

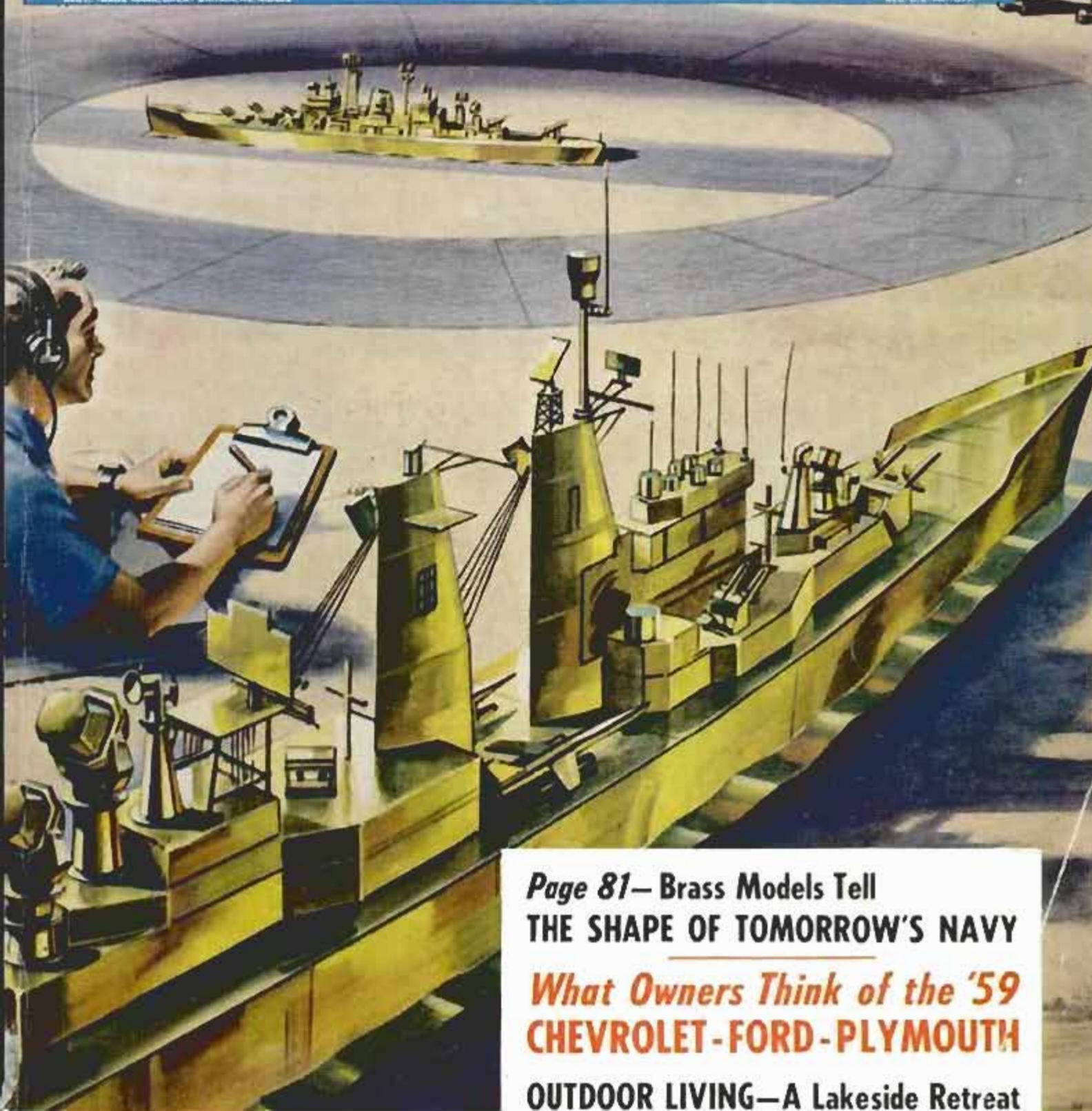
POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK, GREAT BRITAIN, NO. 41628

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*Page 81—*Brass Models Tell
THE SHAPE OF TOMORROW'S NAVY

What Owners Think of the '59
CHEVROLET-FORD-PLYMOUTH

OUTDOOR LIVING—A Lakeside Retreat



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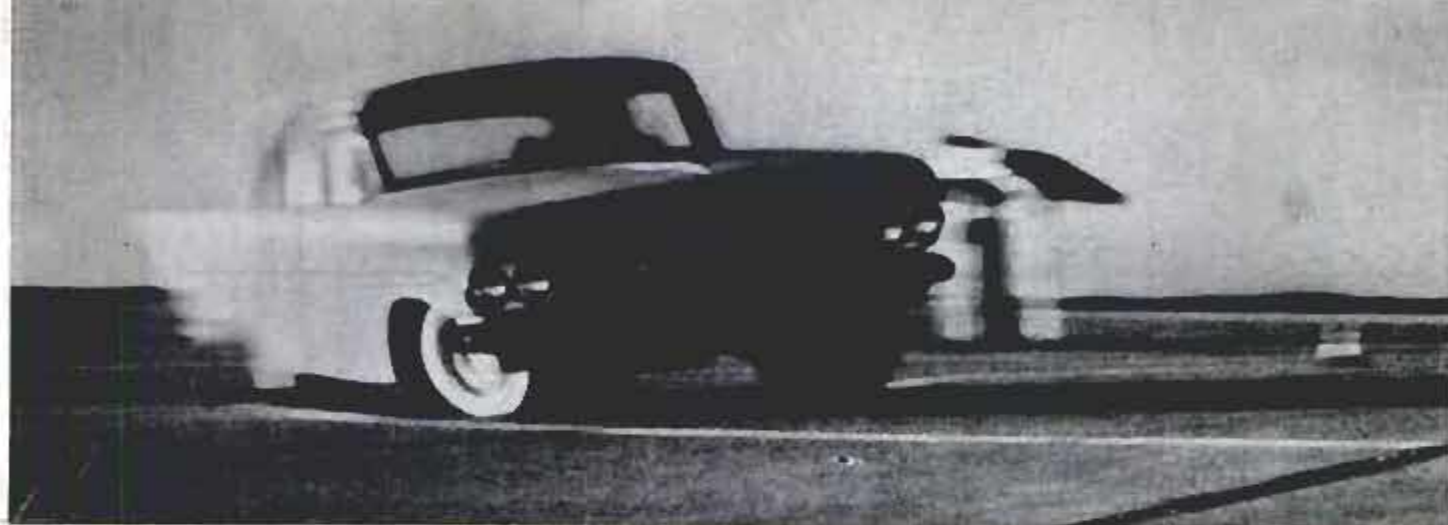
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APRIL 1959

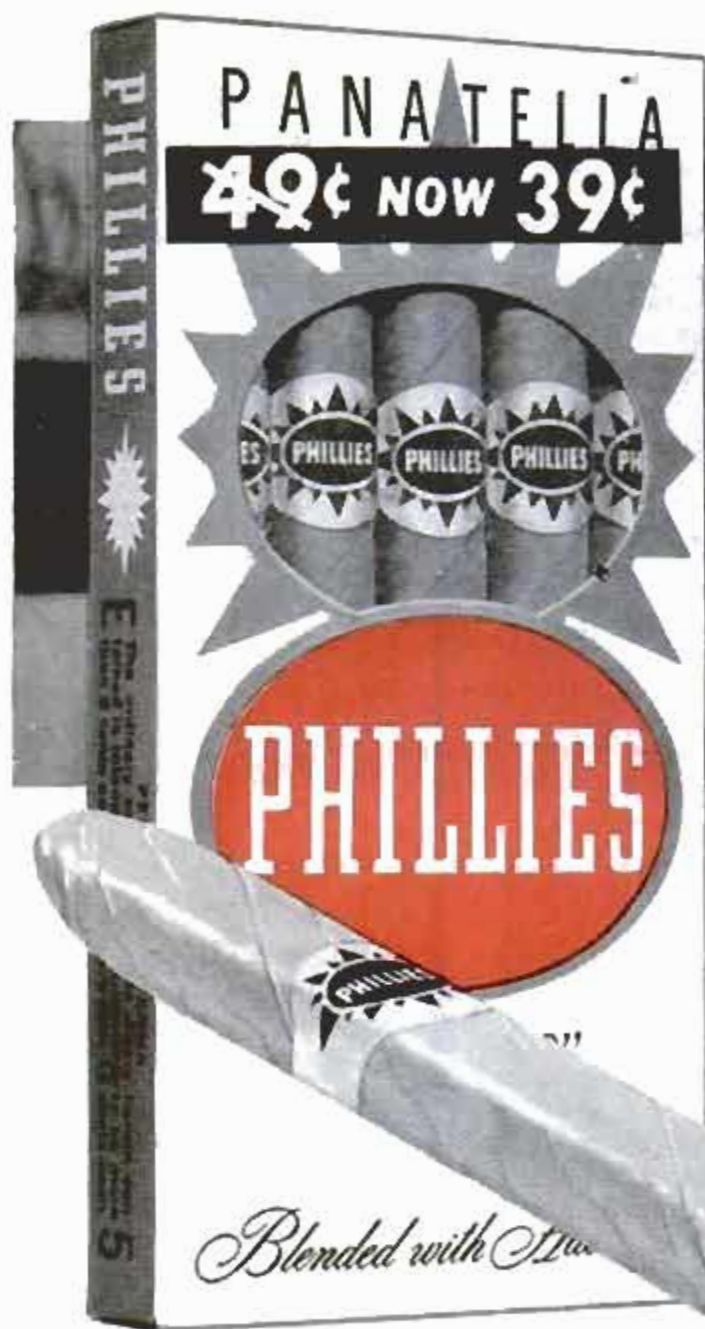
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Next Month...

TWO CARS are setting surprising sales records these days. The Lark and the Rambler are the talk of the automotive industry. What is the reason for their success? Is it because they are small American-built cars? Price? Other factors? Read what the owners themselves say about the Lark and the Rambler in the May issue . . . Also coming up next month is a report on a significant scientific breakthrough — the conversion of heat directly into electricity

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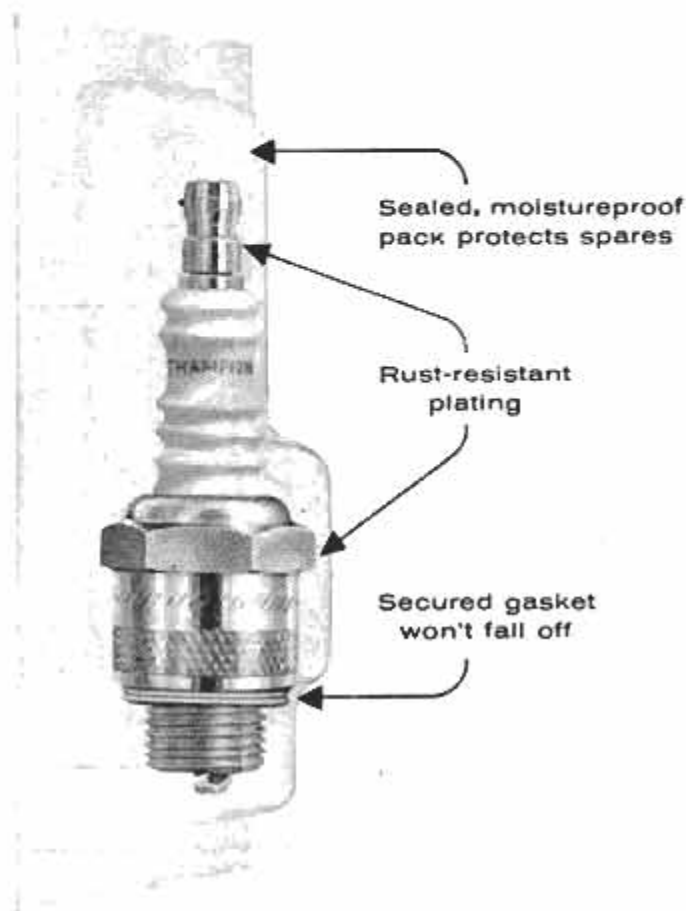
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finish that guards against rust. Another special feature is a secured gasket that won't drop off during installations. These new Champions are excellent for carrying as spares, too. They're the *only* spark plugs in a completely waterproof pack.

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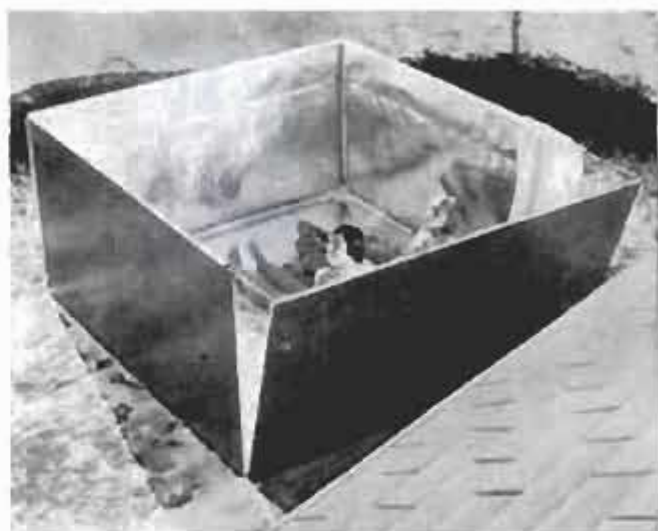
ACROSS THE DESK



To the Editor:

Thought you might be interested in the enclosed photo. This climate-control gizmo, which we have dubbed the "Passion Pit," keeps my family tanned all winter long.

It's an eight-foot by eight-foot plywood box, four feet deep, aluminum foil lined. The north



panel is hinged at the bottom as an adjustable reflector. No matter what the temperature, the passion pit is comfortable on any sunny cloudless winter day between 11 a.m. and 1 p.m.

This is a feature which could be incorporated right into the structure of any house.

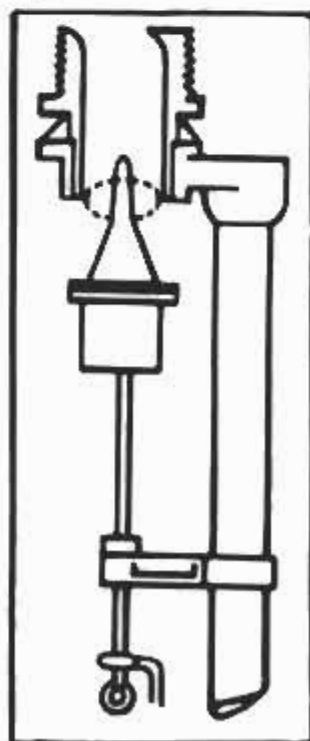
John Barnard, Jr.,
Osterville, Mass.



To the Editor:

Your charming "goof" on page 280, February, reminds me of my wonderful (?) "daze" at Great Lakes during World War II. Only the U.S. Navy and *Popular Mechanics* can make water flow uphill.

At the O.G.U. (outgoing unit), a frightening warehouse of triple deck bunks and inadequate "ablution" facilities, the floor drains provided by the contractor were two inches above the level of the rest of the concrete floor, requiring us gobs to "squeeze" the water into the drain by brute force. Should



Sorry, it's upside down

(Continued to page 10)



To those who want to enjoy
an ACCOUNTING CAREER



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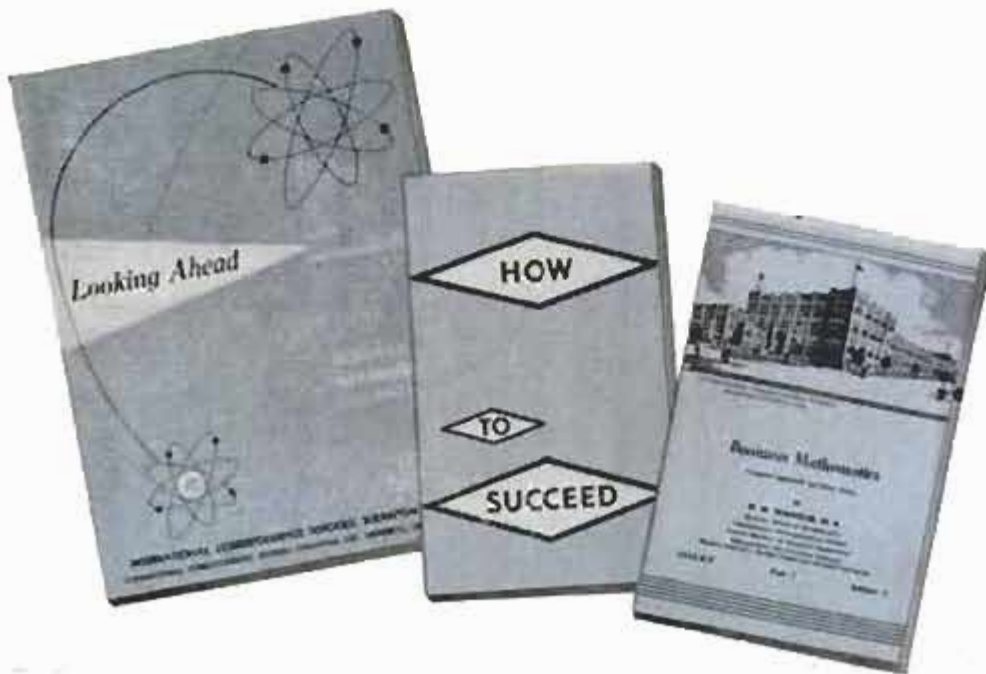
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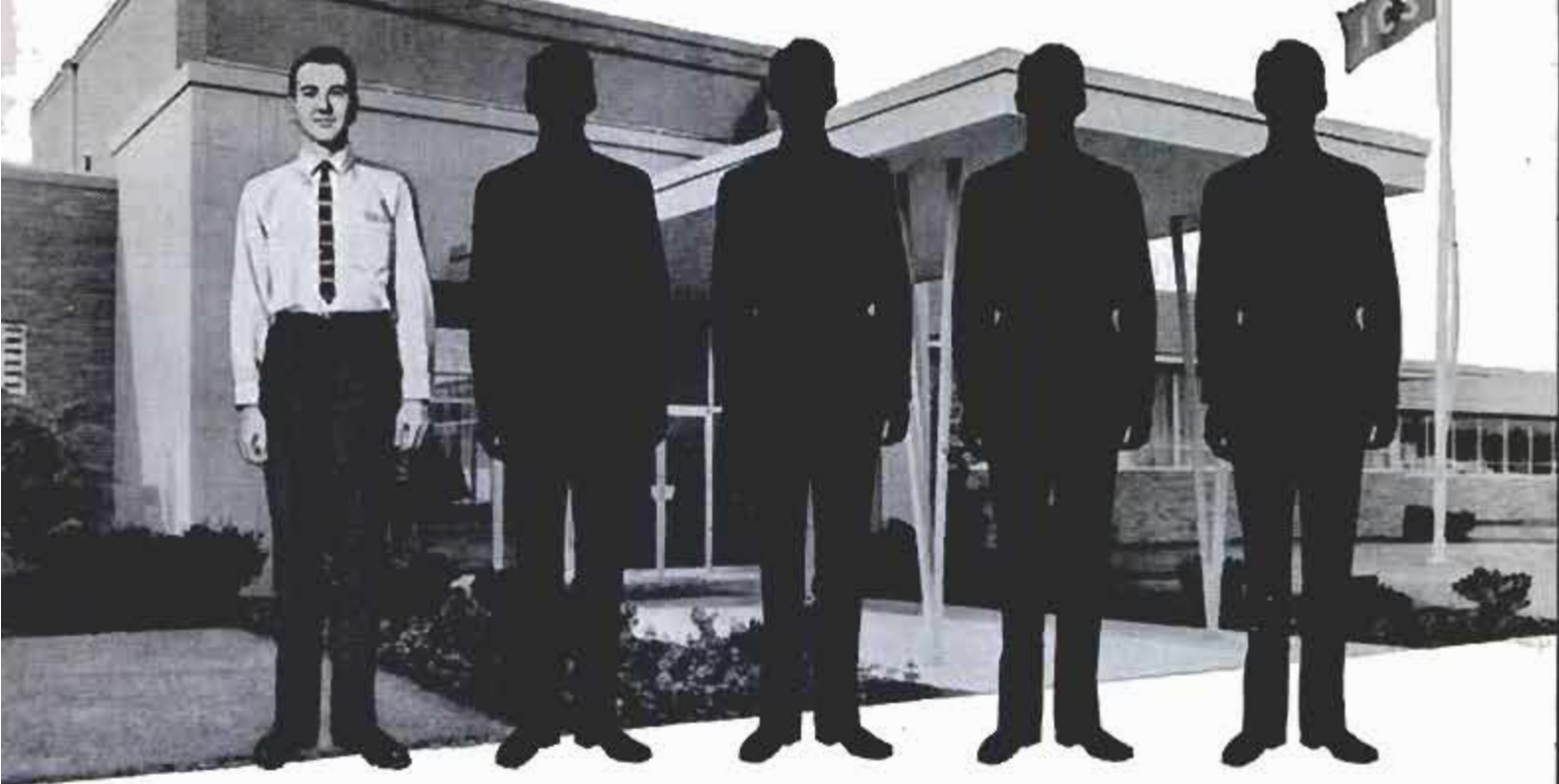
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But—strangely enough—only one person in five actually *does anything* about getting ahead. Only one person in five has the drive, ambition and persistence to keep going until he achieves success.

The others go on, year after year, in the same old pattern—always dreaming—but never really doing anything about the better jobs, the better pay, the better life that could be theirs.

It's up to you to decide in which group you belong. Will you be the one in five who will succeed? Or will you be one of the plodders who are content to remain where they are?

APRIL 1959

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(Continued from page 6)
we happen to complain, we were constantly reminded that in the U.S. Navy even water can be made to run uphill. No doubt the upside-down picture on page 280 was inadvertent, but nevertheless it did bring to mind those famous floor drains at Great Lakes. Many of your readers will surely remember them.

I continue to enjoy your fine magazine. Keep up the good work.

Robert B. Masters,
Marshfield, Mass.



More Readers Comment On the January Auto Issue

Have just finished reading your *Heroic Years of the Automobile*. I do not believe there are many people around today who remember the New York to Paris race, but I do very well.

I was an apprentice mechanic in a garage and repair shop on Tilden Ave., near Bedford Ave., Brooklyn, the very first building in greater New York built for the storage and repair of automobiles—125 by 60 feet without any post. . . .

Here is an item I did not see in your article. There were two or three men in Flatbush who were preparing a Stearns automobile for this race. They did not get ready to start with the others, but left from City Hall, New York City, about a week later. As I remember, they had solid-rubber tires and I am quite sure carried another set of wheels, all iron, no tires, built with flanges to travel on rails. They had built a sort of lever-type shock absorber that really did a wonderful job. Twin traction rear wheels are not really new today for they had the same idea, a lever-locking device that voided the action of the differential gears and made both wheels drive at a time. One would want to spin while the other was still and this proved their undoing, for on Riverdale Avenue somewhere between New York City and Yonkers, going around a sharp curve, the locking device missed a cue, going into action and preventing one wheel from traveling slower than the other and BANG went the differential, and the end of their race.

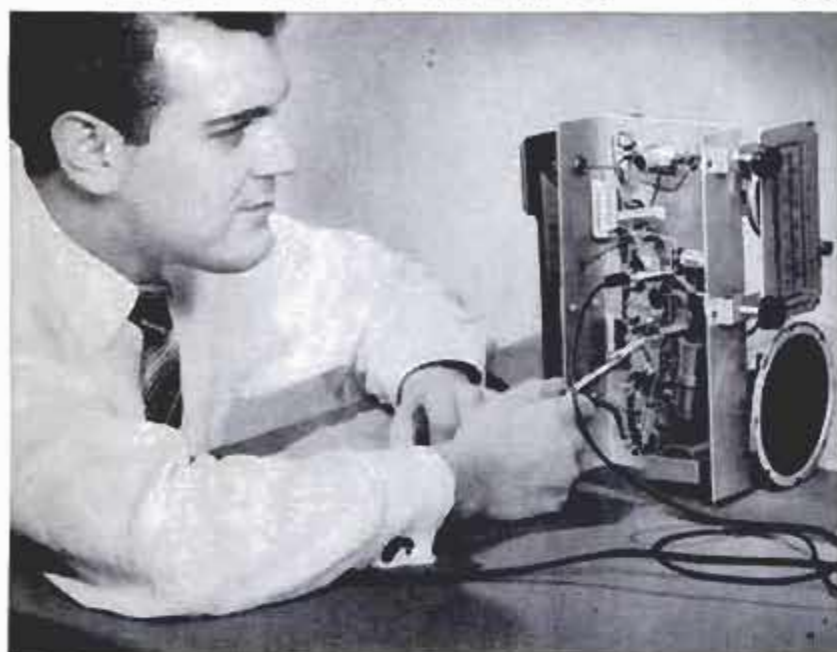
I towed this car and its occupants back to Flatbush with a 1903 two-cylinder Winton. It was rumored at the time that the Stearns people offered \$500 if these men would not enter the race.

I was employed by the Flatbush Automobile Company, E. G. Applegate, owner, from 1907 until 1911, then was a private chauffeur until 1916, when the salaries got low and you became a general all-around man. I joined the Texas Company when they first put in gasoline stations in greater New York, going into wholesale bulk plant managership until 1922, when I went into business for myself. And now at age 69 I am enjoying this wonder state of Vermont. Again my compliments on your very fine article.

Harry B. Hudson,
Bethel, Vt.

(Continued to page 12)

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(Continued from page 10)
Where did you dig up Dale Kelly? You chose the wrong boy. He, in my opinion, don't know from nothing and from nothing I do mean. His article (January, PM, page 182) is very misleading to the public and injurious to many products that have been laboratory and road-tested all kinds of ways. I, myself, have tested most of the products he mentioned and found them to be all the makers claimed. There are those here who say that article was a paid ad by the big companies. Could be. Let me know how many million replies you get in response to the above article.

Meredith Grobmyer,
Forrest City, Ark.



Dale Kelly SAE in his article "How Good are the Gadgets" (January PM) is way off the beam on a couple of counts. His paragraph concerning a certain battery-additive promoter shows that he is grossly misinformed. Kelly should make a thorough investigation of all the facts before issuing damaging statements about a product whose "promoter" chose to spend close to \$500,000 defending rather than compromising with certain New York interests.

L. Corbett,
Rimouski, P.Q.
Canada

Every question has its two sides. Some will not like Mr. Kelly's appraisal of "the gadgets", others will appreciate his advice. We chose him because he is a competent engineer, a former college professor of automotive engineering, and because he is independent. We didn't tell him what to say—except that it must be factual; nor did Wall Street, Detroit, South Bend, Wolfsburg (Germany) or Rome.—EDITOR.



We wish to state the following facts relative to that portion of your article ("How Good Are the Gadgets?" Jan. PM) pertaining to fuel-pressure regulators:

Reference is made to the following statement from the article: "If Detroit wanted lower pressures at the carburetor, a lighter spring in the fuel pump should provide them without the need for additional plumbing."

This statement is true. However, consider the effects of such a change. The pump is a two-stage operation. It must fill up with fuel and the fuel must be expelled into the line. With a light spring, the motion of the diaphragm becomes so fast at higher r.p.m.'s that the pump "hangs up." There is not enough time for the chamber to fill with gasoline before the next stroke. This is one of the basic reasons why the manufacturers have gone to stiffer pump springs.

Your article also states, "If the regulator substantially reduces pressure at the carburetor it could, at high speeds and under heavy loads, starve the carburetor and produce the injurious lean mixture described previously." Since volume of fuel delivered varies as the square root of pressure, one would have to postulate a drastic reduction in pressure in

(Continued to page 51)

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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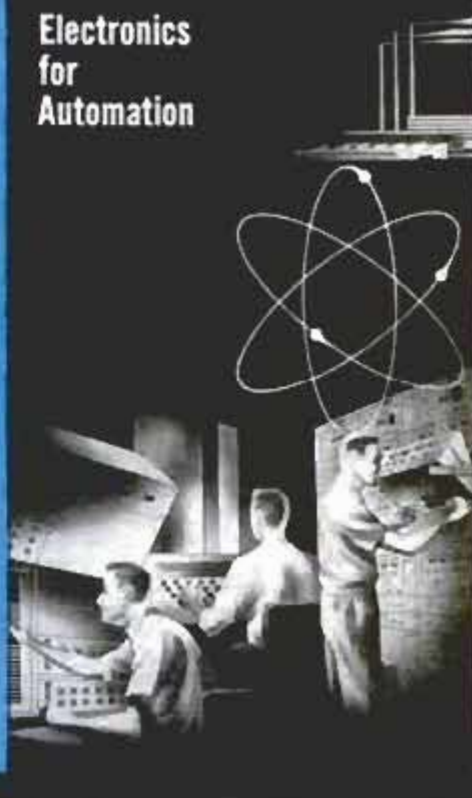
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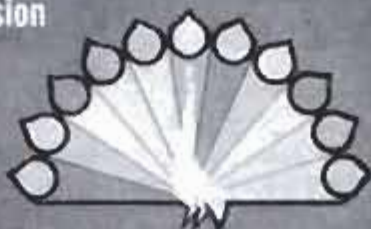
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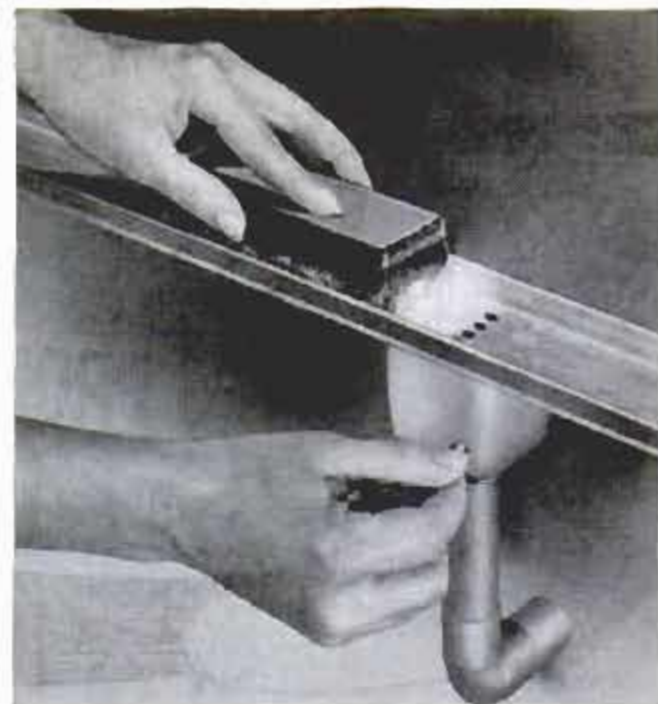
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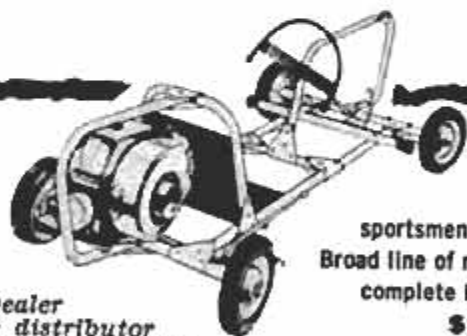


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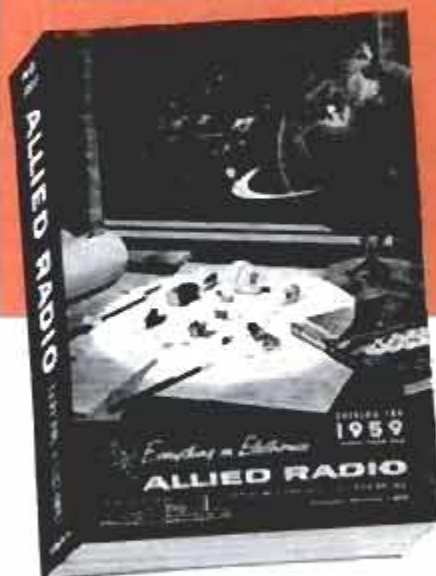
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WHY CHOOSE A TECHNICAL INSTITUTE

By **Walter M. Hartung, President**
National Council of Technical Schools



The increasing complexity of our industrial processes, the great expansion in industrial research, and the unprecedented movement in the direction of automation during the past twenty years, has created a relatively new occupational group of specialists known as "engineering technicians". The scientist and the professional engineer have been joined by the engineering technician to form a great technological team which largely has been responsible for the mechanized 20th Century.

The engineering technician obtains his education in a technical institute. Courses in a technical institute are generally technical in nature and usually are of two to two-and-one-half years duration. Engineering subject matter comprises up to 50% of the academic instruction. Another 40% of the education is obtained practically in laboratories which are quite representative of industry. 10% of technical institute education is in the humanities in order to give the engineering technician a sound basis for self-expression.

Compared with the engineering college, the technical institute offers less in the field of humanities, almost the same amount of engineering subject matter, and far more practical concentration in the laboratory. The technical institute education goes beyond the trade school in that engineering subject matter is taught and laboratory application is for the purpose of demonstrating technical processes rather than for the development of skills. Courses at the technical institute level are definitely considered to be in the area of higher education. Many technical institute programs of instruction have been accredited by the Engineers' Council for Professional Development. In 1944, the National Council of Technical Schools was founded with its primary objective being the promotion of sound educational standards among private resident schools in the technical institute

field. Schools located throughout the United States who carry the National Council stamp of approval, as well as many others, have continued to comply with the accepted code of minimum standards and have produced quality graduates who have contributed greatly in the field of engineering technology. There are two good reasons for attending a technical institute whose courses have approval or accreditation. The graduates are more readily recognized by the industry and much of the subject matter taken has transfer credit, should the graduate plan to continue his education toward the baccalaureate degree.

The technical institute student is a high school graduate. He selects a technical institute program for many reasons. The idea of practical application may appeal to him. He may want to complete a program in two to two and one-half years of schooling. He may desire engineering, but is better qualified for a practical program rather than the theoretical education of the four-year college. He may find it necessary to maintain his earning power and thereby select a part time evening program or a correspondence program. The applicant must possess a high school diploma or the recognized equivalent. At least one year of high school mathematics is universally required and he should be at least seventeen years of age when he starts his training. If at all possible, the student should contact technical institutes for advice while he is in high school, well in advance of his final year. He should select the industry he desires to enter and contact the approved technical institutes offering education in that area. If at all possible, the student should visit in person the technical institute which he has under consideration, in order to become familiar with its program. Their advisors will welcome the opportunity of suggesting high school subject matter which should be taken in the field of mathematics and the physical sciences, so as to provide the strongest possible preparation for technical institute type of education. In the final analysis, the most important advice to an applicant who is contemplating a technical institute education, is to investigate early and check thoroughly into all of the approved programs which offer education in the area of industry which he plans to enter.

Member schools of the National Council of Technical Schools as do many others offer training for engineering technicians in many interesting industrial areas. The Aeronautical Engineering Technician becomes skilled in the technical fundamentals involved in the development and operation of modern aircraft. The Architecture and Building Technician is concerned with the planning of structures and the supervision of the actual construction work. The Civil Engineering Technician may be associated with a contractor as a surveyor, a draftsman or an estimator. In Diesel Technology, the technician is skilled in the installation, operation and maintenance of all types of diesel engines. Drafting Technology concerns a technician who prepares exact detail drawings from rough sketches or specifications. The Electrical Power Technician is skilled in the design, development, operation and maintenance of electrical equipment. The Electronic Technician, in a very popular field, is involved in communications, such as radio or television, or in industrial electronics concerned with the control and operation of advanced equipment, aircraft and guided missiles. The Mechanical Technician is the man who makes it possible for the shop to produce, on a large scale, the articles designed by the engineering department. In refrigeration, heating and air conditioning, the trained technician is responsible for the application of an engineered heating or cooling product to a specific job. The backbone of the radio and television industry is the technician trained in that field. Tool design, die making, instrumentation, gauge design and stationary engineering all offer an opportunity for the specialized education of an engineering technician who is best suited to practically do the job.

A page taken from the catalog of the Academy of Aeronautics presents a typical curriculum of the technical institute type. Since three laboratory hours are considered equivalent to one lecture hour on a credit hour basis, it readily can be seen that the student spends equal time in both lecture and laboratory. This is generally a feature of all technical institute programs.

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	Lecture	Laboratory	Total
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Mathematics I	4½	1	5½
Physics I	4½	2	6½
Engineering Materials	2½	-	2½
Engineering Drafting and Technical Sketching	2½	3	5½
Communication Skills I	2½	-	2½
Total	17½	6	23½
TERM II			
Theory of Flight	2½	-	2½
Mathematics II	3½	1	4½
Physics II	4½	2	6½
Statics	2½	-	2½
Engineering Drafting and Descriptive Geometry	2½	3	5½
Communication Skills II	2½	-	2½
Total	18	6	24
TERM III			
Principles of Aircraft Design	2½	4½	7
Mathematics III	3½	-	3½
Strength of Materials	3½	½	4
Dynamics	2½	-	2½
Mechanisms	2½	1	3½
History of Civilization	2½	-	2½
Public Speaking	1	-	1
Total	18	6	24
TERM IV			
Mathematics IV	2½	-	2½
Thermodynamics	3½	-	3½
Aircraft Construction	2½	3	5½
Aircraft Detail Design	2½	2½	5
Aircraft Structures I	3½	½	4
Aerodynamics I	3½	½	4
Total	18	6½	24½
TERM V			
Industrial Relations	1	-	1
Aircraft Powerplants	3½	3	6½
Contemporary Thought	2½	-	2½
Aircraft Structural Design	2½	3	5½
Aircraft Structures II	4½	-	4½
Aerodynamics II	3½	-	3½
Total	17½	6	23½
Grand Totals	89	30½	119½

The engineering technician is in great demand throughout industry. Many claim that his ratio should be at least five technicians to one engineer in order to establish a proper balance in our technical economy. He begins his employment in engineering departments, in laboratories, in manufacturing plants or in the maintenance of equipment at good starting pay. He finds advancement something which he can look forward to as a deserved procedure. Many engineering technicians advance to high positions not alone based upon the vast amount of experience they accumulate, but also based upon the additional formal education which they take as they go along. The opportunity for good careers is really plentiful so that any engineering technician, who will apply himself, has virtually no limitations imposed upon him. In the final analysis, the graduate of the approved technical institute has an education upon which he can build, either in industry or of transfer value into other educational programs. He is prepared to enter industries in the areas which represent our technological frontiers. Modern buildings, advanced manufacturing methods, advancements in the fields of electronics, the high-speed aircraft and the guided missile all rely considerably on the contributions of the engineering technician. High school graduates entering the technical institute can feel confident that their future as an engineering technician is assured.

Let us follow the thoughts and progress of a high school student through his technical institute education into a successful career in industry. Sometime during his high school days, he may attend a Career Day, at which he will be fascinated by the offerings in a particular industry. He may have spent his spare time in reading magazines which may have awakened in him a desire for aviation, electronics or building construction. His parents and friends may have talked to him about this field or that as being one in which a very enviable career can be established. No matter how the high school student has developed his interest in a particular field, his next step should be a thorough investigation as to how he best can become qualified to enter the industry of his choice.

His first step in this quest for information may be the high school advisor's office. The discussions with this advisor may soon result in the first conclusion that the student possesses a mechanical aptitude along with an engineering awareness. This would almost immediately mean that he should seek his entrance into the industry in the field of engineering or technology. Expecting to graduate from high school in the very near future, the student will have "higher

education" as his goal and he usually will not consider attending a vocational school for the limited purpose of learning a trade. He will want to choose his post-high school education in a field that not alone offers him an opportunity of expanding in the industry of his choice, but also to provide him with an educational background upon which he can build further and further.

His choice will soon narrow down between the private technical institute or the engineering college. He realizes that the traditional four year engineering college will give him a very fine background in the theory of technology. He also realizes that the technical institute, in addition to an engineering background, will give him extensive practice in the laboratory. His decision between the two types of institutes may depend upon financial resources. It might be more expedient for him to obtain his basic higher education in a two or two and one-half year period, rather than four years. The abbreviated program in the humanities offered by the technical institute may be a deciding factor when compared to the more extensive treatment of that area by the engineering college. In the final analysis, his choice is in higher education and he should make every effort to select the institution which will give him the best opportunity of carrying his education through to a successful conclusion.

He now faces the choice of the institution itself. Upon reaching a decision to attend a technical institute, he should then investigate all of those approved schools which offer courses in connection with the industry he has chosen to enter. He should consult his high school advisor. He should write to the approved technical institutes whose information is presented in *Popular Mechanics Magazine*. A letter to the National Council of Technical Schools, 1507 M Street, N.W., Washington 5, D. C., requesting a directory of their approved schools, could be an early step in his investigation of the institutes offering the type of education he desires. He should obtain technical institute catalogues and carefully study them. He will probably wish to attend one of these approved technical institutes which are located near his home, so as to keep his expenses to a minimum. He should consider it a "must" to visit the technical institute of his choice and discuss his program with its registrar or advisors. When the decision has finally arrived at the one technical institute he will attend, the student completes his application form and submits it to the school for processing. Among the first things that will be done by the technical institute is to completely review the high school background of the applicant. An

official transcript will be obtained from the high school, which will present a record of subject matter taken and the grades received in those courses. At that time, the technical institute will review such things as whether or not sufficient mathematics has been taken in high school. The sciences will be well scrutinized, along with communication skills in writing and an ability to properly use the English language. When it has been determined that all of the minimum qualifications have been satisfied, the student will receive his letter of acceptance and he is now on his way toward his career as an engineering technician.

Should he arrive at his chosen technical institute from out of town, he will find housing counselors available who will place him in dormitories, should they be available, or with private families in the vicinity of the school. He will be assigned an advisor to whom he can go with all of his problems. He will attend his classes and find that instructors will carefully present the theoretical background he needs in engineering subject matter. He will attend fascinating laboratories where on a large scale, he will apply this theory as it is done in the industry he plans to enter. He will find his courses in the humanities limited as they are, to be extremely helpful in developing his ability to write better reports and to better express himself. Throughout these two or two and one-half years of education, he will make many friends from among his classmates who will be from homes and families similar to his own. He will approach his graduation with a feeling of confidence because of the intimate knowledge he possesses about the industry that has been his objective over the several years of his preparation.

Months before his graduation, the placement officer of the technical institute will discuss with him what type of actual work he would like to do, where he would like to locate and what the conditions of his position should be. Within the final months of his training, several representatives will visit his technical institute and conduct interviews with the prospective graduates. He will fill out many applications which will be forwarded, along with strong letters of recommendation from the school. Interviews and visits with companies will be arranged for him in order that he may see first-hand that which he is about to make his life's work. The offers he will receive will carry such titles as laboratory technician, technical analyst, methods technician, technical report writer in the fields of research and development. In production he will be offered such opportunities as quality control technician, test technician or pro-

duction technician. In the installation or maintenance of industrial equipment, he will be called a field service technician, a maintenance technician or the manufacturer's technical representative. In the engineering department his title will be engineering aide, associate engineer or engineering draftsman. He will start his industrial career very shortly after his graduation. He will find that his educational background which he obtained in the technical institute has made him closely familiar with the procedures that will be expected of him at the beginning. He will quickly become familiar with the procedures manual of his company. His acclimation to the position will require much less time than others who have not had the opportunity of a practically applied educational background. He will find that his first good impressions will stand him in good stead when it comes time for advancement. As he becomes more and more familiar with the backgrounds of those who are directing his activities, he will find among them many engineering technicians who have an educational background similar to his own. He will find that now he has a profession which he will enjoy, one in which he can advance and one in which he will be able to contribute in the highest sense to the ever advancing technology of our times. He now is a truly important member of the "technological team".

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Looking over your January issue I found that pages 180 and 181 held my interest. I would like to have more information about the Suburban Runabout. Will this car be put on the market and if so at what price? What is the mileage per gallon? Will parts be easy to replace? Why the sliding door (I like the doors)? What power is the engine? If this car is put on the market see if the designers can make it for sale to low-income people.

John C. Mason Sr.,
Washington, D.C.

Other readers also inquired about this "Suburban Runabout." As mentioned in the article, it is simply a "dream car" sketched by two industrial designers as a possible solution to the transportation problem. It is not being built. It could be built, the designers believe, for a price competitive with today's economy cars. Its gasoline economy would be over 30 miles per gallon certainly. The doors slide backward to solve the entry problem in close parking spaces.—EDITOR.



I have just read your "Parade of Cars" in the January issue. One thing caused a bit of straining of the imagination. The listed trunk space for the new Chevrolet was 19.2 compared to 33.9 for Fords. Where did you get your information?

Most of the figures for the GM cars are low by comparison. Can they actually be that much smaller?

My interest in trunk space is rather keen because I feel that cars should perform more than just the function of transporting people. Most of my acquaintances share this opinion along with concern over the lowering trend—that trend of low, long silhouettes at the expense of room and comfort.

LeRoy N. Barker,
Madison, Wis.



In your tables you list a statistic not often seen: Trunk space. However, you do not specify the unit of measurement. Presumably it is cubic feet. This varies from a low of 13.5 in the Rambler to 38.6 in the Dodge.

If these figures are cubic feet, they should be made more of by the manufacturers. Most American families can afford only one car, and that one must be large enough to carry the

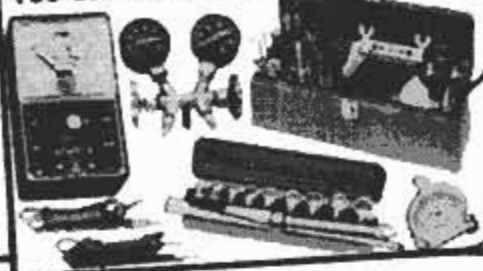
(Continued to page 268)



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MIDGET Plans \$3.00. Detailed dimensions. Easy to make parts. Fab-Kraft, 264 N. Elm Street, Massapequa, N. Y.

FIBERGLASS Bodies for children's cars. Racers, sportcar. Literature 25¢. Amroc Engineering, Island Park, N. Y.

ELECTRIC Car: Similar to golf car. Build it yourself, easily, with our plans for \$2.00. Literature 10¢. Magnuson Co., 5546 Montezuma, San Diego 15, Calif.

MIDGET Racer; complete plans and price list, 25¢. Kickshaw Sales, 3513 Hixson Pike, Chattanooga 5, Tenn.

1959 CATALOG On parts kits for golf buggy or Jr. sports car 25¢. Indus Corporation, 1815 Madison, Indianapolis.

BOYS! Build real gas powered midget car! Plan 35¢. Al Huckabay, C.O.P., S. Hall, Stockton 4, Calif.

$\frac{1}{4}$ MIDGET Racer plans \$1.00. Also $\frac{1}{4}$ and $\frac{1}{2}$ fiberglass bodies available. Hayman Fiberglass Prod., 13502 Alburts Ave., Norwalk, Calif. (A)

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HUNDREDS Of automobile catalogs—American, antique, foreign; dealer books, glossy photographs, shop manuals; free motor magazines listed by non-profit organization. Write immediately; get on free mailing list. Auto Maniacs, Stockbridge, Mich.

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JEEP Owners—V-8 conversions. Read Jeep Owners ad, page 29.

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FREE! Fifty worldwide stamps with likeable approvals. M. Willett, 1221 Washington, Denver 3, Colo.

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SEMI-Precious uncut gems. Ten different for \$1.00. Request list 26. Prospectors Shop, 201 San Francisco, Santa Fe, New Mexico.

EARTH Science, the rockhounds national magazine. Subscription \$2.00. Sample 35¢. Box 1357-PM, Chicago 90, Ill.

ROCKHOUNDS—Visit rockhound paradise. Circular. Heike's Agate Shop, Wenona, Illinois.

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HI-Gloss prints, 3¢. Photos, P.O. Box 342, Oshkosh, Wis.

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KODACHROME Processing by Kodak. 8mm. roll or 35mm., 20 exp., \$1.40. Prompt service. Write for mailers and prices. Color Pix, Dept. P, CPO Box 30, Kingston, N. Y.

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SOUTHSEAS—2x2 Colorslides. Catalogue, sample, 30¢. Avery Colorslides, 4818A Placidia, North Hollywood, Calif.

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SONGWRITERS: Songs recorded free. \$3.00 dues. Box 7431PM, Corpus Christi, Texas.

SONG Request Magazine publishes new songs. Subscription two dollars per year. Olenik Records, Mount Morris, Michigan.

VIOLIN Makers supplies. Free catalog. 309 W. Fourth, Los Angeles 13.

ACCORDION Teachers buy at distributors' prices: Accordion Importers, 7445 East Seven Mile, Detroit, Michigan.

GUITAR Making books, plans, imported woods, tools. List 10¢. Store, 510 East 11th Street, New York 9, N. Y.

SONGPOEMS And lyrics wanted. Mail to: TinPan Alley, Inc., 1650 Broadway, New York 19, N. Y.

POEMS Wanted for new songs and recording. Immediate consideration. Send poems. Songcrafters, Box 6145, Acklen Station, Nashville, Tenn.

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VIOLIN Making supplies. Free catalog. Fred Artindale, Box 71992, Los Angeles 1, Calif.

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SONGS And poems wanted. U. S. Music Studios, Box 222A, Belmont, Mass.

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Hi-Fi components, recorders, tape, records. Wholesale catalog free. Audio Fair, 1799M 1st Avenue, New York 28, N. Y.

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RECORDERS, Hi-Fi. Free wholesale catalogue. Carston, 215-PM East 88, New York City 28.

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AMPEX Tape recorders, components. Boynton Studio, 10-PM Pennsylvania, Tuckahoe, N. Y.

SAVE MONEY on all types radio and TV tubes! 100% guaranteed! Brand new! Write United Radio, Box 1000, Newark, N. J.

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

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YOUR Own successful business can bring you \$20,000 a year regularly, by mail at home. Know-how is important, investment isn't. Get free details, then decide. DeLang Research, Box 52-D, Burlington, Iowa.

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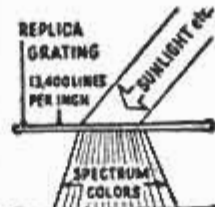
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.

DICK GROAT, Pittsburgh
Pirate captain, says:

**"The best friend in
my home shop is a
tube of 
PLASTIC ALUMINUM"**



"I've tried many fix-it products, but I prefer Duro Plastic Aluminum . . . it saves me time and money," says Dick Groat, star Pirate shortstop and former Duke All-American basketball player.

Off hours, family man Groat likes to relax in his well-equipped home shop. Equipment always includes a tube of Duro Plastic Aluminum. Metal in putty form, Duro Plastic Aluminum fills, seals, solders, repairs—adheres to virtually any surface.

Made with ALCOA® Aluminum Powders by Woodhill Chemical Co., Cleveland, Ohio, Duro Plastic Aluminum is applied like paste, dries metal-hard in three hours. Users say it fixes anything.

ALCOA does not make aluminum putties, but ALCOA Aluminum Powders are used in all the best brands. Cold solders are easy to use, require no tools, heat or flame. They adhere to metal, wood, plastic, glass or concrete . . . are not affected by water, oil or gasoline . . . can be burnished to a high luster or even painted. Write today for more information. Use the coupon.

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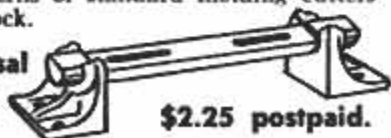
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Eastman Kodak Company, Rochester 4, N. Y.

Movie Projector Threads Automatically

Self-threading is the feature of Eastman Kodak's new eight-millimeter projectors. An automatic control leads the film through the projector and onto the take-up reel without being touched by the operator. The loop former opens automatically, and closes when the machine is stopped.

Revolving Eraser Operates on Battery

Driven by a 1 1/2-volt battery, an electric eraser made in Japan has a tiny, revolving tip to rub out typographical errors without marring adjacent characters. The tip revolves at 4000 revolutions per minute. The unit is designed to be held like a pencil.





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The dramatic new 35 hp. Sovereign by GALE is an exciting outboard motor, equally at home at a swank club anchorage or on the racing waters of a North Woods river!

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test spark of any outboard motor comes from GALE's Magic Magneto.

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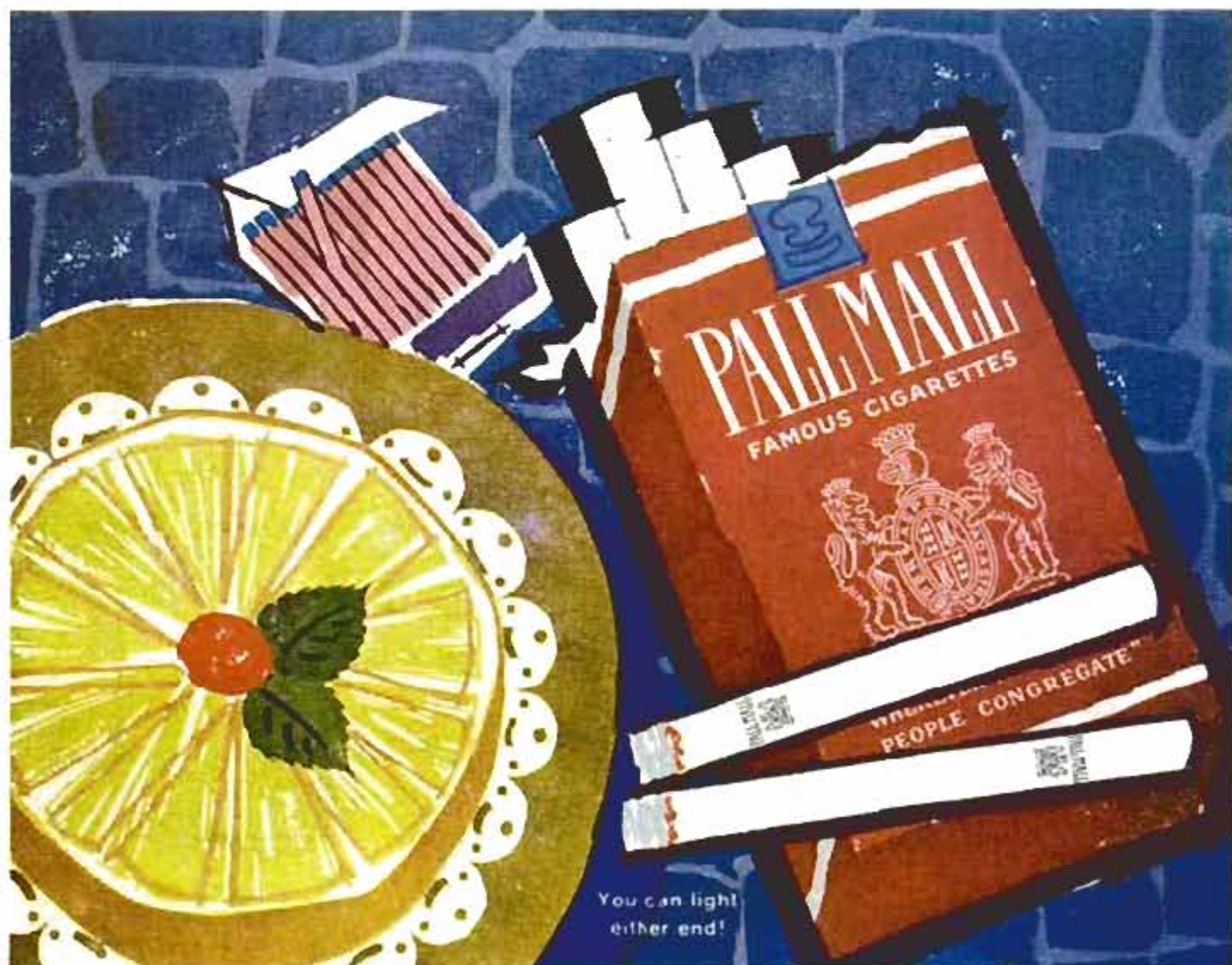
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See how Pall Mall's famous length of fine tobacco travels and gentles the smoke—makes it mild—but does not filter out that satisfying flavor!

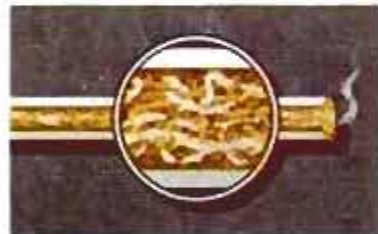
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1 You get Pall Mall's famous length of the finest tobaccos money can buy.



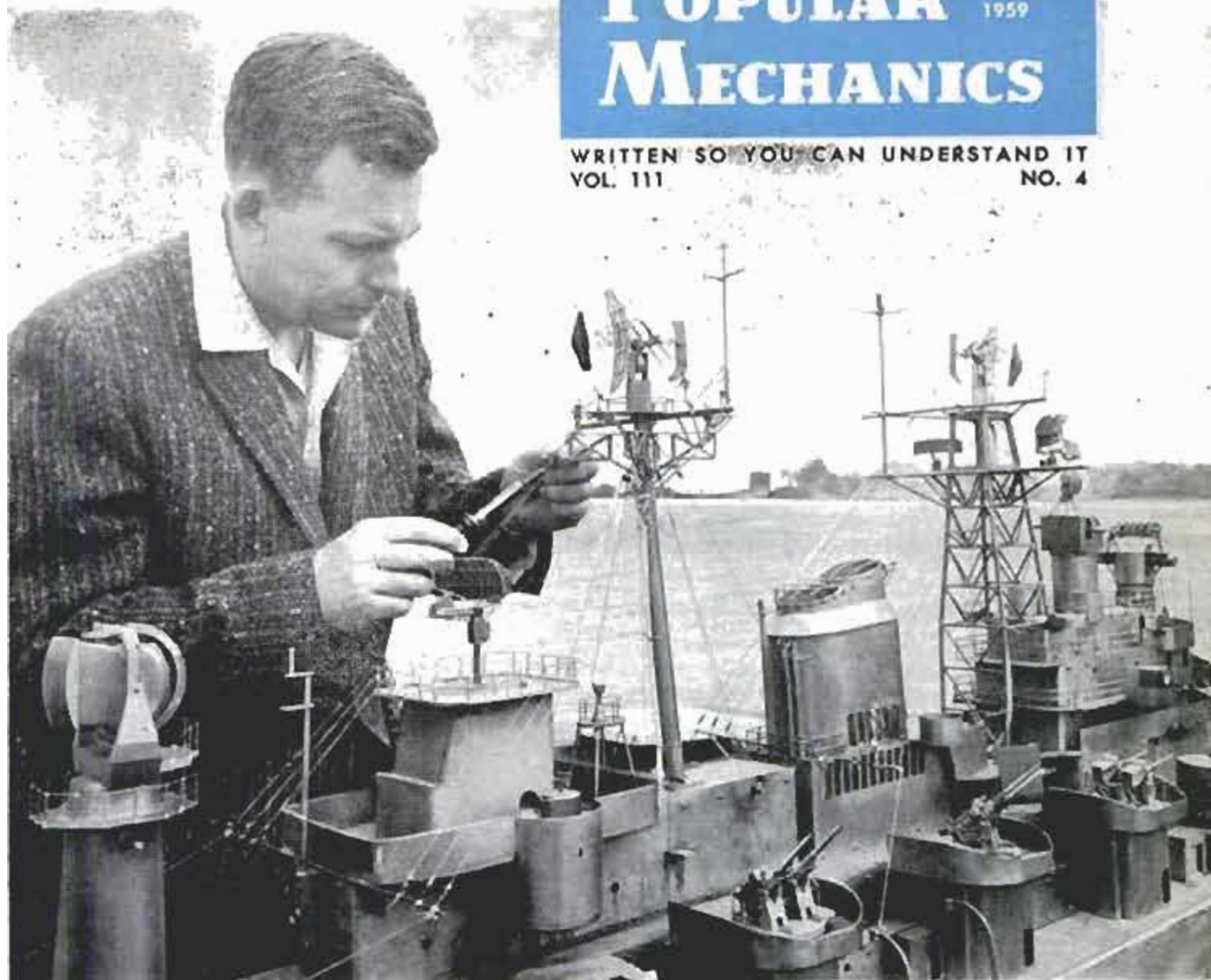
2 Pall Mall's famous length travels and gentles the smoke naturally...



3 Travels it over, under, around and through Pall Mall's fine tobaccos!

Outstanding... and they are Mild!

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At Navy Electronics Laboratory near San Diego, a cruiser model undergoes conversion to guided-missile ship

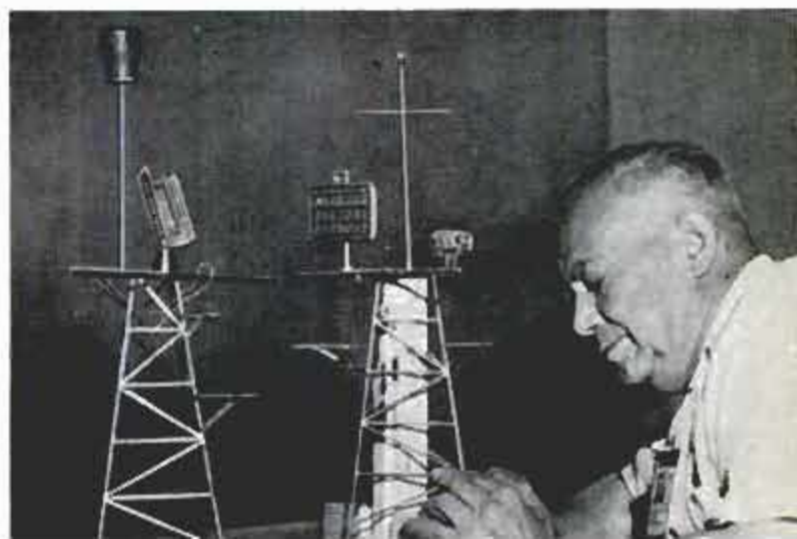
Electronic Architects Shape Our Navy

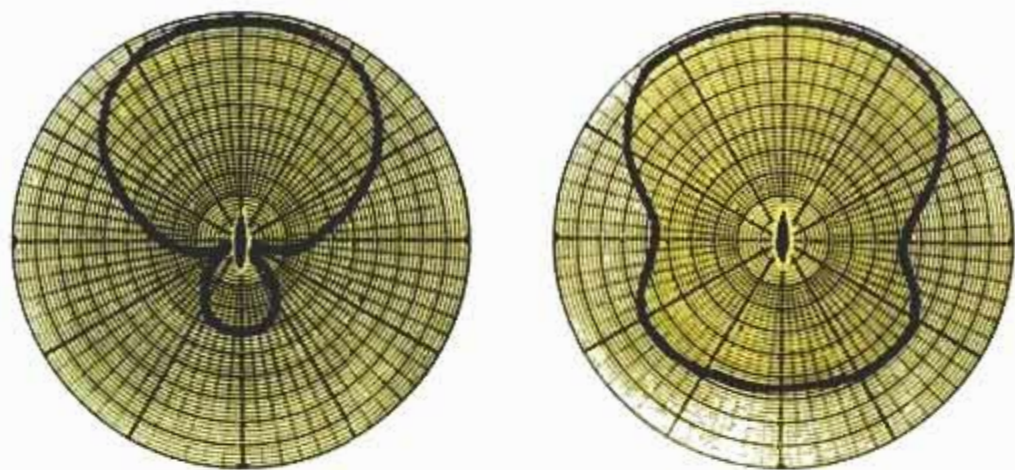
By Thomas E. Stimson, Jr.

ON A MINIATURE "ocean" on top of Point Loma in San Diego, radio engineers are checking out the communication and detection systems of our future fighting ships. They use scale models of the ships themselves, built from the original plans and complete to every single gun, every rocket launcher.

Compared to the ships of the past, the new carriers and cruisers and destroyers are going to have a radically different look, a bare and sometimes blocky appearance. Part of this is for nuclear protection. All crew members will be under cover in

Model builder prepares two masts, complete with antennas, for use on model ship. Scale is 1 to 48





Left, the radiation pattern of radio antenna at the forward part of model ship provides adequate coverage ahead of the ship but has very little range astern. At the right, the radiation pattern of the same antenna is shown after the antenna was redesigned on the basis of tests at the model-ship range. The pattern is now materially improved, and transmission is good over desired distances in any direction



Wooden arch towers above model range. It supports radio antennas high above ship model in center of range

action, inside the ship's structure where they will be protected from blast, flash, radiation and fallout.

But most of the new look comes from what is called "electronic architecture." These days, radio engineers are working hand in hand with naval architects in deciding the above-water appearance of the nuclear Navy.

The new ships aren't graceful in appear-

ance, or even streamlined. Yet it is the odd appearance of their superstructures that enables them to communicate over thousands of miles at any time, to detect missiles and aircraft at tremendous ranges, and to guide their own missiles to nearby or distant targets.

Instead of ordinary smokestacks, a ship may now have two huge towering stacks, deliberately built oversize to serve as



Both new and old-type antennas are visible on cruiser. In background, a radar picket ship is studied

efficient radio antennas. Instead of an ordinary superstructure, another ship may have a big square house standing high above deck simply because this is the shape required by the new long-range radar circuits. And instead of being cluttered with mazes of wires, rods and other antenna arrays, the new ships may have only a few visible antennas even though the number of radio circuits has been multiplied.

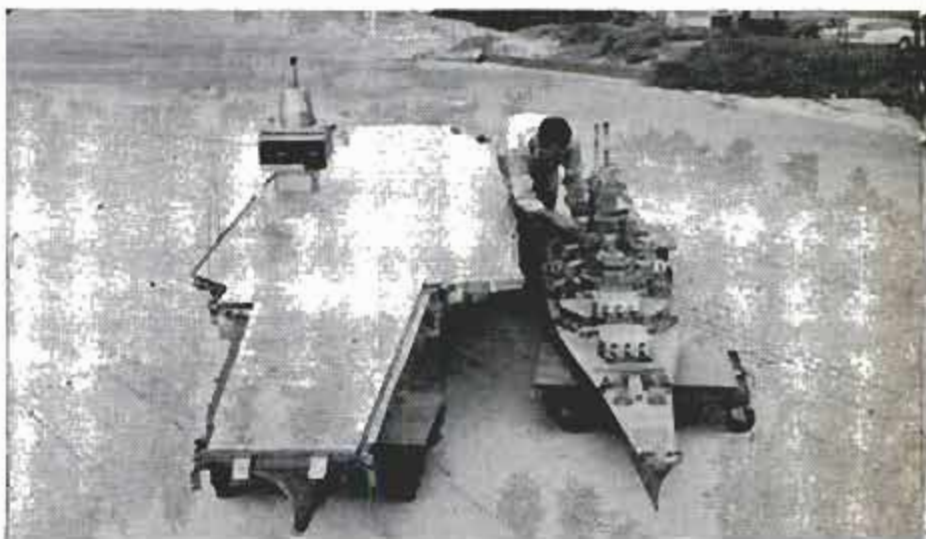
"A modern ship may require upward of 300 different radio antennas," says Valor Smith, head of the ship antenna-systems section at the Navy Electronics Laboratory. "These include antennas for extreme long-range communication, search radars that scan electronically instead of rotating mechanically, and a host of special-purpose circuits by which friendly aircraft can navigate.

"A communication antenna radiates its power in all directions, but if some of this radiation is absorbed by a part of the ship, such as a mast, there will be a shadow or blind spot in that direction. This distortion can make it impossible to communicate in certain directions unless the ship is turned.

"One way of overcoming this is to use the offending mast itself as



In NEL's shop an anti-aircraft gun mount is built. Model guns, missiles, antennas must be able to be turned and elevated. Below, battleship and nuclear carrier compare sizes



Using equipment housed in an underground room below the model, a radio engineer conducts impedance tests. Cruiser has both conventional guns and missiles

the antenna, possibly changing its height or diameter for greatest efficiency. Sometimes when this is done, it's possible to eliminate the original antenna. More and more, portions of a ship's structure and even the entire ship are being used for transmitting and receiving."

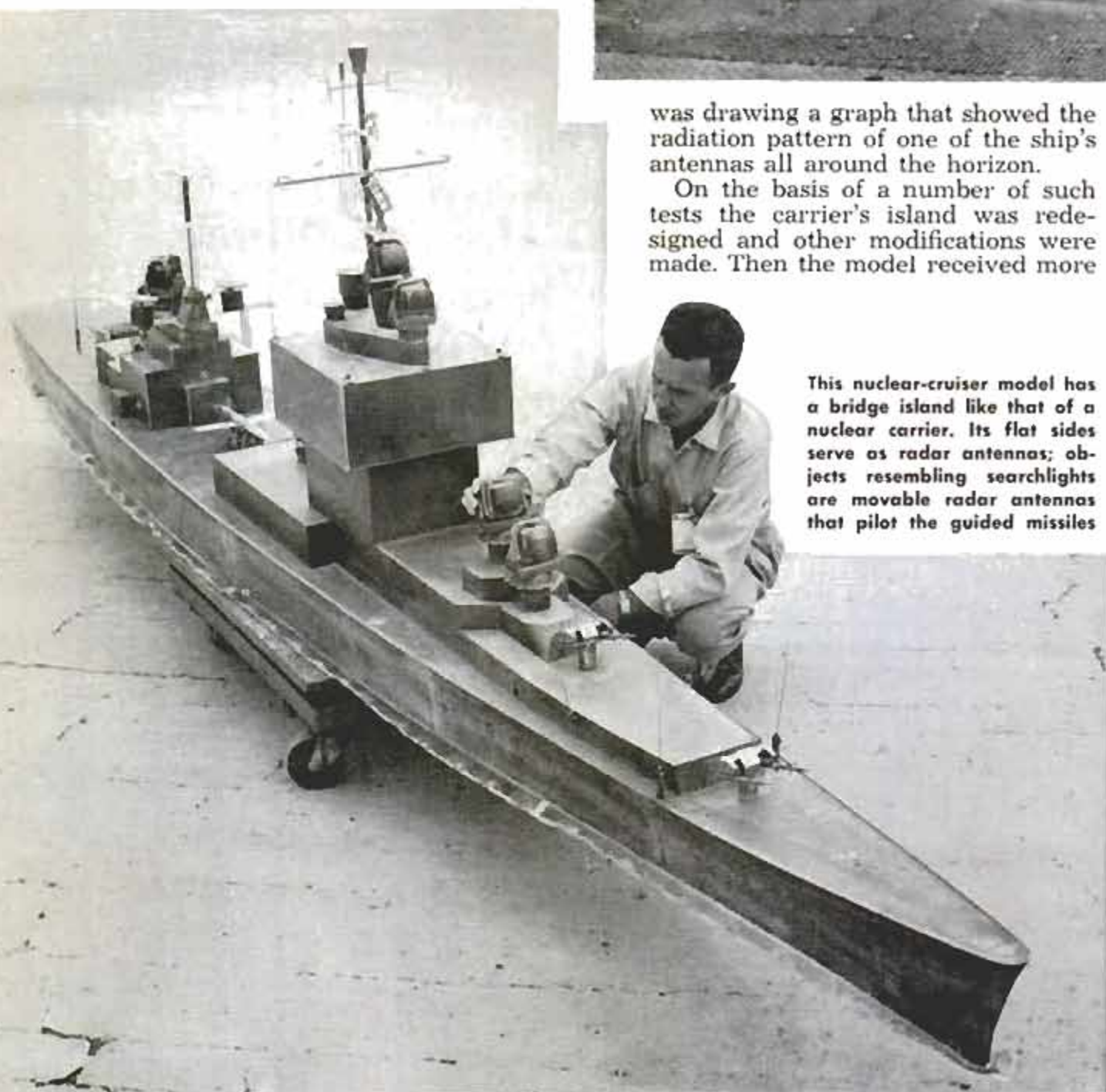
It is for studies like these that NEL's model-ship range earns its keep.

Recently a 22-foot scale model of our forthcoming nuclear-powered aircraft carrier was installed on the turntable in the center of NEL's artificial ocean. From one side of the ocean a radio transmitter "illuminated" the model with energy at the same time that the model was rotating on its turntable. Meanwhile, an inked pen



was drawing a graph that showed the radiation pattern of one of the ship's antennas all around the horizon.

On the basis of a number of such tests the carrier's island was redesigned and other modifications were made. Then the model received more



This nuclear-cruiser model has a bridge island like that of a nuclear carrier. Its flat sides serve as radar antennas; objects resembling searchlights are movable radar antennas that pilot the guided missiles



tests. This procedure was repeated for various frequencies and for various circuits. Within a few weeks all the radio and radar systems of the ship had been tested and adjusted for greatest efficiency.

By doing the work with a model instead of with the ship itself, the Navy saved possibly a year of time plus several million dollars.

In the metalworking shop adjacent to the range, skilled modelmakers can turn out a complete model of a ship in a matter of weeks. The models are built of brass, cost

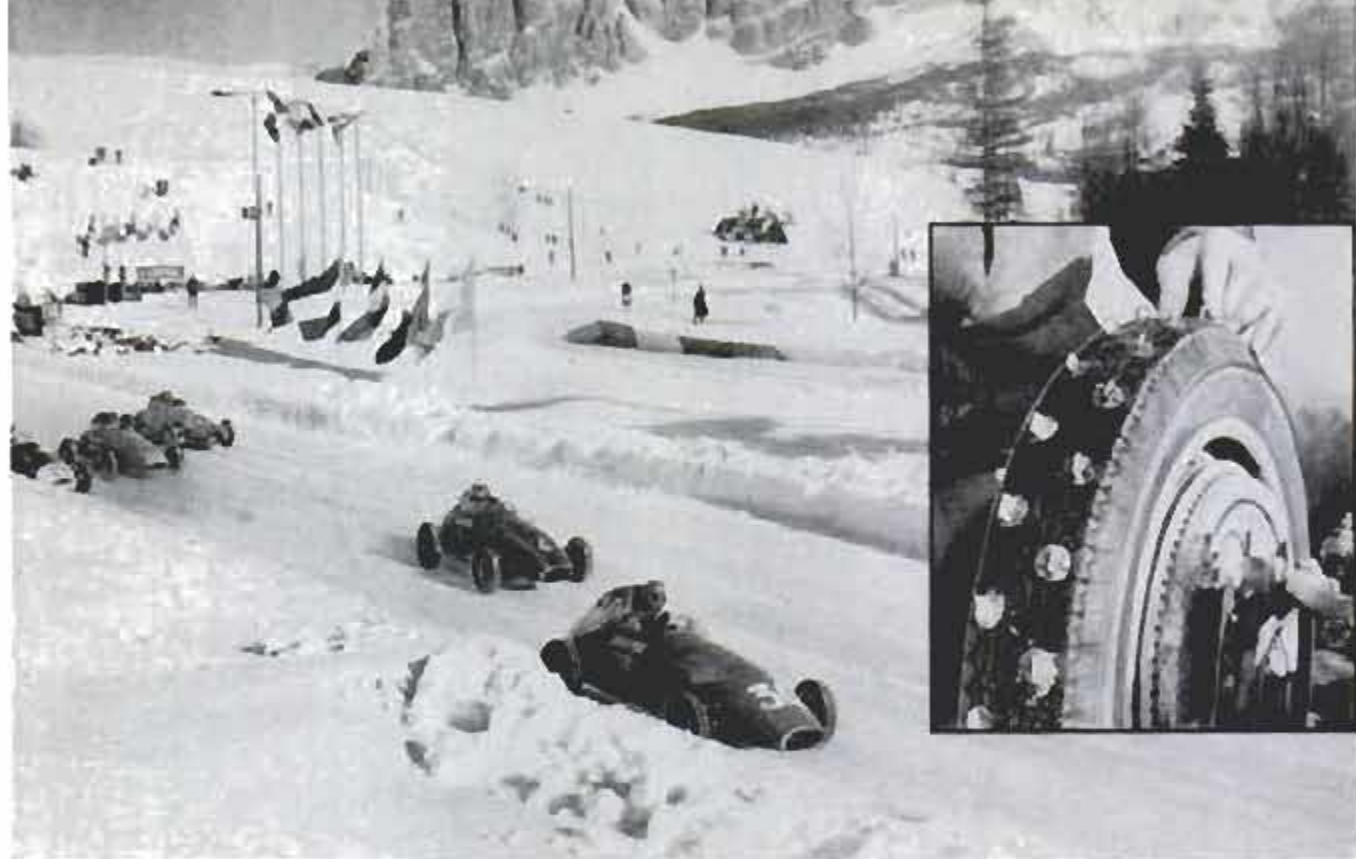
from \$5,000 to \$10,000 each, and are on a 1-to-48 scale, equal to $\frac{1}{4}$ inch to the foot. Guns, missile-launchers and guidance-beam antennas are scaled to an accuracy of $\frac{1}{16}$ inch and each may be turned or elevated so that its possible effect at various attitudes on radiation patterns can be determined.

Radio Frequencies Scaled Down

Since the ships are scale models, radio frequencies must be scaled down also. In
(Continued to page 228)

Three different models of destroyers undergo electronic tests on the artificial ocean at Point Loma





Steel Wedges in Tires Provide Traction for Race on Ice

Apparently racing drivers won't let an added danger keep them from their pursuit of speed. They showed both ingenuity and courage not long ago at Cortina D'Ampezzo, Italy, scene of the first European

Auto Grand Prix. Faced with driving on an icy course, the drivers used tires fitted with steel wedges. The innovation was successful in providing traction as the cars zoomed at top speed.



Pocket-Size Viewer Shows 8-mm. Movies

Want an inexpensive viewer for eight-millimeter movies? A pocket-size viewer is now available. The film is seen through an eyepiece when the viewer is held up to a good source of light. The instrument holds 50 feet of film. A lighting attachment is available for viewing in a dark room. The attachment slides into position on the front of the viewer, and is powered by two Penlight batteries. The viewer is equipped with nylon gears and locking reels. The end of the film is locked in place for a fast rewind.

Is Meteor Dust A Cause of Rainfall?

American and Australian scientists are studying a possible relationship between meteor dust and rainfall. They have noted that heavy precipitation may occur 30 days after the earth enters a region of interplanetary space where meteors are concentrated. Some scientists believe the meteor-dust particles settle into the earth's atmosphere and become the nuclei of ice crystals, which fall to the ground as rain.

Model T Makes Comeback—for the Kids

No longer do kids have to be content with Grandpa's stories about the old Model T. Now they can drive one of their own—a half-scale replica of the famed 1910 "Tin Lizzie." The toy automobile not only looks just like the beloved Model T; it runs like one, handles like one, even sounds like one. It has a 50-inch wheelbase, steel frame and glass-fiber body. Maximum speed can be preset up to 10 miles per hour. The car has a three-horsepower, four-cycle gas engine with a recoil starter.



Rocket Carries Lifeline To Victims of Thin Ice

If a person in West Berlin falls through thin ice on a frozen pond or lake, his life may be saved by a rocket. Fired from shore by a policeman, the rescue device carries a nylon lifeline to the struggling victim.

Concrete-Eating Bacteria Blamed for Conduit Damage

British scientists are studying a breed of bacteria that eats concrete. The microbe is believed responsible for damage to sewage conduits and water-cooling towers. The bacteria live on a diet of sulphur, mineral salts and air, and produce strong solutions of sulphuric acid.

Cars Yield to Planes In Air-Minded Alaska

Motorists are accustomed to giving the right of way to airplanes in air-minded Alaska. The scene below was snapped in Anchorage, which has about one small plane for every 130 persons.



CHEVROLET Owners Rank Them: Handling, Ride, Looks

MARGINAL COMMENTS
BY ART RAILTON
PM'S AUTO EDITOR

Styling is an all-in-the-head affair, a psychological problem. When first out, Chevy's tail may have looked immoderate, but sheer repetition has made it proper—still exciting, but quite proper.

WHAT DO OWNERS of the 1959 Chevrolet like most? More than anything else, they like the car's handling ease. Second of the best-liked features is riding comfort, third is exterior styling.

This lineup is surprising because Chevrolet has the most-changed look of all cars for 1959. Despite its spectacularly different styling the owners rank its looks only third on the best-liked list.

PM asked 1000 owners of 1959 Chevrolets to tell you about their cars. The answers they gave in this coast-to-coast survey were compiled to make this article.

There are, of course, some things they don't like. Most frequently mentioned of the complaints is the difficulty of getting in and out of the low-slung car. Second on the list is poor workmanship, third is the hood hold-down latch.

(Continued to page 91)

PLYMOUTH Owners Rank Them: Handling, Ride, Power

MARGINAL COMMENTS
BY ART RAILTON
PM'S AUTO EDITOR

Handling belongs in top place. Plymouth is the best handling car built in the U.S.A. (one man's opinion).

WHAT DO OWNERS of the 1959 Plymouth like most? Most of all, they like the car's exceptional ease of handling. Second on the list is riding comfort, followed by power and performance.

Styling is now in fourth place in the hearts of Plymouth owners. In 1957, styling was in second place, in 1958 it was in third place and now it is fourth. In all three years, however, top place was held by Plymouth's handling ease.

By surveying 1000 owners of the 1959 Plymouth, PM is able to bring you this frank and informative article. It is based on a total of about a million miles of driving.

The owners told us their troubles, too. Nearly 30 percent (29.4 percent to be exact) have no complaints at all. The one complaint most frequently made concerns poor workmanship, especially in the body. Second on the complaint

(Continued to page 93)

FORD Owners Rank Them: Looks, Handling, Ride

MARGINAL COMMENTS
BY ART RAILTON
PM'S AUTO EDITOR

Ford is playing a new role. Until recently, it was the flashy one, perhaps even the rash one. This year, it takes on a more sedate personality.

WHAT DO OWNERS of the 1959 Ford like most? They like the exterior styling more than any other feature. Second on the best-liked list is handling ease, third is riding comfort.

What specifically do they like about the exterior styling? They like the clean, conservative lines, the absence of extremism. They like the taillights, the big, big lights that are virtually a Ford trademark.

To find the answer to these and other questions, PM sent questionnaires to 1000 owners of 1959 Fords scattered from coast to coast. Their replies were compiled in this article.

We asked what they don't like, also. The most frequently mentioned complaint is poor gasoline economy. Second on the list is the inadequate heater, third is poor workmanship.

(Continued to page 95)

CHEVROLET

**OWNERS
REPORT**
A NATIONWIDE SURVEY



PLYMOUTH



FORD





AN ENGINEER'S ANALYSIS

By **DALE KELLY, SAE**
Registered Professional Engineer

1959 Chevrolet Bel Air V8

MODEL TESTED: Four-door sedan with two-barrel carburetor, single exhaust, Powerglide transmission and power steering.

Rear-axle ratio: 3.36 to 1. Wheelbase: 119 inches. Tires: 7.50 by 14. Weight: 3849 pounds with gas tank half full (53 percent on front wheels, 47 percent on rear).

Mileage on car at time of test: 650 miles. Barometer: 29.30 inches. Temperature: 64 deg. F. Payload: 200 lbs.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Regular gasoline.....	3.5	7.0	14.9	23.5	20.3
Premium gasoline.....	3.5	7.0	14.6	20.7	20.2
Super-premium gasoline.....	No improvement noted				

(Gasoline used had following octane ratings by Research method: Regular 90; Premium 99; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	19.8	17.3	13.8	12.3
Premium gasoline.....	21.0	18.2	15.0	11.7
Super-premium gasoline.....	Not tested			

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$191 for 10,000 miles

(Based on use of regular gas by 75 percent of owners at 30.5 cents per gallon and premium gas by 25 percent at 33 cents per gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed	20	29	39	49	59	69	79

ODOMETER ERROR (miles traveled)

Odometer registered 104 miles for an actual distance of 100 miles



DRIVER'S VISION

Driver could see part of road 20.5 feet in front of car, full width of road 24 feet in front of car



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....27.5-ft. radius
Worst hump that could be crossed.....18.0-ft. radius
Deepest rut that could be negotiated.....6.0 inches
Curb clearance for door opening.....14.0 inches

MISCELLANEOUS

STEERING

Steering-wheel turns for 50-ft. circle...1.9 turns
Curb-to-curb turn-circle diameter.....40.0 feet
Wall-to-wall turn-circle diameter.....43.0 feet
Steering-wheel turns, lock-to-lock.....5.3 turns

CENTER OF GRAVITY: 22.3 inches

TRUNK CAPACITY

16 cartons (one cubic foot each)

WATER RESISTANCE: Good

Splash-pan test: No leaks
High-pressure test: No leaks

OBSERVATIONS

The gasoline tank, although rated at only 20 gallons, actually held 21.4 gallons in addition to whatever gasoline was left in the tank when the engine ran out of gas.

Gasoline economy is excellent for a car of its size. It is the longest (and lowest) in its price class. It is assumed that 25 percent of the owners would buy premium-grade gas to take advantage of the added performance at higher speeds.

Clearance in ruts is poor, being only six inches,

considerably under that of the other two cars.

Turn-circle diameters are 1½ feet larger than for last year's highly maneuverable Chevrolet. Power steering too slow. There should be no need for so much winding when a power assist is used.

Acceleration is considerably under that of last year's car, but gasoline economy is increased. Speedometer accuracy is excellent.

Dale Kelly, SAE

Of all Chevrolet owners in the survey, 25.7 percent make no complaints at all. Nearly two thirds of the owners will buy another Chevrolet next time (61.9 percent to be exact) and another 6.8 percent will buy some other General Motors car, staying in the GM family.

Here are quotations from the owners describing features they like most in their new Chevrolets:

"This is the easiest car to handle that I have ever driven. I own four cars for my business and when I trade the others it will be for Chevrolets."—Arkansas funeral director.

"The ease with which this car handles (even without power steering) is tremendous."—New Hampshire housewife.

"My wife likes the ease of handling in traffic and on the highway. I like most the way it handles when pulling a boat trailer on mountain roads."—California flight-line supervisor.

"Wonderful ride on rough streets. You feel no bumps and the car doesn't lean on curves."—California government employee.

"Takes bumpy roads like a big car."—Illinois retired owner.

"I like its beauty, its sharp styling."—Wisconsin rural mail carrier.

"The exterior styling is out of this world."—California gardener.

"Styling is equal to most higher-price cars."—Georgia post office clerk.

And the Complaints

"People are living longer, incidence of back strain and weakness is increasing, so why not make it easier for one to enter and leave one's car? As it is I have to turn sideways and then strain to leave my auto. It is most difficult for a lady to step out of our Chevrolet without wearing slacks. If you don't agree, watch a lady make an exit from under the steering wheel."—Georgia physician.

"Rear seat of the hardtop is a little hard to get out of. Front seat is much too low and too hard to get in and out of also."—Illinois owner.

"Too hard to enter and leave because of projecting windshield."—Illinois farmer.

"Suggest that assembly should be checked more closely as this car had no nut on generator to hold it in place, no screws to hold trunk lock in place, one parking light was never connected, timing was set too fast, window on driver's side did not function. Work to correct these was done free of charge by dealer but would save money and time if it had been checked more thoroughly."—Pennsylvania railroad man.

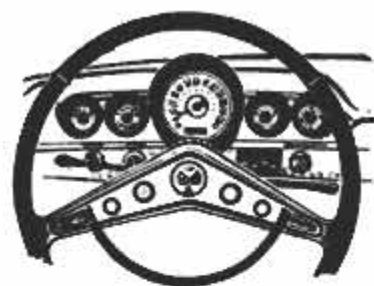
"Inferior workmanship. Nothing fits quite right. Door rattle. Paint poor. Emblem and designs not in line. Moldings fall out."—California lineman.

"First time I released emergency brake the handle came off in my hand. While my wife was driving, the door handle came off. Brakes locked several times. Indicates sloppy work and very poor inspection."—New York owner.

"Hood design seems to make it susceptible to wind. It rises when traveling at high speeds. There is no adjustment to alleviate this condition."—New Jersey chemical engineer.

"Chevrolet should have another kind of hood latch. One in the middle is not enough. At high speeds the hood comes up on both sides."—Texas policeman.

(Continued to page 256)



↑ Chevy instruments are well placed, and are easy to read

← Only a chronic griper could complain about the ride of this car. It takes all but the worst roads calmly, without fuss.

← Therein lies another reason for declining medium-price-car sales.

← Stylists are convinced that car buyers want lower bodies. Past sales figures seem to bear them out. If consumers rebel (and there is growing evidence that they are), designers will change their minds. They're amenable.

← It's hard to be certain who's to blame. As long as cars are built on moving production lines and as long as all-new models come out each year, this complaint will persist. To err is human, 'tis said.

↓ Trunk has high sill to lift over, but lid is easy to open and close





1959 Plymouth Belvedere V8

MODEL TESTED: Four-door sedan with two-barrel carburetor, single exhaust, Powerflite transmission and power steering.

Rear-axle ratio: 3.31 to 1. Wheelbase: 118 inches. Tires: 7.50 by 14. Weight: 3657 pounds with gas tank half full (55 percent on the front wheels, 45 percent on the rear).

Mileage on car at time of test: 400 miles. Barometer: 29.25 inches. Temperature: 65 deg. F. Payload: 200 lbs.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline	2.5	6.3	11.5	22.5	18.7
Premium gasoline	2.2	6.0	10.9	21.0	18.3
Super-premium gasoline.....	No improvement noted				

(Gasoline used had following octane ratings by Research method: Regular 90; Premium 99; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline	19.2	17.3	13.7	11.1
Premium gasoline	19.7	16.7	13.4	11.8
Super-premium gasoline.....	Not tested			

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$207 for 10,000 miles

(Based on use of regular gas by 25 percent of owners at 30.5 cents per gallon and premium gas by 75 percent at 33 cents per gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed	23	32	41	50	59	68	78

ODOMETER ERROR (miles traveled)

Odometer registered 105 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 21 feet in front of car, full width of road 25.5 feet in front of car



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....23.5-ft. radius
 Worst hump that could be crossed.....16.0-ft. radius
 Deepest rut that could be negotiated.....7.5 inches
 Curb clearance for door opening.....14.0 inches

MISCELLANEOUS

STEERING

Steering-wheel turns for 50-ft. circle...1.45 turns
 Curb-to-curb turn-circle diameter.....41.5 feet
 Wall-to-wall turn-circle diameter.....44.0 feet
 Steering-wheel turns, lock-to-lock.....3.5 turns
CENTER OF GRAVITY: 22.6 inches

TRUNK CAPACITY

18 cartons (one cubic foot each)

WATER RESISTANCE: Good

Splash-pan test: No leaks
 High-pressure test: No leaks

OBSERVATIONS

Scale on the speedometer is very confusing. The dots that are closest to the numerals "30" and "40" represent speeds of 20 and 30 miles per hour respectively. This discrepancy is due to the difficulty of making a center-pivoted needle match up with a straight-line scale.

Gasoline gauge did not register with anything under two gallons in the tank.

Owners with steep driveway ramps to climb will appreciate the excellent clearance under the rear overhang (23.5-foot radius).

Wrap-around portion of the windshield interferes relatively little with entrance to the front seat. However, there was considerable distortion through curved ends of the windshield.

This car had largest displacement, highest advertised horsepower, and fastest acceleration (as well as highest gasoline cost) of the three cars.

Its weight distribution lies midway between the Chevrolet and Ford. It is the lightest of the three cars.

Dale Kelly, SAE

list is the location of the inside rear-view mirror, third is body noise, especially in the dashboard.

