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JANUARY

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See Page 84



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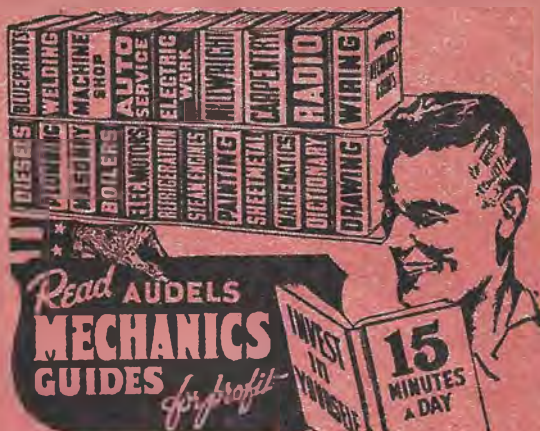
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**PHILLIP G. LOUISVILLE**, 8, Ky., has been operating a Servicing business for 3 years I did \$1,000 business; net profit \$100."



**S. W. DINWIDDIE**, Ill., writes, "After finishing course, I am servicing shop. Now I am Engineer of WCUN Police Radio Installation."



**A. HERR**, New C. Pa., writes, "I have doubled my salary since starting in Radio full time. Am employed by Station WKBO as transmitter operator. Future looks bright to me."



**L. HAUGER**, San Bruno, Calif., tells us, "I accepted a position as Radio and Television Technician . . . promoted to manager of Television Service and Installation."



**LEANDER ARNOLD**, Pontiac, Mich., says, "While learning, made \$5 to \$10 a week repairing Radios in my spare time. Now I have a spare time shop in my home."



**NORMAN H. WARD**, Ridgefield Park, N. J., writes, "4 years ago, I was a book-keeper with a hand-to-mouth salary. Now I am employed by a key ABC station."



**H. B. MILLS**, Washington, Ohio, finds, "Word traveled fast in regard to my N.R.I. training. Have been doing Television installation and servicing, tracing out and eliminating interference, etc."



**C. STAETH**, Fort Madison, Iowa, informs us, "Do Radio Servicing full time in my own shop and am making more money than ever before. I owe this to N.R.I."



**T. S. NORTON**, Hamilton, Ohio, says, "My first job was obtained for me by your Graduate Service Department. Am now Chief Engineer, Station WQOX."



**W. R. NICK**, writes from . . . in control

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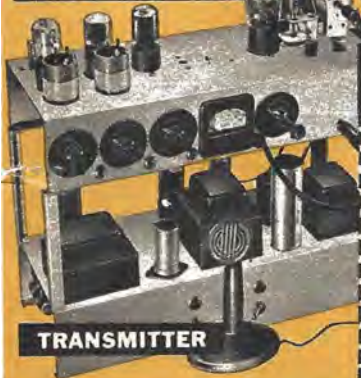
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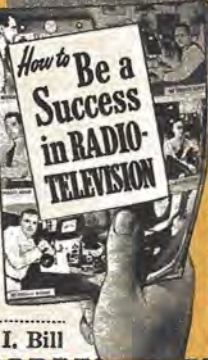
ment with circuits common to Radio and Television. Many of my students make \$5, \$10 a week extra fixing neighbors' Radios in spare time while training. Many start their own profitable Radio-Television sales and service business, using these earnings as capital.

