it and shape it, using ordinary hand or power tools.

New Reynolds *Do-It-Yourself* Aluminum comes in plain and embossed sheets, tubes, bars, rods, angles, screen and storm sash sections, Reynolds Reynolon film, and handy, easy-to-use fasteners.

"Easi-Bild"* patterns of the projects pictured on this page can be obtained for a small cost by filling in the coupon below. Each pattern contains complete list of materials needed. Also at your dealers, free, are (1) instructions for making aluminum screens and storm sash, and (2) a "how-to" booklet containing general instructions and suggested projects. Or send coupon.

Reynolds *Do-It-Yourself* Aluminum won't harm ordinary tools. Its use is approved by leading tool manufacturers. Home owners are cautioned, however, to use *only* Reynolds *Do-It-Yourself* Aluminum, because other types may harm ordinary tools. Reynolds *Do-It-Yourself* Aluminum can be identified by the special Seal attached to every piece.

Stunning desk and lamp are beautiful examples of the versatility of Reynolds *Do-It-Yourself* Aluminum. Patterns #542 and #541.

Radiator cover made of Reynolds *Do-It-Yourself* Aluminum is handsome, efficient . . . costs surprisingly little. Save up to 75%. Pattern #544.

This sewing center will win any homemaker's heart. Yet it's a simple, inexpensive project. Pattern #543.

Reynolds *Do-It-Yourself* Aluminum is now on sale at hardware and lumber supply dealers in this handy self-service rack.

No special tools are needed to make and repair things with new Reynolds *Do-It-Yourself* Aluminum. Saw it, plane it, join it, shape it, drill it with ordinary hand or power tools.

*T.M. Reg. Easi-Bild Pattern Company

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Please send me the following *full-size* "Easi-Bild" Patterns. I enclose_____ in cash or money order.

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you can build a new wall with **Knotty Pine**

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T. M. Reg. U. S. Pat. Off.

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Simplest system ever! You just nail easy-to-handle 16" wide, ceiling-height panels right to the studs. *All at once* you have a *new decorated* wall of beautiful Knotty Pine PANEL SHEETROCK using matching colored nails. The joints are a decorative feature. Also available in plain panels you can decorate yourself, or in predecorated striated finish. Use it with modern USG Metal Trim. Ask your USG dealer, or write Dept. PM 2, Chicago 6, Ill.

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USG UNITED STATES GYPSUM

that no longer is it the specialty of a few experts in power plants and air frames. People from numerous technical fields are now at work on rockets and uninhabited aircraft, and more of them are needed. At White Sands alone, there are jobs waiting for 1000 or more young engineers who hold college degrees. Salaries start at $3410 and range as high as $10,000 per year, and the employment policy is to push research people ahead as rapidly as their abilities permit. There's room for improvement in every part of a guided missile.

Groups in all parts of the world, for instance, are trying to design better rocket motors. No other power plant compares with a rocket for acceleration and top speed and yet the rocket motor is regarded as extremely inefficient. One suggestion, advanced by Dr. Saul Pollock, rocket-combustion physicist of Rotor-Craft Corporation, is to find a way of controlling the acoustic resonances that occur inside the motor chamber. Many rocket explosions and irregular firings can be traced to this cause, Doctor Pollock asserts, and he believes that the rocket motor will be converted from a fuel-hungry monster to one of our most efficient power plants if the power in its acoustic by-products can be controlled and put to work.

Today the United States is manufacturing a number of different kinds of guided missiles and is completing the designing and engineering of still other types. The age of push-button warfare is here. ★ ★ ★

Expansion Plug Seals Open End of Tube

Open gas and liquid lines can be sealed temporarily with a rubber plug that fits into the open end of a tube. Installation or any repairs then proceed without installing a valve or pinching off the pipe. The synthetic-rubber plug and a cylindrical casing are mounted on a bolt tightened at one end by a wing nut. The tightening causes the rubber to bunch up and form a seal which will resist a pressure of 100 pounds. Several sizes are manufactured.

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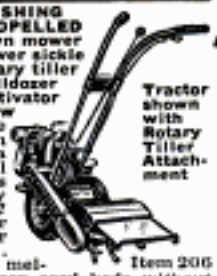
NO PUSHING SELF-PROPELLED
It's a lawn mower
It's a power sickle
It's a rotary tiller
It's a bulldozer
It's a cultivator
It's a plow
Where else can you get a power tool that does so many jobs? Works for you year 'round.



Tractor shown with Rotary Tiller Attachment

Item 206

Prepares mellowed, deep seed beds without labor. Built-in power take-off to drive pumps, saw, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic self-propelled 2 hp tractor. Briggs or Stratton famous engine..... **$119.50**
Rotary Tiller..... **$42.50**
Cultivator..... **$8.75**
Snow Blow..... **$39.50**
Disc Harrow..... **$15.75**
Furrowing Tool..... **$8.75**
Plow..... **$15.00**
Rotary Lawn Mower.... **$42.50**
Sickle Bar Mower..... **$42.50**
Lawn Mower Hitch..... **$4.50**
Freight prepaid to most areas. Easy payment plan available.

BIG ½" DRILL VALUE!

Now, a big production drill at an unheard of price. Heavy duty ½" drill with genuine Jacob's key chuck. Powerful, smooth — drills thru ½" steel with ease. 115v. AC-DC. Written 1 year guarantee. Includes a complete set of 29 tungsten vanadium speed drills from 1/16" to ½" by 1/64's in a permanent steel index box. Bits alone ordinarily sell for $35.00. Drill and bits — certified reg. price $87.50. Factory Special.. **$44.95** Item 33p Wt. 15 lbs.

JET FLOW BLOWER

Tremendous air movement (1700 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" ht. x 8 x 16½". Outlet opening 13"x13⅜". Wt. 45 lbs. (Item 245). Reg. $54.50. Special, **$27.50**

HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds **up to ¾" plate** using ¼" **rods. Built-in air** cooling system. **Arc is easy** to strike and hold, **because of** specially designed **arc stabilizer.** Hi-lo switch **and dial control** gives wide **range of welding** heats. **Run welder at 2600** rpm, with **tractor, jeep or 14 hp** gas engine **or 7 hp elec. motor.** Complete **with instructions,** guar. **and triple V belt or flat** pulley. **You can** pay **more, but** you can't buy **a better welder.** (Item 38) Wt. 110 lbs. $400 value at... **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Special..... **$119.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. **Sold** only with welder at..... **$10.50**

PORTABLE LIGHT PLANTS

(Item 24)

PUSH BUTTON START A.C. LIGHT PLANT 600-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp, easy-starting Briggs gas engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 75 lbs. *Be prepared if war or storm knocks out power lines.* Reg. $275 value.. **$143.50**

700-800 Watt Plant (Item 44) same as Item 24 but larger engine... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator & engine.... **$199.50**

1500-1700 Watt Plant (Item 20) — Similar to Item 24, but has three times more capacity. Wt. 173 lbs. Factory price..... **$279.50**

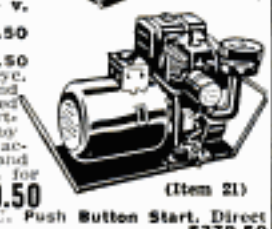
350 Watt Plant (Item 273) 115 v. D.C. 1½ hp. Briggs Engine. Perfect for lights, radios, small power tools Wt. 65 lbs. Factory price..... **$99.75**

GIANT 2000-2500 WATT PLANT

(Item 31)

110-120 V. 60 cyc. A.C. **Absolutely the best made**—exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. (Item 31) Wt. 210 lbs. Reg. price $585.00. Special at **$299.50**
Generator Only and control box..... **$169.50**

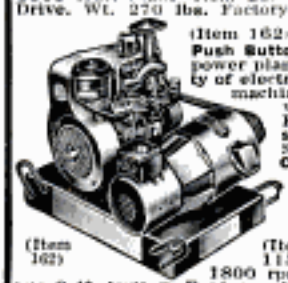
3000-3500 WATT PLANT (Item 198) **110-220 v.** 60 cyc. A.C. Belt drive Wis. Engine. **Push button start.** Wt. 370 lbs. Heavy duty **$399.50**
Generator only for belt drive, Wt. 115 lbs. (Item 198A)..... **$239.50**



(Item 21)

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00. Factory Price (Item 21) **$329.50**

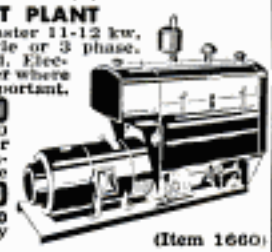
3500 Watt Plant (Item 23) 115 v. 60 cyc. A.C. **Push Button Start. Direct Drive.** Wt. 270 lbs. Factory Price..... **$379.50**



(Item 162)

(Item 162) **HI-LINE 6000 WATT PLANT**
Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 500 lbs. Easily worth $995.00. **With self starter.** Factory price..... **$645.00**
Same plant but with **Crank Start.** (Item 166)..... **$585.00**
Generator and control box only, built driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price.. **$345.00**

DIESEL LIGHT PLANT



(Item 166D)

(Item 166D) Diesel Master 11-12 kw, 115/230 v. AC. Single or 3 phase, 1800 rpm. direct connected. Electric **Self-starting.** Engineered for permanent power where continuous low cost, heavy duty service is important. Wt. 1350 lbs. Reg. list $3650.00. Factory price..... **$1895.00**

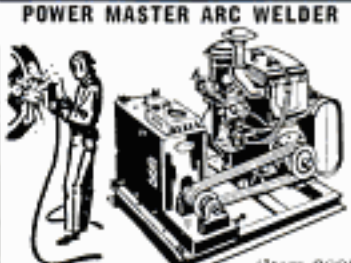
10-11 kw. **GAS DRIVEN PLANT.** 115-230 v. 60 cyc. AC. Single or 3 phase, powered by 4 cylinder Wisconsin air cooled engine. Belt driven. Constructed **similarly to Hi-Line 6 KW** shown above but **much larger.** (Item 217) (with crank start) Wt. 900 lb. Factory price **$1075.00**

Same plant with elec. self-starter.... $1145.00

We make fully automatic controls to operate any of the above light plants. Write for details.

WE MAKE ALL SIZES UP TO 25,000 WATTS

POWER MASTER ARC WELDER



(Item 280)

Now! a portable, rugged, self-powered industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. High capacity DC welding unit enables you to tackle any job with confidence—easily handles anything up to 2" plate using from 1/16" to 1¼" rods. Built-in stabilizer and dual control simplifies any welding job from 30 to 250 amps. Welder is powered by 14HP 2 cylinder air cooled Wisconsin industrial engine with triple V-belt drive. Mounted on a welded steel chassis—easily transported on trailer or pick-up truck. Ideal for shop, factory or farm welding. Complete with instructions and guarantee. Wt. 480 lbs. Compares with welder costing $1200. (Item 280)
SPECIAL for this month only $399.50

MASTER AIR COMPRESSOR

COMPARE!—This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs.!

Tank Tested up to 500 lbs. per sq. in.

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type, 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE.** Low factory prices. With 1½ HP., 110 v. AC motor. (Reg. $175) **$109.50**
(Item 209p)..... **$129.50**
With 1½ hp. motor. Reg. $199.50. (Item 209Ap)...