The following quotations describe in the words of the owners the most popular of the best-liked features:

"I like the way it drives. It handles so well on all kinds of roads, especially on curves."—Illinois farmer.

"My wife and I checked all cars in this price class and Plymouth is the easiest to handle."—Colorado contractor.

"Good maneuvering in heavy traffic."—California Navy man.

"I feel like I'm sitting on a cloud. My body and legs don't ache any more after a drive. I am very relaxed."—New York methods engineer.

"Very snappy performance with the 260-horsepower V8 and Torqueflite transmission."—Minnesota mechanic.

"Superior long-distance riding comfort."—New Jersey minister.

"Plenty of power and pep, and with regular gasoline."—South Carolina sales manager.

And the Complaints

Here, in order of frequency of mention, are complaints about the Plymouth as described by the owners:

"Apparent sloppy inspection at factory. Window handle not installed properly. Heater hoses not connected to defroster vents. One door not aligned properly. Window trim poorly installed, making window closing difficult. Horn didn't work at first. No light for license plate in rear."—California editor.

"Sloppy workmanship as though the workers have no pride in their work or, perhaps, production lines are moving too fast."—California line driver.

"I have found on this as well as on other cars I purchased, it comes from the factory in very sad condition. Loose nuts and screws, some missing entirely. After 1000-mile check, I pay to have it gone over once again."—Maryland building inspector.

"Placement of rear-view mirror is absolutely dangerous. It obstructs vision. Ludicrous too, as it is knocked out of position by driver's hand when shifting into second gear."—Pennsylvania retired grocer.

"They've got to put the rear-view mirror where it won't obscure forward vision. It blocks out the right-front end of the car."—Illinois salesman.

"I notice all Plymouths the cab company operates have the rear-view mirror mounted up top. I intend to have mine moved up there."—Pennsylvania electrotyper.

"Quite a few rattles in doors."—Rhode Island foreman.

"Constant rattle somewhere in dash. Also the speedometer has a slight buzz."—Idaho technician.

"Poor gas mileage on this Six. I practice every economical method of driving I can, but 17 miles per gallon is the best I can get."—Wisconsin railroader.

"I am averaging at present 15.3 miles per gallon over-all with this V8. My dealer is presently trying to get me better economy."—Pennsylvania salesman.

"Powerflite upshifts and downshifts with a hard thump."—Pennsylvania sales supervisor.

"No Park on transmission. I keep forgetting the brake."—Kansas Marine sergeant.

"Every morning when I back my car out I get a noise like a siren going off that wakes up my neighbors. It's the transmission."—New York beer plumber.

(Continued to page 262)



↑ Push buttons (heater on right, transmission on left) flank the speedometer

← An excellent over-the-road car, a pleasure to drive fast. Quiet, comfortable and well disciplined on the highway.

← Let's be reasonable! Can you expect a guy who holds a power wrench that tightens nuts automatically to have "pride" in his work? He doesn't even have to judge when the nut is tight, the wrench decides that for him. He's no proud craftsman, he's a wrench holder.

← Plymouth owners have been complaining about this since 1957.

↓ Spare tire is horizontal, but usable luggage space is about the same as in the Ford and Chevy.





AN ENGINEER'S ANALYSIS

By **DALE KELLY, SAE**
Registered Professional Engineer

1959 Ford Fairlane 500 V8

MODEL TESTED: Four-door sedan with two-barrel carburetor, single exhaust, Fordomatic transmission, power steering and brakes, air conditioning.

Rear-axle ratio: 3.10 to 1. Wheelbase: 118 inches. Tires: 8.00 by 14. Weight: 3929 pounds with gas tank half full (57 percent on front wheels, 43 percent on rear). See note below.

Mileage on car at time of test: 340 miles. Barometer: 29.32 inches. Temperature: 67 deg. F. Payload: 200 lbs.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline.....	3.8	9.1	16.8	33.0	21.6
Premium gasoline.....	No improvement noted				
Super-premium gasoline.....	No improvement noted				

(Gasoline used had following octane ratings by Research method:
Regular 90; Premium 99; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	19.0	15.8	13.2	10.7
Premium gasoline.....	Not tested			
Super-premium gasoline.....	Not tested			

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$206 for 10,000 miles

(Based on use of regular gasoline at 30.5 cents per gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed.....	18	27	36	45	54	63	72

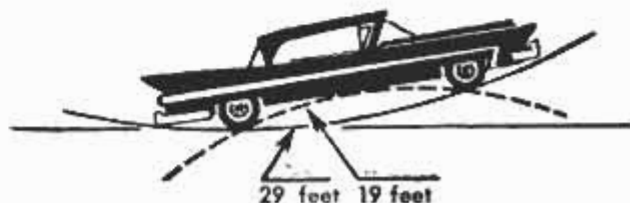
ODOMETER ERROR (miles traveled)

Odometer registered 105 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 18.5 feet in front of car, full width of road 23 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed..... 29.0-ft. radius
Worst hump that could be crossed..... 19.0-ft. radius
Deepest rut that could be negotiated..... 7.4 in.
Curb clearance for door opening..... 12.0 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 50-ft. circle... 1.9 turns
Curb-to-curb turn-circle diameter..... 41.0 feet
Wall-to-wall turn-circle diameter..... 44.0 feet
Steering-wheel turns, lock-to-lock..... 4.5 turns

CENTER OF GRAVITY: 22.0 inches

TRUNK CAPACITY

15 cartons (one cubic foot each)

WATER RESISTANCE: Fair

Splash-pan test: No leaks

High-pressure test: Slight leakage several points.

OBSERVATIONS

High percentage of weight on the front wheels is probably due to the air conditioner. It is fortunate that these coolers are usually sold in regions where rear-wheel traction is not often taxed by ice or snow-covered grades.

Acceleration was relatively modest due to use of smallest V8 engine in this heavy car. It is the heaviest of the three cars tested (due in part to air conditioning). Economy was fairly good, considering the weight.

Steering is much too slow. There should be no

need for so much winding in a car with power steering.

Rear overhang is too low and too long.

Gasoline gauge stopped indicating when supply dropped below two gallons.

Ford carburetor embodies long overdue advances in servicing ease. Without removing or dismantling carburetor, you can drain dirt from the float bowl, check and adjust the float level and replace the float-valve needle and seat.

Dale Kelly, SAE

Of all the Ford owners who answered the questionnaire, 21.0 percent have no complaints at all. It is interesting that among owners of the Ford Six, 31.9 percent have no complaints, while among V8 owners only 16.8 percent are completely satisfied—more evidence to support the hypothesis: Simpler the car, more satisfied the owner.

Here, then, are quotations from the owners about the features they like most in their 1959 Fords:

"Styling is plain and beautiful. Such clean, modern lines are really something to admire."—California salesman.

"Decent looking. Like a car and not like a space ship."—California geology professor.

"Classy without being flashy. Prettiest of all new cars."—Illinois bartender.

"Being a woman, I find my Ford Victoria the best-handling car I've ever driven."—Pennsylvania owner.

"It handles easily. Parks with unusual ease."—Indiana minister.

"One can drive mile after mile without having that tired feeling."—Georgia machinist.

"Riding comfort is equal to many cars in the \$4000 price range. Smooth and quiet operation even at 60 to 70 miles per hour. Not even the usual wind noise at the windows."—Indiana tool and diemaker.

"Good suspension makes riding on country roads smooth."—Pennsylvania technical representative.

Now the Complaints

"Gas mileage not so hot in city. The biggest letdown I have is the advertising Ford has done that the cars will operate satisfactorily on regular gas. Their owner's manual recommends differently. I have driven my car 1747 miles of which 900 was on the Pennsylvania Turnpike. I purchased 177 gallons of gas to cover this mileage."—Pennsylvania V8 owner.

"I bought the 225-horsepower V8 with Cruis-O-Matic for economy. Guess I should have bought the small motor. That economy advertising is greatly exaggerated. I drive it as though I am on an economy run and get about 11 miles per gallon around town."—California salesman.

"Don't get the gas mileage promised me and I drive with care and caution. I also follow the manual on how to get most mileage per gallon. It's a Six and I am getting 14 miles per gallon in city driving."—Wisconsin setup man.

"Gas mileage is very poor compared with claims. I get 12 miles per gallon in city, 17 on trips."—Maryland six-cylinder owner.

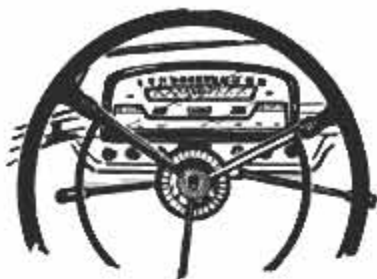
"Heater is no good. I have to drive five miles before it gets warm."—New York store manager.

"Very poor heater. It's rather discouraging to buy a new car and have to pick the days to drive it because the heater won't heat the car comfortably enough to ride in."—South Dakota school principal.

"Cheap model heater in my car has no middle range. It's either too hot or too cold and the defrosters don't defrost high enough on the windshield."—California real estate salesman.

"Car had many small items overlooked during assembly that had to be corrected by the dealer, the defrosters were not hooked up, the dial on the temperature gauge was in crooked, courtesy lights were not wired to the door switches, many metal screws missing from interior window moldings."—South Dakota freight claim agent.

(Continued to page 278)



↑ Instruments are neat, legible and easy to glance-read, day or night

← Front seat is upright, high and firm enough to give an "I'm in control here" feeling to driver. Car itself seems heavier than it is and this contributes to the mental feeling of control. Actually, however, it is out-cornered (marginally) by the other two.

← Dale Kelly lists the test Ford at \$206 a year for gas. Tiny foreign cars use at best \$100 worth of gas a year. Thus you could save \$100 or so at the most. The total amount involved is much less than most people realize.

← Test car's heater worked fine. But apparently some Fords had heater trouble.

↓ Ford's trunk is easiest to load; its taillights easiest to break



SUMMARY OF OWNERS' OPINIONS

CHEVROLET

Best-liked features	
Handling ease	44.3%
Riding comfort	40.6%
Exterior styling	36.5%
Power, performance	21.4%
Visibility	16.1%
Gas economy	12.1%
Most-frequent complaints	
None at all	25.7%
Hard to get in, out	14.8%
Poor workmanship	10.5%
Hood-latch trouble	10.2%
Uncomfortable seats	8.7%
Water leaks	7.1%
Had trouble with V8 engine?	
No trouble at all	83.2%
Some trouble	12.7%
Considerable trouble	4.1%
Had trouble with the Six?	
No trouble at all	85.6%
Some trouble	13.4%
Considerable trouble	1.0%
Best-liked styling features	
Front end	18.3%
Rear end	12.4%
Sleek, low lines	9.9%
Least-liked styling features	
Fins, wings	13.3%
Entire rear end	7.1%
Front grille	5.6%
How is dealer service?	
Excellent	52.2%
Average	31.8%
Poor	16.0%
Would buy from him again?	
Yes, would buy again	45.2%
No, would not	14.2%
No answer, don't know	40.6%
What make was traded?	
Chevrolet	61.9%
Another GM product	6.8%
Ford Motor make	9.9%
Chrysler Corp. make	5.9%
All others	2.2%
No trade, no answer	13.3%
What make will buy next?	
Chevrolet	63.8%
Other GM make	4.9%
Ford Motor make	2.5%
Chrysler Corp. make	2.8%
Other U. S. makes	2.1%
Small, foreign makes	1.2%
Undecided, no answer	22.7%
One suggestion for industry?	
More economy, less power	17.3%
Better workmanship	14.0%
Lower prices	8.1%
Smaller economy cars	5.9%

FORD

Best-liked features	
Exterior styling	37.9%
Handling ease	36.1%
Riding comfort	29.4%
Power, performance	18.0%
Gas economy	18.0%
Roominess	9.9%
Most-frequent complaints	
None at all	21.0%
Poor gas economy	15.5%
Inadequate heater	11.8%
Poor workmanship	8.8%
Water leaks	6.3%
Hard to get in, out	4.7%
Had trouble with V8 engine?	
No trouble at all	80.4%
Some trouble	18.2%
Considerable trouble	1.4%
Had trouble with the Six?	
No trouble at all	83.3%
Some trouble	16.7%
Considerable trouble	0.0%
Best-liked styling features	
Clean, smooth lines	9.9%
Conservative design	8.0%
Taillights	8.0%
Least-liked styling features	
Front grille	8.3%
Taillights	5.0%
Fender ornaments	2.9%
How is dealer service?	
Excellent	48.2%
Average	40.3%
Poor	11.5%
Would buy from him again?	
Yes, would buy again	46.8%
No, would not	12.5%
No answer, don't know	40.7%
What make was traded?	
Ford	58.2%
Another Ford product	2.9%
General Motors make	16.7%
Chrysler Corp. make	6.1%
All others	4.3%
No trade, no answer	11.8%
What make will buy next?	
Ford	62.5%
Other Ford Co. make	1.1%
General Motors make	5.7%
Chrysler Corp. make	2.2%
Other U. S. makes	1.1%
Small, foreign makes	3.2%
Undecided, no answer	24.2%
One suggestion for industry?	
More economy, less power	23.6%
Better workmanship	11.8%
Lower prices	7.1%
Smaller economy cars	6.0%

PLYMOUTH

Best-liked features	
Handling ease	48.6%
Riding comfort	46.7%
Power, performance	25.0%
Exterior styling	23.0%
Roadability	15.0%
Steering	13.8%
Most-frequent complaints	
None at all	29.4%
Poor workmanship	14.1%
Rear-view mirror	11.2%
Rattles, squeaks	9.9%
Poor gas economy	6.7%
Automatic trans.	5.8%
Had trouble with V8 engine?	
No trouble at all	85.3%
Some trouble	13.9%
Considerable trouble	0.8%
Had trouble with the Six?	
No trouble at all	62.0%
Some trouble	30.9%
Considerable trouble	7.1%
Best-liked styling features	
Front grille	14.4%
Streamlined lowness	10.9%
Conservative lines	7.7%
Least-liked styling features	
Tailfins	23.4%
Trunk lid, lock	3.8%
Front grille	2.9%
How is dealer service?	
Excellent	49.3%
Average	38.4%
Poor	12.3%
Would buy from him again?	
Yes, would buy again	50.3%
No, would not	12.2%
No answer, don't know	37.5%
What make was traded?	
Plymouth	48.1%
Other Chrysler make	9.9%
General Motors make	17.6%
Ford Motor make	8.9%
All others	3.5%
No trade, no answer	12.0%
What make will buy next?	
Plymouth	58.7%
Other Chrysler make	6.7%
General Motors make	6.1%
Ford Motor Co. make	3.5%
Other U.S. makes	1.9%
Small, foreign makes	2.2%
Undecided, no answer	20.9%
One suggestion for industry?	
More economy, less power	23.1%
Better workmanship	12.2%
Lower prices	8.0%
Smaller economy cars	7.7%

OVER-ALL RATING

CHEVROLET: Excellent 64.1%

Average 29.3%

Poor 6.6% ↘

FORD: Excellent 57.4%

Average 38.3%

Poor 4.3% ↘

PLYMOUTH: Excellent 66.8%

Average 27.7%

Poor 5.5% ↘

Cargo Hoist Snatches Cars From Illegal Parking Areas

Don't ever park illegally on the streets of Warsaw, Poland. Policemen there will simply remove your car without a turn of its wheels. They do it with all the finesse of accomplished seamen, for they use a ship's cargo-hoisting cradle to lift the car bodily from the illegal-parking area. A mobile crane provides the muscle.



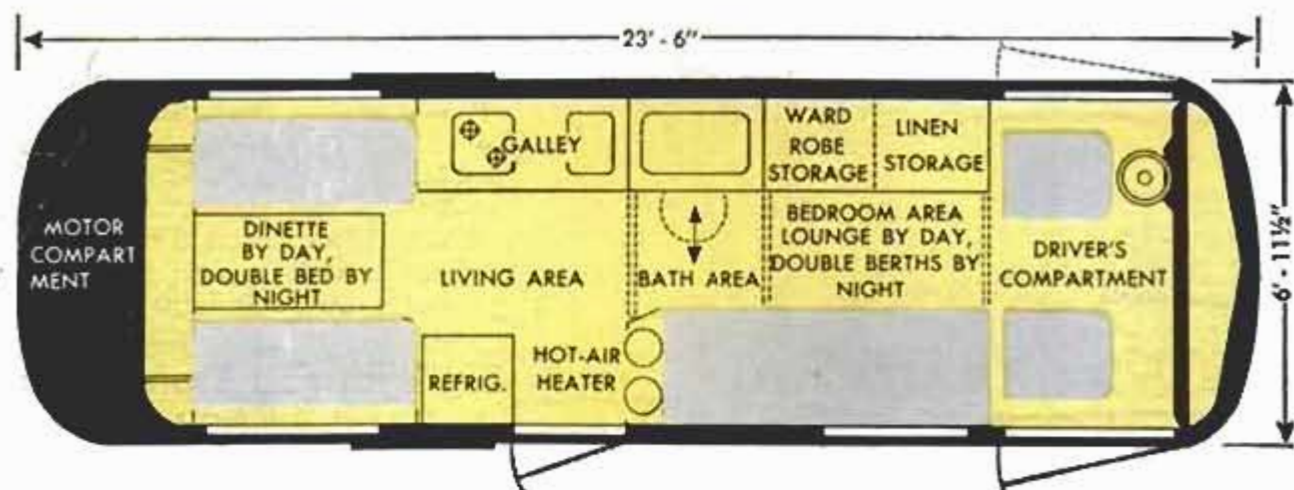
Wheel-Mounted Clamps Move Building Board

Plywood, hardboard, insulation board and even prebuilt wall sections can be moved quickly and easily from the truck to the building site with a pair of wheel-equipped clamps. The clamps, which will hold as many as four sheets of gypsum board, can be attached to the board on the truck bed. The load then can be eased to the ground by two men.

Big Hydrofoil Craft Cruises the Caribbean

Skimming across the Caribbean between Puerto Rico and the Virgin Islands is a huge commercial craft equipped with hydrofoils. Riding above the surface on its spidery legs, the 20-ton craft cruises at 40 miles per hour. The manufacturer now is planning 120-ton hydrofoil boats.



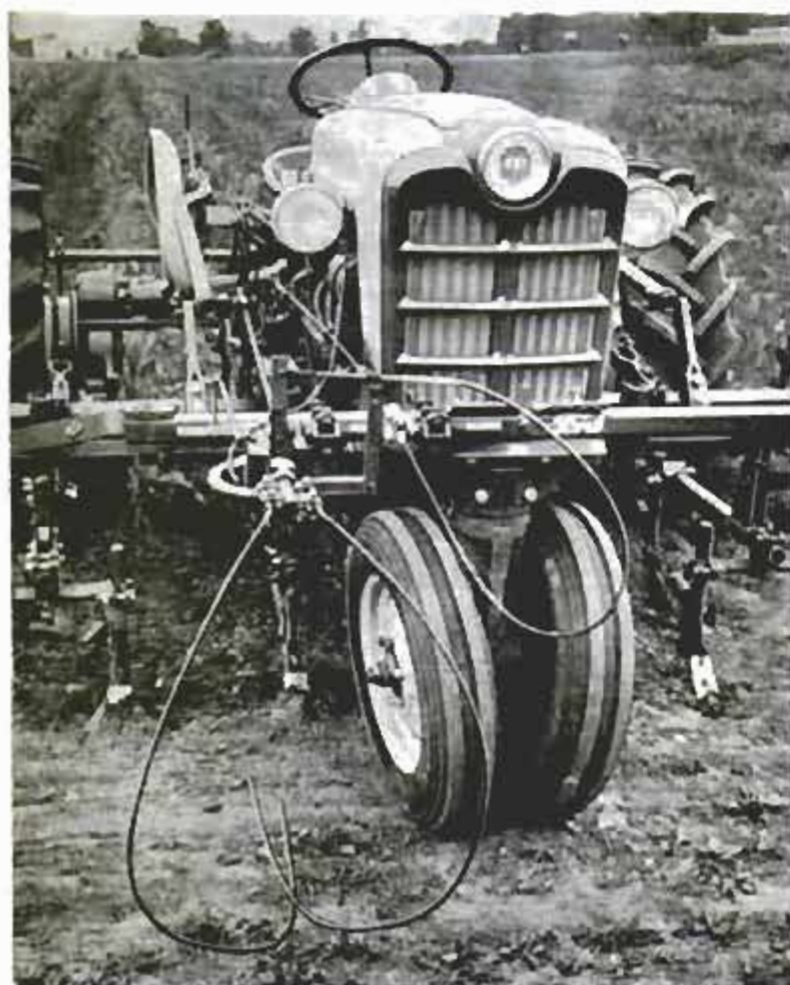


MOTORIZED HOUSE

Driven like a car, a new "house on wheels" has complete living facilities for four persons. Because of its versatile space arrangement, the motorized house is suitable for those who travel for business as well as pleasure. It is powered from the rear by a Ford V-8, 106-horsepower engine and cruises at 60 miles per hour. Propane gas operates the range, water heater, refrigerator and radiator.

Hairpin-Shaped Feeler Steers Farm Tractor

Semiautomatic cultivating is made possible by a hairpin-shaped attachment for farm tractors. The device, resembling an insect's "feelers," touches a corn, cotton or other plant and judges whether the plant is to the right or left of the feeler's center line. The information is transmitted through microswitches to the power-steering linkage which corrects the path of the tractor. The driver can override the device at any time.



Patient Controls Circular Bed

Designed to save the time of nurses and the expense of extra equipment, a new hospital bed mounted on circular tubing can be tilted from horizontal to vertical positions by electric controls. The controls, which can be operated by the patient, activate an electric motor. In the rehabilitation of a paralytic case, the patient can tilt the bed to a nearly standing position, even when he can't leave the bed. And patients in casts can tilt the bed to an upright position from which they can walk away. The bed also can be set at the special angles required for some post-operative cases. The tilting-bed unit fits standard elevators and doorways and weighs 167 pounds.

Ready-in-Seconds Slide Projector

There's no case or cover on Bell & Howell's new slide projector. The machine is carried as is; you merely flip down the front and rear panels and you're ready to show slides. The "dashboard" of controls at the back is illuminated. The projector operates with push-button ease. It has a remote-control system that moves slides forward and in reverse.



Sculptor



By Henry F. Unger

Photos by Author

A STRONG TOUCH of the Old West and the realistic tones of his wood carvings are attracting visitors from all over the nation to the studio of Dee Flagg in Scottsdale, Ariz.

Specializing in personalities of the Old West, Flagg turns out wood sculptures—life-size, statuette and bas-relief. His carvings of Geronimo, Sitting Bull, Buffalo Bill, the James boys and the Daltons, plus a host of other frontier characters, can be seen in museums, stores and homes from coast to coast.

His life-size figure of Sitting Bull was copied from photographs of the famous chief. It was carved in Philippine mahogany. The likeness of Buffalo Bill Cody and a Navajo Indian group were made from basswood, which allows fine detail. He made the beaded work and used hemp for the hair of Sitting Bull. Human hair was used for the Navajo group.



Close-up shows Dee Flagg at work on figure of famed Apache Indian Chief Geronimo. Flagg uses 20 different kinds of tools; makes several of them himself



Relief portrait of outlaw Jesse James, above, measures 21 by 30 inches and is 2½ inches deep. It was carved for a restaurant-museum at St. Joseph, Mo.

Artist poses between realistic life-size figures of Indian Chief Sitting Bull and Buffalo Bill Cody. Sitting Bull was carved in Philippine mahogany

OF THE OLD WEST

The bas-relief figures of the James boys were made for a St. Joseph, Mo., restaurant-museum. Flagg puts the bas-relief works in boiling linseed oil for 10 hours, then adds three coats of bronze stain over a period of about two weeks.

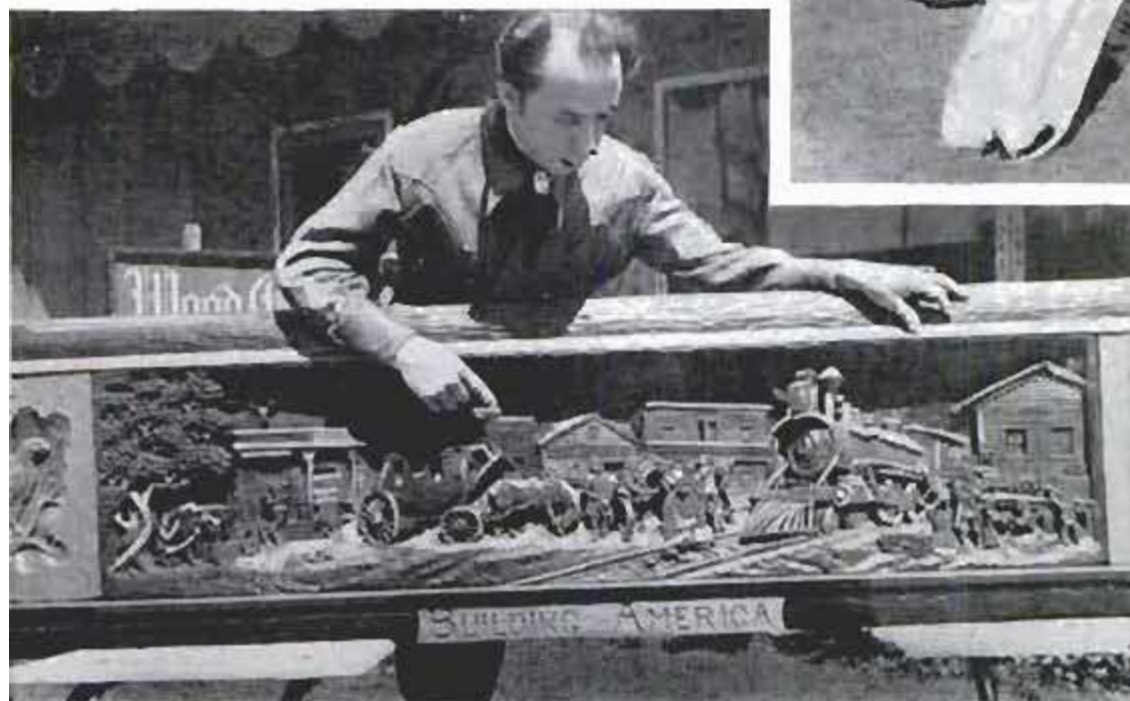
Small statues of Western characters are made from basswood. However, Flagg used gumwood for one 14-inch cowboy statue.

The artist has been sculpturing in wood for 10 years. He started his work as a hobby in Great Falls, Mont., his previous home.

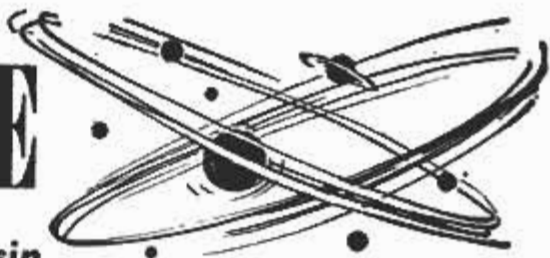
Flagg's carving talents have not been confined to Western scenes and personalities. He also has produced a variety of wood sculptures ranging from a 17-inch statuette of J. Edgar Hoover, the FBI director, to an eight-foot-high replica of a Hawaiian peace god. ★ ★ ★

Flagg's sister adjusts human hair on one of group of Navajo Indians, right. Some statues have hemp hair

Three-dimensional mural carved in piece of spruce is 7½ feet long. Its theme is "Building America"



AN EYE ON SPACE



By Dr. Dan Q. Posin

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



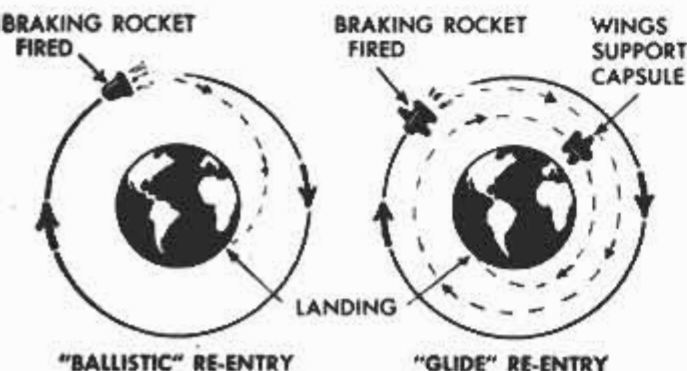
IN ANCIENT MYTHOLOGY, Mercury was the messenger of the gods. Very soon now, Mercury will be the messenger of men.

Project Mercury, of course, is the plan to put a man into orbit around the Earth; and a fast man he will be indeed, making a circuit around Earth in about 90 minutes. This modern Mercury will be as rugged and as wise—and probably as handsome—as the messenger of the gods. The National Aeronautics and Space Administration (perhaps the temple of the gods among men?) has issued the following specifications:

1. Mr. Mercury must be a university graduate with a degree in the physical sciences or engineering; 2. He must also be a graduate of one of the military test-pilot training schools, with at least 1500 hours of flight time; 3. He must be less than 40 years old, not taller than 5 feet 11 inches; 4. His physical condition must be ultrasuperior, and his physical and psychological qualities must be suited to space flight.

The selection of this Mercury of the Earthlings has already begun from a list of 100 candidates. During training at Air Force biomedical centers, the list will gradually be narrowed down. The aspiring Mercuries will undergo centrifuge tests which will simulate the conditions in the capsule during take-off and re-entry. There will also be balloon flights in Mercury capsules to accustom the spacemen to their home in the sky.

Practice shots will be made to launch capsules carrying dummy passengers and equipment, first with short-range solid-fuel boosters, later with more powerful boosters. Animals then will be launched in a series of capsules before the actual Earthling Mercury goes aloft.



While Mr. Mercury is in orbit, instruments will record his psychological and physiological reactions to the effects of weightlessness, of high acceleration during launching, and of high deceleration during the re-entry into the atmosphere. The re-entry can be achieved by several methods. In the "ballistic" method a rocket is fired from the capsule in the direction of flight to slow down the capsule, making it go out of orbit. A set of

parachutes then slows it down even more and finally brings the heroic Mr. Mercury down to Earth. In the "glide" method, a capsule which is part of a glider is used. After a braking charge is fired, the capsule-glider makes use of the atmosphere both for deceleration and support as it traces a long, descending path, going several times around the Earth before landing.

Space query: Is it true that the first man into space will be a woman?
E.L.K., Chicago, Ill.

Answer: In the United States, the man will be a man. The Russians have said that women may be better suited for such a flight. No doubt U.S. women will eventually go aloft—to see what their men are doing.



Sub-Killing Plane Can Stay in Air 24 Hours

Canada's new submarine-hunting aircraft, the Argus CL-28, is the largest plane ever to be built in the Dominion. It's powered by four 3700-horsepower, turbo-compound engines and carries enough fuel to take the average family car five times

around the world at the equator. The Canadair-built aircraft can stay in the air 24 hours at reconnaissance altitudes and speeds. Equipped with the latest submarine-detection devices, the Argus also carries depth charges and torpedoes.

Boat Folds Flat For Storage

Boaters' storage and transportation problems are minimized by a foldable craft that can be carried flat on any car top. It can be unfolded and made ready for use in about five minutes. In its folded position, the boat is about as thick as a small suitcase and can be stored neatly on the walls or rafters of a garage. Made of marine plywood, the boat has a metal transom-brace and an aluminum-alloy inverted keel. All joints and seams are covered with nylon Neoprene webbing.

Rating fish on the basis of intelligence, French researchers have found that carp are intelligent; chub, roach and trout, fairly intelligent; bream, not very intelligent; and eel, pike, perch, minnow and catfish, definitely stupid.

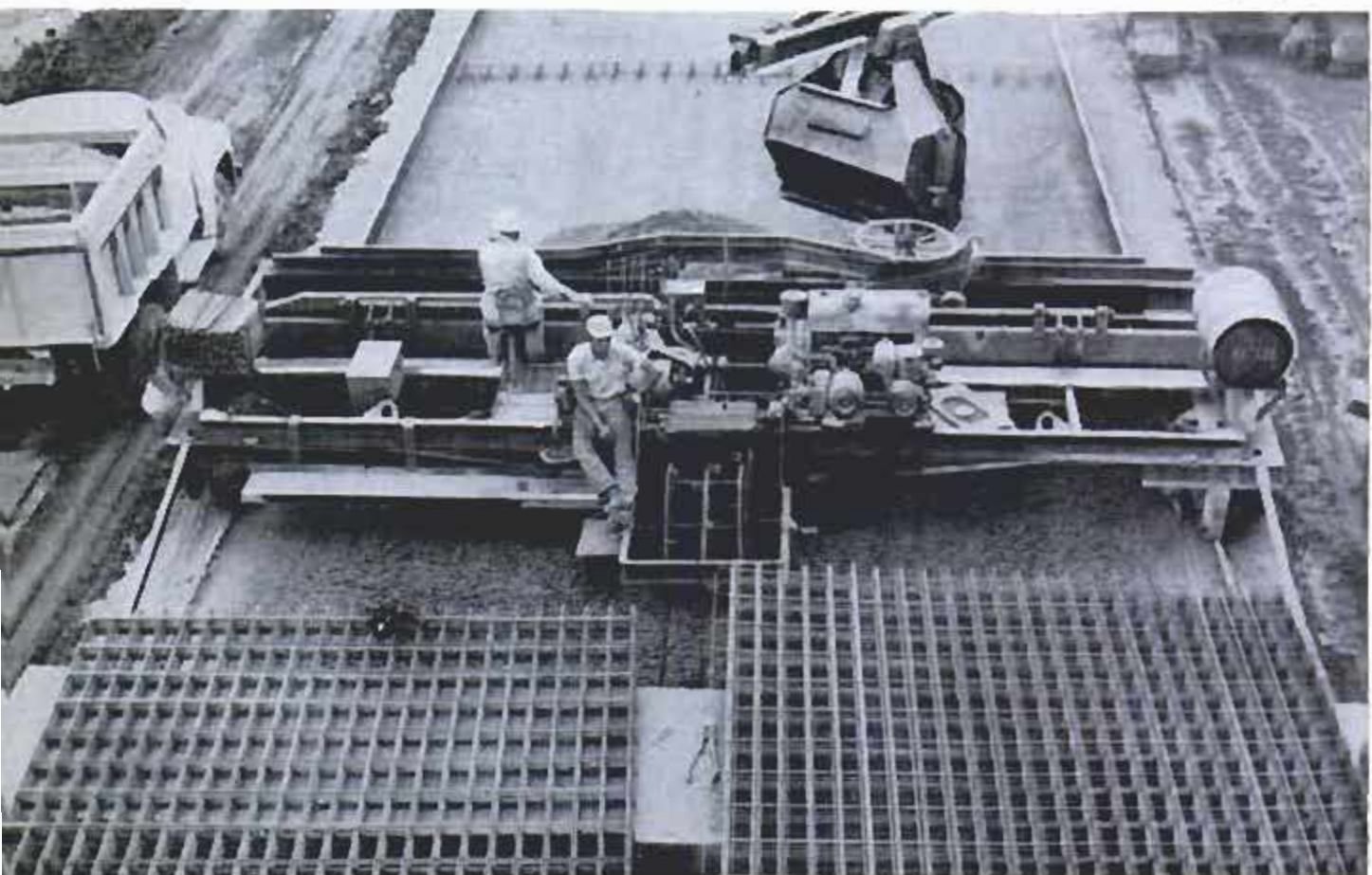


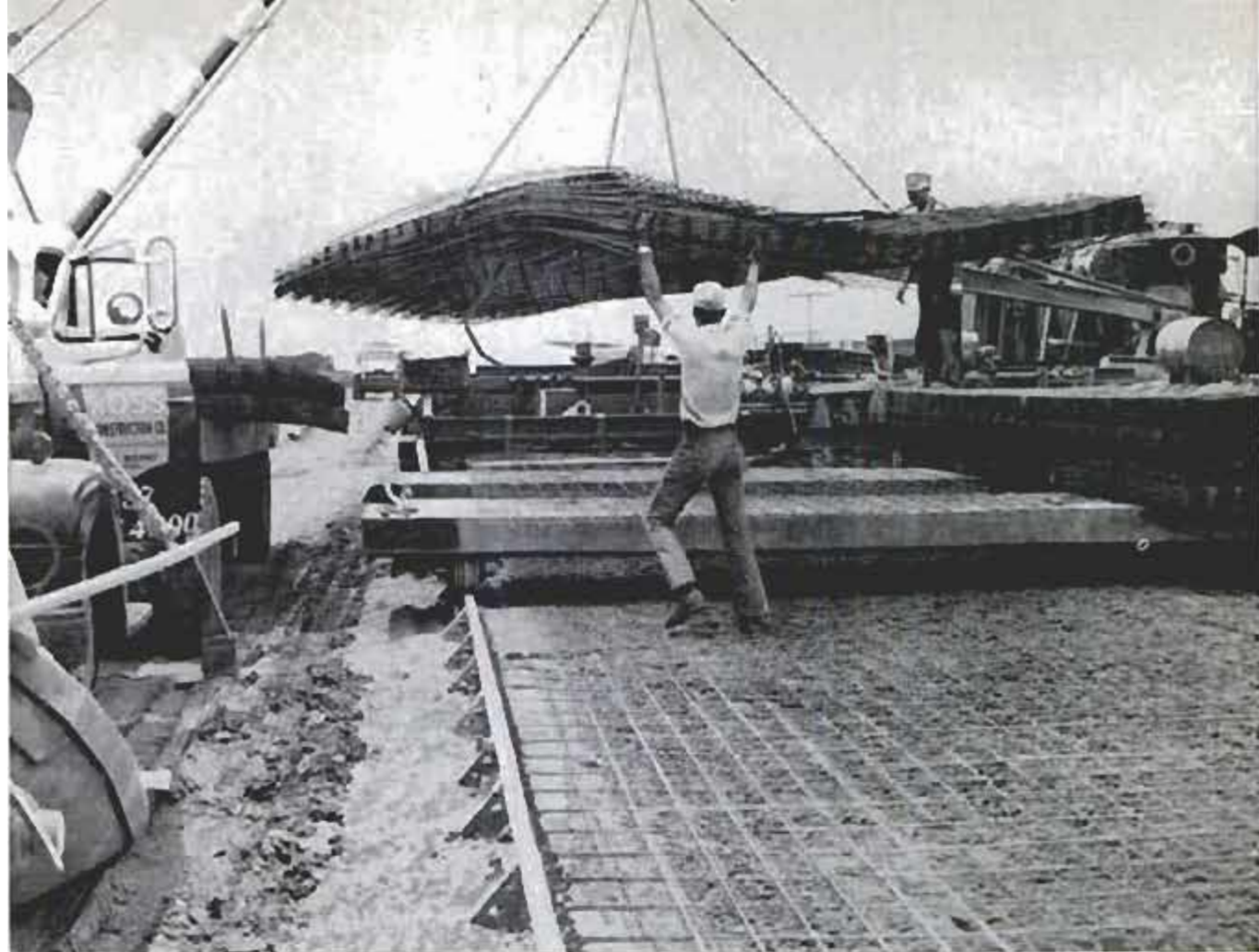


Endless stream of concrete is laid by 24-man paving crew. Trucks and cars of crew are directed by radio.

Roadbuilder

Steel trailer follows concrete spreader of paving train, leaving road shoulders free for rolling equipment





Enough steel for 2000 feet of paving is added to trailer twice a day. Trailer also keeps steel out of mud

With Fresh Ideas

By Joseph B. Mickey

CONSTRUCTION HISTORY was made by the Koss Construction Company of Des Moines, Iowa, and Pauline, Kans., when the new superhighway, Interstate 35, was built across Franklin County, Kans. Ingenious machines and fresh ideas sparked the job.

The 16 miles of 24-foot twin slabs, nine inches thick, were laid at the amazing speed of over 320 feet per hour. Using a 24-man paving crew, an endless stream of concrete was laid in what is now conceded by construction men to be an all-time record for a superhighway. Whether Koss workmen were seeking easier ways to do the job or were exceedingly "brainy" is undecided. In any event, they constantly developed new machines to do the back-breaking labor. And there is a good reason for this when labor costs alone may exceed \$7000 per day.

One of the more spectacular innovations used for the first time on this job was a steel trailer pulled by the first of the two concrete spreaders. This apparently simple

device was loaded with tons of reinforcing steel each morning and noon. Enough steel-wire mesh was loaded each time for 2000 feet of paving.

Two men operated the steel trailer simply by pulling off the sheets of wire mesh and standing on them while the trailer moved slowly ahead.

The steel was placed between the two 4½-inch layers of concrete which make up the paving slabs. Since the slabs were 24 feet wide, two sheets were placed side by side, butting at the 12-foot center line. Ahead of the trailer, a tie-in wheel placed steel rods just below the surface of the first concrete layer's center line. The steel-mesh sheets were placed firmly over the tie rods.

Besides the timesaving involved, and lack of injuries to handlers of the reinforcing steel, there were other major benefits gained from the new methods. For many years, steel had been piled along the highway site. Mud eventually covered the steel, preventing the concrete from making a



Carborundum saw cuts expansion joint in partly-cured concrete



Device called a tie-in wheel places the center tie rod beneath the surface of the first layer of concrete before steel mesh is positioned

good bond with it. The piles of reinforcing steel were constantly blocking the paths of trucks, paving machines and men. Four men were needed to handle the over 200-square-foot sheets of steel mesh and the men received cuts, scratches, back ailments and torn clothing.

The older methods also required that the steel mesh and tie rods be set on little metal "chairs" which were constantly being knocked out of position when the concrete was dumped on them. Tests on the finished roads showed the reinforcing steel was at all levels of the slab. This situation eventually resulted in broken paving and high maintenance costs.

Another Koss idea, now several years old, was the automatic belt-finishing machine. This device replaced the two or more "he-men" who once pulled a 12-inch rubber belt in see-saw fashion across the concrete slab to finish it. This job would "do in" the best of men under a hot sun.

Again, the nonskid texture of a highway surface used to be added to the smooth concrete by men pushing long-handled canvas-covered trowels. The Koss crew members found the job could be done better and quicker simply by dragging a wet canvas behind the belt-finishing machines.

After 24 hours, the concrete slab is sprayed with a solution which seals and prevents scaling. This, also, used to be done by hand. But Koss built a machine that travels about five miles per hour, sprays the top and sides in one operation.

Another highway-building procedure is that of sawing expansion joints about halfway through the top layer of concrete after eight hours of curing. Joints are sawed at 61-foot-marked sections. The job is done with a Carborundum saw at a slow walk and the blade has to be replaced after it

has been used on about 700 feet of concrete. The expansion joint is cleaned with compressed air, filled with a paper rope and covered with burlap. Seven days later, the joint is filled with an expansion compound.

This was a tedious task until a Koss employee found that a grinding machine, about the size of a lawnmower, would force the rope into the crack as fast as he could walk, and with a minimum of labor.

Joint sags and "10-foot waves," which may appear in some highways after they have been in use a short while, are eliminated with the help of a Koss-built device. It aligns the forms quickly and accurately.

Other labor-saving items include a stake puller and a truck-mounted boom to lift the 200-pound steel forms. The stake puller is a small and compact hydraulic device mounted on a tractor. Stakes are driven with air. The only sledges used are to tap the steel wedges of the forms.

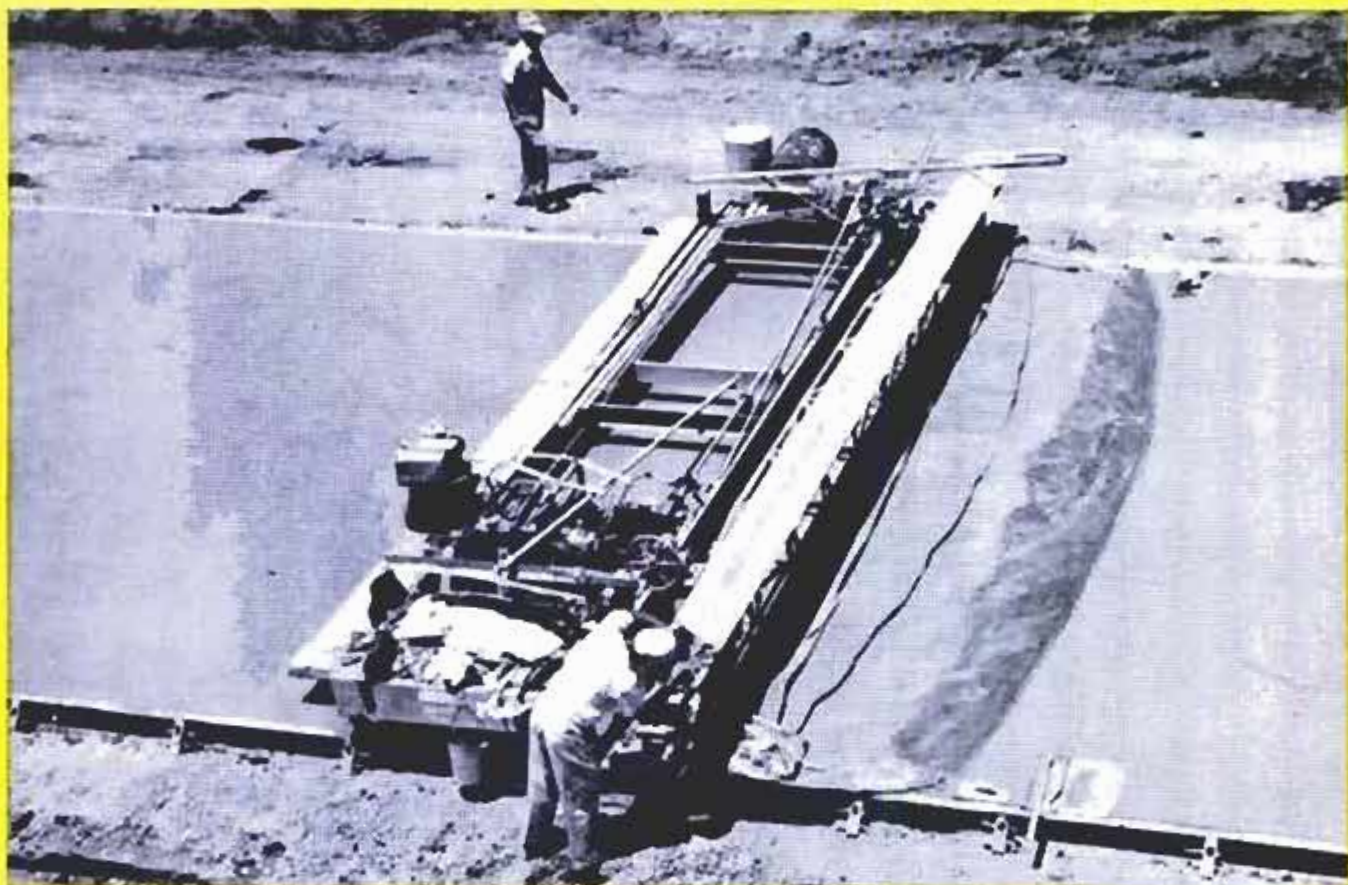
The Koss trucks and cars are radio-equipped for prompt action. A welding truck works around the clock if anything breaks. But breakdowns are rare.

To avoid water-hose problems, the Koss pavers pull their own water tanks. The pavers also carry barrels of a chemical agent, similar to detergents, which is added in small amounts to the concrete batches to retard scaling and cracks in the paving. Although small crews operate the paving train, extra men and equipment are added to the project as the distance from the mix plant increases.

The Interstate Highway is regarded as superior to the Kansas Turnpike in some ways. It is smoother, has a much wider median strip and—most significant of all—set a few records in highway construction by solving many problems that have plagued road builders for years. ★ ★ ★



Concrete surface is smoothed by finishing machine's 12-inch rubber belt. Job formerly required two men
Nonskid texture is added to paving surface by dragging a wet canvas behind the belt-finishing machine



Spray sealer moves at about five miles per hour, spraying sides and top in one operation with no wasted material



By Art Railton

LOOK FOR leg-stretching room inside all the 1960 Chrysler Corporation cars. Their unit bodies are designed with wide, flat rear-seat footwells and narrow sills under the doors to provide plenty of legroom.

Chair-height seats will return (in back only, however). Drivers will still sit close to the floor. Over-all height of the cars will be about the same as in 1959. Added room has been gained by dropping the floor. Because there is no frame with restrictive siderails, the floor can be lower.

Being unitized, the Chrysler bodies will be dipped in primer paint about half way up (a new rubber paint is to be used). Rusting is a big hazard with unit bodies. With a frame, the car will still hold together even though its sheet metal rusts out. But with a unit body, if the sheet metal goes, the car breaks in half.

A few years ago, a move was started to put Plymouth into exclusive dealerships instead of being dualed as it is with other Chrysler cars. The program was stopped. Why? Guesses are that the Chrysler small-car program was just then being started and that complicated the plans.

It looks now as though the upcoming Chrysler small car will be sold by all Chrysler Corporation dealers, replacing the Plymouth as the bread-and-butter car.

So what happens to Plymouth? Speculation is that DeSoto dealers alone will inherit the Plymouth franchise. DeSoto may emerge from the scramble with the old name but a different car, perhaps in a different class—but this is guesswork at present. If DeSoto dealers do get the Plymouth exclusively, they will also sell the new small car while Chrysler and Dodge dealers drop the Plymouth and pick up the small car as their dual.

Lincoln's 1960 automobile is rumored to revert to the frame-plus-body design, instead of the unit body now used. This would permit Lincoln and Mercury to share one shell by 1961. Thunderbird may end up as the Ford Motor Company's prestige car instead of Lincoln.

Ford will be all-new for 1960, the result

of a crash program started last summer when many at Dearborn felt that the finny 1959 Chevy would overwhelm the Ford on the marketplace. It isn't turning out that way. (Chevy is ahead, but only slightly).

Plymouth worries because it isn't sure you mean what you say. Its 1960 car is expected to be the shortest of the Ford-Chevy-Plymouth trio. If you really mean what you say when you complain about long cars, Plymouth is all set, but if you're kidding, it's in for trouble. Remember, it will be a medium-price car in 1960.

What's happening to Buick? A few years ago it was riding high in third place, aiming for second. Now it is well below Pontiac and Oldsmobile and only short skip ahead of Rambler. How come?

Buick is a lot better car than it was back when it was selling well. Many say it is the best looking GM car this year. Yet it isn't selling. Why?

Perhaps the reason is that Buick, more than any other car, has been a status symbol. It is (or perhaps was) the car that appeals to the guy just above the crowd: The senior clerk in the office, the small businessman, the bank teller. It put the owner a step above the multitude and that was important a few years ago.

But something happened. The automobile's star began to descend. Today, it is falling so fast it looks as though its symbol status may vanish entirely. And Buick, the symbol car, is apparently suffering.

This may be good for all of us in the long run (although not for Buick). The family car was becoming too important—important not for what it did, but for what it was. That is an unhealthy base for prosperity in any industry.

Today, more than ever, the car is being bought for what it will do. The astonishing success of the Rambler and the Lark is due more to this changed mood of the public than to the cars themselves. After all, the Rambler is only a little different from what it was when it was having trouble selling 70,000 a year (in 1958 it sold 186,000, in 1959 it hopes to sell 250,000).

Cars haven't changed. The public has.

Not that the public thinks cars are on the way out. They are more essential to the average family than ever. The question is whether they are going to stay in the living room (where Detroit has insisted they belong) or are they to be returned to the garage?

Once cars are back in the garage, sales will rise meteorically. People are ready to buy comfortable, dependable, good-looking transportation, but are reluctant to pay for symbols. This is great news for engineers, sad news for the motivation experts. ★ ★ ★

Major Brown, left, in charge of the weightlessness research, and Lieutenant Gardner demonstrate that two can float as easily as one. Everything else in the plane is tied down to prevent it from floating



A Popular Mechanics Editor learns how to swim in space and reports

IT'S FUN TO BE WEIGHTLESS

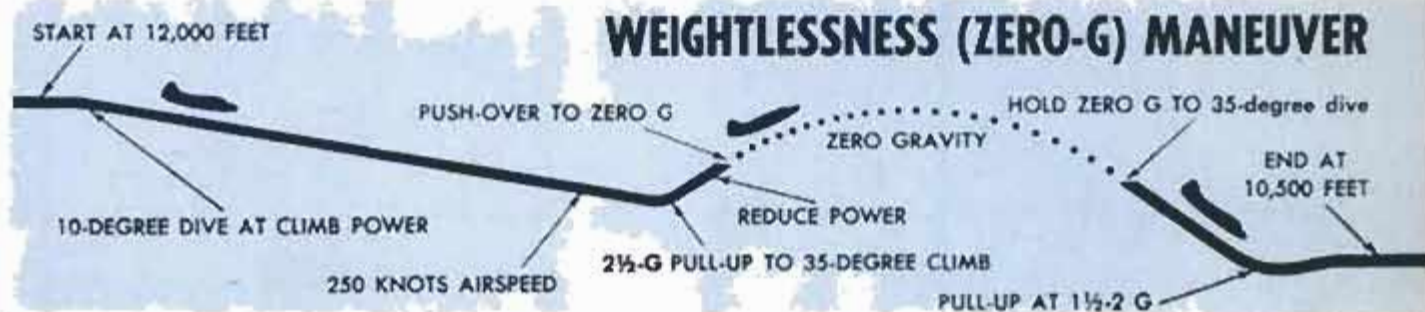
By Clifford B. Hicks

WHEN THE FIRST American goes into orbit—and he's already being selected—he will be encased in a tiny model of the world he left behind. Inside the capsule that whirls him around the earth will be oxygen, moisture, food, heat, air conditioning—all the necessities of life. He'll carry

with him every vital factor of his earth-bound environment.

Every factor but one. He won't carry along the weight of his own body.

In effect, this first spaceman will be falling continuously around the earth. His body won't weigh an ounce. He literally





Test subject, standing on disk, literally floats on cushion of compressed air as he tries to flip switch

will float inside his little space capsule.

Weightlessness is the only factor of his earthbound existence that can't be duplicated—for extended periods—prior to his invasion of space. What will be his reactions? What will weightlessness do to his mind? His muscle tone? His coordination? His emotions?

A search for answers to these questions took me to the Aero Medical Laboratory of the Wright Air Development Center at Dayton, Ohio—one of the few places on earth where scientists are studying the phenomenon of weightlessness. And, sure enough, the Air Force made me weightless!

It's a strange and exhilarating feeling to

"Couch" now under construction will float on air, also will be pivoted in three dimensions on fine bearings to simulate weightlessness in laboratory



drift through space; to kick the wall of a compartment and go sailing 25 feet through the air; to release a pencil and watch it float back and forth in front of your eyes; to clamp your weightless feet to the ceiling with magnetic shoes and suddenly find yourself in a topsy-turvy world where everything but you is upside down.

How can the Air Force create this world of "ungravity"?

The technique involves flying an airplane through a carefully computed trajectory. It had its beginning back in World War II, when the German Air Force developed a drastic maneuver to penetrate formations of Allied bombers. Each German fighter pilot would dive from high altitude until he was below the bombers, then do an abrupt pull-up to attack from below. The attack phase completed, he'd go into another dive. But many a pilot noticed a strange and confusing phenomenon: At the instant of attack, when he needed his finest coordination, his body suddenly became weightless for three or four seconds.

Research on the problem showed the Germans what was happening. The violent maneuver threw the pilot into a trajectory, and the airplane simply stayed around him as he plummeted through space.

Later, when the U. S. Air Force started contemplating outer space as a potential field of operations, it bumped up against the problem of weightlessness (in technical jargon, a zero-G condition). Obviously it is impossible to duplicate weightlessness precisely in an earthbound laboratory. You just can't wipe away gravity. So the Air Force turned to the peculiar experience of the German pilots. Today the Air Research and Development Command is using the technique to study weightlessness at the Aero Medical Laboratory, and at Holloman and Randolph Air Force Bases.

At the Wright Air Development Center, the work was started a little more than a year ago by Maj. Edward Brown. Ed is a big, soft-spoken but articulate psychologist with a scientist's approach to his work. It is his goal to emancipate man from the yoke of his weight for long enough periods to make valid measurements of mental and emotional responses. He is so intent upon his work that you wouldn't be surprised to see him float right up to the ceiling while he's talking. His right-hand man is Lt. Melvin Gardner, a young daredevil who has completed 400-odd runs for a total of more than 90 minutes of weightlessness. Or, as Ed explains, Mel Gardner has just completed his first weightless orbit of the earth.

Computer Determines Flight Path

The section's flying laboratory is a Convair C-131B, a conventional two-engine

transport. Prior to the first zero-G flight, Ed fed a batch of information into a computer, which then determined the precise flight path for the maximum period of weightlessness. The maneuver starts at about 12,000 feet. The plane then goes into a 10-degree dive at full climb power. When it reaches an air speed of 250 knots, the pilot, acting on the computer's advice, does a sharp pull-up to a 35-degree climb, and reduces power. The plane then goes "over the hump" and everything in it becomes weightless.

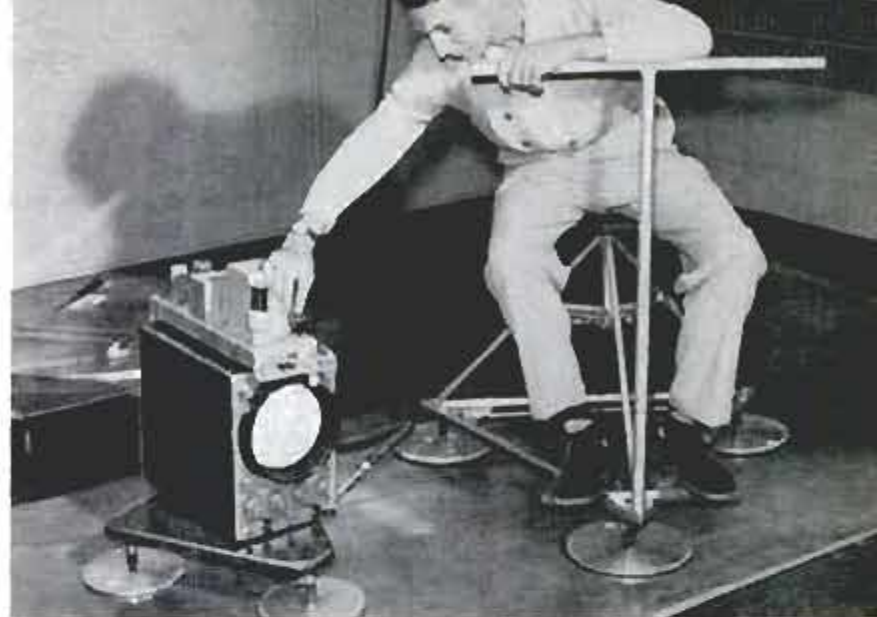
"In effect," explains Ed, "the plane throws everything into a trajectory, just as you would throw a stone. The pilot then follows a precise flight path to keep the airplane around everything that's floating inside. In such a situation, the plane and everything in it are weightless, just as a thrown stone is weightless until it strikes the ground. On the other side of the 'hump,' the plane picks up its 'insides' again. The pilot could follow the trajectory clear on down to the ground, maintaining the weightless stage for a period of minutes—but he wouldn't live to tell about it!"

Jets Extend Weightlessness

Actually, the period of weightlessness lasts about 15 seconds. This may not seem very long, but count slowly to 15 while you imagine you are floating in midair, and you'll find that it's quite a while. Pilots at Holloman and Randolph, using jet planes, can safely extend the period to almost a minute. However, there is little room for test equipment or human maneuvering inside the crowded little jets.

No jet pilot could fly with greater precision than Capt. Joe Edwards, who handles the big plane at Dayton. Joe helped Ed Brown develop the maneuver. During the period of weightlessness you are at Joe's mercy, for if he should fail to fly the 50,000 pounds of aircraft on a hairline course, he could dash the plane against you with such force that you could end up with a wad of bruises. So far, thanks to Joe, no one has been hurt.

Author, guided by Brown and Gardner, begins his first float in padded compartment



In this experiment, the subject rides a frictionless "tricycle." Framework is mounted on three disks with tiny holes in them, and electronic gear is mounted on similar disks. Compressed air is forced through holes to float the equipment. When subject tries to remove tube, he and electronic gear glide apart





During weightless flight, Brown takes test to determine how fast he can flip switches in response to signal lights. His reaction time is about the same as under normal gravity

On my day of weightlessness, Ed Brown first showed me around the flying laboratory. The entire aft section of the plane—a compartment 25 feet long, 8 feet wide and more than 6 feet high—has been padded so it can be used for free floating.

"When you become weightless," explained Ed, "two photographers will be strapped in these chairs at the end of the compartment. They'll take movies and stills of you. We use such photos to record instinctive reactions to weightlessness."

Laboratory Studies

In the center of the plane is a laboratory where the men of Ed's section can study the muscular control of humans and the behavior of liquids under zero-G conditions.

We took off and climbed steadily until Joe indicated we'd reached 12,000 feet. Perhaps I was naive. I thought that, before they sent me cruising around the padded cell, they'd put the plane through the maneuver a couple of times while I was strapped in a chair. But no, there was Ed motioning me back to the rear wall. He helped me strap on a crash helmet.

"Lie face down on the floor with your feet against the back wall," he directed. "Mel and I will help you through your first float."

Lying on that padded floor between Ed and Mel, I had some misgivings. There'd be the awful sensation of a continuous fall, and I've never been very good on a roller coaster.

"We're in the dive now," Ed said into my ear. The only sensation I had was a different beat to the engines.

A few seconds later I felt myself squashed down into the padded floor, and knew that we were in the pull-up. At one point during this short period I weighed 412 pounds—2½ times my normal weight.

Then came the biggest surprise of the day. I felt the crushing weight gradually leave me, until I felt completely unsupported. Suddenly I floated up until I was three feet off the floor. And surprisingly, I had absolutely no sensation of falling. Floating is the only way to describe it.

Ed and Mel were floating beside me. "Put your feet against the back wall and give a gentle kick," said Ed into my ear.

My feet pushed against the back wall. Immediately I went floating down the length of the compartment. I would have drifted right on up to the cockpit if one of the photographers hadn't reached out and pushed me back.

Floating in the middle of the compartment for long seconds, I waved and kicked wildly, trying to touch something with my fingertips or toes. Whenever I succeeded, I went drifting off in the opposite direction.

Weight Returns Twofold

Then the floor gradually moved up toward me. I touched it as lightly as a feather, sank into the pad. My weight not only returned, but returned twofold as the plane went through the two-G recovery.

Ed was grinning. "How did you like it?" "Amazing! I had no feeling of falling whatever."

Ed, always the psychologist, asked, "If you had to describe your feeling in one word, what would it be?"

After a moment of thought I found the word: "Exhilaration."

"You're normal," he said. "That's one of the two words most frequently used. Exhilaration and helplessness."

Joe Edwards signaled that he was ready to put the plane through the maneuver again. This time I lay down on my back and, during the zero-G period, tried shoving off and turning over in midair. I could do it only by touching the ceiling.

We went through two more maneuvers while I drifted in space, watching cigarettes and pencils float in front of my eyes. Once I saw a photographer take his hands off a heavy camera. For several long seconds it floated in front of his face.

After the recovery from the fourth pass, I suddenly searched wildly for one of the paper bags that were stored at strategic points throughout the plane. Until that moment my stomach had behaved perfectly. Now, with unexpected suddenness, I became sick. Mighty sick. . . .

Joe flew the big plane in circles at 12,000

(Continued to page 232)

Miniature dynamometer is used for testing strength of insects. Here a giant rhinoceros beetle is put through paces



Hercules? Paul Bunyan? They were sissies in comparison with the Lightweight Champion of the World . . .

THE MIGHTY INSECT

By Dr. Ross Hutchins

DIRECTOR, DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY,
MISSISSIPPI STATE COLLEGE

WILL KING-SIZE INSECTS someday destroy the civilized world? Recently, several motion pictures have shown monster insects such as ants attacking the human race with devastating results. Perhaps the time has come to examine the facts regarding the physical prowess of our six-legged friends and enemies, the insects.

Of all the creatures of the earth the insects are probably the most remarkable. They are extremely ancient in origin, having lived upon the earth for many millions of years in contrast to man's 100,000 or so. But theirs is a miniature world since, as far as we know, the largest insect that ever lived was a two-foot dragonfly that darted about lakes and streams during the carboniferous era when the ancient coal beds were being formed. Men have marveled at the strength of insects since the days when

Leaf-cutting ant of the tropics carries home large section of leaf; these ants travel long distances





Harvester ant carries away stone it lifted out of nest entrance; stone weighs 52 times as much as the ant

King Solomon watched harvester ants carrying huge seeds into their nests. Some of the feats of strength performed by insects are almost unbelievable when compared with what a man or other large animal could do.

It has been found, for example, that large beetles can support tremendous weights upon their backs. In one test it was found that such an insect could support about 850 times its own weight! At this rate an elephant should easily be able to support a modern destroyer. The truth is that an elephant could hardly carry its own weight.

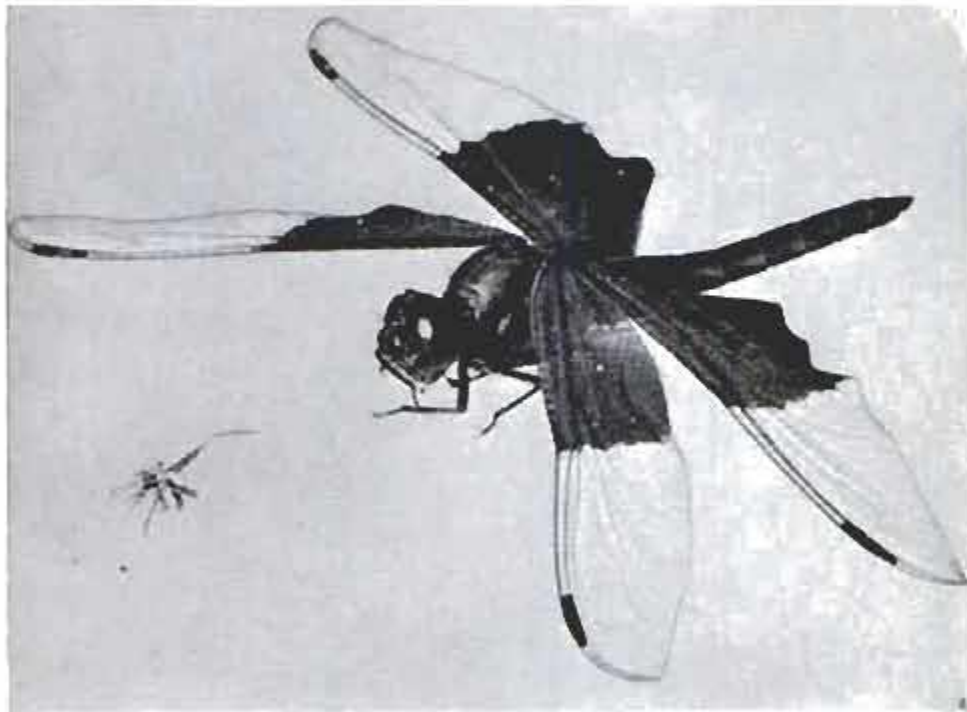
Why a beetle has such apparent muscular power we will attempt to explain later,

but first it may be interesting to consider some of the other amazing feats of strength performed by insects.

The writer was once photographing a colony of harvester ants. One ant was seen lifting a stone up and out of the nest entrance. The ant and the stone were photographed and then collected in a vial. Later they were weighed separately and it was found that the ant had easily lifted 52 times its own weight. Remember the ant actually pulled the heavy stone up and out of the hole. This is roughly equivalent to a man hauling a four-ton weight out of a hole. No man could do this, not even an Olympic weight lifter.



A slug (cousin of the snail) crawls unharmed over the edge of a razor blade. This is possible due to its small size and the slime path secreted by slugs



Big dragonfly about to catch his supper—he can zoom along at 60 m.p.h.

It has been noted that a drone bee is capable of lifting about 15 times its own weight and a worker bee about 24 times. By comparison, a horse can only lift about one half its own weight.

In the southeastern United States there are found many large Passalid beetles locally called Betsy-Bugs. These insects bear upon their backs a short spine or hook. It is a favorite trick, in some rural sections, for children to use the beetles to pull toy wagons with the spine forming a convenient hitching post for a string. Some tests of strength of these beetles were made by the entomology department at Mississippi State College. They were placed on a miniature dynamometer which registered the amount of pull they were able to exert. In these tests it was found that a 1.88-gram beetle could pull 14 grams or about $7\frac{1}{2}$ times its own weight. When wheels are placed under weights, they are easier to pull, and when a loaded toy truck weighing 175 grams was hitched to the 1.88-gram Betsy-Bug, the insect pulled it with ease. If a man could do as well as the insect he should be able to walk off with a loaded moving van.

Toy trucks have been harnessed to other insects with interesting results. For example an earwig has pulled 530 times its own weight, which appears equivalent to a man pulling about 40 tons on wheels!

Other small creatures, besides insects, appear to have strength out of all proportion to size. For example, a

Betsy-Bug beetle pulls toy truck and trailer 90 times its own weight. Snail at top of page totes an 11-gram weight with ease





Children are fascinated as a Betsy-Bug pulls a box that is attached by string to handy spine "hitching post"

snail weighing less than half an ounce can pull a pound weight over a smooth surface, and a snail weighing 1.48 grams was able to creep along a smooth pencil with an 11-gram weight suspended from its shell.

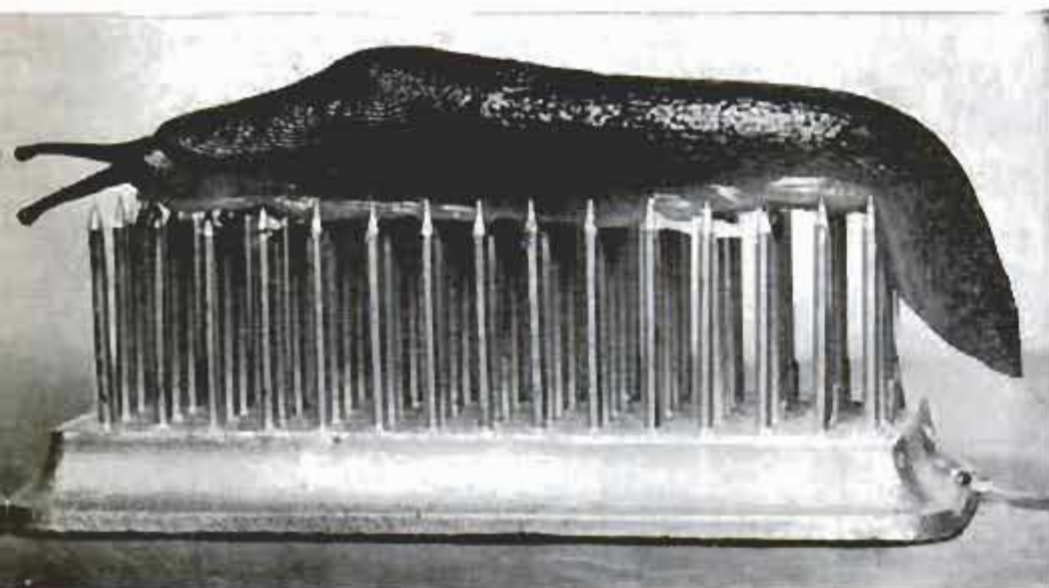
By comparison with insects, man also makes a poor showing in the jumping field. In 1936, Jesse C. Owens broad-jumped 26 feet $5\frac{7}{16}$ inches to establish an Olympic record; and Walter F. Davis, in 1952, high-jumped a record 6 feet 8.32 inches. If we assume that a grasshopper could jump in

proportion to size when enlarged to the proportions of a man, it would, in theory, be able to leap approximately 600 feet—the length of two football fields!

Fleas are well known for their jumping abilities. It has been found that a flea with jumping legs $\frac{1}{20}$ inch long can broad-jump about 13 inches, and high-jump nearly 8 inches. In theory, this flea should be able to broad-jump 700 feet, and high-jump 450 feet if it were enlarged to the size of a man.

Man makes a rather poor showing when

Below, a slug creeps over needlelike points of a flower holder without a single scratch. Right, helpful snail supports two friends. Illusion of strength is due to snail's size





Male stag beetles often toss each other about in battles over females. Right, the giant rhinoceros beetle has a heavy tanklike body and small wing area yet it flies—defying all known aerodynamic laws

his jumping feats are compared with some other animals of more or less his own size. For example:

	Broad Jump (feet)	High Jump (feet)
Man (record)	26'-8 $\frac{1}{4}$ "	7'- $\frac{1}{2}$ "
White-tailed deer	40'	8'
Kangaroo	32'	9'
Horse	27'	8'-6"
Jack rabbit	23'	7'

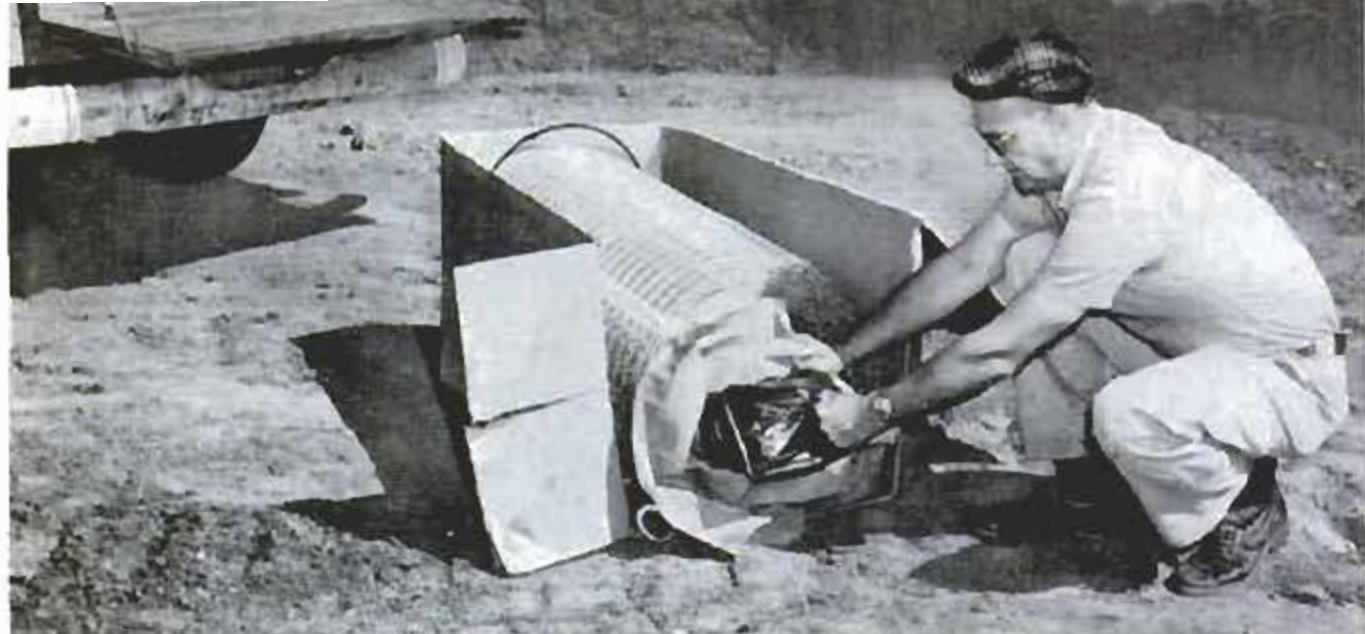
Remember that the human records above are for exceptional, trained athletes; the average man would fall far short of these.

The insects were without doubt the first creatures to fly. Just how long they have had this wonderful ability we do not know, but we are sure that the ancestors of the insects had wings and were using them to fly many millions of years ago—long before the first bird existed. It is likely that no other flying creature has such complete mastery of the air, unless it is the hummingbird. Many insects are able to poise motionless in the air with their wings beating at

(Continued to page 240)

If this grasshopper were as big as a man, it could theoretically hop over skyscraper 20 stories high





Build-It-Yourself Silo Made of Plastic

WHEN A FARMER today wants an extra silo, he can go to a store and buy one in a two by four-foot carton. It consists mainly of a giant sleeve of plastic and sections of rustproof fencing, which provide rigidity. When installed, it is 14 feet in diameter and holds up to 40 tons of silage. The packaged unit weighs about 140 pounds. The farmer himself, with a helper, can erect the silo by following a simple set of instructions. One section of the fencing is formed into a circle and connected with locking devices. Then the sleeve liner is placed inside the four-foot-high ring of fencing. It is filled with silage to the top of the first ring. Then the second ring of fencing is placed atop the first one and it, too, is filled. Filling is continued until the sleeve is nearly full. Then it is tied shut with baling twine. The plastic seals off the air and moisture, and preserves the silage better than some conventional silos. The wire fencing restricts billowing of the plastic in high winds. The plastic silo-liner sleeves have a life expectancy of three years or five fillings and are replaceable.

Photos, from top to bottom, illustrate 40-ton silo in carton; second ring of fencing added when first ring is filled; silo completed and plastic sleeve tied



Photo courtesy U. S. Army, Corps of Engineers

Amphibious Weed Mower Cuts Swamp Path for Engineers

When Army Engineers began a shipping channel survey off Harsen's Island, Mich., they found their transit view blocked by weeds 10 to 15 feet tall. Bulldozers couldn't

clear a path without bogging down in the marshy terrain. The Engineers finally solved the problem by attaching a hydraulic mower to an amphibious Weasel.

High-Speed Card Reader Aids Electronic Computers

Thirty-three punched cards, 80 columns wide, can be "read" every second by a new high-speed machine. The information taken from the cards is fed into electronic data-processing systems. It permits faster operation of devices that convert punched-card information to magnetic tapes.

System Weighs Rail Cars Without Uncoupling Them

Development of a device to weigh railroad cars while they are still coupled and in motion is expected to save railroads millions of dollars annually. The system involves rolling the cars over a series of track humps to assure proper alignment and weight distribution.





Novel Play Boat Assembled From Five-Gallon Cans

For simplicity, it would be difficult to match a new "boat" displayed in Italy. Four five-gallon cans provide buoyancy for the craft. They are connected to a center box by metal rods. The operator sits on a

"shelf" in the box, and maneuvers the craft with a small paddle. The odd little craft can be taken apart easily for storage. It was designed, according to the manufacturer, as a novel play boat or fishing craft.



Electronic "Ear" Finds Tree Beetles

Oregon entomologist Donald Allen keeps tab on timber beetles by listening for chewing noises inside trees. He attaches a microphone to the tree trunk, amplifies the sounds and tape-records them. By analyzing the sounds, Allen believes, entomologists can tell what is going on inside the tree and take effective control measures.



"Brush Off Machine" Keeps Visits Short

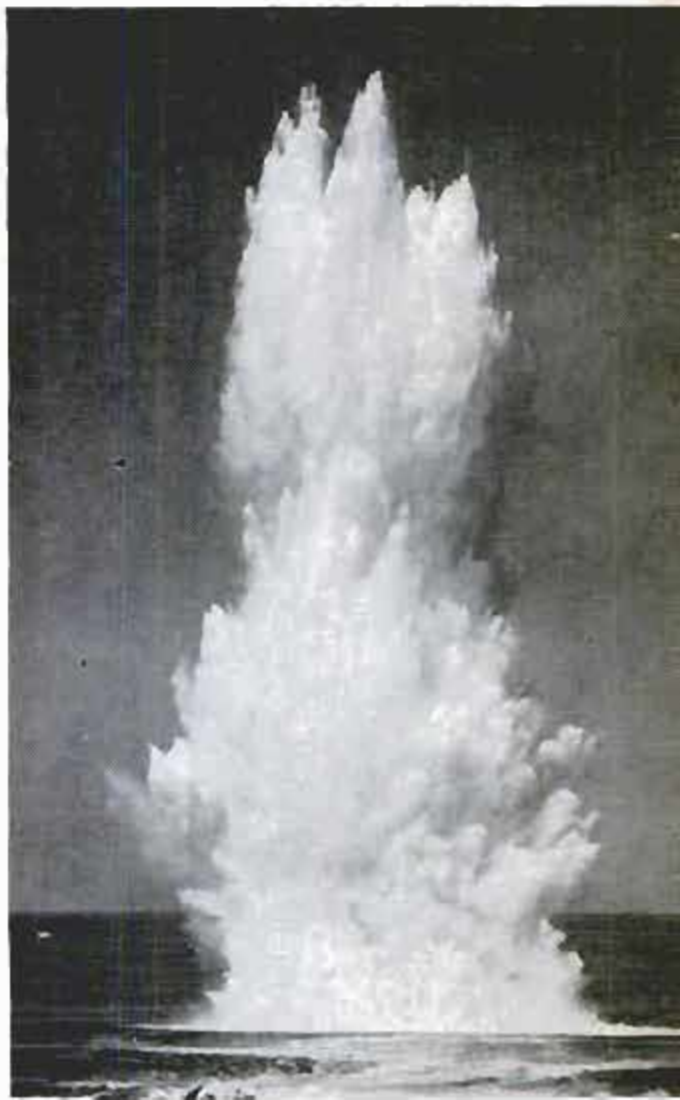
West Germany's Postmaster-General Richard Stuecklen wastes little time on long-winded visitors. On his desk in Bonn is a "brush off machine" which consists of four timers as are commonly used to time boiling eggs. They are labeled, from right to left, "introduction," "get to the point," "hurry up" and "finish." When the sand has run out in all four timers, the visitor is politely ushered out of the office.



Divers Use Copter in Demolition

JUST OFF Newport, Ore., underwater-demolition teams used a helicopter in blasting a trench through ocean-bottom rocks for a pipeline extension. The tiny copter lowered the divers to their inner-tube bases, then returned to the beach to bring the explosives, one case at a time. The combination of divers and copter was used because the surf was much too rough for workers to walk in and too shallow for small boats or a barge.

Underwater blast at right resulted from 900 pounds of explosives flown out by copter and lowered by rope to divers





Riding four inches above ground, 13 Go-Kart racers head for the starting line. Some don't wear helmets

Family Affair: **The GO-KART DERBY**

While his family and pit crew watch, dad makes one more adjustment before driving off to enter a race



SUNDAY MOTORISTS out for a quiet drive through the foothill orange groves east of Los Angeles are often startled by the cheers of a good-natured crowd. Stopping to investigate, they may see a dozen or more tiny vehicles crabbing their way around the last turn of a pint-size race track. At the wheel of each strange little machine is a crash-helmeted amateur Barney Oldfield, a determined devotee of the country's latest sports hobby—Go-Kart racing. Jaws clamped, eyes narrowed behind a transparent plastic visor, he skims over the asphalt with his padded seat a scant four inches above the track.

Many a winning Go-Kart driver has coaxed his mechanical steed to a noisy 50 miles per hour. If that seems slow, as auto

Go-Kart competition has caught on as a sport for the whole family. Here, junior drives the car his father used in a previous race

By Jay Mansfield

PHOTOS BY JOHN HUTCHINSON



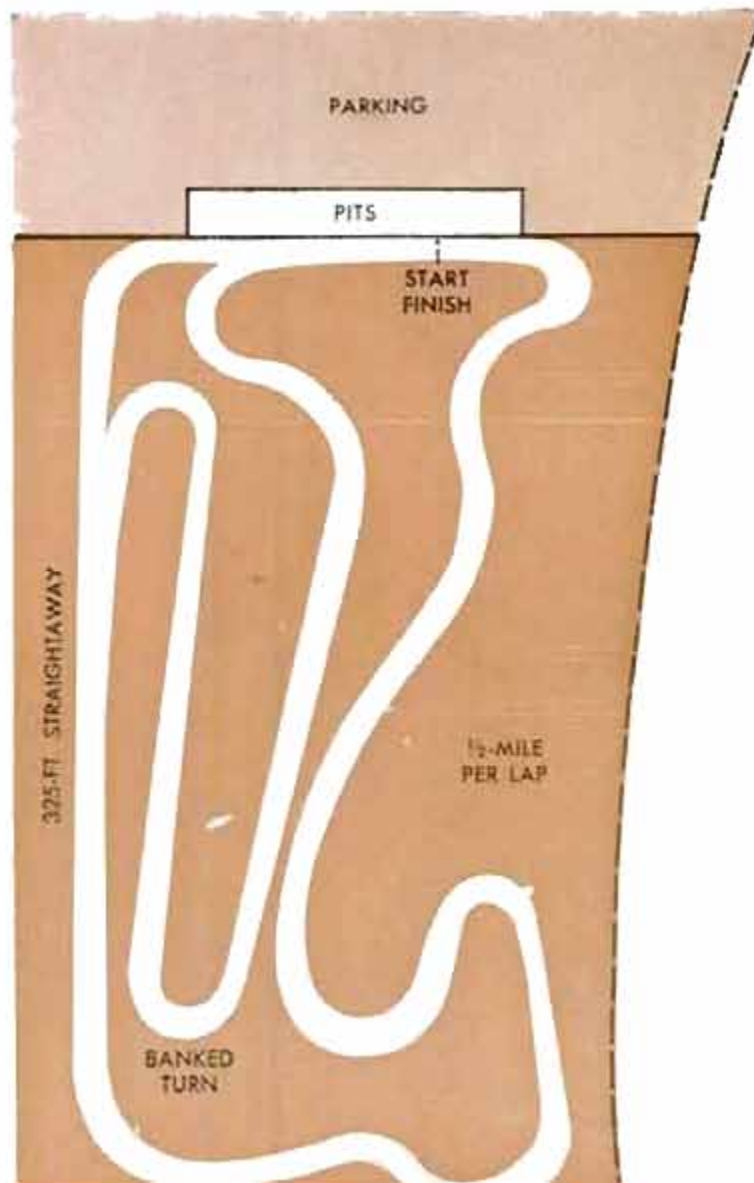
races go, try it yourself—at roller-skate level. But be prepared to shell out some cash for a Go-Kart of your own, because, as one enthusiast put it, "To drive 'em is to love 'em."

A passion for squealing tires and thundering engines is in countless Americans' blood. It surges to magnificent fury each Memorial Day, when high-octane juggernauts pound for 500 miles over the worn bricks at Indianapolis. But there are thrills and chills on the small end of the power scale, too, provided first by the midget racers, then the quarter-midgets. Now, with our national obsession for reducing things to their simplest terms, the inevitable has happened to the racing car.

It took place in California's San Gabriel Valley, home of giant young electronics firms, California Institute of Technology and its jet propulsion laboratory, and some of the world's finest racing automobiles. There, spare-time mechanics produced a speedy little open-air car that one wag has called "a cross between a power lawnmower with delusions of grandeur, and a plumber's mistake." The machine provides the excitement of a racing classic, yet with no real danger.

The result is fun for the whole family

Covering five acres of land near Los Angeles, the Go-Kart track has hairpin turns. Races are divided into three classes, based on engine displacement





Comfortably seated on a fat cushion, a tense-looking young driver has his helmet fastened. A Go-Kart costs about \$200

when a local chapter of the owners' association, Go-Karts of America, meets in friendly rivalry.

The Go-Kart developers' first field of battle was the broad asphalt parking lot of a huge new shopping center, provided free of charge by public-relations-minded merchants. But the new sport soon captured the fancy of enough families to swamp the makeshift facilities. Now they have a new sport-car-type track with hair-

pin banked turns laid out on five acres of their own.

First to arrive on a typical Sunday afternoon are the association officials, who post the day's program. It's not long before station wagons, pickup trucks and family sedans are disgorging the little racers, fuel cans, tool boxes and mechanics at the designated pit locations.

Spectators who don't possess pit passes stake out with folding chairs beyond marked safety limits. None has ever been endangered, but the association carries a \$300,000 insurance policy just in case.

When the Go-Karts roll out for the first race, mom may be at the wheel, with dad and the kids pushing to start the diminutive engine. There's a slow warm-up lap—then down goes the green flag. Skids and spin-outs there are a-plenty, but with their low centers of gravity and widely spaced 10-inch wheels, none of the bantam buggies has ever flipped over. Six-year-olds drive with the aplomb of vets.

All this began, no doubt, in the inventive minds of pre-hotrod-age boys, who for years have enlisted older brothers' help in mounting used lawn-mower engines on homemade wagons and cruising neighborhood streets, to the despair of traffic officers. But this dangerous pastime became a full-fledged and much safer sport when the grown-up took over. Now the young-

Want to lose weight? Sign up in the pit crew. You can drop pounds pushing a Go-Kart off to a start





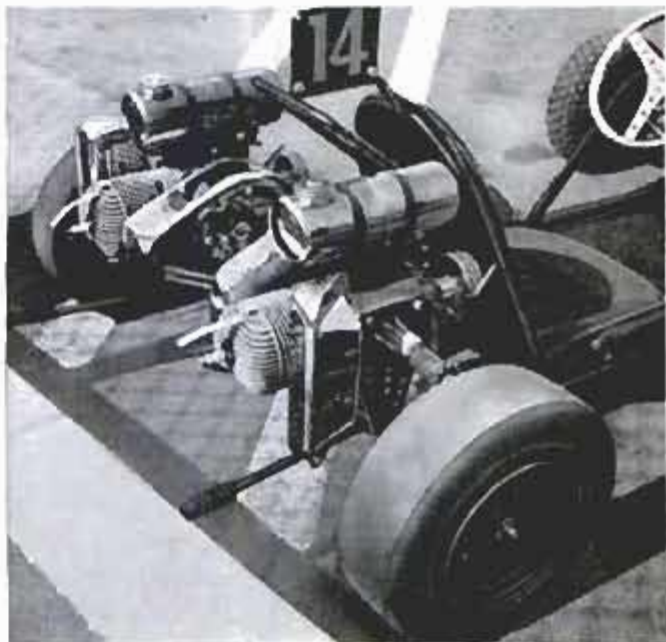
Younger sister and brother look doubtful, but the driver seems confident he'll triumph for the family

sters have a much better time than ever. Art Ingels, a 210-pound Monrovia, Calif., craftsman who builds big Indianapolis race cars for a living, decided that he and a group of friends could put together a racing machine that would fit the average man's

wallet, as well as the trunk of his car. What they came up with bears little resemblance to an automobile. It's bodiless. It's fenderless. Its 2½-horsepower, two-cycle engine works up to a screaming 7500 revolutions per minute. It feeds on eye-dropper

Go-Karts are compact little vehicles, but the owner of this one has found enough room for three engines

Large, smooth tires on the rear wheels give a Go-Kart a high degree of traction on the asphalt track





Before the races start, an expert driver does his stuff for spectators—such as making a sharp turn on just two wheels



Family huddles on mechanical problems are commonplace in the pits. Some owners mix wood alcohol and castor oil for fuel



amounts of lovingly blended fuel mixtures—some so exotic as wood alcohol laced with castor oil! But all of this has made the gallopin' Go-Kart a low-flying picnic for hobbyists from every walk of life.

Association Stresses Safety

The owners' association, a non-profit corporation, includes doctors and dentists, lawyers and engineers, tradesmen and teen-agers, at least one race-horse jockey, and—to show the attraction of the sport—several professional big-car race drivers. Strict association rules, drawn with safety and fair competition in view, limit the racers to one of three classes.