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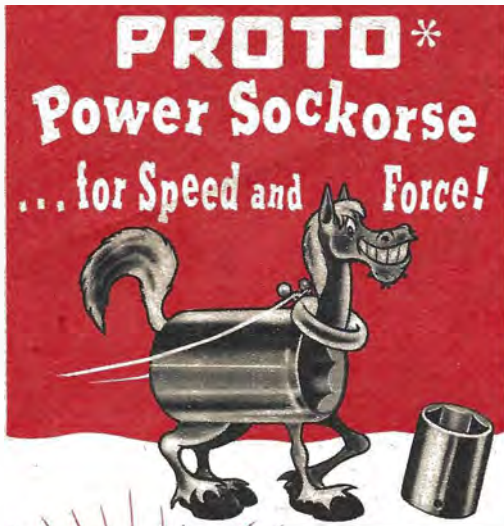
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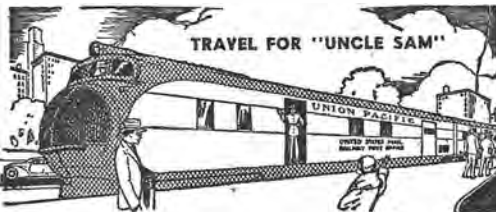
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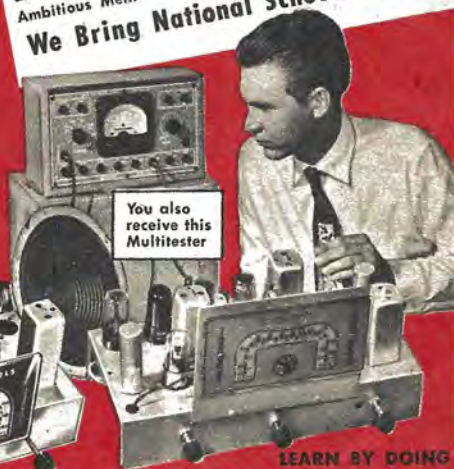
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## The Editor's Workbench

MI Crafts Editor Bob Brightman, left, and Larry Eisinger, his predecessor and now editor of Fawcett Books, cast their votes for the model cutter which won the 1950 First Army Area crafts contest for M/Sgt. Vic Patacca.

### This, That and The Other

AS MECHANIX ILLUSTRATED circulation keeps on growing and growing and growing, it's nice to know that we're scoring in the Quality Department as well as in Quantity. Not long ago the American Institute of Graphic Arts—a top-drawer organization founded in 1914 to raise the standards of the graphic arts in the United States—held its first annual Magazine Show. Every outstanding magazine in the country was invited to submit its best issues for the year of 1949. Out of 562 entries, 53 magazines were awarded the AIGA's coveted Certificate of Excellence for the high quality of their design and printing. Among the winners was (y)our favorite magazine, MECHANIX ILLUSTRATED. We're darn proud of the award—and of our genial and exceedingly talented Art Director, Frank Taggart, whose MI art staff made it possible for us to cop the kudos. . . . Letters have begun to trickle in anent the November and December Editor's Workbench pieces about Mimi, my 1929 Model A Ford. Mostly for. (That is, for Model A Fords, not especially for what I had to say about them.) One of the nicest letters comes from Phil Palker of Uniontown, Conn., who owns a dozen Model A cars and trucks. He tells me that during the gasoline-rationed war years he used to mix kerosene with his gas, 50-50. The cars ran fine, he says, "but did they smoke!" He advises me to stick to regular gasoline. He also tells me, "The Model A Ford was the best car that ever was made and there are thousands of other people who'll agree with me on that." And he wants me to tell those thousands of people that they can still buy almost everything for

a Model A at Sears Roebuck, Montgomery Ward, and Spiegel, the big mail-order houses—a pretty convincing proof of the car's continuing popularity. . . . Quite a few other readers tell me they wish they could lay their mitts on a brand-new Model A. Who doesn't! But, you know, in spite of the loyal affection so many of us feel for the old girl, I wonder whether a 1951 Model A would be successful today in a car market which seems to prefer the great big bathtub-with-marshmallow-tires kind of an automobile? Even if an up-to-date Model A could be delivered for around \$750 (which I doubt, labor costs and taxes being what they are) I'm inclined to the opinion that there wouldn't be enough buck-on-the-barrelhead buyers to make it a profitable gamble for some auto maker to revive the old warhorse. I've heard lots of guys say, "Ford could make millions if they brought back the Model A." But I wonder. . . . Anyway, it was (and it is) a wonderful bundle of automobubble and if I was a poet I'd probably say it something like this:

*Some cars had class, some hadn't much,  
But one thing you can say:  
There'll never be a car to touch  
That matchless Model A!*

Amen. If you want to know just how many miles behind the times my critical judgment of automobile design runs, take a look at the picture of the supercharged Duesenberg phaeton which decorates the top of page 85. Don't get me wrong—I still love Mimi the Model A. But I think that Duesenberg is just about the most beautiful automobile I ever saw. So now you know.—Bill Parker.