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Improved new model, many uses. Establishing foundation lines, laying drains, ditches, roads, terraces, fences, etc. Extremely accurate. Tested by thousands of users. So simple a boy can use it. Indispensable to Home Mechanics, Carpenters, Masons, Contractors, Engineers, Gardeners. Complete with instructions. Item 312. Wt. 1 lb. Factory Special..... **$2.50**

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(Item 16) **Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire encased in a treated braid jacket. So tough that you can drive over it.** Use indoors or out. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. (Item 16) 40 ft. (wt. 2½ lbs.) Usually $4.50 Special..... **$1.99**
Combination 2—40 ft. & 1—20 ft. (total 100 ft.) (Item 16c) **$4.95**
100 ft. length (1 piece) (Item 16p)..... **$4.85**
NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only* **$8.95**

Variable Speed Selector

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists — any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: ½-1 hp, wt. 36 lbs.; 1-2 hp, wt. 55 lbs.; 2-3 hp, wt. 105 lbs. Reg. list $228, $252 and $352. Our prices . . . **$79.50, $89.50** and **$114.50.**

44 Pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome alloy. Absolutely the best. Complete range of 21 sockets from ¼" thru 7/16" (¼" drive) & 7/16" thru 1-1/16" (½" drive). Two extensions, reversible ½" ratchet, 3 drift punches, sliding "T" head, all angle coupling, ½" speeder, ¼" breakover, 3 pc. high chrome alloy combination wrench set & 8 pc. offset wrench set in a big dog-house toolbox with ample room for other tools. (Item 596). We challenge anyone to match this value! Easily worth $49.50. Wt. 16 lbs... **$21.95**

32 Pc. SOCKET SET
(Item 205) Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a big, dog-house steel box. Wt. 17 lbs. List price $62.90 Factory Special..... **$27.95**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... BIG 1954 Catalog

MASTER MECHANIC MFG. CO., DEPT. 33E **Burlington, Wis.**

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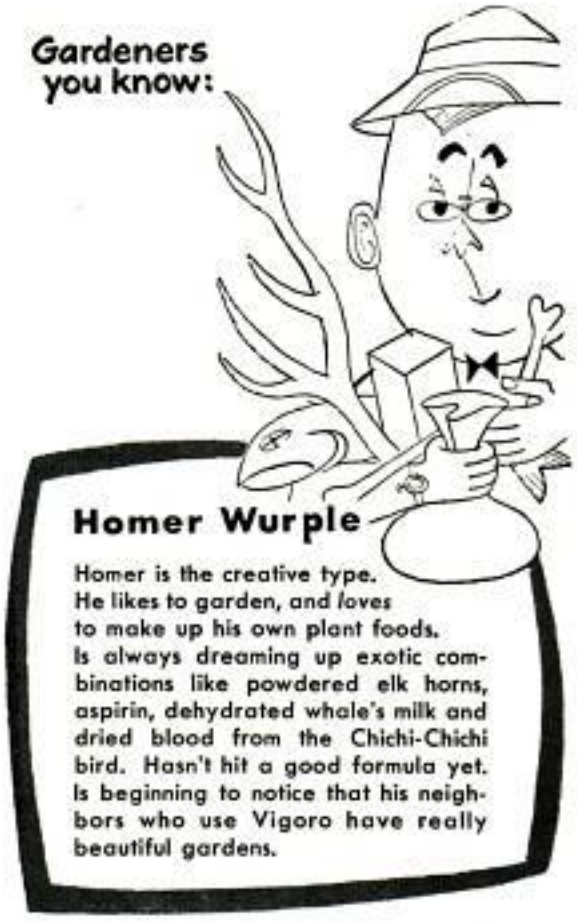
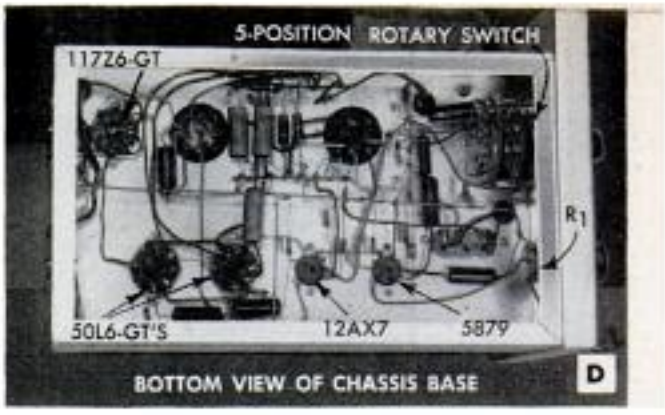


There's a bit of Homer in all of us. Gardening just wouldn't be gardening if you couldn't get excited about new things.

But in gardening, too, it's nice to have "old reliables" to fall back on. Tried and true varieties of roses, for example. Also Vigoro—complete, balanced plant food.

Vigoro just had to be good to get where it is. And each year, we make it better than the year before. That's why amateur and expert gardeners have made Vigoro the most-used plant food in the world. What better proof of quality could you ask for?

There are now two kinds: Regular Vigoro . . . and new Instant Vigoro that's soluble in water. Both can make any plant grow and thrive even in plain sand.



Super-Fidelity Home Phono Has Back-Loaded Cabinet

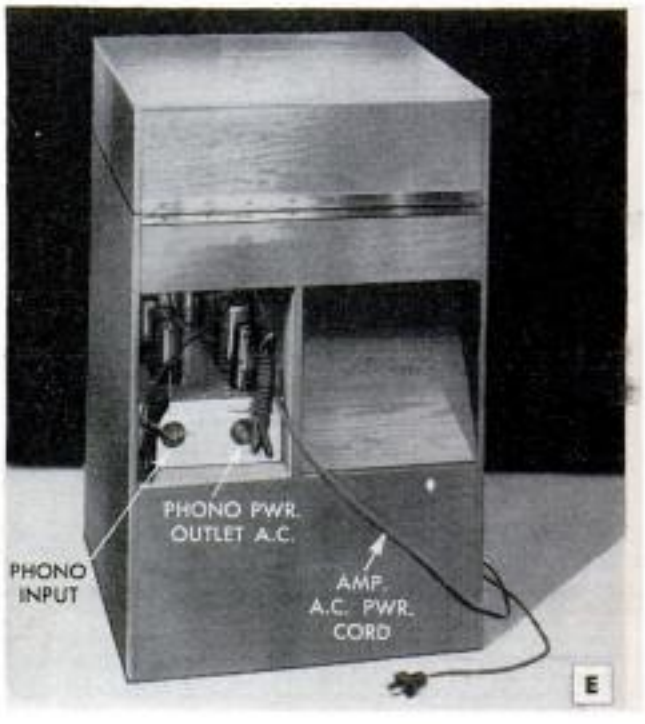
(Continued from page 248)

50L6's; the driver stage is a directly-connected dual triode 12AX7. The input tube is a relatively new low-noise, low-microphonic pentode 5879. It is available from radio-parts houses for about $1.75; the rectifier tube is a 117Z6-GT.

The phonograph unit has a 3-speed changer with turn-over crystal pickup for microgroove 33 and 45 r.p.m.; and standard 78 r.p.m. This V-M model 920 record player has a "siesta" switch, Fig. 3, so that both motor and amplifier can be turned off automatically at the end of a series of records. The usual way of operating is indicated in Fig. 2 where the off-on switch is on the amplifier panel.

Any crystal phono pickup which has ½-volt or more output is suitable for this amplifier. However, reluctance pickups such as G.E., Pickering etc., are not

(Continued to page 282)



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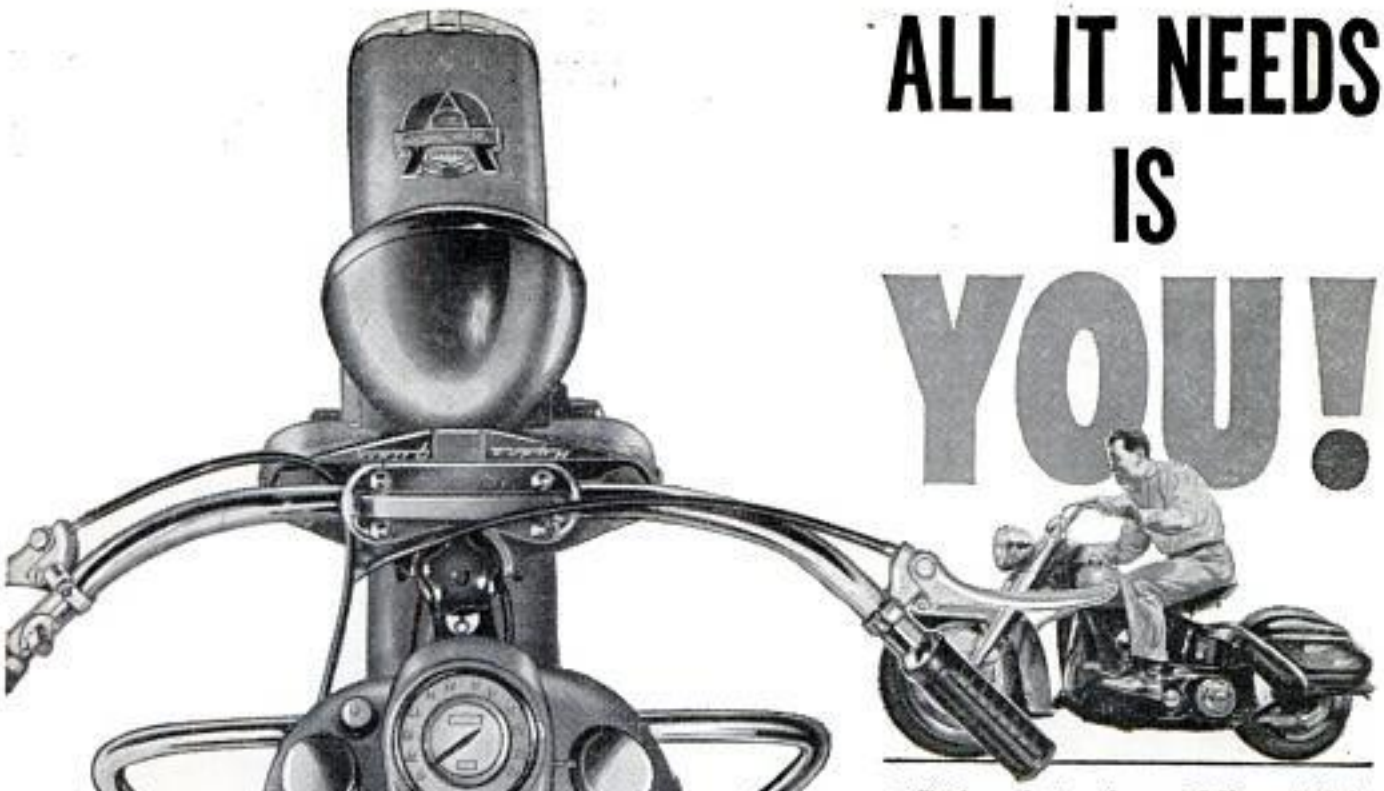

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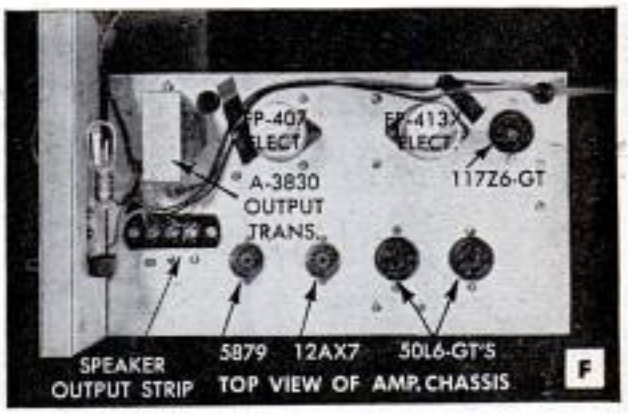
recommended for use in this back-loaded cabinet. The amplifier gain must be so high, and efficiency of a back loaded speaker is so great, that it is impractical to use them.

There are two parallel heater circuits in the amplifier. The 117Z6-GT is one all by itself, the other includes audio tubes.

Note R-27 resistor across 12AX7 and 5879 heaters; this makes for quieter operation, by running the heaters slightly below rated voltage. Should one of these tubes fail, there will be added voltage applied across R-27. This is a 5-watt wire-wound resistor and it will take this extra load until the defective front-end tube is replaced.

Photos B, D and F show various views of the completed amplifier chassis. When mounting the component parts, be sure that



nothing is "grounded" to the metal chassis. Each 4-section electrolytic-capacitor unit has its Bakelite wafer mount screwed to the top of the chassis. Use small-head mounting screws so that the can does not touch the chassis by way of the screwheads.

The amplifier chassis base is detailed in Fig. 4. The phono-input jack is mounted on the small Bakelite panel so that both terminals are insulated. The short lead from this jack connects to the common bus bar, see Fig. 1, the insulated common bus is indicated by the heavy line in both circuit diagrams. As far as possible, keep grid and plate leads apart, or cross them at right angles. Push them, after soldering, close to the chassis; any grid wire close to the chassis is automatically shielded. Scotch tape is handy for this purpose. Solid push-back No. 20 tinned copper wire is used for wiring; the common bus bar, however, is bare No. 14 tinned copper.

The .05 mfd. 400-V. capacitor C16 is important, one terminal connects to the metal chassis by means of a soldering lug under a short machine screw and hex nut; the other terminal connects to the common bus. Feedback must be connected correctly. The leads to each push-pull 50L6-GT are color coded in the diagrams. ★ ★ ★

(To be continued next month)

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THE KAYE—1146 sq. ft.—4 large bedrooms, U-shaped kitchen, sheltered entrance, hip roof—Deluxe throughout.