Class A includes Go-Karts with single engines displacing up to 5½ cubic inches; Class B, single engines from 5½ to 11 cubic inches; Class C, the same Go-Karts, but with twin engines (one for each rear wheel) displacing up to a total of 16½ cubic inches. One of the twin-engine racers has officially averaged 55 miles per hour over a quarter-mile course.

Build Racers From Scratch

Some of the association members build the racers from scratch, but most make a family project out of assembling their Go-Karts from a prefabricated kit that costs about \$130. Average labor for a handy man, with willing helpers, comes to about 40 hours. Total cost of the racer, plus necessary tools and equipment is less than \$200. At that price, it's not hard to become a fan. ★ ★ ★

Mom takes her turn at the wheel while dad watches the kids. Many drivers have coaxed their machines up to 50 m.p.h.

Polish Prefab Built on Stilts

For the equivalent of about \$1500 you could buy, in Poland, a prefabricated house on stilts. The space under the house serves as a carport and garden-tool shed. The house has two bedrooms, living room, kitchen and bath. Most of the front wall is glass.



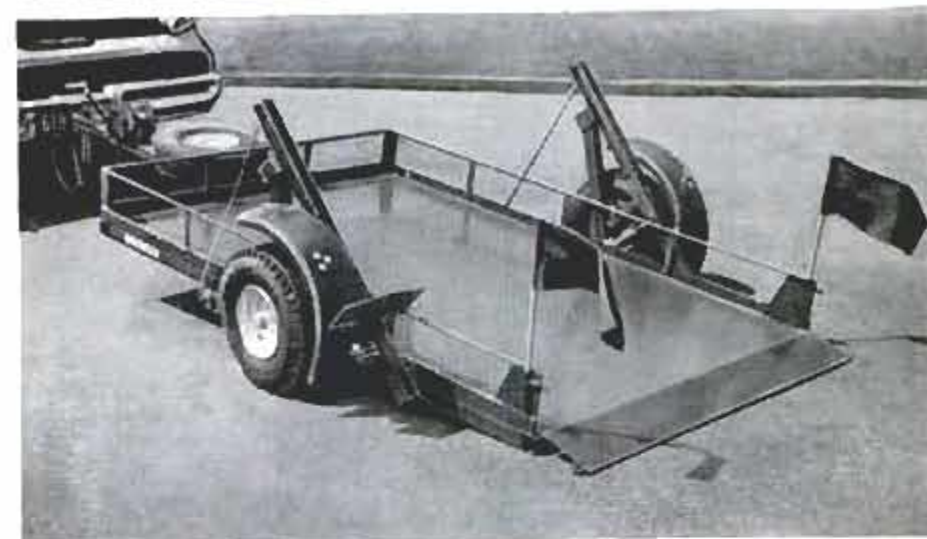
Electronic Tracer "Reads" Pencil Line

Westinghouse has developed an electronic tracer that automatically directs a battery of gas-cutting torches through intricate patterns. With a vibrating photosensitive cell, the device can follow a penciled drawing accurately at speeds up to 30 inches per minute. It has a safety circuit that stops the machine if the tracer leaves the pattern.



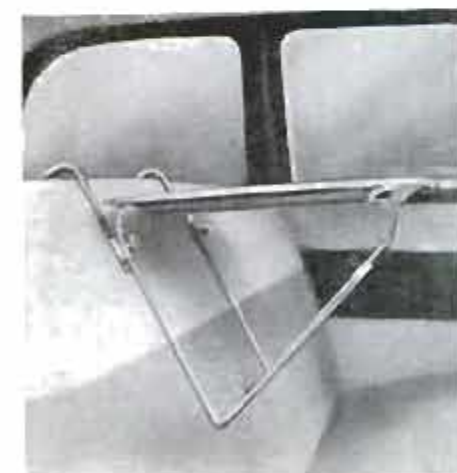
Roll-on Trailer Drops for Loading

One man can load or unload a trailer that carries a 1000-pound load at normal highway speeds. A winch-operated elevator lowers the rear of the trailer to ground level so that loads can be rolled or pushed onto the bed. The winch then raises the trailer bed to travel level. Bed sizes are 56 by 68 and 56 by 84 inches.

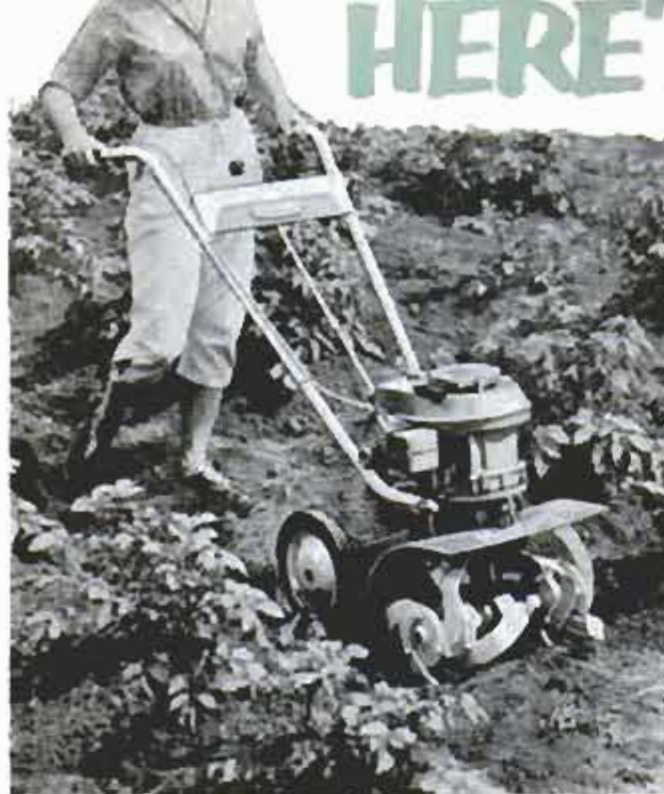


Tray for Car Serves Either Seat

There's room enough for a typewriter on a tray that attaches to the front seat of a car. It's adjustable to use shelf space for persons either in front or back. It also can hang flat against the back of the front seat when not in use.



HERE



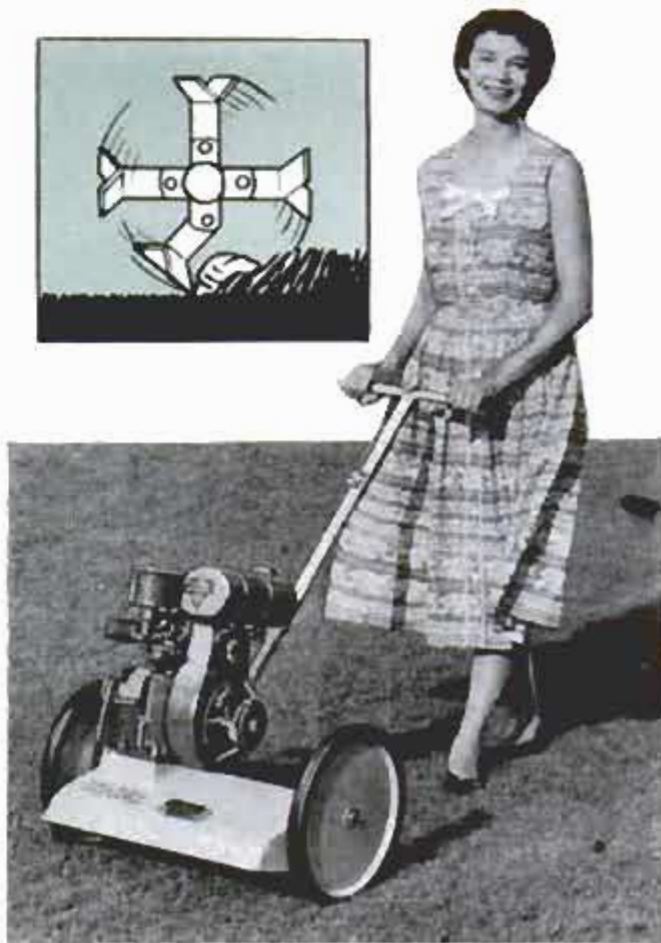
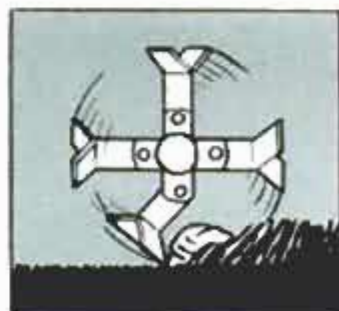
EXPANDABLE TILLER is designed to permit the addition of extension tines which tailor the tilling swath to varied row widths. Each extension tine adds four inches to the rotor width and is locked in place with a steel pin. Extensions total 24 inches
 Bolens Products Div., Food Machinery & Chemical Corp.,
 Port Washington, Wis.

SINGLE-WHEEL SPREADER distributes a two-inch band of fertilizer, insecticide or other granular material and mixes it with the soil, all in one operation. A metering mechanism is mounted on axle of drive wheel. Spreading action starts when wheel turns
 Peter Seymour Co., 4446 Gaywood Dr., Hopkins, Minn.



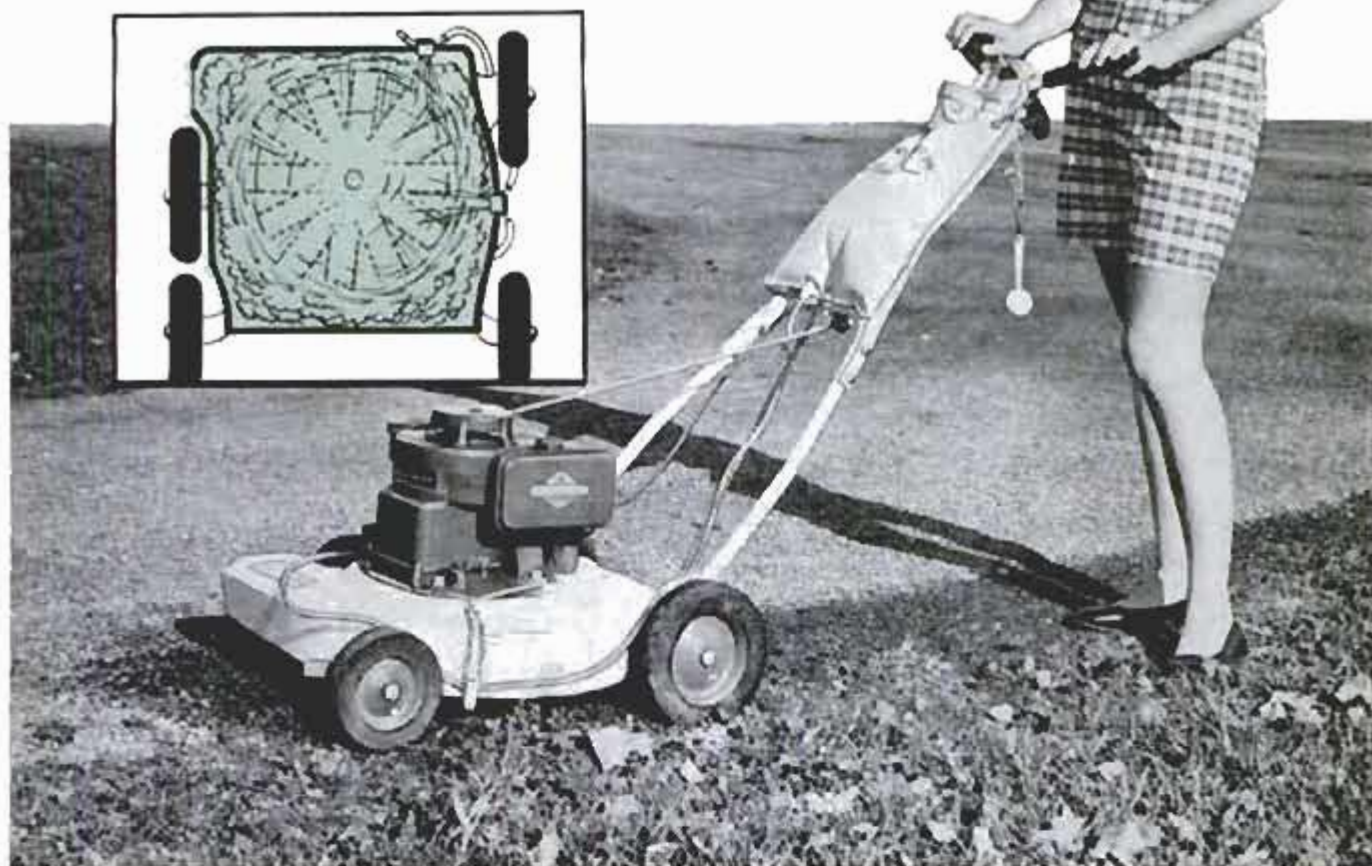
CHEMICAL FEEDER can be attached to any blade-type rotary power mower. The new distributor system allows feeding of chemicals to the lawn while you are mowing. Both weed-killing chemicals and liquid fertilizers can be used. Unit is easily attached
 Mo-An-Spray Co., Neodesha, Kans.

SWINGING-KNIFE MOWER has 48 separate blades mounted so they fold back when they strike stones or other obstructions. Free-swinging knives return to cutting position when clear of obstruction. Mower also is designed to deflect objects toward ground
 C. W. Mott, 4015 Eberly Ave., Brookfield, Ill.



THE GARDENER

SPRAYER ATTACHMENT for rotary mower directs fine streams of liquid weed killer into path of rotating cutter blades. Weed killer runs from plastic bag reservoir through vinyl tube to noncorrosive spray nozzles
Spray-Mow Co., Belleville, N. Y.

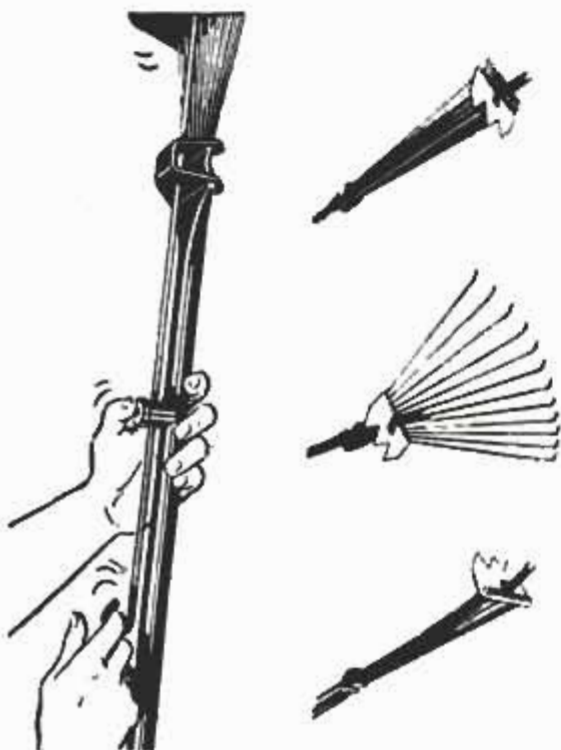


RAKE, HOE AND WEEDER are combined in a single lightweight garden tool. A rod in a push-button socket on the handle adjusts the tool from one use to another. Spring-steel rake prongs adjust from 6 inches up to a maximum of 13½ inches in width

Dandy Products Corp., 221 Oshkosh National Bank Bldg., Oshkosh, Wis.

REEL OR ROTARY? You can have either in a riding mower this season. Both types of mowing units can be set by an adjustment handle for eight different cutting heights. Safety features include a blade brake, for each type of cutter, that stops the blade instantly and can be locked when the mower is not in use. Four-wheel suspension resists tipping on hills

Porter-Cable Machine Company, Syracuse, N. Y.





Fastest Message Printer Writes 50 Words Per Second

Operating 45 times faster than an average typist, the Army's new message printer can write 3000 words per minute. A 3000-word message, as shown above, is about six feet long. Letters and numbers are printed by electrode "guns" instead of keys.



Man "Lost at Sea" 72 Hours In Tiny Escape Capsule

In a research pool, a U. S. airman spent three days in an escape capsule that has about as much space as a home refrigerator. He lay in a semireclined position, alongside survival food and equipment. The capsule may be used on supersonic aircraft.

Plastic-Foam Strip on Mop Dislodges Stubborn Spots

Abrasive plastic foam is connected to an absorbent cellulose sponge in a new type of mop available for household chores. The urethane foam strip dislodges dirt spots that resist ordinary mopping action. No mechanical adjustments are necessary.

One-Quart Garden Gun Sprays Both Liquids and Dusts

All standard types of garden chemicals, either dusts or liquids, can be sprayed by a new gun that converts quickly from one to another. It holds one quart of chemical and has a spray range up to 20 feet under pressure from a replaceable unit.



YOU'RE LOOKING AT THE GAS-TURBINE ERA



Turbine-electric locomotive will pull a 5000-ton train, delivering rated horsepower even at 6000-foot altitude

By Capt. W. D. Brinckloe, USN

IMAGINE A DAY when boats can go twice as fast as conventional boats today, powered by engines that weigh only a quarter as much as ordinary power plants, when helicopter engines are lighter than five-horsepower outboard motors, when tractors have twice as much power, locomotives are only half as long and cars burn kerosene or peanut oil. Want to be around when these miracles happen?

You are. They're happening today, thanks to that simplest of all heat engines, the gas turbine.

The idea is far from new. An Englishman patented a gas-turbine cycle in 1791—with jet propulsion, no less. A Heinkel gas turbojet plane flew in 1939. The first gas-turbine ship put to sea in 1947, and a Rover turbocar rolled down the highway in 1950. But it took the tough postwar alloys to open the gas-turbine era for real.

One of the gas-turbine's advantages is versatility. A piston engine delivers only rotating power, but a gas turbine can produce thrust, shaft power, compressed air and heat. A piston engine demands special

octane fuels, whereas a gas turbine will gulp down just about any solid, liquid or gas that burns. A turbine is amazingly light and compact, instant-starting, rugged and reliable. It needs no cooling water.

Disadvantages? Initial cost is one; fuel appetite another. Both are improving fast. Existing gas turbines, if mass-produced, could compete with piston engines in price. And, though gas turbines swallow a lot of fuel, operating costs are low because the fuels can be inexpensive ones.

A gas turbine has three basic parts: A *compressor* (driven by the power turbine) delivering compressed air to a *combustion chamber* where the injected fuels are burned; the resulting hot gases shoot into the *turbine*, where the rotor blades produce shaft power. The compressor can bleed off pneumatic power, and the exhaust can provide heat or thrust. Some turbines provide a double yield; for example, Solar's 100-pound Mars turbine provides the Boeing tanker with both electricity and cabin heating.

Many consider cars the real test. First was the 1950 Rover, with its 100-horsepower turbine without clutch or gearbox. It handled nicely in traffic. When the engine was beefed up to 200 horsepower, the trim roadster made 152 miles per hour. In 1952 both Austin and Fiat tested turbine power plants, and a 1953 French turbocar got six miles per gallon of kerosene at nearly 125 miles per hour.

Turbine in a Bus

In 1953 General Motors put a 370-horsepower turbine into a bus, nearly doubling

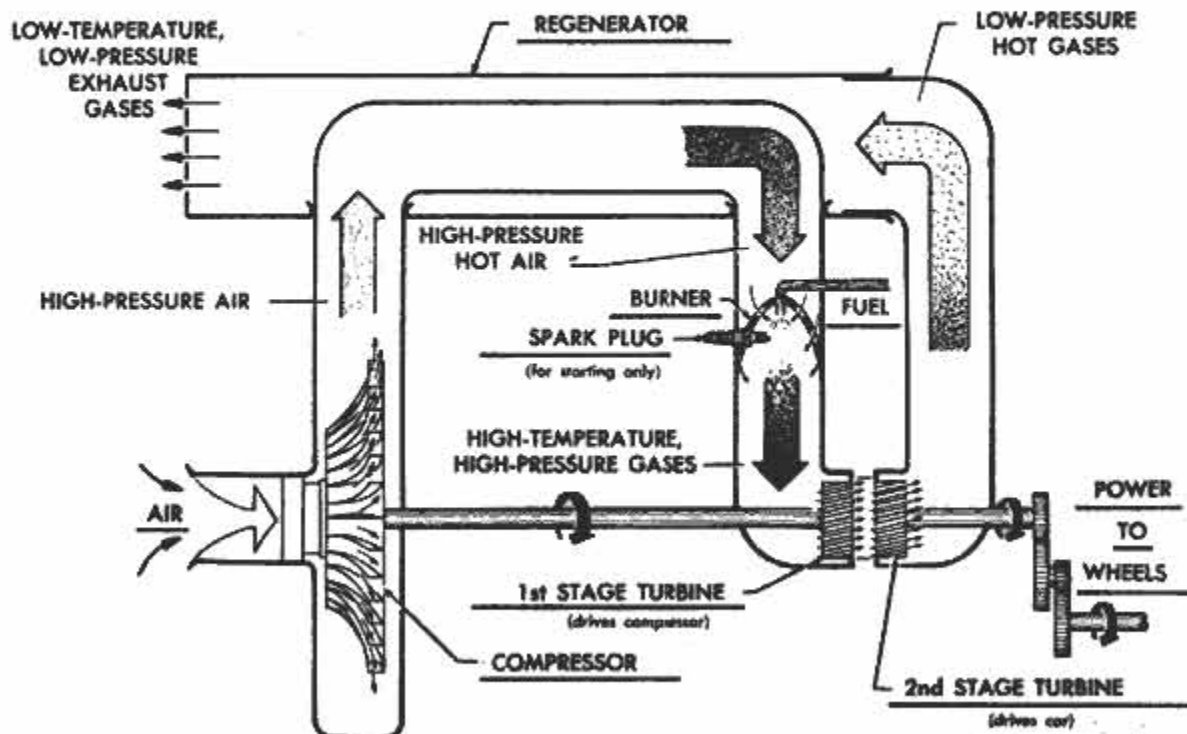
the power, shoehorned another into the Firebird test car and promptly ran it up to 230 miles per hour. GM unveiled a free-piston turbine auto in 1956. Ford, after assembling a gas-turbine truck for the opening of its new proving ground, has come up with nothing new in gas turbines since. Chrysler installed turbines in stock bodies. Its 1956 Turbine Special Plymouth crossed the continent at 13½ miles per gallon, running continuously except for two minor shutdowns.

What's holding the gas-turbine car back? Expense, scarce metals, low engine braking and slow pickup are all factors, though near solution. In addition, production and maintenance know-how must be taught, present machinery replaced and strange new parts substituted in dealers' bins. But these will come. GM's gas-turbine research spokesman, W. A. Turunen, says that the Turbo-titan truck engine may be "very close to production." If you just can't wait, go to Birmingham, England, and Rover might assemble you a plastic two-seater for \$9000.

Gas Turbines Go to Sea

The gas turbine is finding its sea-legs, too. In 1956 the Navy put a 400-horsepower engine in a 40-foot diesel boat, cutting engine weight by 50 percent and raising speed from 12 to 26 knots. Gas turbines show great promise for powering landing craft, with advantages of greater evasive ability, a first wave ashore in half the time, two troop loads ashore to one with a diesel and, as I learned on my first ride, stopping power that can spill passengers.

Diagram shows the gas turbine that powered Chrysler's Turbine Special Plymouth on its cross-country trip





Kaman helicopter has 825-horsepower gas-turbine engine. A turboprop version of engine has 960 horsepower

Ships benefit, too. A 10-knot Liberty ship was equipped with an open-cycle gas turbine late in 1956 and exceeded 18 knots. The Maritime Commission plans to develop a 20,000-horsepower closed-cycle turbine, and, with the Atomic Energy Commission, is pushing development of a gas-cooled nuclear reactor coupled with a closed-

cycle gas turbine. And awaiting installation in a new destroyer is a hybrid combining 45-percent conventional steam turbine for cruising with 55 percent lightweight gas turbine for full-power boost. About 95 percent of wartime operations were below half power, so this plant should be economical and in addition should have the

Soundproofed hood covers the compact gas turbine which powered the Plymouth in its virtually nonstop run





Gas-turbine ground unit starts a B-66 by spinning the jet engine with air taken from the unit's compressor

gas turbine's speed for battle emergencies or storms.

Gas-turbine helicopters are promising but expensive. General Electric has a Navy contract for a 2600-horsepower engine whose triple power-to-weight ratio and competitive fuel appetite promise convertiplanes and cargo helicopters of impressive range and payload. At the other extreme is Solar's tiny Titan, a one-man military helicopter engine that wraps 55 horsepower in a 50-pound package only 20 inches high. This mighty mite, to fly this year, could put wings on the foot soldier.

Recent research indicates that vertical-take-off planes will be equipped with turbine engines. And an Atomic Energy Commission spokesman states that recent reactor experiments indicate that gas turbines will propel nuclear planes.

Even bulky locomotives are switching to turbines. The trail-blazing Union Pacific is operating turbine locomotives that develop 53 horsepower per foot of length against 30 for the diesels. Thirty 8500-horsepower bruisers are on order. They promise quite a few advantages, including

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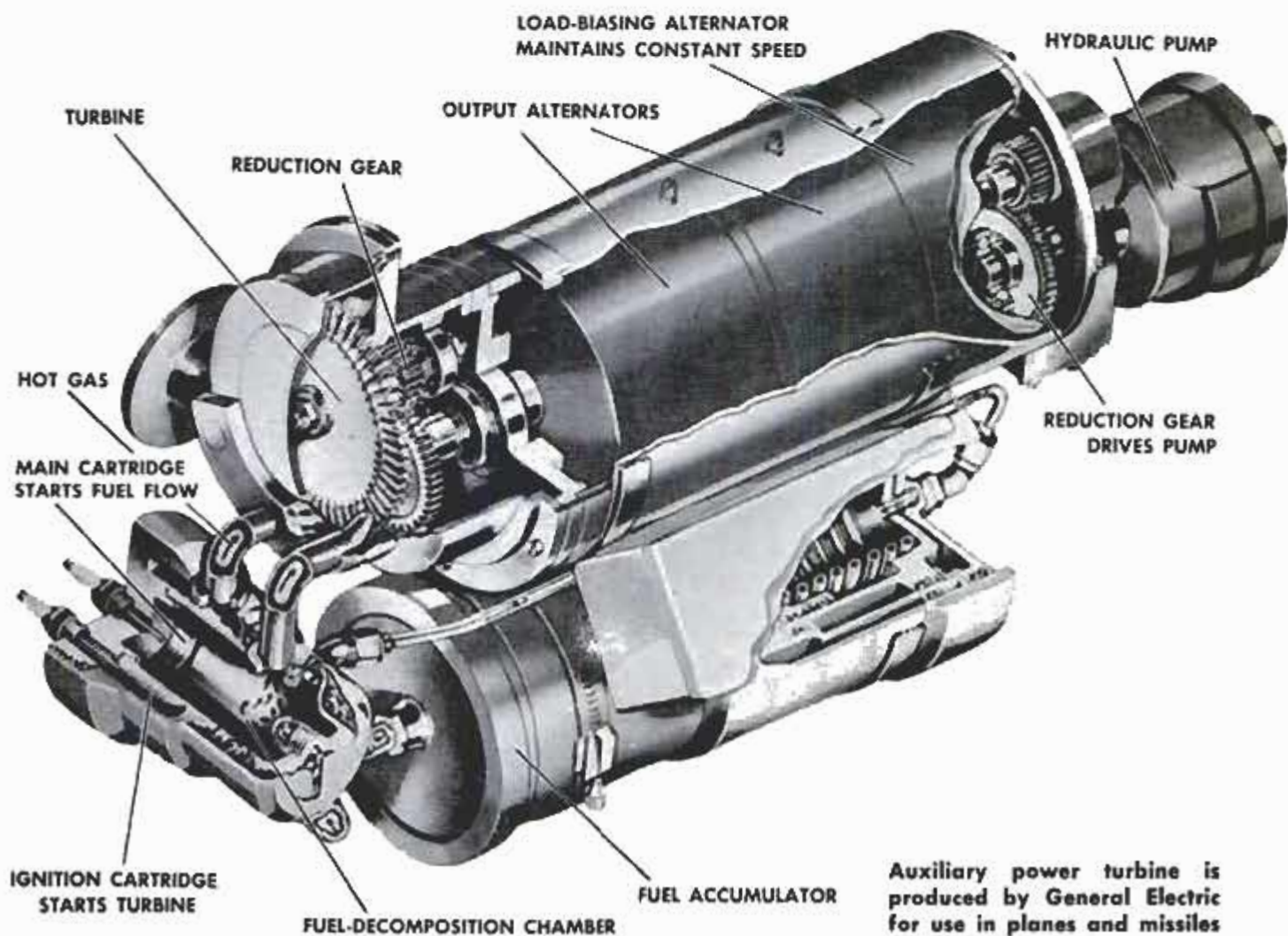
Exhaust heat from a turbine fire pump effectively removes ice from the anchor-handling gear of a Navy ship in polar seas

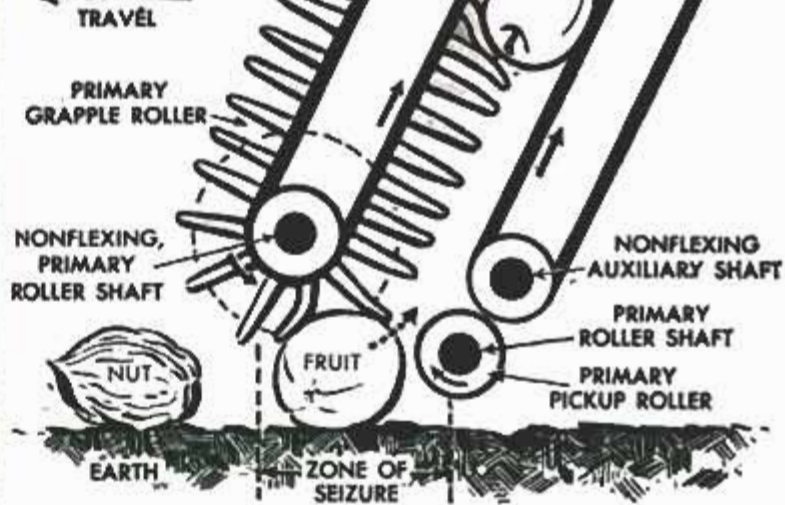
Tiny engine can be easily lifted by one man, yet develops more than 55 horsepower





Two compact 500-horsepower engines produce the large amounts of electricity required by a minesweeper





Fruit-and-Nut Harvester Picks a 30-Inch Swath

With a 30-inch swath, a fruit-and-nut picker developed by engineers at the University of California and U. S. Department of Agriculture can harvest more than 1000 prunes an hour. Operated by one man, the self-propelled machine replaces about four

hand-laborers. Fallen fruit and nuts are pulled up between resilient rollers and carried by rubber-tipped conveyor belt to a box at the rear of the machine. The entire front end pivots so that soil contours are followed closely.



Printer Makes Enlargements Of Microfilmed Records

Positive enlargements of microfilmed records can be made on a machine developed by the Charles Bruning Company. The machine enlarges the microfilm 14 to 16 times and produces black-on-white prints on standard sheets. The finished prints are delivered at the rate of four per minute.

Here's a Short-Line Railroad That Really Makes a Profit

Fishermen below Marble Falls Dam, Austin, Tex., used to have to climb up a steep incline with their gear and catches. No more. Now they pay a dollar to ride on a 500-foot railroad built by a local dentist. The car is pulled by a cable wound up by an electric motor.



Electric Ferries Serve Fruit Farms

At several spots along the Sacramento River in California, ferryboats instead of bridges are maintained by the state. The ferries are used mainly to link the fruit farms of the area with nearby towns. The toll-free ferries operate on 7½-horsepower electric motors. The current flows through the guide cable.



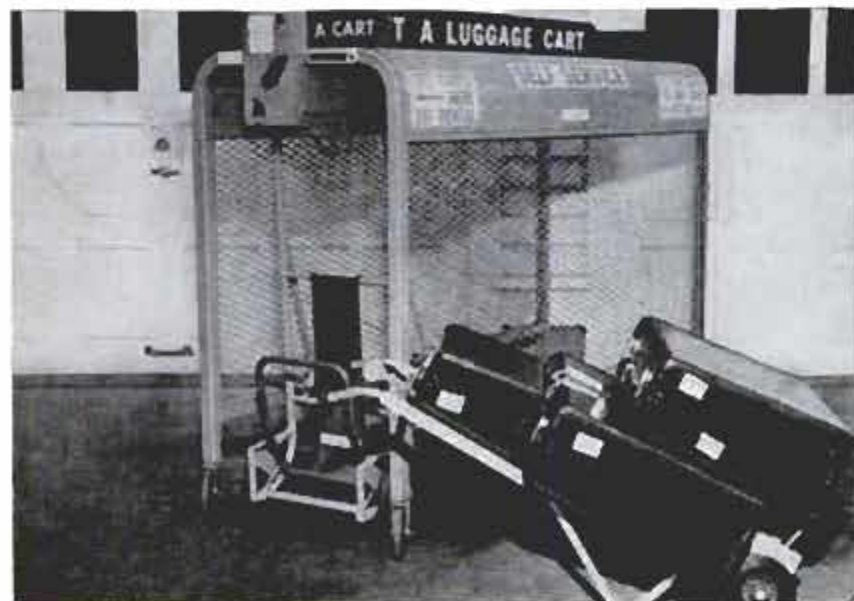
Crankcase Oil Fuels Weed Burner

Clean crankcase drainings, diesel fuel, crude oil and kerosene are used as fuel in a weed burner which can be mounted on nearly any trailer. The fuel is pumped from a 50-gallon barrel into a 14-foot boom, which is spring-tensioned and swings to any angle to burn a large area. One man operates the boom. A special L-shaped torch, four feet long, is used to ignite the burner. The burner consumes about 30 gallons of fuel per hour.



Self-Service Luggage Carts for Railroad Stations

Developed by Mrs. Leonore Breeler of Fredonia, N. Y., and tested in railroad stations is a lightweight self-service luggage cart. Handles of the carts can be locked to a stall by a coin-operated device. When the cart is returned, the device returns the deposit.





When it's time to harvest plumes, ostriches are placed in a wooden wedge and blindfolded with a hood

African Ranchers Raise

THE WORLD'S

Black and white plumes are taken from male ostrich. Plume is cut, not plucked, so another will grow

Ostrich hides are shipped to Holland where they're tanned and made into expensive handbags and shoes





The brown female ostrich takes the day shift in incubation, the male the night shift

LARGEST POULTRY

By
Lyn
Harrington

Photos by
Richard
Harrington

The lordly ostrich, for which a fancier paid as high as \$5000 in the days of the plumed hat, is back in business

OUDTSHOORN, a small town in South Africa, is the ostrich capital of the world—as it was in the boom days before automobiles outmoded ostrich-plumed hats.

"In the boom days," a guide at the Highgate Ostrich Farm recalled, "everybody had an ostrich or two in the back yard. Wealthy fanciers paid up to \$5000 for an especially fine bird. They lived like kings in those days, before World War I."

Almost as many ostriches are being raised today—42,000 of them—as before 1914. Waving plumes are the main product of ostrich ranching, though they are used more often in circuses than at the grand opera. Some are made into charming evening or boudoir capes, dyed in pastel tones. Some are used in novelties. The body feathers go into feather dusters, occasionally dyed red, blue or green. But nothing is



Male ostrich in mating season will attack anything. To ride ostrich, below, you need firm grip on wings



wasted in this business. The meat is cut into strips which are salted and sun-dried to become "biltong," a South-African form of dried meat. The bones go into fertilizer and the hides are shipped to Holland for tanning. The attractive, long-lasting leather is made into high-priced handbags and shoes. Even the blown eggs are made into souvenirs, which the tourists snap up.

In spite of their curling plumes, ostriches are naked-looking birds with long necks, legs and most of the body innocent of feathers. The males have all the voice. The females are speechless. During the breeding period, the male ostrich is a very fierce fellow. Farm workers won't enter his paddock without the protection of a thorn bush, the one thing he respects. Careless workmen can show terrible scars.

When a breeding female has about 15 eggs in her clutch, she settles down to six weeks incubation. She takes the day shift and her dismal feathers merge into the sand of the bushveld. Comes evening, the big black male takes over the night shift. He isn't noticeable in the dark, but his single big toe can maim a predatory animal.

After some of the eggs are hatched, the parents become bored with sitting around and ignore the rest of the clutch. Ostrich farmers today take the remaining eggs into the house to finish the incubation. But the old-timers had a different technique. They hired Kaffir girls in wide, thick flannel skirts to finish the hatching. ★ ★ ★

Mother ostrich, below, turns her eggs. She may have 15 eggs in clutch, hatches them in six weeks. One egg weighs more than three pounds and would make an omelet equivalent to two dozen chicken eggs



Instrument Measures Corrosion Inside of Pipelines

Special "probes" in an electronic device help measure internal corrosion in pipelines and other equipment. Measurement is made in terms of electrical resistance. The device can detect as little as a millionth of an inch of corrosion, providing a daily, or even hourly, record of the rate of corrosion. It enables equipment owners to determine the amount of inhibitors needed to combat the corrosion.



In Switzerland, DIAL ELEVEN

A TOURIST arriving in Geneva, Switzerland, without hotel reservations, can find a room—if any is available—by merely dialing 11 on the telephone. Operator 11 keeps an up-to-the-minute record of hotel space.

Number 11's public service is diverse, originally established to locate numbers and addresses, and to handle emergencies such as fires, accidents, medical cases. The operator knows what doctors are on duty, what pharmacies are open all night, the nearest taxi (or undertaker), first-aid stations, election results, hours of theaters, museums, parks, and can even give information on schools and conferences.

If you are in danger (or think there's a burglar in the kitchen), you are invited to call Number 11. When a tourist's car breaks down on the highway he has only to call her, give his location, and wait. The mechanic she has called from the nearest garage soon shows up. Throughout Switzerland, in city or hamlet, people think of Number 11 when they want any information. Want to know the population of a town? What films are showing? When does a concert start? Stuck on how to spell a word? Call Number 11. In Geneva alone, she answers 4500 such calls every day, plus waking up 950 people every morning in a "reveille" service.

In any of three official languages (German, French, Italian) and sometimes English, she will tell you what streetcar to take to your local destination, give you train, plane and boat schedules.

Messages may be left with Operator 11 for other people who call in for them, or she will answer your phone and take messages. She will even remind you of your wife's birthday if you want her to.

Skiers and travelers particularly con-

cerned with Alpine weather conditions get the latest bulletins on snowfall, avalanches and road passability from her.

Even the youngsters call Number 11—to leave their orders for Santa Claus.

A record of the more complex (or sillier) questions received includes: "Who was the inventor of postage stamps?" (Answer: Sir Rowland Hill, 1837), "The age of Pope John", "The longest word in French" ("anticonstitutionnellement"), "What does a tadpole eat?"

In an attempt to limit calls, people who pose such questions as: "How do I throw flowers at a public ceremony?" or "Can a young man get cerebral cancer?" or "If I leave my wife must I pay her expenses?" are referred to florists, doctors, lawyers. When it comes to such questions as: "What is the diameter of the smallest hoop through which a lion can jump?" some people obviously have nothing else to do.

"It's getting out of hand," says Manager M. Gonet, "but we try to answer if we can."

By dialing another number, the latest international news—updated every 3 hours—can be heard in three different languages continuously from 6 a.m. until 9:30 p.m. The latest sports results are available by dialing 164. Musicians have recourse to the standard "La—as in "do-re-mi-fa-sol-la-ti-do." And, as if all this weren't enough, if you cannot understand the system and want more information on it, a call to 19 will bring a counsellor to your door.

Being a very small and highly organized country, it is not surprising to find that one can dial any part of Switzerland from another, instead of going through a long-distance operator. Each *canton* (state or county) has a number which is prefixed in dialing the local number.—Irene F. Day.



Lightweight and easily trailable on the highway, the catamaran can be launched anywhere an outboard can

A Packard Weds a Flying Boat To Churn the Ohio River

By Kirk Polking

SOME SCRIBBLED drawings made in a Philippine prison camp turned up life-size on the Ohio River when Cincinnati John Brush launched his amphibious Packard.

The idea for the craft came from conversations with a fellow prisoner and former harbormaster for the United States Government at Manila. The goal: A boat-auto combination that would be lightweight and easily trailable on the highway, and could be launched and removed at any beach accommodating outboards.

The answer for John Brush was the purchase of two cracked-up flying boats for their hulls. After the cabins and several

feet of the tail section had been removed, the hulls were modified. Next, a frame of steel tubing was designed to connect the two floats, and troughs for the car wheels were fabricated from high-tensile aircraft-aluminum sheet. Landing-gear wheels were altered and remounted, one on each float, for trailing on the highway. All aluminum parts were riveted and all steel tubing welded. Another Cincinnati, Donald Witte, handled the critical parts of the welding and riveting fabrication that were needed for the desired light weight.

The 21-foot-long, 13-foot-wide catamaran is folded down and into itself by a hand crank so that its maximum width on the



After the Packard's reverse gear backs the craft off, the car can be driven up to 15 miles per hour

highway is 78 inches. A three-point tractor-type trailer-hitch, connected to the major members of the steel-tubing frame, joins the car and catamaran for trailing on the highway. Its height when folded is only six feet and the car can easily tow it at speeds up to the legal limit on all highways.

Launching takes about 30 minutes. Similar to any outboard launching, the car backs the catamaran into the water until it floats. The nature of the hull construction makes it tend naturally to open up to its floating position when the catamaran reaches its normal draft of about 18 inches. Next, a six-foot bridge-ramp and a four-foot beach-ramp are laid into position and a line fastened amidships on each side. Line handlers on the beach steady the craft from the beach. Wheel-stops position the

car exactly. The drive shaft of the car is then connected to a countershaft on the boat. The countershaft drives the propeller. The Packard's front wheels are now in position on wheel disks that are connected to the rudder by cable.

After the ramps have been pulled aboard and tied down, and steadying lines tossed to the pilot, the amphibian is ready to take off. Putting the car in reverse gear backs the craft off the beach, and from then on the car is driven in high gear at any speed desired up to 15 miles per hour (12 knots). The craft is steered from the driver's seat.

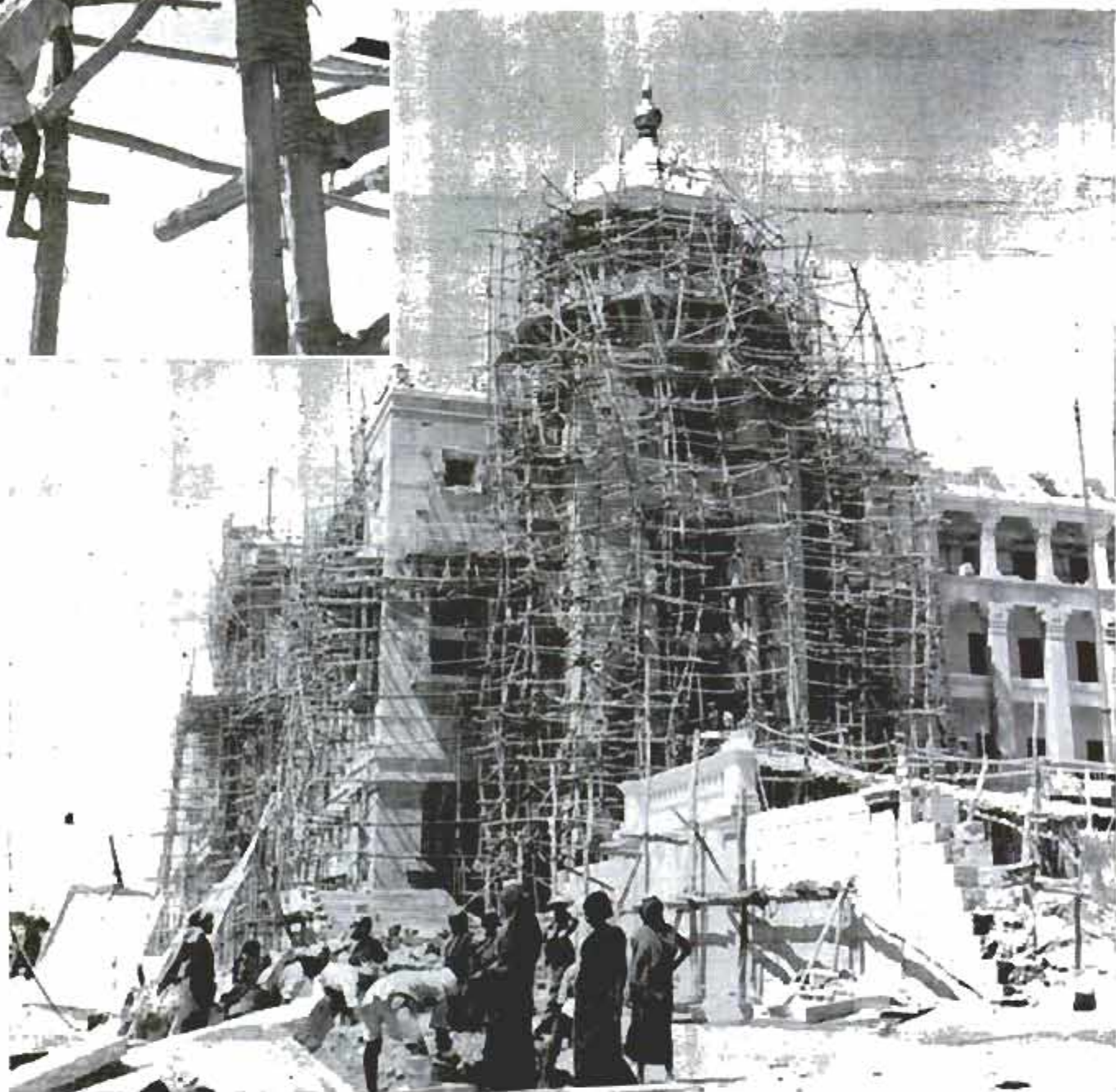
Since nothing has been left on the beach, the driver need not return to his starting point. He drives onto any beach that will support his car, cranks up his catamaran and takes off for the nearest highway. ★★★

Thirteen feet wide in water, the catamaran is hand-cranked to a width of 78 inches for highway travel



Modern India Builds With Old Methods

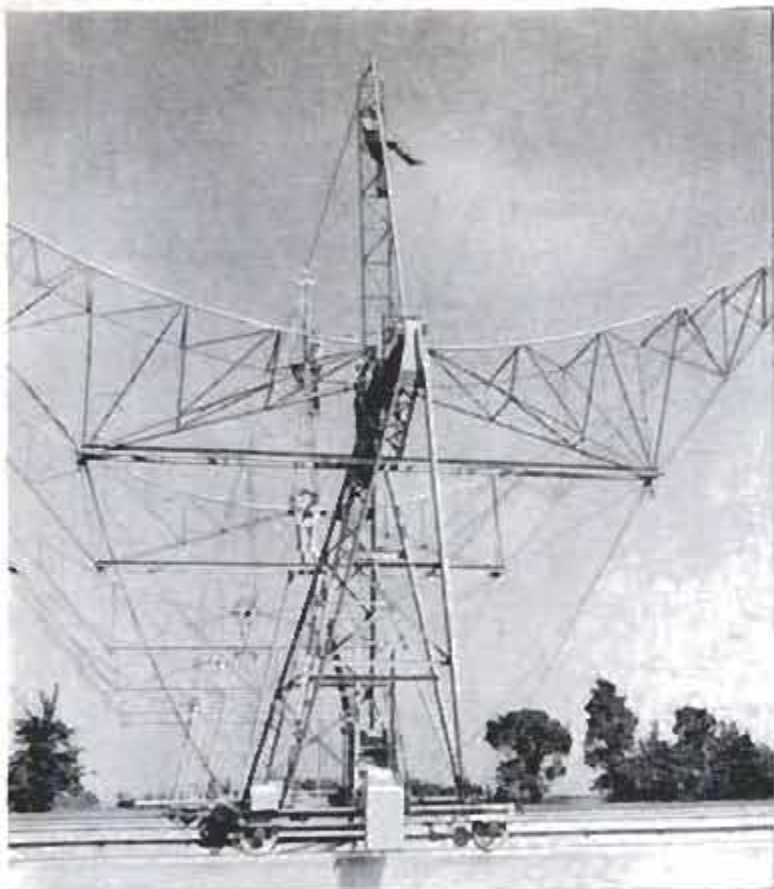
Bamboo poles lashed together with coconut fibers form the primitive, but effective, scaffolding still used to construct buildings in India. Hand labor is used to prepare cement and lift blocks of stone for a new Indian government building at Mysore.



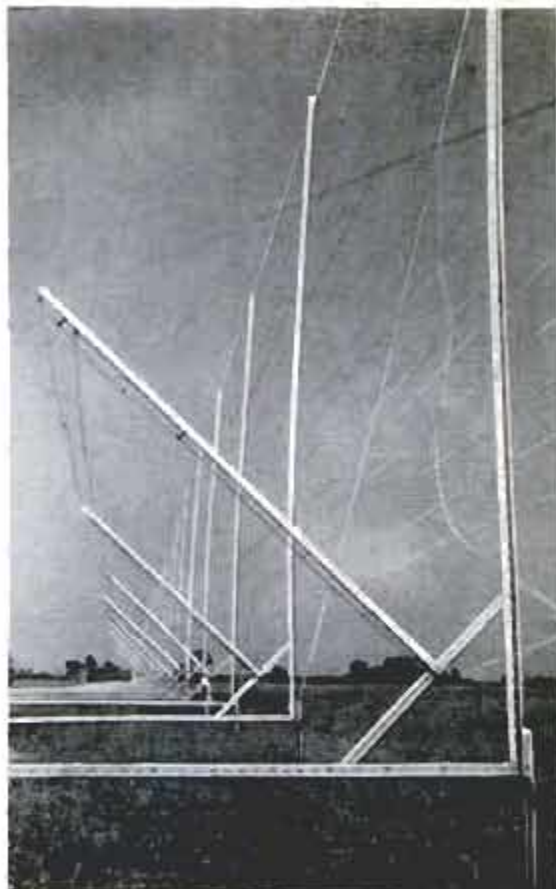
Magnetic-Coated Glass Rod Aids Missile Navigation

Computing speeds of electronic "brains" may be increased up to 20 times because of the recent development of a glass rod with magnetic coating that serves both as a switching and information-storage element. The new component, developed by the National Cash Register Company's Electronics Division, is about $\frac{1}{1000}$ inch in diameter. Five thousand of the rods could operate simultaneously on the power needed to light a 100-watt electric bulb. The small power requirements of the rod will make it valuable to missile-navigation systems.





Pictured under construction at Cambridge University in England is new interferometer that moves on 1000-foot track

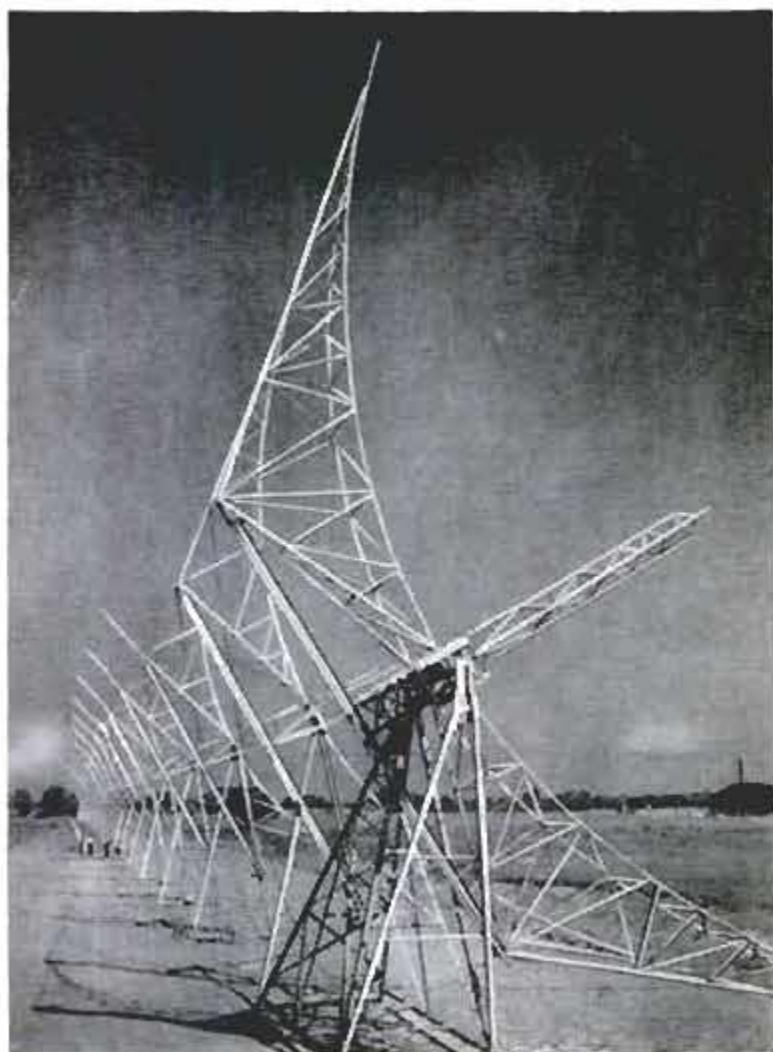


"Pencil beam" system's fixed aerial is in form of open triangles. It's 3200 feet long

Radio 'Scopes Trap Waves In Giant Collectors

ELEVEN YEARS ago, British astronomers developed an interferometer (radio-wave interference meter) that located a radio source 200,000,000 light-years away. Recently they put two new and improved models into operation. One works on a wavelength of 1.7 meters and has a collecting area of about 190,000 square feet, which makes it more sensitive than any previous radiotelescope. Especially suited for studying radio sources in other galaxies, it has a fixed east-west aerial 1450 feet long and 65 feet wide, and another east-west aerial 190 feet long and 65 feet wide that moves along a 1000-foot stretch of north-south railway. Directions of incoming radiowaves can be measured accurately to within less than one minute from a strong radio source. The other instrument, better adapted for studying the Milky Way, works on a band of 7.9 meters. It has a fixed east-west aerial that runs along a 1700-foot track. Called the "pencil beam" system, it has a collecting area of 200,000 square feet.

Radio telescope's fixed aerial, 1450 feet long and 65 feet wide, is shown below during building. End tower is complete





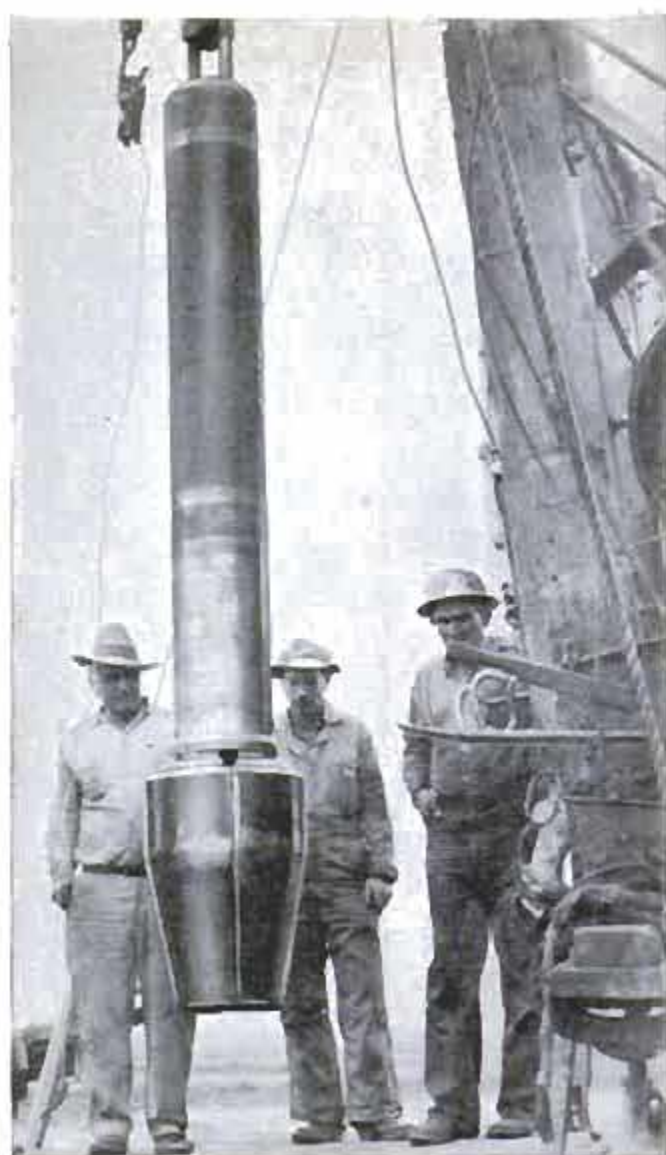
Taller Rice Ends Backaches

From a fungus that usually ruins rice plants, University of Michigan botanist Peter Kaufman obtains gibberellic acid, which makes the rice stems grow two feet taller. The taller stems will mean less back bending for Asian farmers who produce rice.



Guitar Contains Speaker

Amplifier, power supply and speaker are carried inside an electric guitar that weighs a total of 19 pounds. A microphone is attached. One transistor battery provides the power.



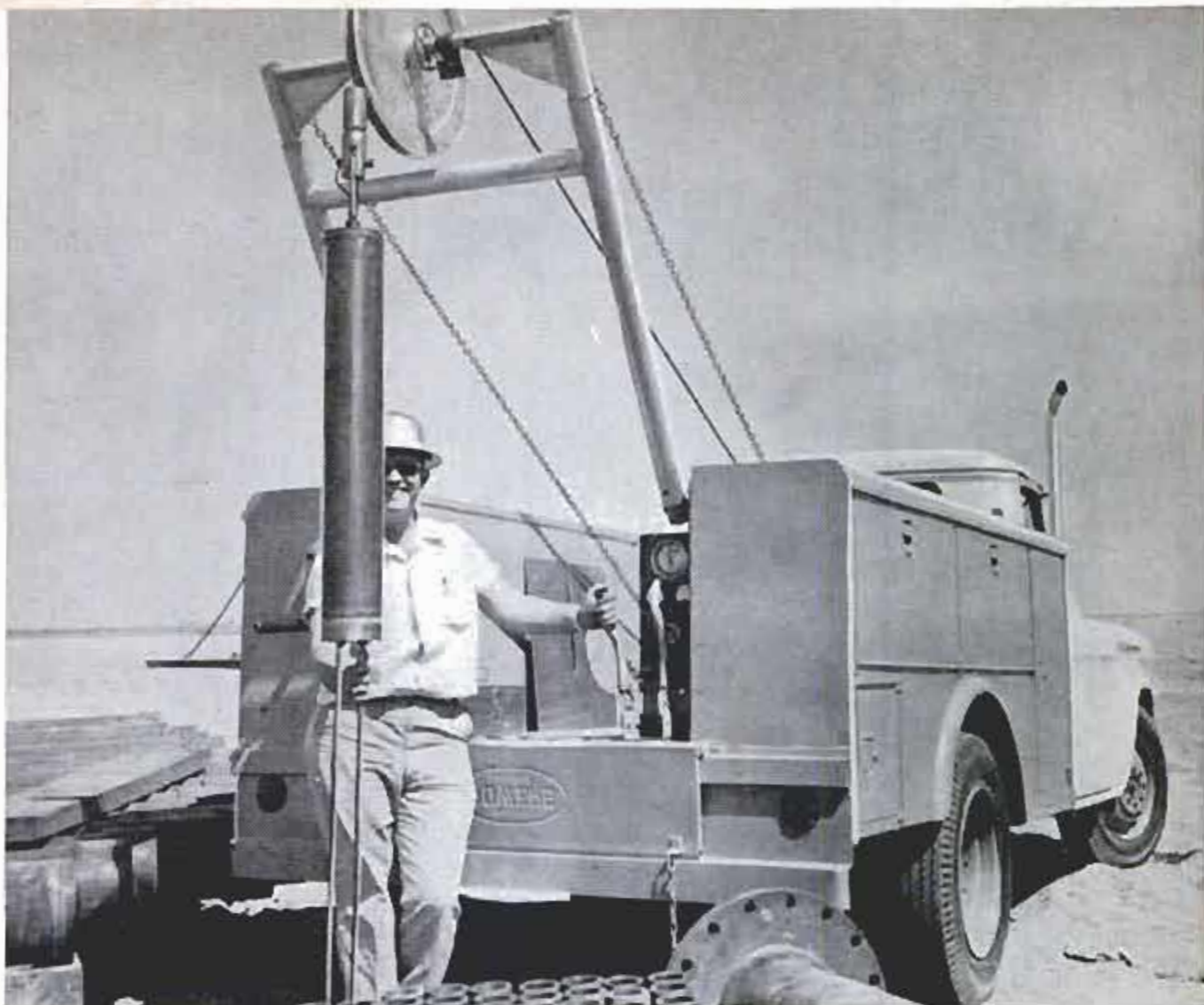
Big swage is used to straighten well casings

Underground

HOW DO YOU FIND a leak in a well a half-mile or more deep? A California firm has solved the problem with the invention of a three-dimensional camera that can be lowered into the hole. It snaps a series of pictures which can be developed and examined at the site, pinpointing the trouble with a degree of accuracy never before possible.

The device is especially valuable in locating the cause of diminishing water flow in the deep industrial, municipal or farm-irrigation wells which may cost up to \$50,000 and extend more than 3000 feet below the surface of the ground. Some of them develop casing breaks during the first month and others fail after only a few years of use.

When failure threatens, the bizarre camera rig is trundled to the site on a truck that carries its own electrical supply, picture-developing tanks, chemicals, a refrigeration system and massive swages that



Camera that takes 3-D pictures is readied for descent into deep well where it will pinpoint casing fault

"Eye" Peers Deep Into Wells

can exert hundreds of tons of pressure to re-form a collapsed or wrinkled casing far beneath the water surface.

The camera is lowered into the ailing well and, with strobe lights powered from the truck, views are taken directly ahead of the camera and at right angles to the axis of the well. Each shot is fired from the surface through an electrical circuit. A footage meter on an instrument panel indicates the exact depth at which each exposure is made. More than 400 pairs of exposures can be made before withdrawing the camera.

The film is scanned for possible defects in the casing which may have permitted the water to flow elsewhere. Exposures which show apparent faults are mounted for examination in a 3-D viewer. Prints are made for engineers and well-owners.

The photo log not only locates the defect but helps well-repairmen decide exactly what remedial action should be taken and which tools are needed for the job. ★ ★ ★

Here's what camera found—a bad compression break far below ground level. Well was saved by relining





For Easy Handling, Build a Hydraulic Houseboat

INSURANCE SALESMAN Russel Carne of Cedar Rapids, Iowa, controls his 28-foot, 7000-pound houseboat with more ease and precision than the average 10-foot outboard. The secret is hydraulics. Carne's ponderous inboard craft has no rudder, and his "clutch," "throttle" and "transmission" are managed by a lever no larger than a short pencil. The Jeep engine drives a hydraulic

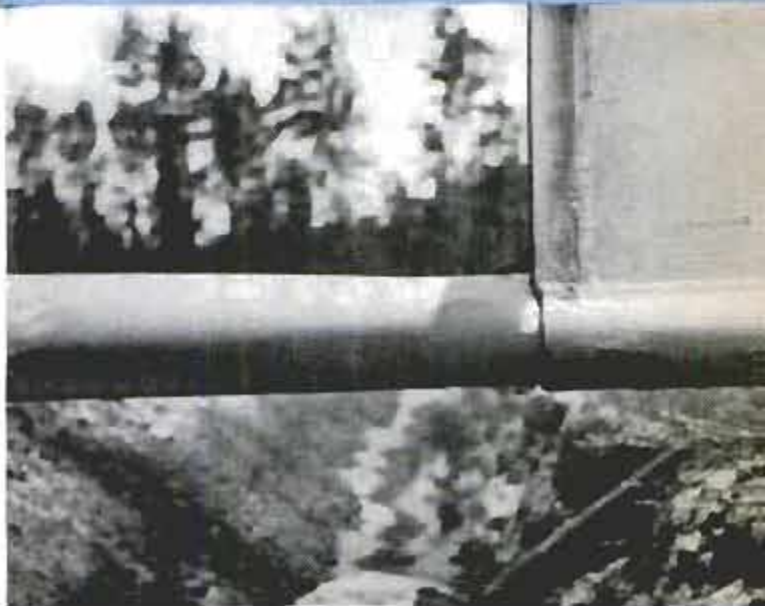
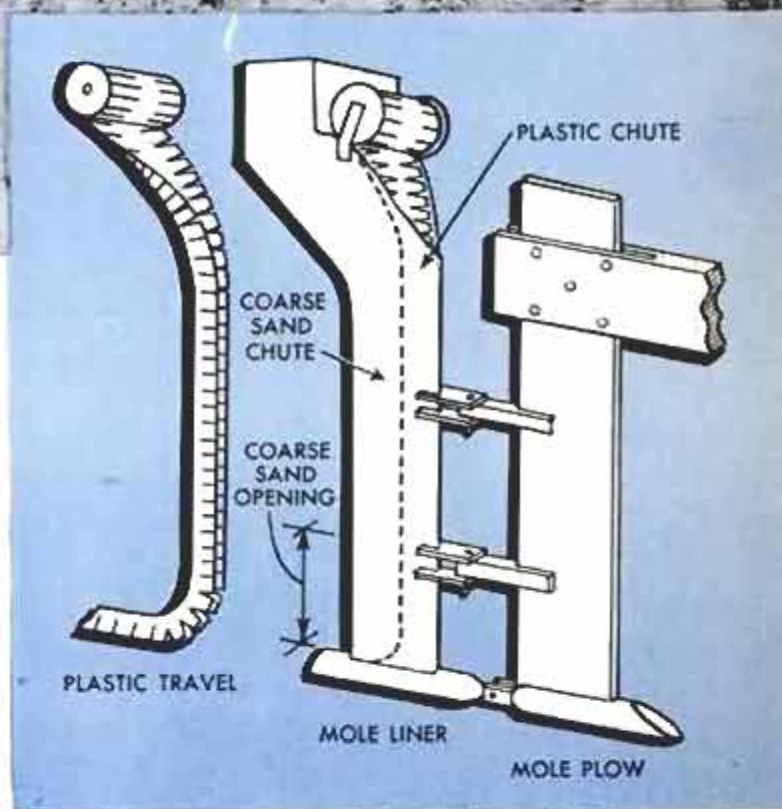
pump. Hydraulic fluid, at 1000 pounds per-square-inch pressure, is metered through a variable forward-neutral-reverse valve to a 12.2-horsepower hydraulic motor equipped with a 15-inch prop. The unit is swivel-mounted and immersed in water. The boat is steered the same as an outboard, by swinging the motor. Carne built his craft in 14 months of his spare time.





Mechanical Mole Forms Drain

ONE COSTLY and time-consuming job on a farm is that of installing a subsurface drainage system. For every foot of drain tile laid by conventional methods, 400 pounds of earth must be dug and replaced. Technicians at the Caterpillar Tractor Company are experimenting with a machine that may solve this agricultural-engineering problem. The machine, not yet on the market, is called a mole-lining machine. It doesn't dig a ditch and it doesn't lay standard tile, but it can build a plastic drainpipe 30 inches beneath the ground surface at a rate of 150 feet per minute. As illustrated on this page, the device consists of a needle-shaped plow connected by hinges to a chute which has a spool of sheet plastic at the top. The mole plow forms a three-inch tunnel as it's pulled through the earth. The chute trailing the plow feeds out a continuous length of plastic which is curved to fit the tunnel. One model also has a coarse sand hopper and chute, behind the plastic "travel," to deposit a porous layer above the drain. The plastic drainage system can be installed for approximately one third the cost of conventional tile, and at a rate about 20 times faster.





Birthday cake, complete with candles, wasn't too seaworthy, but won a prize for Peg Veasey. Motor was installed in a well in the center of the cake. Under power, cake barely stayed afloat



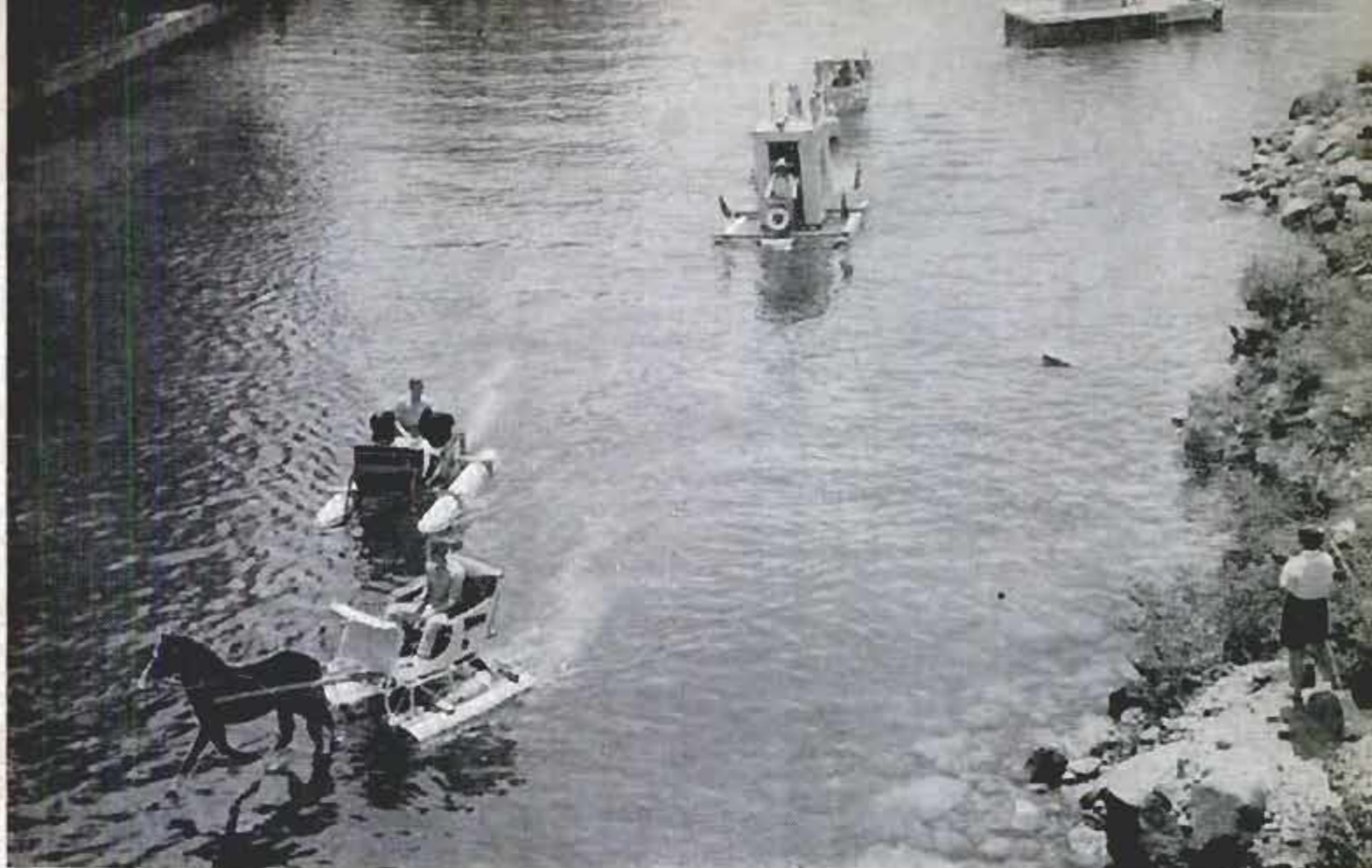
DIG



Want to save money? Here's a sleek little craft that costs practically nothing. Nail a frame around an inner tube and you've a boat anyone would envy. Well, almost anyone



Here's a houseboat of a brand new design. It floats on logs. Skipper pedals a bike up front, but it's all for show. Actually her brother is operating the motor from inside the structure



THOSE CRAZY BOATS!

Photos by Carleton W. Patriquin

THESE BOATS would give nautical nightmares to a marine architect, but they provided laughs for 50,000 spectators.

Perhaps the strangest boats ever designed (if you can call them boats!) show up each year during a boat show at Weirs Beach, N. H. One of the events of the show

is the Crazy Boat Splashlom. Anything that floats and can be propelled by an outboard motor can be entered.

In the parade the spectator may see anything from a bathtub to baby scales moving majestically across the water, the creation of an amateur boat "designer." ★ ★ ★

No need to put the old sleigh into storage when winter's over. Just mount it on four water tanks, hitch up Dobbin and you can use it through the summer, too





Floating flower garden, mounted on hot-water tanks, is watered with an old-fashioned pump. The gardener won third prize with this rig. Incidentally, "she" is a man



Simplest boat of all was two truck tires tied together. Motor was mounted on a crossbar inside one tire. Skipper just missed dunking in water



Master of this majestic ship piloted it from a cockpit made of a baby basket. His proud pennants included diapers hanging from a rack for drying clothes



Distaff boater zipped across the water on water skis big enough for Paul Bunyan

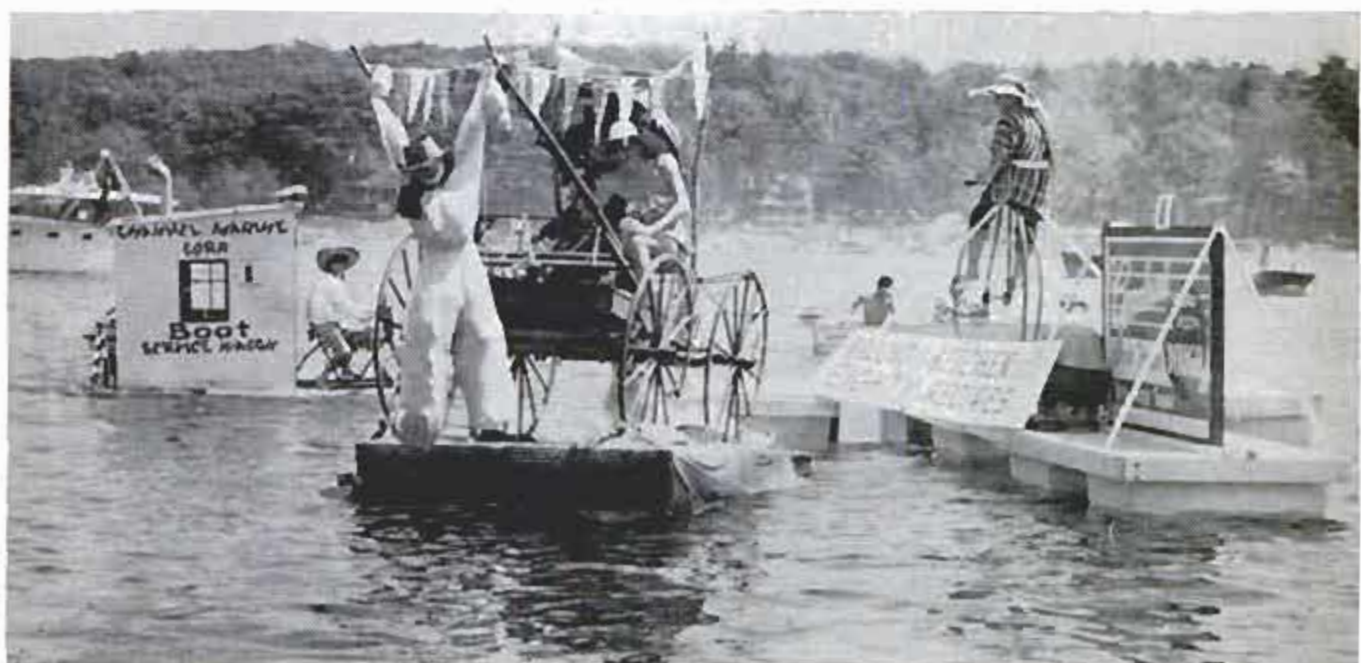
Some motor! Huge put-put mounted on aluminum floats didn't power the boat. Small motor is hidden behind seat



What is it? Rocket ship? Locomotive? And which is the bow, which the stern? Actually, it's a section cut from a 275-gallon drum and nobody knows—least of all the skipper—which direction it will move



First prize went to the strange conglomeration in the center of the photo below. It consisted of an ancient buggy mounted on something that floated, with a scarecrow hanging from the shafts. Didn't make sense, which is probably the reason it won!





Push-Button Dock Loads Ore Vessels

At a dock on Lake Superior near Duluth, Minn., ship loading is controlled by push button. Manning a small console in a tower, an operator controls nine shuttle belts running simultaneously. He works under the direction of a vessel's mate, who communicates with the tower by telephone. The operator has independent control over each conveyor connected with his tower. There are two towers at the dock. In loading taconite pellets, as shown at left, the operator can control the rate of flow into the hatches, and shuttle the conveyors back and forth to "trim" the load. Each conveyor can load at the rate of 750 or 1500 tons of pellets per hour. When each conveyor has loaded a predetermined amount in a hatch, it stops automatically. Signal lights on the control panel and dock alert the operator and mate that the hatch is filled. A continuous record of the weight delivered into each hatch of the vessel is recorded by instruments in the tower.

Venus to Be Goal Of Giant Radar

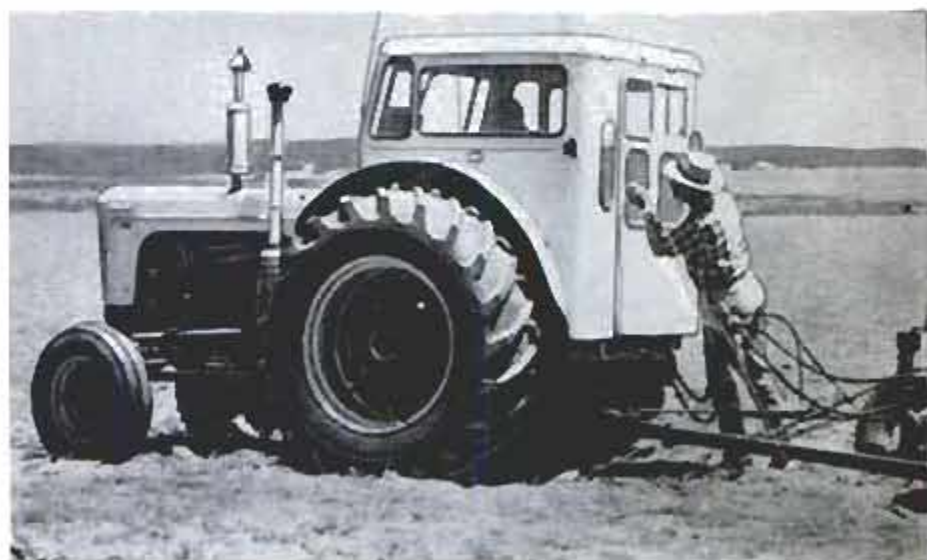
In two years a radar as large as two football stadiums will be used to explore Venus. Now in model form, the radar will be installed in Puerto Rico. The 1000-foot detector is being designed by scientists at Cornell University, who hope to complete it by April 1961, when Venus will be closer to earth than at any other time in recent years. The radar also will inform on Mars, the sun, and upper-atmosphere temperature and electron density.



Close-up of tractor shows how 2½-horsepower compressor unit and condenser coil were mounted on tractor frame to operate air-conditioning unit in cab. Cab interior has acoustic insulating board, carpeting

Custom-Built Cabs For Farm Tractors

Colorado wheatgrower Doyle Neiman can listen to sweet music in air-conditioned comfort while tilling his 2000-acre spread. He had custom-built cabs installed on his two diesel tractors. The walls are lined with acoustic insulating board and the floors are carpeted. The cabs have air-conditioning units.



Prewired Electric Unit Quickly Converts Vase Into Lamp

If you happen to have a distinctively shaped vase, bottle or similar object you've been saving as a possible future lamp base, you can complete the project in minutes with one of the prewired units now on the market. The lamp unit illustrated has tripod legs and is about nine inches high. The legs can slip into the vase or bottle opening or the tripod part of the unit can be removed and another base substituted. No drilling or wiring is required. You provide your own light bulb and lamp shade. The prewired tripod unit weighs seven ounces.





tronic compass checker developed by Sperry Gyroscope Co. for the Air Force, two men can do the job in two hours. The equipment rotates the earth's magnetic field electronically around the aircraft. Magnetic compasses are calibrated periodically since changing metallic and electrical influences affect accuracy.

Prefab Streets For Stuttgart

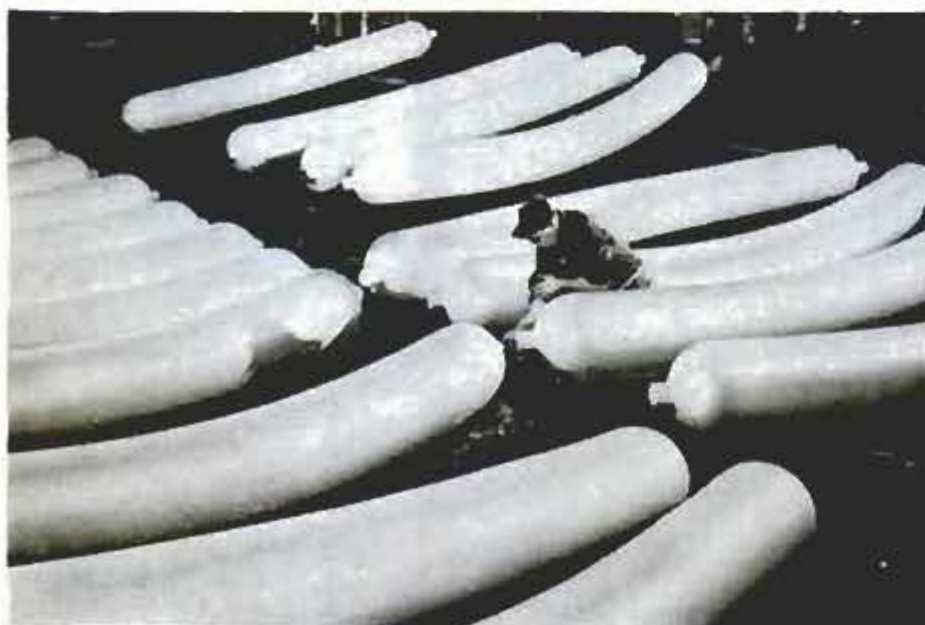
Two-ton slabs of paving are lowered on a graded sand subsurface to form a street in Stuttgart, Germany. Asphalt then is poured over the concrete slabs. The new method cuts construction time.

Washing Machines Mix Milk

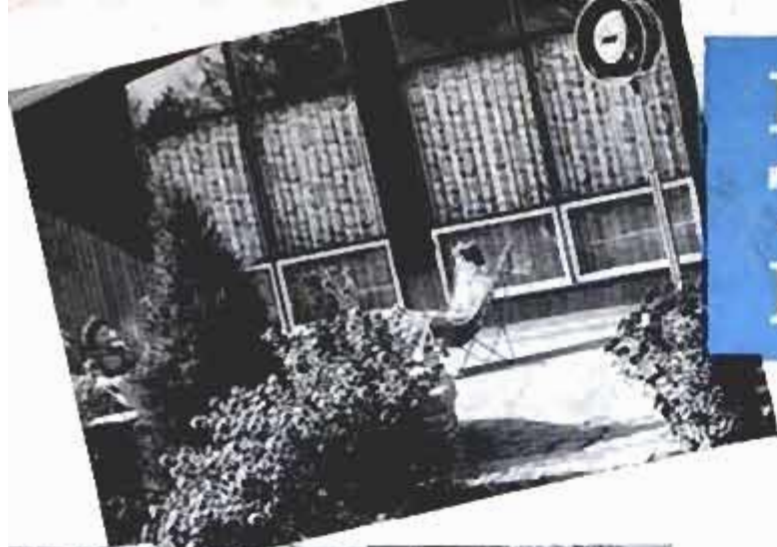
More than 100 clothes-washing machines are used in Spain to liquefy powdered milk. The machines are operated by missionaries associated with the National Catholic Welfare Conference.

Steel "Frankfurters" For Submarines

Passers-by seeing the batch of curved, cylindrical objects in a Navy yard might suspect that someone wanted to demonstrate the size of Paul Bunyan's frankfurters. Actually, the seamless-steel cylinders were built to house oxygen aboard the Navy's latest submarines. They were curved to conform to the contour of a modern submarine's hull.



Radio Television Electronics



How to Pipe Your Patio With Sound

By James Joseph

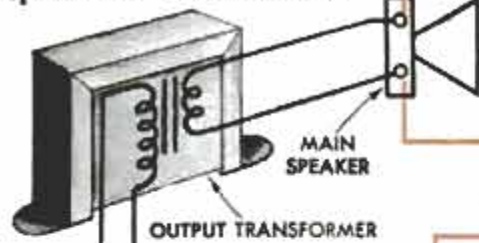
MMUSIC CAN ADD RELISH to the family barbecue . . . sportscasts can take the drudgery out of gardening . . . the latest news can spark outdoor-party conversation. And they will—if you pipe your patio with sound.

The "piping," moreover, is easy and can be quite inexpensive. All you need is a speaker, some outdoor hookup cable and a weatherproof receptacle. These—plus a little ingenuity—will literally transport your radio or hi-fi system out-of-doors, to any

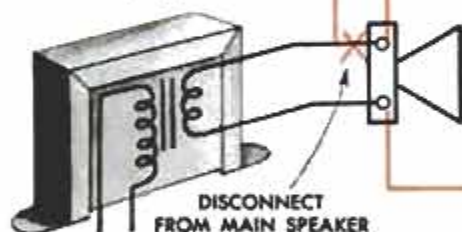
desired spot in your garden or patio.

Your choice of speakers for the great outdoors runs the gamut of the dealer's catalogue. You can use a hi-fi speaker or a less-expensive conventional one. Weatherproofed units, their "innards" protected by a metal or plastic horn, are ideal for permanent outdoor installations. The new "weatherized" units with their impregnated cones and weatherproof enclosures are just as good. Even a regular indoor speaker in some sort of portable enclosure

Open-circuit jack wired to voice-coil lugs of set speaker permits both speakers to operate at the same time



Closed-circuit jack, disconnects set speaker when extension line is plugged in



Open-circuit jack used with 2-pole, 3-position selector switch increases versatility. This arrangement permits speakers to be operated individually or simultaneously

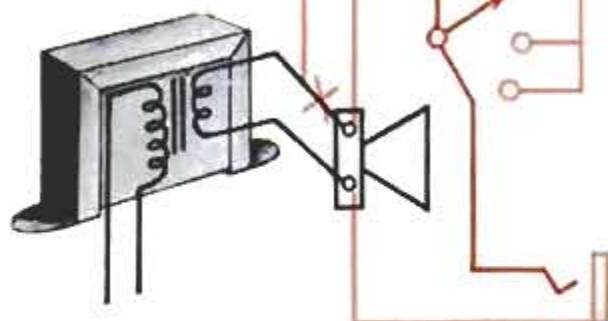


Fig. 1. Connecting extension speakers to radio or phonograph is simplified by phone jack wired to set speaker. Jack may be mounted on back of cabinet so that matching plug on extension-speaker line can be easily inserted

will do very nicely if you take care to protect it from the elements. It all depends on the sound quality you want and, of course, your pocketbook.

You can install one extension speaker or a half dozen, depending on the power which the amplifier of your music system can deliver and the coverage you need. Most radios, even the small table-model variety, can drive one extra speaker without excessive strain. Hi-fi systems with powerful amplifiers can drive more. But outdoors—as indoors—the speakers' total impedance must match the output impedance of the amplifier if best sound quality and maximum volume are to be obtained. The matching isn't difficult but the installation does demand some careful planning for optimum versatility.

Whether you plan to use a number of permanently installed outdoor speakers or a single portable one, you'll find it convenient to install a weatherproofed, plug-in

receptacle at every desired speaker location. All receptacles can be wired in parallel with the one closest to the house while a two-wire cable from the latter can be connected to the music system inside through a window or wall opening. This arrangement permits you to change the location of the outdoor speakers to give you just the coverage you need, without resorting to a long and cumbersome cable between the speaker and a single receptacle.

The problem of how to connect the extension-speaker line to the music system deserves some consideration. If you plan to use an ordinary radio or phonograph, it is a relatively simple matter to provide an output jack so that the extension-speaker cable can be plugged in. Several methods for wiring the jack into the circuit are shown in Fig. 1. With this setup the mismatch resulting from the use of a single extension speaker would not seriously affect the performance.

Fig. 2. Typical examples of speakers engineered for the outdoors illustrate styles to fit into any surroundings

A. Lowell's Hifilite; B. Electro-Voice's Musicaster; C. Jensen's Model HF-100; D. Shalida's prong-based Audiolite



For more elaborate installations, where several outdoor speakers are to be permanently connected to a hi-fi system, for example, matching does become a problem. Fortunately, most high-fidelity amplifiers have a number of output-impedance taps (usually 4, 8 and 16 ohms) which can be used for matching purposes. Speaker impedances, too, are standardized. Commonly, the smaller speakers have 4-ohm voice coils while those of hi-fi speakers are usually 8 or 16 ohms. Proper choice of speakers permits virtually any number of them to be connected in various ways (series, parallel or series-parallel) to provide the correct total impedance needed for matching one of the amplifier taps—see "Wire Your Home For Sound," *Popular Mechanics*, Jan. 1956.

Mounting Outdoor Speakers

The large variety of outdoor speakers permits the selection of units for almost any type of installation. Some typical ones are shown in the photographs on page 157. Illustrated are Jensen's HF-100 mounted on an adjustable patio stand, the tree-trunk mounted University MLC and two versions of Shalda's versatile Audiolier. The basic idea is to mount the speaker near a previously installed receptacle so that only a short length of cable is needed to interconnect the two.

Right here let's differentiate between *weather-proofed* and *weatherized* speakers. The former, like the aforementioned Jensen and University models, and Electro-Voice's spanking-new Musicaster (Fig. 2B), require no protective enclosure. The latter, though resistant to the elements, are mounted in weathertight fixtures, which are often unique and decorative. Typical of these is Lowell's patio lamp—the Hifilite—which mounts a weatherized speaker in a dome-shaped baffle above a light bulb, Fig. 2A. You get all-around sound—and light—from a single fixture. Another version of the Audiolier, Fig. 2D, conceals a 6-in. weatherized speaker in a mushroom-shaped fiberglass housing—ready for "planting" anywhere in your yard or garden.

Cable Considerations

Having decided on the number and type of speakers you need, you'll have to give some thought to the cable which interconnects the various receptacles. First of all, the receptacles themselves must be weatherproof and should be equipped with a two-prong socket which differs somewhat from that of a standard a.c. receptacle. Otherwise it would be too easy to inadvertently insert the matching speaker plug into the a.c. outlet, causing immediate and expensive damage.