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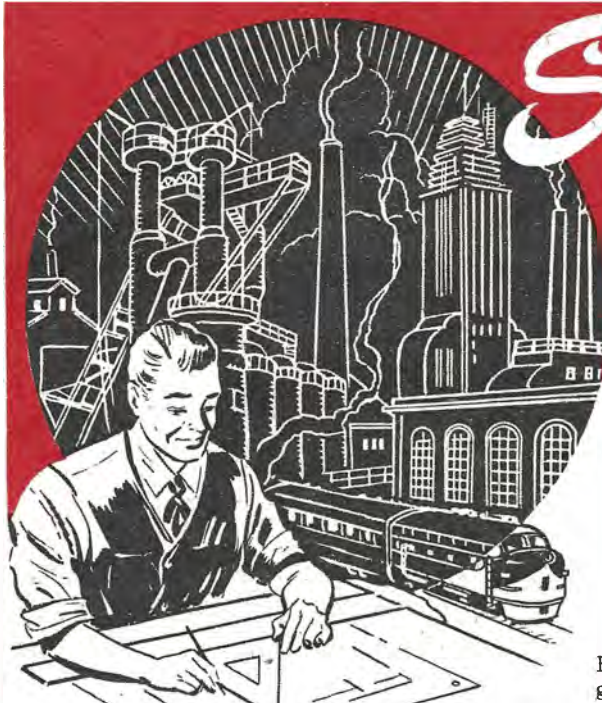
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# Invention Clinic

Joseph H. Kraus

## Paper Match Book Problem

Today's paper match book is widely used but often condemned. In its most popular style, two rows of die-cut, specially treated paper strips are tipped with a chemical mass which ignites by friction and chemical combination when rubbed against a striking surface generally found on a wrap-around cover.

Sometimes the entire book of matches goes off in the hands of the user when a spark falls on other unused matches. This even happens at times when careful attention is given to the admonition "Close cover before striking." It requires no stroke of genius to realize that what is needed is an invention which will effectively prevent this from happening.

But there is more to the problem than just this. Any new design must be adaptable to modern paper-match-making machinery, and to the mechanical devices which pack the matches into boxes. It must not increase costs of production—preferably it should reduce them.

Remember that matchmaking machines represent an investment of millions of dollars. They have been developed over a period of many years. No radical change would be welcome unless material saving in costs of production were possible to amortize the costs of new equipment. Even then, interim production should allow for continuous sale in a highly competitive market with inventor's royalties and interest on borrowed money included in the costs. It must be worth the manufacturer's risk to make the change-over and investment.

Many inventors have attempted to accomplish all this and practically all of them have failed in their attempt.

### Pull Matches

During recent years there has been developed an element of safety not found in the regular book match—the pull match which was first protected (in its present style) by Rodney S. Pullen in 1932.

While the original pull-type match dates back to an early time in the history of the Patent Office and probably was first protected way back in 1880, the new feature of Pullen's invention is that the matches have a sort of jump space of retardation. It's produced by adhesive material or by die stamping alongside the match heads "for insuring involuntarily a proper speed for ignition."

Thus, you must pull on the unprepared end of the match. This zips the head past the striking surface, ignites the match and insures that the other matches in the holder will not take fire.

### Strictly Advertising

Another popular style of paper match is more an effective advertising medium than a departure from regular practices. Here we find a shaped, die-cut body which reproduces a picture of the advertiser's product or his activities. Thus there may be a miniature cigar, bottle or hat. This was protected by J. O. Trautwein of Chicago in 1931.

### Background

With these types in mind, let's look into a few of the many hundreds of patents which have been given over to improving the simple paper match, exclu- [Continued on page 20]



Joshua Pussey's first book of safety matches patented in 1892 had striking surface on inside, left. Outside told of coming of Mendelson Opera Co.



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PATENTS

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## Invention Clinic

[Continued from page 18]

sive of the patents devoted to match-production machinery. Perhaps the first flexible cover, as applied to match books, was protected by J. V. Jones in 1883. At that time inventors were paying considerable attention to the pull-match idea, although there were not as many patents issued in those days.