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THE TWELVE FINEST

American Classics

(Continued from page 153)

limited production. That is what makes them the exciting cars they are. They were scarce when built, they are rare today. Because of their special construction, they have "hand-tailored craftsmanship," they are works "of mechanical perfection" and they "make the blood race a little faster in any person who appreciates machinery."

"A Classic is a man's car." The Kissel White Eagle Speedster, built in 1927, is exactly that, without ornamentation, power conveniences and other "complex simplifications." The man who owned and drove a Kissel was a man through and through, say the followers of the Classics. And the same is true of the Stutz Super Bearcat of 1932.

"It is a car designed more for impression and appearance than for practical usage." . . . "It is an engineering exaggeration, magnificently overdone. It is not practical, but it is more car than was ever put on four wheels before or since."

Nobody is suggesting that Detroit should abandon its present designs and go back to the Classic standards. In the first place, the price would be prohibitive. The Duesenbergs cost about $8500 back in 1931 and that was without the body! When you bought one, you bought the chassis (engine, frame, running gear) and hired someone to put a body on it. That is the reason for hyphenated names like Roadster-Murphy, Victoria-Rollston—Murphy and Rollston being noted body builders of the time.

In a sense, however, Detroit does make use of classic designs because such designs are part of the history, the experience, of automobile design and no engineer or stylist can ignore history. The Classic was ahead of its time—it led the way. Look again at the 1933 Pierce Silver Arrow V12. Built 21 years ago, it still looks modern, even to the recessed door handles that are yet to come out of Detroit.

Probably the best definition, although certainly not the most definitive, was this one: "A luxury car of yesterday that people of today look at and say, 'Gee! What an automobile! I would sure like to own one like that.' "

In a word, then, a Classic is a car with "character"—a car that "excites the imagination." It is, as one poetic member wrote, "a hunk of iron with a soul." And, according to the Classic Car Club's motto, "They don't build them like that any more." ★★★

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The Great Road Races of the World

(Continued from page 183)

Q: John, you were the first American to win a Coupe des Alpes in an Alpine Rally. Will you tell us about that race?

FITCH: Of course, it isn't really a race. It is a rally—you are racing against time only. More than one person can win a cup in each rally—all you have to do is go through the whole event without losing any marks. You lose marks by failing to show up on time at any of the control points. It runs for about 2000 miles, through the Alps and in France, Switzerland, Italy and Germany.

Q: You are competing with the clock and the rules, is that it?

FITCH: Yes and there are special tests, like timed climbs up mountains from various controls, scattered all along the course. You have to be at these controls at exact times. In some sections, that requires very fast driving. In others, like in the city of Milan or in Switzerland, where they aren't quite so enthusiastic about cars racing around on their roads, you have a relatively low speed to maintain. It is almost always through the Alps, up and down the passes. Some roads are about six feet wide and of loose gravel on narrow, obscure passes open only a few weeks each summer. They are snowed in the rest of the year.

Q: What car did you drive in the rally?

FITCH: The Sunbeam Alpine—a two seater.

Q: What is the best sports-car race in this country?

FITCH: The sports-car racing fraternity has lost several established road courses, but through the Strategic Air Command of the Air Force has gained many more airport courses. Of the old courses, I liked the 6.8-mile country road at Elkhart Lake that permitted very high speeds on a somewhat rough road that swept over rolling country and through the main streets and sharp turns of that resort town. The airport race I enjoyed most because of the course was the McDill Field race at Tampa, Florida. There were several right and left high speed bends that required precise control and an interesting series of slow turns, some of which decreased in radius, requiring much attention in positioning.

Q: Are these airport races as challenging as the road race?

FITCH: With careful planning of the course they can be very interesting. Last winter's Tampa race was very fascinating —and safe, too. There were right and left-angle turns and switchbacks, fast and slow bends.

(Continued to page 288)

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by Tom Hanlon
CBS ACE RACE REPORTER

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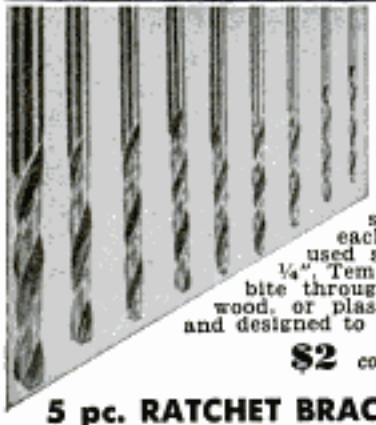

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WALTERS: Road courses do present more of a challenge and that's why drivers usually like them better, but airport courses can be made exciting and challenging, if laid out skillfully.

Q: What does a sports-car driver have to be able to do adroitly in competition?

FITCH: Well, the tricks are pretty simple. Actually they are not important because everybody does them! Principally, you have to step on the brake and the accelerator at the same time so you can synchronize the engine speed and gear speed while braking. More important is knowing when to do the various tricks.

Q: Then the mental is more important than the physical?

WALTERS: It is coordinated—both mental and physical. Anybody can move a wheel just so, but it is the coordination that counts—knowing when to do what.

Q: Does that come only from practice?

FITCH: I think it is something you either have or don't have. You see drivers who have had no experience drive extremely well in their first race.

WALTERS: Yes, these drivers may have had no racing experience, but they have been the constant headache of the local constables for years, I'll bet!

Q: How do you tell a good driver?

FITCH: Just look at his times—they tell you a great deal. See how fast he gets around the circuit. At Le Mans, the best way is to drive behind him for a lap or so. You can see how fast he goes through the corner; what he is doing to correct the car's behavior, whatever it may be. Cars have different characteristics. If a car is not tracking straight through a corner, if the back end is set out from the front and the driver is correcting all the way through, you can be sure he is going at just about the limit of the car and that means he is good.

Q: Does a good driver drive the car at its limit all the time?

WALTERS: A good driver drives as slow as he can and still win.

Q: He doesn't know what that speed is at the beginning of the race, does he?

WALTERS: A good driver knows it before a poor driver.

Q: Tell us what a good driver does when he comes up to a curve.

FITCH: Here is a simple example of what happens at Le Mans. You come down the straightaway at your predetermined top speed. When you get to the 800-meter marker, cut off and get on the brakes.

WALTERS: In many cases the cutoff point and the way you slow down is not even the choice of the driver—it is prescribed by the team manager. As is the

(Continued to page 290)

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speed at which you will drive, of course.

Q: How do you apply the brakes?

FITCH: In a conventional sports car having normal brakes you use short, hard, interrupted pressures, backing off between applications to let them cool. Then you shift down to third gear so the engine can help stop you and you brake it two or three more times and shift to second. If you get down to second and the brakes begin to rumble or one of them grabs or you are going too fast to get into the corner and have to go down the escape road, then you know you have to start braking a little sooner next time.

WALTERS: It's as cut and dried as that. On each team, someone who knows what the car will do determines the exact procedure during practice. Drivers are then asked to follow his advice.

FITCH: Le Mans is not good for discussing driver technique because it is so cut and dried, as Phil says. That is why we say the car is so important there.

Q: Is the technique different on the difficult circuit at Nurburgring?

FITCH: I suppose not really, but there is more chance to use technique. There are more turns, which often run together and are complicated by positive and negative banking. And there are steep up and down grades. There, most of the drivers are familiar with the course and it is assumed that they know what to do. If they take the downhill section too fast and abuse the brakes, run too deep into the corners and have to stand on them too hard without any respite at all, in two or three laps the brakes start smoking, the lining begins to burn and they are out of commission.

WALTERS: It is entirely possible to destroy a car in 25 miles by the way you drive it. So, even in the so-called sprint races, the first thing a driver does is recognize the car's capabilities and stay within them.

Q: What happened to you at Rheims, France, John?

FITCH: I went off the road at 140 miles per hour and thought I would never stop bouncing. The Cunningham went end over end once and I don't know how many times it rolled.

Q: That was the open roadster, wasn't it?

WALTERS: Yes, it was the open Cunningham. The good roll-bar construction saved his life.

FITCH: I was conscious of trying to hold myself down in the car and of course I had a safety belt holding me in also.

Q: Do you wear a safety belt when driving in competition?

(Continued to page 292)

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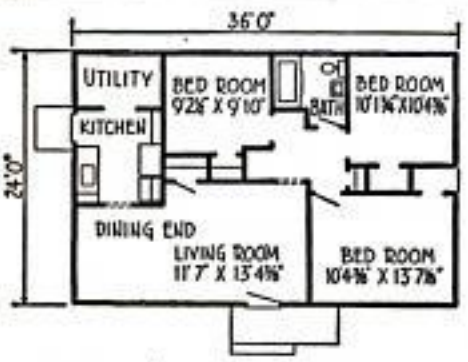

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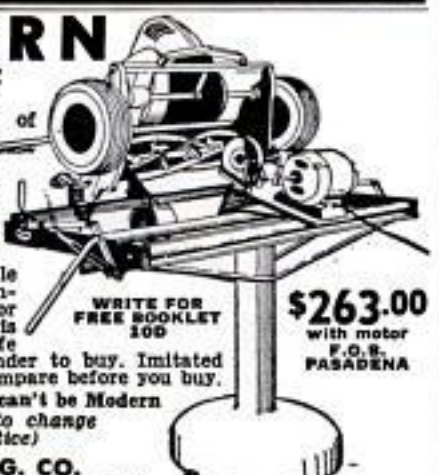

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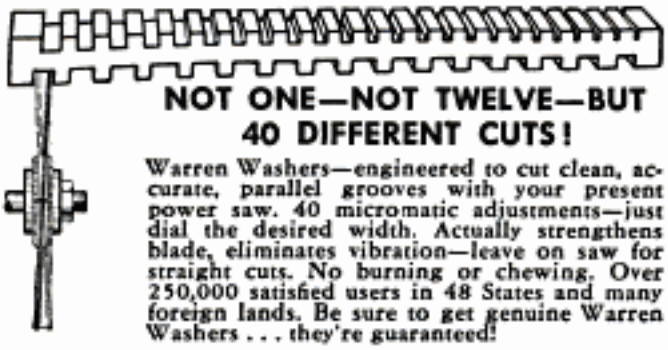

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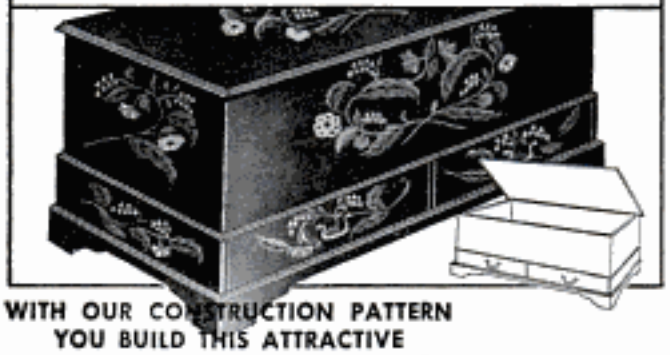

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FITCH: I feel in most cars a belt is desirable when racing.

WALTERS: Wouldn't you say that in any car that you are protected in, it's a good idea? But if you are half sticking out, it is probably best not to have one on.

FITCH: Well, I feel that it may be desirable even in a car that you stick out of because you can loosen the belt. I don't say that you would, but you can loosen it with just one motion of the hand. In minor accidents, where you run off the road and the car stops suddenly but remains upright, you are usually safe if you are fastened in, but if you go flying unprotected through the air at high speed and hit a tree or anything solid, it's too bad.

Q: What attributes of a sports car should the American family car adopt?

FITCH: I would say less unsprung weight in the rear axle. It is not for any obscure sport or competition reason, but simply to make them more pleasant to drive and ride in.

WALTERS: I suggest that the car's ability to stop quickly from high speeds be improved. They can do it with bigger brakes, by cooling the brakes or by going to spot brakes.

Q: What would less unsprung weight do?

FITCH: It would keep the back wheels on the ground, the result being that the car would handle better, it would stay on the curves better and would be much more comfortable.

Q: What changes in design would be necessary?

FITCH: I would think the best system would be a trailing-link suspension.

WALTERS: With a sprung differential.