The photos in Fig. 3 illustrate the installation of a single receptacle during construction of a brick patio. Here, photo A, a prong-based Audiolier, guyed for extra rigidity, is about to be planted

(Continued to page 244)

Fig. 3. Typical outdoor speaker installation shows Shalda's prong-based Audiolier being "planted" during the construction of a brick patio. Direct-burial cable from weatherproof, plug-in receptacle runs toward the house between courses of bricks



Dr. H. F. Olson, director of RCA's acoustical-research program, speaks into microphone as typewriter automatically types out his words. Background console houses "electronic brain" which activates machine



BEHIND THE SCENES IN ELECTRONICS

By Lothar Stern

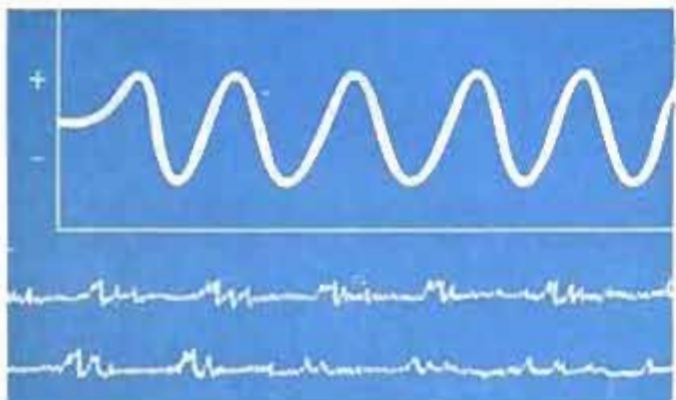
SEEING IS BELIEVING"—but whether you're watching the well-rehearsed program of a master magician or witnessing a demonstration in an electronics research laboratory, the results are often equally mystifying.

Take for example the case of the "educated" typewriter. Here is an apparently ordinary machine, completely unattended, clicking away merrily to spell out the words spoken into a nearby microphone.

On a stage, a similar demonstration would lead you to look for hidden strings and their concealed manipulator. But at the David Sarnoff Research Center, listening to Dr. Harry F. Olson dictate the words which spur the machine into lively action, there is no room for chicanery. There are strings, of course—in the form of electrical solenoids which activate the keys—but these are energized by electrical impulses from an "electronic brain," and the transformation from spoken to printed word is accomplished entirely by electronic and mechanical means.

The typewriter looks like a fugitive from the salvage pile. And that, laughs Dr. Olson,

Fig. 1. Comparison between fundamental sound wave and the complex pattern of a simple speech sound



is exactly what it is. But the machine itself is relatively unimportant. The actual printing could be done by other means, and it is possible that any final instrument will not resemble a typewriter at all. What is important is the electronic brain that activates the final mechanism. And any "magic" connected with this development lies in the inventiveness of the human mind which has managed to endow a machine with some of its own properties.

Electronic Recognition of Speech

Sound travels through the air in the form of waves. These waves can be picked up by a microphone and converted into electrical currents having exactly the same wave shape. A fundamental sound, for example, is simply a wave whose peaks and troughs repeat themselves periodically at a given frequency (rate).

But human speech never resolves itself to such a basic wave. Even a simple speech sound, Fig. 1, consists of a hodgepodge of frequencies all mixed up in continuously varying amplitudes (strengths). The composite wave of any particular speech sound looks very much like that produced by any other speech sound.

Careful investigation, however, revealed to early researchers that each sound wave does vary from every other. In Fig. 2 the contents for the sound "I" were analyzed at certain specific intervals during its occurrence. While the wave at each specific time contains all frequencies from about 100 to 6400 cycles per second, it is clear that some frequencies are much larger in amplitude than others. Moreover, the fre-

quencies which predominate at one particular instance may not be nearly so prominent at a different time.

For different sounds, the time-frequency-amplitude relationship varies considerably from that for the sound "I". Even for the same sound the pattern will change, depending on the person being used as a subject. Yet, whether the subject is a man, woman or child, a particular sound is associated with *some* specific amplitude peaks which *always* occur at the same frequencies and at the same time.

Here, then, is the common denominator which can be used to separate the various sounds. All you need is a device which:

1. Separates the various frequencies of a particular sound.
2. Chops up the sound into specific time intervals and remembers which frequencies exceeded a specific amplitude.
3. Memorizes the time-frequency-amplitude relationship of all possible sounds.
4. Changes this relationship into a specific electrical signal.
5. Uses this signal to initiate a series of electrical impulses which activate the solenoids of the typewriter keys.

Quite a trick for a so-called inanimate object!

But before the design of such a unit could even be attempted, a number of other factors had to be considered. Should the electronic brain respond to basic phonetic sounds, to individual syllables or to complete words? The answer to this question would decide the complexity of the system.

Earlier studies indicated that for word intelligibility approaching 100 percent

(Continued to page 248)

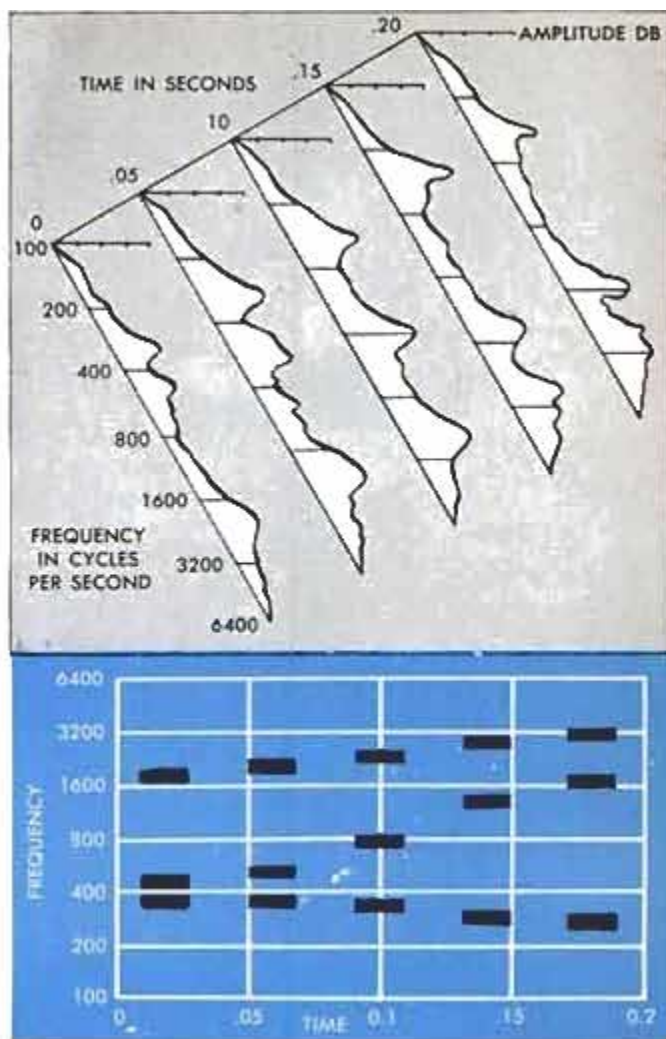
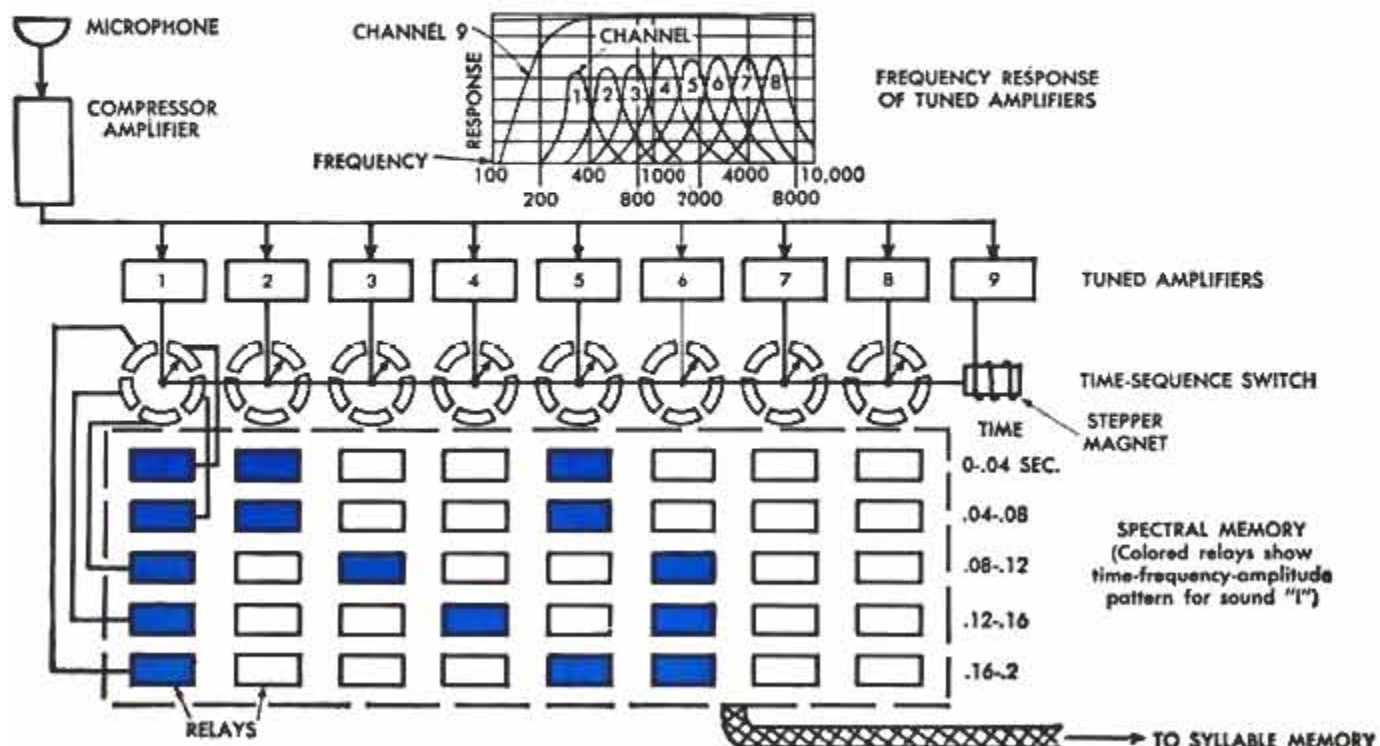


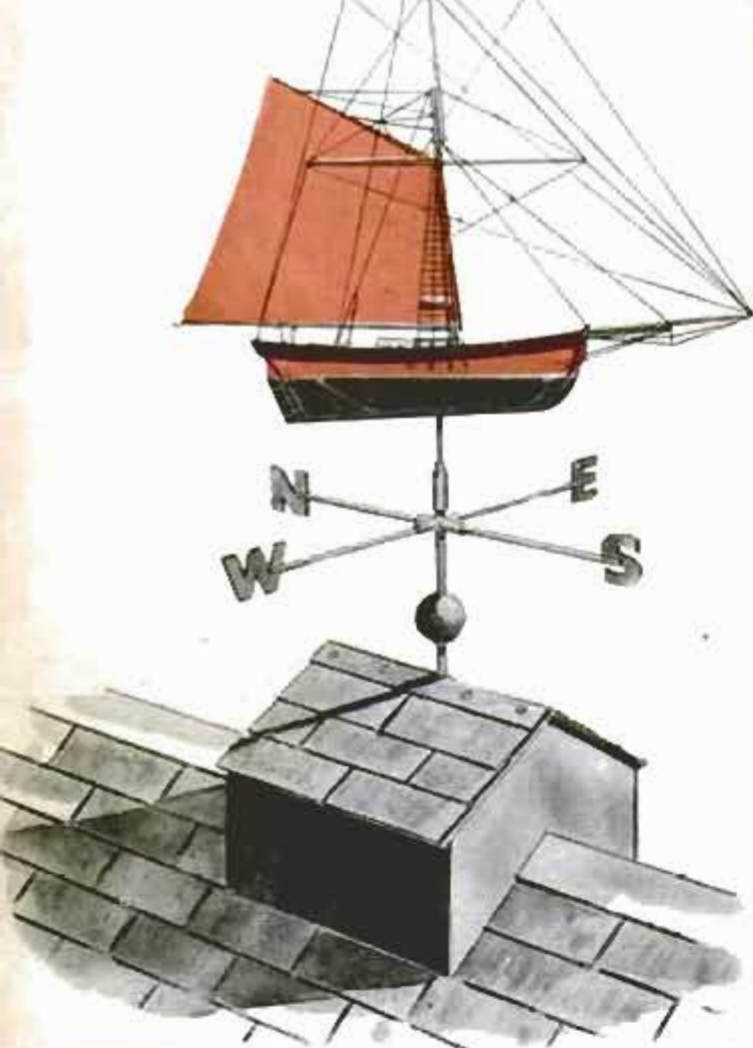
Fig. 2. Analysis of speech sound "I." Top: Amplitude-frequency relationships at certain time intervals. Bottom: Black rectangles indicate frequencies which reach or exceed a predetermined amplitude level

Fig. 3. Simplified block diagram of electronic equipment which identifies various complex speech sounds



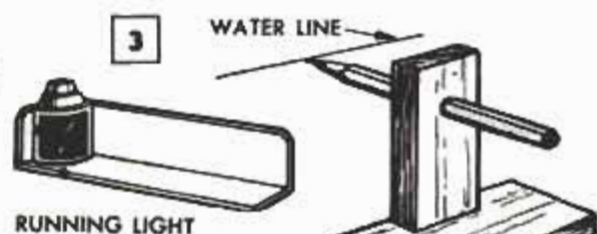
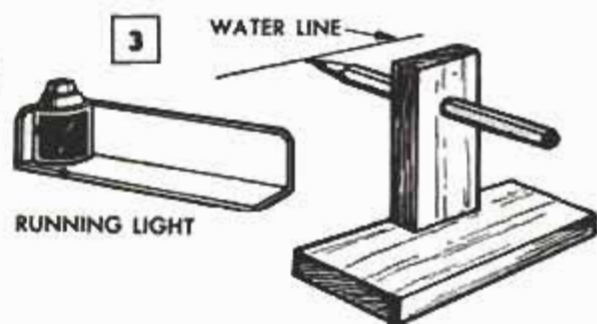
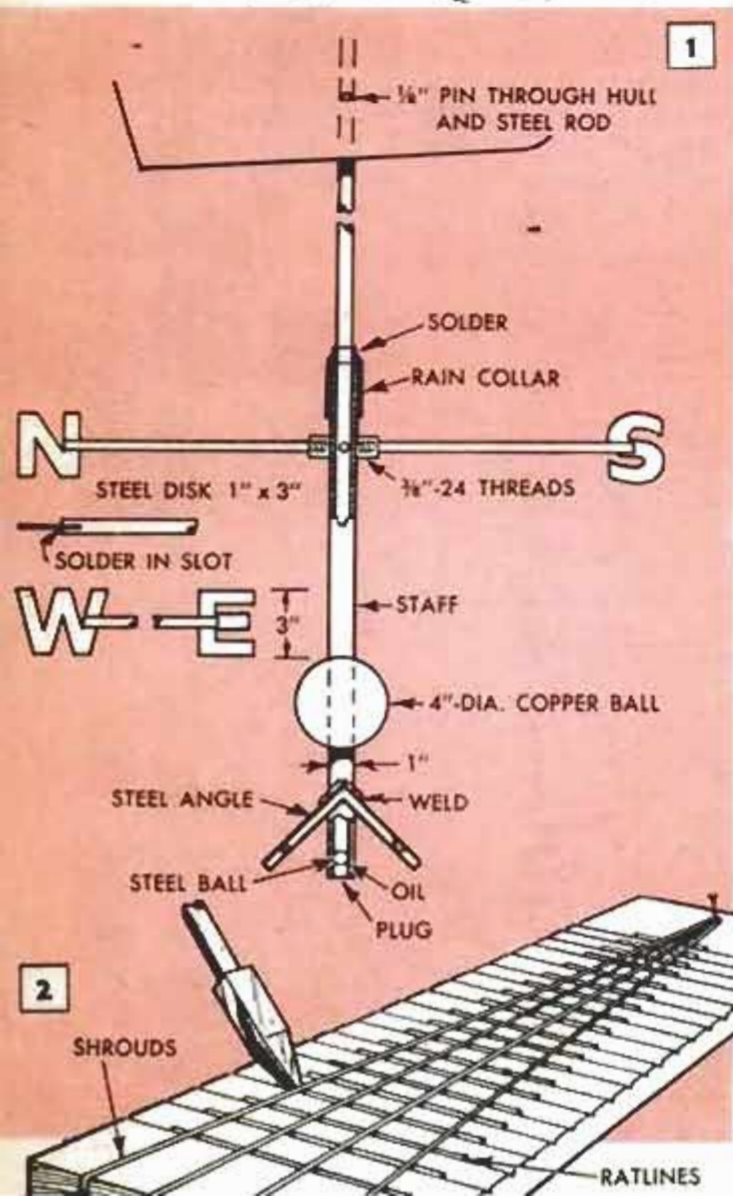
SAILING-SHIP WEATHERVANE

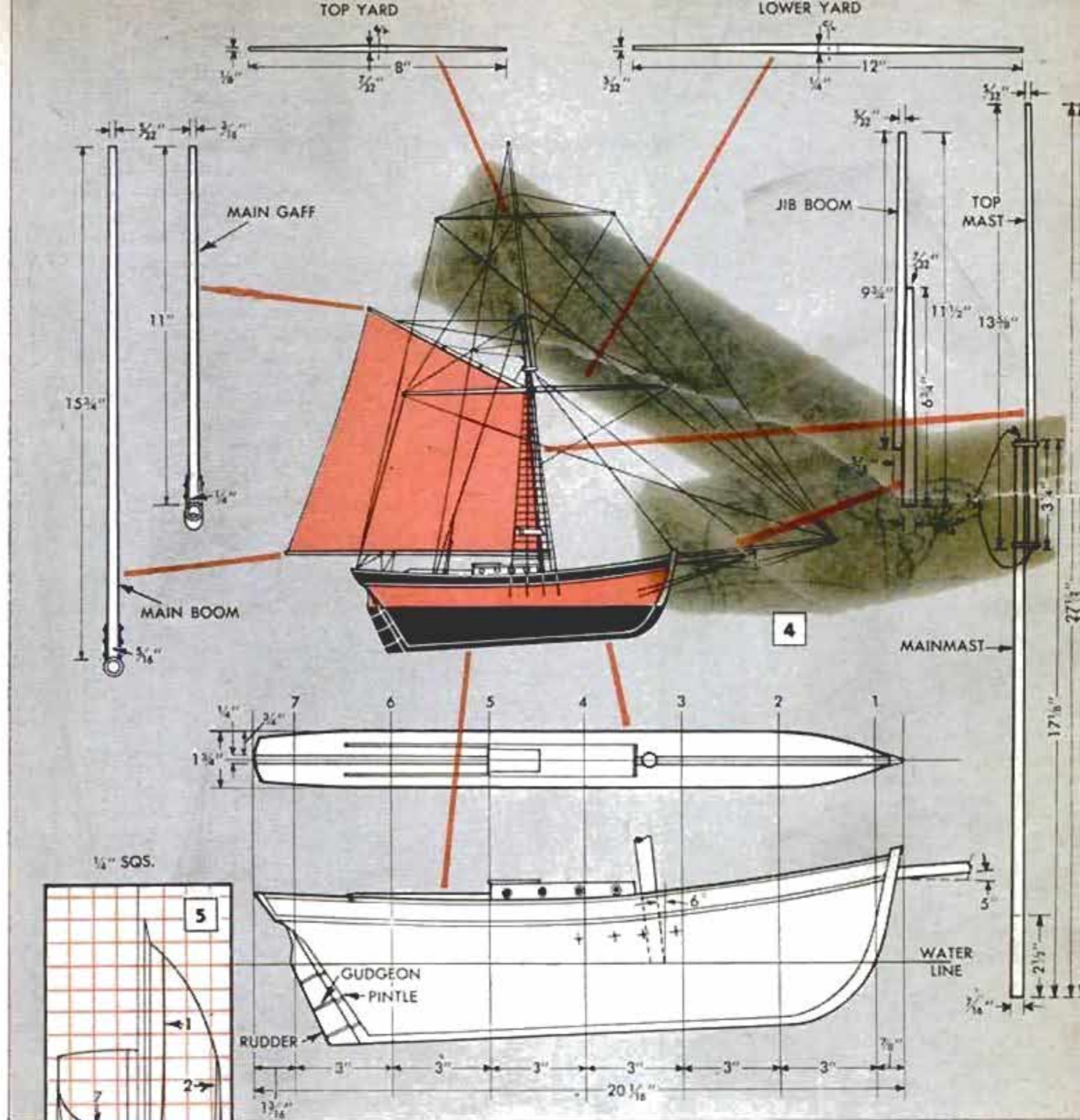
By C. W. Woodson



THIS CUTTER-RIGGED sailing ship will ride out even a heavy gale, and its copper rigging and sail will last for years.

The ship's hull consists of two $\frac{3}{4}$ x 7 x 21-in. outer blocks and one $\frac{1}{4}$ x 7 x 21-in. center block, the latter projecting to form the stem, keel, sternpost and rudder. On each block draw a water line 3 in. from the bottom edge and parallel to it. Locate the stations on it from Fig. 4 and draw them with a square. Enlarge the squared pattern, Fig. 5, and draw the profile pattern by transferring to each block the distances above and below the water line at each station. Joining these points will result in a profile pattern of the hull. Bandsaw the separate blocks, then glue them together in a "sandwich." Cardboard templates, made from the squared patterns in Fig. 5, are used at their respective stations when carving the hull to shape. The deckhouse and coaming now are shaped and glued in place. Lengths of dowel, tapered as indicated in Fig. 4, are used for spars. Holes for the mast and bowsprit are drilled and these parts are glued in place. Shrouds and ratlines are assembled on a jig, Fig. 2, the ratlines being positioned in grooves, and each intersecting length of copper wire is spot-soldered. The ends of the ratlines then are trimmed flush. Several inches of wire are left on the ends of the shrouds to permit attaching them to the hull. Boom and gaff jaws are shaped from strip copper to fit snugly around the mast, Fig. 4. The mainsail is cut from sheet copper and laced at the head and foot to gaff and boom with copper wires passed through holes punched in the metal. The luff, or edge of the sail adjacent to the mast, is laced to the mast





with wire loops. The sail can be painted or left to weather naturally. Running lights, Fig. 3, are made and soldered to the shrouds and ratlines. The left-hand (port) light is painted red, the starboard is green. The bowsprit and jib boom, Fig. 4, are lashed together with wire and rigged to the mast with wire. The pipe staff supporting the weather-vane ship, Fig. 2, is welded to a 12-in. length of steel angle that is drilled and screwed to the roof ridge. The steel rod on which the ship is mounted rotates on a steel ball at the lower end, the bearing being immersed in oil. When drilling a hole in the hull for inserting the supporting rod, balance the completed ship and drill at this point. A $\frac{1}{8}$ -in. steel pin through the hull anchors it to the rod. At the point where the rod enters the pipe a rain collar of sheet copper is soldered, Fig. 1. Letters indicating wind direction are cut from sheet copper and soldered in slots cut in steel rods, Fig. 1, that are threaded at one end and screwed into a steel disk that is fitted on the pipe column. Give the ship's hull several coats of paint, and paint or varnish the masts and yards. After painting, level the hull and remark the water line, as in Fig. 3. ★ ★ ★

Screen Strip Used for Scribing Large-Radius Circles

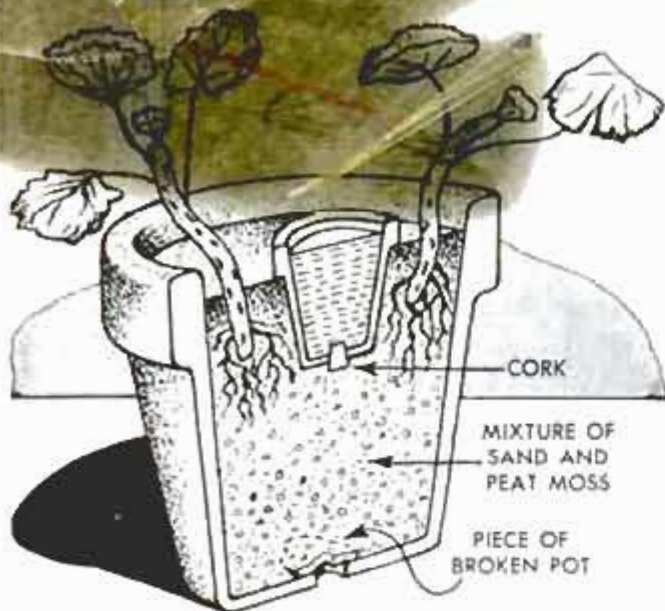


When it is necessary to scribe a circle or arc of large radius one home craftsman uses a strip of screen wire as a trammel. The pivot end of the strip is held in place by a small nail while the circle is traced with the point of a pencil inserted at the desired radius at the other end. A coating of paint or varnish will help prevent the wires in the screen strip from separating.

☐ Easiest way to check for air or gas-line leaks around the home or shop is to coat the suspected joints and valves with shaving cream from a pressurized can. Any leaks present will be indicated by bubbles appearing in the cream.

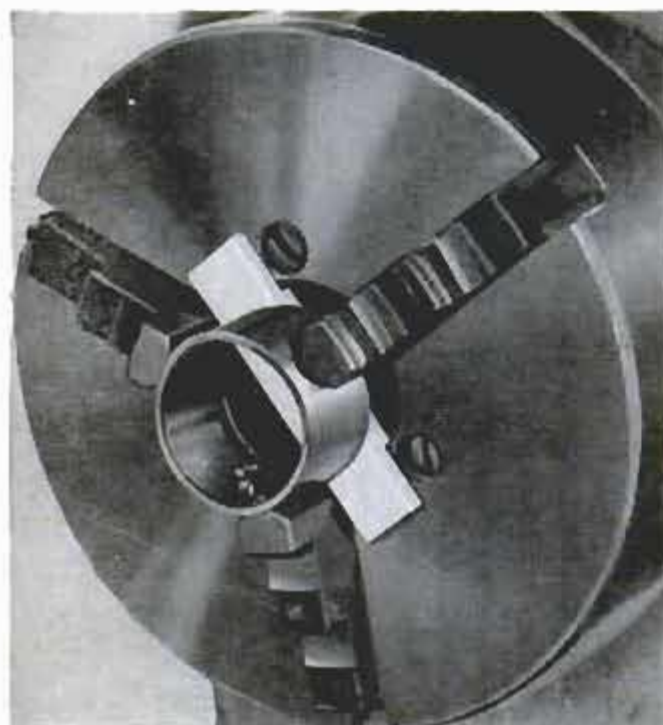
Joseph J. Papp, Dayton, Ohio.

Pot Within A Pot Waters Flower Cuttings



For best results when growing flower cuttings, plant them in a clay pot and keep the soil uniformly moist in the manner recommended by the National Association of Clay Pot Manufacturers. The cuttings to be planted are treated with rooting chemical and then inserted in a 6-in. pot containing a mixture of sand and peat moss. A small pot is placed at the center as shown. The latter pot is kept full of water that slowly seeps through its walls to provide the right amount of moisture for root growth. To prevent excessive evaporation the pot should be covered with a glass bell.

Stop Prevents Work From Sliding Into Lathe Chuck

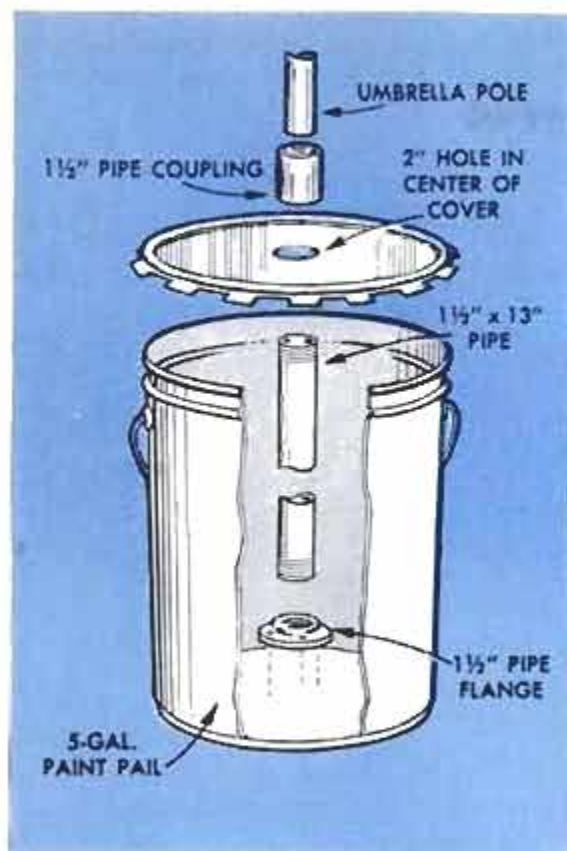


Because workpieces with thin shells, or those of soft materials, cannot be gripped tightly, they tend to slide back into a lathe chuck when pressure is exerted by a machining operation. To prevent this, fit a stop across the chuck opening as indicated. The stop can be a strip of either wood or metal, shouldered near the center so that the thicker section will fit snugly in the chuck opening. The shoulders prevent the stop from shifting when the lathe is operated at the higher speeds.

Cars that are equipped with limited-slip-type differentials should not be started when one of the rear wheels is jacked up. The car may "walk" off the jack due to the torque being diverted to the wheel resting on the pavement. If it is necessary to run the engine at such times, block up the rear axle at both ends.

Stanley Clark, East Bradenton, Fla.

Stand Permits Using Beach Umbrella on Patio

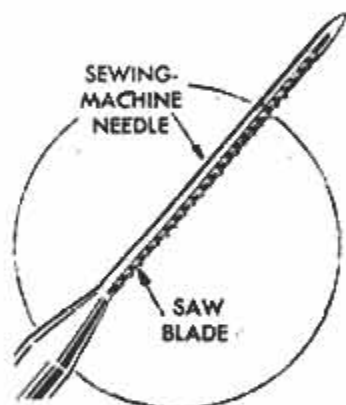


Here is a portable stand for a beach umbrella to permit using it on the lawn or patio as well as at the beach. Made from a 5-gal. paint pail, a length of pipe and two pipe fittings, the stand will hold the average size umbrella upright in all but the strongest of breezes. To make the stand, bolt a 1 1/2-in. pipe flange to the bottom of a paint pail and cut a 2-in. hole in the center of the cover as indicated in the detail. Then

screw a 13-in. length of pipe into the flange, fill the pail with sand and fasten the lid in place. A coupling screwed on the upper end of the pipe holds the stand rigidly together and conceals the hole in the cover. Paint the stand as desired and apply decals to the sides to give it an attractive appearance. Leave the handle in place for easy carrying when moving the stand.

K. W. Brown, Oakland, Calif.

Modelmaker's Broach From Needle and Saw Blade



This handy modelmaker's broach is made from a length of fret-saw blade cemented in the slot of a sewing-machine needle. When chucked in a pin vise, it can be used for cutting keyways. — C. L. Griner, La Porte, Ind.

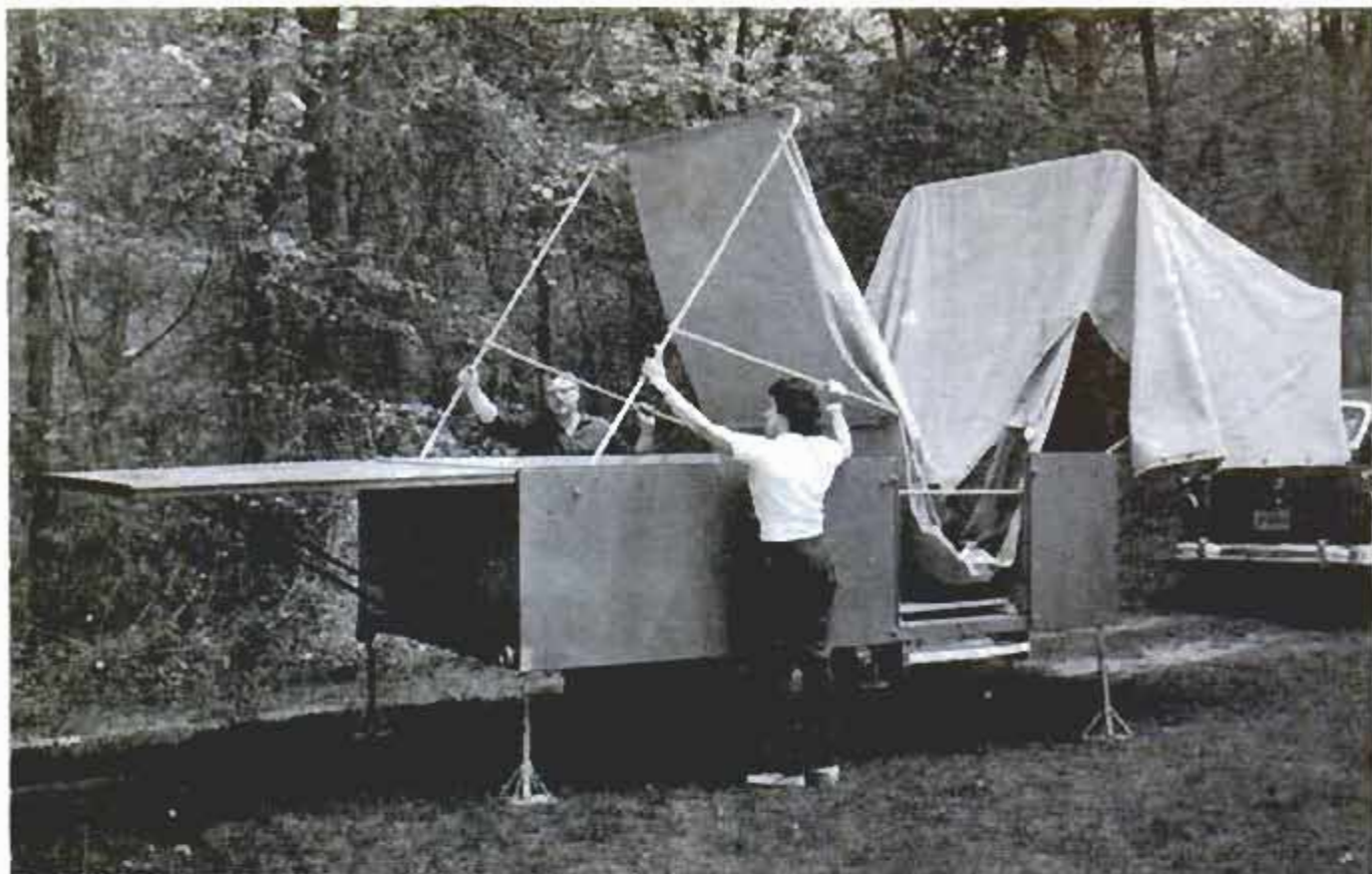
Wrap a spare key in aluminum foil and bury it in the ground next to the entrance of your house to avoid being locked out the next time you return home without a key. The key will be easy to find if a small tab is formed on one side of the foil and allowed to project from the ground.

Use Plastic Bird Ladder For Flowerpot Trellis

For a decorative trellis for a small potted climbing plant, insert a plastic bird ladder in the pot as shown. Such a ladder may be obtained at most department and pet stores for a small sum. — G. E. Hendrickson, Argyle, Wis.



Steel wool rolled into a slender wad and forced into an enlarged screw hole in wood or plaster will permit the screw to be tightened properly. The screw threads turning in the steel wool compact it in the voids and take a firm grip. — C. V. Mathis, Wildwood-by-the-Sea, N. J.



The folded top is raised from its resting place above cabinets and secured in place in a matter of minutes

YOUR VACATION

LAST MONTH in the first installment on building this unusual canvas-top camping trailer, we gave instructions and details for completing the trailer frame and body. Now you are ready to construct the interior storage cabinets and counters. Before doing this, however, it is a good idea to lay tile or linoleum over the entire floor area. Covering the floor at this stage avoids having to cut around cabinets after the interior arrangement is built in.

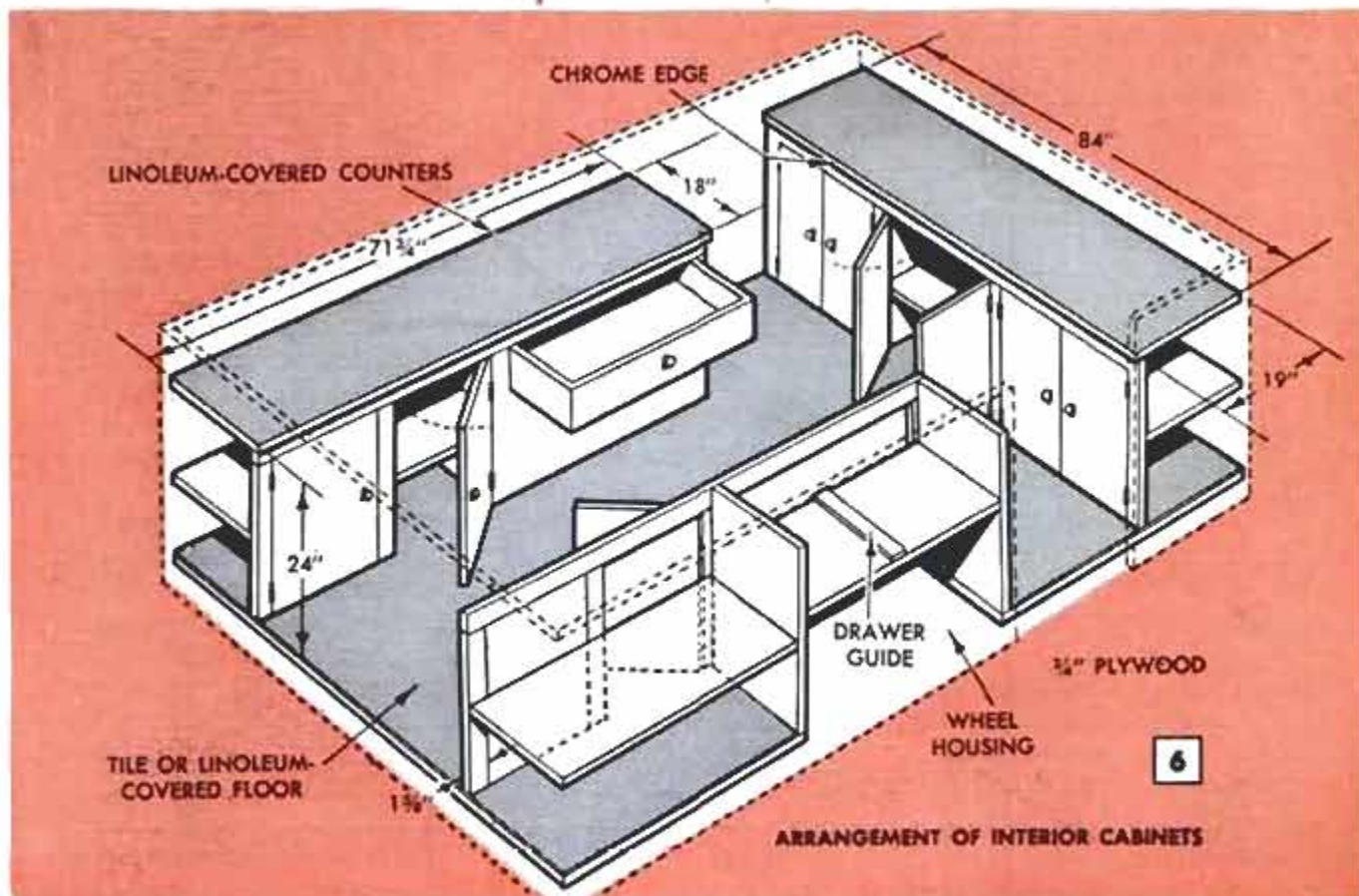
Supporting arms for the bunk panels, which are stored on top of the folded panels, are installed first. The arms fit into brackets attached permanently to the ends of the trailer



Fig. 6 suggests a cabinet arrangement, but this is optional, and the cabinets may be built and arranged to suit individual requirements. In the original arrangement, two-shelf cabinets built along both sides and the front end of the trailer were found to provide sufficient storage space. This arrangement leaves ample room to install a small refrigerator, water tank, or a sink unit. Because of sanitary conditions, however, a large insulated jug with spigot was preferred for a water supply.

When constructing the side cabinets do not let them extend past the wheel wells. Otherwise they will interfere with the door and its frame when folding it down to rest on the floor. Keep the cabinet tops flush with the ends, particularly at the door opening in the trailer box. Also be sure to allow at least a 6-in. clearance between the upper surfaces of the cabinets and the top of the trailer box. The canvas top folds into this space when traveling. If of uniform height, the cabinet tops may be used as seats when dining or entertaining.

Before building in the cabinets, study your needs carefully. Then build them accordingly. You may find you will need more drawer



HOME

By Clifford J. DeLeeuw

PART II

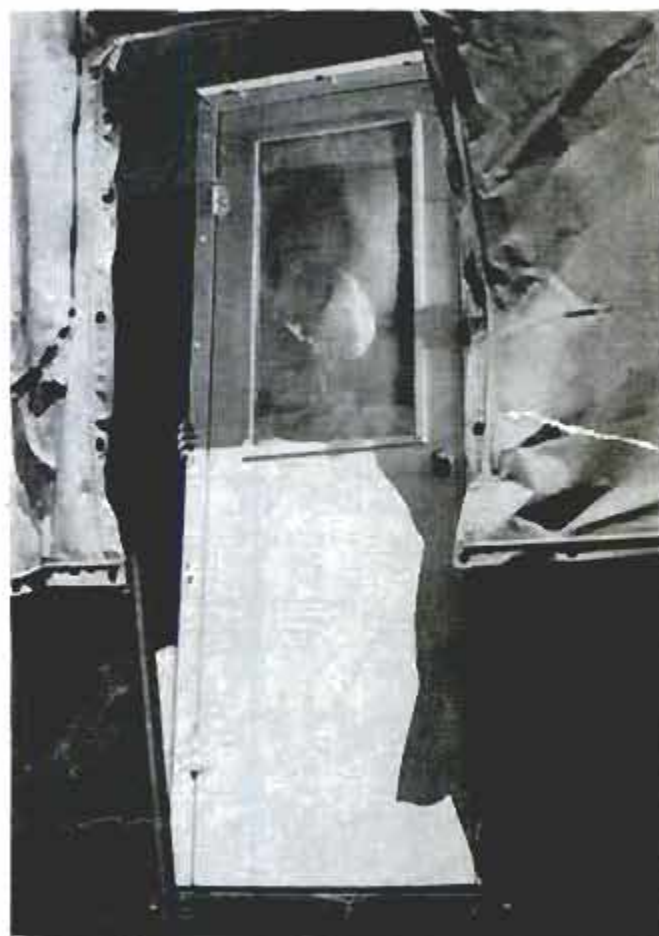
After completing the trailer body with cabinets, and making the folding canvas top, you are ready to hit the road for the "shakedown cruise"

space than pictured, for example. Or, it may be necessary to space the shelves differently in each cabinet. Plywood of $\frac{3}{4}$ -in. thickness is ideal for construction of the cabinets. It will serve for the doors, too, and will provide tops strong enough to be used as seats. Chrome edging will protect the edges of the tops.

The door is next. The frame is made of 2 x 2-in. stock and is mounted as previously stated. See detail C of Fig. 7. Made of $\frac{3}{4}$ -in. outdoor plywood, the door is 2 x 6 ft. in size, and is hung to the frame by means of three butt hinges. The screened opening in the door may be any size desired. Save the cutout. It is used as a storm panel, which is inserted in the opening from the inside, and is held in place by turnbuttons or storm-sash spring clips. The opening is screened from the outside, screening being tacked in place and the tack heads covered with molding.

Having completed the trailer and body unit, you now are ready for the folding canvas top. This is detailed in Fig. 7. The

After erecting the canvas top, the door-and-frame unit is swung up into place and secured, after which the canvas top over the doorway is snapped to frame



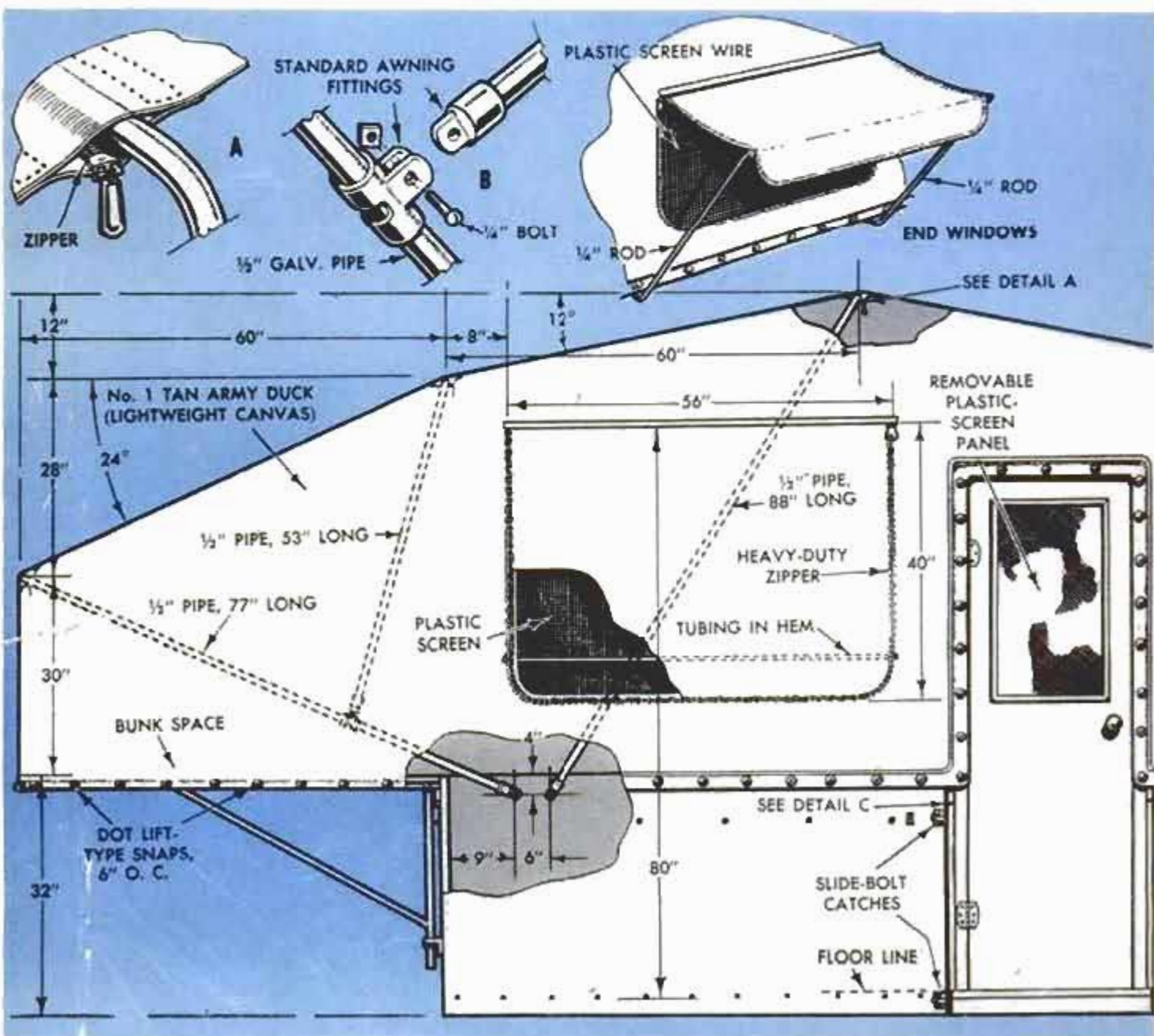
bows, or top-supporting members, may be made of 1/2-in. pipe, aluminum rods or thin-wall conduit. For the original trailer, thin-wall conduit was used because pipe adds considerable weight, and aluminum rods, while ideal, are quite expensive. When bending the conduit to form the bows use a minimum radius of 3 in. Be careful to avoid buckling the metal. The bows are assembled to the inside surface of the trailer body by means of standard couplers. The second bow from each end is assembled to the end bow with standard awning fittings. See detail B of Fig. 7.

The tent top is made of 9-oz. army duck, tailored to the bows and the doorframe. Unless you are adept at this type of work, it is best to have the canvas cut and sewed by an awning maker. Zipper-fitted hems are provided for the bows as shown in detail A, Fig. 7. When lowering the top, the center hem must first be unzipped to allow the canvas and bows to fold down properly. The canvas is attached in place by lift-type

snaps located on the sides of the trailer body, around the doorframe and along the sides and ends of the bunk lids.

For ventilation and illumination, two large windows are provided on opposite sides of the canvas top and two small ones at the ends. The windows are covered with plastic screen sewed to the canvas. Canvas flaps are provided over each window. They are sewed to the canvas at the tops of the windows, and fitted with zippers along the sides and bottoms. If you feel that the two large windows and the screened door are ample for ventilation, the end windows may be eliminated.

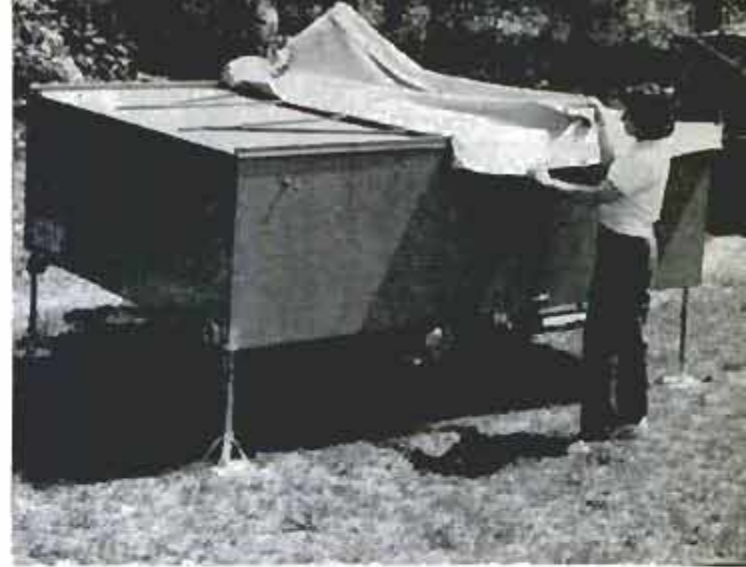
Awnings not only add to the appearance of the trailer but, more important, will keep out the sun. The window flaps can be converted to serve as awnings by sewing 2-in. tapes horizontally to the inside surfaces about 2 in. up from the bottom to provide hems. Metal tubing 1/4-in. in diameter is slipped through the hems. Rods pivoted to the side of the trailer body slip into the



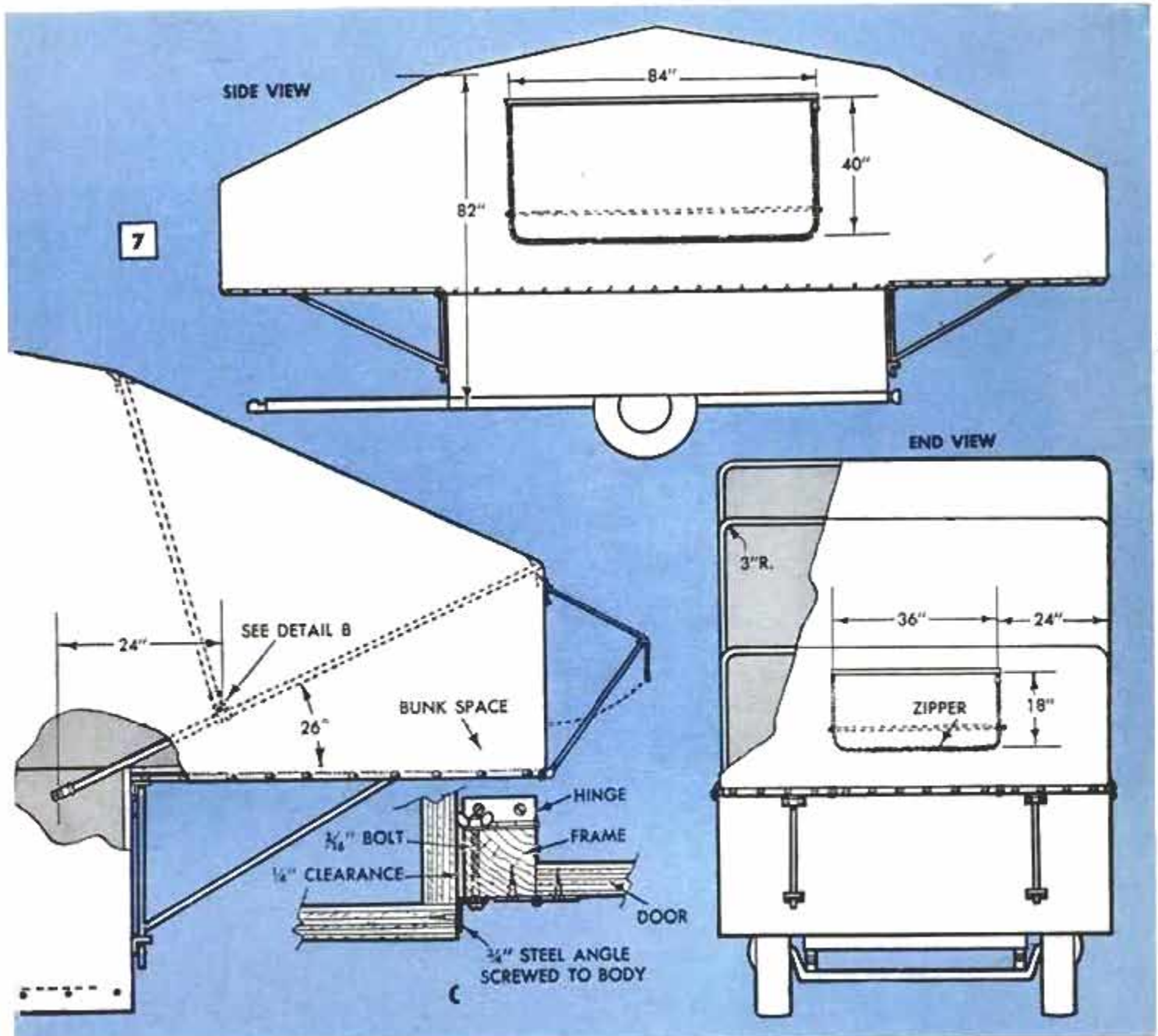
ends of the tubing to support the flaps awning style. Make the tubing pieces slightly shorter than the widths of the flaps. This will prevent interference when the tubing is left in the hems.

When traveling, the folded trailer is covered with a canvas tarp of the same material as the top. The tarp is fastened to the lift snaps on the trailer body. For sake of appearance, the tarp should be tailored to the body. Here, as with the window flaps, the tarp may be made to serve a dual purpose. It may be used as a canopy over the door and large window by using supporting rods and a zipper to attach it to the canvas top.

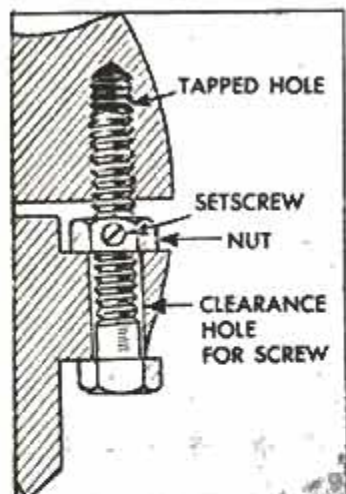
If desired, retractable trailer steps may be purchased for entering the door. Or a step unit may be built of wood and stored inside the trailer when traveling. A tongue jack is desirable for use when the trailer is unhitched. The jack should be of the folding type and should be attached permanently to the tongue. ★ ★ ★



When setting up the trailer, place the stabilizing jacks at each corner first. Next remove the tarp, install the supporting arms for the bunk panels and swing the latter into place. Then erect the folding top, secure it to the snaps, and finally erect the door-and-frame unit and snap the canvas top to it



Anchored Nut on Lockscrew Opens Split Fixture



Split fixtures used to hold round work for machining sometimes are difficult to loosen when the work is to be removed, even though the lockscrew is backed out all the way. Instead of prying the slot to wedge the fixture open, fit a nut on the lockscrew and keep it in position

with a small setscrew. A slot may have to be milled in the fixture to accommodate the nut and the lower hole reamed. Now, when the setscrew is backed out, the nut will bear against one side of the fixture and "jack" it open.

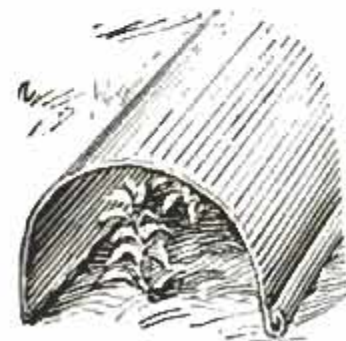
Frank La Saracina, New York City.

Maintenance for Small Engines

Since there is no odometer on the small engines used in power mowers and garden tractors, as well as outboards, hours rather than miles indicate the need for tune-up and maintenance of the smaller engines. After 100 hours of operation, clean and gap the spark plug; after 200 hours, replace the plug, says the service department of the Champion Spark Plug Co. Clean and regap the points of the magneto every 200 hours. If they show signs of wear or pitting, install new points and a condenser. Because of the extreme conditions of water and dirt to which small engines are subjected, clean the fuel filter frequently.

Protecting Plants From Frost

Rows of vegetable and flower transplants can be covered at a minute's notice to protect them from frost, with shields improvised from lengths of regular half-round eave-trough. Not only is this method of covering much easier and faster than the common practice of placing cans and boxes over the tender transplants, but the eave-trough covers won't blow away. —G. E. Hendrickson, Argyle, Wis.



SIDEWALK CRUISER

By Dave Swartout

SIDEWALKS become "rivers" for your youngsters when this cruiser body is fitted on their coaster wagon. When the boat "docks" at the back porch, lifting off the body reconverts it to a land vehicle. The cruiser shown will fit a wagon measuring 13 x 28 in., but can be scaled up or down for other wagons. Sides of the boat are 52-in. lengths of $\frac{1}{8}$ -in. tempered hardboard, smooth side out, for a right and a left-hand side. Bolt the sides to a length of metal angle, then "wrap" them around the wagon and temporarily clamp them to the transom with wooden cleats. The transom is 16 in. straight across the top, and is $\frac{1}{2}$ in. wider at the bottom. Force the bow wedge as far forward as it will go, to push the sides away from the front wheels, then nail it and the transom in place. Trim the sides flush with the transom. Place blocks under the sides to position the boat so the side decks, cut from 1-in. lumber as indicated, will fit on the top edges of the wagon body when the cruiser sides are flush with the decks. After assembling the rest of the boat, use a 1-qt. paint can and a pencil to mark the waterline. ★ ★ ★

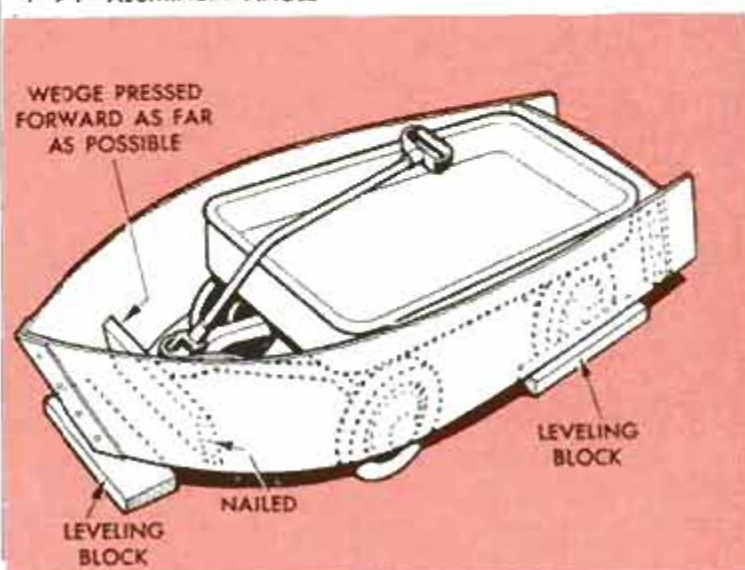
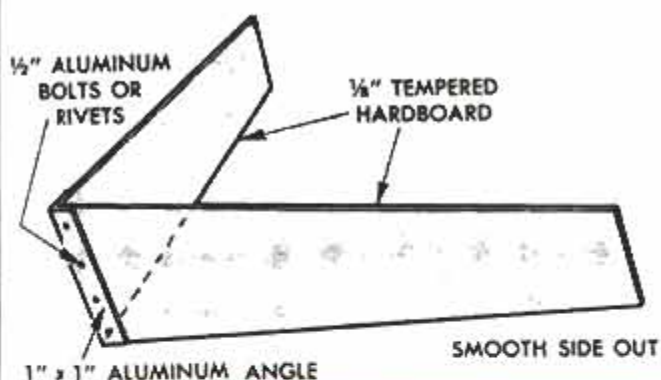
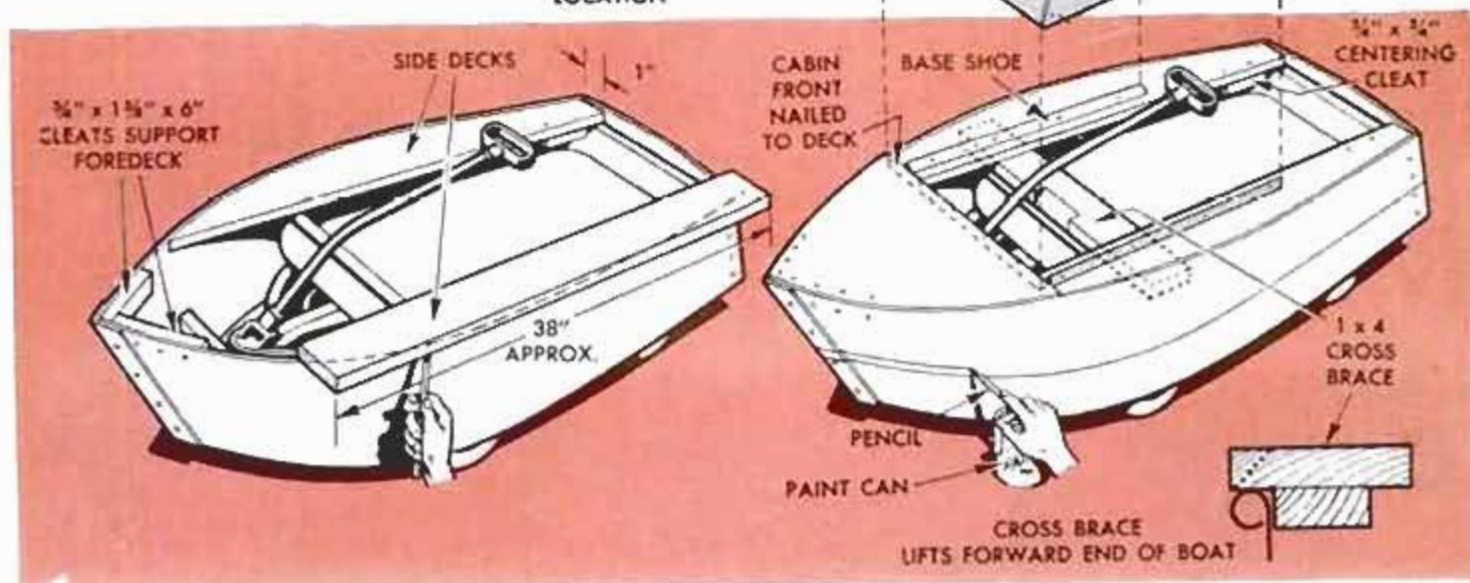
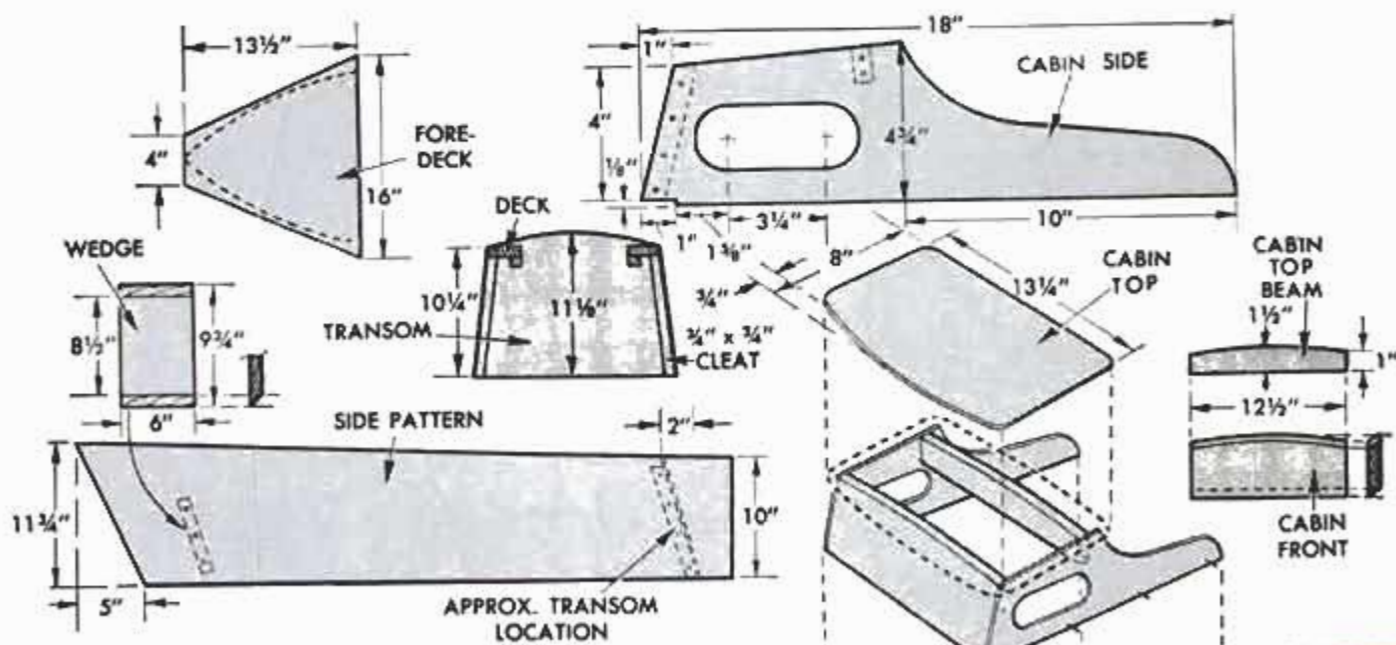
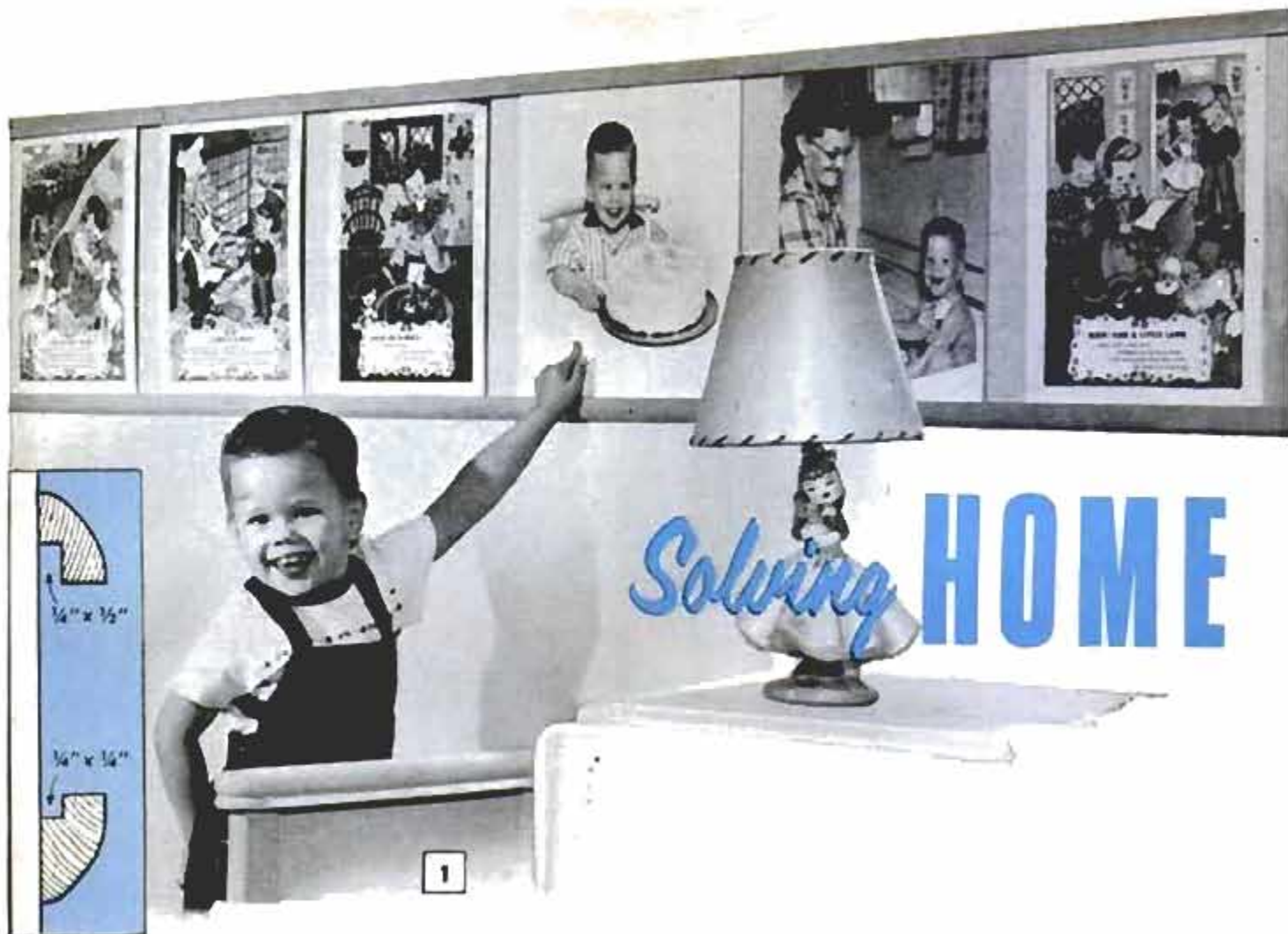




Photo courtesy Masonite Corp.

With Sister at the "wheel" of the cruiser, the front lawn can be a storm-tossed sea or a quiet inland lake





1. STRIPS OF MOLDING rabbeted as indicated and fastened to a wall, provide a simple method of displaying photos and drawings in a child's room. The strips are spaced $13\frac{1}{2}$ in., so 14-in. photo will fit

2. CRISP CEREALS AND CRACKERS are assured when they are stored in modified cabinet above gas refrigerator. Replacing bottom of cabinet with expanded metal allows heat to enter and keep contents dry

3. WHEN MAKING BREAD CRUMBS with food grinder, avoid the usual need for cleaning countertop. Tie a plastic bag over the discharge end of the unit as shown so crumbs will drop directly into the bag

4. FREQUENTLY USED SPOOL OF THREAD is kept handy by dropping it into small jar with screw top. Thread is passed through slit in cork fitted in hole cut in the lid, eliminating the problem of tangling



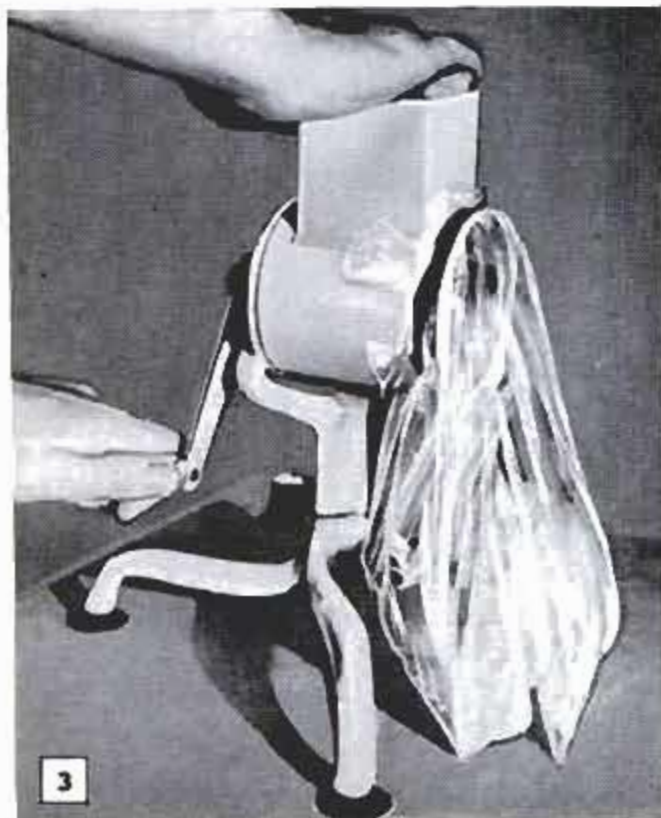


PROBLEMS

5. WHEN SOLDERING A BROKEN LINK in a locket chain, position it for easy working by inserting a wooden toothpick through two adjacent links as shown, so the damaged link stands out by itself

6. SOILING DOORKNOBS WITH PAINT from your hands during a decorating job can be avoided by tying small paper bags over the knobs. Household plastic wrapping also is ideal for this purpose

7. PREVENT WINDOW SHADES FROM BLOWING when a window is open by replacing the usual ring or pendant on the shade cord with suction cup. The cup is pressed onto smooth surface of the window sill



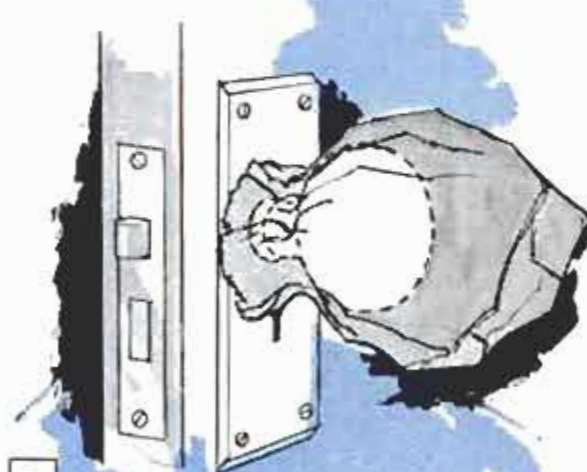
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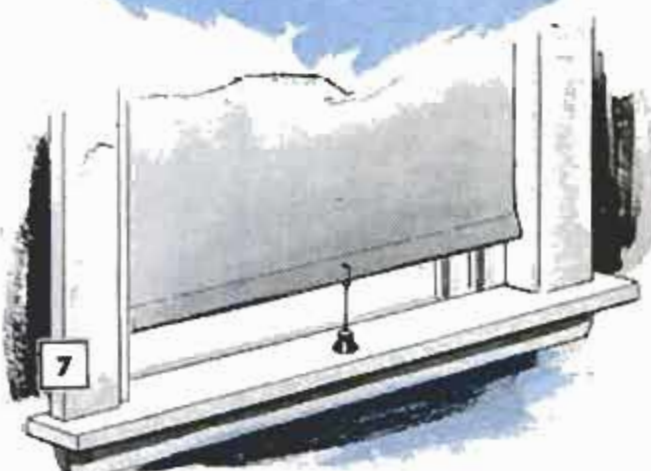
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5



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7

Cabinets Fitted The Easy Way



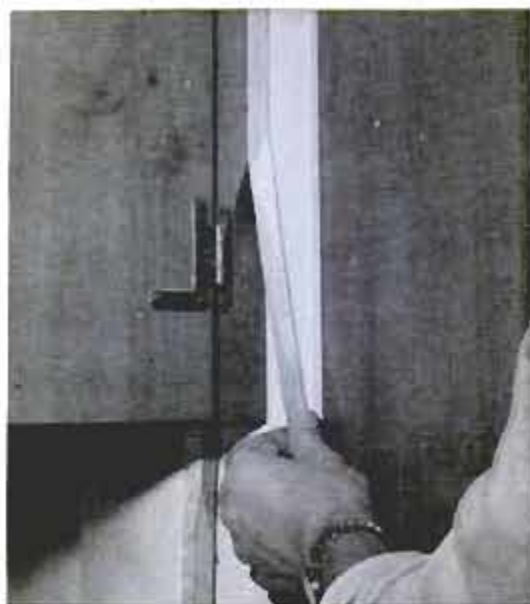
Above, cabinet corner member is cut along line marked on tape so that it fits flush against wall having irregular surface

MAKING THE END of a kitchen cabinet fit flush against a wall is easy if done as recommended by Western Pine Assn. First prop the cabinet in place. Then apply a strip of masking tape to the cabinet member that butts against the wall as in the upper right photo. Set the legs of a compass to the widest part of the gap between the cabinet and wall and trace a line on the tape as in the lower right photo. Be careful not to change the compass setting and keep the metal point in contact with the wall at all times. When a member does not extend sufficiently beyond the end of the cabinet to permit trimming along the line traced on the tape, a strip of matching stock must be added to it. The same procedure applies for fitting each end of a cabinet.

Strike Two Chalk Lines at Once

To save time when striking two parallel chalk lines while working alone, here is what one home craftsman does. One end of the chalk line is tied to a common nail driven on the first mark of the first line and then stretched around a finishing nail driven on the first mark for the second line. After moving to the far end of the chalk line, the second line is struck. It is then pulled taut and allowed to snap free of the finishing nail, after which the line is picked up and positioned to strike the first line, saving a trip to relocate the secured end.

Nils E. Mockler, Putnam Valley, N. Y.



Above, cabinet is propped in position and member next to wall is taped for marking. Below, surface irregularities of wall next to cabinet are outlined on tape by compass

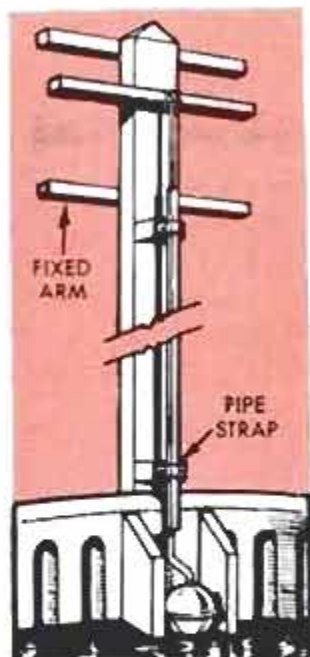


"Ping" Okay When Starting Car

Some late-model cars with high compression engines "ping" when starting; the ping is caused by the fuel igniting prematurely in the cylinders. This is not detrimental to engine life and apparently is a "dieseling effect," wherein the heat developed by compression causes the fuel to explode as in a diesel engine, according to Champion Spark Plug Co. If such ping does not disappear after starting when the pistons are moving at a higher rate of speed so that the fuel charges can be ignited at the correct time, check the ignition timing. If the latter is correct, you may be using too low a grade of fuel.

Water Level in Distant Tank Indicated by Float Gauge

Water level in a stock tank located some distance from the farmhouse can be checked visually with this gauge. It consists of an upright post bolted to the tank on which two crossarms are spaced a distance equal to the depth of the tank. An aluminum crossarm is fastened to a $\frac{1}{4}$ -in. aluminum rod that slides inside a $\frac{1}{2}$ -in. pipe which is clamped to the post. A float fastened to an offset on the lower end of the rod slides between guides so it cannot turn and bind the crossarm.



Checking Ignition Polarity

Reversing the polarity of an ignition coil by accidentally switching the primary wires will not prevent an engine from running, but will make it hard to start, cause rough idle, and the spark plugs may misfire on acceleration. From 35 to 40 percent more voltage is required to fire the plugs when coil polarity is reversed. A coil tester may be used to test coil polarity, or a high-tension voltmeter may be employed. For the latter, ground the positive lead of the meter and touch the negative lead to the terminal of a spark plug when the engine is running. If the needle swings up-scale, polarity is correct. A home mechanic can hold a wooden pencil between the plug and wire to make the test. If the spark flares on the plug side of the pencil lead, polarity is correct, being negative to the plugs.

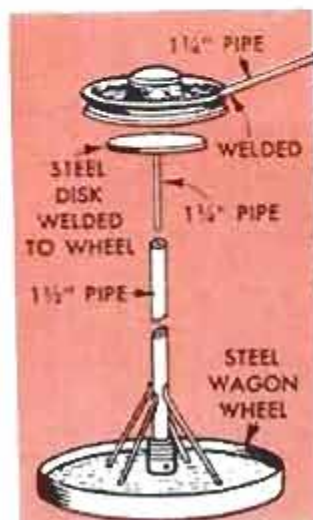
"Double End" Worm Container

If you fish with worms, you will have no problem digging them out of a container because they move to the bottom, if you use a container that is "double ended." Remove both ends from a food tin, then use two tins of slightly larger diameter as caps. When ready to bait a hook, invert the tin, remove the lid and the worms will be right at the top of the material in the container, ready to be selected.



Rotating Clothesline Utilizes Wagon and Auto Wheels

Assembled mainly from steel pipe, this rotating clothesline is located adjacent to a sidewalk to avoid wet feet. An auto wheel supports the line-holding arms, and is welded to a steel disk that is welded to a length of $1\frac{1}{4}$ -in. pipe. The latter fits inside a column of $1\frac{1}{2}$ -in. pipe which is welded to a steel wagon wheel. Braces are welded between the column and spokes, and the assembly is set in concrete as indicated.—A. W. Ranniger, Carroll, Iowa.





POPULAR MECHANICS presents its 4th annual outdoor-living section—16 pages of ideas for converting your back yard into an open-air "room" where you can bask, dine and spend the summer in true lazy-man style. Included is a waterside home for the boating family—a summertime retreat that tucks away for the winter, furniture, boat and all

Unusual and Modern Ideas for Living Outdoors

By Wayne C. Leckey

THE BIG MOVE will soon be under way—to the back yard, that is. Families everywhere will begin the popular trek to the great outdoors for a delightful summer of informal living and dining at home.

If you are new in joining America's outdoor way of life, you can get in on the fun

on the most limited budget. You can start out with a patio slab, a picnic table and a portable grill. Actually, this meager beginning can be a part of an ultimate plan that eventually will take in the entire back yard. You don't have to do the whole job at once. It can be spread over several years.



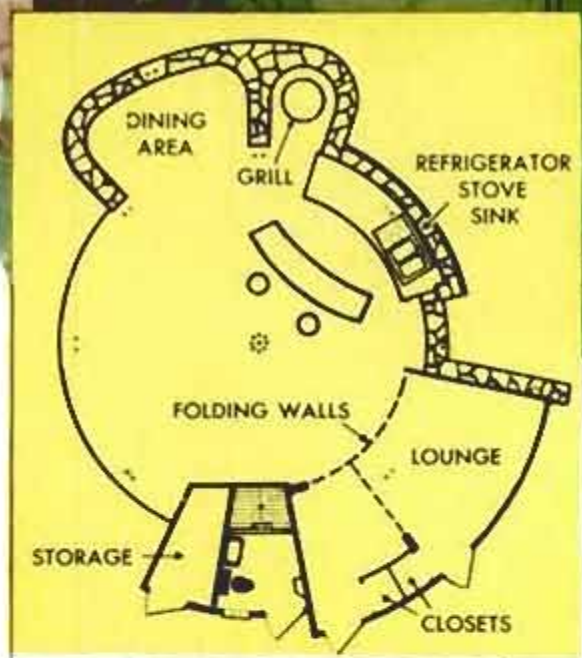
SHELTERS



PATIOS



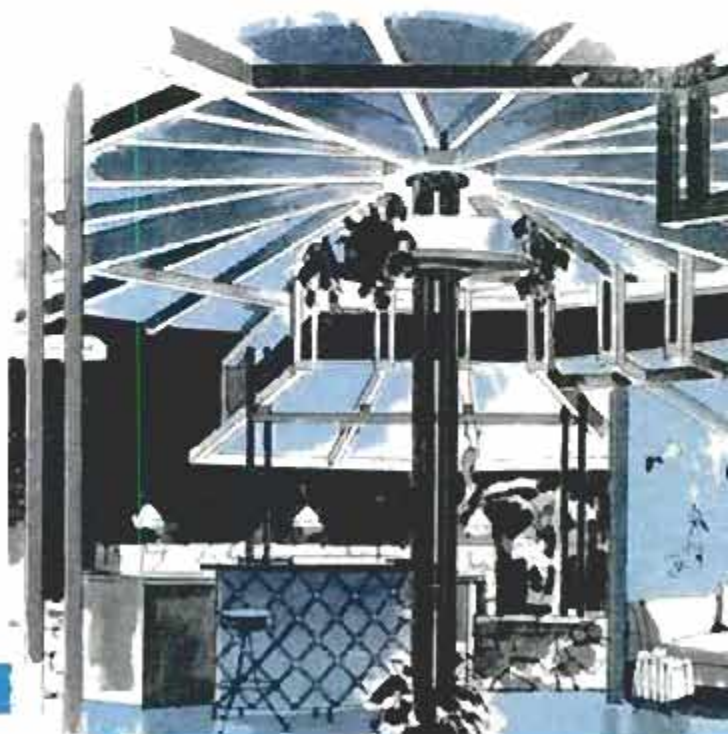
LIGHTING

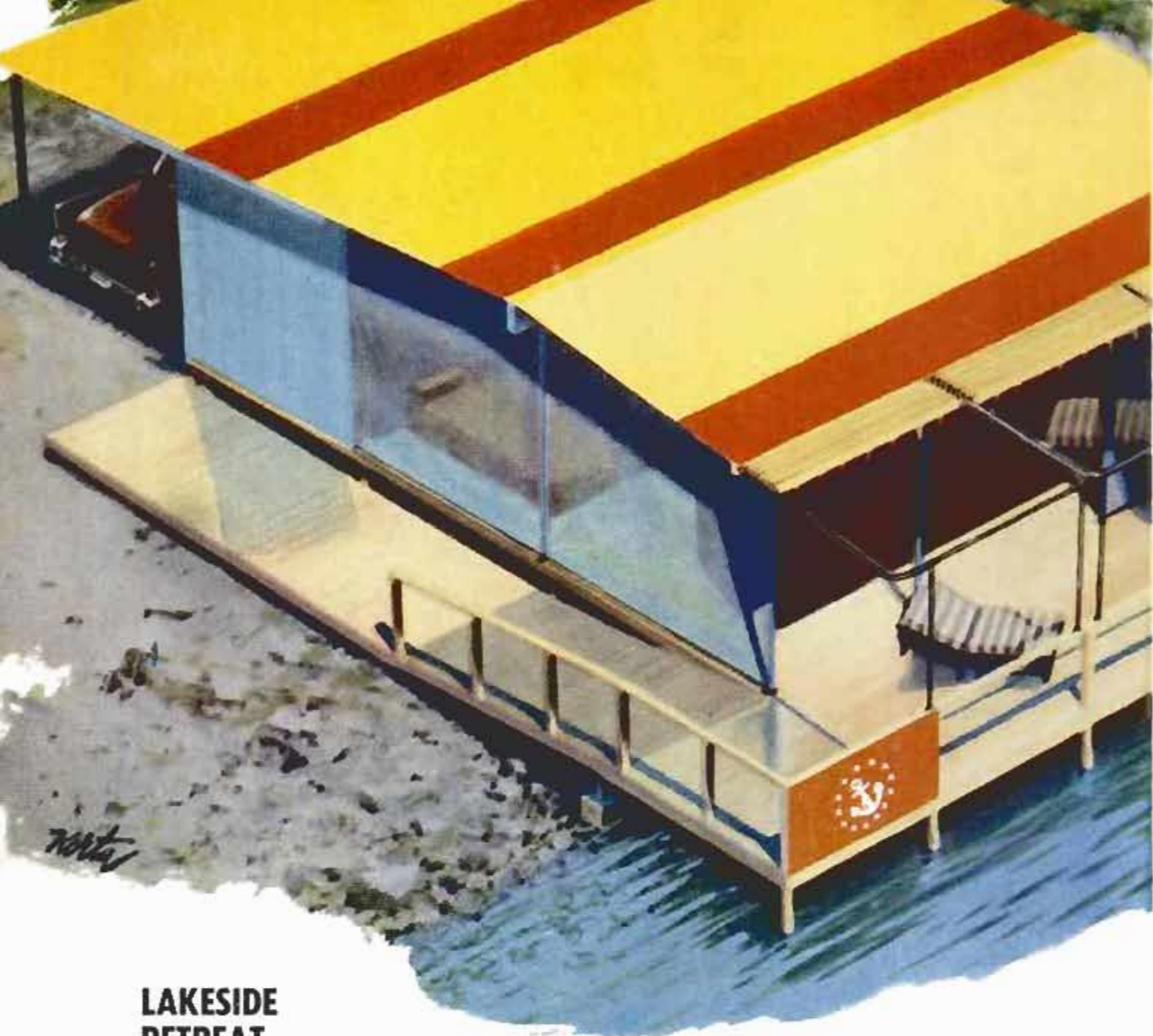


This swank cabana was designed for the Robert Goldsmiths of Beverly Hills, Calif., by architects Robert Kleigman, A. I. A., and Matthew R. Leizner, A. I. A.