It may be that the first paper match sprang from the idea covered by Joshua Pussey of Lima, Pa. The patent was issued in 1885—but this was not a match at all. It was listed as "Bengal Lights" and was a die-cut, impregnated cardboard, arranged in book form, intended for use as colored lights. In those days it was sporting to have fireworks and colored, fire-lighted parades. In 1892, Pussey also patented the first safety matchbook.

A rather fancy, folding cover for pull-style matches was granted a patent in 1894. And Charles W. Oertel of New York, protected the idea of placing the striking surface on the inner face of the cover in 1908.

In 1915 a patent was issued to Cesare Campus of New York for placing the striking surface on the bottom of the outside flap so that it could tip in under the fold. Then Lucian E. Parker, of Wadsworth, Ohio, decided that it would be a good idea to hold the bottom fold in place and keep the matches inside the book by running through a simple staple.

In the meantime, several patents had been issued to various inventors to cover matches arranged in star-shaped formations so that they could be rotated out of the package. There were also strip forms for swinging outward and other styles with similar purposes.

Then O. J. Friedman decided that the proper position for the striking surface should be on the back of the folder, so a patent was allowed him in 1916 for this idea.

The first reference to the need for some method to protect the user from the danger of having the book go up in flames occurred in a patent issued to J. F. Nolan of Yonkers, N. Y. His invention called for an inside flame-proof cover which should be closed before striking.

Further attention was given to this situation by J. B. Ramirez of Warren, N. J., when he protected a matchbook which would unfold completely. Thus the match heads were far from the striking surface. However, he furnished no assurance that the users would let the strips dangle while striking the matches.

Individually compartmented matches of the pull variety, arranged to be torn from continuous perforated strips, comprised the design for which C. I. Pfersch of Barberton, Ohio, got his patent in 1923.

[Continued on page 24]



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# Dear Editor

Use this letters column as you see fit—make it a complaint box, question box, suggestion box or even a soap box. But use it! Our only requirement is that you sign your name and keep 'em short, interesting and clean. Address mail to: MECHANIX ILLUSTRATED, Letters Editor, 67 West 44th Street, New York 18, N. Y.

## ● **Shutterbug In Action**

My two-month-old daughter Katherine Ann happened to be reading MI one day and noticed the pictures you ran of all those



youngsters reading the magazine. Being the youngest of all, she was highly disgusted.

Mrs. Jerome Delfeld  
Brownsville, Wis.

*Probably highly uncomfortable, too, what with papa's foot in her back to hold her up (look behind tree). At least he took off his shoe (see circle).*

## ● **Formula For Movies**

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W. G. Mooney  
Ottawa, Ill.

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## ● **Don't Notch That Seal**

Our Service Department has called our attention to an article in the July issue of MI (Car Care, page 132) which reads: "Ford recommends that a small notch be cut on the seal of the radiator cap to prevent excess pressure from building. Too much pressure will force water into the overflow pipe."

Our Engineering Department does not agree with this statement as they insist that the radiator cap was designed to build up pressure which should not be released except by the automatic control incorporated into each cap. They suggest that any alteration in the seal . . . would completely change the proper functioning of the pressure cap.

William T. Gosset, V. P.  
Ford Motor Co.  
Dearborn, Mich.

## ● **Mimi Vs. Betsy**

Bill Parker can have his Mimi, I'll take my Betsy any day. Last summer she thought nothing of rolling up 10,000 miles on your A-1 (?) highways. The only mechanical



trouble we encountered was a stripped timing gear which cost 11 bucks.

What say we get together and ask Henry Ford to start building the Model A again?

Ted Stocker  
Port Alberni, B. C.

[Continued on page 28]



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## Invention Clinic

[Continued from page 20]

### Tricky Designs

Many other patents followed with the striking surface arranged in many different ways. On one, the surface was a hollow channel located at about the position where the manufacturer's name usually appears. Another had a double striking strip between which the match head was to be inserted. Finger pressure had to be applied and the match pulled. A third had an oval window either front or back of the cover behind which the striking surface was arranged. Obviously the inventor never tried the article or he would have discovered that the window did a fine job of increasing danger by breaking off matches.