FITCH: Yes, it could also be done by de Dion or by sticking to present designs and using lightweight metals. ★ ★ ★

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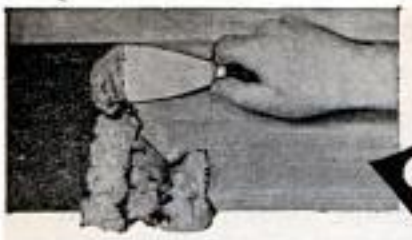

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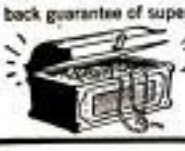

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28 Lawn Ornament Patterns, 25c. Other Patterns: 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 15¢ each. 25 Novelty Patterns, 30c. **All 62 Full Size Patterns, $1.00.**
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Four inches more than other heavy-duty lathes. 33" between centers. Extra features. Compare SHOPSMITH! It's a saw, sander, vertical and horizontal drill, too. Write for free catalog.

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AMONG ITS 101 Handy Uses

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- Protecting Tool Handles
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Yes, for preserving fine woods . . . and for an unending variety of other daily uses both indoors and out . . . you'll find Archer Pol-mer-ik the *handiest* single item in your home or shop.

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Archer Pol-mer-ik is the choice of most professional painters for paint reducing and brush conditioning. And with good reason . . . for Pol-mer-ik's special heat processing rearranges and locks together the oil molecules, giving you a tougher, more durable paint film than ordinary linseed oil. Paints reduced with Pol-mer-ik brush out easier . . . level better . . . establish a smoother surface that collects less dirt, and gives you a longer-lasting job! For better results, use Archer Pol-mer-ik *whenever* you paint!

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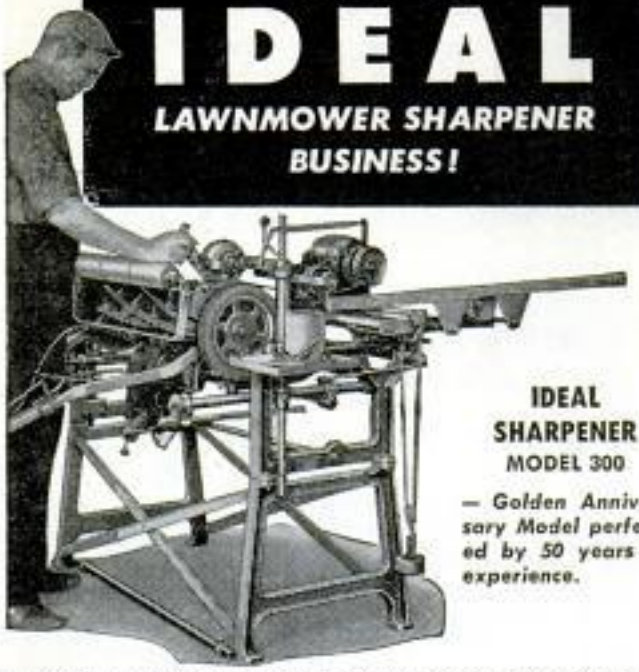

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Report to Detroit

(Continued from page 171)

have become accustomed in the motorcar.

A four-passenger car seems to have no great appeal in the United States, despite its popularity in Europe. Nearly 60 percent said they would not buy a four-passenger car "under any conditions."

"A car of this size would not take care of my family." Ashton, Idaho, teacher.

"A one-car family could never take anyone with them."—Holcomb, Mo., teacher.

While automobile manufacturers seem to add more chrome each year to their new models, the owners say they don't like it. Only a tiny 9 percent said they want more chrome, while 32 percent specifically asked that less chrome be used.

"Remove all chrome and replace it with stainless steel." — Plainfield, N. J., plant executive.

"Keep design conservative, very little decoration and a minimum of chrome. Concentrate on comfort and safety."—Moncks Corner, S. C., engineer.

"Cut down on chrome, especially that which can reflect the sun into the driver's eyes."—Albuquerque, N. M., engineer.

On the average, the owners trade in their cars every three years. Only 9 percent said they traded to take advantage of new styling changes whereas 37 percent traded for mechanical reasons. Most owners (73 percent) see no sense in annual exterior style changes anyway.

"Car becomes outdated too soon."—Pawtucket, R. I., proofreader.

"New styles have too many bugs."— Kokomo, Ind., personnel representative.

When asked about features they would like to have in their future automobiles, the owners showed an amazing interest in the air-cooled engine—amazing when you realize there is no such automobile engine in production in this country today. The air-cooled power plant is the first choice for the "car of tomorrow" with 40 percent of the owners asking for it.

Second most popular feature for their car of tomorrow, according to the owners, is a rear engine. There are 22 percent of the owners who want that. These are the two most frequently picked mechanical changes.

As mentioned above, the most frequent suggestion the owners make to the manufacturers is that they build for greater safety. The second most frequent suggestion is that the cars should give better gasoline mileage.

"Instead of going overboard on this horsepower race, they should develop an

(Continued to page 296)

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No. M- 30 Hobbyist assortment of six small magnets . . . . . $ 1.50

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The Gem Maker comes complete with all necessary equipment, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt, for only $29.50, f.o.b., Burlington, Wisconsin. Write today for information and literature.

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Saw Wood..Make Many Other Hard Jobs Easy

Sturdy 1½ to 5 H.P. Walking Tractor

Best for all around garden and lawn work. Variable speeds, adjustable wheel widths, individual gang tool controls. 3 speed and reverse automotive gears on 3 and 5 H.P. models. Superb traction, deep plowing, easy handling. All wanted tools and attachments.

Rugged, Low Cost 2½, 5, 8 H.P. Streamliner

Powerful, practical, streamlined, comfortable. Pulls 8, 10, 12 inch plows, cultivates between 38" rows, bulldozes, mows lawns, operates belt attachments. 3 speeds and reverse automotive transmission. Friction brakes. ¾ to 7 M.P.H. Nothing else like it in a tractor that will get the work done.

Inexpensive New Tiller...Lawn Mower

Nine inch rotor pulverizes 12 inch swath 6 inches deep. 1½ H.P. Extremely low cost. Rotor quickly replaced with single wheel for lawn mowing, hauling, etc.

Also larger 8, 12 H.P. riding tractors with 3 speeds and reverse automotive gears.

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the MAGNETIZED RE-CHUT

This new handy magnetic tool will prove to be one of the most versatile in your tool kit. The slotted head is perfect to grab nails — any size — and hold them in exact driving position, in hard-to-get-at places. It can't be beat as a metal retriever — the narrow head and 7¾" over all length enable you to get into transmissions and other housings where your fingers can't reach. In fact, the ingenious craftsman will find a thousand uses for this sensational, inexpensive tool. Send for your Re-Chut today . . .

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engine with fuel economy in mind."—Los Angeles photographer.

"Build lighter but not smaller cars with much smaller but more efficient engine and transmission with consequent economy to the owner and less wastage of our natural resource—petroleum."—Washington, D. C., technician.

Owners in large numbers also suggest that car makers deliver their products to the buyer in better condition, with more attention to details of assembly.

"Better materials and workmanship. Modern cars—even in higher price ranges—tend to use inferior materials. Factory workmanship is sloppy. Too much repair by the dealer is necessary"—Klamath Falls, Ore., industrial-relations adviser.

"More rigid inspection in final assembly. Slipshod work is inexcusable."—La Habra, Calif., machinist.

There are many other interesting facts that the survey disclosed. These are presented in detail in the percentage charts that accompany this article.

Only 50 percent reported that automatic transmissions are worth the extra cost. Yet Detroit is predicting that in a few years, all cars will have automatic transmissions. Power braking is second in popularity with 33 percent, 22 percent approve power steering. Reclining seats (available in only one make of car today) are desired by 24 percent of the owners. Evidence of the increased interest in safety is the fact that 14 percent of the owners are willing to pay $50 extra for an automatic headlight dimmer to help reduce night hazards.

As in all our Owners Reports there are many remarks that are interesting even though they do not necessarily reflect a frequently held view.

"All cars should have a passing gear for emergency use."—Charleston Heights, S. C., Navy chief.

"Electric windshield wipers on all cars."—New London, Conn., retail salesman.

"Remove steering wheel as a vision and collision hazard."—Jamaica, New York, engineer.

"Make a grille that is easy to clean. There are too many places you can't get with a sponge or your hands."—Salem, Ore., printer.

"Provide a windshield free from interior reflections."—Franklin, N. H., field man.

"Stop spending millions on the horsepower race and spend a like amount on suspension and steering so that cars with 200-horsepower engines will be safe to drive."—Huntington, W. Va., salesman.

"Simplify engine design, keeping in mind the man who has to service the engine after

(Continued to page 298)

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Power these electric generators with your own gasoline engine, power take-off, or electric motor, and save the difference.

ITEM #G-3—3000 Watts, 120 Volt, 60 Cycle, 1200 R.P.M. single and three phase, for two or three wire circuits. Excellent source of electricity for portable or stand-by use for homes, farms, hatcheries, radio stations, factories. Built by Robart Mfg. Co. to exacting specifications of the U.S. Army. Ball-bearing, generator, fan cooled. Equipped with standard 1⅛" shaft with keyway for direct or pulley drive. Built-in Self-Exciter Foot Mounted. Gov't. Acquisition Cost: $325.00. Dim. 21"x13" Dia. Ship. wt. 250 lbs. New Low Price: **155.00** F.O.B. Chicago

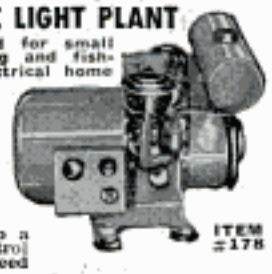
ITEM #G-75

ITEM #G-75—7500 Watts, 120 Volt, 60 Cycle, 1800 R.P.M. single and three phase current, for 2 or 3 wire circuits electric generator, double ball-bearing construction, standard 1¼" shaft with keyway, and included at no extra price, 5-groove six inch pulley for belt drive. Direct connected Self-Exciter Foot Mounted. Gov't. Acquisition cost: $545.00. Dim. 34"x11½". Ship. wt. 420 lbs. Price Slashed To: **269.00** F.O.B. Chicago

PORTABLE ELECTRIC LIGHT PLANT

NOW . . . SAVE $161.00 on this $250.00 VALUE — 350 WATT A. C.

Compact Electric Plant suited for small homes, cabins, campers, hunting and fishing camps, trailers and small electrical home appliances. Operating costs: About 5c per hour. Runs exceedingly quiet. Sturdily constructed for dependable service. Net weight only 88 lbs. Can be carried from place to place, or transported in trunk of car.


ITEM #178

350 Watt—110 Volt—60 Cycle—A.C. Model—M.S. 35-3, made by Midco Mfg. Co. 1 Cylinder, 4 Cycle Engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 350 Watt Generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. Shipping weight 116 lbs. Commercial List Price $250.00 NOW ONLY . . . . . **89.00** F.O.B. Chicago

D. C. GENERATORS

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Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost $380.00. Shpg. wt. 55 lbs. Dimensions 16" x 10" x 7". F.O.B. Chicago. **35.00**

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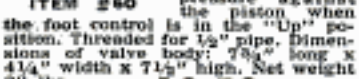
BRAND NEW — For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for ½" pipe. Dimensions of valve body: 7¾" long x 4¼" width x 7½" high. Net weight 28 lbs. A $64.00 value for only. **19.50** F.O.B. CHICAGO

EXTRA HEAVY DUTY Double Action HYDRAULIC CYLINDER



ITEM #224. 3¼" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure. ¾" pipe thread ports —1⅝" stress-proof ground, polished & plated solid steel shaft. Overall length closed 36". ¼" steel wall cylinder barrel clevis mounting at base and shaft. Features—Tie Rod construction. Honed barrel. Ship. wt. 50 lbs. F.O.B. Chicago. . . . **39.60**

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BLACKHAWK HAND-HYDRAULIC PUMP

ITEM #82. Perfect for Hydraulic Presses, Snow Plows, Farm Wagons, Jacks, and Farm Plows.

A few easy strokes of the 20" handle and you can lift 5000 lbs., using Item 355 — Hydraulic Cylinder.

Blackhawk Model P-151 —complete with built-in oil tank and release valve.