How spacious and fancy need a patio be? That's up to you. Partial shelter usually is preferred to a roofless slab, not only for the protection afforded but for the additional feeling of privacy it gives. A good example of the ultimate in patios is the luxurious lawn cabana shown above. Most unusual in construction, its two "umbrella" roofs provide protection from the sun and rain, and the structure is sufficiently open and airy to retain the feeling of being outdoors. Designed for poolside use, the

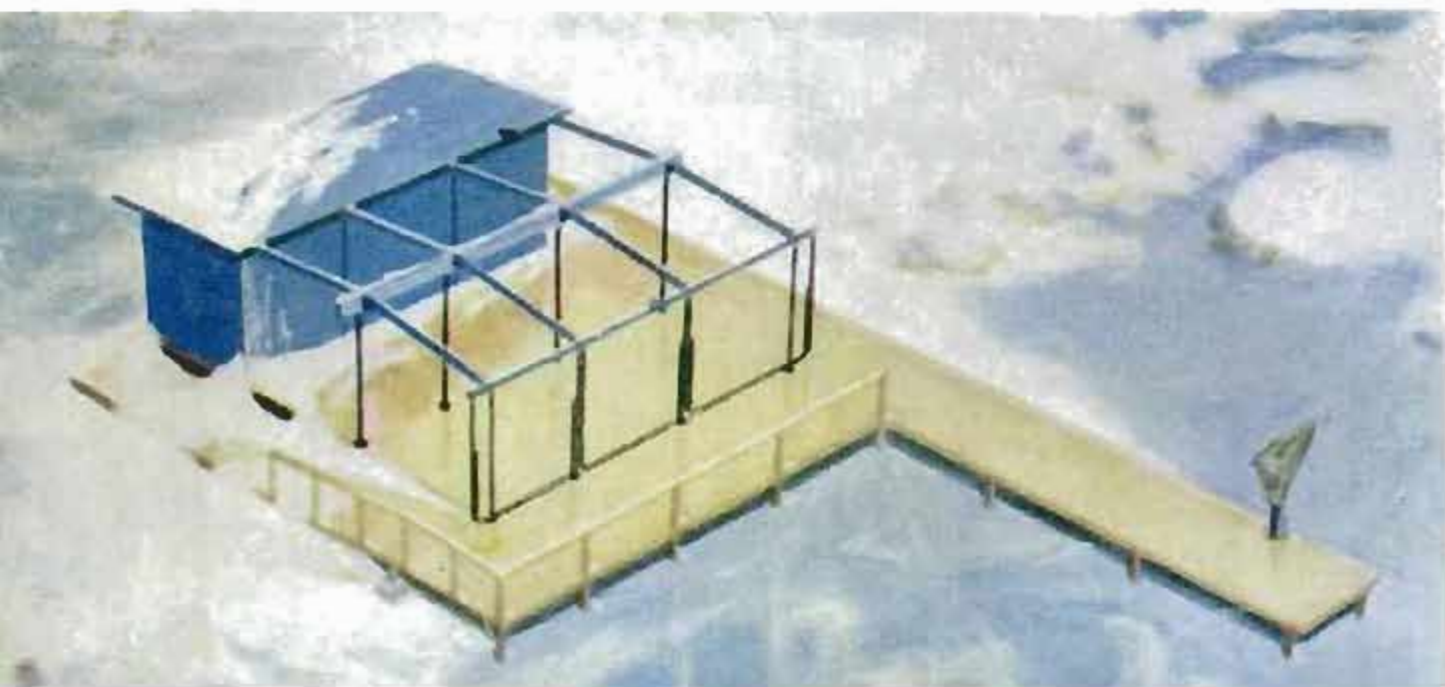
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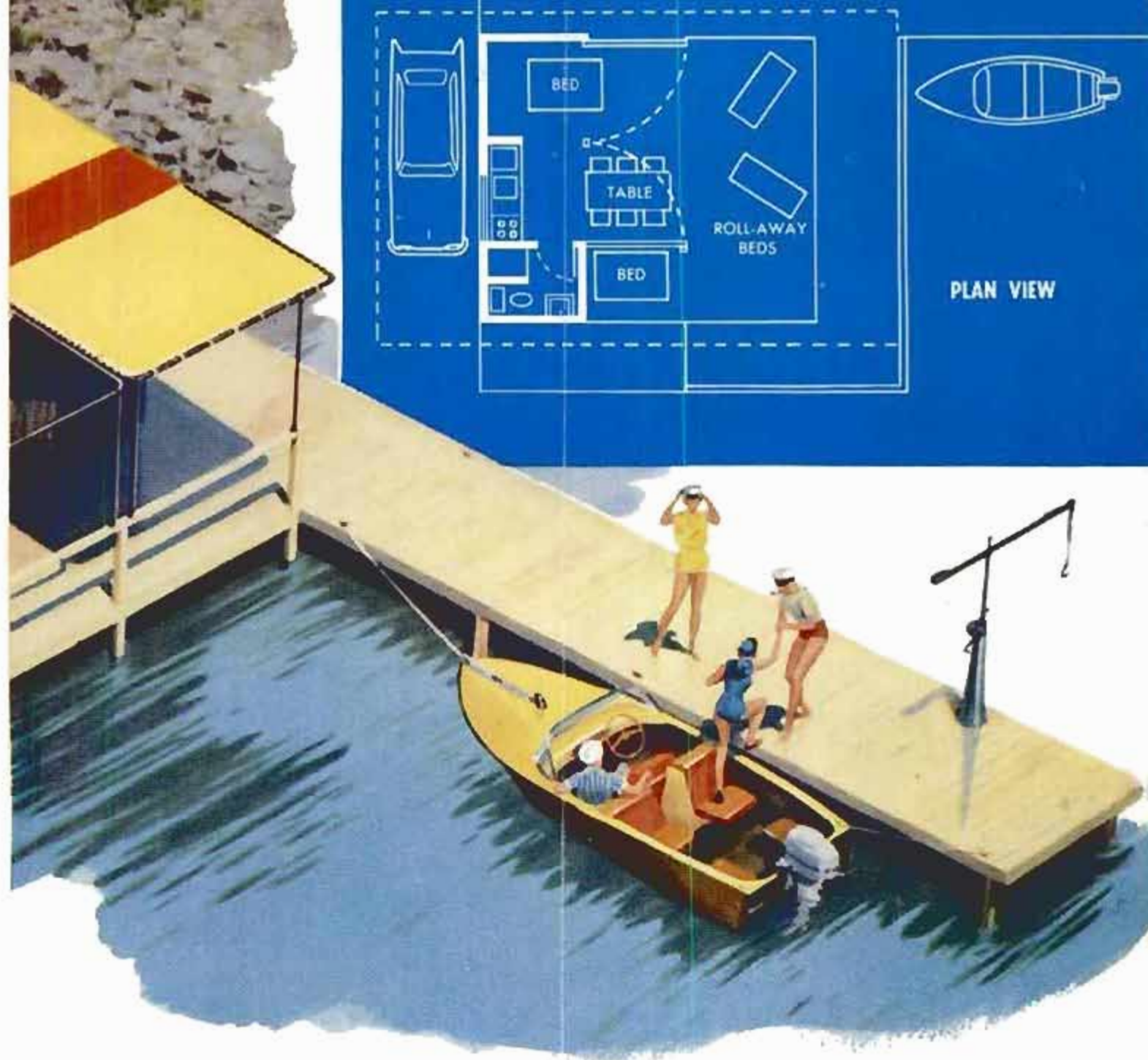




LAKESIDE RETREAT

Saying adieu to your lakeside abode when the boating season ends is about as simple as packing a suitcase. The whole affair, canvas roof, beds, furniture and side screens—plus your boat and motor—tucks away safely for the winter in a boxlike structure that is the core of this outdoor patio on water. Pipe supports fold down





OUTDOOR LIVING need not be confined to the backyard necessarily. The boating family, for instance, can enjoy all the good things that go with patio life at a near-by lake in a dream home like this. Created for the Family Boating Bureau of Johnson Motors by Dave Chapman, Inc., Industrial Design, the bold planning reflects the growing interest in waterside living and things to come.

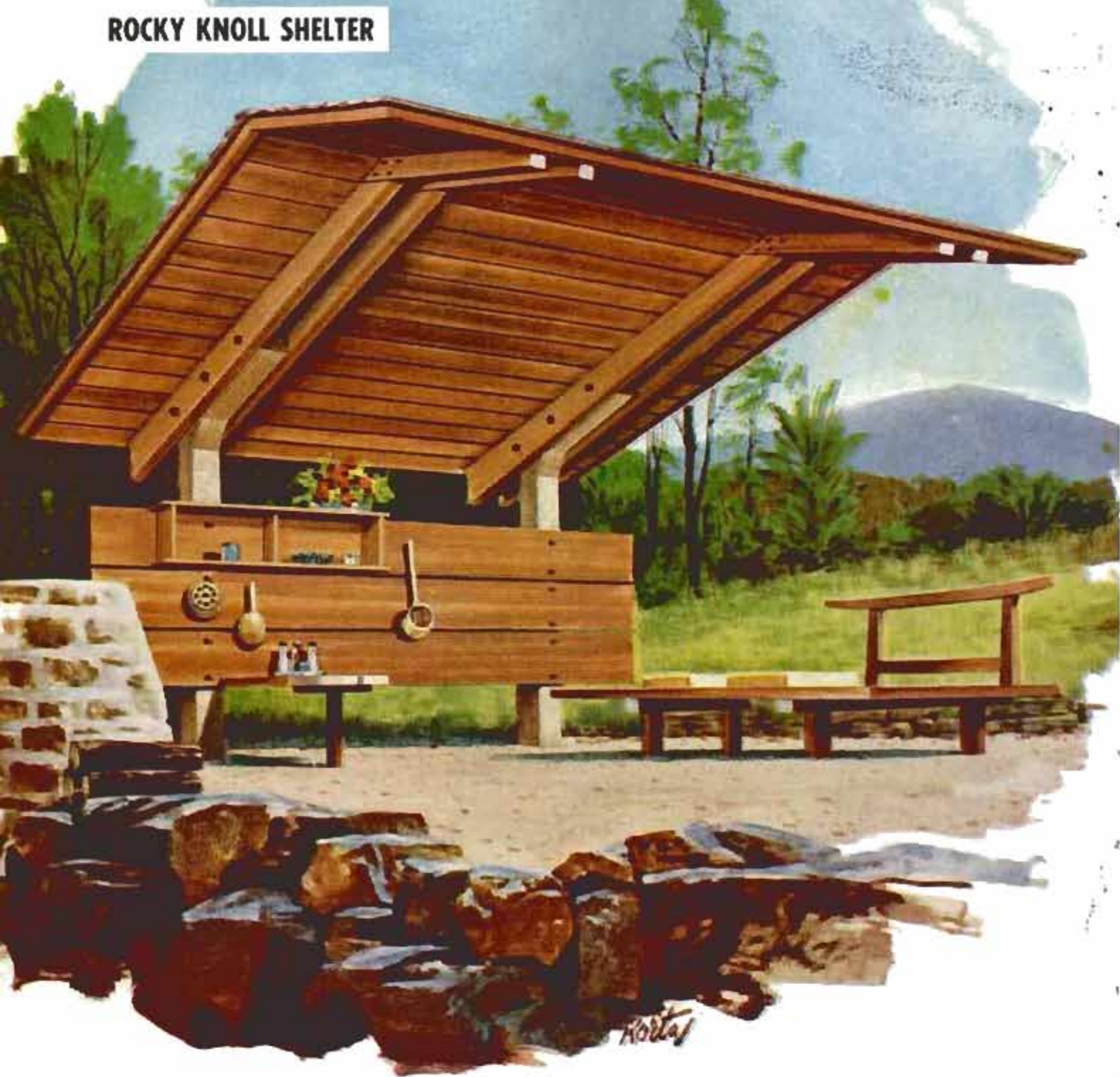
Planned as a place where mom and the kids can spend a lazy, carefree summer, and dad, the week ends, the basic design permits the home to be quickly stripped and tucked away for the winter in a box-like structure that is a part of the platform and pier. From its bare beginning, the basic design can be expanded into a permanent year-round dwelling. The first-year ver-

sion as pictured here shows the structure as being little more than a platform covered with a canvas roof and open on three sides. A core unit which houses toilet, bath and cooking facilities, has wide doors which form walls when open. By replacing the canvas with a permanent roof, substituting solid walls of glass and wood for the drop screens and installing a heating system, the strictly summer version becomes a practical year-round home.

In the basic plan, only the bare essentials for dining and sleeping are considered. Standard box springs and mattresses, plus roll-away beds which become lounges during the day, provide sleeping for four. Table and chairs of the folding variety permit all the furniture to be stored inside the

(Continued to page 190)

ROCKY KNOLL SHELTER



A most unusual outdoor room is this redwood lanai which blends with a ranch-style home and a wooded setting

cabana has dressing and lounging rooms that can be closed off by accordion walls, toilet facilities, a refreshment bar, plus everything needed for family cookouts and party entertaining. It has a smooth floor for dancing and a dining nook partially walled with stone.

Western outdoor living becomes a way of life that can be enjoyed a good part of the year with the redwood lanai (above), designed and built by George Nakashima, renowned woodworker, for the Simpson Redwood Co. Its unique cantilever design captures the casualness of the West and reflects the Orient to make it especially appealing in a rustic, wooded setting. A de-

tailed plan for building this patio shelter is available for the asking from the Simpson Redwood Co.

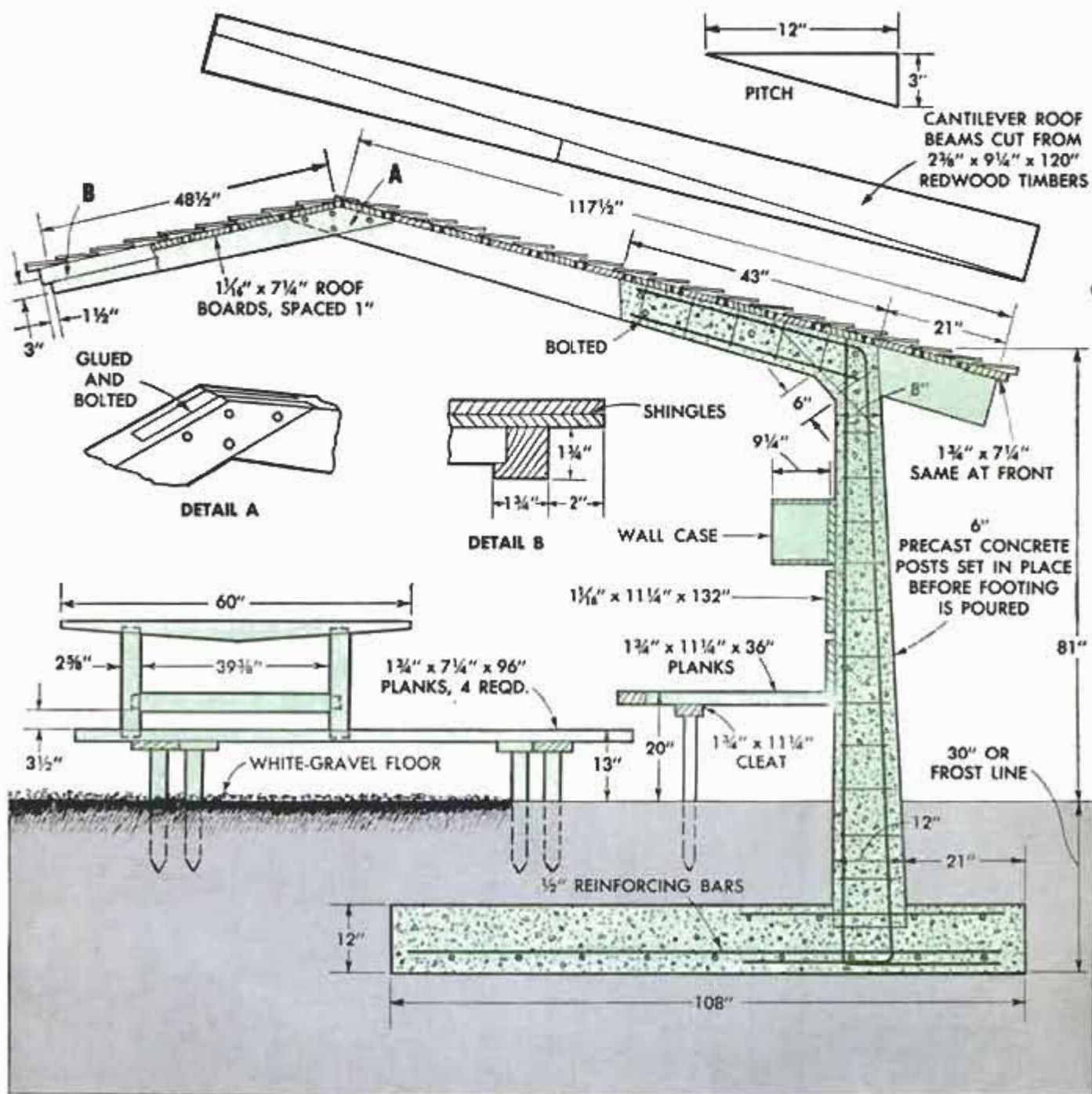
Construction of this free-standing structure features two precast piers of reinforced concrete which support an arched cantilever roof. The sectional elevation drawing on the opposite page shows how the piers are solidly anchored in a reinforced slab footing measuring 9 ft. square. The roof beams are bolted securely to the piers, then covered with roof boards and wooden shingles. The overhanging roof affords shade and weather protection to a gravel-covered patio free of additional posts. The redwood is left unpainted so that the nat-

ural warm, russet color of the wood, in time, changes to a soft driftwood gray. A windbreak is provided by bolting three wide boards to the concrete piers. The resulting wall is used to support a shelf and utensils, as well as a low worktable for the family chef. The combination table-and-bench lifts off its stake legs for storage.

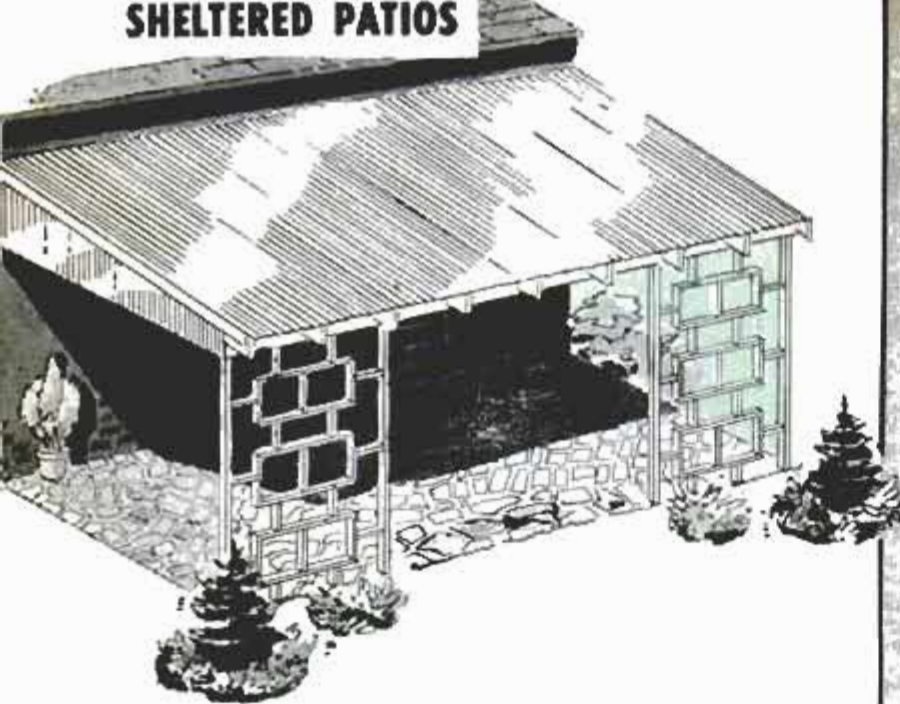
Your home may lend itself to an attached patio. If it does, there are several lightweight materials especially suitable for decking it. One is Diamond-Rib aluminum. An embossed, corrugated panel, it comes 48 in. wide and from 6 to 16 ft. long, and because of a special rain-channel crimp, the overlapping sheets cannot leak. Colorful panels of glass fiber, such as Filon and Corrulux, are other materials. Being translucent, they are ideal for patio roofs since they transmit soft diffused light and glare-free shade.



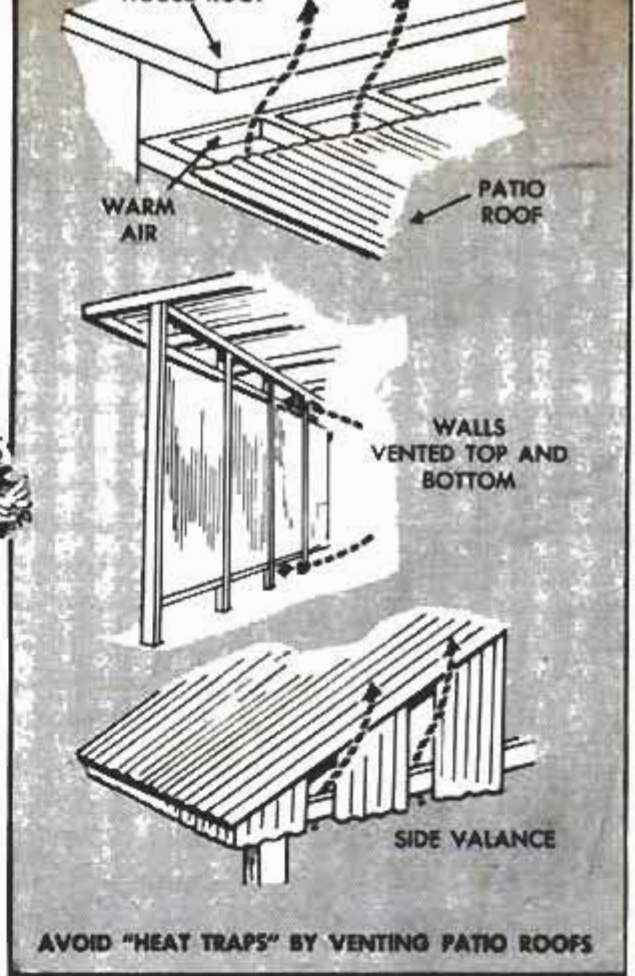
Table is designed so it serves the dual purpose of a table and seat. Natural-color rattan pillows are the "chairs." Table top rests on stake legs so it can be lifted off and carried inside for the winter



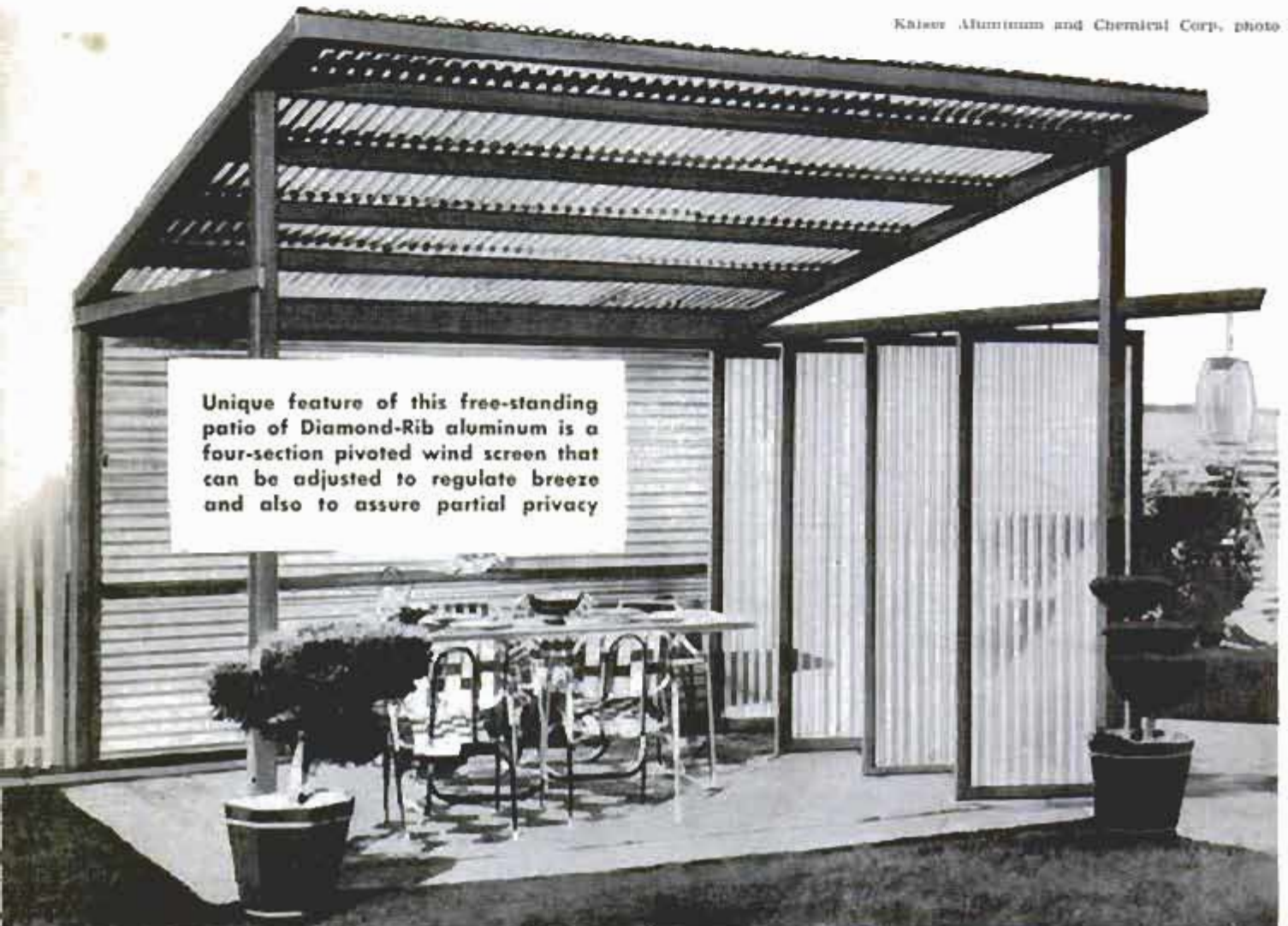
SHELTERED PATIOS



A roofed patio will radiate heat and unless vented to let the trapped heat escape, the heat will be noticeable. The details at the right show how roofs, walls and valances that are covered with plastic or other material, should be vented to assure adequate circulation of air and a cool enjoyable patio



Kaiser Aluminum and Chemical Corp. photo



Unique feature of this free-standing patio of Diamond-Rib aluminum is a four-section pivoted wind screen that can be adjusted to regulate breeze and also to assure partial privacy

Handiness of the portable charcoal grill and brazier has made cookouts sheer fun for all. The latest in these portable grills is the covered kettle type which cooks without flame and can be used indoors as well as out, since there is no smoke. Heat is controlled through dampers in both the cover and the bowl. Constant turning of meats or fowl is not necessary as reflected heat cooks from all sides. Dampers let you snuff out the fire and reuse the unburned charcoal. Kettle grills come in various sizes and with or without wheels.

Newest and most novel innovation in permanent-type outdoor fireplaces is the take-it-with-you one shown below. This one is a knockdown affair since the concrete logs interlock like building blocks and do not require mortar. Logs are made of lightweight shale aggregate which stack around a metal firebox. The complete fireplace sets up in minutes.

Your cookout facilities can be as elaborate as the grill shown above. Made a permanent part of the patio, it incorporates a built-in Dutch oven. Both oven and grill have cleanouts at the bottom. Such permanent-type fireplaces can be built by the do-it-yourselfer, using stone, brick or concrete blocks. A novel fireplace can be assembled from regular concrete blocks, using the core holes in the blocks to form a ready-made chimney flue. Plans for building several fireplaces are included in a *Popular Mechanics* booklet, *Build Your Own Barbecue*.



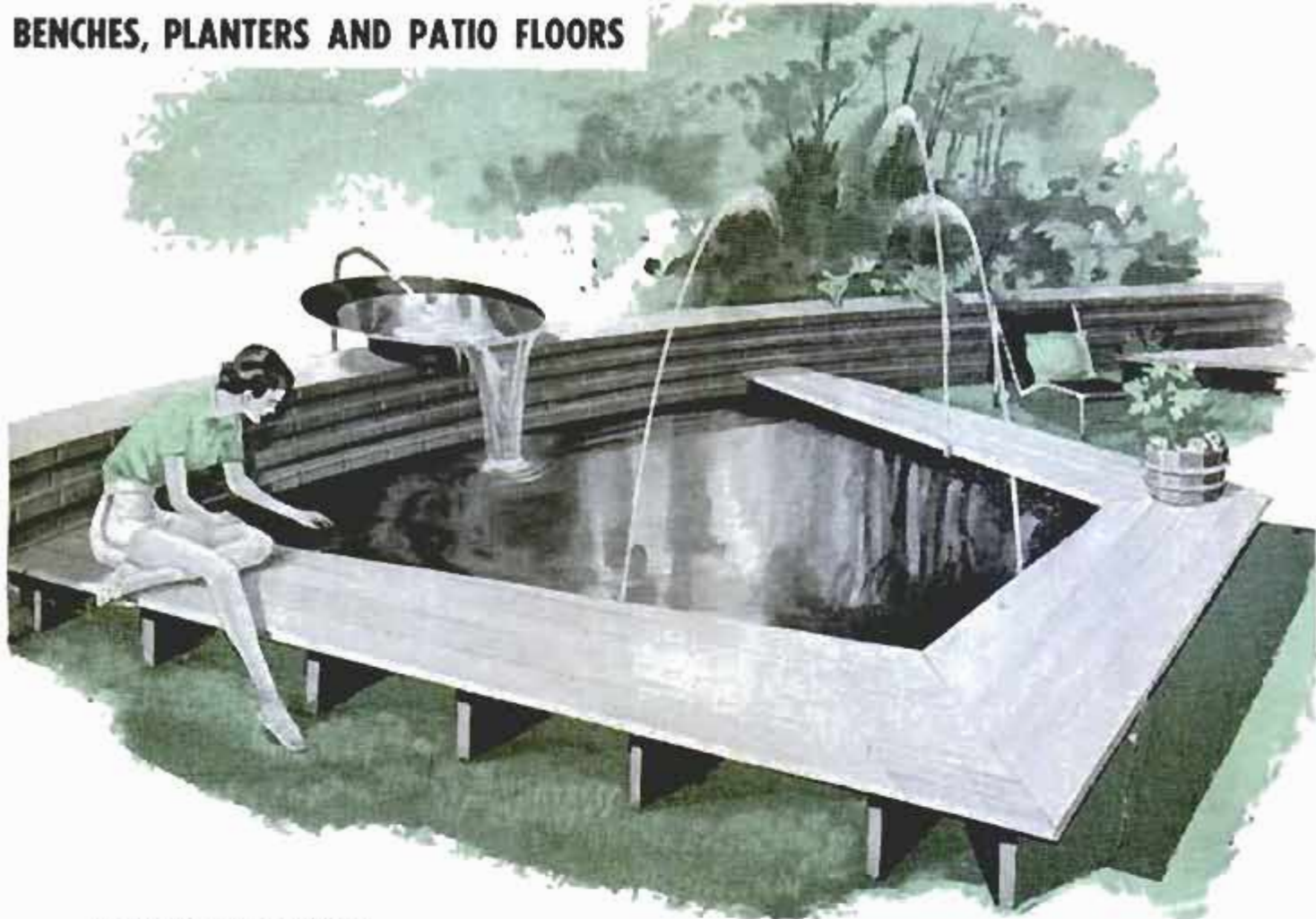
Above, Dutch oven and barbecue grill are housed in an attractive brick structure fitted with a shingled canopy. Below right, hooded brazier is out of way by being attached to fireplace wall and piped directly into chimney

Weber Brothers Metal Works photo



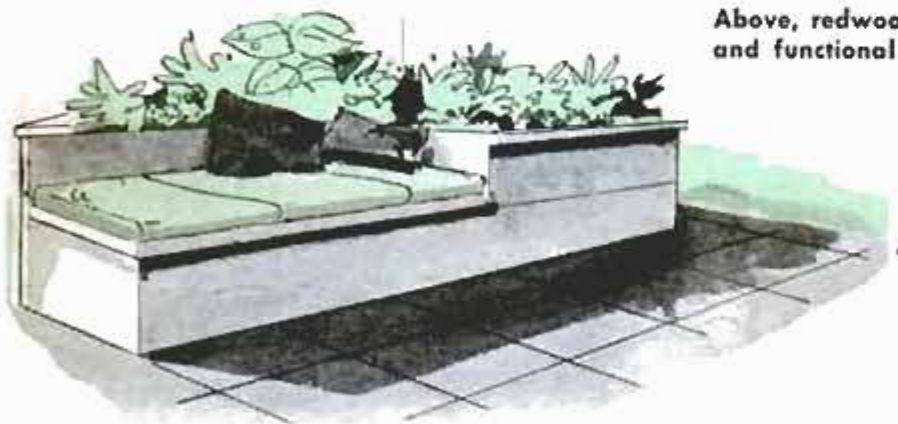
Irions' Concrete Block Co. photo





Courtesy Simpson Redwood Co.

Above, redwood bench in free form adds interesting and functional border to a patio fountain and pool

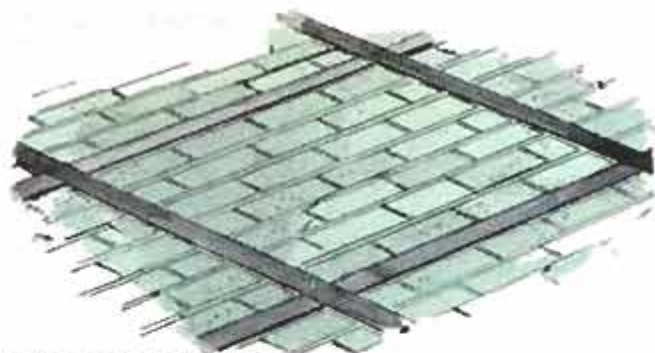


Left, combined with a planter, this unique built-in bench will add a conversation piece to your patio. Padded cushions are covered with a water-repellent material to withstand rain, dampness

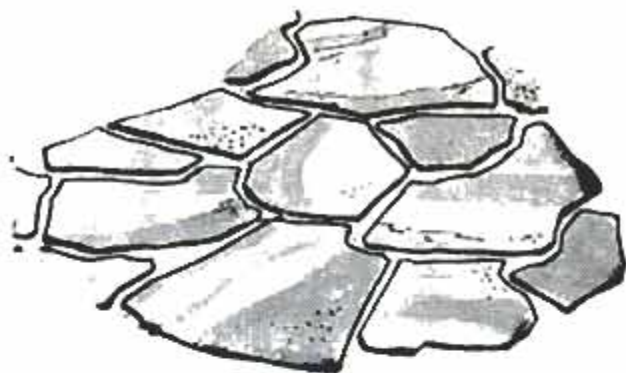
Below, planters can be of wood and metal. This one shows how Diamond-Rib aluminum forms four sides



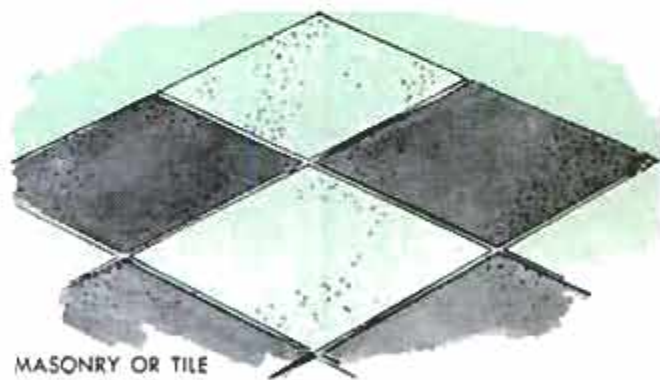
Benches and planters are as much a part of your outdoor room as the patio floor itself, not only from a comfort standpoint but beauty as well. Redwood is the most durable wood to use for outdoor furniture, painted or unpainted. Other woods will do if first treated with a wood preservative, such as pentachlorophenol or copper sulphate, and kept well painted. If you are handy with tools, you can make a lot of your own patio furniture, following some of the unusual ideas presented here, or pieces of your own design. In the case of planters, they should be fitted with metal containers to prevent wood rot. Benches can be incorporated into planters and fitted with colorful weatherproof vinyl cushions to make them more inviting.



BRICK AND REDWOOD



FLAGSTONE



MASONRY OR TILE

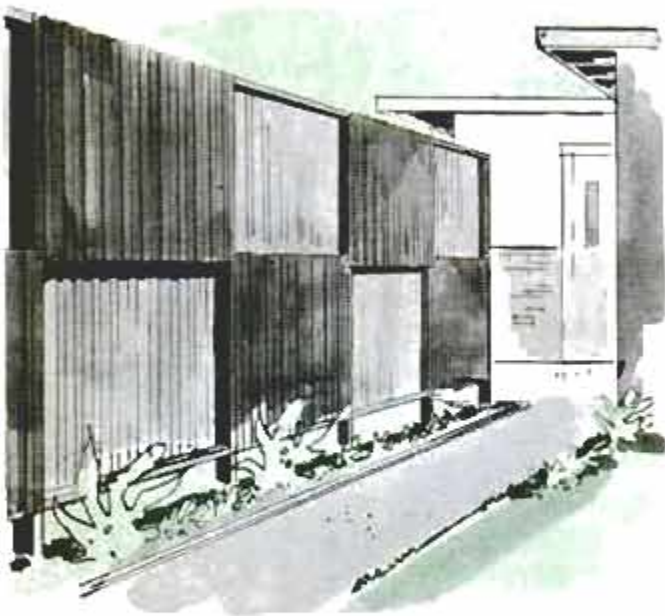
Deciding factors in the type of patio you pick depend on the amount of money and effort you wish to spend. Simplest and cheapest patio you can build is one of 2-in. masonry blocks laid $\frac{1}{4}$ in. apart on a 2-in. bed of tamped sand. Dry sand swept into the cracks between the patio blocks is settled by spraying the surface with a hose. While it will cost a little more, dry portland cement sprinkled on the sand bed beforehand will give a better bedding. You also can fill the cracks with soupy mortar instead of sand. In addition to masonry units, you have a choice of flagstone, concrete brick, slate, redwood, common clay brick, precast slabs of colored concrete and poured concrete.

Three popular patio floors are shown above. If you feel ambitious, you can cast your own paving slabs and add a personalized touch by impressing the hand and foot prints of youngsters in the individual slabs

Simpson Redwood Co. photo

Redwood spaced for drainage and laid in squares adds an interesting parquet pattern to all-wood patio floor





Painted checkerboard style, this eye-stopper fence consists of aluminum panels applied to opposite sides



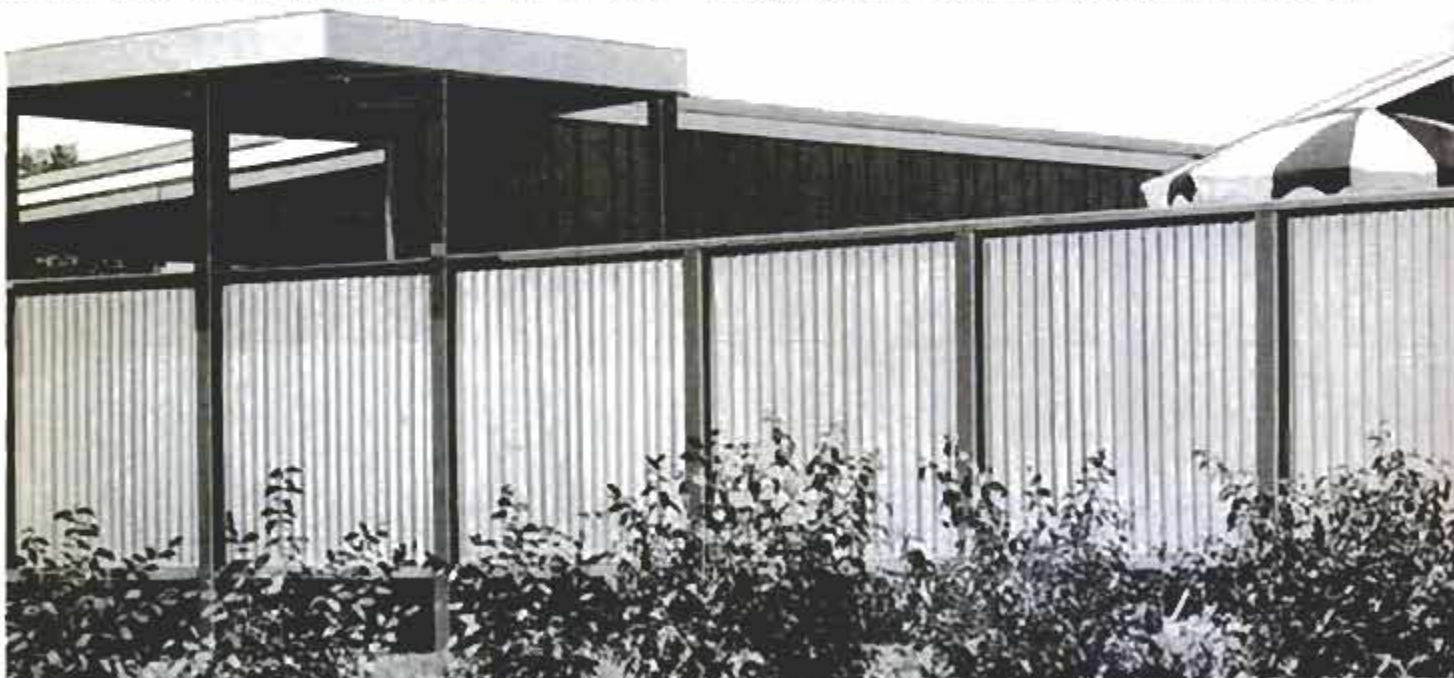
Attractive masonry wall combines regular 4-in. concrete building blocks with ornamental criss-cross ones
Courtesy National Concrete Masonry Association

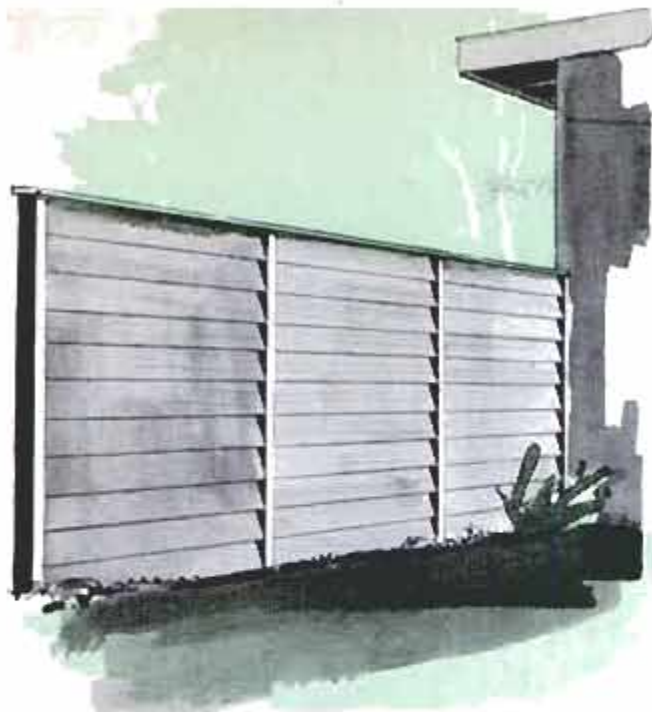


Lightweight inserts of corrugated aluminum make a modern patio enclosure that requires no painting

Privacy is the best reason for having a fence around your patio. Screened from direct view of neighbors or passersby, you will feel less like a fish in a bowl and free to relax in solid comfort. In addition, a fence will serve as a windbreak and add a decorative touch as well. If you are handy with hammer and saw or a trowel, there are any number of attractive and simple fences you can build, a few of which are shown on these two pages. Stock fencing is available by the running foot at lumberyards, which simplifies the job to the setting of posts.

Since a fence or windbreak is only as durable as its posts, you should pick a wood that contains natural preservatives against the two enemies of wood—termites and fungus growths, which produce rot and de-





Louver pattern has redwood boards set at angle to control strong cross winds, assures complete privacy

cay when the wood is in direct and prolonged contact with the ground. Redwood and cedar have these natural preservatives. Where other woods are used they first should be treated with an artificial chemical preservative of the paint-over type. A popular and fairly simple fence to build is a woven one. Here, the horizontal rows of boards are laced in and out through the posts, starting at the bottom and alternating the weave so that succeeding rows of boards fall on opposite sides of the posts.

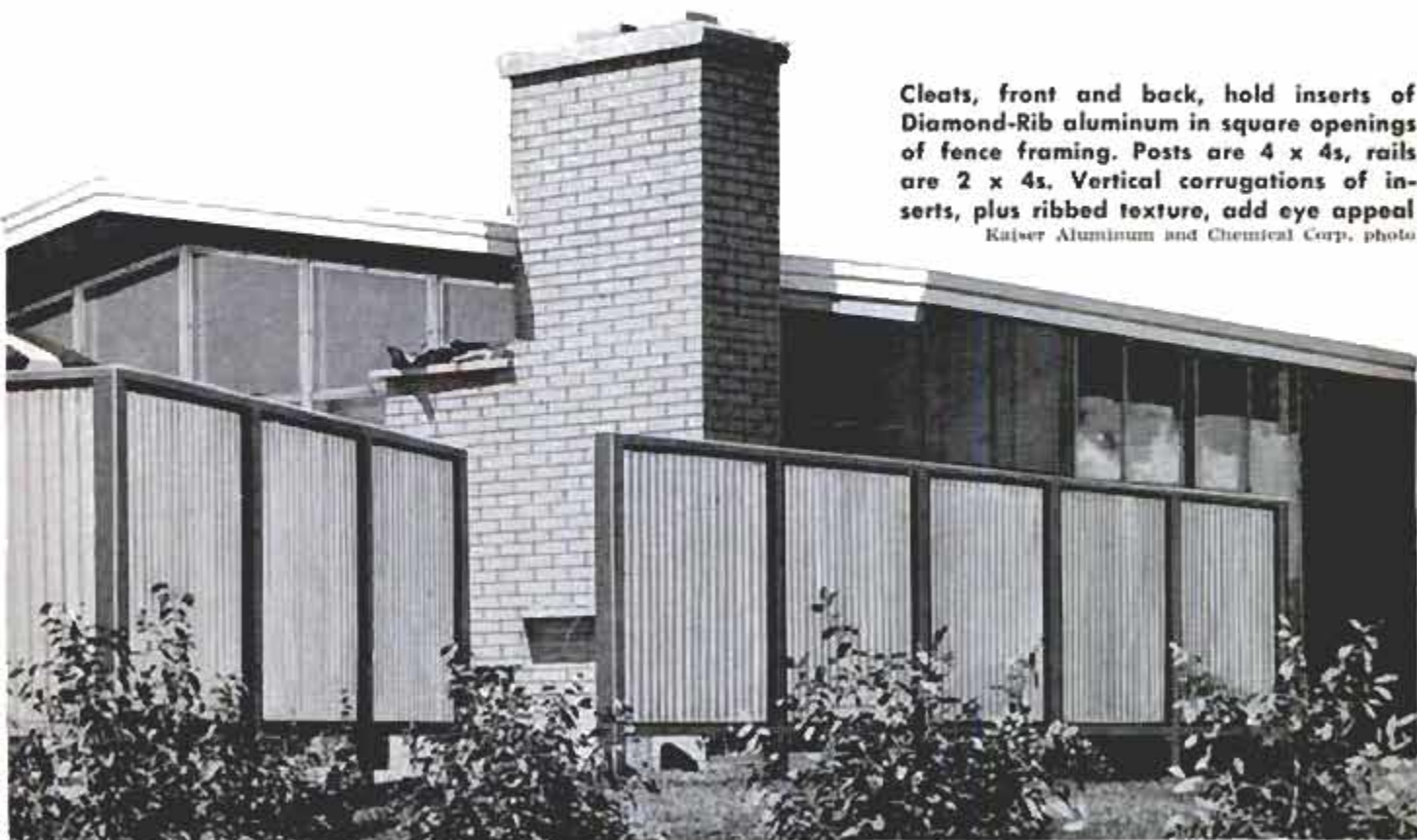
Another simple fence to build is one



California Redwood Association photo

Blocking adds decorative touch to plain fence. Posts are 4 x 4s, blocking between 1 x 4s is 2 x 4s

where the rows of boards are nailed to opposite sides of the posts, the first row to one side, the second row to the opposite side and so on up to the top. The boards may be spaced an inch or so apart to make the fence partially open or kept tight by keeping the edges of the opposite rows even. Both of these fences are "good" both sides as compared to a picket fence, for example, where the posts are completely exposed on one side. Standard 1 x 6 and 1 x 8 boards need only be cut to length in building either of these fences.



Cleats, front and back, hold inserts of Diamond-Rib aluminum in square openings of fence framing. Posts are 4 x 4s, rails are 2 x 4s. Vertical corrugations of inserts, plus ribbed texture, add eye appeal

Kaiser Aluminum and Chemical Corp. photo

OUTDOOR LIGHTING



General Electric photo

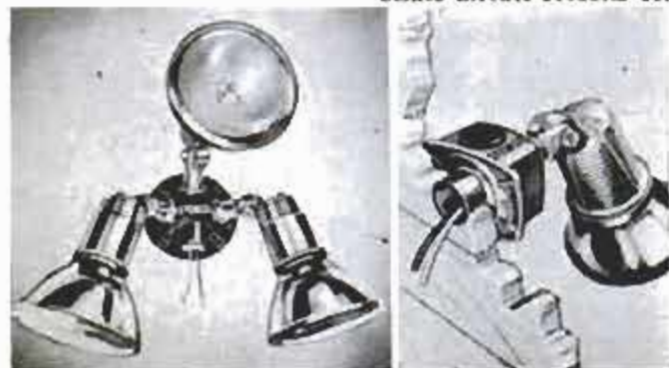


Egg-crate roof over patio permits projector lamps to be concealed in open wells as in detail above. These lamps also come equipped with spikes for ground placement



Two popular fixtures for outdoor lighting are the bullet type with metal or plastic housing and the enclosed floodlight type having colored glass which snaps in place

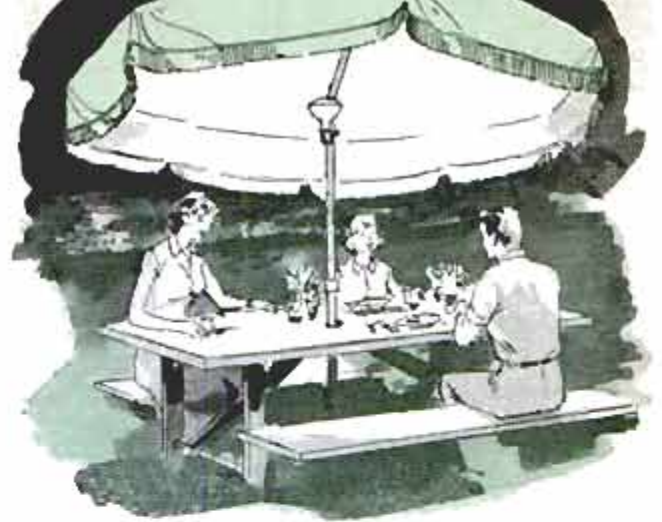
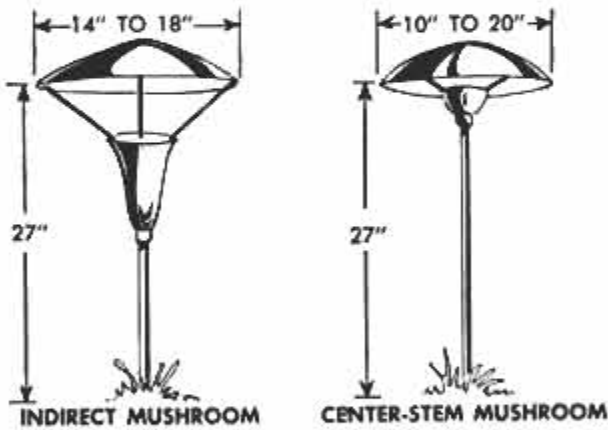
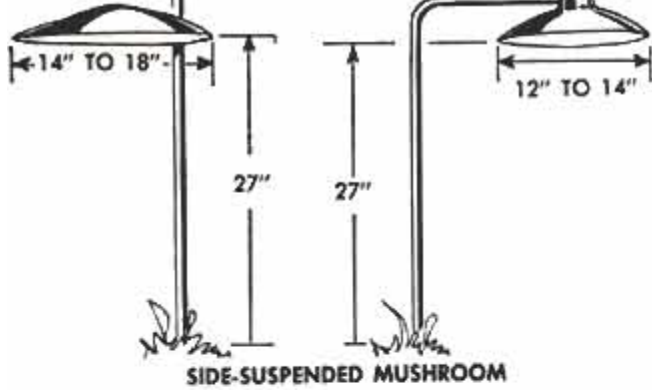
Stonco Electric Products Co.



Chances are you'll enjoy your patio more after sundown when it is cool, and this means you will have to devote some thought to outdoor lighting. This will involve not only the patio, but the flower beds and play areas as well. A gaily lighted terrace or patio will add savor to food and spark to cookout entertaining. Bubble units fitted with 75-watt-reflector lamps and hung overhead as shown in the photo above, will provide exciting spotlight drama to buffet dining. The lightweight units are easily hung from a patio ceiling, or roof overhang. Lighting can make your flower beds a colorful focal point of the outdoor room at night if you embed mushroom-type fixtures among them.

Proper wiring, permanent or temporary, is essential for the extension of outdoor living at night. Permanent outlets, of course, facilitate installation without the potential hazards of temporary wiring stretched across walks and driveways. Fence posts, trees and buildings are a few locations where weatherproof outlet boxes can be mounted. Separate circuits, with switch control either inside or out, should be provided. It is always wise to turn off

Left, new floodlighting fixtures for patio lighting include surface-wall and through-wall mountings that do not require separate splice boxes. Full length, cast box covers hold up to four lampholders



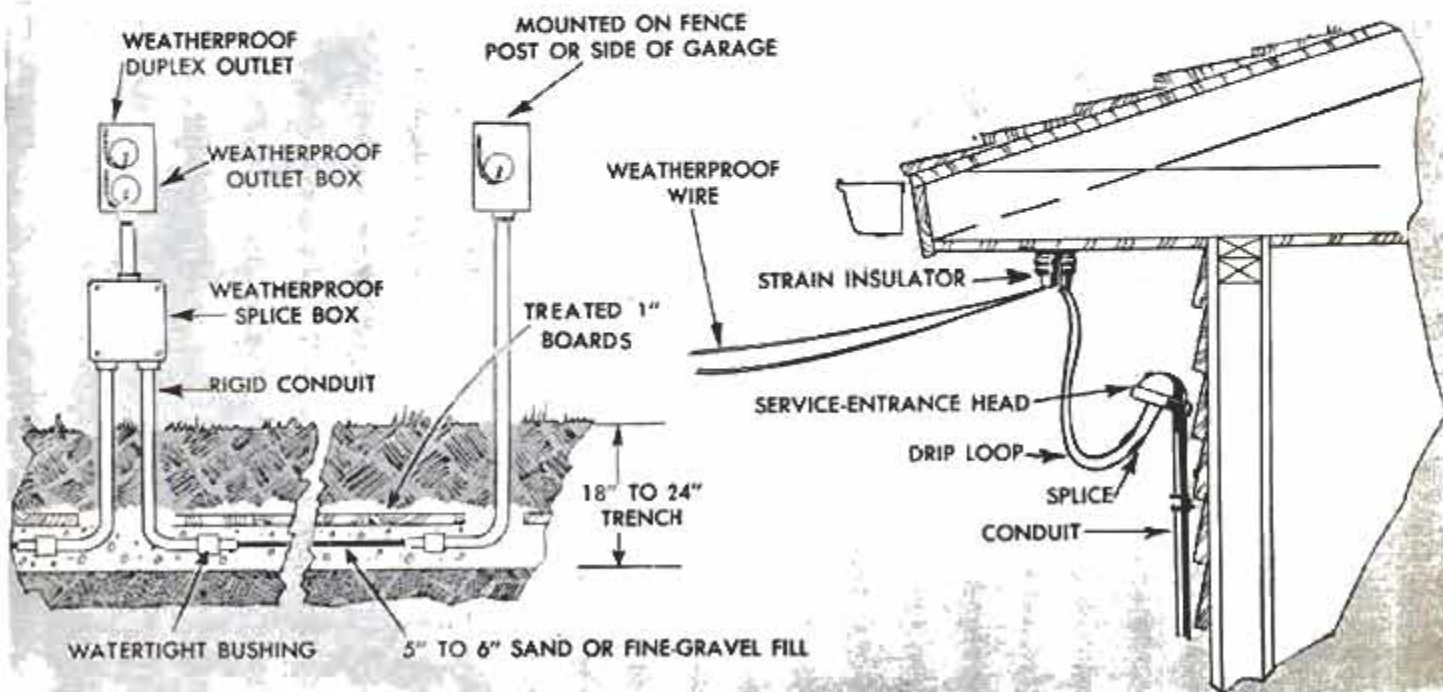
Sunshade umbrella by day becomes lighted canopy by night when an upturned reflector bulb is attached to supporting pole. Colored bulb is most effective

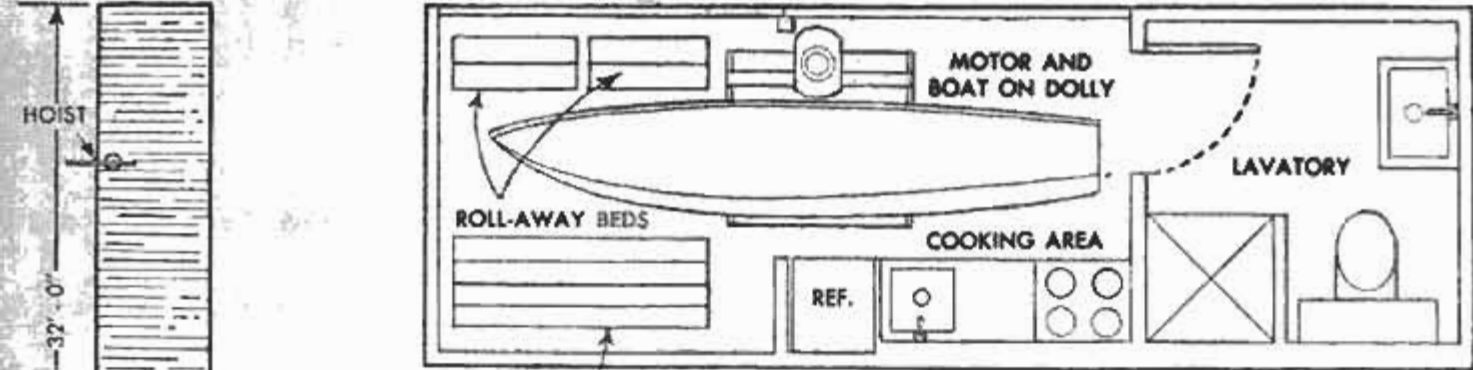
Courtesy General Electric Co.

or disconnect the circuit when changing bulbs or placing equipment. Portable cord sets specifically designed for outdoor use are available. These have molded junction and socket connections which insure that the cords will remain weatherproof. While not the neatest installation, overhead wiring is the simplest to install, compared to underground, when there are buildings or trees for support. Wires should be at least 8 ft. above the ground and supported about every 15 ft. with insulators. In the case of underground wiring, sand or light gravel around the wires will help water drainage, and boards over the wires will give further protection. Short conduit els guard wires above ground.



Built-in step lights, louvered for light control, are excellent pathfinders when patio walk is adjacent to garage or house. Mount 18 in. above grade

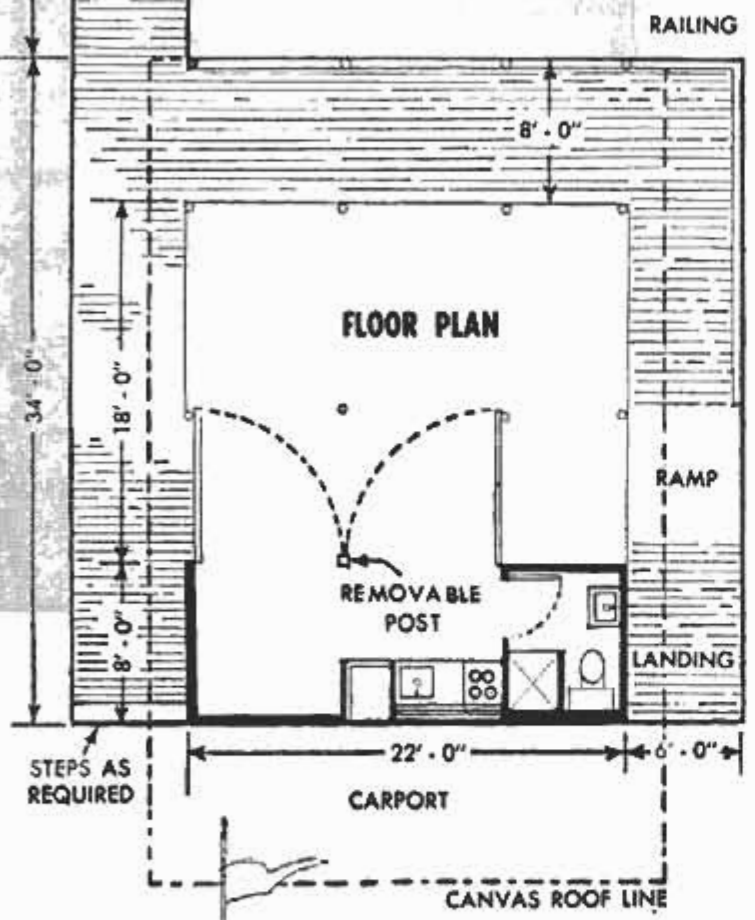




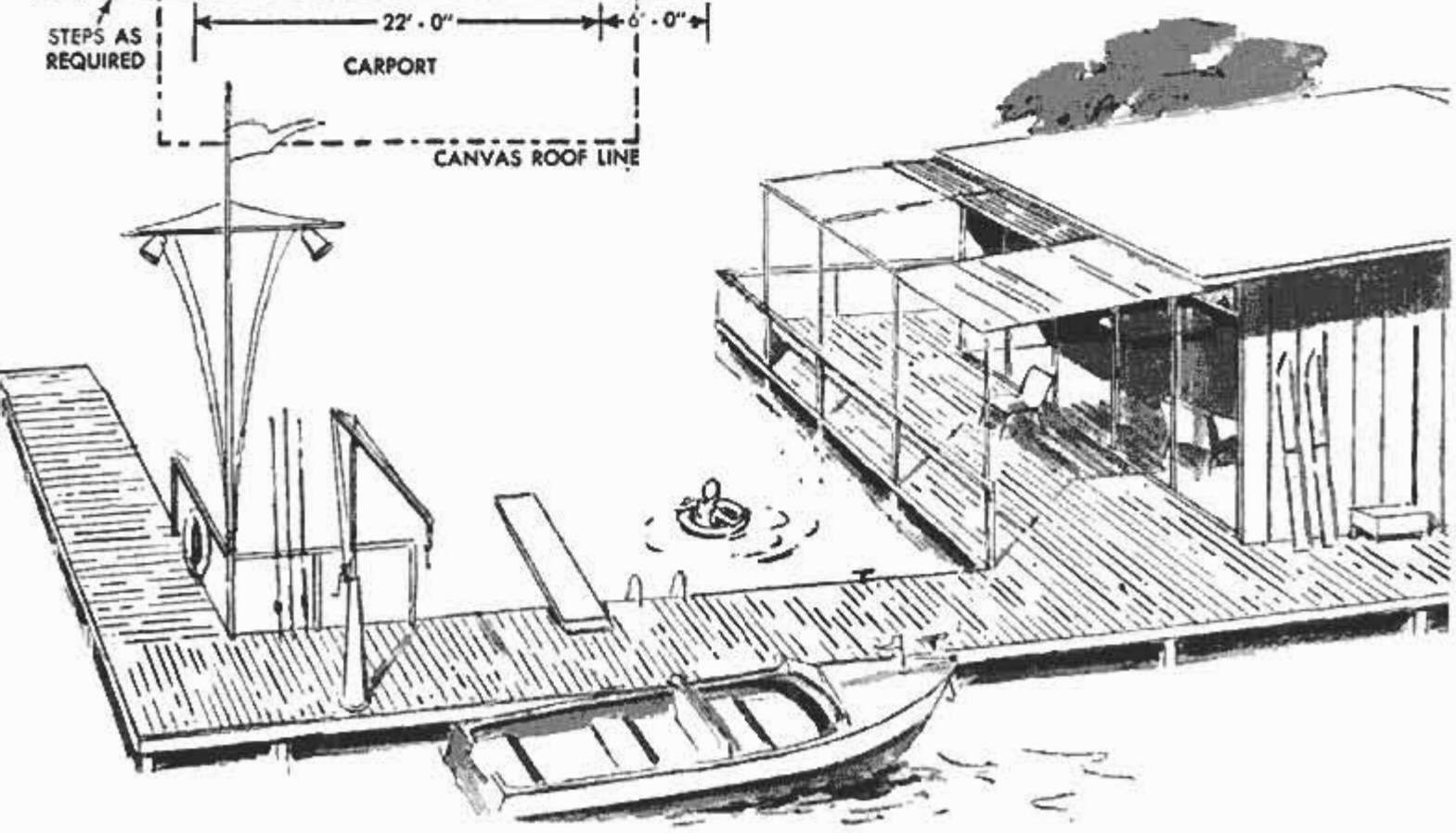
BOX SPRINGS AND MATTRESSES

Plan above shows how dolly with boat and motor aboard can be stowed away for winter inside core along with box springs, mattresses and roll-aways

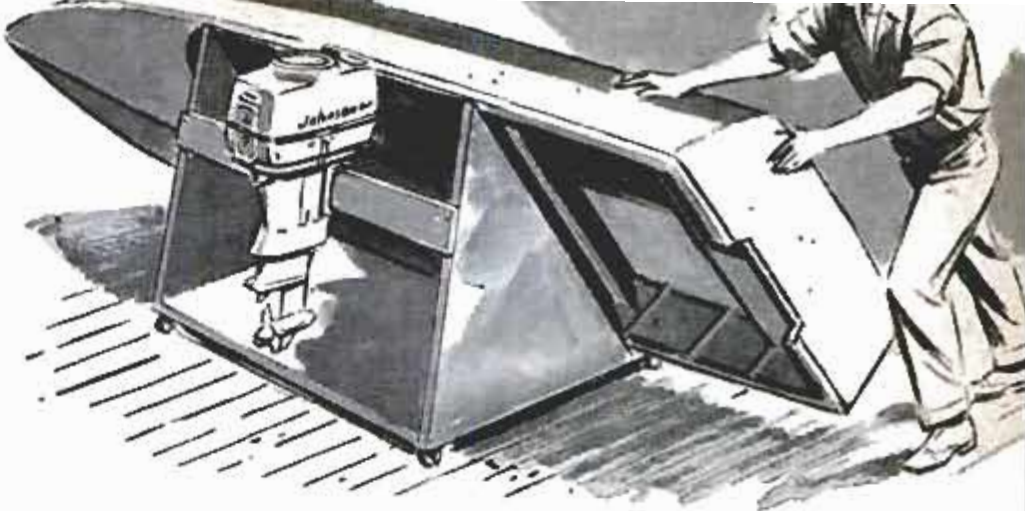
(Continued from page 179)



core unit during the winter, plus a 14-ft. boat and motor, in the manner shown above. Roll-down side walls of screen and canvas give privacy and protection from insects and the weather, and a section of the sunshade roof pushes back for sunbathing on the deck. A ramp makes it easy to wheel a barbecue grill or outboard-motor dolly about. The illustration below gives an idea of how the home might look when developed into a permanent shore-front dwelling. Notice how the roof is extended at the rear to provide a stall for the car, how a push-back awning shades the picture-window front and how the pier can be extended, L-shape, to form a swimming pool. Construction details for the basic house are to be given next month. You will find the design flexible enough to let you adapt your own ideas in building the ideal lakeside retreat. ★ ★ ★



Dolly makes easy work of storing boat and motor safely inside when house is closed up for the winter. "Transom" on dolly permits motor to be clamped in upright position. Made of sturdy plywood and fitted with swivel casters, dolly can pinch hit as table when a drop leaf is hinged across front



WATERSIDE-HOME SPECIFICATIONS

BATHROOM

1. Lavatory basin—vit. china
2. Toilet—vit. china
3. Shower installation, steel (includes fittings, soap dish, mixing valve and shower arm)
4. Bathroom accessories
5. Bathroom cabinet, wall mounted

KITCHEN

1. Three-in-one electric sink consists of 1/3-hp. shallow well convertible pump, 30-gal. electric storage-type water heater and white porcelain enameled cabinet and sink
2. 20-in. rangette; complete baking, broiling and four burner top-of-stove cooking
3. Refrigerator, apartment size, 9.1 cu. ft. with frozen-food storage. Fits space 24 in. wide. Right-hand door only

FURNITURE

1. Mattress and box spring set, 54 x 75 in., 2 sets reqd.
2. Steel bed and frames, 2 reqd.

3. Roll-away bed for indoor bed and outdoor lounge, 2 reqd.
4. Folding steel table, 30 x 72 in.
5. Folding chairs, 6 reqd.

CORE STRUCTURE

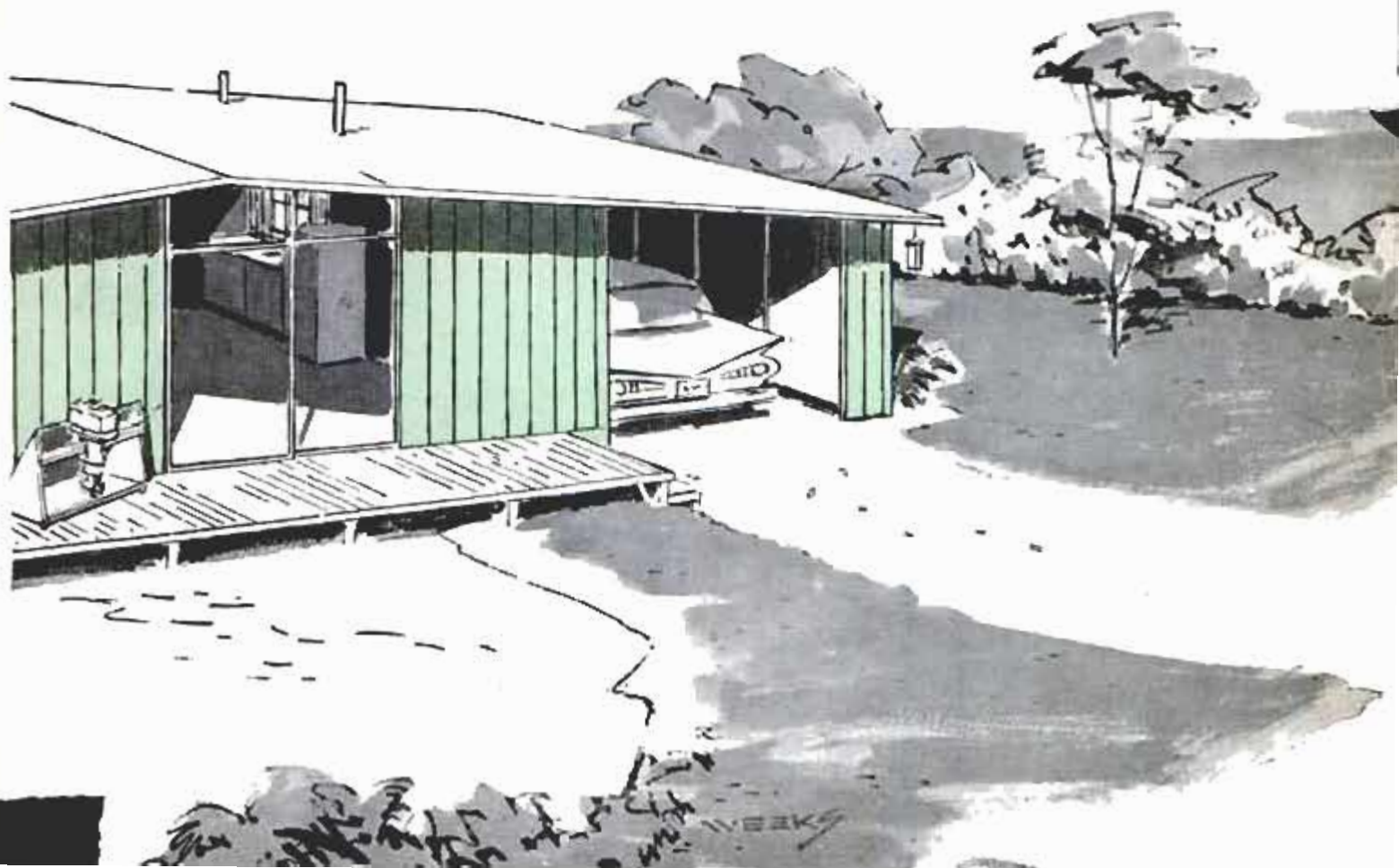
1. Exterior wall—texture One-Eleven, 4 x 8 plywood panel
2. Interior wall—1/4-in. plywood or wallboard
3. Door-Wall—texture One-Eleven, exterior, 1/4-in. plywood or 1/2-in. wallboard
4. Floor all tile
5. Structure sealed weathertight, vermin-proof and locked securely
6. Roof construction—standard method

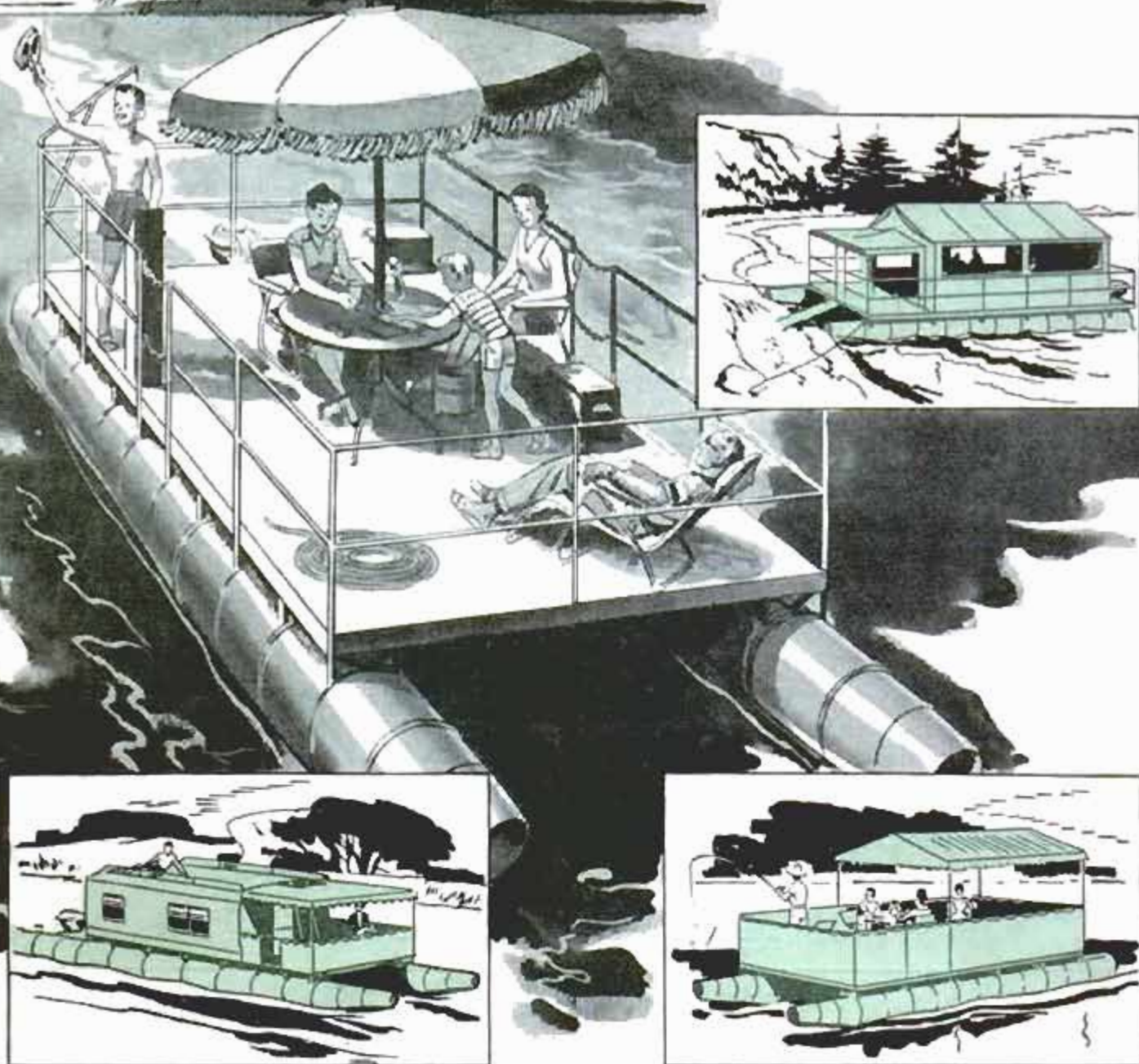
DECK, DOCK AND RAMP

1. Decking—1 x 6 select-grade Douglas Fir
2. Stringers—2 x 6
3. Beams—4 x 4
4. Piling 6 to 8-in. dia. pine or oak
5. Footing—concrete
6. Railing—2 x 4 pine or fir

CANOPY AND SUPPORT

1. Vinyl-coated army duck





VERSATILE PONTOON BOATS

By Earl Wobeck PART II

HAVING COMPLETED the pontoons, railing and supporting assembly for the deck as described in Part I, the next step is to seal the welded joints on the bow sections with glass fiber. This is done by first troweling a heavy coat of glass-fiber glazing compound on the metal to completely cover the joints as in Fig. 13. The surfaces to be coated must be sanded to a bright finish and cleaned with lacquer thinner to assure a permanent bond. After the compound has hardened, sand it smooth and cover each joint with a 5-in.-wide strip of 10-oz. glass-fiber cloth, saturating it with

Keel is blocked up on pontoon centerline so brackets can be aligned with it and clamps tightened in place



12

... of epoxy resin. Allow the
... to cure several days before
... the bow sections.

Motor Mount

The motor mount consists of two welded-steel brackets to which a 1 $\frac{3}{4}$ x 12 x 46-in. laminated-plywood motor board is bolted as indicated in Fig. 19. When assembled, the completed unit is bolted to the first and second deck beams to provide a sturdy mount that will accommodate a single motor or a twin installation up to 50 hp. Note that the steel-channel members to which the board is bolted are angled 78 deg. to provide the proper motor-tilt angle. All members of each bracket are bolted and welded together as a safety precaution.

All remote motor controls and instruments are grouped compactly on the steering stand within easy reach or sight of the



13

Welded joints on bow are coated with glass-fiber glazing compound to make them airtight and smooth

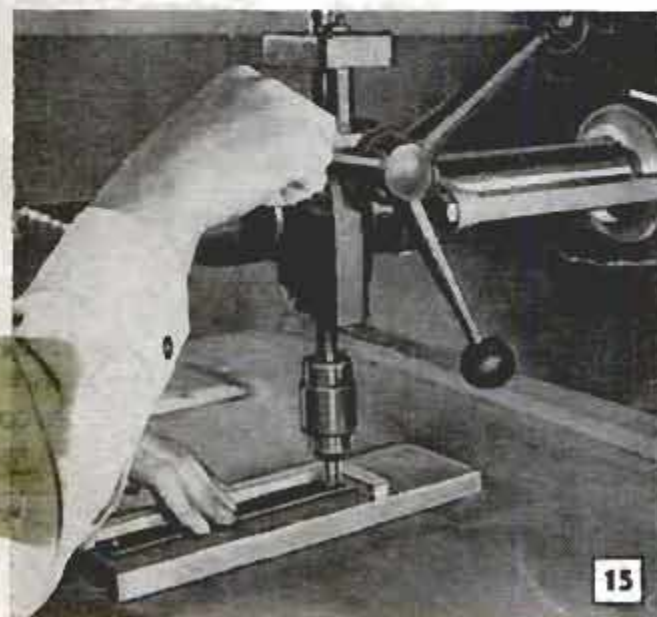


14

Beams are positioned on deck, spaced as required so that holes for deck bolts can be drilled accurately

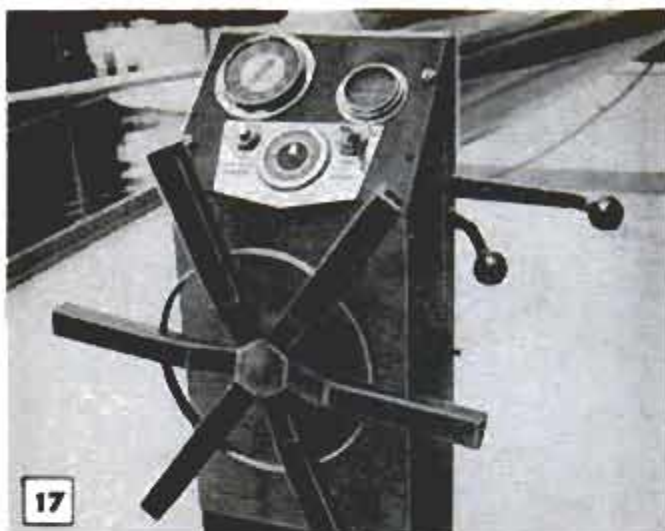
Using jigs like one below saves time when drilling or countersinking holes in sets of identical parts

To make short-radius bends in steel parts, use tool like one shown that grips metal next to point of bend



15





17



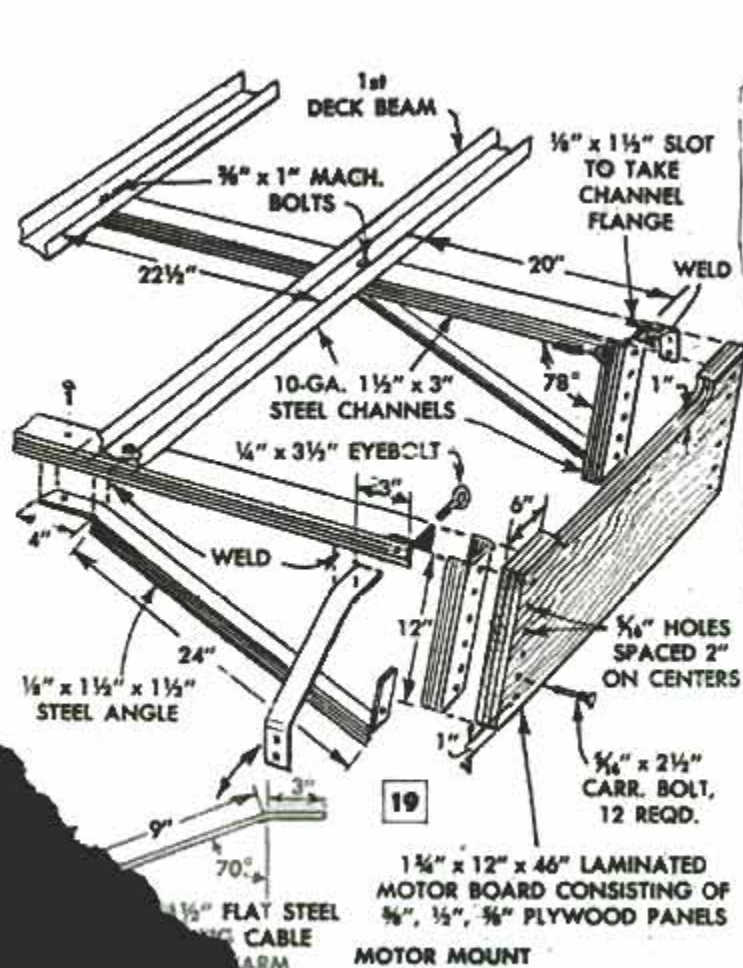
18

Steering stand has throttle and shift controls at side, speedometer, starting switch and ammeter at top

Tightener springs connected to ends of steering cable keep proper tension on cable at all times

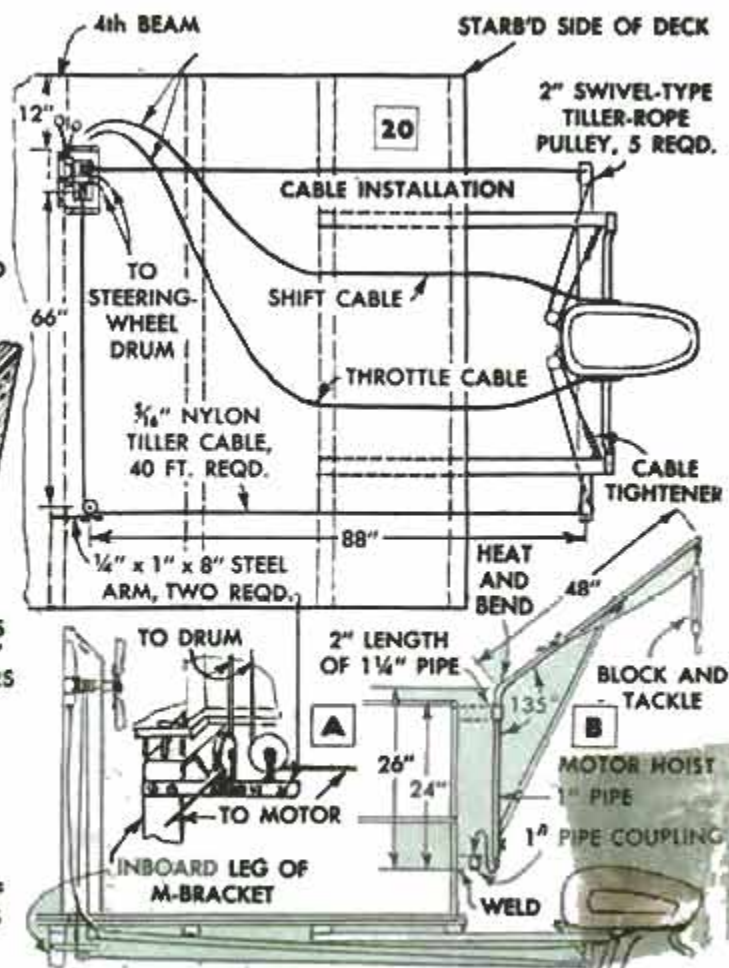
helmsman, Fig. 17. The stand is welded from sheets of 14-ga. steel as detailed in Fig. 23. Steel angles welded to the base provide flanges for bolting the stand to the deck and fourth beam as indicated in Fig. 20. A cutout on the starboard side of the stand permits mounting the shift and throttle-control box inside. The instrument panel is made from 1/2-in. mahogany-veneer plywood and bolted in place as shown. Mounting holes for the instruments and controls are cut in the panel to suit the ones used, being sure to allow adequate clearance for the latter inside the stand.

The steering-wheel assembly consists of a spoke-type wheel, drum and shaft. The wheel spokes are made from 1/8 x 1-in. steel cut and welded together according to the dimensions given in detail A, Fig. 23. A ring formed from 1/8 x 1/2-in. steel is welded to the spokes at the back. The shaft is a 1/2 x 8-in. carriage bolt with the squared shoulder ground off to permit the head to fit flush in a 1/2-in. hole drilled in the center of the wheel where it is welded in place. The drum, on which two turns of the tiller cable are wound, is secured to the shaft by means of flanges formed by two steel strips



19

1 1/4" x 12" x 46" LAMINATED MOTOR BOARD CONSISTING OF 3/8", 1/2", 3/8" PLYWOOD PANELS
MOTOR MOUNT



... to the shaft to engage slots of the
 size cut in the drum as in detail B. To
 permit the shaft to be slipped into position
 on the stand, horizontal notches are cut in
 the sides of the holes through which the
 flanged part must pass.

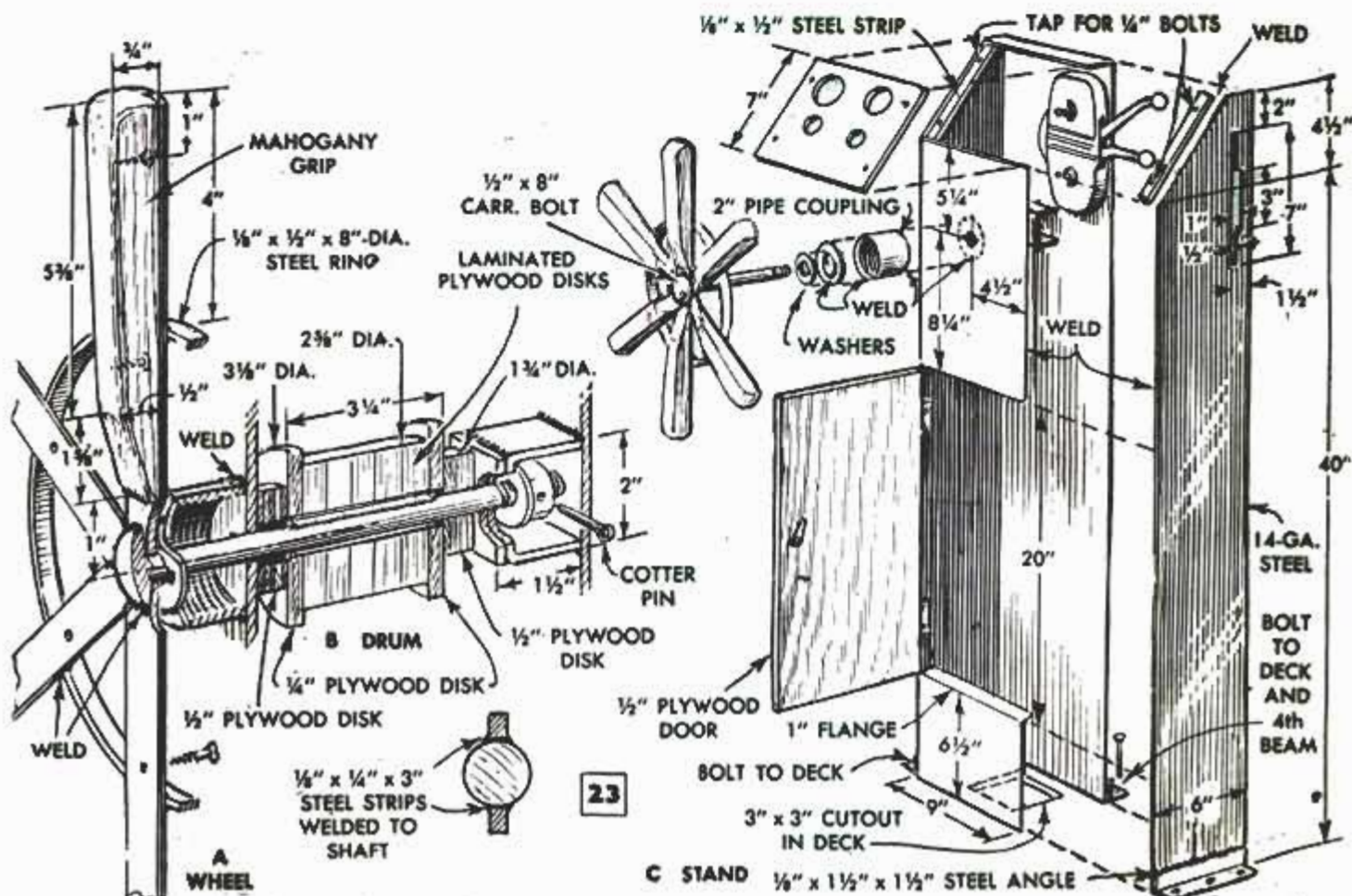
Remote steering and motor-control
 cables are installed as shown in Fig. 20.
 Five pulleys are required for installing the
 tiller cable. Two of them are bolted on the
 pulley arms of the motor mount and three
 are bolted on $\frac{1}{4}$ x 1 x 8-in. steel arms, de-
 tail A, that are mounted on the inboard
 legs of the M-brackets at the fourth beam.
 Tightener springs secured to the cable ends
 as in Fig. 18 keep proper tension on the
 cable.

Motor Hoist

The motor hoist permits one person to
 transfer a heavy load, such as a large mo-
 tor, from dock to boat with ease, Fig. 22.
 As shown in detail B of Fig. 20, a length
 of 1-in. pipe threaded on one end, a length
 of $\frac{1}{2}$ -in. thin-wall conduit, a 1-in. coupling
 and a 2-in. length of $1\frac{1}{4}$ -in. pipe are all the
 materials needed to make it. The conduit
 serves as a brace and is bolted to the hoist
 instead of welding it in place to permit the
 hoist to be unshipped from its mounting
 for removal. In use, the threaded lower end
 of the hoist is turned into the coupling
 which holds it upright and permits a pivot
 of 280 deg.