Several patents are calculated to expose the striking surface only after the book is closed. This is accomplished by trick folds or paper-spring action. Holders also are provided to permit removal of only one match at a time.

A tricky book design appeared in a patent issued to H. B. Eastman in 1938. In this, the matches pop into view through a slit when the head end of the cover is pressed down.

All manner of variations may be found. There's a combination match and cigar, match and cigarette, match and cigarette package. Also patented are a system for feeding a cigarette and match at the same time, a combination match and toothpick book, a small place card and matches combination and one which houses a memo pad and stocks lucifers.

### Other Angles

Perhaps the final answer will lie in another direction. A 10,000-light match has been developed. This is a chemical unit in the form of a very thin pencil. A small pocket clip contains the striking surface and the clip is removed

[Continued on page 26]

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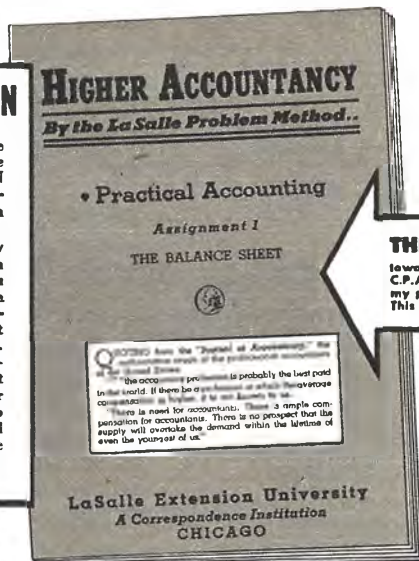
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## Invention Clinic

[Continued from page 24]

for lighting. You cannot strike this match anywhere except on the specially prepared striker. You blow it out when you are through using it and put it back in your pocket. There's no ash or blackened tip to rub off and the flame it gives is about the same size as that of a match but is not blown out as easily. Supposedly it would cost no more to manufacture than a similar number of matches.

This article is not yet on the market—but I have seen it in operation. So maybe the ultimate answer will result from a revaluation of chemical methods. The pocket lighters are taking a turn for the better and soon it may be possible to use pellets, rods or compressed gases to furnish the fuel at prices comparable to or lower than the cost of production and handling of book matches.

### Next Month

Next month Mr. Kraus will analyze another invention for which a need often has been expressed—the self or easy opening envelope.

## INVENTIONS

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# Dear Editor—

[Continued from page 22]

## Nash In A Crash

Mr. W. C. Zuern of Lexington, Ky., was driving his Nash across a railroad track and failed to notice a Diesel locomotive entering the crossing. The bumper of the Diesel caught the right side of the car pushing it sideways. Zuern gunned the engine, pulling away from the train. In doing so, he escaped the locomotive but rammed into a stone wall, hence the smashed up front end.



Zuern was not even bruised and in a car of rigid "X" frame design there's no doubt but that the damages would have been more severe. Police and witnesses as well as the owner expressed amazement at the comparatively mild results.

W. G. Haworth  
Associate Director of Public Relations  
Nash Motors  
Kenosha, Wis.

## Another Word Fiend

Perhaps you will be interested to know that I have extracted exactly 1000 words from your name MECHANIX ILLUSTRATED. Will submit list on request.

C. W. Hall  
Greenville, Mich.

No comment.

[Continued on page 30]





"We have been using your book on Auto Repair for the past year and feel like it is a third man around the shop."—F. M. Scott, Stanwood, Wash.



"Fixed motor in 30 minutes another mechanic had worked on half a day."—C. Auberry, Murfreesboro, Tenn.



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## *Dear Editor—*

[Continued from page 28]

### ● **MI Monthly Mystery**

An ad in the back of the program for the Canadian National Exposition in Toronto lists General Motors automotive products as Chevrolet, Pontiac, Oldsmobile, Buick, Cadillac and Vauxhall. What is this mysterious sixth?

John J. Boland  
Oil City, Pa.

### ● **Tibet Gold Rush**

Nice timing on your story on Tibet in the November MI (Tibet—Golden Roof Of The World, page 74). I picked up my copy of the magazine while the invasion was still going on and was surprised to read the following in the story: "The gold rush hasn't started yet—unless you count the Chinese Communist invasion."