Rated 1200-8400 lbs. per square inch. Dim. 9"x7"x6". Ship. wt. 35 lbs. Worth much more. F.O.B. Chicago. **22.50**

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ITEM #355 — 2½" bore and 7½" stroke, 1½" stainless steel piston rod. Lift capacity 5000 lbs., using 1000 lbs. pump pressure. Manufactured by Delco-Remy Division of General Motors Corporation. Clevis mounting on base and piston rod for 7/16" bolt. Overall length closed 21". Distance between centers 19". Supplied with fittings to ⅜" pipe thread. Brand new—in original carton. . . . . **16.00** F.O.B. Chicago

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GENERAL MOTORS —ALLISON

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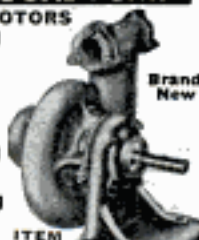
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AMPERES, DC: 10
DECIBELS (5 RANGES): —12 TO +55 DB
OHMS: 0-2000 (12 OHMS CENTER), 0-200,000 (1,200 OHMS CENTER), 0-20 MEGOHMS (120,000 OHMS CENTER)

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44 • EStebrook 9-1121
In Canada: Bach-Simpson, Ltd., London, Ont.

the body has been put around it."—San Antonio, Tex., farm-equipment dealer.

"Build in a one-shot lubrication system."—Grafton, N. D., minister.

"Too much emphasis on styling. Who cares how a car looks just so it's safe and gets you where you want to go, comfortably and safely?"—New York City salesman.

"Have front and back floors level instead of raised in the middle."—Waterloo, Iowa, carpenter.

"Make steering ratio lower and cornering better."—Centralia, Ill., engineer.

"I do not believe in forsaking the safety features of the older cars just to accomplish a rakish style, as some manufacturers seem to be doing."—Albuquerque, N. M., administrator.

Finally, the owners were asked to give their opinion of the foreign car, a subject of much discussion these days.

They are obviously not impressed by what the Europeans are doing despite the fact that the air-cooled engine and rear engine that the owners want in their future cars are fairly common in Europe today.

Only 19 percent had anything at all favorable to write about imported vehicles. The majority (55 percent) were definitely opposed to the foreign car for various reasons, ranging from a belief in American mechanical superiority to a feeling that we should trade at home to protect our standard of living.

"I prefer getting into a car, not putting one on like a vest."—Miami, Fla., executive.

"I believe in patronizing the home market first under any circumstances and believe foreign cars are a fad for those who want to be different."—Shaker Heights, Ohio, accountant.

"All right for European cities where the streets are all narrow. We are a people who like more room and comfort."—New York City contractor.

"Okay for playboys."—New York City banker.

"Not so modern as ours. They are years behind in styling. The good foreign car is excessive in cost."—Bremerton, Wash., master mechanic.

"Owners seem to make foreign cars a hobby rather than an essential means of transportation."—Baxley, Ga., forester.

There you are, Detroit. That is what a cross section of the automobile market thinks about you and your competition. Naturally, every one won't agree with the results of the survey, but the replies do prove that Americans are more auto-conscious than ever. A careful reading of the percentage tables will give all of us, and especially the manufacturers, something to think about. ★ ★ ★

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Note! The economy-minded home mechanic or hobbyist will find Bon-E-Con tools especially suited to *his* requirements. They are tools any man would value at prices anyone can afford. And Bon-E-Con tools carry the same guarantee as Bonney tools.

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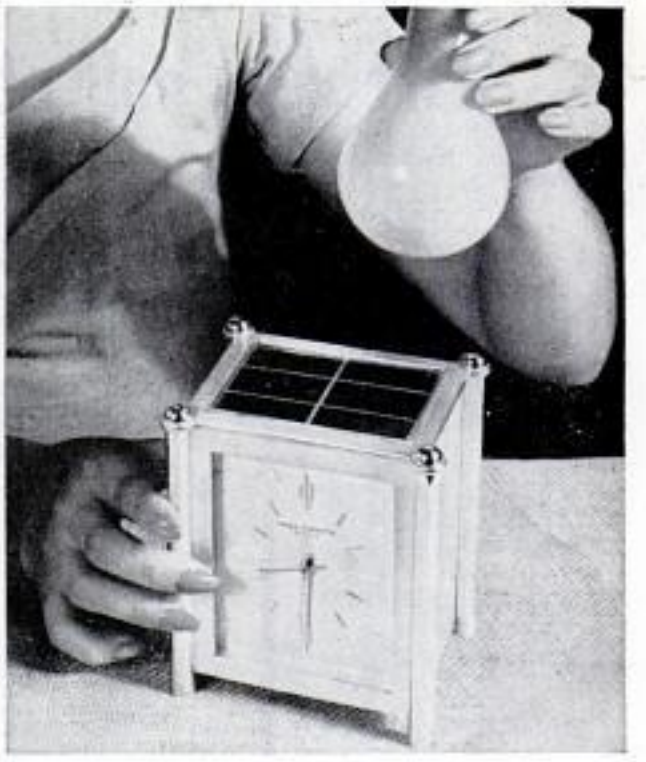

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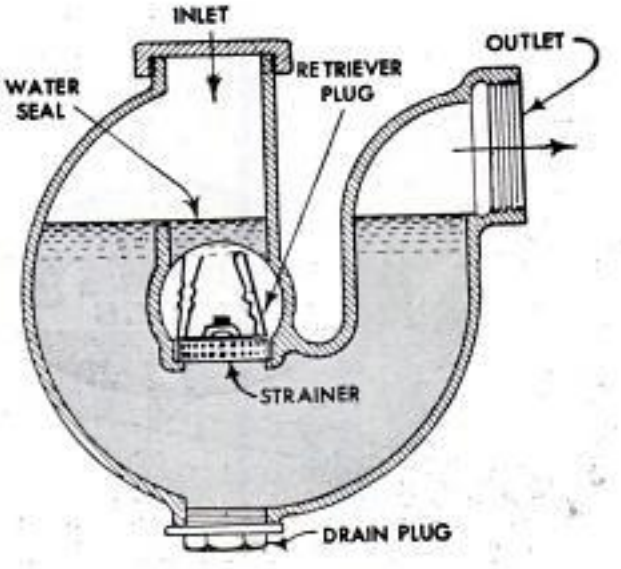

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24 V. 90 Amp. ball bearing motor with double end ½" 11 spline shaft. Can be used on 110 AC by changing internal leads — instructions on request. F.O.B. Detroit $9.95

NEW 1/20 H.P. CONT. DUTY MOTOR

110 volt, 60 cycle A.C.—1750 RPM. Ball bearings, ¼" shafts — weight 3½ lbs. New, guaranteed — ideal for fans, other continuous duty uses. Postpaid $4.95

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For slow motion displays, toys, rotating TV antennas, etc. 24 volts—operates on 110 with resistor which is included. Single or twin 3/16" shaft. 5" high. Postpaid $4.49

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Set of 12 different used files in good, usable condition. Various sizes—lengths up to 12"—half rounds, knifes, bastards, mills and others. Postpaid.

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Save 85%! 8" dia., ⅝" bore. New, fast working. Perfect for welders, machine shops, hobbyists. Postpaid . . .

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30 new grinding wheels, all types and sizes, up to 2" diameter, with ¼" arbors. Mandrel included which fits all wheels. Use in drills or flexible shafts. Postpaid..... $3.29

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ROTARY MOWERS—Cut toughest weeds; mow finest lawns. Choice 20-inch or 16-inch sizes.

POWER SPRAYER — For field, garden, yard, orchard use. 5-gallon capacity. Mounted on all-purpose carrycar.

PLUS rotary Sno-Thro, recoil starter, litter stirrer disc, paint sprayer, electric generator, all-purpose carrycar.

Free! See your dealer or write for colorful folder and amazingly low prices.

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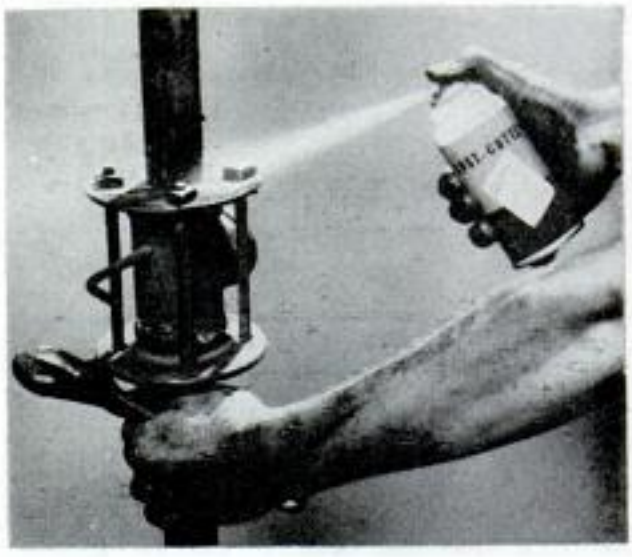
High Living for Mechanics

Maintenance stands three stories high are used by mechanics servicing the Air Force's C-124 Globemasters. Tail sections of the planes are more than 48 feet high and require the special stands to reach every part. The big transports are moving supplies overseas and returning troops.

Chemical Rust-Cutter

In a matter of minutes an aerosol-spray chemical cuts through rust to loosen nuts, bolts and studs. Emitting a mist that penetrates the smallest crevice, the pressurized container makes it easy to apply the de-rusting chemical where it is needed. It also leaves a rustproofing surface film.



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PREVENTS RUST
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- In handy 20¢, 35¢ and 95¢ tubes at Sporting Goods, Hardware, Marine and Auto Supply Stores.
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LOW PRICED TURNTABLES

for radios, TV converters, lazy susans, many other home, office, shop uses. Standard model's rigid 16 gauge steel plate, 12" x 8", rotates with ¾" clearance on patented no-oil bearing, holds up to 50 lbs.

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Agents, Dealers write for terms. Mfrs. write for other sizes.

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A SIZE FOR EVERY NEED
1,000 to 50,000 watts. Compact, quiet-running, easy to install. Gasoline engine powered.

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FOR DOZENS OF HOBBY AND HOMECRAFT JOBS

plus all kinds of soldering

- **INSTANT HEAT** saves time and current
- **DUAL HEAT** for heavy or light jobs
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- **SPECIAL TIPS** for cutting, smoothing and soldering

Here's the fastest, most efficient soldering tool ever, and by simple interchange of tips it does dozens of other money-saving jobs. Thousands are in use by Radio and TV technicians and professional mechanics. 4 models up to 275 watts. See them at your Hardware Dealer, or write for catalog describing uses.

Cuts plastic tile

Seals freezer packages

Removes hard putty

Repairs furniture scratches

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ALL YOU NEED IS A TUBE OF

DU PONT DUCO CEMENT

REG. U. S. PAT. OFF.

LOOSE BATHROOM TILES can be put back in to stay with tough "Duco" Cement. It's waterproof, too.

BUILD STRONGER MODELS. Quick-drying "Duco" Cement is standard equipment with most model builders.

DROPPED GLASSES? Save the day by anchoring lens or replacing chips with transparent "Duco" Cement.

BROKEN FINGERNAILS get first aid with transparent "Duco" Cement to stop further damage.

TRAIN IVY on walls for distinctive decoration. Fasten string to wall with waterproof "Duco" Cement.

SCUFFED SHOES, leather heels and inner soles can be repaired in a wink with Du Pont "Duco" Cement.

UMBRELLA HANDLES *will* come off . . . but they go back on to stay when fastened with strong "Duco" Cement.

CRACKED LENSES on flashlights will hold fast until replaced, if they're mended with "Duco" Cement.

DU PONT BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

(Continued from page 14)

it is impossible to guess where the half horn ring is located. By the time this half-ring section is located, it is too late to use it.

A horn signaling device is one of the most important safety helps on a modern car. It is of utmost importance that the control which operates or blows the horn is located in such a position that it is always in the same place. I cannot understand why a half or a whole horn ring was ever placed on a car because it is too close to itchy fingers who prefer to use the horn instead of their brakes and brains. Too many drivers seem to think that a little touch on the horn button leaves the responsibility of an accident entirely to the other fellow, so what chance does a pedestrian have? According to statistics, we kill and maim more people with our automobiles than in our wars. A horn is so small an item, but still it does so great a job if applied in the right way.

Could it be possible to have our automobile manufacturers abolish the horn-ring situation and make a useful horn button where it is available at all times?

William Bakker,
Chicago.

If You Drink, Don't Drive

And a Munich, Germany, inventor has a device to enforce that warning. Alfons Siedenhaus has built an alcohol meter attached by electric cord to the dashboard of his automobile. Before he can start the car, the driver must breathe into the meter. If the breath is too alcoholic, the car will not start; if only moderately tainted, the meter permits the driver to proceed at not more than 35 miles per hour.