Above, control cables must have enough slack in them to avoid binding on sharp turns. Below, hoist makes easy work of lifting heavy motor from dock to boat



After completing all parts of the boat, it should be assembled at home and then disassembled into the various units for hauling to be sure no construction details have been overlooked. Such corrections as are necessary can be made easier when power tools and shop equipment are available. Much of the construction involves making numerous parts that are identical, such as the M-brackets and pontoon clamps. Much time can be saved and a high degree of uniformity maintained by drilling them on a jig as in Fig. 15. When bending flat-steel parts, make saw cuts in the edges and use a tool like the one shown in Fig. 16 to grip the metal at the bending point to produce accurate short-radius bends. Each of the keels is installed by blocking it up on the pontoon centerline to clear the keel brackets. The latter are then aligned with the keel, Fig. 12. Pontoon clamps are tightened in place and the keel is lowered on the brackets to be screwed in place. To assure perfect alignment of deck panels, position the beams on the deck according to the required spacing and drill the holes for the deck bolts as in Fig. 14, using the holes drilled in the beams as a guide and keeping deck panels butted closely together.

Paint the completed boat as desired, priming all bare metal with a rust-preventive paint and thoroughly coating the deck edges with paint to prevent the plies from separating. The motor board, wheel grips and instrument panel should be varnished. Before deciding upon the type of superstructure you would like, consider its suitability for the type of boating to be done. Suggestions for several types of deck shelter are given in the illustration on page 192. If a cabin is to be built on the deck, use lightweight materials wherever possible to reduce the total deck load to a minimum, keeping in mind that the maximum carrying capacity of the boat is 2500 lb. Of course, the cabin must be made in easily disassembled units for utility-trailer hauling, unless the boat is permanently berthed on a lake or river. Since the maximum beam of the boat is in excess of 8 ft., it cannot be trailered, assembled, without a special permit. ★ ★ ★

Window-Washing Tip

When washing windows it can be exasperating to leave streaks and not know which side of a pane you must wipe again to remove them. To avoid this difficulty, wipe one side with vertical strokes and the other side with horizontal ones. Then when streaks appear, you can determine instantly which side requires additional wiping. — M. R. Beasley, Jackson, Mich.

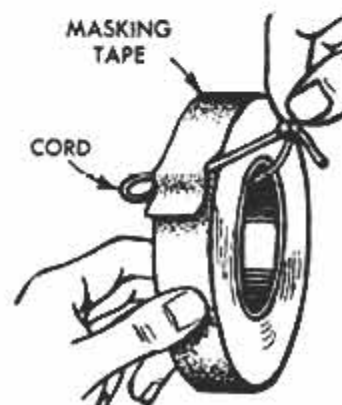
Clothespin "Reel" Stores Fishing Line

For would-be Huckleberry Finns who like to have a fishing line handy at all times, here is a safe way of carrying it in the pocket. Insert the hook in the crotch of a clothespin as shown and then wrap the line around it and the pin. This way the hook cannot come loose to snag clothing or fingers.—G. E. Hendrickson, Argyle, Wis.



Cord Lifts End of Tape

Place a cord under the end of masking tape to prevent it from sticking tightly to the roll. To free the end just lift the cord and there you are. Tie the cord to the roll and it will always be at hand when needed.

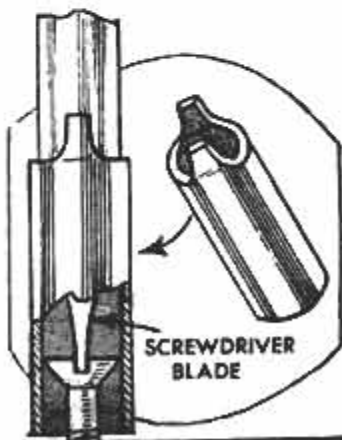


How to Avoid Boat-Trailer Sway

Boat-trailer sway usually is caused by arranging the load too far aft on the trailer, according to Peterson Bros., Inc., manufacturers of Gator trailers. To correct this, move the boat forward on the trailer, or move fuel cans and other unattached gear forward. Most boats 14 to 16 ft. in length should be loaded so that there is a weight of 50 to 60 lbs. bearing on the trailer drawbar for smooth trailering.

Guard Prevents Marring Finish

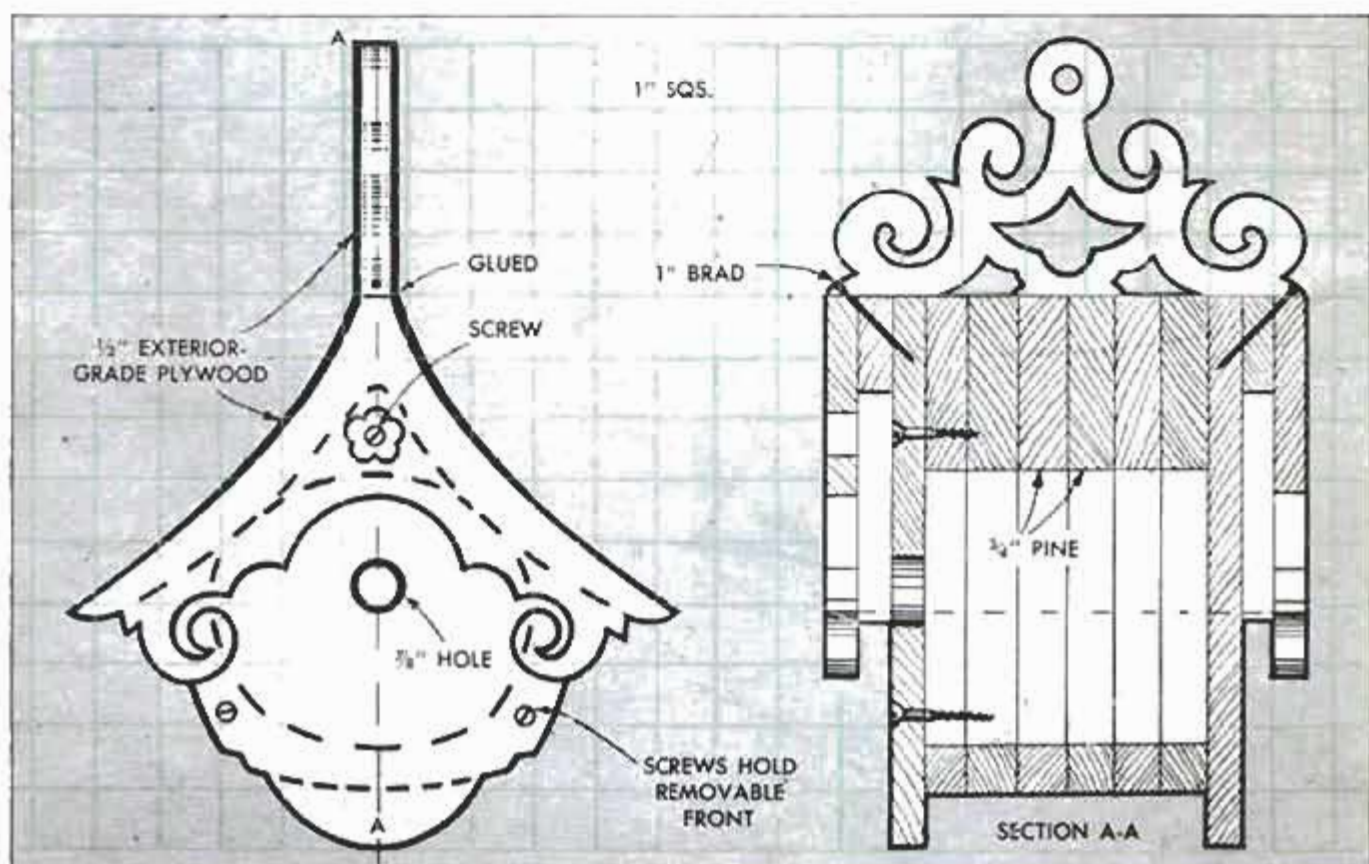
Your screwdriver can't slip out of the screw slot when fitted with this sliding guard. Make the guard from a length of steel tubing, filing one end to form lugs which are bent inward to hold the guard loosely on the blade.



Gingerbread WREN HOUSE



THERE IS A TOUCH of fairyland in the unusual design of this wren house, yet it is simple to build. White pine is used for the jigsawed "layers" of the main section, while $\frac{1}{2}$ -in. plywood is cut to form the front and rear gables and ridge decoration. If the ridge member is glued only to the center section of the house, and the front brad is replaced with a wood screw, the front of the house can be removed to permit cleaning by taking out this screw and three others





IT'S SPRING CHECKUP TIME

By George Willys

THE FIRST balmy week end of spring is a cue for many motorists to give the old bus a facelift with a thorough wash and polish job. Equally important at this time of year is a checkup of the mechanical parts. An hour or two spent now may save many dollars in garage bills later. Metal parts shrink when cold, allowing bolts to loosen. Grease is washed away by snow-melting chemicals, causing metal parts that should move easily to bind. A grease job is the first item for a "spring tune-up."

Fig. 1. Clean the sediment bowl on fuel filters, whether on the fuel pump or of the auxiliary type

Next, lift the hood and check the engine. Fuel filters should be clean, Fig. 1. If the filter contains an element other than a ceramic type, Fig. 2, it should be replaced. If your engine is an inline model, pull off the breather cap and filler tube and clean the mesh filter inside, through which the crankcase fumes are exhausted, Fig. 3. On V8 engines, pull off the oil-filler cap and clean the filter that is inside it. Brush the battery top with a solution of baking soda and water, Fig. 5, then rinse with clear

Fig. 2. Fuel-filter elements, such as shown, should be replaced, as there is no sure way to clean them





Fig. 3. Crankcase-breather pipes, such as this one, on inline engines should be removed and cleaned thoroughly

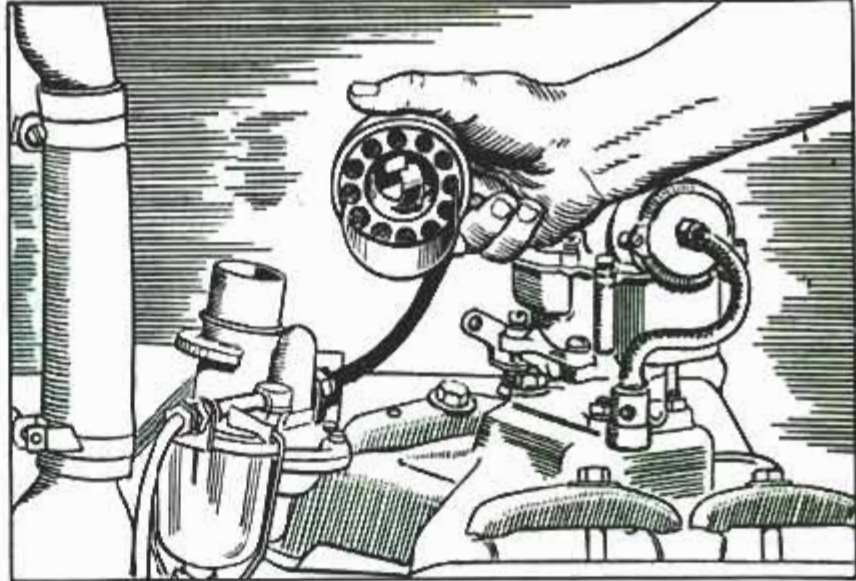


Fig. 4. The cap on the oil-filler tube of most V8 engines contains a filter of copper mesh. Remove the cap, immerse it in gasoline, then remove and allow to drain dry before replacing



Fig. 5. Above, assure maximum efficiency from a battery by washing top with solution of baking soda and water, then rinsing thoroughly with clear water

Fig. 7. Treat a battery carefully. When removing clamps, first loosen bolt, then pry clamp apart with screwdriver. Pry clamps apart when installing, so they slide on easily. A hammer is never used

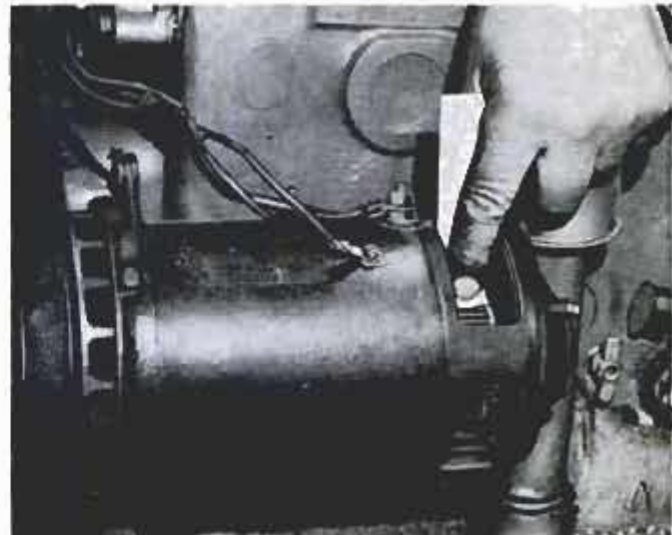
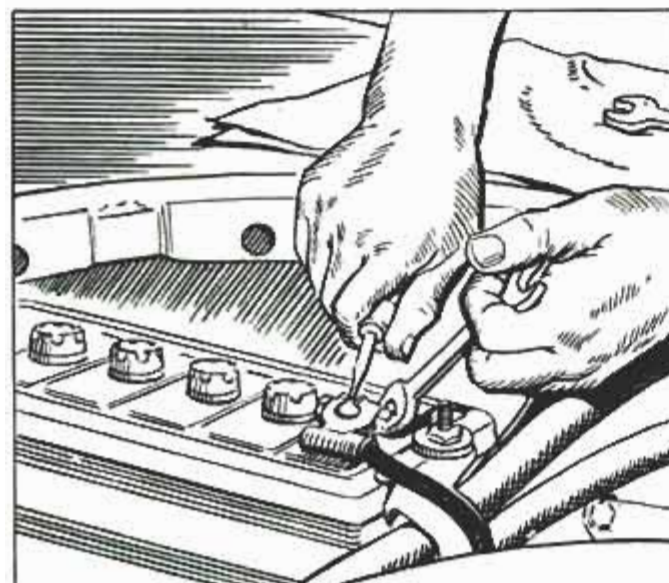


Fig. 6. If your generator is type with removable band permitting access to commutator, clean it by holding fine sandpaper against it while engine idles

Fig. 8. With cable clamps removed, clean battery posts with sandpaper, scrape inside of clamps bright with pocketknife. If clamps do not tighten firmly, cut metal from between bolt lugs so that they will

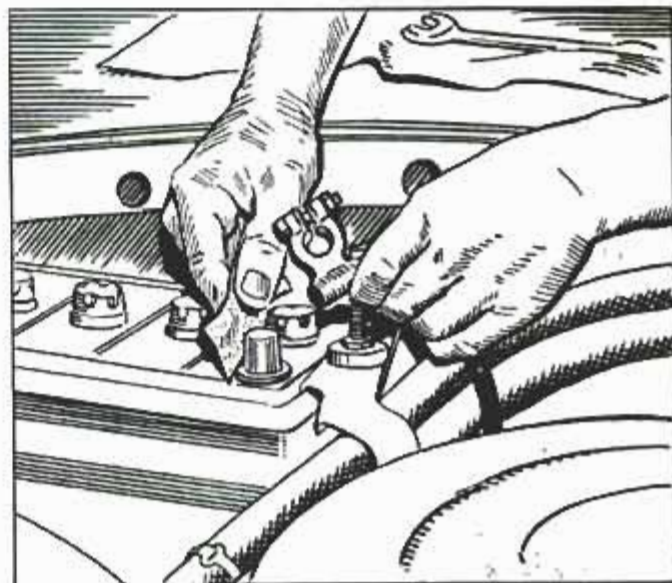




Fig. 9. Tighten up the head bolts, beginning at center and working toward each end. If torque wrench is not available, just "snug up" firmly on each bolt



Fig. 10. If heat-riser valve on exhaust manifold does not work freely, pour penetrating oil on shaft, work valve back and forth until it will rotate easily

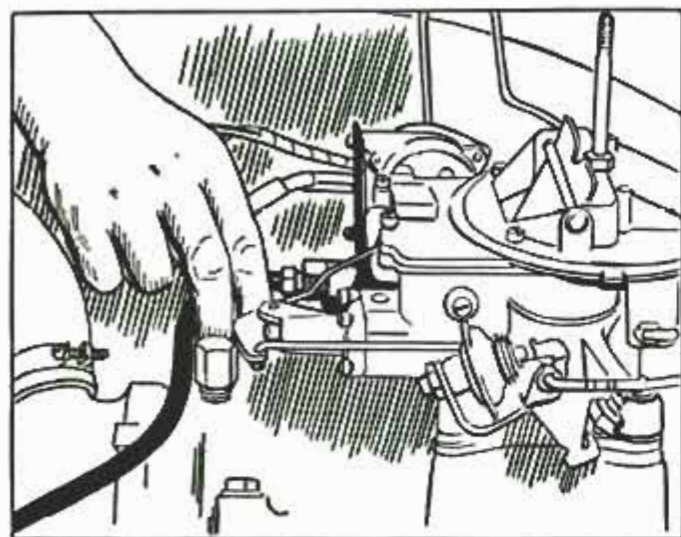


Fig. 11. Grasp fuel line at carburetor and shake to see if carburetor sections have loosened. Screws should be tightened to prevent fuel and air leaks

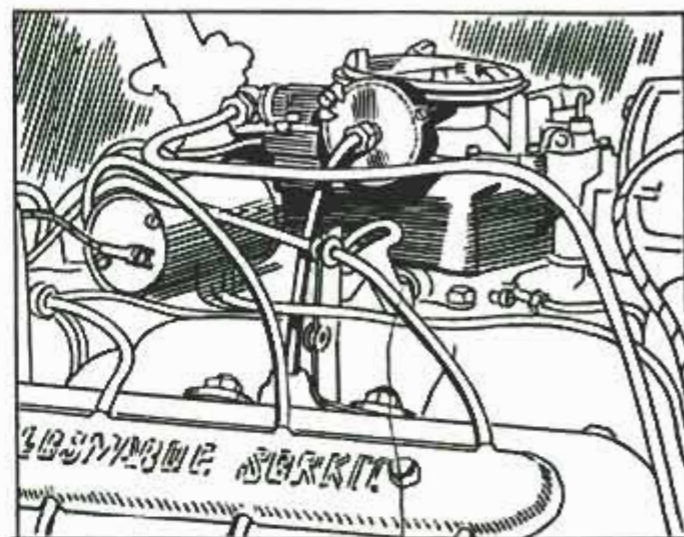


Fig. 12. Automatic-choke housing and tubing connection to it should be tight, so there is no leakage of hot air, assuring rapid opening of the choke

water. Loosen the bolts on the battery-cable clamps and pry them open with a screwdriver, Fig. 7. Clean the battery posts with sandpaper, Fig. 8, the inside of the clamps with a pocketknife. Replace both cables, then tighten the nuts holding the opposite ends of the cables to a ground connection and the starter. If your generator is of the type that has a removable band permitting access to the commutator, dress the commutator with fine sandpaper while the engine is idling, Fig. 6. Tighten the head bolts, Fig. 9, as they may have become loosened due to the extremes of temperature in winter weather. Check the heat-riser valve on the exhaust manifold by moving it, Fig. 10. If it does not pivot easily, squirt penetrating oil on the shaft and work the weight back and forth until the shaft rotates freely. Grasp the fuel line where it connects to the carburetor and pull it back and forth, Fig. 11. Large air cleaners on late-model engines tend to loosen the screws holding a carburetor to-

gether, and the test will indicate if this is happening. It is possible on some carburetors to tighten the screws with the carburetor on the manifold. Other types will have to be removed to permit tightening screws on the underside. Next, mark the halves of the automatic-choke housing so it can be replaced in the same position, then remove it and examine the inside. Work the levers and the vacuum piston to be sure they move freely. Do not oil any parts, simply clean them with carbon solvent if they are binding. If there is a dirty, greaselike substance in the choke housing, it means there is an exhaust gas leak into the tube leading to the choke cover. On some cars this means that the tube running through the heat passage under the carburetor in the intake manifold must also be replaced. Your garage man can make this repair, if you cannot handle it. If exhaust gases leak into the choke, poor gasoline mileage and slow opening of the choke result. ★ ★ ★

"Solar Match" From Flashlight

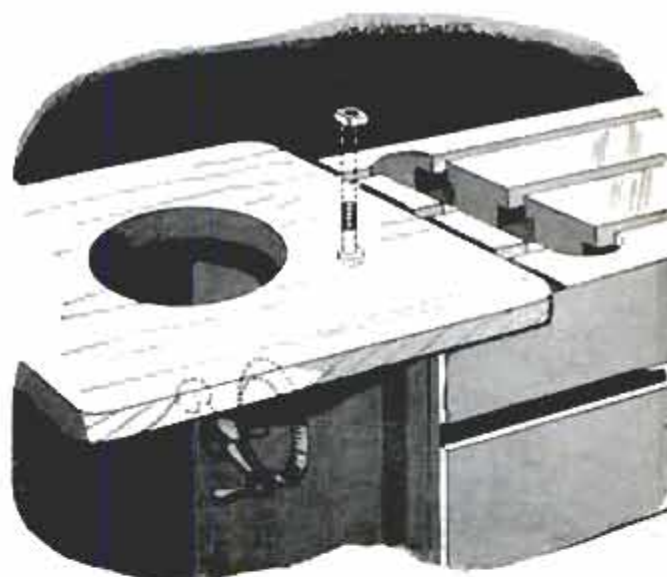
Lighting a cigarette or starting a fire without matches is no problem if you have a large flashlight. Used as a solar match, a 2½-in.-dia. flashlight reflector that is clean and highly polished will develop a very high heat. After removing the reflector, insert the cigarette or twig to be ignited through the bulb opening and point the reflector toward the sun. Pull the item to be ignited down into the reflector until the greatest amount of light is concentrated on the tip. Wear sun glasses when looking at the light.—Manuel Sanz, Downey, Calif.



Guard Protects Table Setting On Jig-Boring Machine

When a milling machine or jig borer has been set up for critical repeat operations this improvised guard protects the table setting. It serves the dual purpose of warning other operators that the machine is set up for operation and also prompts those working nearby to stay clear. The guard simply is a piece of hardwood attached to the table with a T-bolt so that it covers the adjusting wheel or ball crank. A round opening can be cut at the center of the guard so that the setting on the micrometer collar can be seen easily.

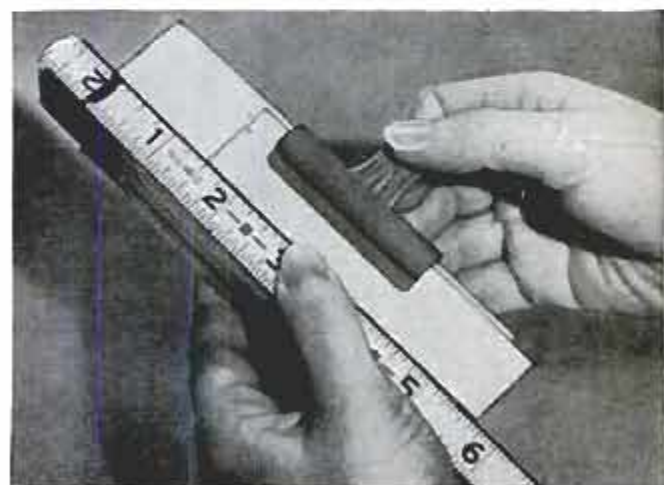
Frank La Saracina, New York City.



Improved "Caliper Rule" Makes Inside Measurements

In locations where an ordinary folding rule cannot be used to make an inside measurement, this improvised "caliper rule" will do the job accurately. Two strips of thin wood, metal or cardboard are overlapped and fitted into the location to be measured, then held together with a spring-type paper clamp. The length of the adjusted strips then is measured with a rule.

Ⓜ Do not store objects made of styrene-type plastic in a closet where moth balls or crystals are used to protect garments. The chemical vapors of the moth repellent will damage the plastic material.



Pipe-Flange "Feet" Support Tent Poles on Soft Ground



If the center poles of a large-size tent sink into soft ground, the problem can be eliminated by providing "feet" for the lower ends of the poles. The feet are pipe flanges that have an inside diameter slightly smaller than that of the poles. The ends of the poles are tapered slightly, then the flanges are "screwed" onto the poles so they cut threads into the wood.

G. E. Hendrickson, Argyle, Wis.

Correct Spark-Plug Tightening

About 85 percent of the spark plugs in engines checked by one spark-plug manufacturer were not tightened firmly enough. The 14-mm. spark plugs used in modern engines should be torqued to 30 ft.-lb. With any ratchet wrench, the plugs should be tightened firmly against the new gaskets, then given about one quarter turn more to crush the gaskets to assure an effective seal against compression pressures.

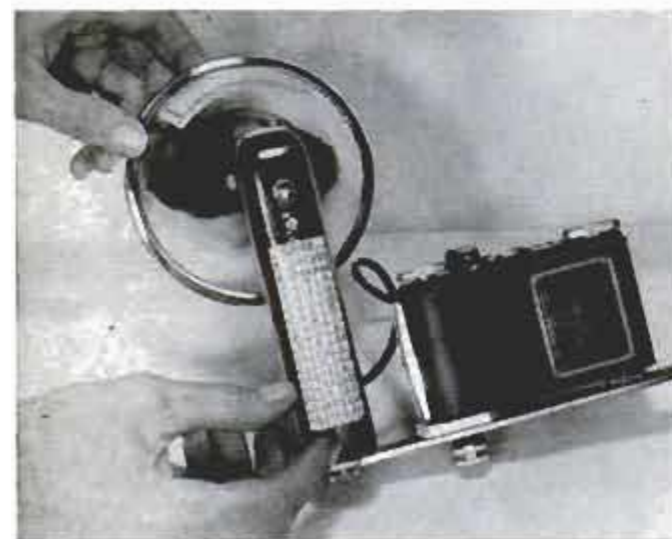


Chart Aids Fast Camera Setting

Taped to the reflector of a flash gun, a simple chart will provide instant information for diaphragm settings, eliminating the chance of error and the need for calculations when in a hurry. Distances from 2½ ft. to 16 or 18 ft. are divided into the film index number to determine the f stop for 1/25 or 1/50 second. The information then is inked or typed in three columns ruled on a paper to form a chart. Also, a folder packed with most film will include a chart showing the proper f-stop setting to use with a particular flash bulb. This chart is cut out and fastened to the reflector with cellulose tape.



Protecting Binocular Lenses

To protect the objective lenses of a pair of binoculars when the instrument is used under dusty conditions, or where moisture, especially salt spray, might contact the glass, cover each lens with transparent sheet plastic, such as used for wrapping food. The plastic is held in place with rubber bands to protect the lenses. The clear material interferes with the performance of the instrument so slightly that it is difficult to detect any change in viewing power. The plastic covers can be left on when the binoculars are placed in their carrying case.—R. Hanscom, Elmhurst, Ill.

On the MARKET

for Do-It-Yourselfers

1. PATIO TABLE AND BENCH KIT in redwood is made sturdy and weatherproof, is finished in natural with a finishing material especially suited to this wood. It's small-fry size, just right for youngsters aged 5 to 7. Table top is 14½ in. wide and 30 in. long and table is 15½ in. high when assembled. Benches are 30 in. long and 9½ in. high. Kit comes with instructions for assembly

Alko Sales, 1223 N.W. 50th St., Oklahoma City 10, Okla.



2. DRAWER SLIDE is fitted with nylon rollers and is self-aligning for easy installation. Formed lips fit along underside of drawer to eliminate measuring and leveling. Cabinet tracks mount on bottom rail, flush with the drawer opening. Each slide is fastened in place with only four screws, and slotted screw holes in tracks provide easy adjustment. Side clearance required, only ½ in.

Amerock Corp., Rockford, Ill.



3. MUFFLER AND EXHAUST-LINE SEALER has adhesive properties that bond it firmly to any surface in the car's exhaust system. It spreads like putty and dries metal-hard to form a heatproof, shakeproof, oilproof seal that prevents leakage of dangerous exhaust fumes into the interior of the car. Supplied in an unbreakable 6-oz. plastic squeeze tube for easy application in close places

The Magic Iron Cement Co., 5403 Bower Ave., Cleveland, Ohio



4. PLASTIC WALL TILE in harmonious colors are basic parts of these colorful decorative accessories. Each unit comes as a kit, three of which are pictured: Wren house, night light and bi-level planter. Each kit is supplied with step-by-step instructions, cement and whatever special parts are necessary to complete the project. Wren house is designed to be suspended by coat hanger

Artercraft Plastics Co., Inc., 255 W. 70th St., Chicago 20



4



POPULAR MECHANICS SHOWCASE OF TOOLS

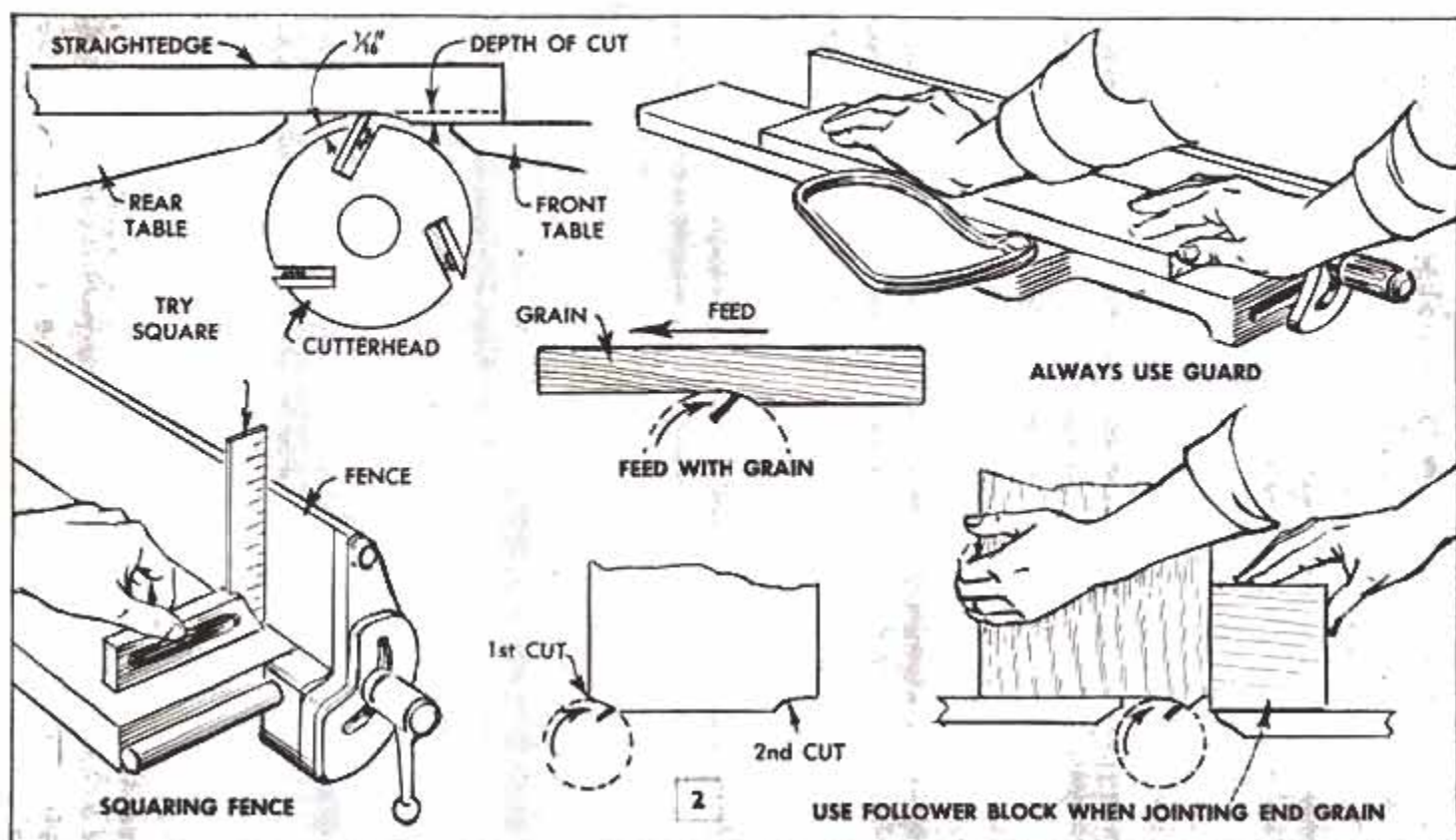


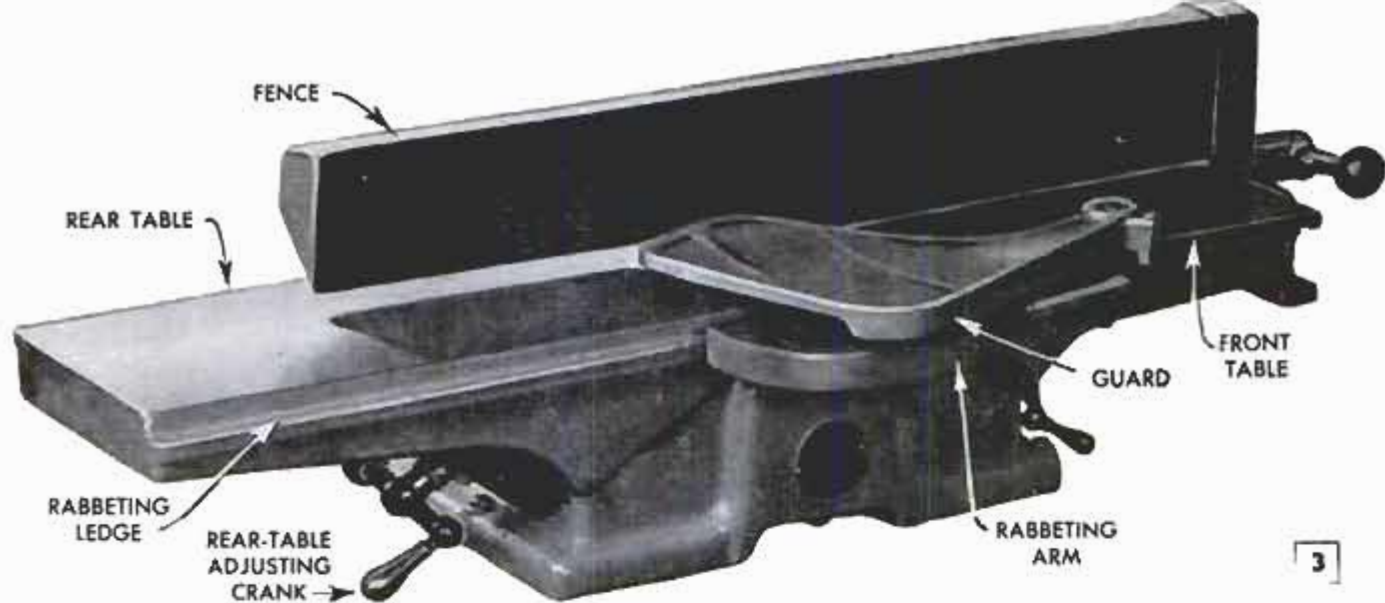
Four and

A JOINTER is simply a power-driven plane. It is stationary, works on both the edge and face of the stock and can be used for many operations in addition to jointing and facing. The machine is of simple construction, the principal parts being pictured in Fig. 3. The capacity is determined by the length of the cutterhead; that is, a 4-in. jointer has a cutterhead 4 in. long and will surface stock up to 4 in. wide. Only the 4 and 6-in. jointers, the small-shop sizes, are pictured on the following pages.

Jointing (planing edges of stock), facing, planing to thickness, rabbeting, tapering of

This is the fifth in a series of articles to aid readers in determining sizes and types of tools best suited to their needs. Tools shown are intended to give readers a "showcase" view of various units available in workshop sizes. Picturing tools in this series does not constitute approval or disapproval of them by Popular Mechanics.





Six-Inch Jointers

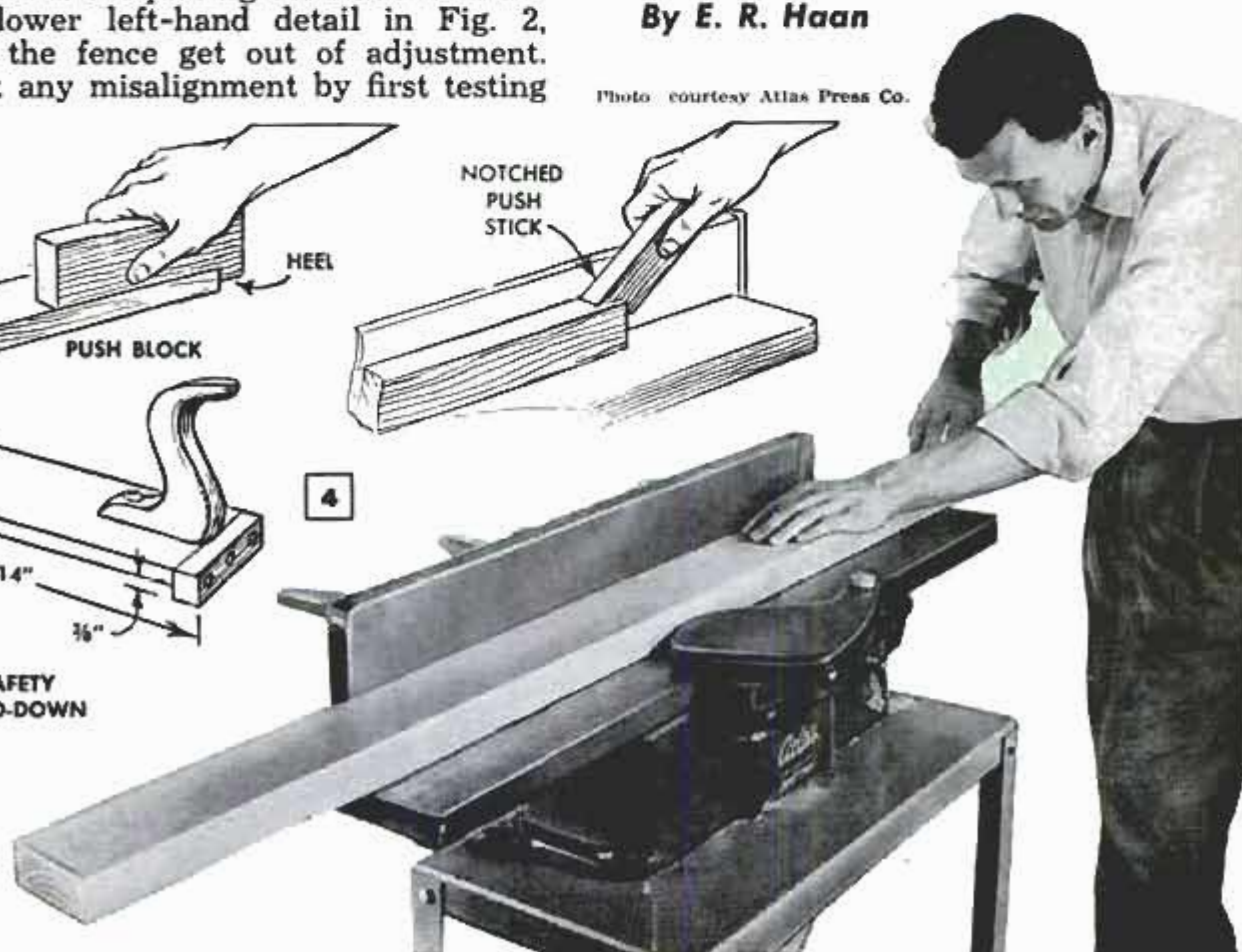
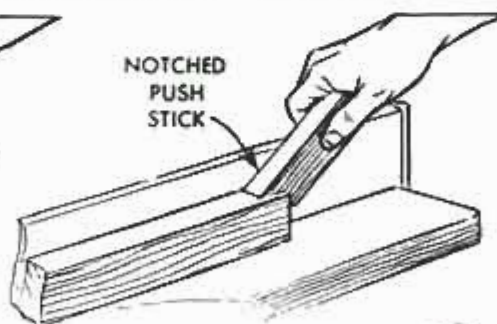
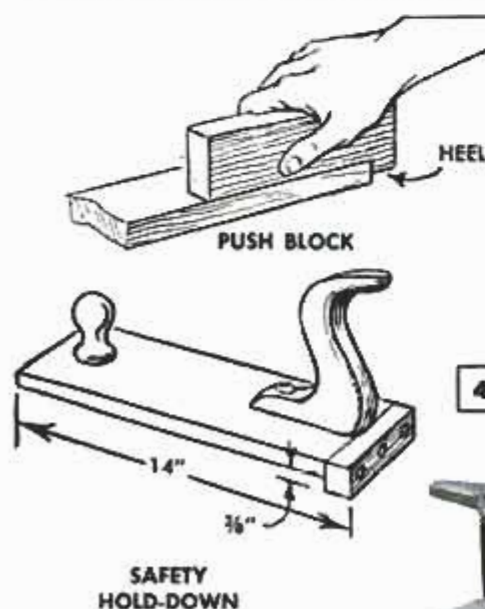
square stock, cutting tenons, making moldings, beveling and chamfering are common operations on both the 4 and 6-in. machines. Fig. 2 and also Figs. 5 through 15 show some of these operations. Occasionally it's a good idea to make the check detailed in Fig. 1 to see that the rear table of the machine is positioned at precisely the highest point of the circle described by the knife edges. See also the upper left-hand detail in Fig. 2. Late-model jointers have some means of squaring the fence with the table, lower left-hand detail in Fig. 2, should the fence get out of adjustment. Correct any misalignment by first testing

with a try square and then resetting the pointer or the stop at the 90-deg. position.

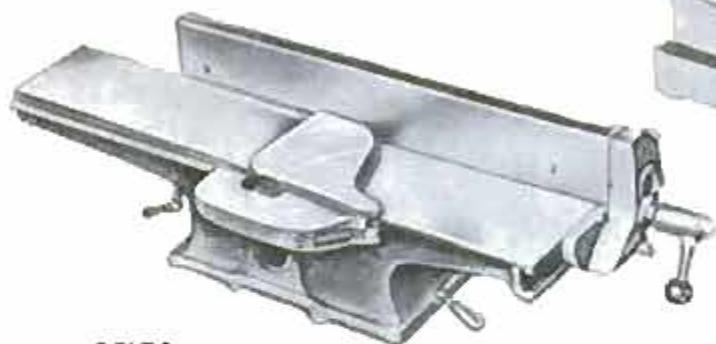
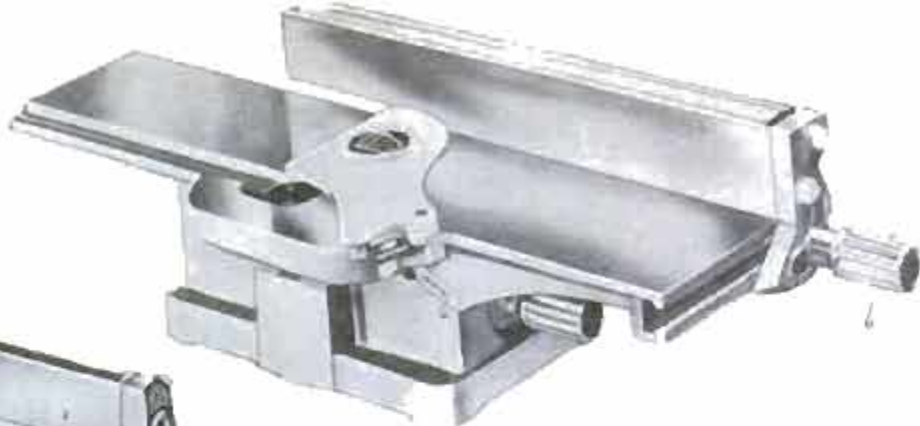
In cabinet work it occasionally is helpful to run end-grain cuts on the jointer. When this is to be done make a first and second cut as in the lower center detail, Fig. 2. Then complete the cut, using a follower block as in the lower right-hand detail to prevent splintering. Of course, these details have been exaggerated for purposes of illustration. End-grain cuts should be

By E. R. Haan

Photo courtesy Atlas Press Co.



**DURO
DURO METAL PRODUCTS CO.**



**DELTA
ROCKWELL MFG. CO.**



**MAGNA
YUBA POWER PRODUCTS, INC.**



**SPRUNGER
SPRUNGER BROS., INC.**

**WALKER-TURNER
ROCKWELL MFG. CO.**

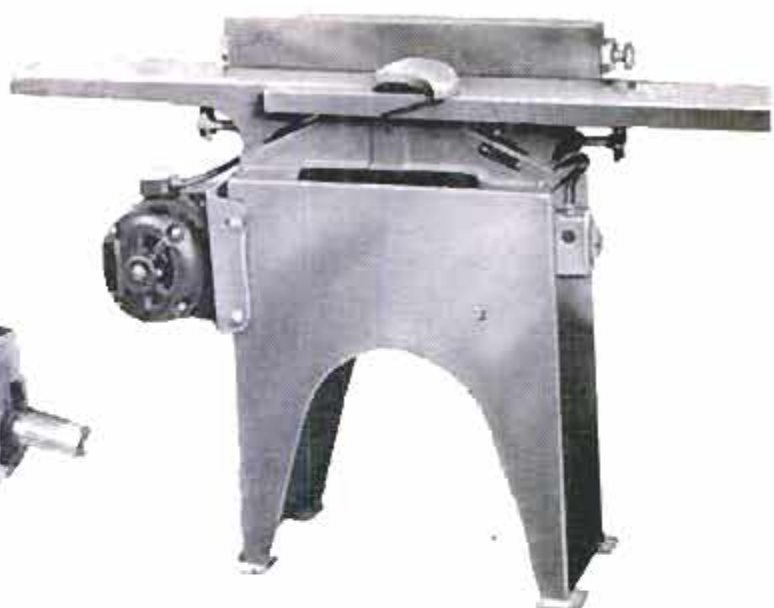
SPECIFICATIONS OF JOINTERS

NOTE: Most manufacturers make other sizes of jointers in addition to those listed here. Usually jointers are obtainable with or without a stand or base.

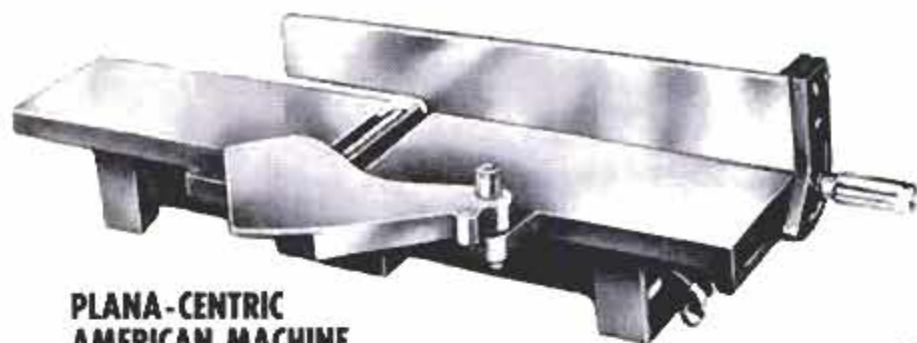
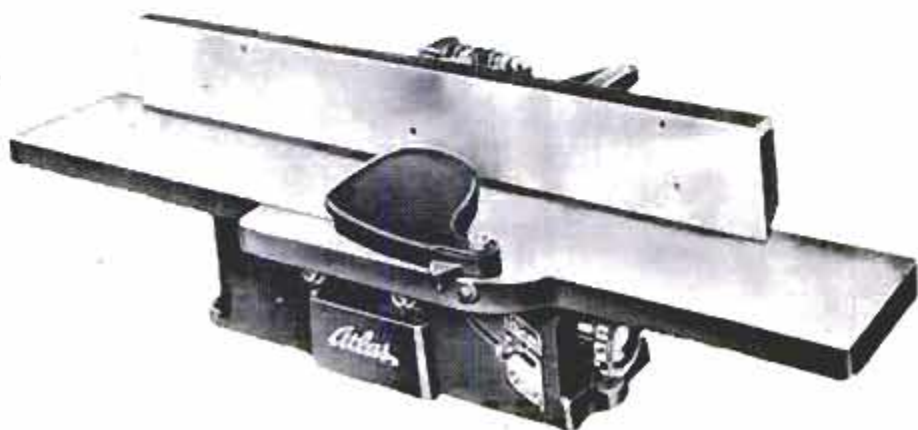
ABBREVIATIONS: A — grease-sealed ball bearings. L — length. W — width. R.p.m. — Revolutions per minute. All dimensions given in inches.

Trade Name and Manufacturer	Width of Cut	Depth of Cut	Table Size	Fence Size	Over-all Dimensions (without stand)			Dia. of Cutting Circle	R.P.M. of Cutter	Bearings
					Length	Width	Height			
Atlas Press Co.	6	1/2	42 x 6-15/16	32 x 4 1/2	42	16 1/2	11 1/2	2 3/4	4100	A
"Comet"—Consolidated Machinery and Supply Co.	6	1/2	62 x 8 1/2	30 x 4	62					
"Craftsman"—Sears, Roebuck & Co.	4 1/2	3/8		26 x 3 1/2	31 7/8	14 3/8	8-7/16		4500	A
"Darra-James"—Tookraft Corp.	4 1/2	3/8		21 x 2 3/4	30 3/8	9 1/8	8 1/8	2 1/4		A
"Delta"—Rockwell Mfg. Co.	4	1/4	27 1/2 L.		32	12	9 1/2	2	3600	A
Duro Metal Products Co.	4 1/2	1/4	7 1/2 W.	18 1/2 x 2 1/2	24					A
"Magna"—Yuba Power Products, Inc.	4	3/8	28 L.	21 1/2 x 3						A
"Plano-Centric"—American Machine & Tool Co.	4 3/8	1/8		17 L.	25	8	5		4000	
"Powr-Kraft"—Montgomery Ward & Co.	4	1/4	28 L.							A
"Walker-Turner"—Rockwell Mfg. Co.	6	1/2	42 1/2 x 7	36 3/4 x 4	48	14	10 1/4	2 1/2	4500	A
Sprunger Bros. Inc.	4 1/2	5/16	24 1/2 L.	20 1/2 x 2 1/2	29 1/4	9 1/2	7		4300	
Boice-Crane	6	3/8	60 x 9	48 L.			8 3/4	3 3/4	3500 4500	A
Yates-American Machine Co.	6	1/2	50 x 6	34 1/2 x 4				2-13/16	4300	A

**COMET
CONSOLIDATED MACHINERY
& SUPPLY CO.**



**POWR-KRAFT
MONTGOMERY WARD & CO.**



**PLANA-CENTRIC
AMERICAN MACHINE
& TOOL CO.**

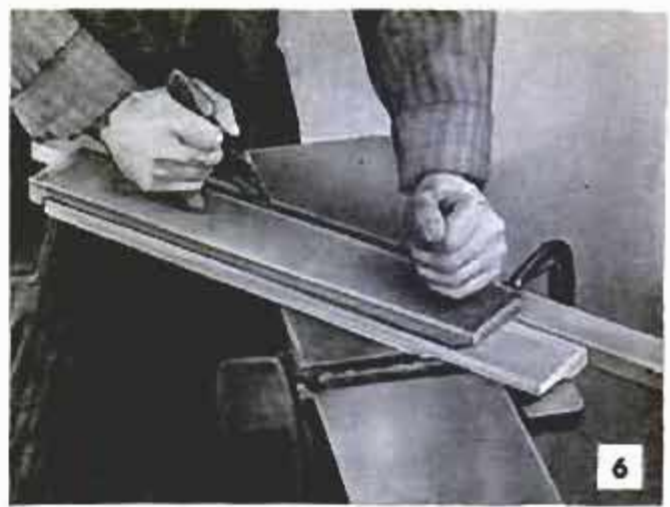
**ATLAS
ATLAS PRESS CO.**



**DARRA-JAMES
TOOLKRAFT CORP.**



**CRAFTSMAN
SEARS, ROEBUCK & CO.**



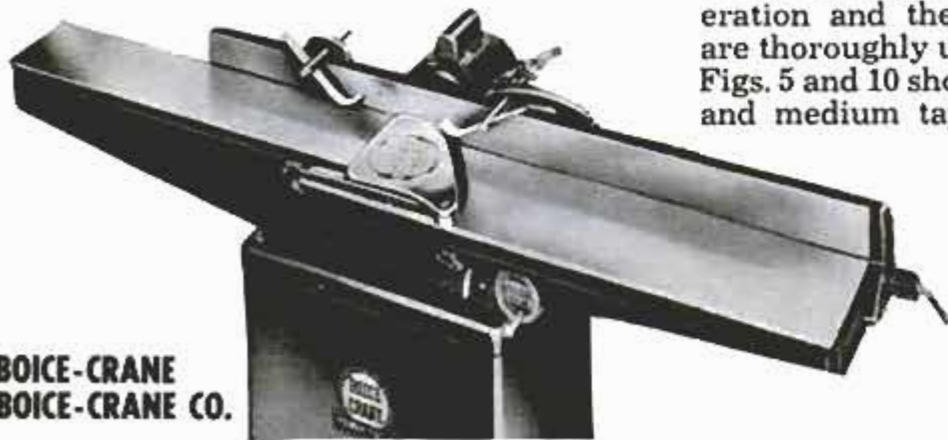
Photos courtesy Atlas Press Co.

light and the stock must be moved slowly across the machine table.

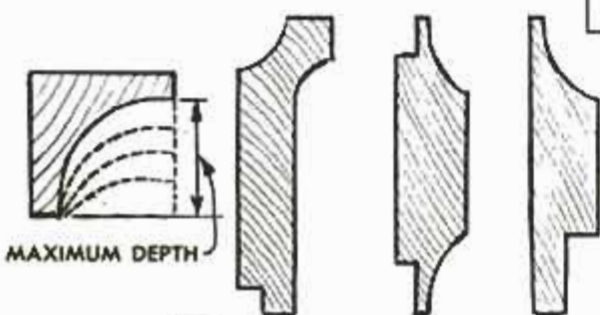
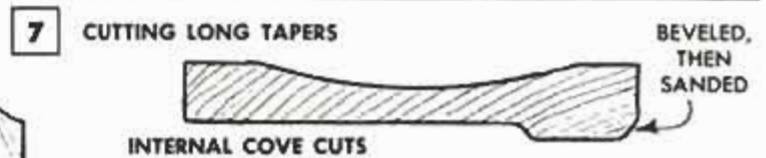
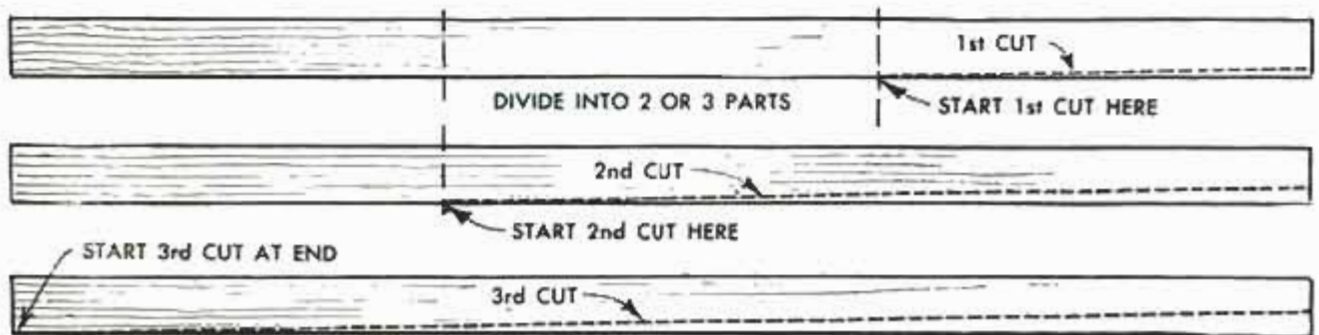
When jointing or facing, take advantage of the grain of the wood. Plane with the grain wherever possible and against the grain only when the nature of the work requires it. Set the machine to take a light cut, never more than $\frac{1}{32}$ in. when planing against the grain, and move the work slowly and uniformly over the cutterhead.

In any facing operation, or a jointing

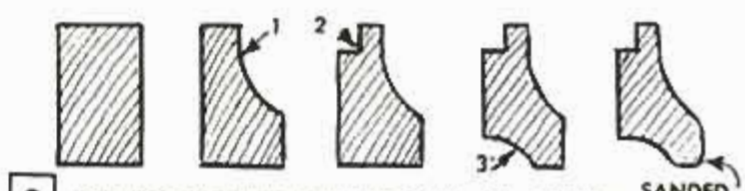
operation on narrow stock, it's best to use either a hold-down, push block or a push stick, Fig. 4, on stock $\frac{3}{4}$ in. or less in thickness. Always use the guard and never place your hands or fingers at the edges or ends of the work as indicated in the upper right detail of Fig. 2. To push work over the cutter knives in this manner is inviting serious injury. Only on such operations as rabbeting and those pictured in Figs. 5, 6, 10 and 11 is it permissible to remove the guard and only then if the operation and the precautions to be taken are thoroughly understood by the operator. Figs. 5 and 10 show methods of cutting short and medium tapers on square stock, the



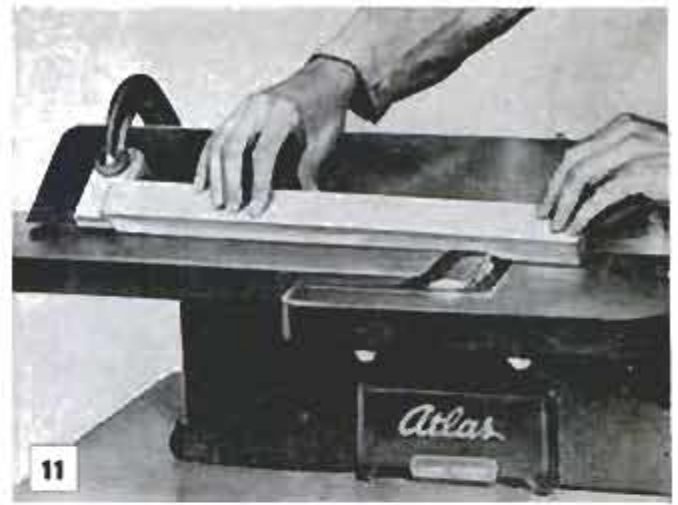
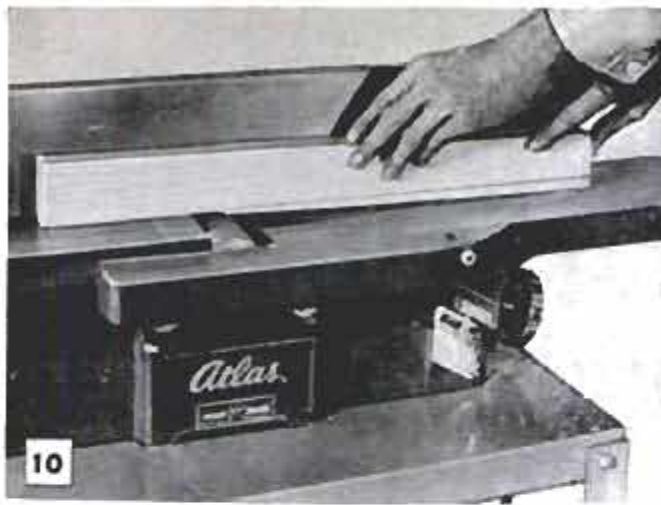
BOICE-CRANE
BOICE-CRANE CO.



8 MOLDING MADE ON JOINTER



9 SHAPING PICTURE-FRAME MOLDING ON JOINTER



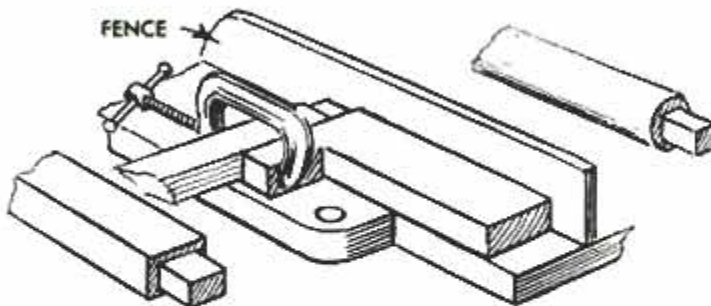
Photos courtesy Atlas Press Co.

pieces being no longer than the front table of the machine. Compare the procedures with those detailed in Fig. 7, which shows a method of cutting a full-length taper on stock which is longer than the front table of the machine. To cut the short, sharp taper, Fig. 5, the work is placed on the rear table and the end elevated on a block. Mark the work on all four faces, the marks indicating the length of the taper. Clamp a stop block to the fence so that you can start each cut directly over the center of the cutterhead. A taper equal to or less than the length of the front table can be made without using the block, Fig. 10.

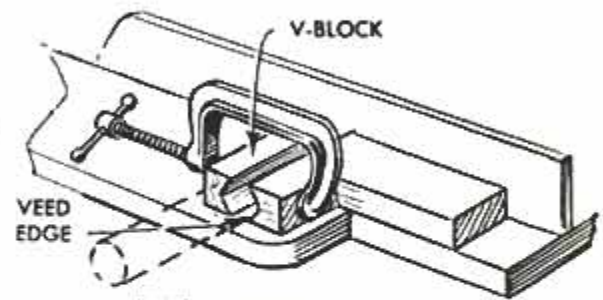
Moldings can be made on the jointer, using methods pictured and detailed in Figs. 6, 8 and 9. The operation is similar to cove-cutting on the circular saw, a fence being clamped to the machine table as in Fig. 6 and the stock run diagonally over the cutterhead. A stopped chamfer or a stopped cut is run as in Figs. 11 and 15, the length of the cut being determined by stop blocks clamped to the jointer fence. * * *



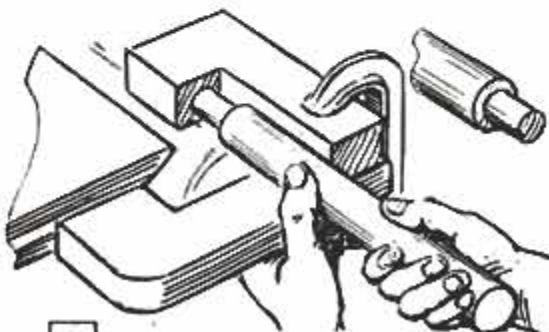
**YATES-AMERICAN
YATES-AMERICAN MACHINE CO.**



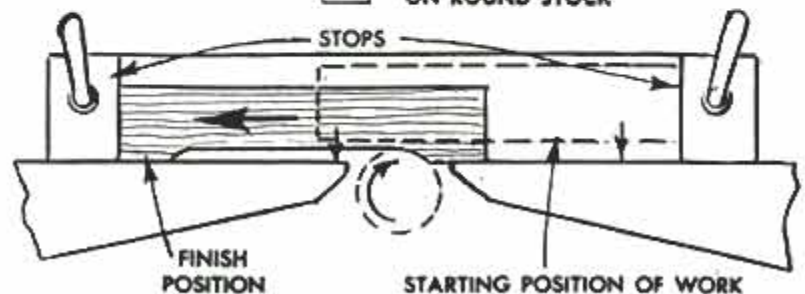
12 MAKING CHEEK AND SHOULDER CUT TO FORM REGULAR TENON



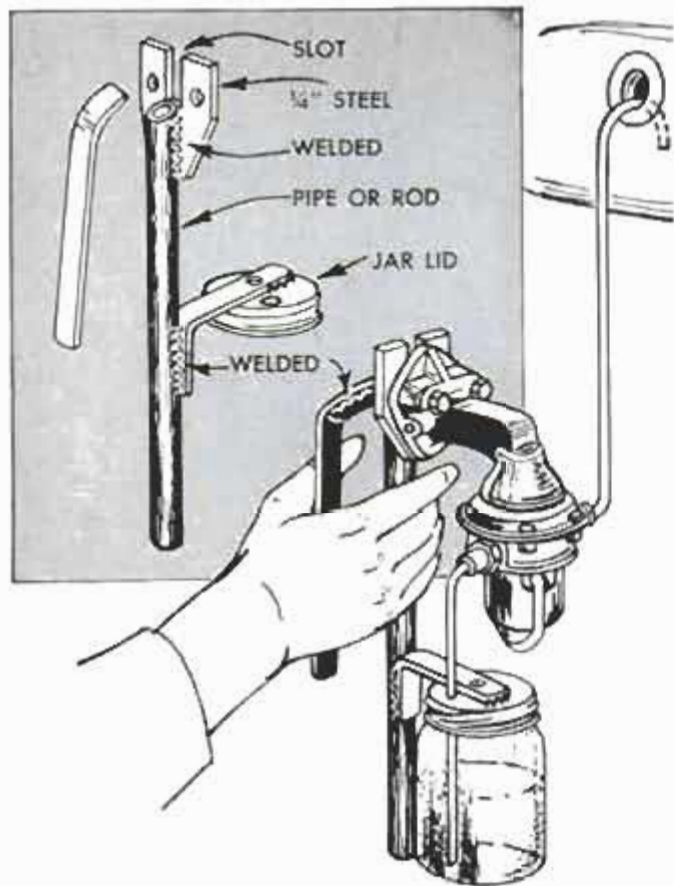
13 SQUARE TENON CUT ON ROUND STOCK



14 SHOULDER CUT ON DOWEL TO FORM ROUND TENON



15 MAKING STOPPED CUTS



Fuel-Pump Conversion Used for Filling Brake Master Cylinder

Here is a handy pump for filling brake cylinders, wet-type clutches such as are used on some cars and for filling transmissions requiring a light grade of oil. The main part of the pump is a fuel pump of the single-diaphragm type that is bolted to a holder. The holder consists of a V-shaped plate which is slotted to take the pump arm and a bracket to which a jar lid is attached, both of which are welded to a length of pipe as shown in the detail. A length of flat steel shaped as shown and welded to the pump arm provides a handle for operating the pump by hand. Lengths of fuel line are attached to the inlet and outlet sides of the pump as shown in the drawing so that when operated, fluid is pumped from the container screwed on the jar lid to the chamber being filled. Size of the jar used is determined by the capacity of the part to be filled. Since glass jars break easily, select a lid for which replacement jars can be readily obtained.

D. E. Bidwell, Escondido, Calif.

☐ For handy seed storage, tie or glue matchboxes together and label the front of each with the name of the seed stored in it.

☐ Old flatirons make interesting book ends and doorstops when enameled white and then decorated with decals or hand-painted designs in contrasting colors.



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Have you been wanting a Hi-Fi set for your home . . . a portable transistor radio no bigger than your hand . . . and any of the other pieces of electronic equipment that are adding so much enjoyment to modern living? Then here's how you can have them, at merely a fraction of the usual purchase price. Using Popular Mechanics' new book—*Electronics Made Easy*—

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This unusually practical book enables you, without any previous experience, to enter the amazing field of electronics for fun or profit. In 192 pages of simple step-by-step instructions and hundreds of illustrations, you learn all about Hi-Fi—exactly what it is and how to build your own Hi-Fi system. You discover how to make the "miracle" transistor radio, how electronic tubes work, how to do radio

servicing, how to use test instruments and make your own, and how to convert old radios into inter-com systems and other devices. It's fun and easy to build your own electronic equipment with the help of this book which contains numerous do-it-yourself projects. Send for your copy of *Electronics Made Easy*. It's your key to the most fascinating hobby of these times **\$3.50** for just.....

Send your order to Dept. 459

POPULAR MECHANICS PRESS, 208 East Ontario Street, Chicago 11, Illinois

Portable **SAW CASE** *converts to table*

TAKE YOUR PORTABLE electric saw to the job in this carrying case, set it up on sawhorses and you have a stationary table saw as in the right-hand photo below. When the job is done, convert the table back to a carrying case as in the left-hand photo. The conversion takes only a minute or two.

The original case was made from fir plywood and was designed by the Douglas Fir Plywood Association. It's rigid and does not split or warp. From plywood panels the parts can be cut to the width needed without having to glue stock edge-to-edge to get the required widths. Plywood in $\frac{1}{2}$, $\frac{5}{8}$ or $\frac{3}{4}$ -in. thicknesses may be used for all the parts. The $\frac{1}{2}$ -in. thickness makes the lightest carrying case, but the table will be somewhat less rigid. Plywood $\frac{5}{8}$ in. in thickness is perhaps the best all-around choice as it is sufficiently rigid at the unsupported corners of the table and holds screws and bolts better than the lighter

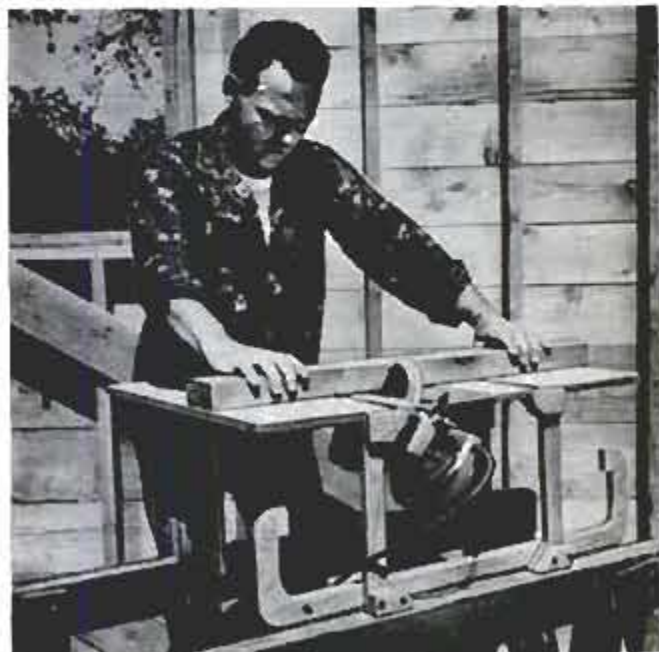
Unit folds into carrying case for portable electric saw. No latches or other extra parts are required

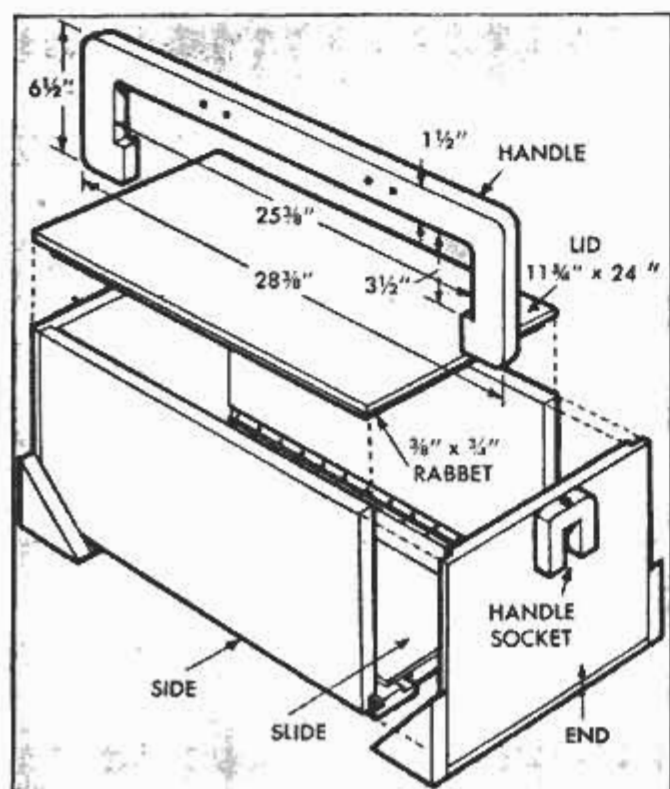
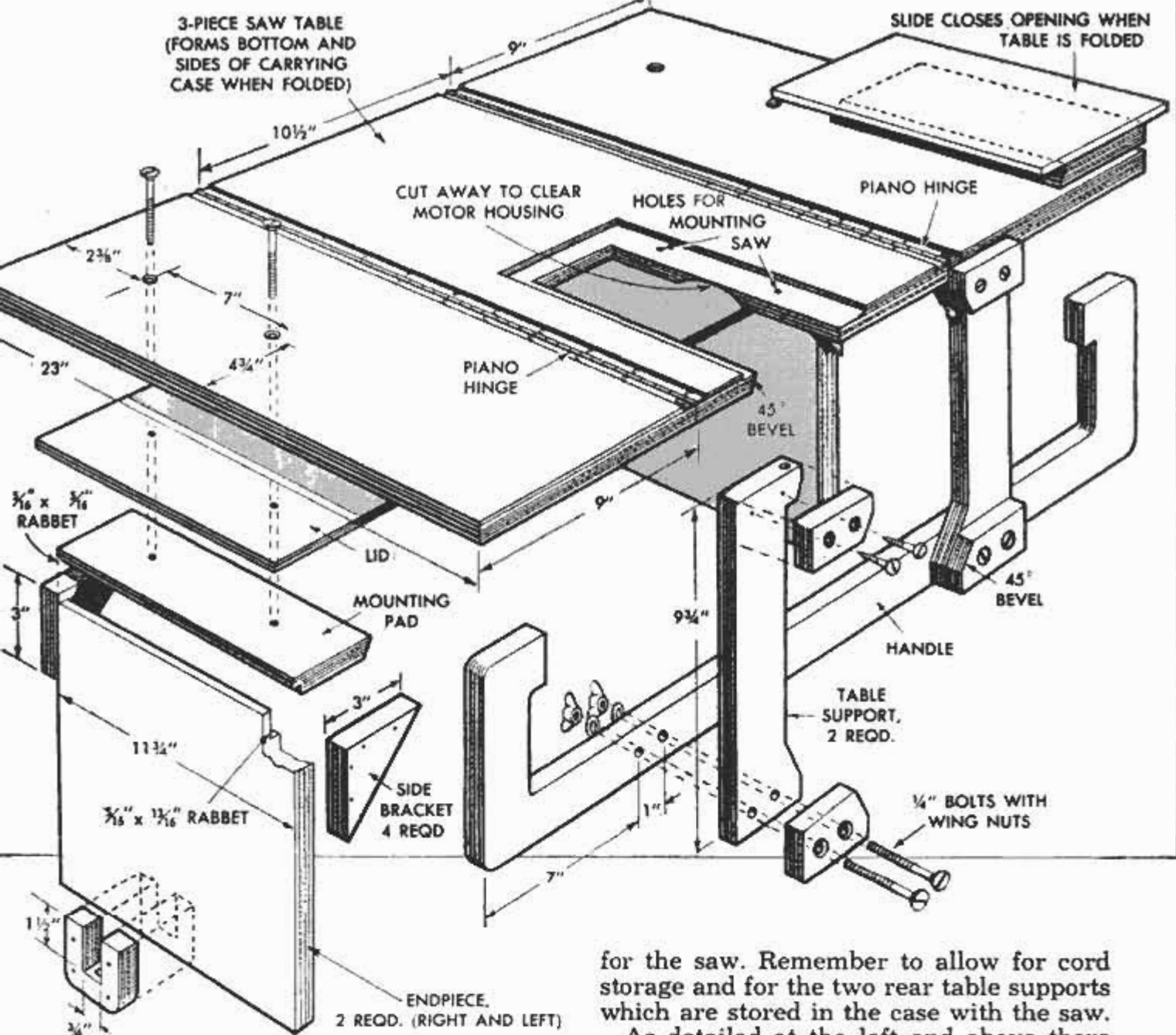


SAW-60

material. Before cutting any material to the dimensions given in the details on the following page, be sure to measure the portable saw to determine the minimum amount of space it will require for storage in the case. It may be necessary to change some of the dimensions of the case, which are only general, to provide ample space

Remove the handle, unfold carrying case, lock the portable saw in position and you have a table saw





for the saw. Remember to allow for cord storage and for the two rear table supports which are stored in the case with the saw.

As detailed at the left and above there is some latitude in cutting and assembling the parts. For example, in the detail at the left the endpieces are shown rabbeted. This makes a neat and somewhat more stable assembly when the parts are assembled as a case. Rabbeting the ends of these pieces is not essential. The rabbets can be omitted and only the top, or lid, rabbeted as indicated. When assembled as a case, the rabbeted lid will hold the parts in position.

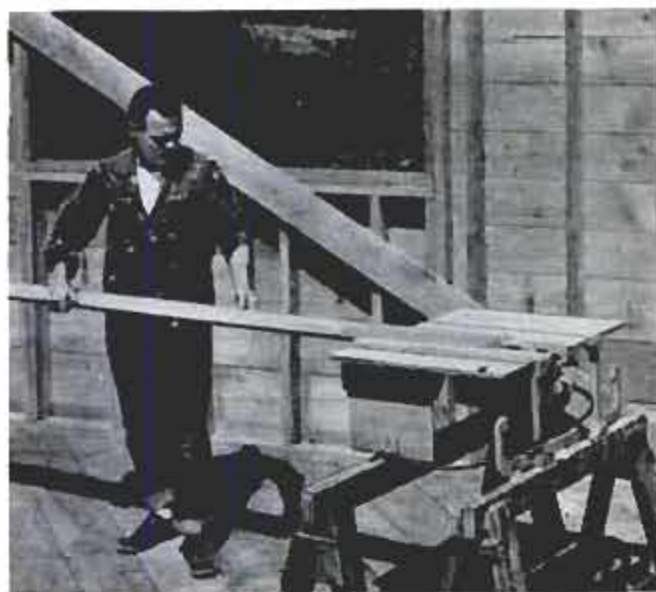
Note that the table consists of three pieces, or panels. The two narrow panels form the table wings and are hinged to the center panel. When folded, this unit forms the bottom and sides of the carrying case. Both edges of the center panel and one edge of each side panel, or wing, are rabbeted to take a piano-type hinge. When running the rabbets care should be taken to see that they are cut to the correct depth to take the hinges with sufficient clearance and that they are of equal depth on the three panels.

Note also that the sides of the opening, or slot, in the center panel of the table assembly are cut at 45 deg. and that the edges of the slide are cut at a corresponding angle. The slide serves as a means of closing the opening when the top is folded to form the bottom and sides of the carrying case. The size of the opening is not given, as it must be cut to fit the sole plate of the portable saw.

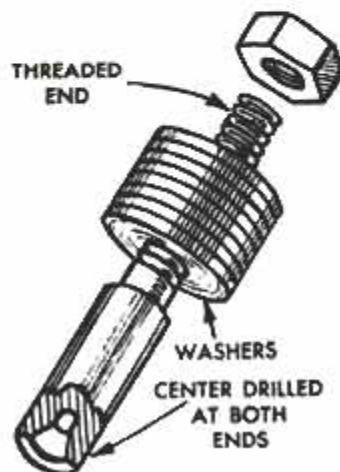
Make and join the three table panels first, but before cutting stock be sure that when folded these parts will provide ample space for the saw, the two table supports and the electric cord. Follow with the lid, the endpieces, the supports and, lastly, the handle. The top end of each support is joined to the back edge of the table by a single bolt passing through the hinge leaf. In this sequence you can use the table as the basis for determining the required sizes of the other parts. Certain of the smaller parts such as the triangular side brackets, or braces, joining the mounting pads to the endpieces, also the notched handle sockets, can be attached with glue and small nails or brads.

It is important to make the handle last so it can be cut to fit over the ends of the case with just enough clearance to permit it to slip easily into the carrying position. It will be somewhat more comfortable to the hand if the handle is made from $\frac{3}{4}$ -in. plywood. Note that the notches in the handle sockets are made $\frac{3}{4}$ in. wide to permit use of plywood of this thickness.

After the parts have been cut to size it is a good idea to sand all edges smooth and then round the corners slightly. This tends to prevent splintering and makes the wood easier to paint or cover with a clear finishing material such as that made especially for use on fir plywood. After finishing the table, sand it, then give it two coats of paste wax and rub to a high polish. ★ ★ ★



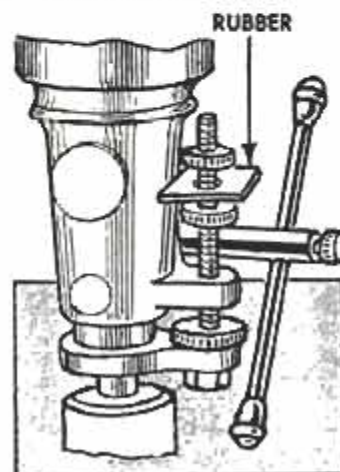
Arbor for Turning Washers



Often it is necessary to reduce the diameter of washers of a given size. This can be done in the lathe by making a shouldered arbor, the small diameter of which is turned to take the washers in a close fit. Center-drill both ends to take the lathe centers.

Nonlocking Depth-Gauge Nuts

When the depth-gauge nuts on your drill press lock you may be in trouble. It can happen, unless you take the precaution of placing a thin rubber washer between the nuts. Then they'll hold the adjustment without any possibility of locking.



Novel Drill "Vise" Grips Round Work

There are times when you have to improvise a usable tool quickly from whatever happens to be at hand. For example, you need a vise to grip round work and keep it from spinning while drilling. Remove a V-belt from another machine and locate a short length of tubing large enough to slip over the belt, leaving a loop projecting from each end. Slide the tubing on the belt to adjust the loop for size, and then drop it over the work. Tighten the vise by pulling on the free loop and there you are.—G. E. Hendrickson, Argyle, Wis.

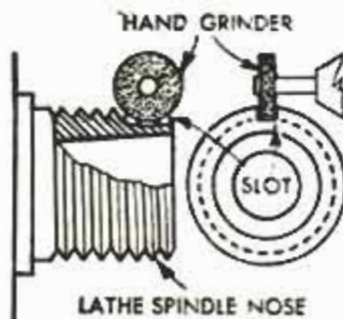


Hanger for Portable Drill



Every owner of a portable electric drill has a storage problem. Lay the drill on the bench top and it's always in the way. It may fall from a shelf. It won't hang on the tool panel and if stored in a drawer or tool box the cord may be damaged. But there's a way: Tighten the chuck on a screw eye and you can hang the drill almost anywhere.

Chip Groove in Lathe Spindle

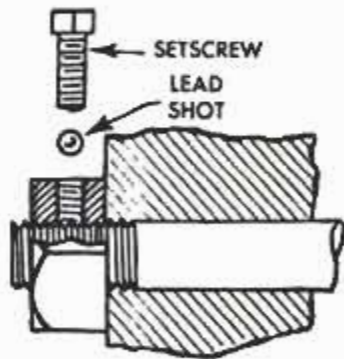


A chip groove cut longitudinally across the threads on a lathe spindle nose traps metal chips and abrasive material that may otherwise damage the threads in time. With care you can do the job freehand with a hand grinder and a suitable abrasive wheel. But perhaps a better way is to mount the grinder in an offset holder attached to the tool post or bolted to the carriage compound. This method will assure an accurate cut to a uniform depth.

H. J. Gerber, Stillwater, Okla.

Lead Shot Prevents Thread Damage

Some types of assemblies subjected to unusual vibration or shock require that nuts or threaded collars be locked in place with a setscrew. One way to prevent damage to the threads is to drop a BB shot into the hole before turning in the setscrew. The lead shot will compress, take the thread form and hold securely.

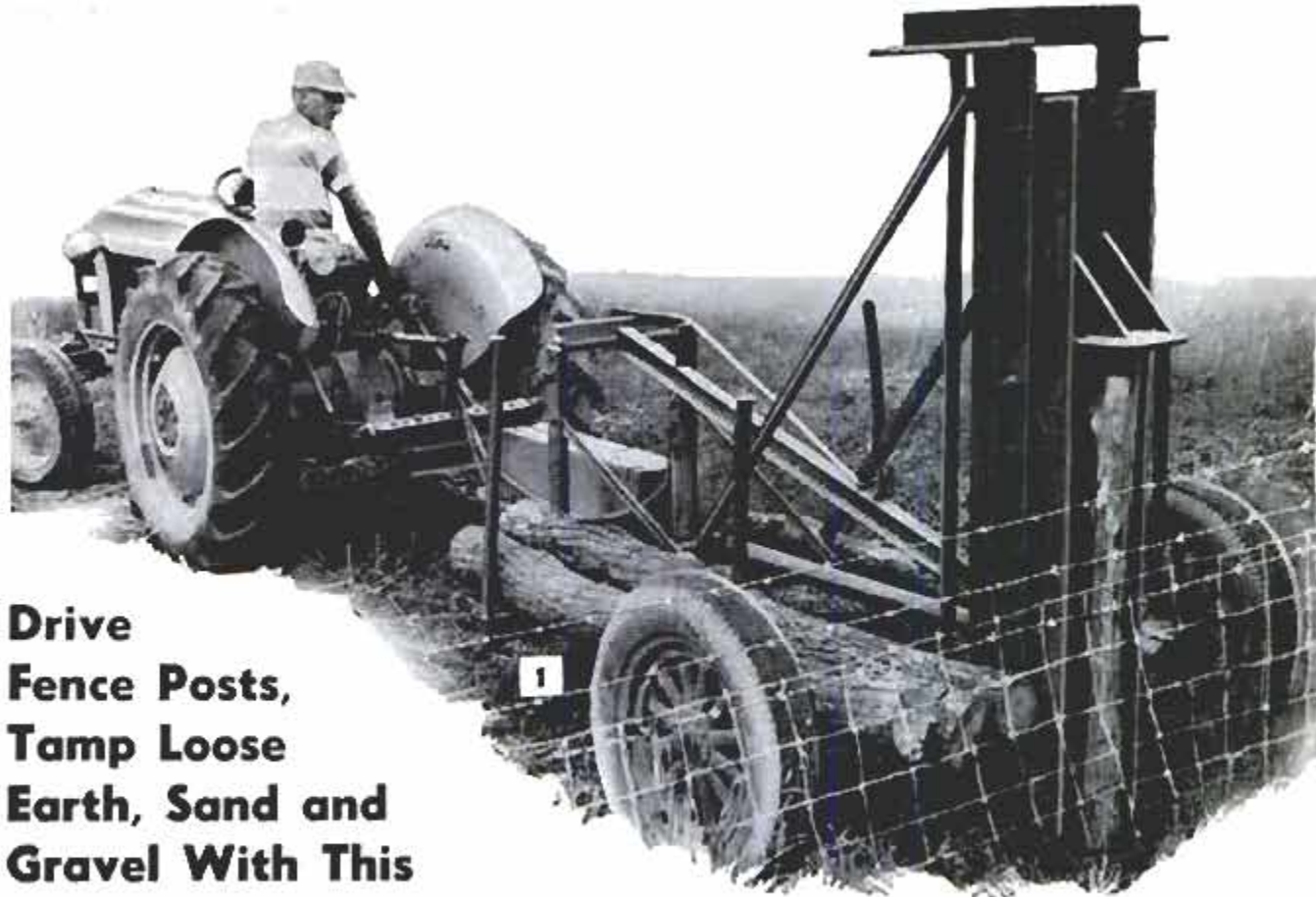


Compensating for Chuck Runout

Usually it is possible to compensate for slight runout in a worn drill chuck and keep it in service until it can be repaired or replaced. One way is to select tools commonly used in the chuck and test each in turn. When located so that they run true when locked in the chuck, make a mark with layout ink on one chuck jaw and another registering mark on the shank of the tool. In this way each of the marked tools can be re-located accurately.



Frank LaSaracina, New York City.



**Drive
Fence Posts,
Tamp Loose
Earth, Sand and
Gravel With This**

TRAILER-TYPE DRIVER

By A. M. Wettach

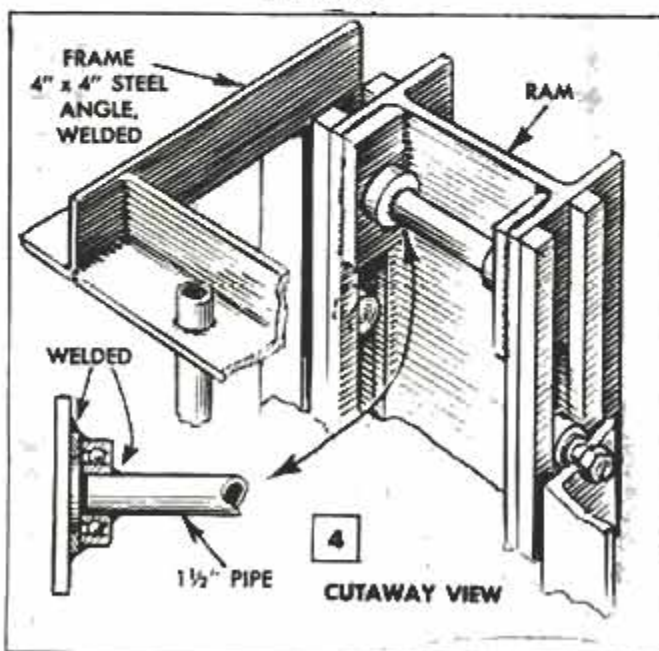
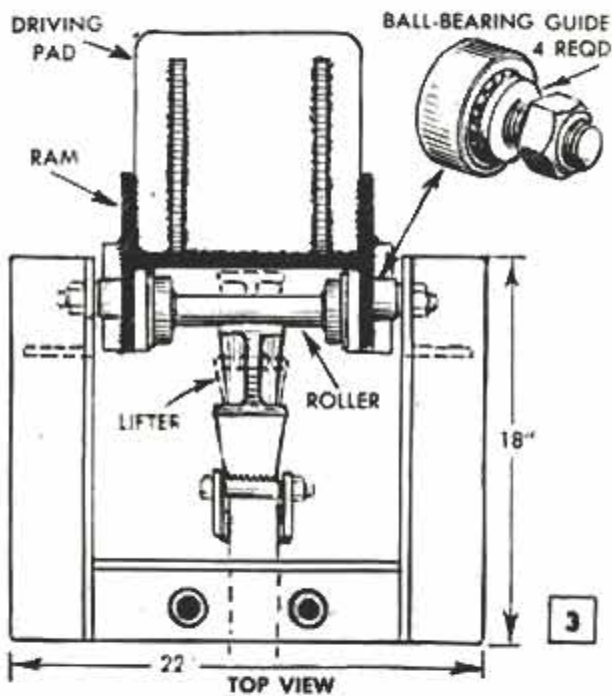
BUILT IN A FARM SHOP almost entirely from salvaged materials, this hydraulically operated unit is designed to serve the dual purpose of a power driver and tamper. The ram, or driver, is operated from the tractor hydraulic-lift system through a two-way hydraulic cylinder. Maximum speed is about 30 strokes per minute. Length of the stroke can be varied to suit the job being done.

Operation of the machine is simple, fast and effective. When replacing a defective post in a line fence, the machine is backed up to the fence as pictured in Fig. 1. The staples are pulled from the post to release the wire, and a chain is looped about the post. A single upward stroke of the ram lifts the defective post. The replacement post is then driven, without moving the driver, and the wire restapled. When building completely new fencing the machine will drive unsharpened wooden posts in soft ground without boring holes and will set steel posts to the correct depth with only a few strokes of the ram. As pictured, a number of wooden replacement posts can be carried on the trailer frame, which is fitted with stakes for this purpose. This feature saves time in fence repair.