I wonder if that could be the real reason for the invasion?

I. K. Janir  
Chicago, Ill.

[Continued on page 33]

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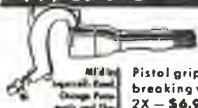


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# Dear Editor—

[Continued from page 30]

## ● Two Sinks For One

In reference to Mrs. Robertson's question about her strangely glowing sink in the October Dear Editor column, I suggest that the glow is not in the sink at all. Rather it is in the human eye.

I went into our darkened kitchen one night and reached up to turn on the bright light above the white porcelain sink. The bulb lit and immediately burned out, plunging me back into darkness. In about two seconds a glowing image of the sink and surrounding objects came back into my perception. I placed a new bulb in the socket and investigated this effect for a while.

You can make the sink reappear on the other side of the room if you turn around quickly enough after switching the light on and off. It's lotsa fun—why don't you try it yourself?

W. B. McGill  
Atlantic City, N. J.

No thanks, after drying the dinner dishes, one sink is enough for us.

## ● Oldtimers On The Road

Here's my 1915 Model T Ford. The kerosene lamps are used as parkers because there is no starter, generator or battery. The magneto keeps it running.



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Gary Newell  
Cavan, Ont.

On the level? Maybe down a steep incline.

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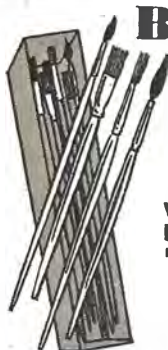
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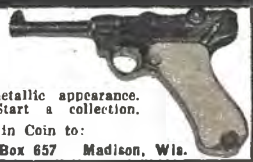


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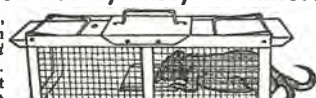
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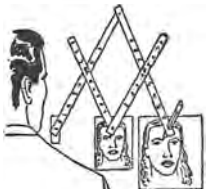


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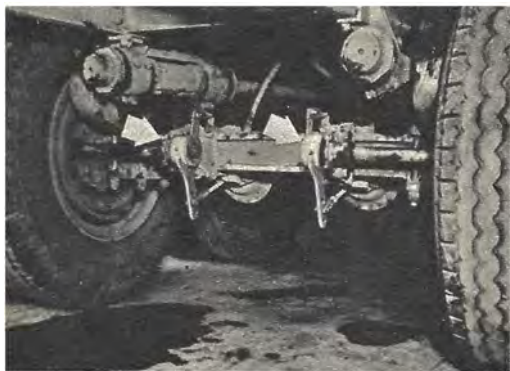
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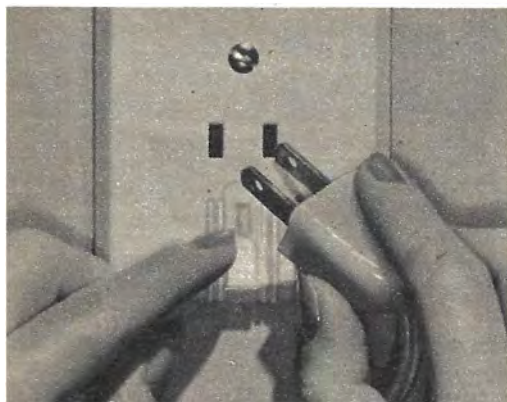
# Miscellany

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[Continued on page 41]

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# Miscellany

continued from page 39

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1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Fawcett Publications, Inc., Greenwich, Conn.; Editor, William Parker, Mamaroneck, N. Y.; Managing Editor, Ralph Daigh, Pelham Manor, N. Y.; Business Manager, Gordon Fawcett, Greenwich, Conn.

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Business Manager.

Sworn to and subscribed before me this 26th day of September, 1950.