★ ★ ★

Not many tourists have seen this road sign. It marks one of America's newest communities, a town being built some 400 miles north of Seven Islands on the St. Lawrence river, to house 500 men and their families. This is the "capital" of the new Ungava iron field, whose fabulous story is told in a feature beginning on page 118.

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TRANSMITTERS • AMPLIFIERS
TEST EQUIPMENT

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Build your own world-wide radio or choose from over 50 other top quality Heathkits. Easy to build from clear, step-by-step instructions. No specialized knowledge required. Low Kit prices include tubes and all necessary parts. Save money—buy directly from manufacturer.

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$25.50
SHIP. WT. 12 LBS.

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SMALL! POWERFUL!

America's finest low cost tractor. Ruggedly built. Easy to operate. No belts, no chains. Borg-Warner clutch, trans. and diff. 140 to 1 reduction. 40% more drawbar pull than ordinary tractors. 8-1/4 H.P. engine—gasoline or kerosene. 20 quick change implements. Write for complete details.

ECONOMY TRACTOR

ENGINEERING PRODUCTS CO.
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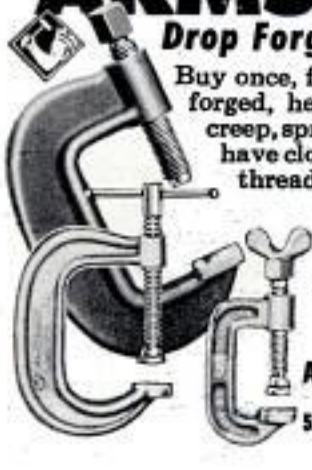
Drop Forged "C"—CLAMPS



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"The Tool Holder People"
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for fast, clean boring

Greenlee 22
SOLID-CENTER AUGER BITS

Here's the auger bit that makes good workmanship come easy! Smooth, *accurate* holes are bored swiftly because solid-center design gives extra strength and provides fast, positive chip clearance. Every GREENLEE 22 Solid-Center Auger Bit has accurately sized, perfect cutting edges that last through long use. "Induction Heat Treated" for uniformity, long life . . . "Plastic Sealed" to reach you factory-sharp. Available in 18 sizes: from 4/16" diameter through 24/16". Buy singly or in sets attractively packaged in handy plastic rolls, steel boxes or metal holding panels. Stocked by leading hardware and building supply dealers.

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Converts linear to board feet, gives nail specifications, tool sharpening tips. Compares woods, gives bit sizes for screws, concrete mixes, painting information, etc. Convenient . . . simple to read. 6" diameter circular shape . . . heavily varnished cardboard. Send 25¢ (no stamps please).

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GREENLEE

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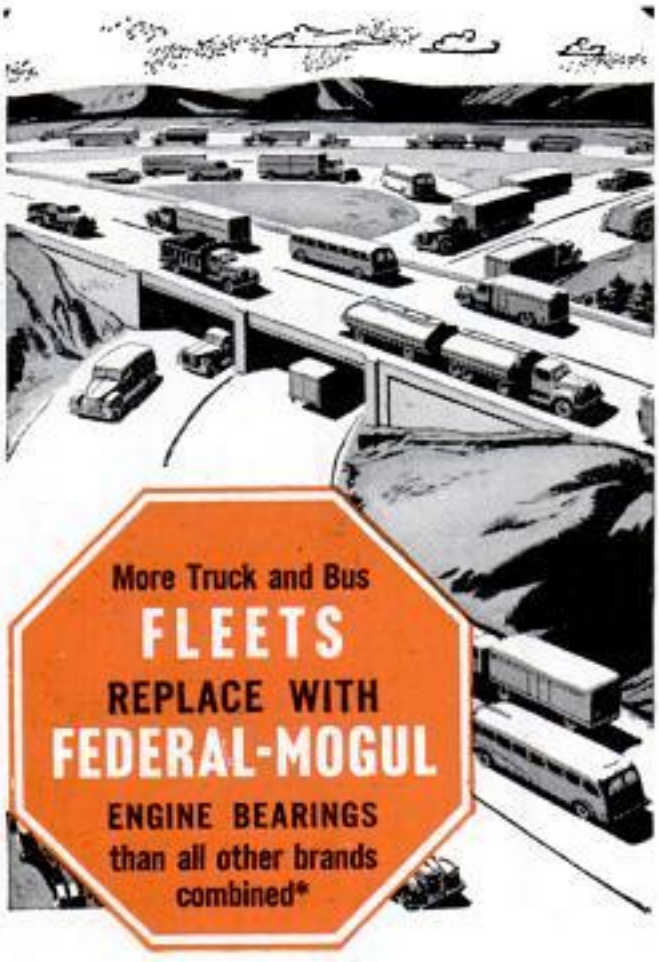

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*The men who run America's great truck and bus fleets *know* how to recondition engines for best results. In a recent survey of these experts, 53% of the replies stated that they used Federal-Mogul engine bearings in service work. Take advantage of the experts' experience! In reconditioning your car engine, restore full, clean power, pick-up and economy—install Federal-Mogul oil-control bearings! They cost no more, yet have been the best sellers in the replacement field for 30 years . . . because of quality! Federal-Mogul Service, Div. of Federal-Mogul Corp., Detroit 13, Michigan.

for New Power . . .

FEDERAL-MOGUL

Oil Control Bearings

BEARING MANUFACTURERS TO THE AUTOMOTIVE INDUSTRY SINCE 1899

Parade of 1954 Cars

(Continued from page 154)

THINGS to look for during 1954:

Buick, Oldsmobile and Cadillac advanced their 1955 plans up to 1954, bringing out costly new bodies, improved engines and other mechanical changes. Ford showed its new overhead-valve V8.

Transparent automobile roofs made their first production appearance in Mercury and Ford cars.

General Motors disclosed its experimental gas-turbine engine.

It is generally conceded that while 1954 will be a "good" sales year, it also will be competitive and even "rough."

There are distinct possibilities that the industry, or at least some of its members, will introduce 1955 models much earlier than in previous postwar years. Sales managers would like to get back to the fall introductions traditional in prewar years.

Engineers who are informed on such matters estimate that the new plastic Corvettes are costing as much as $10,000 each to produce (they sell for about $3500). However, production costs are expected to drop sharply after full output gets underway in St. Louis, where they will be mass-produced.

"The end of the lush market," a merchandising expert declared, "will come this year with the end of Cadillac's independence from depreciation schedules. Since the end of the war, Cadillac owners have been getting by on Chevrolet depreciation losses each year. But soon such owners will have to figure a depreciation of $1500 or more on an annual trade in."

Sports cars are expected to become increasingly popular during 1954 with Dodge's "Firearrow" rumored as going into production. This will be somewhat different from the model unveiled at the Chrysler show, but with much the same body lines and power plant. Ford's sports-car entry should appear in 1954 also.

The V8 engine is a "comer" and while the only additional user in 1954 is the Buick Special, the rumors are that there will be a wholesale switch in 1955 and 1956. There are even rumors of midyear change-overs to V8. Mentioned in this category are Pontiac and Plymouth.

After that the only holdovers will be Chevrolet, Nash, Packard, Hudson and Kaiser-Willys and there are many indications that they will soon join the parade.

If there isn't a merger before summer among certain independents, you can expect to see a pooling of production facilities to save money in the competitive battle against the Big Three.

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Note: all AC plants are 115-v 60-c.

- Plants 25 KW A-C....$1190
- Plants 5 KW A-C.....$595
- Plants 3 KW A-C.....$349
- Plants 2 KW A-C.....$289
- Plants 1 KW A-C.....$189
- Plants 3 KW 115-v D-C.....$169
- Plants 1.5 KW 32-v D-C.....$72
- Plants .6 KW 32-v D-C.....$64
- Generator 3 KW 115-v A-C.....$149
- Generator 2 KW 115-v A-C.....$139
- Generator 1 KW 115-v A-C.....$104
- Generator .6 KW 115-v A-C.....$79
- Generator 3 KW 115-v D-C.....$49

Save to 70% — See our catalog.

WATER PUMPS & SYSTEMS

- Centrifugals ¾" ....$19.95 1"....$29.85; 1½"....$38.60
- Rotary. Bronze, rubber paddle. Self priming. Pressure to 30 lbs. ¼", $14.75; ¾", $19.50; 1", $25.
- Rotary. Bronze-nylon roller. Self priming. Pressures to 100 lbs. ½", $17; ¾", $24; 1", $32.
- Auto Water System. Lifts to 22 ft. 110-v 300 gals. per hr. 40 lb. pres. Compact. Easy to install.....$70

Gauges, valves, couplings, hose, etc. Free advice.

SUPER CLOSEOUT BARGAINS

- Famous make $200 Tape Recorder $149.00
- Winch, 1500-lb. cap. 1-4 ratio....$19.95
- Mechanics Tool Chest, deluxe....$19.75
- Gas Chain Saws, leading make....$199.00
- Electric Chain Saws.....$89.25
- Rural Magneto Phones.....$9.95
- Tarpaulins, finest new Army type 10 oz. 8x10, $8.80; 10x12, $13.20; 20x20, $43.95
- Revolver, Automatic .22 cal.....$39.50
- Electric Drill, ¼" 110-v.....$26.95
- Electric Drill, ¼" 110-v.....$16.89
- Drill Set, 29-Piece, 1/16" to ½"....$8.98
- Air Corps G-v Searchlite.....$4.39
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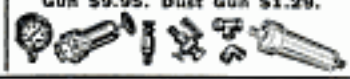

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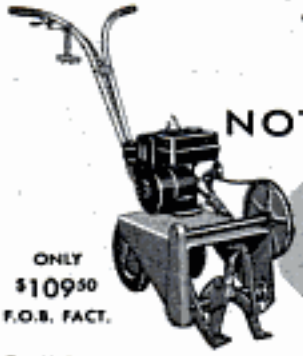

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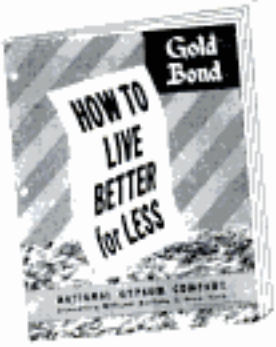

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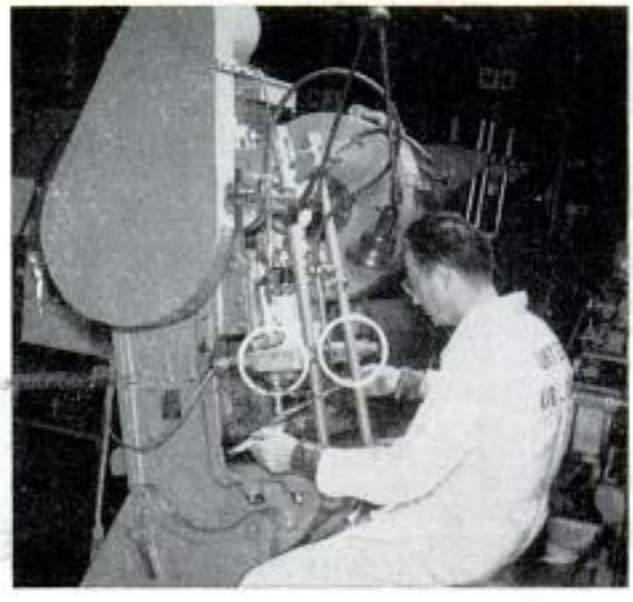