A detachable pad fitted to the lower end

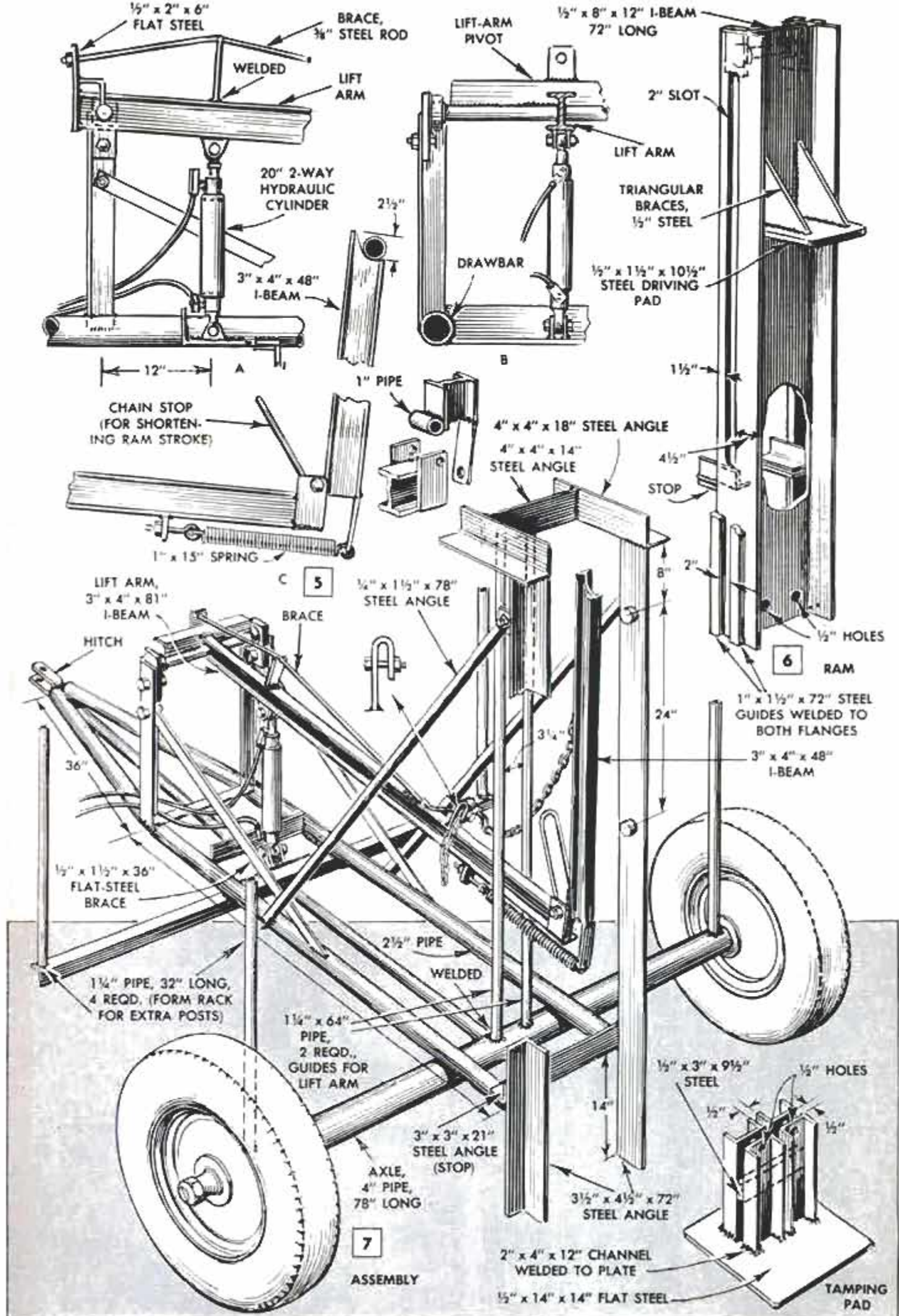
Nearly all parts of the driver-tamper are assembled by welding rather than relying on bolts and rivets. Maximum strength and rigidity of parts are essential. Top speed of driver is about 30 strokes per min.





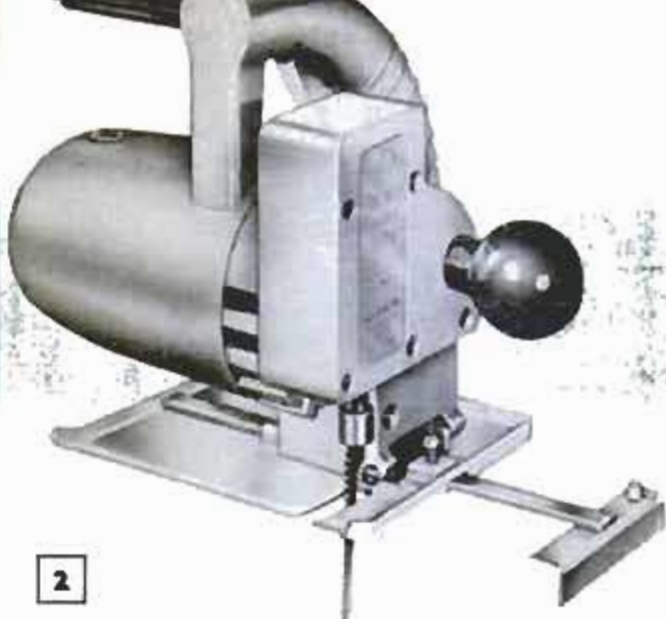
of the ram, Figs. 6 and 7, converts the machine to an efficient tamper. This will firm loose earth and machine-tamp gravel fills in preparation for pouring concrete-slab floors for buildings and feed lots. In this type of work the ram stroke is shortened by adjusting the length of the chain, which trips the vertical section of the lift arm and permits the ram to drop free. The manner in which this mechanism operates and the provision for adjusting the length of the chain will be seen from details in Figs. 3, 5 and 7. Note in detail A, Fig. 5, that the lower end of the hydraulic cylinder bears on a heavy steel angle, the ends of which are welded to the A-frame forming the drawbar. Use a very heavy steel angle or channel for this purpose, as it is important that the mounting be rigid. Note also in detail B, Fig. 5, that the ball bearings carrying the lift-arm pivot are welded to short steel straps which, in turn, are bolted to the upright supports. This method of mounting is necessary in order to permit the hydraulic cylinder to be removed for use on other equipment or for servicing. Figs. 3 and 4 and detail C, Fig. 5, show the construction of the two-piece lift arm and how it operates. The pivoted vertical section of the arm is connected to the horizontal section by a chain, Figs. 2 and 7. At the beginning of the up-stroke the shaped upper end of the vertical section engages a roller at the upper end of the ram, Figs. 3, 4 and 6. At a given point on the up-stroke, determined by the length of the chain, the latter tightens and pulls the vertical section of the lift arm clear of the roller. This movement releases the ram and permits it to fall free in its supporting column. The action of the trip chain can be controlled at the improvised chain clevis, Fig. 7, and also by the chain stop, detail C, Fig. 5. Note that one dimension on the A-frame is not given. This distance is optional as it may be necessary to increase the over-all length of the drawbar in order to facilitate short turns with a tricycle-type tractor.

Note that wherever possible parts are joined by welding rather than relying on bolts or rivets. Rigidity is essential in this type of assembly. When welding the parts of the column in which the ram is supported, care must be taken to allow just the right amount of clearance. The ball-bearing guides used may require clearance slots in both webs of the I-beam (ram), Fig. 6. The guides should carry the ram with a minimum of side play. Some experimentation likely will be necessary in cutting and filing the curved seat at the top end of the vertical section of the lift arm. The arm should release easily yet hold securely throughout the up-stroke of the ram. ★ ★ ★



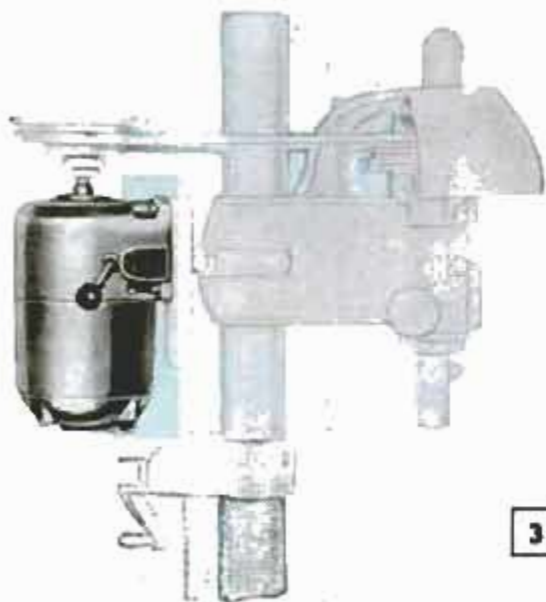


1

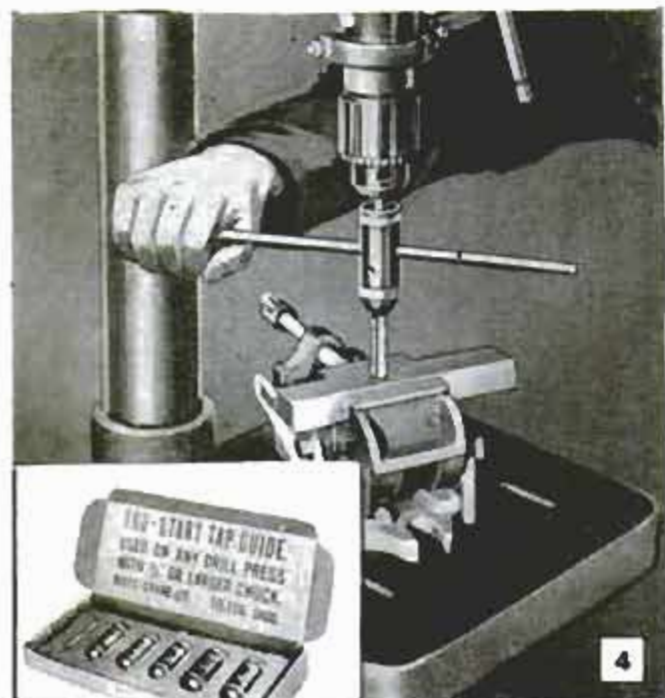


2

SHOPPING FOR TOOLS



3



4

1. MAGNIFIER illuminates and magnifies fine-assembly and inspection operations. Lens is 6 x 6-in. plastic optically ground to give 36 sq. in. viewing area free from distortion. Light on the work is provided by fluorescent lamp. Both lamp and lens are adjustable

The Fostoria Pressed Steel Corp., Fostoria, Ohio

2. HEAVY-DUTY SABER SAW cuts stock 6 in. thick at 90 deg., and 4 in. stock at angles up to 45 deg. With a metal-cutting blade it cuts pipe, tubing and flat steel up to 1/2 in. in thickness. Comes regularly equipped with a ripping fence. Weighs about 6 1/2 lb.

Wen Products, Inc., 5810 N. Northwest Highway, Chicago

3. SELECTIVE-SPEED GEARSHIFT DRIVE is available with single and two-speed motors from 1/2 hp. up. A single-speed motor provides four output-shaft speeds; a two-speed motor, eight output-shaft speeds. Useful in wide range of applications requiring variable speeds

The Lima Electric Motor Co., Inc., 111 1/2 W. North St., Lima, Ohio

4. TAP GUIDE reduces tap breakage to the minimum and gives a straight, true thread—every time. Comes as a kit consisting of tap holders, or "chucks," and a drive handle for hand-tapping operations in a drill press. Work is held in the vise as pictured

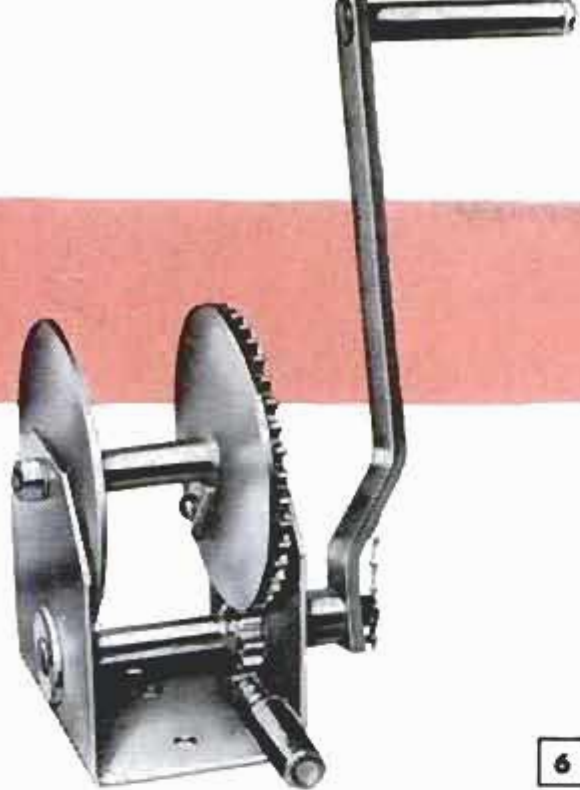
Bolce-Crane Co., 913 W. Central Ave., Toledo 6, Ohio

5. SMALL-PARTS TRAY is 18 in. long, 3 in. wide and 2 in. deep. It comes with adjustable dividers and spaced hooks on the back for hanging on perforated-hardboard panels. Tray is semicircular, which makes it easy to select small items from each compartment

Industrial Marketing Service, 23350 Edward St., Fort Dearborn Station, Dearborn, Mich.



5



6

6. BOAT WINCH provides safe, one-man loading of large boats on any suitable trailer. Equipped with removable handle, safety chain for positive locking, spring-loaded ratchet and separate hand brake
Draw-Tite Mfg. Co., Belleville, Mich.



7

7. REMOTE-CUP SPRAY UNIT saves time on small jobs requiring only a limited quantity of finishing material. Cup can be used with large or small production guns. Handles all common finishing materials
The DeVilbiss Co., Toledo, Ohio

8. SOIL COMPACTOR is self-propelled, handles nearly all silts, sand, gravel, crushed stone, hot or cold asphaltic mixes. Unit is powered by 3.5-hp. engine, has compacting force of 2300 1-ton blows per min.
Master Vibrator Co., 1752 Stanley Ave., Dayton 1, Ohio



8

9. MICROMETER has one-finger locking lever, is available with carbide-tipped spindle and anvil. Bronze inner sleeve eliminates friction between spindle and sleeve. Dull chrome finish with black graduations
MG Tool Co., 80 White St., New York City 13



BRONZE INNER SLEEVE

10. PROSPECTOR'S PICK comes in 22-oz. head weight, is designed for use on hard surfaces. Nylon grip eases shock of sharp blows, absorbs rebound and "sting." Pick is also made in 12 and 20-oz. sizes
Eatwring Mfg. Co., Rockford, Ill.



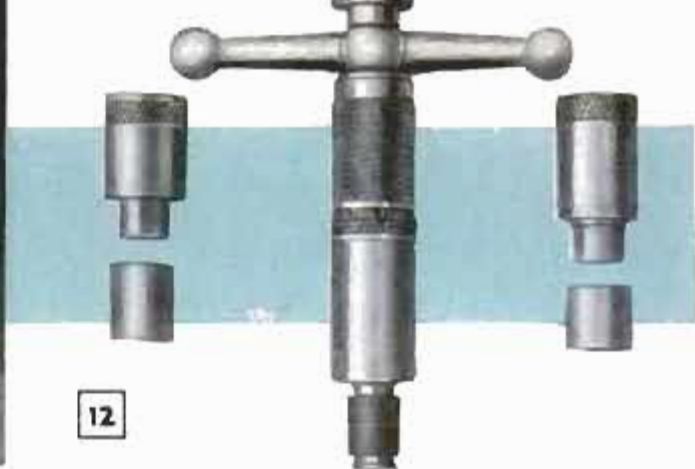
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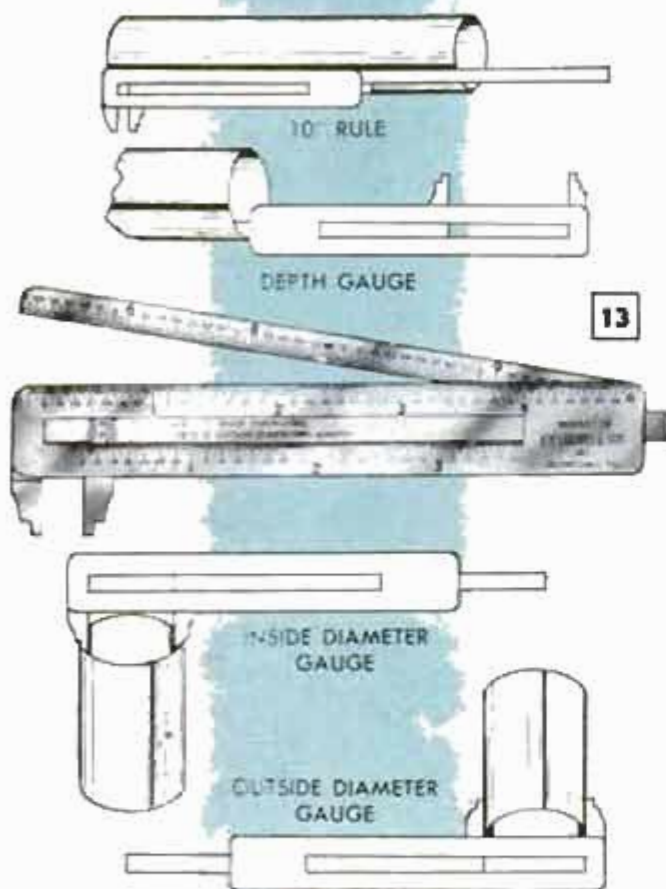
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12

11. BLADE SHARPENER holds and guides file at correct angle, permits sharpening circular saw blades without removing from arbor. Metal slide attaches to miter gauge. Blade is then tilted to correct angle
 Martin Saw Filer, 530 Greenleaf Drive, Monroeville, Pa.

12. BUSHING AND BEARING REPLACEMENT TOOLS are available to fit nearly all types of automotive bushings. They do not burr or score thin bushings used on wrist pins, steering knuckles, generators, starters
 Hamilton Tool Co., Third and Adams Sts., La Grande, Ore.



13

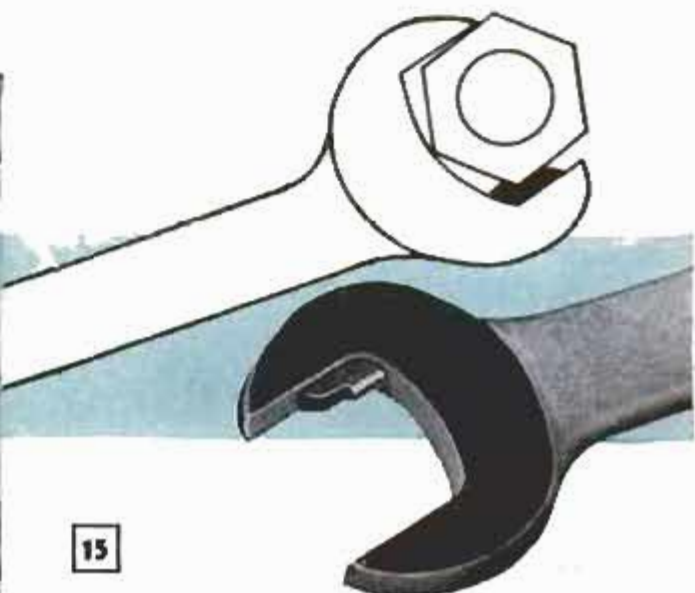
13. CALIPER RULE is more than just a caliper. It's a 10-in. rule and depth gauge as well. Measures inside and outside diameters up to 4 in. and also provides a decimal-equivalent chart. It is only 5/8 in. long
 L. F. Grammes & Sons, Inc., Allentown, Pa.

14. HEDGE TRIMMER attaches to any 1/4-in. portable electric drill, does a neat and speedy job of trimming the toughest hedge. Also can be used to trim grass along walks, walls and other hard-to-mow places
 Englin Enterprises, P.O. Box 4840, University Station, Tucson, Ariz.

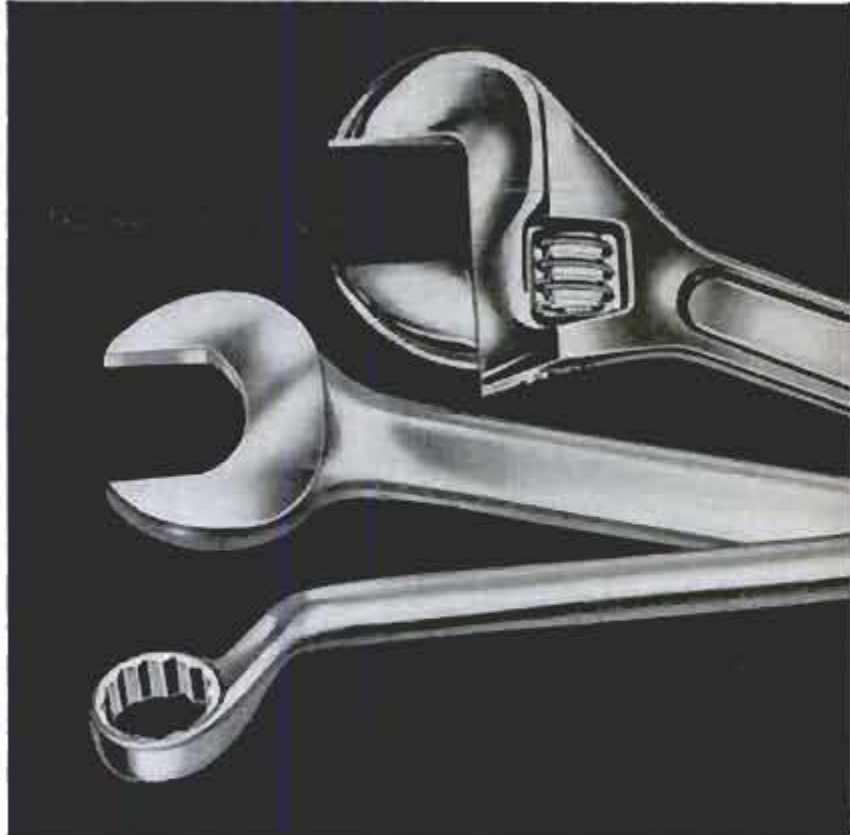
15. RATCHET-ACTION END WRENCH has no moving parts. Available as a kit including most-used sizes from 7/16 to 3/4 in., also individually in any of 5 sizes furnished. Kit includes plastic storage roll
 Columbia Products, Inc., Baltimore, Md.



14



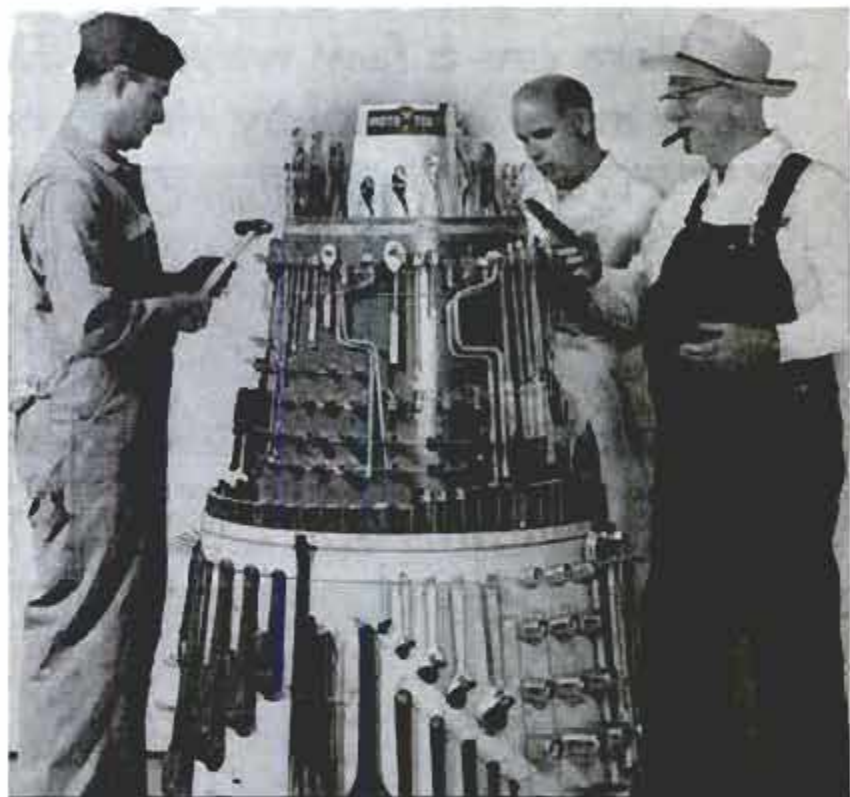
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It has a part to play . . . making your hobby better—more rewarding.

Precision camera? Yes. Expert's camera? Yes—but you don't have to be an expert to operate it. Kodak, in the American tradition, has created

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Here are a few ways the Signet 80 Camera can make any hobby richer, more rewarding . . .



You get needle-sharp pictures with the coupled rangefinder—2½ feet to infinity! Couples to all lenses.



You shoot exactly what you see, with the brilliant big-as-life viewfinder. Image is life-size!



You read exposure easily—with ultra-sensitive photoelectric meter! Sets for all films.



You change lenses instantly—switch to wide-angle or telephoto. Just drop in, start shooting!



You pull in faraway scenes, take candid portraits with the telephoto lens. (90mm *f*/4, \$69.50)



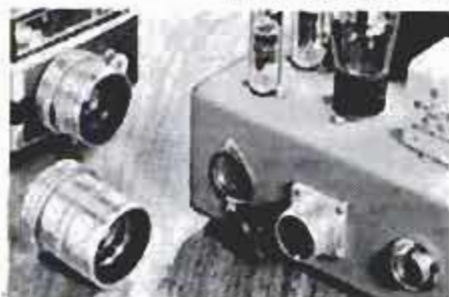
You capture the broad sweep of a scene with the wide-angle lens. (35mm *f*/3.5, \$57.50)

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You load film fast—drop it in, close the camera. You can do it with one hand, blindfold!



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South Bend 13" and 14½" Lathes

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- Microfinished bearings with no metal-to-metal contact.
- Belt drive to spindle for vibration-free operation—no gear marks.
- Precision-cut gears and ground shafts for smooth power feeds.
- Rugged, rigid construction that will stand up under hard usage.
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SPECIFICATIONS	13"	14½"
Swing over cross slide.....	7¼"	8¼"
Maximum collet capacity.....	1½"	1¾"
Spindle speed range.....	20-940	15-875
Shipping weight, 7' bed.....	1760 lbs.	2089 lbs.
Base price.....	\$1675	\$2074

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Pipe Insulation

Q—The hot-water pipe from my water heater to the bathroom is 24 ft. long and in cold weather, when the basement is cold, it is necessary to let the faucet run for some time before the water is warm. Isn't there a way to insulate the pipe to prevent the heat loss?

S. O., Iowa

A—If the warm-water pipe from the heater is below the floor joists and is straight, then perhaps it would be possible to cover it with a preformed cellular insulating material of the type used for covering the hot-water and steam lines of heating systems. This material usually comes in 3-ft. lengths and is available to fit various sizes of pipe from ½ in. up. There also are available shaped insulating elbows and tees for covering the pipe connections. In addition to the rigid type of pipe insulation there is available a flexible insulating wrapping which can be used on pipes placed between joists or otherwise difficult to reach. Both types can be quite effective in reducing heat loss between the heater and bath. After insulating the pipe it may be well to lower the setting of the thermostat slightly, especially if it has been set higher than normal to compensate for loss through the uninsulated pipe.



Staining Brick

Q—My fireplace is built of what I suppose are common brick (it is quite old) and these have been discolored by smoke directly over the fireplace opening. I'd like to clean off the smoke stain and then color the bricks red with white mortar joints. Is this practical? How can it be done?

H. S., Me.

A—If you are sure that the discoloration is due to smoke it usually is possible to clean it off with ordinary household ammonia. A mild washing-powder solution will remove accumulated dirt and dust. Wash off with clean water. If the brickwork is old and porous it will absorb considerable water. Allow to dry thoroughly. We hesitate to recommend that you stain the brickwork, as the results are never entirely certain. Some individual bricks will absorb more stain than others, especially if they are quite old, as you say. For this reason we would suggest that you obtain several common bricks and experiment with these before applying any stain to the fireplace bricks. A simple and

(Continued to page 226)

What kind of a car do you want, exactly? Chevrolet has a choice of nine engines, five transmissions, two suspension systems, regular or Positraction rear axles, special cams, solid or hydraulic valve lifters, two air conditioning systems, even Fuel Injection—the list of extra-cost options is astonishing. But what it means is that you can virtually design your own car, tailored precisely to your needs. Here's one case in point:

“I ‘built’ our Chevy as a packhorse”



“My wife always puts down ‘profession: housewife’ on the income tax forms—but she’d be a lot more accurate if she made it ‘bus driver.’ We’ve got a Little Leaguer, a Boy Scout and a daughter in ballet classes, plus a fanatic interest in gardening, and it seems to me she spends 90 per cent of her time transporting kids or plants somewhere.

“So when it came new car time for us I took Chevy’s whopping list of options and sat down to ‘build’ a car that would make her job easier. The nine-passenger wagon, of course, because we *have* to have the space—and the kids love that rear-facing third seat.

“The budget pointed to that penny-saving Six engine, but Powerglide and power steering were almost necessities—all her

driving is stop-and-go neighborhood stuff.

“But I made myself a real hero with something she’d never have thought of—Positraction. She still doesn’t know *how* it works but to hear her talk you’d think I’d invented the wheel—she can cruise right through a foot of snow or the spring mud on that dirt road out to Wolcott’s Nursery without a whisper of wheelspin. But I guess I did almost too good a job; that car is *hers*, and I practically have to pry her fingers off the wheel to borrow it!”

It’s a fact; you can make a car *yours* all the way through with Chevy’s terrific spread of options—sit down with the specs and see what you come up with! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



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Be sure it's a genuine CHANNELLOCK
Look for the trademark on the handle

(Continued from page 224)

quite effective stain can be made by mixing equal parts of boiled linseed oil and turpentine and adding Venetian-red oil color to make a stain of the shade desired. Apply to the test bricks with a soft brush and note the results when dry. If satisfactory, try on a small area of the fireplace, covering, say, a half dozen of the old bricks. If the results are satisfactory, then of course, go over the whole fireplace. When the stain is thoroughly dry it perhaps would be a good idea to coat the bricks with a masonry sealer. **Caution:** If you use ammonia solution (household strength) to clean the bricks be sure to provide adequate ventilation. Use a fan if necessary to provide sufficient air circulation.

Preventing Screen Stains



Q—I have bronze window screens which have been in use only one season. I notice that the screen wire is no longer bright as it was when installed. Also there are dark stains on the siding. I'm told this discoloration comes from the screens: Is there any way to prevent this?—E. E., N. J.

A—It is difficult to prevent oxide coatings from forming on copper and bronze screen wire. The coating that forms on the screen wire does not destroy the metal but will discolor painted woodwork as you describe. An older protective finish which seems to give fairly good results consists of a mixture of varnish, 2 parts; boiled linseed oil, 1 part and pure turpentine, 1 part. This mixture can be applied to the wire with a brush, but a better applicator can be made by tacking a small piece of old pile carpeting to a block of softwood. Drying time for the mixture can be shortened somewhat by adding a drier in the proportion of a tablespoonful or so to a half gal. of the material. There also are available clear plastic sprays in pressurized containers. These should prove equally effective in preventing discoloration of screens and woodwork but, of course, the cost of application per screen will be more than that of the varnish-oil-turpentine mixture. For best results the finish should be renewed periodically.

Polishing Old Silver

Q—I have some old silver heirlooms, a teapot, chafing dish and some tableware, which are quite valuable to me because of family associations. All pieces are a rather dark, brownish color and it seems impossible to restore the surfaces to a high luster with any ordinary silver polish. I've tried several with about the same result—no high polish. How does one go about getting the high luster I see on silverware? Could I have the pieces buffed at a plating shop?—L. M., Ga.

A—Evidently the pieces have not been polished for years and have become blackened by silver sulphide. We could not recommend buffing, unless, of course, the pieces are taken to an experienced silversmith who will be best qualified to judge what cleaning and polishing procedure to use in restoring the pieces. Your silversmith is not likely to recommend polishing old pieces to the high luster you seem to prefer, as a high polish is not generally looked upon with favor by collectors of old silver. We do not think the various polishes you say you have used are at fault as these usually are compounded for periodic use on silverware which ordinarily is kept in good condition. If you wish to try the job of cleaning the old ware yourself, here's a method that is safe and generally gives good results. Mix (dry) cream of tartar, 2 parts; levigated chalk (not precipitated), 2 parts; and alum, 1 part. Keep the unused portion of the dry mixture in a container that can be tightly closed. Wet whatever amount is to be used with just enough clean water to form a fairly heavy paste. Charge a linen cloth with a small amount of the paste and rub the silverware lightly. This treatment usually can be depended on to remove the dark coating with comparatively little rubbing. Wash off the residue with clear water. If you keep the pieces on display then frequent light polishing is necessary.

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Here are three important ways in which Today's Army can help you further your education . . .



1. LEARN THROUGH SCHOOLING: If you're now in high school—by all means *stay in school!* But if for some reason you've had to leave school, here's how Today's Army can help you qualify for a high school diploma or college credits. The United States Armed Forces Institute (USAFI) can offer you more than 150 top-notch academic and technical courses. And there are even opportunities for regular classroom instruction right on your post. You can earn credits in courses you need to get your high school diploma—drawing a regular salary while you're learning! Thousands of Army personnel have qualified for high school diplomas and begun college level studies through USAFI. So can *you!*

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* **HERE'S HOW** your choice is guaranteed *before* you enlist: Just tell your Army recruiter which outfit you want to join—or where you'd like to serve. He'll check to make sure there's a spot open in the outfit or area you want. If there is, you get it. If not, there's no obligation.

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TAXI ENGINES RUN 200,000 MILES . . . AND SO CAN YOURS!



Do as fleet owners do—replace key parts and get like-new pep and power!

Your car engine is *not* worn out at 40,000 or 50,000 or 60,000 miles. Take a tip from the experts who own and run huge fleets of cars and trucks. Overhaul the engine, replace key parts such as bearings and rings . . . and get back all the pep and power of a brand-new car!

SYMPTOMS OF BEARING WEAR

Your car will tell you when it needs new engine bearings. Is it sluggish or slow; does it miss, knock or ping? Is your gas mileage low; do you need oil *again*? Are spark plugs fouled with sludgy black oil and carbon? Then it's time for an overhaul—and new Federal-Mogul bearings.

FOR AN "OVERHAUL", BEARINGS

You're wasting money on any overhaul that doesn't include new engine bearings. Parts account for the smaller portion of the cost, so it pays to do the job *right* the first time. Even new piston rings can't control the 25-times normal oil throw-off from worn engine bearings.

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Bearings are the heart of your engine. Yet when you need main, con rod or camshaft bearings,

it costs no more to use the best—Federal-Mogul Engine Bearings. Ask your mechanic . . . he knows and trusts Federal-Mogul quality!



FEDERAL-MOGUL SERVICE



Division of Federal-Mogul-Bower Bearings, Inc. • Detroit 13, Mich.

Electronic Architects Shape Our Navy

(Continued from page 85)

practice this means multiplying the desired frequency by a factor of 48 and using the higher frequency for the tests. The scaled-down antennas on the model ships do not transmit; instead, they are used to receive signals that are broadcast to them. This amounts to the same thing, electronically, and is more convenient. The formula works so well that the predictions obtained with the models prove to be very close to the actual efficiencies obtained by the ships themselves.

The artificial ocean at the Navy Electronics Laboratory consists of several acres of flat asphalt that has been sprayed with a coating of lead, which is similar in conductivity to sea water. The turntable on which the models are placed for measuring the shapes of their radiation patterns is located in the center of this ocean.

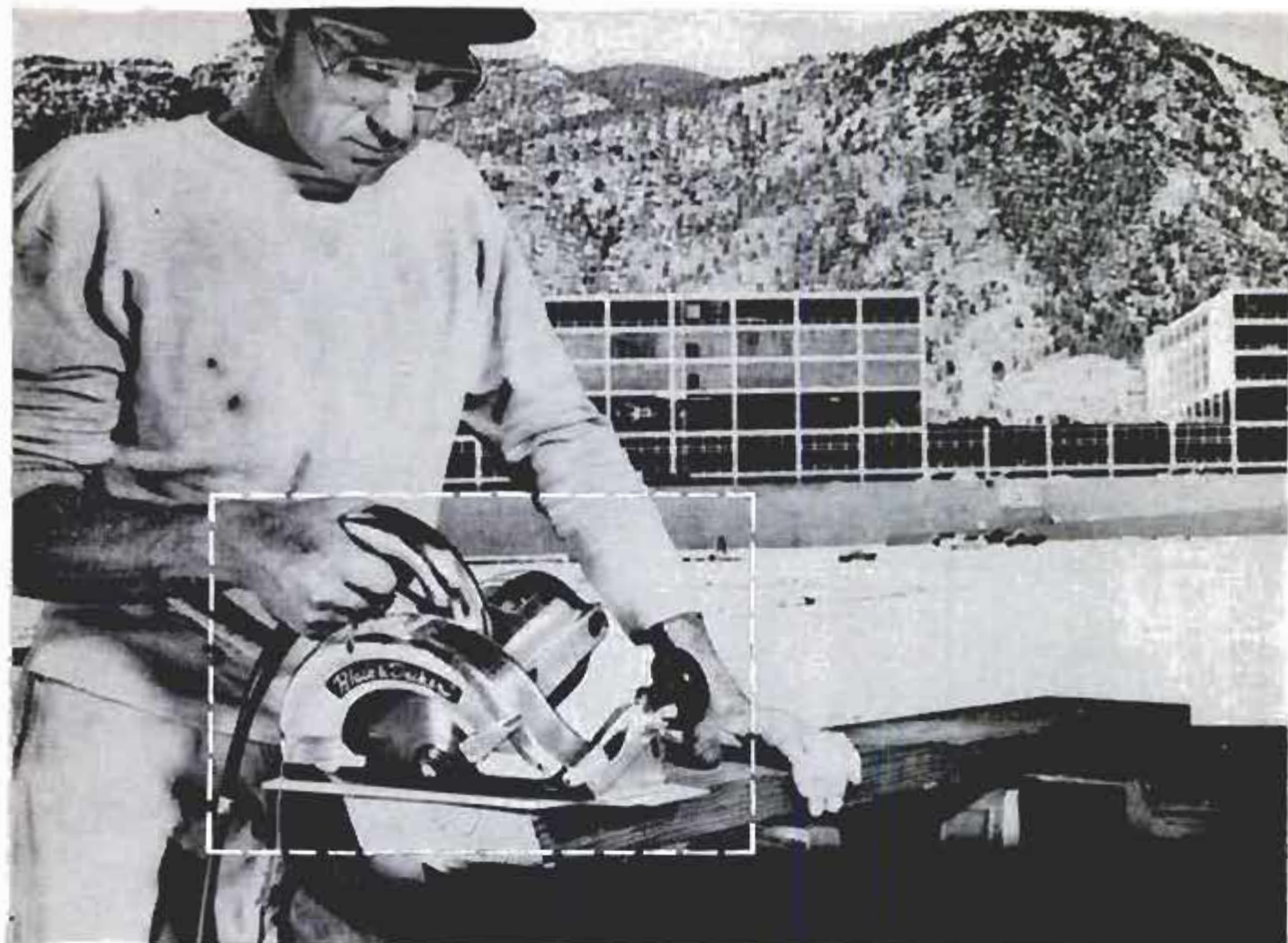
Three-Dimensional Studies

A 77-foot tall, self-supported arch of wooden timbers was recently installed to reach out over the lead ocean so that radio power can be directed at a model ship from overhead. This permits antenna studies on a three-dimensional basis and is especially important in testing long-range communication antennas. Any power that radiates upward from such an antenna is wasted; the desire is to beam as much power as possible at a low angle toward the horizon and on to the ionosphere, from where it will be reflected toward a distant receiving station.

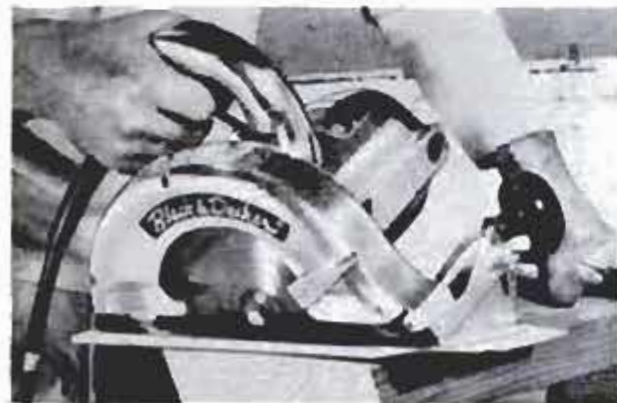
Adjacent to the main model range is another artificial ocean on which the impedance properties of the model antennas are studied. By measuring the resistance of an antenna, it is possible to calculate how much power must be delivered to it to transmit to a certain point. It is always important to keep power down to a minimum for the sake of security.

Among the models recently tested on the range is one of the atomic-powered guided-missile cruiser that uses an electronic island structure similar to the island on the nuclear carrier. The island has four rectangular sides and each side is an electronic radar-scanner and height-finder. So intense is the power radiated from these walls that they are mounted high above deck. Thus, members of the crew at deck level are not exposed to the beams. This ship carries no conventional guns; it is armed with short-range rockets for use against aircraft and other targets, and with long-range, Regulus

(Continued to page 242)



BLACK & DECKER SAWS ARE PROVED ON AMERICA'S TOUGHEST JOBS!



- CONTROL IN THE WOOD . . . light, balanced, easy to adjust, accurate guide.
- BLADE WON'T QUIT . . . no clutches or overload gimmicks necessary to protect the powerful B&D-built motor.
- SAFETY . . . totally-enclosed, guarded blade; automatic release switch. UL-listed.
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- STRENGTH . . . with new, heat-treated reinforced brackets and shoes.

Black & Decker Saws are on the job at America's top 10 construction projects—From the new Air Force Academy to the Cape Canaveral Missile Center.

The same tough dependability, prized on big construction jobs, makes a Black & Decker Saw *your* best choice—whether you use it on the job or around your home. You'll find it turns out work faster, with far less maintenance and easier handling. Choose from five models—6½" to 9¼" blade sizes. Check Black & Decker's Chain Saw attachment, and the Heavy-Duty Saw Table that triples your Saw's usefulness. Ask your B&D dealer for a demonstration next chance you get.

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World's Largest Maker of Electric Tools

You're Looking at the Gas-Turbine Era

(Continued from page 110)

freedom from water supply; fast, cold starts; clean, quiet exhaust; longer operating periods; no-jolt starts, and rising torque with falling speeds.

Jet-Plane Starters

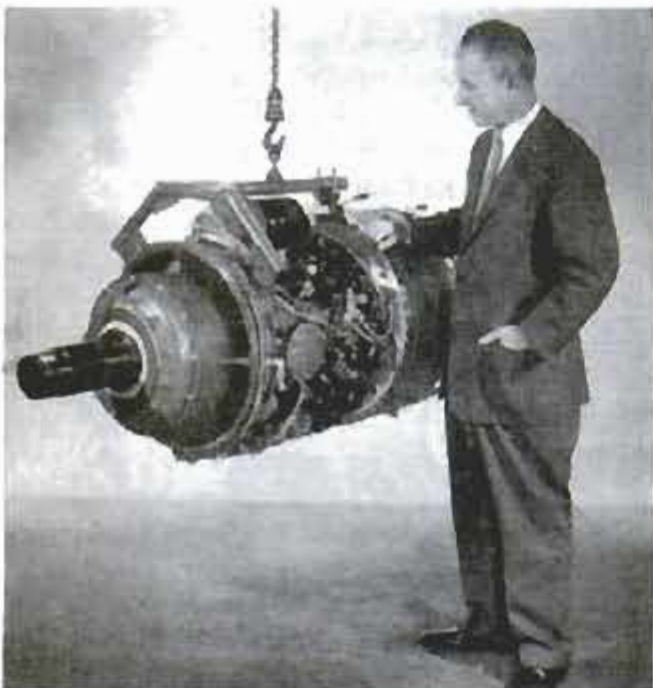
Miniature gas turbines are also being used to start jet planes, operate airborne generators and even supply extra power for taxiing.

The mighty Atlas missile couldn't steer without a midget gas turbine that spins the gyro-brain.

General Electric has about 100 turbine power plants scattered around the world. One station reports 27,000 hours of operation with only 34 hours of "down" time. Another reports "the gas turbine is 30 percent cheaper to operate." And Trans-Arabian Pipe Line has 5000-horsepower gas-turbine pumping stations, erected at one sixth the cost of diesel stations, which operate in the waterless desert by radio control from more than 50 miles away—strong proof of their reliability.

Turbines are used for all kinds of odd jobs. A giant flying boat sank with a 14-foot hole in its bottom; two portable turbines filled the hull with a huge air bubble so the plane could be towed 14 miles to shore. The Air Force now de-ices B-52 wings with the blast from a turbine; the treatment costs \$37, whereas an antifreeze washdown formerly cost \$750 and took four

Compact 1500-horsepower engine is expected to play a big part in the future of vertical-take-off planes



Chevrolet turbine-powered truck has excellent hill-climbing ability, low maintenance, burns cheap fuels

times as long. The same turbine frees Navy deck machinery of arctic ice. Solar's portable fire pumps, now used at sea, may soon be used by smoke-eaters who parachute down on forest fires.

Turbines of Tomorrow

What about the future? Featherweight lawn mowers, outboards and scooters? Not for a while, for they cost too much (though an engineer in California assembled an honest-injun turboscooter for his lucky kid). But an oil company is ordering turbine hydrofoil boats for South American lakes, yacht builders may switch to turbines; turbine air freight may someday rival highway rates, and turbine buses and trucks may come along most anytime.

Someday you may soar downtown in your own flying sportster—powered, of course, by a flyweight gas turbine. ★ ★ ★

Gonna Go to Mars? Then Here's Your Menu

You like slugs and snails for dinner? There may be a job for you on the crew of a spaceship. Scientists studying the medical aspects of future space trips think that a steady diet of algae, which has been suggested for the "closed-feeding system" of existence in space, might pall on a long trip—and a trip to Mars would take you upwards of two and a half years. Dr. Robert G. Tischer, bacteriologist at Mississippi State University, has proposed that space crews take along slugs, snails, goats, daphnia or other algae-consuming animal life to provide animal protein food in more desirable form than straight algae.



PAINT NEWS

NEW DU PONT

LUCITE ACRYLIC HOUSE PAINT

TRADEMARK

LASTS 50% LONGER

DRIES IN 30 MINUTES

Here's the greatest paint discovery since Du Pont quick-drying auto finishes: Du Pont "Lucite" Acrylic House Paint. It's so durable it lasts 50% longer than ordinary paints! No other paint even comes near equaling it. An acrylic emulsion, it is recommended for use only over No. 38 Blister Resistant Wood Primer on new wood or on old surfaces from which the finish has been completely removed.

Exposure panels and test houses indicate that the same advantage of longer life can be expected when "Lucite" House Paint is applied over firmly adhering old finishes that are in good condition for repainting. But, further experience is needed before such use can be made a recommendation.

SOLVES BLISTERING PROBLEM

For a long time blistering has been home owners' most serious paint problem. Until now, it has been an almost insolvable, recurring predicament.

The combination of No. 38 Primer and "Lucite" Acrylic House Paint can give unprecedented protection against blistering because it is chemically engineered to allow moisture vapor to breathe through while shutting out water penetration from the outside.

EASIEST PAINT TO APPLY

"Lucite" Acrylic House Paint flows on more smoothly and evenly than any paint you ever used. It dries in 30 minutes and it's ready for a second coat in one hour! Thus you can save a lot of time and money by avoiding a great deal of ladder shifting that is usually necessary. One coat covers, two give maximum protection and durability. Water is all you need for thinning. And it's so easy to clean up... fresh paint spots wipe off with a damp cloth. Soap and water clean your brushes. This amazing new paint and primer are now ready for immediate delivery at your Du Pont Paint Dealer's. You'll find his name in the Yellow Pages of your phone book.

*Buy the Paint That's Worth the Work,
the Beauty Lasts*



**Better Things for Better Living
... through Chemistry**

WORLD'S THINNEST UTILITY PLIER

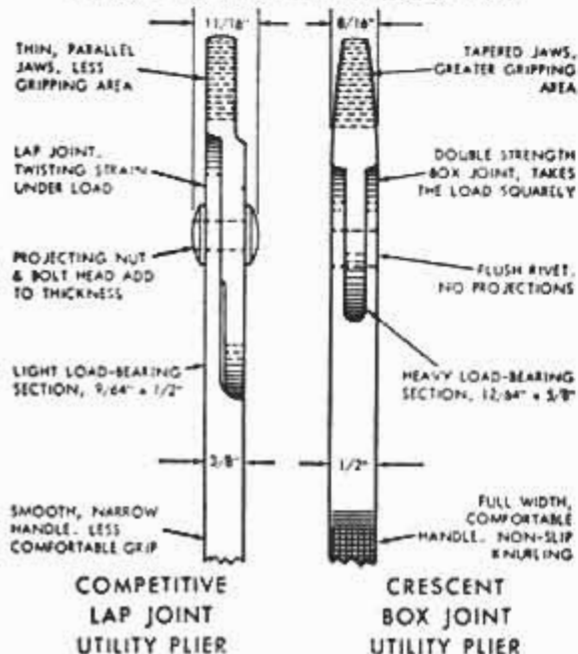


An amazingly versatile tool. Its unusual thinness, extreme strength and exceptional gripping power are equalled by no other 12 ounce tool. The reason is illustrated below.

Grips flat, square, hex or round objects. Jaws are adjustable to four positions up to 1½" capacity. Rust resistant zinc plating.

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PLIER No. P210
\$3.15 RETAIL

COMPARE THESE ACTUAL DIMENSIONS



CRESCENT TOOLS

Give Wings to Work

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

Its Fun to be Weightless

(Continued from page 112)

feet. Finally I managed to say weakly, "Is this normal, too?"

"Yes," said Ed, "particularly with people who don't do a lot of flying. We have a hunch that it's not the weightless stage, but passing in and out of it that causes nausea."

A Walk on the Ceiling

Four more times we went through the maneuver. Once Ed had me strap on a pair of magnetized shoes and try to walk upside down along a metal strip on the ceiling. I had a surprising reaction which, once again, I learned was normal. The instant my feet touched the ceiling and clung there, the ceiling without any question became the floor. I had the crazy sensation that Joe Edwards, whom I could see up the corridor, was sitting upside down in the cockpit. Meanwhile Ed was walking along the ceiling in a pair of suction shoes he had improvised from the suction cups on his top-of-the-car carrier. I saw one of the other men in the crew trying to pour Coke from a bottle. I was hard to shake out, and drifted around the compartment in globs that appeared to be semisolid.

After four more exhilarating runs, I again became violently nauseated. That was enough. We headed back for Wright Field.

In Ed's office, with my 165 pounds back again, I asked, "Just what are you trying to find out?"

"First of all, human reactions," Ed replied. "You may not have realized it, but when you were drifting down that compartment you were making quite precise swimming motions with your hands and feet. Our movies show that this is an instinctive motion. As a matter of fact, swimming motions help you maneuver while you are floating.

"Second, we want to learn about man's capacity to perform certain tasks under zero-G. We visualize the first man in space as essentially a maintenance man. His primary job will be to keep automatic equipment in working order. If an electronic tube has to be replaced, will he be able to pull hard enough to get it out of its socket? Here, I'll show you a crude but typical problem."

Ed switched on a movie projector. In the film, Mel Gardner was lying on the floor waiting to enter the weightless state. A moment later he shoved off and drifted toward the ceiling. In his hand he held a wrench. Working awkwardly, he managed

(Continued to page 234)

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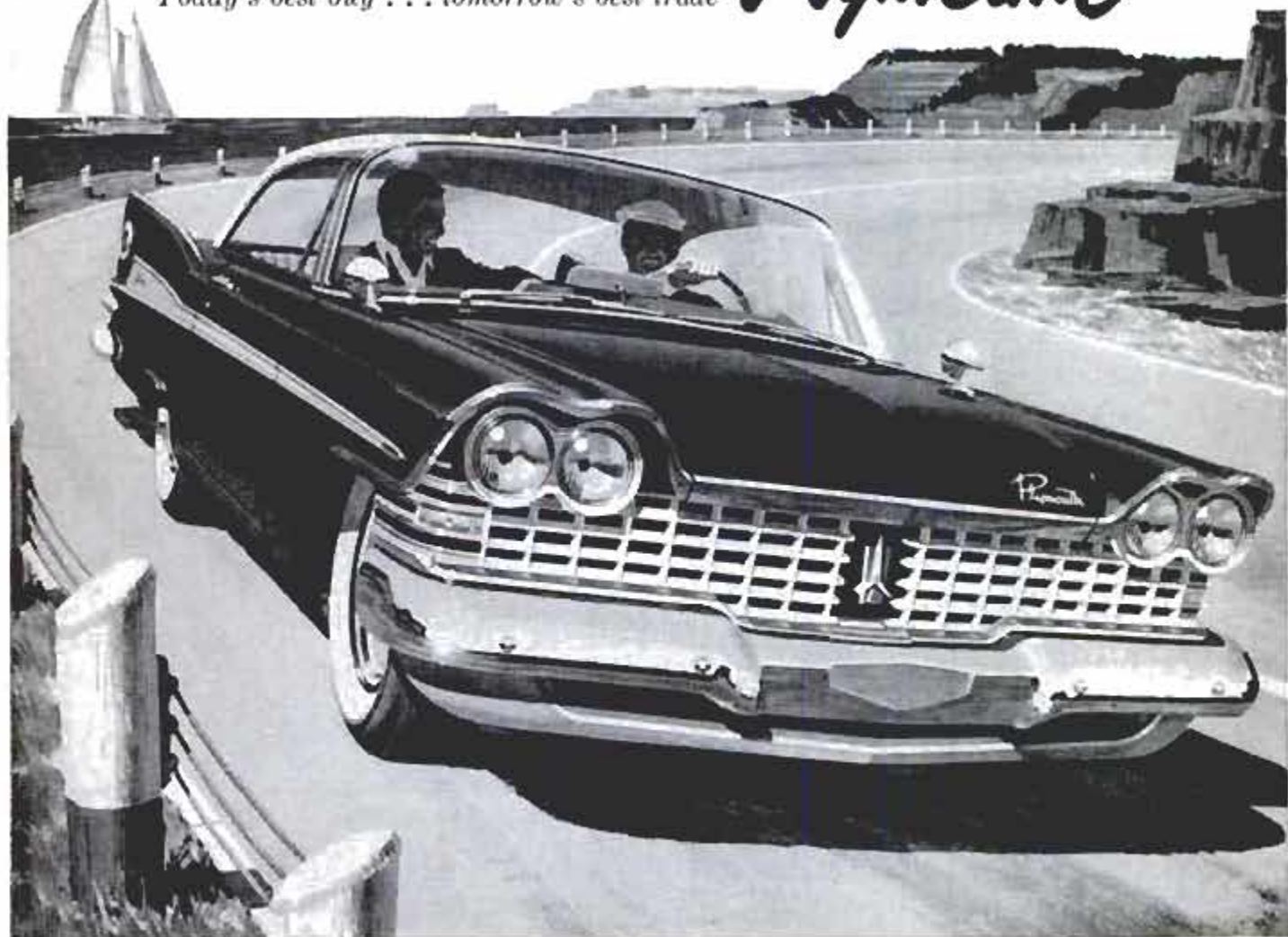
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to fasten the wrench to a bolt protruding from the ceiling. Then he tugged at the wrench. Instead of turning the bolt, his body began spinning around the wrench.

"You see?" said Ed, turning off the projector. "This is a very simple problem, but one that man has never before encountered. Suppose our spaceman has to pull out a panel of electronic equipment—which he very likely will have to do. Even if he has a handhold, how much pressure can he exert in one jerk? And if he succeeds in putting that panel into motion, how will he stop it?"

Behavior of Liquids

"Third, we're studying the behavior of liquids under zero-G. This was forced on us when we had major trouble with the plane. The propellers are controlled by a reservoir of oil. During one zero-G flight, the oil rose to the top of the reservoir, pushing air to the bottom. The air was trapped in the line, and the propellers ran away. Since then we've been studying liquids of all sorts under zero-G. Prior to our experiments, we were told that any air in a covered flask likely would be dispersed throughout the liquid. Actually, the air stays in distinct bubbles that 'hitchhike' on each other. Surface tension keeps them from combining."

Ed went on to explain some simple equipment tests. The tests are about as inexpensive as you could conceive, but 10 years ago they would have been considered so wildly implausible that they would have brought strong protests from taxpayers. One item under test is a crude model of a "reaction gun" to provide thrust to a man under zero-G. It consists of six bottles of compressed air coupled to a short hose and nozzle. In a condition of weightlessness, Gardner squirts the air out the nozzle, and the jet thrusts him in the opposite direction. Also under test is a handheld gyro to keep a man's body from turning in midair.

"I suppose you want to know about our conclusions," Ed said. "Our first conclusion is that we aren't far enough along in this strange field to reach any ultimate conclusions. We must do a lot more work even to get tentative answers. Actually, we won't know any final answers until the first man goes veering off into orbit, for he'll be weightless for hours or days. His reactions under prolonged zero-G conditions may be vastly different from our reactions for short periods. For example, you experienced a feeling of exhilaration. Over a long period, this sensation might give way to a feeling of depression that would significantly alter your efficiency.

(Continued to page 236)





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"I'll make only one guess—a strictly personal one. From the work we've done here, I don't believe that the weightless state will seriously reduce man's ability to function efficiently, provided his maintenance equipment is properly designed. If you want to find out more about maintenance research, you should talk with Captain Pigg."

Weightlessness on Earth

Capt. LeRoy Pigg is in charge of the Maintenance Design Section. He's another young man, a Ph.D. who goes about the sometimes humdrum detail of his everyday work with the exciting and certain knowledge that the first American citizen soon will soar into space. Captain Pigg's job, in effect, is to pin down the maintenance factors which must be engineered into the design of space equipment. His section has come up with some highly imaginative systems for testing weightlessness in an earth-bound laboratory.

David W. Rees and Ernie Dzendolet, Captain Pigg's right-hand men, showed me one laboratory. On the floor was a smooth metal plate measuring about four by eight feet. Resting on the plate was an odd machine that resembled an overgrown tricycle, except that it rested on three horizontal metal disks instead of wheels. Within arm's reach of the tricycle was a panel of electronic gear, mounted on three similar disks.

"Climb onto the tricycle," directed Rees, "reach out and remove one of the tubes from the electronic panel."

I sat down on the tricycle. Rees turned a valve, and there was the hiss of escaping air. I reached out for one of the tubes. The moment I touched it, the panel went skittering off in one direction, and my tricycle glided across the metal plate in precisely the opposite direction.

Floating on Air

"You're on a friction-free platform," explained Rees in answer to my bewildered expression. "Compressed air is forced through tiny holes in the bottom of the disks, raising you and the electronic equipment a fraction of an inch off the metal plate. You're literally floating on a cushion of air. In this frictionless state, as soon as you touch the panel, both you and the panel react much as you would under zero-G. With this equipment we can make fairly accurate tests in two dimensions of three-dimension weightless reactions.

"For example, we put a subject on the tricycle in front of a solid control panel. We want to test a pushing movement, so

(Continued to page 238)

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we install an instrumented bar for him to push with his right hand. Two feet from the bar is a handhold for his left hand. We know from the resulting tests that under these conditions the average man can exert a push of only one pound. If he gives a sudden thrust instead of a steady push, he can exert up to five pounds, but he can't maintain the pressure because he'll pivot right around his left hand."

Perhaps the closest thing to weightlessness on earth now is under construction at the laboratory. When it's completed, a man will be strapped into a couch which will float on a friction-free air platform. But the couch itself also will be pivoted on a system of fine bearings so it can swing in any direction. Then, whenever the man touches anything, not only will he go skittering off across the platform, but will turn end over end and revolve.

The world of weightlessness is such a strange field that researchers are trying every conceivable idea to approximate it. With one instrument they stimulate the inner ear electrically. The subject, with his eyes closed, feels he is rocking in a swing. Eyes open, he becomes stationary and the rest of the world is rocking.

Other researchers even have tried curare, the rare South American "poison arrow" drug. Curare causes a muscular

reaction which creates the sensation of floating. To put it bluntly, the drug is applied to the subject's rear end, and his reactions are studied while he has the feeling of floating above the seat!

No one claims, though, that weightlessness can be duplicated for any length of time. Ed Brown, in one of his rare flights of speculation, unconsciously walks over to the nearest window and gazes up at the sky.

"Right now we're on the edge of a vast new frontier of knowledge," he says softly. "We don't really know much about what's out there. We're taking tiny research steps toward a goal that's millions of miles away. What will really happen to man in space? What will happen when he sheds his weight as though he'd taken off a suit of clothes?"

He pauses for a moment, then answers his own question. "We don't know." ★★ ★

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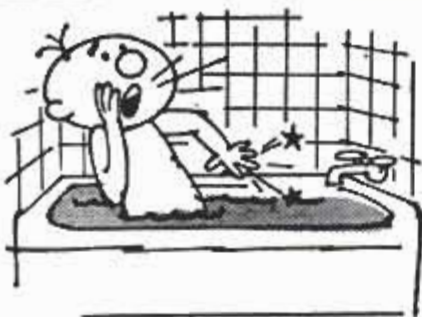
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The Mighty Insect

(Continued from page 117)

a tremendous speed, and some insects such as dragonflies capture their prey by swift pursuit in the air. Then, too, considering their sizes, insects fly at fairly rapid rates. For example:

Housefly	5	m.p.h.
Wasp	12	m.p.h.
Hornet	13.3	m.p.h.
Grasshopper	15	m.p.h.
Honeybee	25	m.p.h.
Horsefly	30	m.p.h.
Bumblebee	35	m.p.h.
Dragonfly	60	m.p.h.

The weights carried by many flying insects are quite remarkable and are often beyond the pay loads of any manmade airplane. This is especially true when one considers the small wing area of some of the insects. It has been said that theoretically the heavy-bodied bumblebee can't fly. Fortunately, the bumblebees never heard this statement so they go right on flying. For an airplane to carry a 100 percent pay load is extreme aerodynamic efficiency, but many insects can equal or exceed this. Some bees can airlift several times their own weight.

One of the most destructive insects in the world is the African locust (*Schistocerca gregaria*). Great clouds of these locusts fly for vast distances during migration. Some interesting research has been done recently on the fuel consumption of these insects during flight. It was found that they use 13.7 calories of energy per gram of body weight per hour of flight. One calorie of energy is equal to the work required to lift a three-pound weight one foot. Thus in an hour of flying, a two-gram locust expended enough energy to lift a three-pound weight to a height of over 27 feet! Studies of other flying insects would undoubtedly show similar results.

Let us now consider the facts as far as known regarding the relative strengths of men and insects. Many of the feats of strength of insects appear to be much more remarkable than they actually are. In the first place, as an object becomes larger it grows heavier out of proportion to its size. Thus, if we enlarge a one-inch cube to two inches on all sides we actually have eight cubic inches even though we have only doubled its actual dimensions. By this reasoning, an insect or a stone becomes much heavier in proportion to size as it is enlarged. In the second place, muscles, too, do not become stronger in proportion to size. What most people do not realize is that muscle tissue of similar quality has the

same power per unit of cross section, regardless of length. In other words, a muscle one square inch in cross section and an inch in length would be just as strong as one having the same area of cross section but two inches long. This boils down to the simple fact that a long muscle is no stronger than a short muscle—assuming, of course, that they both have the same diameter.

It may be argued that the arrangements of insects' muscles are different from those in man and other animals. In the case of insects, and some other creatures such as crabs, the skeletons are on the outside. This, perhaps, results in a little better leverage for the enclosed muscles. If we consider the *absolute power* of muscles (that is, the maximum loads they can raise per square centimeter of cross section), then insects' muscles appear to be no more powerful than those of the warm-blooded animals. For example, the value for human muscle is 6 to 10 kilograms per square centimeter, and for the muscles in a grasshopper's hind leg 4.7. Thus, muscle for muscle, the human variety may be nearly twice as powerful as that of the insect.

The above comparisons of muscular power and size-weight ratios may be somewhat disillusioning to writers of science fiction. It is possible that if a beetle should be enlarged to the size of an elephant it would actually be unable to walk because of the great weight of its body and its heavy tank-like armor. And if a flea were to grow as large as a kangaroo it probably couldn't jump at all! ★ ★ ★

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winged missiles. So that they will not interfere with the launching of the missiles, many of the communication antennas on the ship are bunched around a single mast on the rear island.

Another model, of a destroyer, uses its main superstructure as the antenna for a number of circuits, and mounts a few whip antennas on its gun turrets. Still another model represents a radar-barrier ship and is a merchant vessel converted to a radar platform.

Cruiser's Stern Rebuilt

One cruiser conversion was a real problem, electronically. This ship retains its forward gun batteries and anti-aircraft mounts, while the stern was rebuilt to carry missile launchers and guidance antennas. With such a cluttered superstructure, the radio engineers had to use many conventional wire antennas. Before they finished, they had to place two different kinds of masts on the ship for best radio efficiency.

The battleship is one of the few types not being studied these days. Once the mightiest dreadnaughts afloat, battleships have bowed out to the newer types. If they ever are restored to service they probably will serve as lowly supply ships. Their huge guns and turrets would be yanked out and their magazines rebuilt so they could carry enormous supplies of stores, aviation fuel and rockets for delivery to the more lethal rocket ships and super aircraft carriers.

Aside from its electronic architecture, the Navy is developing still other electronic marvels. For its aircraft it is testing a new radar ground scanner that gives a pilot an exact picture of the ground below and on all sides, allowing him to "see" just as well after dark or in a fog as he can in broad daylight.

For its carrier-based aircraft the Navy has a new automatic landing system, operated from the carrier island, that lines up the airplane with the deck, brings it in at the right rate of descent, and chops the power at the right instant. With this system a pilot can actually hold his hands behind his helmet all during the landing procedure. For deck personnel on its carriers, the Navy has a new radio helmet that allows the plane handlers to talk back and forth with perfect clarity even while exposed to the 100-decibel roar of nearby jet planes. ★ ★ ★

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Pipe Your Patio With Sound

(Continued from page 159)

beside the receptacle. Wiring of the receptacle is shown in photo B. The two-wire cable enters the receptacle through a hollow-tube base and is connected to the socket. Photos C and D show the cable being routed to the house between courses of brick. Later, when dry cement is tamped between the rows and wetted, the cable is permanently sealed between the bricks.

Additional cable can be run from this receptacle to others located in strategic points throughout the yard.

Indoors, speakers can be wired with common lamp cord, but out-of-doors you need something better. Ideal is the flat

Wire Size (B&S)	Load Impedance		
	4 ohms	8 ohms	16 ohms
14	125'	250'	450'
16	75'	150'	300'
18	50'	100'	200'
20	25'	50'	100'

Table 1. Maximum length of cable for 15% power loss

lead-in used for TV. Even longer-lasting is direct-burial two-wire cable coated with neoprene which, though constantly exposed to ground moisture, will outlast the best of speakers.

In burying the cable, dig your trench at least 6 inches deep. Once the cable is laid, protect it with strips of wood before filling in the trench and replanting. Though this method of protection isn't foolproof, it'll thwart most shovels and other garden tools—but not gophers.

Actually, the cable needn't be buried. It can be run along fence railings, or tacked under the eaves if this is more convenient. But, no matter what method you use, there's a practical limit to how far you can run your outdoor-speaker leads.

The limiting factor is line loss, which depends primarily on wire size and the voice-coil impedance of the extension speaker. For short cable runs the loss is negligible, but as the length increases an appreciable portion of the amplifier power is sometimes wasted in the cable. A 4-ohm speaker at the end of 18 ft. of No. 22 cable, for example, receives only about 85 percent of the radio's output power.

To reduce line losses, a cable with heavier wire can be employed. Table 1 gives the maximum recommended cable

(Continued to page 246)

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INTERIOR: One coat REZ COLOR-TONE . . . well brushed out . . . over previously Clear REZ sealed surface. Finish with final coat pale, clear SATIN-WOOD REZ. Sand lightly between coats.

EXTERIOR: Just two well brushed-out coats of REZ COLOR-TONES on bare wood will seal, color and protect. Use Clear REZITE for additional protection.



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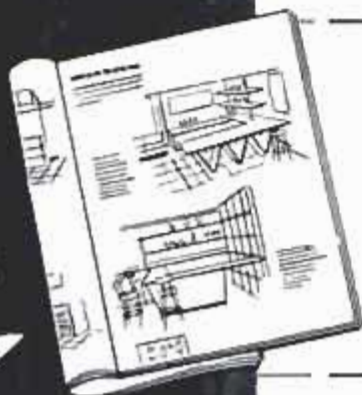


13 REZ COLOR-TONES

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on exterior and interior wood.*

REZ Color-Toned sealers are the easiest, most economical, most richly beautiful finishes for siding, garages, carports, fences, garden furniture, etc. Just one coat for interiors or two coats for exteriors seal and color, and the wood is protected against weather, sunlight, changing humidity, rain, sleet, snow! REZ Color-Toned sealed wood retains natural grain pattern.

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lengths for practical wire sizes and typical speaker impedances. The table is calculated for an arbitrary power loss of about 15 percent. With sufficient amplifier power, greater line losses can often be tolerated, but with careful attention to details such as these, your music system moves outside to add a pleasing new dimension to outdoor living.

Warning: The use of outdoor speakers with some a.c.-d.c. type radios or phonographs could present a shock hazard if the line-cord plug of the equipment is incorrectly inserted in the wall outlet. To eliminate any possible danger, the equipment should be checked with an inexpensive and easy-to-use neon tester (see *Popular Mechanics*, June 1958, page 146) immediately after being plugged in. Alternatively, the receiver or phonograph can be equipped with a polarized plug to fit into a correspondingly polarized wall receptacle. This modification, which should be done by a competent radio technician, would assure permanent safety by preventing the line cord from being incorrectly inserted in the a.c. receptacle. ★ ★ ★

Meteor Trap on Satellite Catches Tiny Particles

So that tiny particles of meteoric matter can be detected during spaceflights, a satellite with a built-in meteor trap has been designed at Boston University. The trap consists of two rotating cylinders—the outer one with one slit, the inner with two. As this combination spins about its axis, meteors pass through the system and hit a microphone located on the inside edge of the outer cylinder. It is estimated that the rotating trap could detect about one meteor per day if the collecting area of the microphone were about 1½ square inches.

Do You Know This Old Timer?

(Answer to quiz, page 14)



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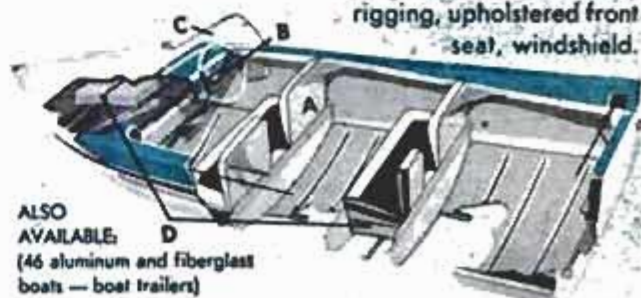


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Behind the Scenes in Electronics

(Continued from page 161)

about 36 sounds, 1000 syllables or 10,000 words would be required. Obviously, a system responding to basic sounds would require the smallest number of memory units in the electronic brain. The atrocious spelling of such a machine, however, would cause every English teacher to throw up his hands in despair. In contrast, the spelling of the word system would approach 100 percent correctness but this would result in an electronic "monster" which would have little practical use. As a compromise, the syllable system was adopted.

Briefly, the components and operation of such a system are shown in the very much oversimplified diagrams of Figs. 3 and 4.

Sound waves created by a speaker's voice are converted into corresponding electrical variations by a high-quality microphone. The resultant minute electrical currents are then amplified in a compressor-amplifier to a relatively constant level, regardless of whether the incoming signal consisted of a loud or a soft sound.

(The need for a compressor-amplifier can be understood by remembering that the entire system operates on the time-frequency-amplitude basis. Analysis is accomplished by determining which frequencies of a par-

ticular sound reach a predetermined level at a specific time. Without a compressor circuit a loud sound entering the microphone could give even the low-amplitude frequencies sufficient energy to reach this predetermined level.)

The composite signal from the compressor-amplifier is applied simultaneously to nine individually tuned amplifiers. Eight of these are carefully adjusted, each to a different frequency in the audio spectrum, so that each of them passes only a very narrow band of frequencies. These provide the means for analyzing the frequency content of a particular sound. The ninth amplifier passes all audio frequencies (except those below approximately 200 cycles, which contain little useful speech information) and if the energy level of the incoming sound is high enough, the output of this amplifier triggers a time-sequence switch. A relatively high energy level is needed to prevent the system from responding to background noise or sounds not spoken directly into the microphone.

Having met the first requirement, that of separating a sound into its component frequencies, the time-amplitude relationships are now analyzed and the information stored in a spectral memory—a fancy name

(Continued to page 250)

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for a series of relays which close in response to a given signal.

The output signals from the eight frequency-selective amplifiers are connected, through the time-sequence switch, to eight individual relay coils. Once activated by an initiating sound, however, the switch begins to rotate in a series of steps, changing its position 5 times during a predetermined interval of 0.2 second.

In the first switch position, the amplifier outputs are applied to the first eight relays of the spectral memory, and any frequency having sufficient amplitude will close the contacts of its corresponding relay. For a second time interval, corresponding to the second switch position, the amplifiers are connected to a second set of eight relays and, again, some of the relay contacts will close in response to some of the frequencies contained in the original sound. By the end of the fifth time interval, all of the relays in the spectral memory will have been scanned. The resultant pattern of closed relays will be that of a specific syllable and will not be duplicated by any other. We have, therefore, a means for identifying any particular sound.

The remaining problem is one of translating the pattern of a particular sound into electrical impulses which energize the typewriter keys in the proper order to spell out the corresponding syllable.

Suppose all of the contacts of the spectral-memory relays representing the sound "I" were connected in series with the coil of another relay. Now every time this particular pattern appeared on the spectral-memory panel, the circuit to the following relay would be energized. This relay could be called a "syllable memory" because it would close only if a particular syllable were spoken into the microphone. We could, in this manner, interconnect the spectral-memory relays so that the pattern made by any desired sound would close a different syllable-memory relay. This requires one syllable-memory relay for each syllable the typewriter is expected to reproduce.

We now come to the final phase of the operation—that of causing each syllable-memory relay to type out a particular series of letters. (For this example we will assume that each syllable contains a maximum of five letters.) This requires the use of another time-sequence switch, plus a letter matrix connected to the key solenoids.

Let us assume that the syllable "I" causes relay No. 1 of the syllable memory to close. This, in turn, energizes the second time-sequence switch, causing it to rotate in five

(Continued to page 252)

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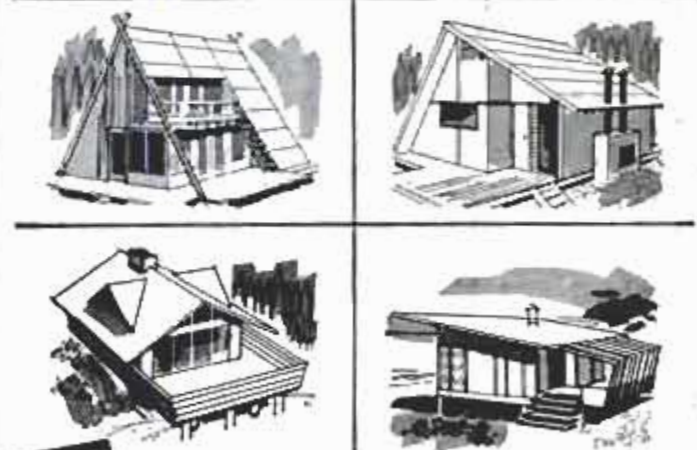
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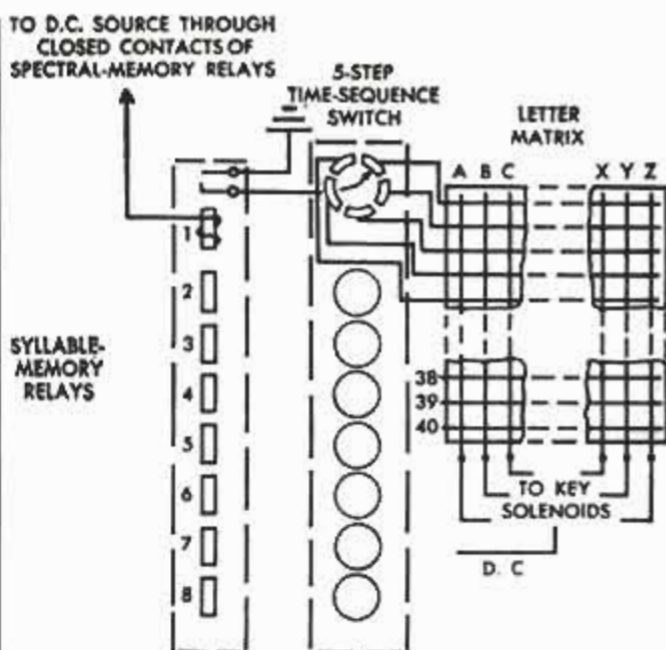


Fig. 4. Simplified diagram of typewriter-activating mechanism. Circuit handles eight different syllables

consecutive steps. For each step, the wiper arm of the switch closes a different contact which may or may not be connected to a point in the letter matrix. For "I," only the first contact would be connected so that only the solenoid connected to key "I" would be energized. Longer syllables would involve more switch contacts so that up to five letters could be typed in any sequence.

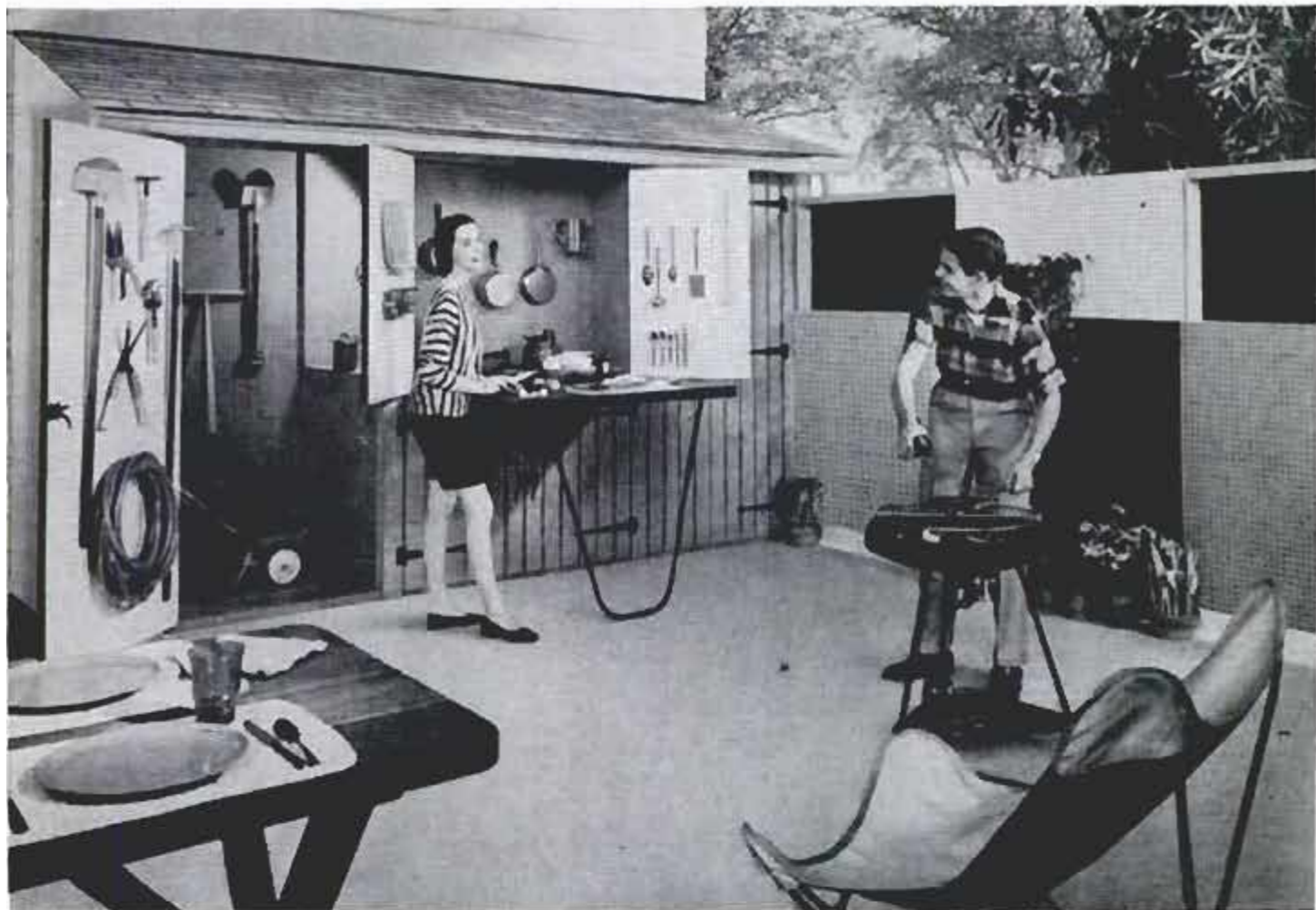
Would the electronic typewriter replace typists and stenographers? No! says Dr. Olson. The inherently poor spelling of this system, Fig. 5, precludes its use for any finished correspondence. But its eventual applications may be of far greater significance. The same principle used to activate typewriter keys could just as easily convert verbal instructions into any electrical or mechanical action. Voice-controlled cash registers, adding machines—even electronic computers—require only a 10-digit system. In fact, any operation which can be performed by pressing a button or operating a dial could be done quicker and with less chance of error by verbal commands.

In this sense, the electronic typewriter—a rudimentary device today—may some day equip all of us with a versatile "third hand," guided only by the voice. ★ ★ ★

Fig. 5. Typical sentence using phonetic syllables

the ultimet object is to develop a type righter which types in respons to words spocan into a mycrophone the output being immediately legible and yousable for intra ofis work filing and eventual transcription into convention al letters

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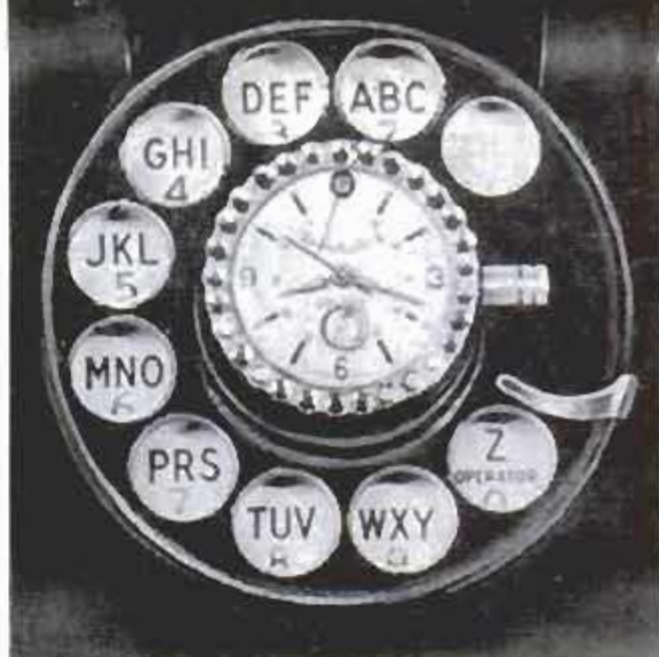
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This Month's
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(Page 24)



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KNOW THE TRUTH ABOUT POWER. Telescope experts confirm that an Astronomical Telescope will only give you practical powers to about 50 or 60 times per inch of objective diameter—powers above this only produce empty magnification — make viewing dim, difficult and unsatisfactory.

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Complete Line of Astronomical Telescope Parts and Assembled Telescopes. Also huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Telescopes, microscopes, Hand Spectroscopes, Sniperscopes, binoculars, etc. Request Catalog "H"!

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HERE IT IS!

The ORIGINAL Go Kart

Here's the fun-on-wheels whiz that started the Karting Kraze. Club-approved! No other like it on the market today. Dual brakes, full circle steering wheel of polished aluminum. Chrome moly tubular frame, 2 1/2 hp gas engine, foot throttle and brake, ball bearing steering assembly, bucket seat, real racing wheels and tires make the 115-mile-a-gallon Go Kart 400 B the ultimate in family fun. Dad loves the performance, Mom loves its safety and kids just plain love it. Send for one. Now.



\$129⁵⁰

KART KIT

Upholstery and Chrome accessories optional.

NEW 57 lb. Go Kart Cycle



Lift it with one hand (wt. 57 lbs.). Stow it in your car trunk (21" high, 34" wheel-base). Goes like a bat! (3 hp West Bend engine). Another fun-on-wheels sensation from the originators of

\$149⁰⁰

Go Kart

Go Kart Mfg. Co., Inc.

Dept. PM-4
6300 Irwindale Ave.
Azusa, Calif.
Please rush my

Prices F.O.B. Azusa, Calif. Calif. residents add 4% sales tax. Safe delivery to overseas personnel is guaranteed.

- Go Kart Kit \$129.50
 Assembled Go Kart \$164.50
 Go Kart Cycle \$149.00

Enclosed is my cash, check or money order for
 Full price \$25 deposit (balance C.O.D.)

Name.....

Address.....

City..... Zone..... State.....

Go Kart Plans available \$3.95

DEALERS AND DISTRIBUTORS: WRITE OR WIRE FOR TERRITORIES

Owners Report on the Chevrolet

(Continued from page 91)

Chevrolet admits it had some trouble with hood catches at first and changed design early in the run. Hoods didn't fly open, Chevy says, simply lifted up onto safety catch. →

Stoplight dragsters are a vanishing breed—a dwindling tribe being kept alive by drivers who sit diagonally in the corner leaning half on the door, half on the seat. →

No doubt here. Chevy's rear vision is unexcelled. →

These owners are smart enough to accept reality: Big, roomy, heavy cars with plenty of power use gas. So relax and enjoy it. →

Ten years ago a car that drove at high speed as easily and as safely as this car does would have been a sensation at any price. Today we scarcely marvel at it. We are too busy complaining that Detroit never makes any progress to see how much progress has been made. →

All three cars have trunks of about the same usable volume. All three carry luggage more commodiously than they carry people. →

If this owner was getting 20 m.p.g. he'd be as happy as George Romney. How much would he save on a 1000-mile trip? About \$5! →

"Hood latch came open at about 60 miles per hour, ruining the hood."—Indiana general manager.

"Seats are too hard. After about ten hours of driving you are so tired you can hardly stand."—Missouri carpenter.

"Seating poor. Front seats not holding up on most models. Legs and knees awkward position. On long trips it gives some backache."—Michigan test driver.

"Water leaks under floor mat near accelerator pedal and causes a sour smell."—Wisconsin technician.

"Water leaks into trunk. Can't seem to stop the leak."—Maryland salesman.

More Best-Liked Features

The following quotations describe, in the words of Chevrolet owners, additional best-liked features and are arranged in order of frequency of mention:

"I like performance. This Impala has three carburetors and it passes other cars easily."—Utah welder.

"Swift acceleration."—Ohio police officer.

"One hundred percent vision, front and rear, due to large expanse of glass."—Iowa nurseryman.

"In view of the fact that this is a heavy station wagon I did not expect very good mileage. However, I am pleased with the 18.6 miles per gallon I get on long trips with this Six."—New Hampshire salesman.

"My V8 has a handshift and overdrive for better gas mileage. I get 15 miles per gallon in city."—Indiana railroad police captain.

"I have automatic transmission and my gas mileage with this Six (21 miles per gallon on trips) has been a very happy surprise."—Massachusetts salesman.

"Steers very nicely."—Minnesota operator.

"Power steering much improved this year."—Tennessee car-rental agent.

"Holds the road beautifully, especially at higher speeds on the open road."—Georgia teacher.

"Doesn't have air buffeting at high speeds. Holds the road good."—Utah interior decorator.

"Plenty of room inside. Trunk is very spacious also."—New York electrician.

"Wide seats. Roomy."—Florida insulator.

"Wonderful trunk space. Five of us recently drove to Mexico City and we had room for all our luggage in the trunk."—California secretary.

"Chevrolet retains safety factor. There is no brake fade. Engineering five years ahead."—New York attorney.

More Complaints Also

Here, also in order of frequency of mention, are additional complaints about the 1959 Chevrolet.

"Dissatisfied with gas mileage. I have a four-barrel carburetor with a 230-horsepower engine and must use premium gas. I get 15.2 miles per gallon on long trips."—Pennsylvania aircraft instrument mechanic.

"Salesman assured me I would average 13 miles per gallon or more in city driving because of improvements supposedly made in the V8 engine. I am getting about 8 miles per gallon in this Impala convertible."—Missouri mechanical engineer.

"Don't like the V-shape of the trunk which makes it very

(Continued to page 258)



New Sea-Horse 5½, thermostat-controlled cooling... \$230

How Johnson engineers cured “chills and fever” in outboard motors!

Just as our human “machinery” works best at 98.6° F., there is also an optimum temperature at which an outboard delivers top efficiency.

In gasoline engines, the temperature is usually controlled by circulating water around the cylinders. Easy enough, you’d think, in an outboard motor running in water. But the very fact that an outboard motor draws its cooling water from the water it’s running in creates some special problems.

For example, lakes, rivers and oceans represent a wide range of water temperature from spring through fall. Obviously a system designed to cool a motor running at full speed in 80° summer lake water must not *over-cool* the same engine running in almost freezing water.

In 1958 when Johnson pioneered with outboard-ing’s first “V” engine it had a new thermostat-control on the cooling system. This unit was specially designed to hold engine head temperatures at an ideal 140°. It worked so well on the Sea-Horse V-50 and 35 that for 1959 similar thermostat-controlled cooling has been built into all models down through 5½ hp. The result is smooth running performance at any speed—and in water of any temperature.

New thermostat control is just one feature of Johnson’s exclusive Dynautical Design—to go better with your boat and make your boat go better. For full details see your Johnson dealer. He’s listed under “Outboard Motors” in the Yellow Pages.



Johnson

**FIRST IN SALES
FIRST IN DEPENDABILITY**

Quadrant should, of course, be lighted for the stranger who might drive your car. But after a week's use, you rarely look down at the shift quadrant. →

Low seating is a legitimate complaint. It brings reduced vision as well as reduced comfort. Short drivers get tired necks straining to see over wheel. →

Length may have some (just a tiny bit) logic: It marks the status of the owner. But there's absolutely no argument for an 80-inch-wide car that will seat comfortably only two persons abreast. →

Why would an R.F.D. man use a 1959 Chevy? It's certain the men at the Tech Center didn't plan the 1959 Chevy for rural mail deliveries. →

This warranty thing is being abused, if owners are telling the truth. Dealers keep stalling until the period expires. Some foreign cars (cheap ones, too) have 6000-mile warranties. →

Salt is a problem for the public, not the auto industry. To save tax money, cities spread salt. It's cheaper to melt snow than to move it. That saves tax money, but adds millions to the public's bill for replacing rusted auto bodies. →

hard to load and unload heavy objects."—Missouri branch manager.

"Trunk is so tight that it sweats and keeps everything wet."—Texas retired serviceman.

"Extremely bad body noises. Interior parts also noisy."—New York textile stylist.

"Doors rattle and glass is either too tight or too loose."—New York barbershop owner.

"There should be a light on the shift quadrant. At night you cannot see the dial and must memorize the shift pattern."—Ohio county worker.

"Too much glass. Insurance rates too high."—Idaho owner.

"Windshield extends too high into the roof. Makes driving a pain when sun is shining."—Illinois auto repairman.

"Impala sport coupe is too low. No headroom."—Pennsylvania mechanic.

"In their efforts to please the teen-agers, they are using too small wheels just to lower the appearance of the car. Teen-agers may want cars lower, but the rest of us are very unhappy with them."—California salesman.

"Not enough room for my 6-foot 2-inch frame. No room for my legs. Not made for a big man."—Indiana soldier.

"You sit so low the hood blots out the road when cresting a sharp hill."—Texas farmer.

"Needs a well for feet in the front floor as in the back seat."—California truck driver.

"Car is so wide I have only about eight inches' clearance in my garage. Have already stripped chrome from one side. Cost \$24.33 to replace."—Georgia sales representative.

"I use the car on a rural mail route. I find it almost too wide inside. It's hard to reach some mailboxes and still keep foot on the brake. Also dust collects on the rear of the car above the bumper, perhaps due to wind currents?"—Ohio rural mail carrier.

Comments to Auto Industry

PM asks the owners to make suggestions for the whole automobile industry. Chevrolet owners, like Ford owners want the companies to build for economy first. It is difficult for the companies to believe this when their most expensive cars are the ones that sell best. Here are some other interesting comments from the Chevrolet owners, comments meant for the whole industry, not just Chevrolet:

"Warranty period should be for more than 90 days or 4000 miles. That is not enough to show up all the defects in a car. I realize that the engine, transmission and rear end are warranted for 12,000 miles, but there are so many other things that can go wrong. If you buy a television set for \$100, you get a year's warranty. When you spend nearly \$4000 for a car you only get 90 days."—Michigan bartender.

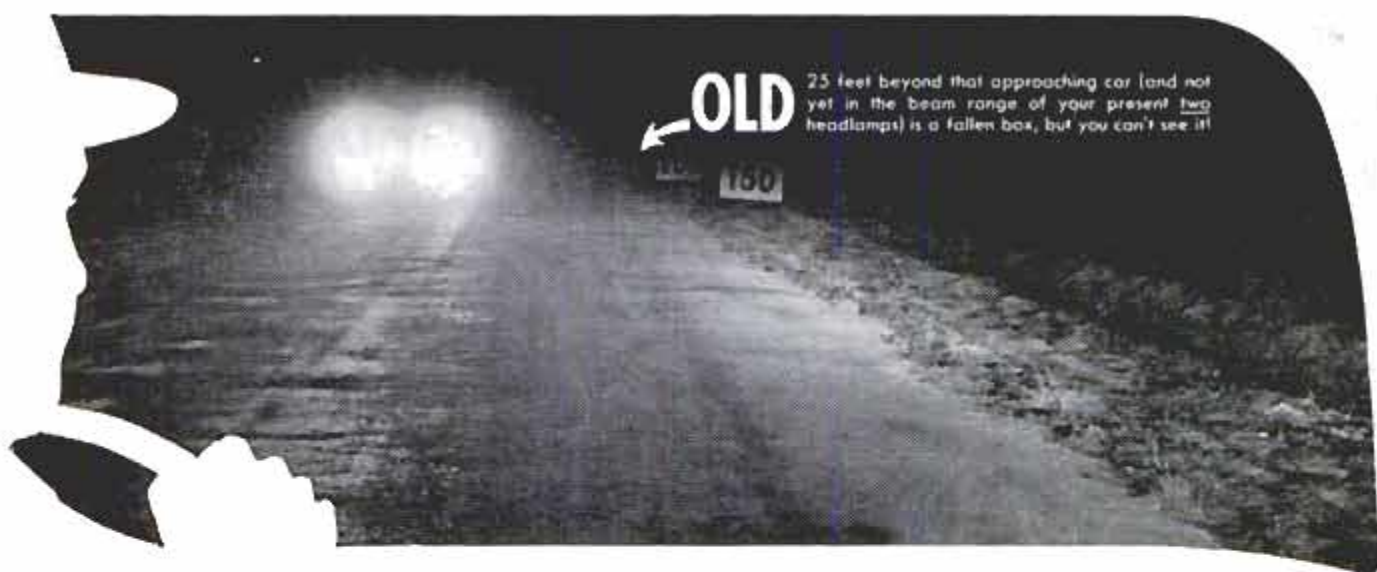
"I believe car manufacturers in general are saving on quality and covering it with more style. This is the fault of the public which demands style first."—Florida housewife.

"I would like to see the auto industry improve the protection against salt that eats the finish and the chrome so fast. Seems that there would be something to put on to protect against it."—New York factory worker.

The following quotations describe additional likes and dislikes of the Chevrolet owners. Each was listed by only a few owners, but is interesting enough to quote:

"The Turboglide transmission is what I like most. There is no shifting or feel of shifting and it does not 'wind up' like many others. It is expensive, but I like it."—Michigan bookbinder.

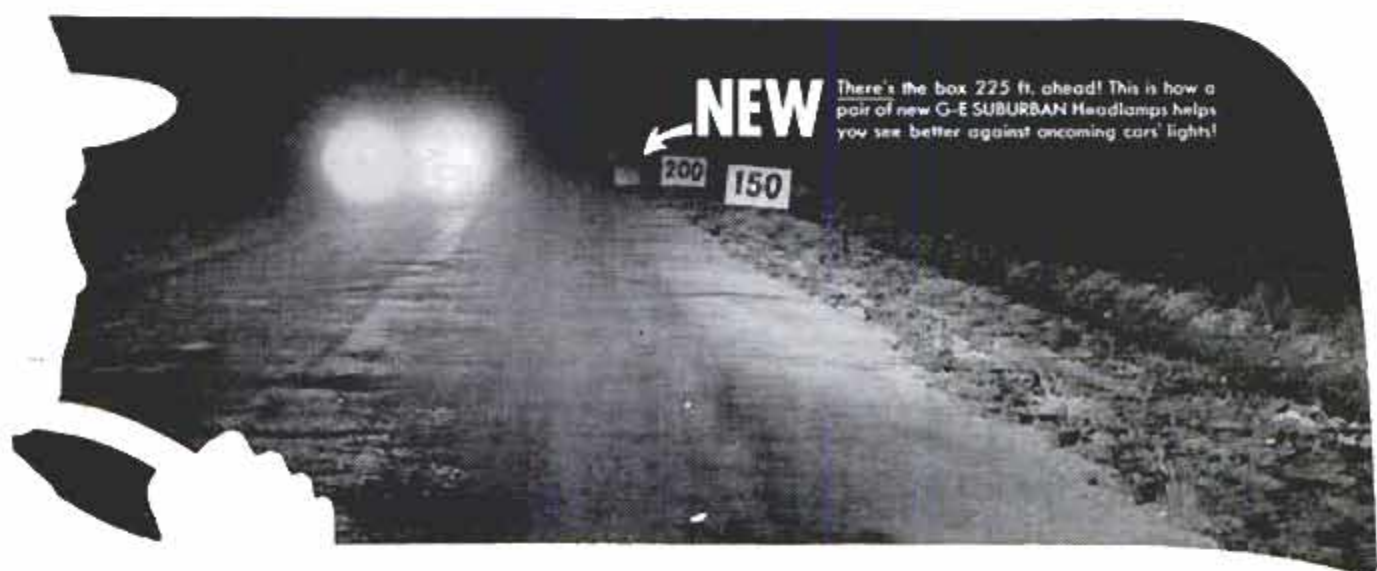
(Continued to page 260)



OLD

25 feet beyond that approaching car (and not yet in the beam range of your present two headlamps) is a fallen box, but you can't see it!

See better in spite of the other car's lights!



NEW

There's the box 225 ft. ahead! This is how a pair of new G-E SUBURBAN Headlamps helps you see better against oncoming cars' lights!

Get NEW G-E SUBURBAN Headlamps with the "built-in spotlight" effect in the low beam

... especially designed for all cars with two headlamps

Only the new General Electric SUBURBAN Headlamps have the low beam filament *optically centered* in the reflector. Because this filament is on focus, it provides *twice* as much light in the "spotlight" area—with ample light to the sides of the road—and with no added drain on the battery.

The additional light enables you to see better beyond the oncoming car in

spite of *its* lights—when both cars are from 75 to 200 feet apart. And it helps you recover your vision more quickly after the other car goes by.

See the dramatic difference; get G-E SUBURBAN Headlamps. Have a pair installed and aimed now. General Electric Co., Miniature Lamp Dept., Nela Park, Cleveland 12, Ohio.



Special low beam filament shield lets you see better in fog, rain or snow. The upper beam reaches far and wide for safer driving on the open road.

Get a pair today

Progress Is Our Most Important Product

GENERAL  ELECTRIC

Sitting in the Chevy → you feel as though you're in a bank vault. It's hard to say what creates this secure feeling, but it very definitely exists.

Miscellaneous: Most satisfactory once you are reconciled to low front seat, high steering wheel, extreme breadth (it's only two inches wider than Plymouth, but flat hood makes it "visually" wider and that's what the driver has to live with). Rear-seat comfort is excellent for two, due to well-planned stepdown (which produces an unfortunately wide straddle for center rider). Rides well, as do all three cars. Only the most sensitive tailbone (or most prejudiced) will detect major difference in three cars. Takes big bumps confidently, causing no concern lest control be lost. Windshield seems far forward, like looking through a window from across the room.

"Has a very strong body and frame."—Nebraska salesman.
"My wagon sits out in the weather every working day and all I do is turn the hose over it to wash the grime away. It's as beautiful as ever. I'm grateful for the new paint."—California welder.

"I like the ease of washing and keeping it clean. Even around the grille, bumpers and taillights there is not one crevice or hard-to-get-at place. With a brush anyone can wash it in 10 minutes. Incidentally, it rides a lot better with about 100 pounds of sand in the trunk."—Indiana trucker.

"I like the electric windshield wipers."—Ohio truck driver.

"Trunk lid operates easily."—Michigan sales engineer.

"Heater should be under the seat. Should be some way to get heat to the rear."—Pennsylvania housewife.

"Can't keep front end lined up. Wearing out front tires."—Illinois construction driver.

"Poor design of gas pedal. Keeps falling off."—New York sales executive.

"Gas tank hangs below bumper. Punctured it while backing up."—Illinois contractor.

"Windshield seems to get dirty faster than in previous years."—New York cashier.

"No courtesy light switch working off back doors."—New York advertising salesman.

"Gas gauge doesn't work."—California housewife.

"Ignition key wouldn't turn in lock. Another person I know had same trouble."—Michigan mail carrier.

That is the story of the 1959 Chevrolet as told by the people who know the car best—the owners themselves. For an engineer's test report, turn back to page 90. ★ ★ ★

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For genuine B&D repairs check Yellow Pages under "Tools-Electric" for address of nearby Black & Decker

FACTORY SERVICE BRANCH

Free tool inspection when requested • Genuine B&D parts used • Factory-trained technicians • Standard B&D Guarantee at completion of recommended repairs • Fast service, reasonable cost, always.

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QUALITY ELECTRIC TOOLS

NOW! a hi-compression staple gun

for only
\$4.95



With Exclusive Push-button Loading and Built-In Staple Extractor.

Indispensable for home use...and never before priced so low! This compact, all steel, powerful SWINGLINE 101 staple gun is ideal for insulation, carpentry, upholstery, screening, wire fencing, plus thousands of other uses. Handle locks to fit pocket. Lightweight, maneuverable, jam-proof! Staple sizes $\frac{1}{4}$ ", $\frac{3}{16}$ ". Send for FREE book—"Tips for Tacking".

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At Times Like This —
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80% Steel

When home repair troubles start to pile up . . . don't let it get you down . . . Get **PLASTIC STEEL** the permanent mender with a million uses around the home, garage or farm. **PLASTIC STEEL** fixes practically anything in minutes . . . saves you hundreds of dollars on repair bills.

As easy to use as modeling clay **PLASTIC STEEL** forms to any shape, bonds metals, wood, concrete or glass to itself or each other. Hardens to a steel-like strength in two hours. Can be filed, sanded or painted.

Repairs broken furniture, light fixtures, tools, toys, and appliances without special tools. No heat or pressure required. Seal leaking pipes, tanks, sinks, radiators and furnaces with **PLASTIC STEEL**. Holds under pressure. Won't shrink or expand.

PLASTIC STEEL fixes cracked motor blocks, torn fenders, leaking gas tanks, tractor parts, feed tanks and planting machinery. Unaffected by weather, won't corrode!

PLASTIC STEEL — in the black and yellow package — is available in three convenient home kits — \$.98, \$1.89 and \$3.95. At all leading hardware stores.



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DEVCON CORPORATION
176 Endicott Street, Danvers, Mass.

Also available — **NEW Devcon**® Rubber and **Devcon**® Aluminum

**DOLLARS FOR MATERIALS?
HOURS and HOURS
in WORK?**



**SPEND A PENNY MORE
FOR PERMANENCE WITH
SOUTHERN FASTENERS!**



NOTHING can take the place of the right screw for the right job in your shop projects, whether at your work or your hobby.

Professional craftsmen know that only a screw holds like a screw. So why risk having a sub-par project, when **Southern QUALITY** Screws and Bolts give your work finish, permanence, and quality.

Specify **SOUTHERN SCREWS** in the **EZ to C** package at good hardware or building supply stores everywhere. And ask for your free copy of Southern's **TC-4** folder, showing how to select and use the proper size screws, how to drill pilot holes, etc.

BUY SOUTHERN — BY NAME.

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Southern Screws Sold Through Leading Wholesale Distributors

**SAVE STRAIN
SAVE SKIN**

WITH
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**CUSHION
GRIP**

SCREWDRIVERS

**50%
GREATER TURNING
POWER**

16 sizes and styles—Regular and Phillips. \$1.00 and \$2.70. At your hardware store.

- SUPER COMFORTABLE
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 - ALLOY STEEL BLADE
- Resilient Neoprene **CUSHION GRIP** lets you turn screws tighter with less work—and you don't hurt your hands. Tested and approved by Mechanics

Patent No. 2871899

THE BRIDGEPORT HARDWARE MFG. CORP., BRIDGEPORT 5, CONN., U. S. A.

HOME WORKSHOP

*Space
Saver!*

\$4⁹⁵
PER PAIR



FOLD UP WHEN NOT IN USE • CLAMP ON IN A JIFFY!

**TROJAN FOLDING
ALUMINUM SAWHORSE LEGS**

PATENT PENDING

New **TROJAN** Sawhorse Legs require minimum storage space when folded. Made of heavy gauge aluminum. Weigh only 5 lbs. per pair. Officially tested to 2,000 lbs. Use any length 2 x 4 or 2 x 6. Slip-on extensions raise horse to 30" higher for work benches, picnic tables, outboard motor racks, decorators' platforms, display tables, etc. When not in use, horse may be stored by loosening handles, removing board and folding up legs.

PACKED TWO PAIRS TO A CARTON

MAIL COUPON TODAY:

TROJAN PRODUCTS CORP. DEPT. B

1131 E. 25th St., Indianapolis 5, Indiana

Payment enclosed. Send 2 pr. horses, \$11.35

Send 2 pr. with exten's., \$15.90 Free Folder

Price includes shipping charge

Payment: CASH MONEY ORDER CHECK

NAME _____

ADDRESS _____

Dealer Inquiries Invited

All high-powered cars have difficulty starting on ice. Cars seem to be getting more helpless on ice every year. Like dinosaurs in the mud, perhaps. →

How fast we change! Who would have guessed two years ago that Plymouth's fins would ever be called "conservative?" At this rate who dares guess what cars will look like in 1965? →

Here is where Plymouth excels. It feels more like a sports car than lots of sports cars being sold today. →

It's a plot! Cars get heavier, tires softer, so you have to buy power steering. Roofs get lower so you have to get swivel seats. Windshields get bigger so you must buy tinted glass! Oh, well, it's only money. →

Excellent over bumps, big or small. →

Due to what stylists call tumblehome, a narrowing effect above the belt-line. Nobody talks about it much these days. Must be going out of style. → Straight vertical lines are coming back, perhaps.

Can't understand why this has happened (and many cars have this weakness). There must be plenty of ram effect as a car moves along the highway so a blower should be unnecessary. →

"I have three-speed automatic transmission. It would be nice to be able to start in second gear on icy roads. There's a button to hold it in first, a button to hold it in second after starting in first, but no button for starting in second."—New Jersey accountant.

Additional Best-Liked Features

The following quotations describe the other best-liked features, arranged in order of frequency of mention:

"Conservative good styling."—New York salesman.

"Styling in excellent taste, not gaudy like others."—West Virginia store manager.

"Clean styling as compared with Chevy's outer-space body and Ford's box on wheels."—New Jersey inspector.

"I like its roadability and the way it seems to follow the road."—California salesman.

"Amazing cornering. Really hugs the road."—Connecticut musician.

"No sway on curves."—New Jersey contractor.

"Steering feels solid."—Illinois foreman.

"Easy control. Steers with one finger."—New York hospital attendant.

"Large usable space in this wagon. Swivel seats a great convenience if driving older people or when I'm 'dressed up.' Don't use them otherwise. So big I have carried four ceiling-high Christmas trees in it. It's truly a car for a housewife with four youngsters. Two crib mattresses fit behind the second seat for long naps."—Michigan housewife.

"I like the push-button drive and heater controls."—California layman.

"Excellent heater and defroster with simple controls."—New Jersey restaurant owner.

"Good firm brakes."—Michigan engineer.

"Real happy about the V8's gas mileage. I get 15 miles per gallon around town."—Iowa floral designer.

"I like the Six because it is sturdy and economical. I get 17.5 miles per gallon over-all."—Illinois salesman.

"Torsion bars absorb bumps and dips and give one the feeling his car is geared to the road instead of floating over it."—California machinist.

More Complaints as Well

In order of frequency of mention, here are additional complaints made by owners:

"In the rain, water runs off the windshield onto the floor when the front doors are opened. This has already ruined my floor mat and the floor is beginning to rust."—Florida Air Force employee.

"You get a shower bath when you open any door in the rain."—Georgia drug clerk.

"Dust is sucked inside trunk."—Georgia textile worker.

"Interior is cheap with rubber matting and cheap upholstery."—Illinois Belvedere owner.

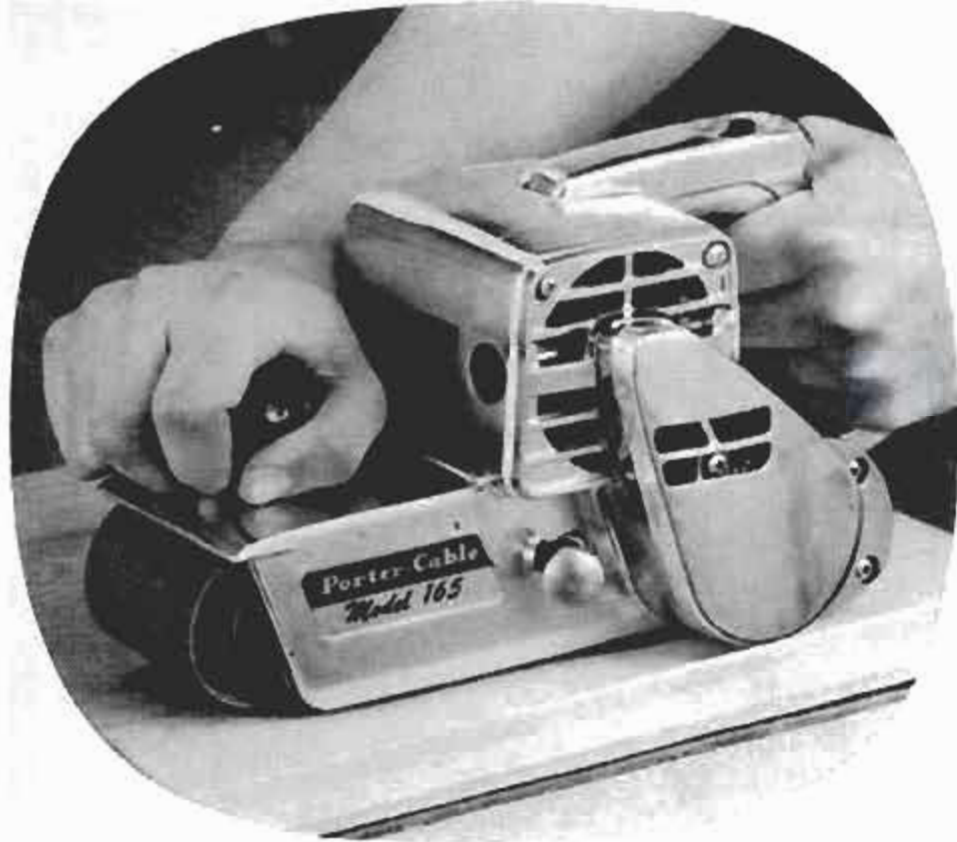
"I have had my front seat cushion cover replaced once and the new one is coming apart at the seams also. Either the material or the thread is defective."—Maryland U.S. Army man.

"No provision in heater for pressure feed of air through system. You must use the blower."—Ohio salesman.

"Dash is too tinny."—Ohio dentist.

"Material very poor. Brake handle looks as if a good pull

(Continued to page 264)



Porter-Cable BELT SANDER

for fast professional finishes... compact, it weighs only 7½ lbs. and perfectly balanced so that you can use it vertically, horizontally, or overhead with ease. Belt is always perfectly aligned and tensioned, can be changed in seconds. Super-quality features include powerful 5½ amp. motor, neoprene-nylon drive belt, precision spur gears and bearings, takes standard 2½", 2¼" or 2" belts.

MODEL 165
only \$49⁹⁵

SANDERS every home craftsman dreams about
...AND **NOW CAN AFFORD!**

Porter-Cable FINISHING SANDER

for slick, factory finishes...smooth-working on furniture, drywall joints, doors, windows, screens, cabinets. Lightweight and so perfectly balanced it can be used in any position. Orbital action, quick-change clamps, takes standard 3" x 8" sandpaper sheets.

MODEL 145
only \$29⁹⁵



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On the test car, the latch didn't work at all. Once open, it stayed open. It's a long, long reach for the driver, too. →

One of the unsolved problems is what to do with the driver's legs as seats get lower. →

Transistors do seem to be temperature sensitive. On very cold days they distort badly until warm. Radio quality has suffered since the much-heralded transistor arrived. →

The same old story: You can't have your wrap and wipe it too. →

We had all better get used to stepping down as we step up into the automobile because the depressed floor is here to stay. →

Even from here, I can see the hair rising like nettles on the necks of foreign-car enthusiasts when they read this! →

would break. Heater adjustment looks like a toy. Just generally poor material."—Missouri dentist.

"Engine is very noisy when cold, but after it warms up it quiets down."—Missouri electrician.

"Door on glove compartment does not fit properly or work right."—New York retired owner.

"Little too noisy going over bumps or tracks. I may be fussy, but when a car lists for \$3850 it should be a little quieter."—Massachusetts student.

"My only complaint is that the fins are too high on the back."—South Dakota farmer.

"Hard chrome rings in this Six will not seat. Result is oil consumption. Dealer will put in new rings after 5000 miles."—Michigan clerk.

"Seats are too low, causing legs to extend almost straight out and a trip of 720 miles was very tiring. Seat does not support the legs between the thigh and knee. My right leg must be kept high for the gas pedal and my left is almost straight out and braced to maintain my position on the seat."—California city employee.

"I don't like the straight-line speedometer."—Michigan engineer.

"Transistor-powered radios do not have the richness of tone that the vibrator sets did."—District of Columbia electronics salesman.

"Windows hard to crank up and down."—Maryland businessman.

"Ignition key on standard-shift models is in a crazy spot behind the steering wheel."—Pennsylvania salesman.

"When front seat is in forward position, I can't see the high-beam indicator light on dash."—New York lawyer.

"Windshield wipers leave blind spots."—Illinois office worker.

Other Best-Liked Features

"Excellent visibility through windshield. Also easy visibility of dashboard."—Texas carpenter.

"Most of all I like the easy starting in subzero weather."—Illinois credit man.

"Large luggage space in trunk."—California conductor.

"The dealer had me bring my car back because the factory had discovered an error in the steering on all early models. I admire Chrysler Corporation for correcting this error."—Tennessee salesman.

"In other low-price cars you have to step down too far when entering the car. Although I'm young, it is very difficult for older people to get in and out of that kind of body. In the Plymouth you do not have to step down too much."—Pennsylvania government clerk.

"I like the aura of luxury about it: The deep-pile carpet (it's a Fury), padded-leather steering wheel, rich upholstery, push-button controls make me feel 'idle rich,' tasteful affluence of its styling. There's no penny-pinching here."—Michigan executive.

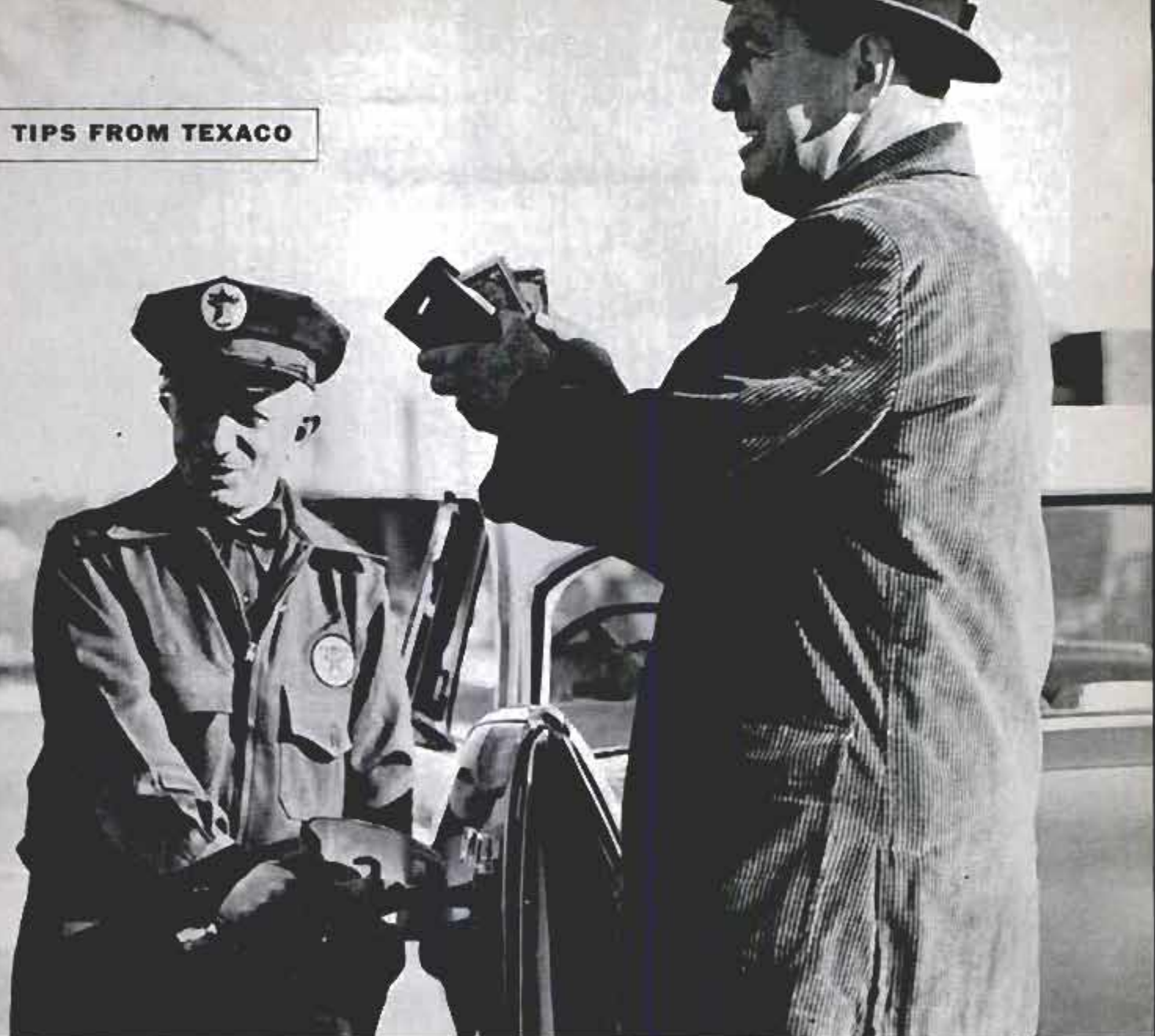
"I have a wagon and like the hidden storage compartment and fender-mounted spare tire."—New York repairman.

"I am an Englishman specializing in repairs to Jaguar, Bentley, Rolls-Royce cars for an importer. We in England do not produce a car of Plymouth's styling and performance in that price class."—Maryland mechanic.

Plymouth owners make some valuable suggestions to the automobile industry as a whole. Here are some of the most interesting:

"Operating a car at this altitude (over 6000 feet) makes a

(Continued to page 266)



How to wring more mileage from every drop of gasoline

- 1** Keep your carburetor air cleaner thoroughly clean or replace it regularly. Dirt chokes air-flow and wastes fuel.
- 2** Clean accumulated dirt, oil and mud from your fan blades (or have your Texaco Dealer do it).
- 3** Accelerate gently. "Jackrabbit" starts use up to 60% more gasoline.
- 4** Reduce engine friction by having your crankcase drained and refilled with the motor oil that lubricates ideally in every season . . . all-temperature Havoline Special 10W-30! Get maximum protection against cold start wear, hot running wear, and power-robbing sludge and deposits.
- 5** Maintain a steady, light foot on your gas pedal, and allow engine compression to slow you down instead of braking hard.
- 6** Turn off ignition when you stop for more than a minute. Takes less gas to restart than idling for 45 seconds!
- 7** Make sure tire pressure is correct.
- 8** Keep your tank filled with *the* gasolines blended for top performance and economy . . . Texaco. Both Sky Chief Su-preme and *regular price* Fire Chief are 100% Climate-Controlled for every one of 26 climate areas in the U. S.

THE TEXAS COMPANY



Buy the best . . . buy TEXACO

With all the emphasis on multiple and big taillights, why not have them give us additional information? There could be slow-down lights, stopped lights and even accelerating lights. Stylists would have a ball with them.

Miscellaneous: Of all three, this is the most fun to be with. Balance is excellent. Handles and rides like a good car should. Feels nimble. Makes you feel on top of things. Steering precise. Front-seat exit and entry easiest of the three. Back seat hardest to enter as door opening is restricted. Speedometer dial confusing as numerals and dots don't match due to an abortive attempt to make a pivoting needle line up with a straight line. Gas gauge has three huge dots for a scale. Each dot is several times as wide as the needle. Most unprecise. It reads empty for miles, full for miles, too.

big difference in a lot of things: power, cooling and others. The auto makers are just beginning to realize this."—Colorado clerk.

"Separate the taillight from the brake light. There is too much red light in the same area and it makes 'reading the lights' very confusing."—Michigan teacher.

"Unless the new cars of today are checked more carefully before leaving the factory, I am afraid I and many other annual new-car buyers will be forced to use our cars for three to four years."—Illinois truck-part salesman.

"The industry should conduct a national promotional campaign on safe and courteous driving. Make it unfashionable to beat the yellow light, to avoid making a full stop at stop signs, to bawl out the other driver. I believe courtesy and obeying signs will do more than any other single thing to reduce accidents."—Maryland salesman.

"The industry should provide more transportation and less luxury, that's what a car is for."—California vice-president.

"Build the cars higher for more convenient entry and exit. I prefer my 1956 Chrysler to this 1959 Plymouth for that reason."—New Jersey funeral director.

"Educate the public to prefer the less spectacular styling."—California school principal.

"We need better inspection. If you do not purchase your car from an outstanding dealer who intends to maintain the warranty beyond the contract, you are in trouble. A good dealer is the secret to real new-car satisfaction."—Illinois service manager.

And so the report on the 1959 Plymouth ends. That is what the owners think of the car, and they should know. For a performance report on the car turn to page 92. ★ ★ ★

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At 1 $\frac{3}{8}$ Acres Per Hour



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NEW 5 $\frac{3}{4}$ hp Briggs & Stratton Engine

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Tank Tested up to 500 lbs. per sq. in. 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. 1/2 HP. Model (Cap. 85 lbs.) Regularly \$175. (Item 209) \$109.50
1/2 HP. heavy duty model, Hep.-Ind. motor & unloader switch (Item 209a) \$129.50

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1 1/2"x10'	7.95	2"x10'	16.50
1 1/2"x20'	10.95	2"x10'	9.50
1 1/2"x25'	13.95	2"x14'	21.50
1 1/2"x50'	24.95	2"x50'	47.50
1 1/2"x100'	49.95	2 1/2"x10'	21.75
1 1/2"x10'	10.95	2 1/2"x17'	37.50
1 1/2"x25'	14.75	3"x10'	25.50
*Discharge Hose		4"x15'	44.95

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Send free information on 210 Utility diggers.

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CU-8L-68

(Continued from page 51)

kids and Aunt Jane and all their luggage down to the shore, or on that trip through the National Parks, that every family wants to take.

Having looked into, but not measured, the trunks of many cars, I cannot believe that the Plymouth, which has a low deck aft this year, has nearly twice the trunk space of a Chevrolet, and that the great big Lincoln has half the trunk space of an Imperial, which has an especially low deck.

We have a large American car, a Cadillac, and a "compact" German car, a Mercedes 180. In my circle of acquaintances, most of the foreign cars are second cars or owned by what you aptly call the "beret class" (a good name for my friend with a Porsche) or by single women. Most imports are too small to be practical to that average family who can spend not over \$2000. He buys and in my opinion will continue to buy a second-hand car. The guys with \$3000 plus to spend will buy the Impalas and the Galaxies.

Joseph L. Gillson,
Wilmington, Del.

Trunk-space figures are part of the specifications provided by the manufacturers themselves on a standard form set up by the Automobile Manufacturers Association. The companies do the measuring and the units are cubic feet. Apparently, GM uses a different system from the others. PM is presently trying to get comparable figures on trunk space for all makes and when it does, the information will be published. There seems no doubt that GM divisions are underrating themselves in trunk capacity.—EDITOR.

☆

Your automobile section in January PM was terrific. Where can I purchase an NSU sport coupe? It is by far the most outstanding foreign auto. I would be much obliged if you could tell where I may obtain a look at this amazing little car. Thank you again for such a fine magazine!

William Patrick Allison,
Arlington, Calif.

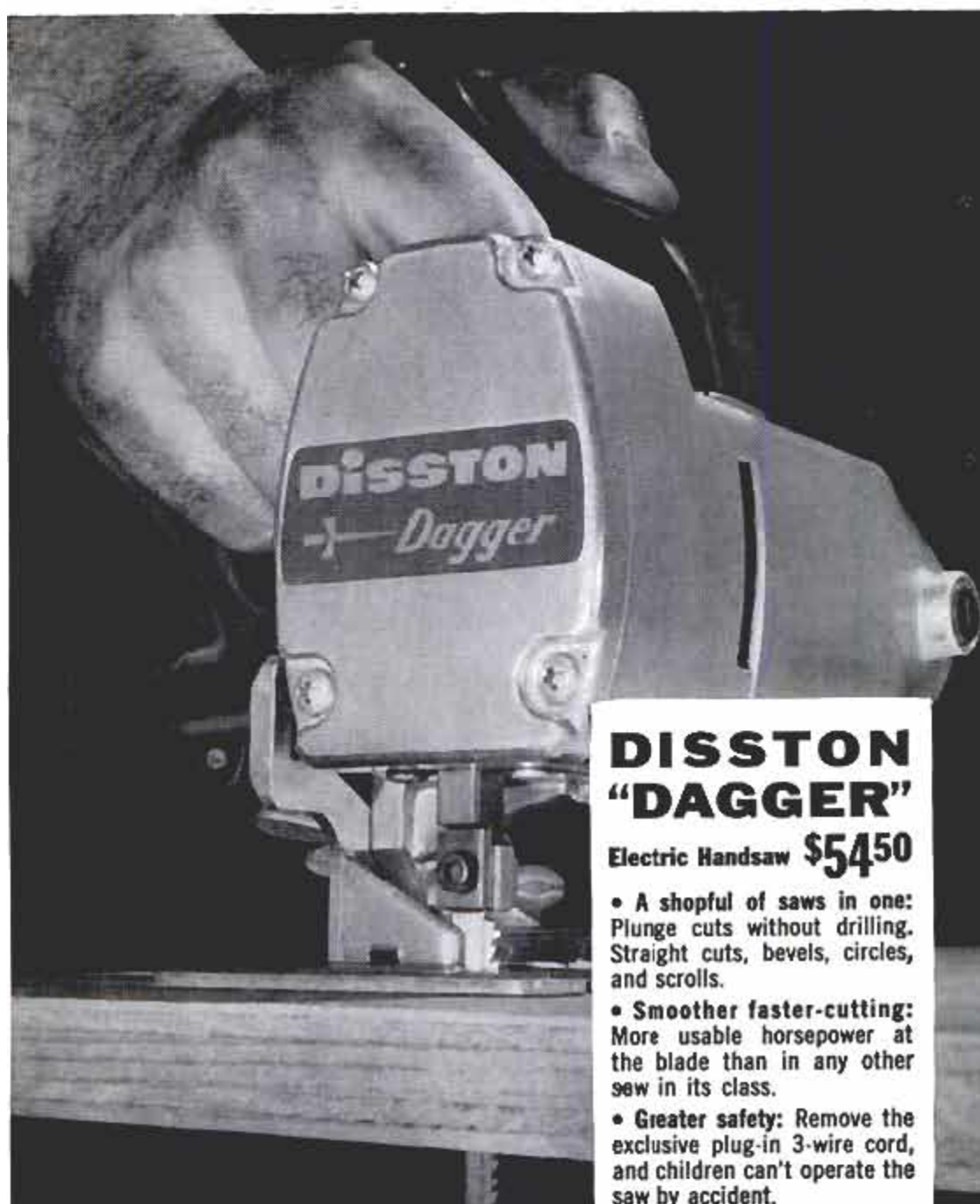
For information on the new NSU, write to Fandex Commercial Corp., 487 Park Ave., New York City 22.—EDITOR.

The statistic revealed by Ford's George Walker about the number of times one's hat gets knocked off entering or leaving a current Detroit model is the one clear call for all of us to stand up and be counted!

I say any man who objects to having his hat knocked off a measly four times a day in order to keep our national economy sound is downright subversive! I wouldn't put it past him to buy foreign cars—at the expense of the American standard of living.

As for me, every time my hat gets knocked off I think of Valley Forge, the Halls of Montezuma, Gettysburg and Chateau Thierry and, with a joyous shout of "Carry on," crawl into my car and am off—ready, willing and able to have my hat knocked off 18 times a day if need

(Continued to page 270)



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Electric Handsaw \$54.50

- A shopful of saws in one: Plunge cuts without drilling. Straight cuts, bevels, circles, and scrolls.
- Smoother faster-cutting: More usable horsepower at the blade than in any other saw in its class.
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Cutting speed jumps to 3600 strokes per minute, fraying reduces, and blade life lengthens with Disston's unique Orbite action. Blade bites on the upstroke, backs away on the downstroke.

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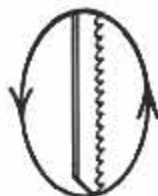
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Cuts scrolls . . . curves, angles and figures . . . all types of scroll-work. Takes place of jigsaw on many jobs.



Cuts tubing and metal . . . as well as hard and soft woods, and plastics. 9 basic blades for a wide range of materials.

be to prove that Detroit, as always, knows what's good for baby.

Jonas Arnold,
Wilton, Conn.



Reading your interviews with the stylists, their arguments didn't sound too bad, but when you look at their creations—Man! My dream is a means of transportation comprising four wheels, a gas turbine driving two electric motors, one on each steerable front wheel. I'm an electrical and electronics engineer and just don't give up hope of one day seeing civilian uses for the many nice machines being made for Uncle Sam. Very, very heartily, let me say, nay pray: Keep up your good work.

Harold G. Lenz,
Baltimore, Md.



The comments offered by the representatives of the automotive industry [interview with the stylists in January *PM*] indicate they are truly the men in the ivory tower.

The general tone of their comments indicates that they believe the whole country will go to pot if we don't trade every year.

Who do these people talk to when they take an opinion survey? Each other? I'm not seeking the blame for poor business conditions last year. I'm happy to say that I contributed. It's not likely that I shall ever again buy an American-made car until I find one I can

park easily, can afford to drive and one that doesn't depreciate \$2500 in three years.

Who can throw away money in that fashion?

Mr. Maguire says he has never seen a poor man in a Volkswagen. We're even. I've never seen an industrial designer in one. Perhaps we don't take our surveys in the same cocktail lounges.

By the way, what constitutes a poor man? My gross take-home pay is slightly less than \$4500. Simple economics will prove that I can't afford to replace any American-made car every three years.

They say money talks. Mine sings loudly of Volkswagen with a muted chorus by Renault and an occasional aria by Simca.

I believe in buying American by Americans only when it's the best available. If their interest in the buyer was what it should be they would offer a small "quality" car. Surely one manufacturer can do this.

Population of this city is less than 40,000 but we have 11 different makes of foreign cars selling here.

William H. Gates,
Cheyenne, Wyo.



I am 12 years old and am an American-car addict because of their beautiful length, width, heights and styling. I can't stand British and European cars. I buy *Popular Mechanics* each month for the auto section, especially the "Detroit Listening Post" which is very good indeed.

(Continued to page 272)

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"Of Course, I said **RIDGID**

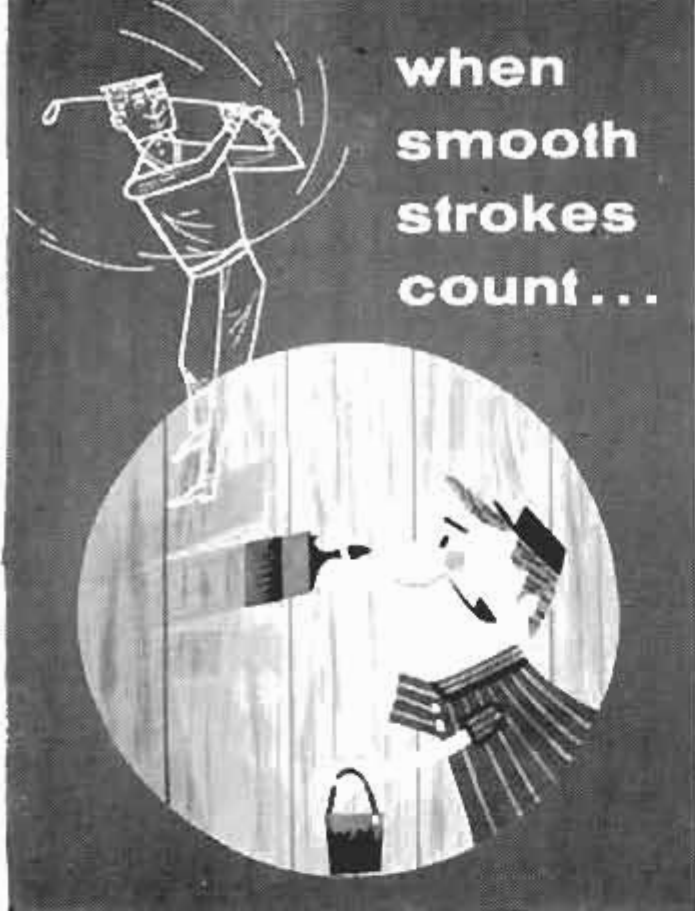
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FREE! 32-page book tells you "How To Do A Good Paint Job" with brush and roller. Write to Baker Brush Co., Inc., 83 Grand Street, New York 13, N. Y.

TAPERED TYNEX OR PURE BRISTLE
AMERICA'S FINEST PAINTING TOOLS

©1959, Baker Brush Co., Inc.

(Continued from page 270)
You say that by the end of 1959 the U.S. small cars will be out. I am wondering if Chevrolet brought out a smallish car would they still make large cars as well?

Will the small cars still have beautiful wings, double headlamps and lots of chrome?

Do you think the small-car fad will pass away and large cars will be the only type of American cars on the market?

If you went out for a walk by a road in your town how many cars which are British or foreign-made would you see in an hour?

Richard Tilley,
London, England

A look at the 1959 automobiles and a study of their specifications, make us wonder if progress hasn't come to a game of ring-around-the-rosey or follow-the-leader (if you can call that progress).

Automobile testers like to emphasize performance features, disregarding everything else. They report on the time it takes to go from zero to 60 (who has any occasion to drive like that?). They report on how a car corners (who abuses a car that way?). What the top speed is (where can you legally drive that fast?). How many panic stops it takes to make the brakes fade (who is going to brake a car that way?).

Why don't they give us the lowdown on car construction and tell how thin the sheet metal is, how much cheap cardboard is used, how hard it is to get in and out of the rear seat, how skimpily padded the swing-out seats are?

Perhaps *PM* could help bring about an improvement. There seems to be a widespread opinion that a magazine such as yours carries some weight with auto companies.

How about asking all your readers to express their views? Or would it hopelessly swamp you?

Bill Davidson,
Kansas City, Mo.



When the Ford Motor Company's Maguire stated that he had never seen any poor people driving Volkswagens, "only grey-flannel non-conformists," he portrayed most vividly the American motorcar industry's pique over the public's reaction against the impractical monstrosities that Detroit is trying to foist upon it.

How long will the automobile companies characterize the ostrich principle? How long will they remain intentionally purblind to what the average buyer is really looking for in a car?

Denny Larke,
Great Falls, Mont.



Mr. Maguire asks "What is a quality car?" Do quality and quantity honestly go hand in hand? I don't think so and your Owners Reports would back up my opinion. Limited production is Rolls-Royce's answer to this angle and body specialists like Park Ward, Hooper, etc., split this production again.

(Continued to page 274)

reach for the reel fishermen trust!

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BRONSON REEL COMPANY, BRONSON, MICHIGAN
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World's Most Complete Line of Fine Fishing Reels

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do-2



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WIDTH . . . IN SECONDS**

FOR PROFESSIONAL PRECISION . . . only with a COMET QUICK-SET DADO! Cut to a maximum depth of $\frac{3}{4}$ ". Dial the exact width (from $\frac{1}{4}$ " to $1\frac{3}{8}$ "), without removing the tool from the arbor. Watch the balanced, tool-steel COMET blades cut perfect dados, rabbets and ploughs . . . on any table or radial arm saw. Use COMET for quick, professional precision . . . stays sharp 5 times longer! If not at your local dealer, order direct by check or money order. **19.95 PREPAID**

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a division of The Siegler Corporation

G.E. AIR COMPRESSOR

ITEM #461 — High pressure two cylinder, two stage air compressor rated 1000 P.S.I. output. Driven by 1/3 H.P., 27 volt D.C., 17 amp. motor. 14" L x 9 1/2" H. Shp. Wt. 15 lbs. U. S. Gov't paid \$296.00. OUR PRICE.



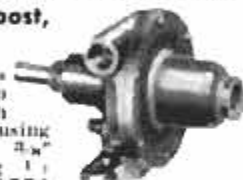
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F.O.B. Chicago. High pressure Air Receiver Tank for compressor, 2 lbs. . . . **\$4.00**
PRESSURE GAUGE 0 to 2500 P.S.I. **\$1.50 EA.**

OBERDORFER BRONZE CENTRIFUGAL PUMP

For: Fluid Transfer, Sprinkler Boost, Circulating, Marine Coolant

ITEM #481 — Designed for continuous heavy service. Carbon bearings require no lubrication. For direct or belt-drive with speeds up to 3450 RPM. All bronze housing impeller with 1/2" stainless steel shaft. 3/4" inlet and outlet, CCW rotation. Using 1/2 H.P. motor will deliver 3 GPM @ 1750 RPM. At 3450 RPM delivers maximum of 7.25 GPM at 0 head, 4.25 GPM with 20' head.



\$26.50 Value **Our Special Price \$8.95** ppd. 2 for **\$17.50**

Briggs & Stratton Gas Engine Driven 1000 WATT A.C. POWER PLANT

Portable — Only 61 Pounds!

ITEM #1008B — Brand New! Duplicates standard house current. Generator and engine mounted on steel base with sturdy belt guard. Operates at 3600 R.P.M. Standard double outlet receptacle with overload fuse protection. Ready to run, 20 1/2" x 12" x 16".



GENERATOR 1000 Watt continuous duty, 115 volt AC, 60 cycle, single phase, automatic voltage regulation.

ENGINE Famous easy-starting 2 1/2 H.P. Briggs & Stratton 4-cycle air-cooled, automatic recoil rope starting. Adjustable automatic governor. Adjustable jet carburetor. SAVE **\$159.50** \$100! Usually \$259.50. NOW, F.O.B. Chicago.

SPECIAL BARGAIN BUYS!

BAIL PUMP

ITEM #491 — For pumping out bilges, sewers, basements, ditches, etc. Of heavy gauge sheet metal. Full length handle and spring valve for high volume with minimum effort. 60" long, 3" dia. Weight 22 lbs. F.O.B. Chicago. **\$3.95**



SUBMERGED PUMP

ITEM #513 — For fuel or water transfer, booster pump, etc. Rated at 500 G.P.H. at 8 P.S.I. Motor rated at 24 V. D.C. 9 lbs. F.O.B. Chicago. **\$8.95**



BOLT & WIRE CUTTER

ITEM #478 — New! With extendable handles for extra leverage. Center cut type bolt cutter. Capacities: medium hard bolts in thread 3/8"; medium hard metals 5/16". NOW ONLY **\$3.95** ppd. 2 for **\$7.00**



G-1 AIR TANK

ITEM #63 — Stainless steel, 450 lbs. P.S.I. Aviators Breathing Oxygen bottles, type G-1, 2100 cu. in. (appr. 9 gals.) int. vol 24" x 12", 1/4" threaded openings each end. 19 lbs. F.O.B. Chicago. **\$13.50** 2 FOR **\$25.00**



FREE! New Catalog. Value-Packed Pages Galore! **FREE!** War surplus, new equipment. Write today!

GROBAN SUPPLY CO. Dept PM-4
1139 S. WABASH AVE., CHICAGO 5, ILL.

(Continued from page 272)

Generally speaking, I like the lush lines of your products very much indeed, more than some of Britain's Humpty Dumpty designs. We are now going to Italy for our designers.

The design point I do not like in U.S. cars is the overhang. The old prewar cars enjoyed good handling because there was a wheel at each corner and there was no tail to wag the dog. Surely you must have a nation of showmen if it is the acres of a car that count in the rat race?

Are Messrs. Doblin and Fitzgerald serious? This looks like an attempt to cross a 2CV Citroen with an old D-type Jaguar. If you want a suburban runabout why not buy the Fiat Multipla, illustrated on page 166? If the import duty is too high then surely plagiarism would be better than this monster!

John Pullin,
Darlington, Durham,
England

1/4 MIDGETS

The little league of family racing. \$449.00 complete. Write for free literature. Dealerships now available.



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Here is a complete metal workshop! It **PUNCHES** hurr-free holes in metals up to 16 gauge, to 1" from edge of stock. Has five round punch sizes: 1/8", 5/32", 3/16", 7/32" and 1/4". Square, oval and hexagon shaped punches available. **SHEARS** metals up to 16 gauge thickness, to 1" wide, at any angle. Also shears rod, wire. (Cutting surfaces are hardened steel that can be re-sharpened!) **FORMS** metal with bends up to 90° using rod or bar stock up to 1" wide, 16 gauge thick. **RIVETS** with any solid or hollow rivet up to 1" from edge of stock and up to a maximum of 3/8" in total thickness. Guaranteed!



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18" BENDING and FORMING BRAKE

• SMOOTH BENDS
• FORMS UP TO 90°
• UP TO 16 GA. THICKNESS

EXPERIMENTERS! SERVICEMEN! SHOPS! This unique design permits forming chassis, boxes, covers, trays, etc. by means of 1" deep slots in brake-bar which allows corners to fold in. Provides flange edges up to 1" on bend. Rugged construction. Guaranteed!



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glue
for



The glue for joints subject to water, weather, acids, alkalis and molds. Forms a bond stronger than the wood itself! Best you can buy for outdoor use. • Get free copy of "Elmer's Guide to Good Gluing". Send stamped, self-addressed envelope to Elmer, The Borden Company, Dept. 4G, 350 Madison Ave., New York 17, N.Y.

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SUDS! SCRUBS! RINSES!



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PRECISION AND
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**FIRST RADIAL SAW WITH DUAL PORTABILITY
EVER OFFERED AT THIS LOW PRICE!**

Shopmate—all the accuracy and twice the versatility of other radial arm saws. A rugged, big capacity precision instrument that produces an endless variety of professional quality work!

Powerful 1 hp automatic safety clutch saw makes all cuts easily: cross cuts, dados, rips, mitres, bevels, cove cuts, etc. Widely spaced ball bearing carriage, heavy-duty 3/4" Acme elevating screw, heavy steel U-beam base, treated hardwood table, precision calibrated scale adjustments with positive indent stops 45° left and right, anti-kickback in front of blade, finger-tip power control, 8-second blade coast-down, full 180° swing, and many other features.

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PORTABLE ELECTRIC TOOLS, INC.
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ON THE SHOPMATE RADIAL SAW!

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Get this handy new set of wood-boring power bits with FREE metal bit holder. Keeps bits protected and in order... gives instant size selection. Holds up to 11 bits. Comes to you free with set of six GREENLEE ZIP BITS sizes $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{7}{8}$ ", 1".

Set with free holder, only **\$3.90**

ZIP BIT has nonslip HEX SHANK BORES IN ANY WOOD, AT ANY ANGLE, ANY SPEED

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New Magic RUBBER

Repair All Rubber and Fabrics with a Squeeze of the tube.

Tough, elastic rubber in paste form. Seals windshield leaks, repairs convertible tops, awnings, tarps, boots, raincoats, swimming pools, hoses. Dries quickly — permanent, waterproof.

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The Amazing Metal Mender with 1001 Uses

Solders, seals, repairs all metal. No heat or tools needed. It's real metal in paste form that can be drilled, filed, tapped, threaded when dry. Waterproof, gasolineproof, heatproof to 600°. For Home, Auto, Boat, Plumbing.

NEW APPLICATOR CAP MAKES SPREADING A SNAP

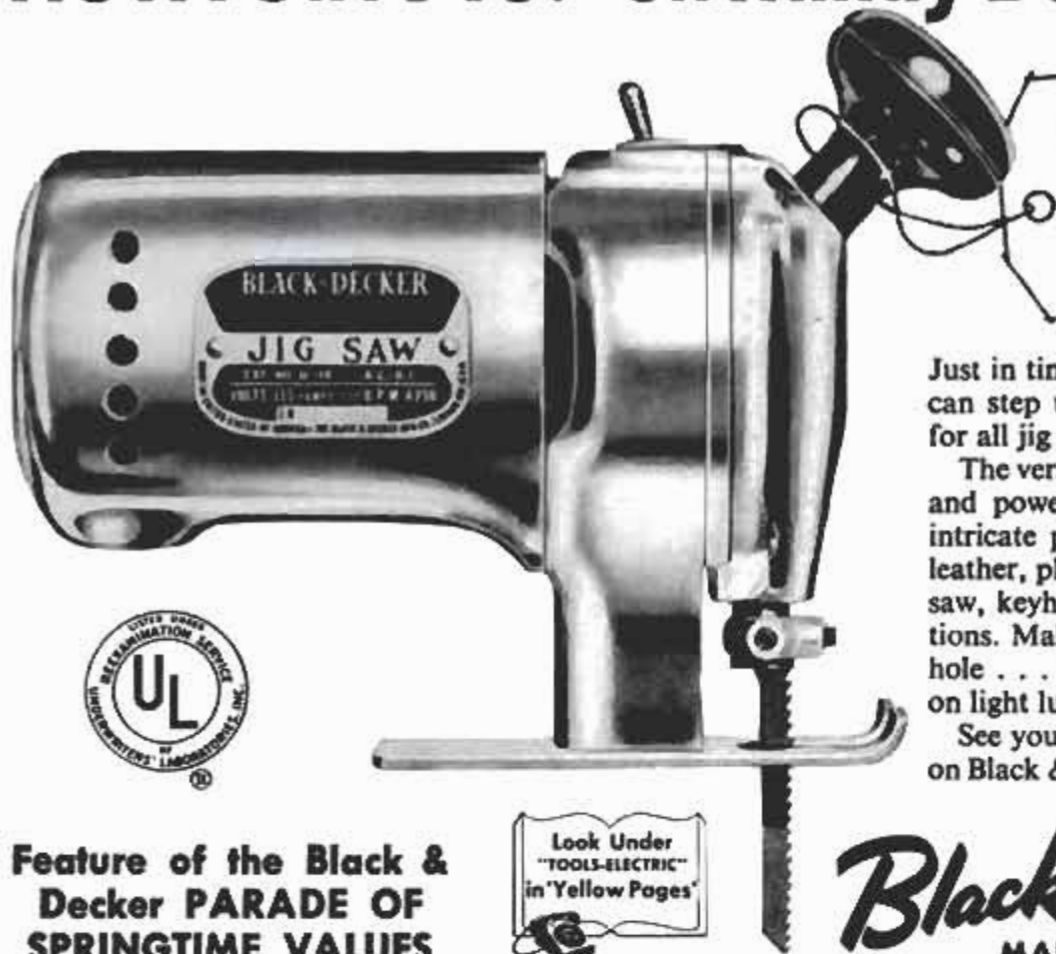
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SAVE \$4.55

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Just in time for Spring fix-up! Now you can step up to Black & Decker power for all jig sawing jobs . . . at a saving!

The versatile B&D Jig Saw is compact and powerful, cuts straight, curved or intricate patterns in wood, sheet metal, leather, plastics, etc. It does many sabre saw, keyhole saw and band saw operations. Makes pocket cuts without a lead hole . . . makes a handy trimming saw on light lumber.

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(Acquisition cost of \$400)

MANY USES: Boat Hoists (will operate off battery); Midget Cars; Small Welders; Delivery Carts. HOBBYISTS & INVENTORS: "Worth having just to play with." Shipping weight, approximately 40 lbs. DIRECT CURRENT - 24 VOLT.

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CHILD SIZE ELECTRIC MODEL "T"



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- 5 to 7 miles per hour
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PARTS - Price list with plans

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WITH STANDARD TOP QUALITY SCREWS, BOLTS, AND NUTS.®
GENEROUS QUANTITIES IN CLEAR PLASTIC BOXES - 59¢ PER BOX.
USE DRAWER RACKS - 59¢ EACH - FOR NEAT HANDY SHOP STORAGE.
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LOOK IN YOUR STORE FOR THESE 'STOCK YOUR SHOP' BOXES.
A PRODUCT OF ELCO TOOL & SCREW CORP., ROCKFORD, ILLINOIS.
MANUFACTURERS OF FASTENERS FOR INDUSTRY SINCE 1922.

Owners Report on the Ford

(Continued from page 95)

Why do all these woes → descend on one guy? We like to think that mass production assures all pieces will be of the same quality. For some strange reason, it doesn't work out that way.

Here's a reasonable man. He doesn't expect to get 30 miles per gallon. He's happy with 16.5 → on trips and is enjoying his new car.

As the people's space in sedans gets smaller, station wagons get more popular. Eventually all cars excepting sports models will be wagons → —seems inevitable.

Driver's position → makes parking the Ford easiest of the three.

Most sensible thing is → to take the hat off first—he probably can't wear it inside the car anyway. If he knocks his hat off on the Ford, he'll bang his head on the others.

"The first night I drove my car home the right door would not lock. The window trim around the glass was not put in properly, causing the door window to crack. It had to be replaced. Both side vents leaked and in retaping them one was cracked. Trunk leaked until they gooked it up with some kind of clay. Thermostat had to be replaced. It's on the blink again. Carburetor dashpot had to be replaced. Solenoid was replaced. Engine would not start in Park. I could go on and on, but I'm tired and disgusted."—Pennsylvania machinist.

More Best-Liked Features

The following quotations by Ford owners describe the other best-liked features in order of frequency of mention:

"When you need it for passing, the engine response is very good."—Wisconsin engineer.

"Very responsive to the accelerator pedal."—New York housewife.

"I have to keep a complete record of all costs of driving. I have 14,000 miles on this Ford V8 and the costs are reasonable. I get 16.5 miles per gallon on long trips."—Iowa newspaper worker.

"I never thought I would like a Six before trying this one. It has enough power to take me anyplace I want to go and is much cheaper operating. I have standard transmission, handshift and get 17.5 miles per gallon in city driving."—West Virginia laborer.

"With this Six I have no need to buy anything but regular-grade gas. I get about 20 miles per gallon on trips."—Kansas road-maintenance operator.

"Plenty of room inside. My wife and I are both tall and we have plenty of room."—Kansas teacher.

"Lots of room. Living on a ranch, this is important. We often have two or three hired hands and need room for groceries for seven or eight for a week or more. This Ford wagon has room."—Nebraska rancher.

"Dependable. It always starts readily on a cold morning."—Missouri homemaker.

"Have had less trouble with this car than any other Ford I have had."—Pennsylvania safety engineer.

"Interior workmanship and materials, colors and fabrics are very good."—Michigan salesman.

"The trunk is low and easy to put things into."—Missouri farmer.

"Excellent view of all four fenders from the driver's seat."—California electronics engineer.

And Additional Complaints

These are some more complaints of owners, described in their own words in order of frequency of mention:

"My only complaint is that rain pours in around the windshield."—Georgia housewife.

"Trunk leaks when it is washed or when it rains."—Michigan newspaper employee.

"It's too low for me to get in and out without knocking my hat off."—New York engineer.

"I'm short and the front seat has to be pulled up close, making it hard to get in and out of the car."—Tennessee housewife.

"Wagon tailgate rattles terribly and can't be stopped even

(Continued to page 280)



EXTRA BLOWOUT PROTECTION: Nylon has lasting strength to guard against blowout. Nylon protects against the four kinds of unseen tire damage that can lead to sudden tire failure: (1) heat, (2) bruising from bumps, (3) moisture, (4) flexing. All tire makers use nylon cord in their better tires. Why risk a dangerous blowout? Have your tires checked regularly. And whenever you need new tires, be sure they're made with nylon cord!

THE SAFEST, STRONGEST TIRES ARE MADE WITH

NYLON

Enjoy the "DU PONT SHOW OF THE MONTH" on CBS-TV



BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

Power assist is not so effortless as the others'. But this is deliberate. It is meant to provide a feel of the road. →

If the wheel was higher, it would be awkward to see over. Solve one problem and create another.

Next time, he should buy an automatic transmission and eliminate the problem that way. →

Another gear shifter! It's too bad that manual boxes haven't had a fraction of the time and money that were spent on the automatic shift. If so, handshifting would be as pleasant as it can be with fine machinery. →

Every year somebody puts lights in the bumper and regrets it. It all started years ago with Buick's back-up lights. →

Actually, it isn't. It does feel heaviest, however. (Chevy is the heaviest.) →

with extra weather stripping. Cardboard roof material squeaks."—Texas jet pilot.

"Door rattle very bad and will not stay tightened up. Road and engine noise travels up steering column."—Ohio machine repairman.

"Noisy engine. Pings when using regular gasoline."—New Jersey housewife.

"Interior looks nice, but cheap. Beginning to wear and only two months old."—California inspector.

"Power steering (so called) doesn't give the assistance claimed in parking and steering."—New York secretary.

"I drove from California to Illinois and used 12 quarts of oil in this V8. Then I drove to Texas and used five quarts of oil. When the garage took the heads off, they found the rubbers on the valve springs up too far and put new rubbers on."—Illinois service manager.

"I used nine quarts of oil in 910 miles. Had a ring job done."—New Jersey dispatcher.

"Has V8 engine but seems very low powered. Acts like 60 horsepower when I use regular gasoline."—Missouri laundry owner.

"Poor power. Checked and found compression varies 35 pounds."—California technician.

"Front grille too fragile. Is dented by other cars in parking. Taillights vulnerable. One smashed by spear on front of Cadillac."—Massachusetts newspaperman.

"Steering wheel should be higher for more legroom to operate clutch and brake pedal."—Illinois machinist.

"Throws antifreeze out overflow pipe. Pump must move too much water for capacity of radiator."—Minnesota postal clerk.

"Slow windshield wipers in heavy snow when going up hills."—Illinois engineer.

"Shifting gears is like shifting a truck."—Illinois construction worker.

"Don't like exposed hinges on bottom gate of wagon. They rust and fill with ice and snow."—Michigan banker.

"No light on ashtray. Have you ever tried to put out a cigarette at night while driving with two women in frilly dresses in the front seat?"—California store manager.

"I don't like the fact that Ford introduced a newly styled Galaxie only a few months after the original showing. I am sure Ford made many enemies among the early purchasers."—Indiana dry cleaner.

"Don't like front grille. Would make a good carrot cutter."—Pennsylvania salesman.

"Front turn signals are too low and too vulnerable. They are so low that other motorists are not able to see them occasionally."—California soldier.

"Poor position of steering wheel in relation to front seat. Tiring on arms."—Michigan inspector.

Other Best-Liked Features

"Smooth engine performance. Won't fail to start in any weather under any condition."—Ohio foreman.

"Hand choke on the Six makes it easy to start."—Maryland research analyst.

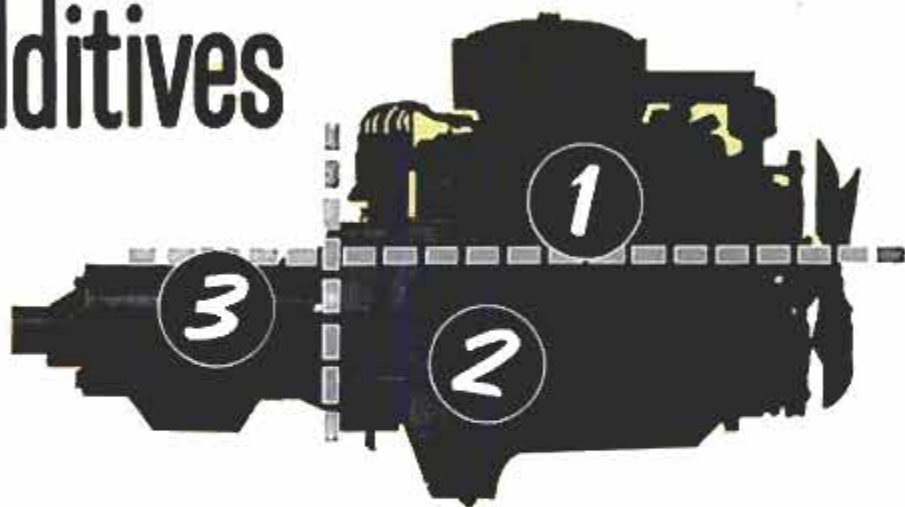
"Holds the road real good. Feels solid holding the steering wheel. Motor purrs like a kitten."—Florida retired owner.

"Seats are comfortable. Higher off the floor."—Florida mail carrier.

"Heaviest built low-price car on the road. It's just built for us farmers."—Texas farmer.

(Continued to page 282)

Now CASITE ends the confusion about additives



Regardless of "cure-all" claims—*one additive alone is NOT enough to keep engines clean, friction-free, and at peak operating efficiency. Now CASITE gives you all three necessary specific treatments.*

1
for the
**FIRING
ZONE**



1. IMPROVED CASITE . . . for the Firing Zone

The nation's favorite "Tune-up in a can" now vastly improved with spark plug and carburetor cleaner and acid inhibitor. Recommended for use in the gas tank or carburetor air intake to free valves and rings and clean carburetor and spark plugs. Also for use in crankcase oil for quicker starting, less start-up wear and to break-in new or rebuilt engines. List price \$1.25.

2
for the
**FRICION
ZONE**



2. CASITE C-C-C . . . for the Friction Zone

A new heavy-duty crankcase concentrate with Barimen and acid inhibitor. Recommended for use in crankcase oil to quiet noisy engines, reduce friction and oil consumption, stop hydraulic lifter noises, smooth out and pep up engine performance, clean and protect engine parts from wear and acid corrosion. List price \$1.50.

3
for
**AUTOMATIC
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MISSIONS**



3. CASITE "SMOOTH SEAL" . . .

For Automatic Transmissions—to reduce jerks and roughness and assure smooth, quiet operation. Stops and prevents leaks due to hardening or shrinking of the transmission seals. Reduces shock and wear, enables delicate parts to last longer. List price \$1.95.

USE ALL 3 RESULTS GUARANTEED or double-your-money-back!

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICHIGAN

Casite, Piston Rings, Oil Filters, Spark Plugs

Miscellaneous: Vacuum wipers not steady under varying loads. Ford best for over-all comfort of both front and rear seats. Plymouth's front seat is easiest to get in and out, Chevy's rear seat is best for legroom. But Ford seats are best all things considered. Ride is firmest of the three. Transmission (three-speed automatic) is smooth and provides good getaway. Quadrant well marked. Hood is hinged in front as a safety measure. More awkward for engine maintenance, however. Air intake for heater is up front where likely to pick up fumes in traffic. Altogether the car tends to be more conservative, more practical than the others. Has best road clearance also.

"Windshield is high enough so you don't hit knees getting in and out of car."—New York salesman.

"More accessible back seat."—Illinois nurse.

"Good door operation. Shut easily. You don't have to slam."—Nebraska merchant.

"Like the way the doors stand open."—Indiana barber.

"Having hood hinged in front eliminates possibility of its blowing open."—Michigan insurance agent.

"Wish the locking rear axle was standard. I have one and once you've driven one on snow or ice you'll never go back to the regular axle."—Michigan salesman.

"I believe the Ford Six delivers all the power needed by the average owner. This is the sixth one I have owned. I average about 20,000 miles a year. The 1959 Ranch Wagon is very easy for my wife to drive as the steering is excellent."—South Dakota service man.

"I was afraid to buy a Six for many years, but since owning this one would recommend a Six to anybody."—Virginia government worker.

"This Six is ideal winter car. Not overpowered on slick highways."—Michigan machine operator.

"I like the steel retractable top, but not enough room in back seat."—Utah truck mechanic.

"It's an American-made car and I believe in American-made products."—Tennessee railroader.

"This car was assembled at Chester, Pa. I intend to request that my next car be assembled by this same plant. They seem to do a better job of assembling them."—Virginia barber.

That is the Ford story for 1959—the good and the bad as told by the owners themselves. For an engineer's report on the Ford turn to page 94. ★ ★ ★

Which Irwin bit bores holes fastest?

Fastest cutting new Speedbor "88" for electric drills. Bores 1" holes 2 1/2" deep in just 60 seconds. Increases the average boring range of small power drills. Sizes 1/4" to 1", \$.75 each. Sizes 1 1/8" to 1 1/2", \$1.25 each.

Fastest Boring 62T Hand Brace Type. Only 16 turns to bore 1" holes through 1" wood. Double cutter action. Sizes 1/4" to 1 1/2". As low as \$1.

Fastest Boring Expansive Bit Type. Bore up to 35 standard holes with just one bit. Two sizes give 1/2" to 3" boring range, America's most versatile bit for home and farm. Only \$3.80 for largest size.

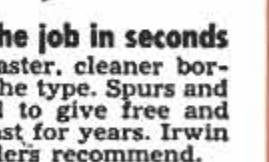
Balanced cutting heads do the job in seconds

Every Irwin wood bit gives faster, cleaner boring in any wood — no matter the type. Spurs and cutters are precision-balanced to give free and easy cutting action. Made to last for years. Irwin is the wood bit hardware dealers recommend.

Free Booklet tells how to use, select and take care of wood bits. Many pictures. Write Irwin, Dept. 49PM, Wilmington, Ohio

IRWIN
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- the original solid center auger bit
- screw drivers • screw driver bits



Better, easier, Rotary Tilling with finger-tip controlled full power reverse!



Simplicity
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TILLER-CULTIVATOR

Works close to fences, between shrubs... no exhausting "pull-back"!

A powerful sod buster for toughest soils — crumbles soil with gentle spading, lifting motion for perfect rotary tilling. Complete job visibility. Ask your Simplicity dealer how easy it is to own Roticul —

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Your first pipeful tells you why

Smooth-smoking, even-burning, long-lasting, mild AMPHORA is blended in Holland. Popular priced. In handy pouches and tins, at tobacco counters everywhere.



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BUY GREAT NECK HAND TOOLS

... for long-lasting performance

**Precision Balanced
NAIL HAMMER**



One-piece, forged steel, rubber-cushioned, no-slip grip

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FOR PANELING... BUILT-INS... CABINETS... FURNITURE

The Complete Interior WOOD FINISH

in One Can

READY TO USE

A finer clear, semi-gloss for natural wood beauty. Non-darkening. ANYONE can use Deft... it's so easy.



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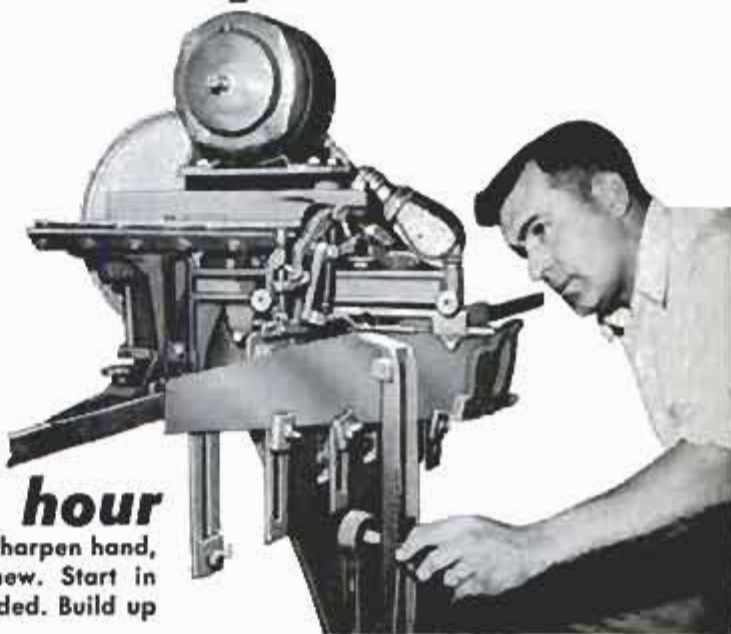


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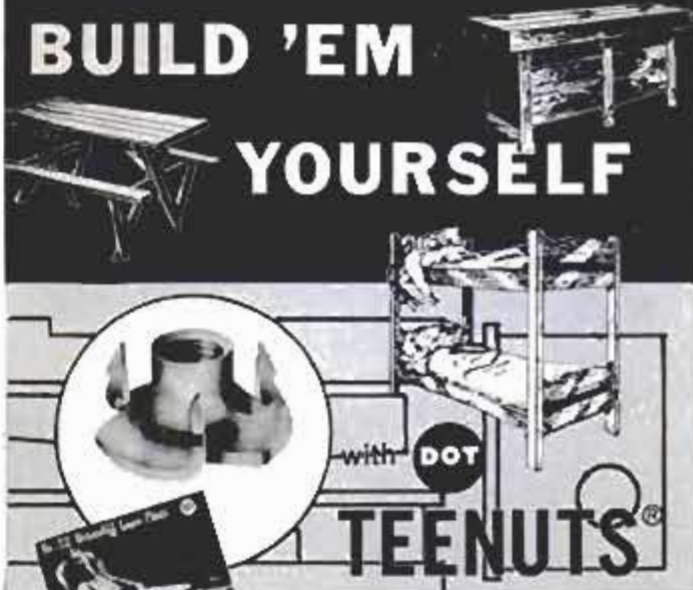


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• Generator: Hobart 3000-w, 115-v, 60-c, 2-wire. Engine: Hercules 1-cyl, water cooled. Complete control panel, circuit breaker, voltmeter, ammeter, (free), meter, etc. Size 55"x25"x32". Wt. 700 lbs. Cost \$345 FOB Govt. \$1,248. SALE. **\$345 FOB**
Transformer for 115-230-v power, \$27.95 FOB

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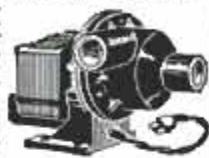


• Item #540. Compact, powerful AC, DC rotary actuator unit. Use to operate remote valves and levers, steering control, door openers, switches, make small winch, open-close drapes, antenna rotator, etc.

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• Item #672. Famous new-condition P-1 200-250 amp aircraft generator. Thousands of these giving excellent service as welders. Other uses are AC power plant, fast battery charge. Easy to adapt into portable welder, using 10-12 HP engine or drive off tractor pulley. 200-250 amp 24/30-v, 2500-4500 rpm. Size 15" x 6". Wt. 48 lbs. Govt. cost \$300. SALE. **\$18.95 FOB**



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• Item #123. Brand new 115-v timing clock will switch electrical appliances ON or OFF at any predetermined time. Excellent to control TV, coffee-makers, fans, air conditioners, lights, etc.

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With portable steel hand cart (shown), rubber wheels, specially constructed for mounting this unit. Incl. 25' rubber air hose. 6' extension cord with plug & fittings. Wt. 76 lbs. Complete with cart—\$26.95.
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With Deluxe accessories consisting of one 200 AMP. Gen., adjustable helmet, electrode holder, 30' welding cable, rheostat, giant toggle switch, voltmeter, voltage reg., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST — \$500. Most items new — all perfect. \$26.00.



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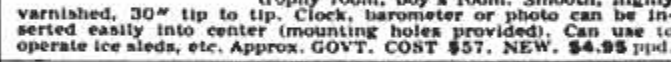
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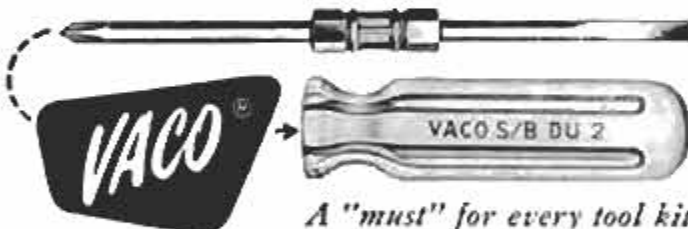
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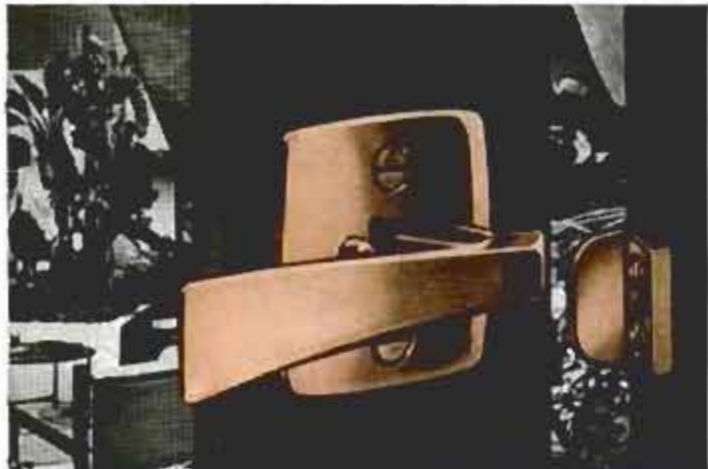


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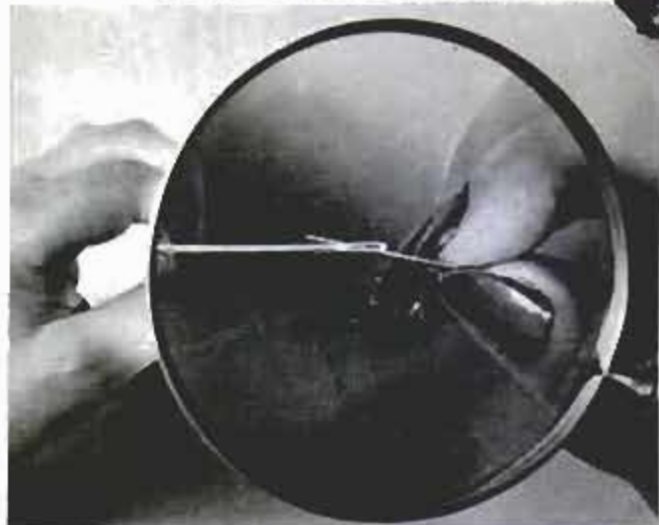
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2-SPEED ENERGIZER
 Heavy duty gear box gives extremely high torque at low RPM. Speeds of 200 or 275 RPM are selected from a special control built into the handle grip. Operates on normal 110-115 Volt AC current. Originally designed as an auxiliary power source to actuate an aircraft starter. May easily be converted to use as an extra heavy duty drill, post hole digger, etc. Worth over \$350.00
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WINCH TAKE-OFF UNIVERSAL
 Originally designed for a heavy duty drive take-off to a winch. Takes a 1-3/8" shaft on one side and a 1-1/2" dia. shaft on the other side. One yoke is key slotted. Zerk lubricated. Width 4", length 5-1/2". SAVE 444
 A \$250.00 VALUE

OPEN CENTER 4-WAY HYDRAULIC VALVE
 Sliding piston valve with built-in relief valve to limit stroke. Pressure balanced in neutral position.
 5/8" AC tube ports. No. H-V13U 788

688 HAND PUMP
 Operates at 1500 PSI. Displaces 0.19 GPM at 30 cycles per minute. Capacity 1.5 cu. in. per cycle. Built-in return flow check valve. No. HP-3USU
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 Aircraft type. Easily converted for use as Arc Welder. Rated 300 Amps. 24-32V, DC.
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1 1/2" BELT PULLEY ADAPTER to adapt V-belts to generator... \$27.50
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DOUBLE ACTION HYDRAULIC CYLINDER
 For long stroke operations and pressures to 1500 PSI. Stroke 26-3/8". Bore 1-1/2". No. H-35
 Shaft 1". Eye-to-eye length 32-3/8".
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 Reg. Palley Cat. Price \$16.50

1500 PSI Dbl. Action HYD. CYLINDER - No. H-84ASU
 Has bore of 1-1/2". Adjustable stroke 1-3/16" to 4-3/8". Shaft 9/16" eye-to-eye length 14-1/2"
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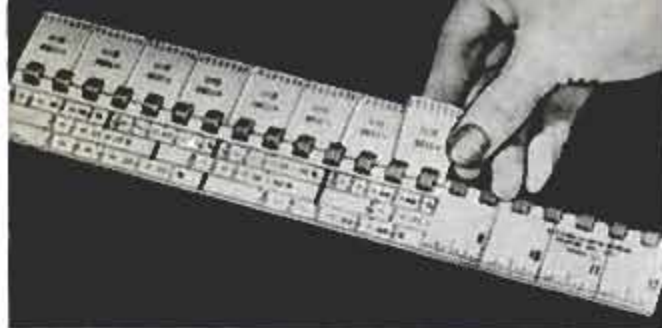
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Hinged Tabs on Ruler Teach Child Fractions

Designed to help children learn arithmetic, a regulation 12-inch ruler has hinged tabs which translate inches into fractional or decimal parts of a foot. For example, if the child raises eight of the 12 tabs, he reads the fraction $\frac{8}{12}$. Then he reads that $\frac{8}{12}$ equals $\frac{2}{3}$ equals $\frac{4}{6}$. He also sees that $\frac{8}{12}$ equals the decimal .666.

Number of Astronomers Will Double in Space Age

Space-age demands are expected to more than double the number of astronomers in the United States in the next 15 years—from 800 to more than 1600.



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Hoe Attaches to Shoe

You don't need to bend over to get at those weeds. A special shoe-hoe will chop them down. The hoe's clamp holds securely after the shoe is eased into it.

Speed Detector Keeps Light Green Until Car Crosses Intersection

No more will British motorists need to shoot through an intersection on the yellow light. An electronic device detects a car's speed and prolongs the duration of the green light just long enough to allow the vehicle to get across before the light changes. The device estimates speed on the time taken for car wheels to pass over two channels spaced only five inches apart.

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Springfield Homemaster Electro-Sweep Suburbanite Pelican cart



PACE-SETTING DESIGN . . .

THE LARK² BY STUDEBAKER

➤ The Lark combines a number of unusual qualities in a manner that is a tribute to engineering. ➤ Its 108 inch wheelbase is long in relation to its 175 inch overall length.

➤ There is virtually no overhang, front or rear, so that handling and cornering is of continental calibre while interior space (seats six) is typically U.S.A. ➤ Ride is comfortably firm, but not hard, due to an interesting suspension system.

➤ Variable rate coil springs surround hydraulic shocks up front, while asymmetrically mounted semi-elliptics combine with outward angled hydraulic shocks at the rear, boost cornering ability, cut "squat" when accelerating and provide all around stability.

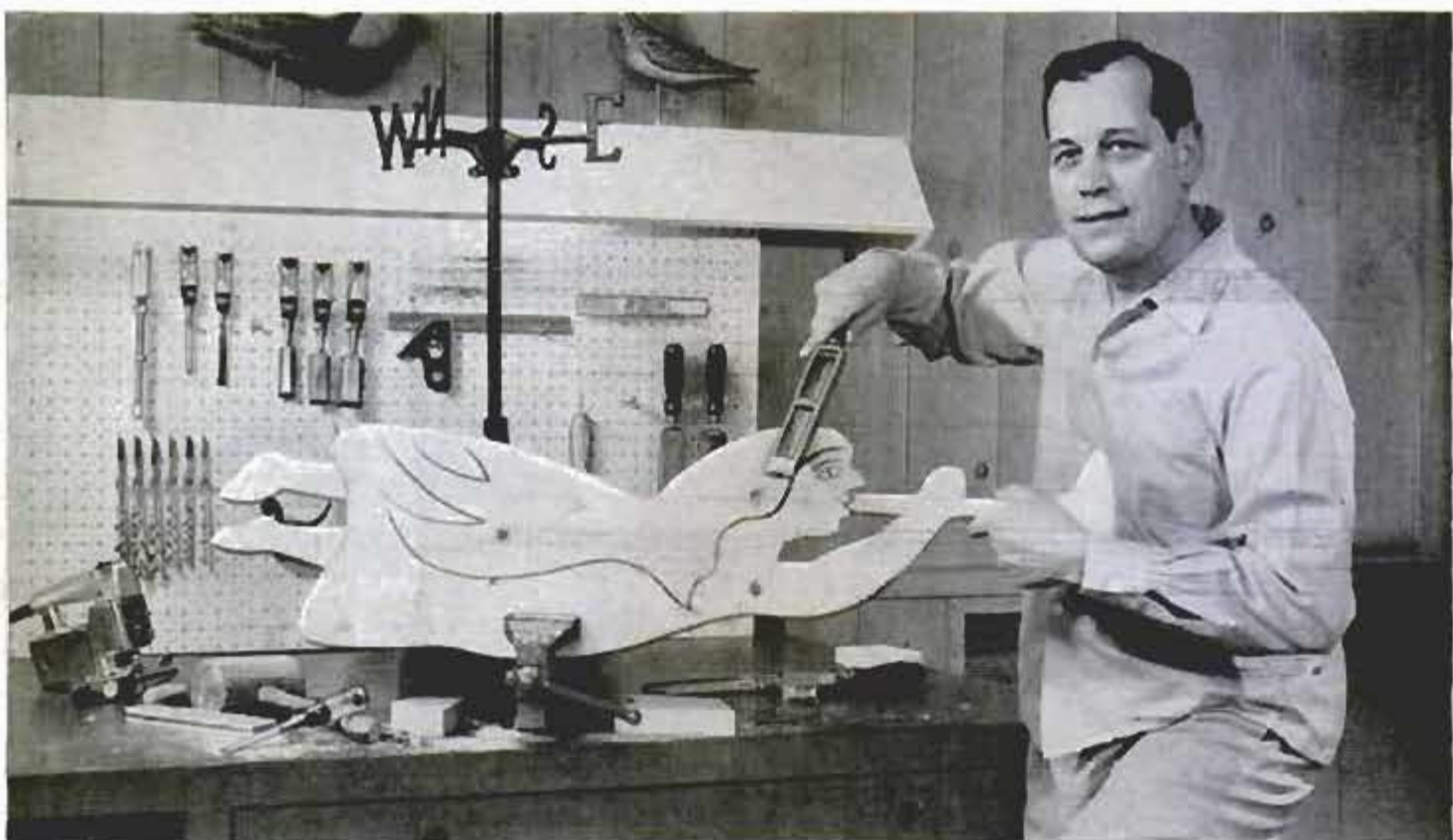
➤ The economical 170 cu. in. "6" utilizes an entirely new combustion chamber shape for amazingly smooth combustion on low grade fuel.

➤ The V-8 is available with 4-barrel carburetor and dual exhausts. With this combination, performance is *exceptionally good*. The car really digs in and goes.

➤ Many options are available. ➤ And if you enjoy tinkering with your own engine, The Lark's a pleasure. Peek under the hood and look at the labor-saving working space.

➤ In fact, drop in at your Studebaker Dealer's and enjoy a demonstration drive.

The Lark is available as a 2-door and 4-door sedan, hardtop and station wagon.



"Stanley SURFORM® is a versatile tool"

"I have used SURFORM in various ways—smoothing over rough metal edges, forming wooden shelving, and shaping all kinds of pieces. Most of the work on Milady Weather-vane here will be done with the regular cut flat blade SURFORM file, but I have also used both the half-round blade and Pocket SURFORM. As a working artist and a some-

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So says Stevan Dohanos, noted artist, illustrator and founding faculty member of the Famous Artists Schools of Westport, Conn. And Stanley SURFORM is now more useful, more versatile than ever. 6 tools, 5 different replacement blades are now available.



450 razor sharp, tool steel cutting edges that never clog because the cuttings clear automatically through 450 holes.



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File Type Stanley SURFORM—No. 295. Complete with regular cut flat blade

File Type Stanley SURFORM—No. 295HR. Complete with regular cut half-round blade

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Replacement blades for all tools—75¢ to \$1.19

See Stanley SURFORM. Try Stanley SURFORM. You'll want Stanley SURFORM in your shop. On sale wherever good tools are sold, or write to Stanley Tools, Dept. 624, New Britain, Connecticut, for illustrated "SURFORM" folder.

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