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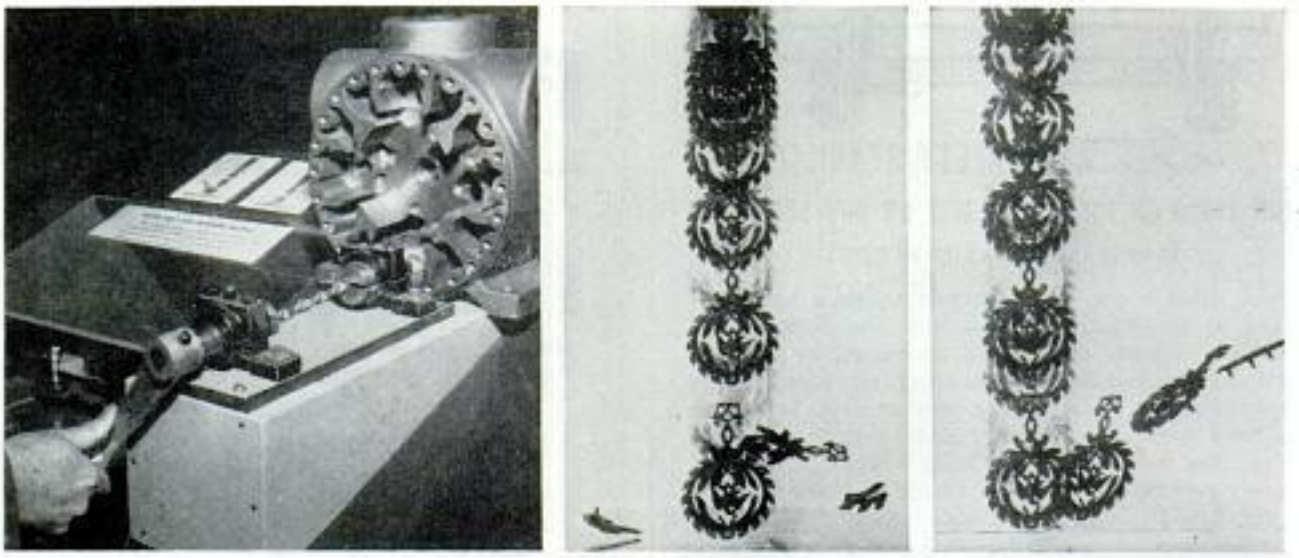

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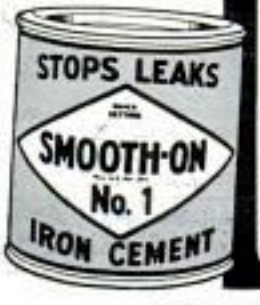

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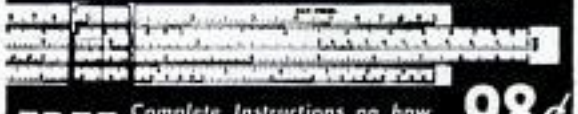

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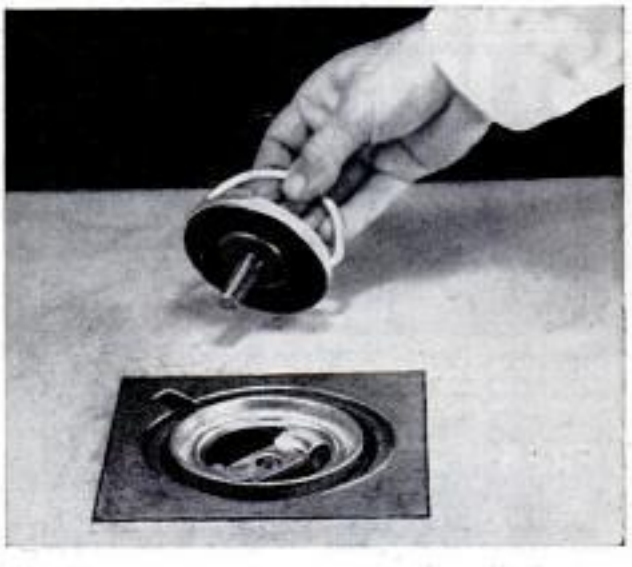

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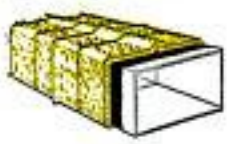

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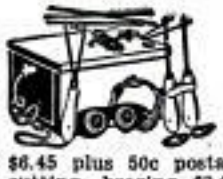

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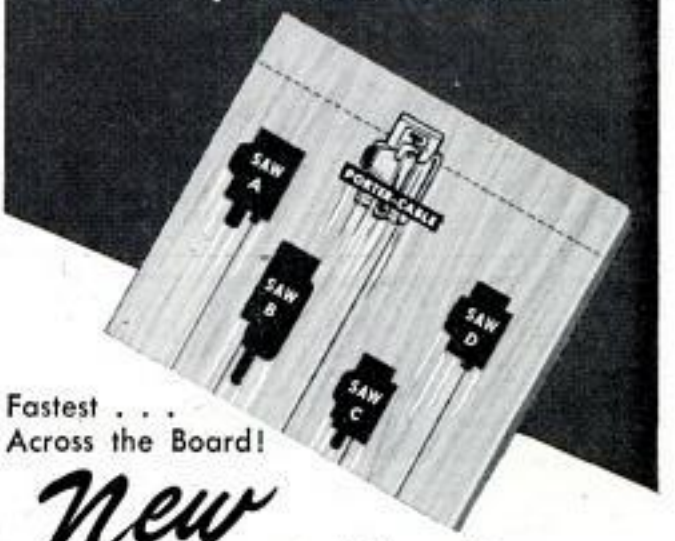

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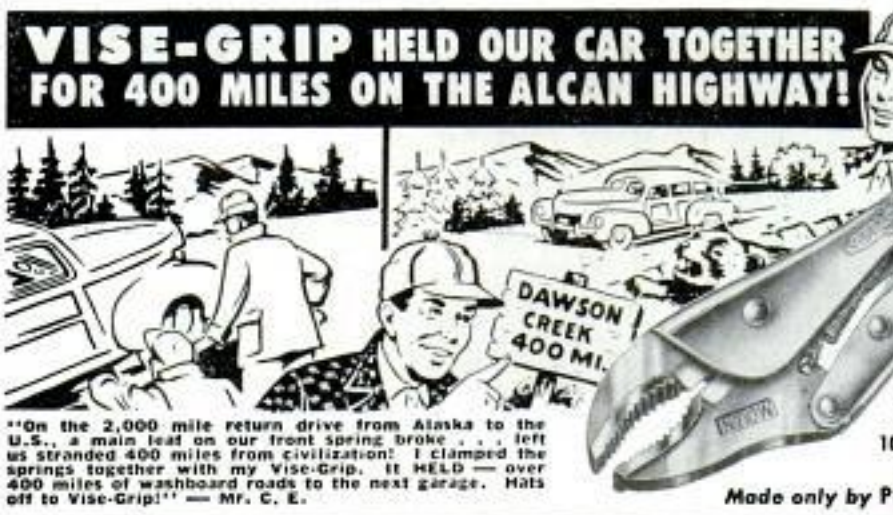

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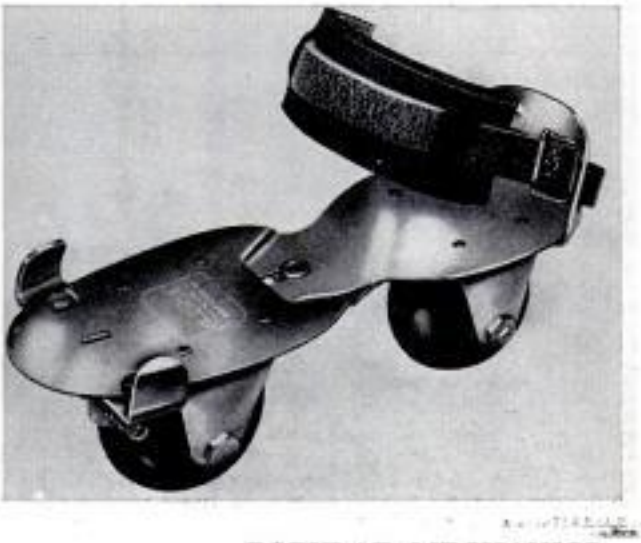

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Lockheed Aircraft Co. photo

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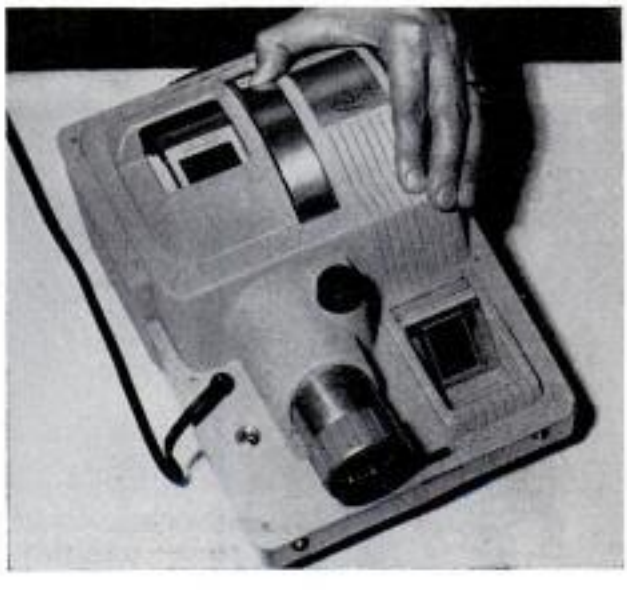

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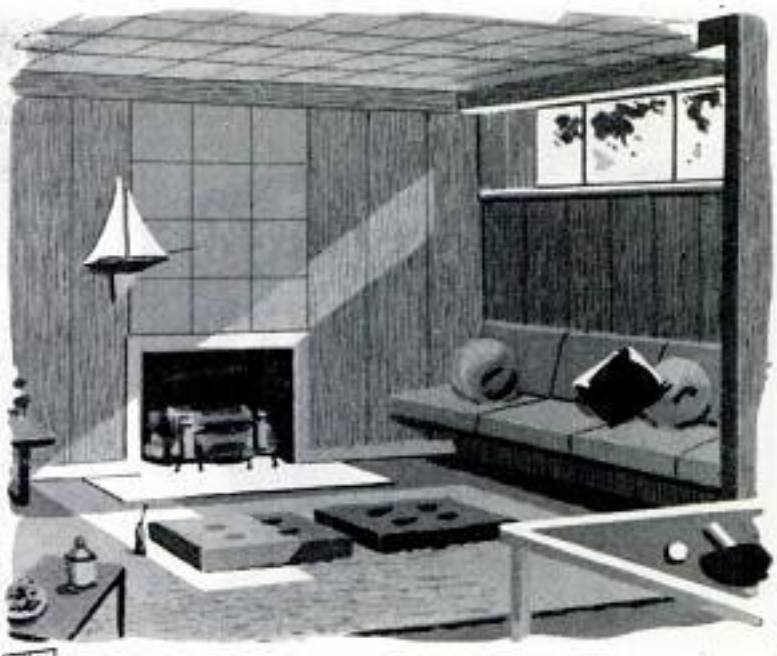

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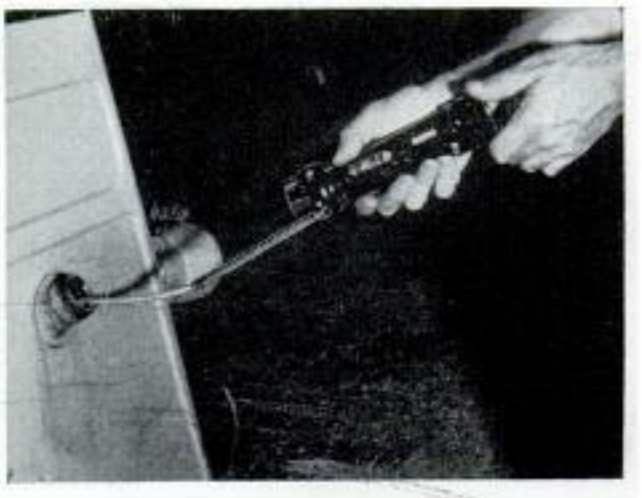

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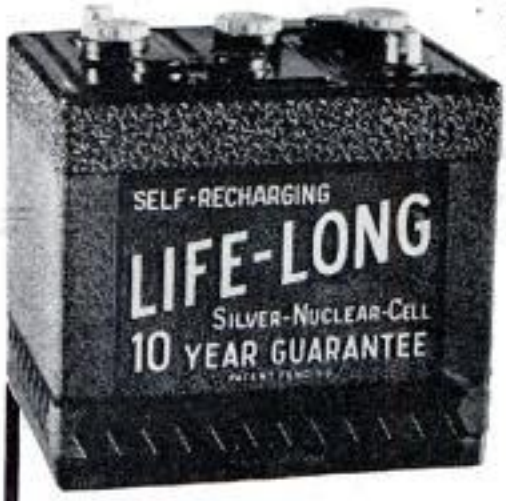

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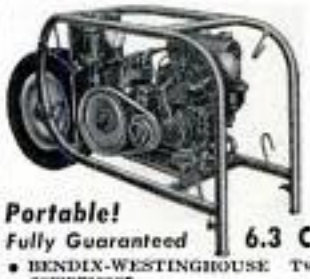

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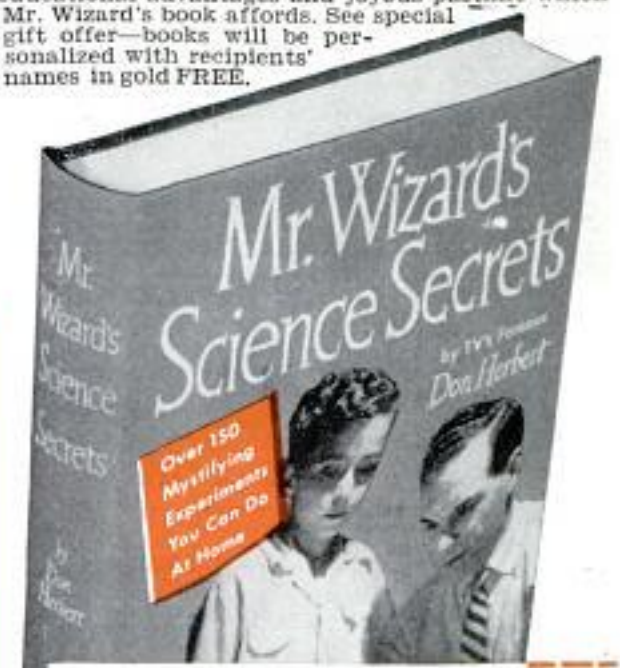

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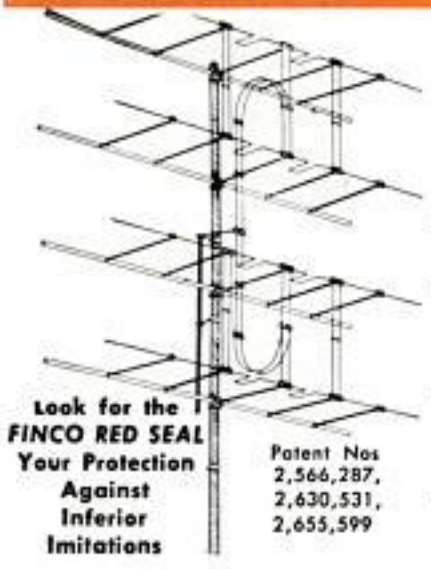

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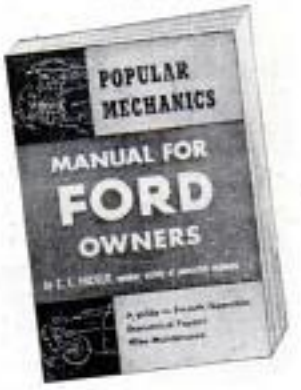

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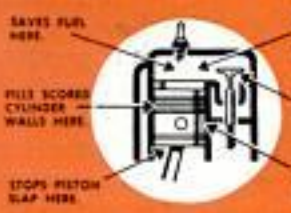

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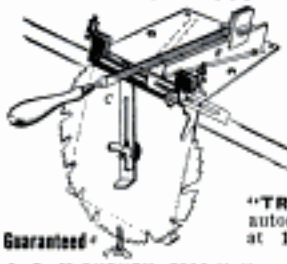

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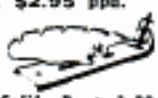

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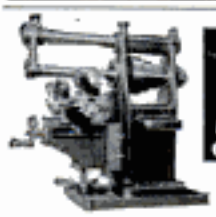

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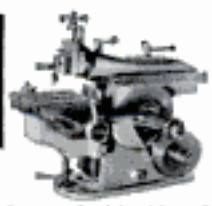

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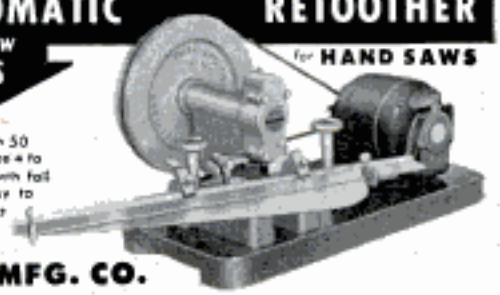

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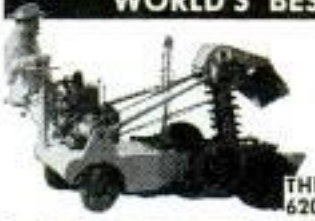

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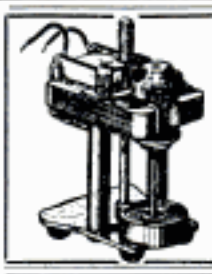

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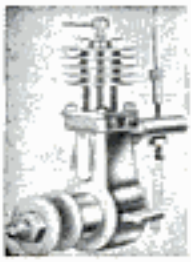

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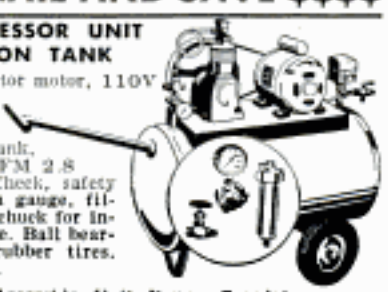

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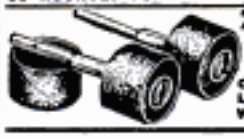

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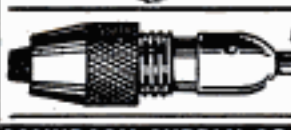

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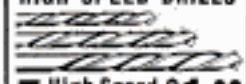

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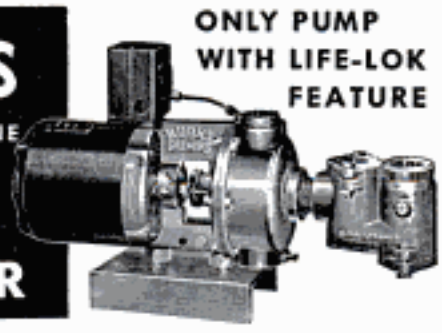

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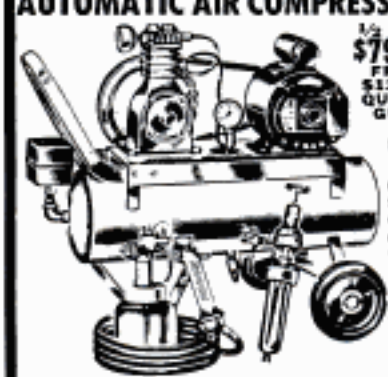

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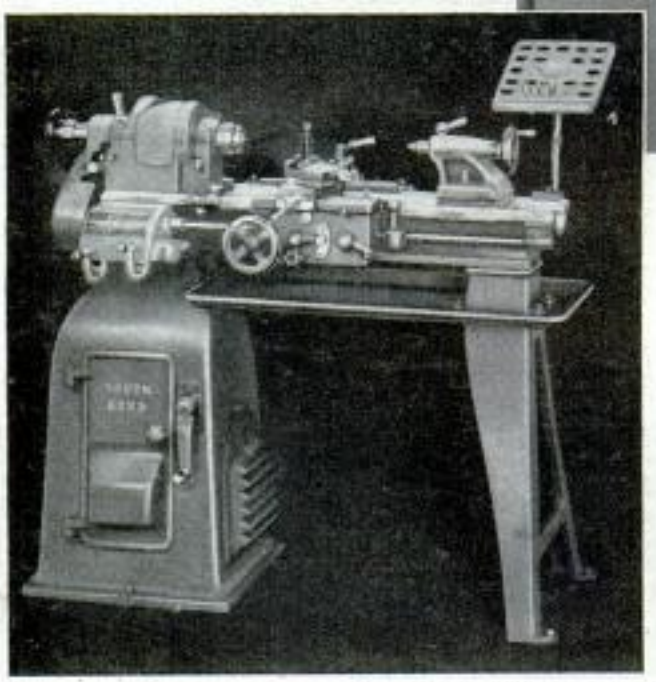
SOUTH BEND
10"-1" COLLET LATHE

Top Value
for those who want the best!



Built for exacting industrial work, the South Bend 10"-1" collet lathe satisfies the demands of any craftsman. Its accuracy simplifies precision jobs and permits work of the highest professional quality. This is the perfect tool for shop owners who want accuracy and versatility. Write for literature on the 10"-1" collet lathe and its many attachments. Time payment terms: 10% with order and balance in 12 or 18 months.

Can I get it? When? How?

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ TOOL GRINDERS

☐ ½" & 1" Collet TURRET LATHES

☐ 7" BENCH SHAPERS

Name_____ Company_____

Street_____ City & State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

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THIS ALADDIN 5-ROOM HOUSE

$1995

FREIGHT PAID

Slightly Higher West of Missouri River

YOU CAN BUILD THIS ALADDIN READI-CUT HOUSE YOURSELF... and Save Hundreds of Dollars!

Imagine receiving A COMPLETE HOUSE IN ONE SHIPMENT—ready to erect! You get everything needed. The lumber is the finest—every piece THOROUGHLY DRY. And it comes to you the EXACT SIZE needed—cut at the mill by fast, precision machines. No stopping to measure and saw each piece! (You save as much as 30% on labor—18% on waste) and YOU CAN CHOOSE FROM 99 INDIVIDUAL PLANS—beautiful, modern houses of all sizes and styles. Not only will you save money but you will have the satisfaction of knowing that Aladdin Houses have withstood the test of time during the past 46 years. Aladdin's thousands of satisfied customers are your guarantee of honest value. We will send you names and addresses on request.

BEAT THE HIGH COST OF BUILDING!

BUILD YOUR OWN HOME

With carpenters getting up to $24 a day think how much you can save by building your own Aladdin house! Carpentry work runs from 300 to 1200 hours. Even if you hire help you save because most of the expensive, time-consuming labor (measuring and cutting) has been done at the mill. No wonder the cost of an Aladdin house often compares favorably WITH PRE-WAR COSTS! Drawings and instructions are easy to follow and cover everything from foundation up. More than half the Aladdin houses sold have been erected by buyers themselves!

NO DEALERS' OR AGENTS' PROFITS IN ALADDIN PRICES—*BUY DIRECT!*

GOOD HOUSES NEVER GROW OLD—
ALADDIN HOUSES ARE NOT PREFABRICATED

QUALITY: ALL EXPOSED LUMBER IS GUARANTEED TO BE CLEAR AND **KNOTLESS**

WHAT READI-CUT MEANS

The picture at the right shows how each piece of Aladdin lumber is cut to EXACT size at the mill—mitred and bevelled for perfect fit. Aladdin houses are designed to meet the most exacting building standards in both construction and materials.

IMMEDIATE DELIVERY

WHAT YOU GET WHEN YOU BUY AN ALADDIN HOUSE

- ALL THE LUMBER accurately cut to fit, marked and numbered ready to erect practically without the use of a saw.
- SIDING • WINDOWS • MOULDINGS • GLASS
- MILLWORK • DOORS • HARDWARE • NAILS
- FLOORING • TRIM • PAINT • ROOFING
- COMPLETE DRAWINGS & INSTRUCTIONS

EXCITING NEW HOME DESIGNS FOR 1954!

SEE THEM IN THE LATEST BOOK OF ALADDIN HOMES →

Send 25¢ FOR BEAUTIFUL NEW FULL-COLOR 64 PAGE CATALOG **No. AM-17**

ALADDIN GUARANTEE SATISFACTION OR YOUR MONEY BACK

THE ALADDIN CO.

BAY CITY, MICHIGAN

Est. 48 Years

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Why did you change to Camels, WILLIAM HOLDEN?

"With so many people smoking Camels, I figured they must be good! So I tried them— found their cool mildness and swell flavor suit my taste to a T! You ought to try Camels yourself!"

WILLIAM HOLDEN, star of "Forever Female", is another on the big list of Hollywood personalities who prefer America's most popular cigarette, Camel!

for Mildness and Flavor

CAMELS AGREE WITH MORE PEOPLE

THAN ANY OTHER CIGARETTE!

Make your own 30-day Camel mildness test — you'll see how well Camels' mildness and flavor suit you.

YOU, TOO, rate the cigarette that rates *best* with the *most* smokers! After all, Camels' costly tobaccos *assure* you a cool, cool mildness, a rich, exclusive flavor that other brands can't match! So *try* Camels – today. Smoke only Camels for 30 days. Let your own sense of good taste tell *you* why Camels' flavor and mildness agree with more people than *any* other cigarette!

R. J. Reynolds Tobacco Co.
Winston-Salem, N. C.

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