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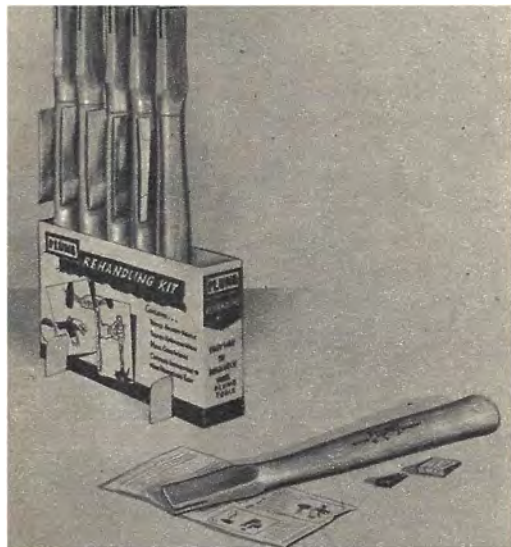
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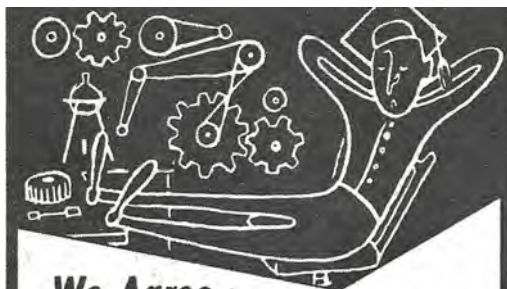
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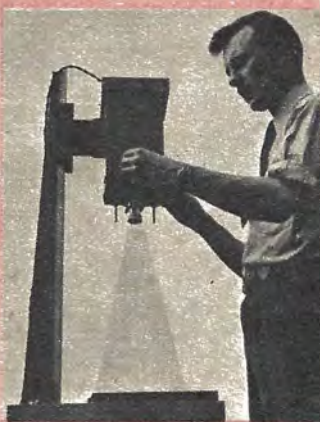
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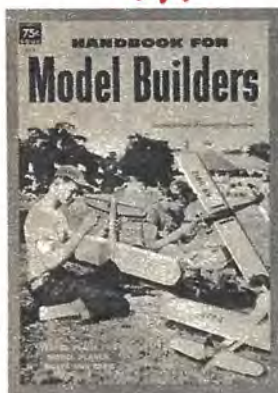
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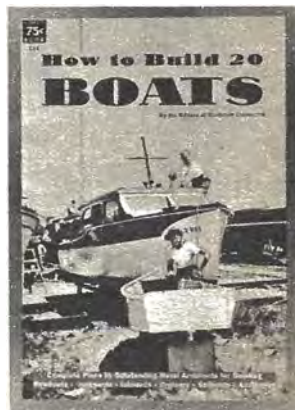
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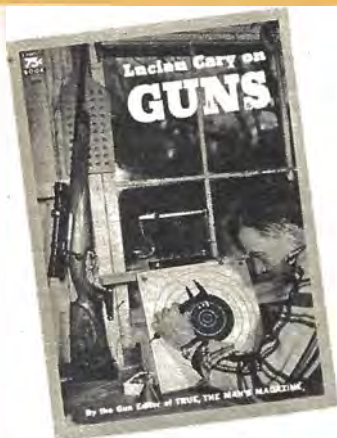
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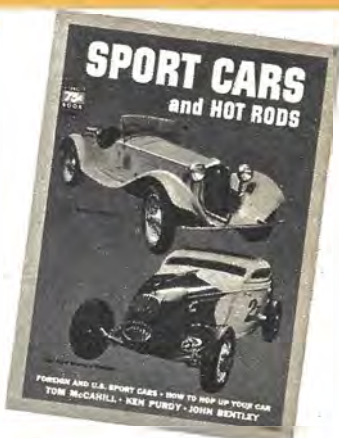
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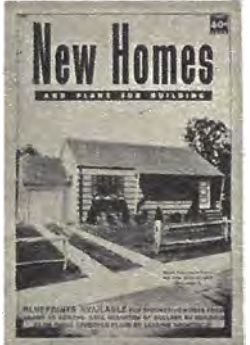
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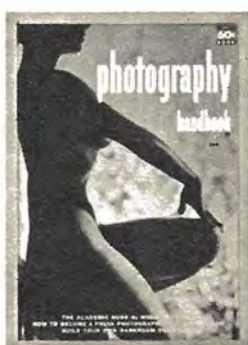
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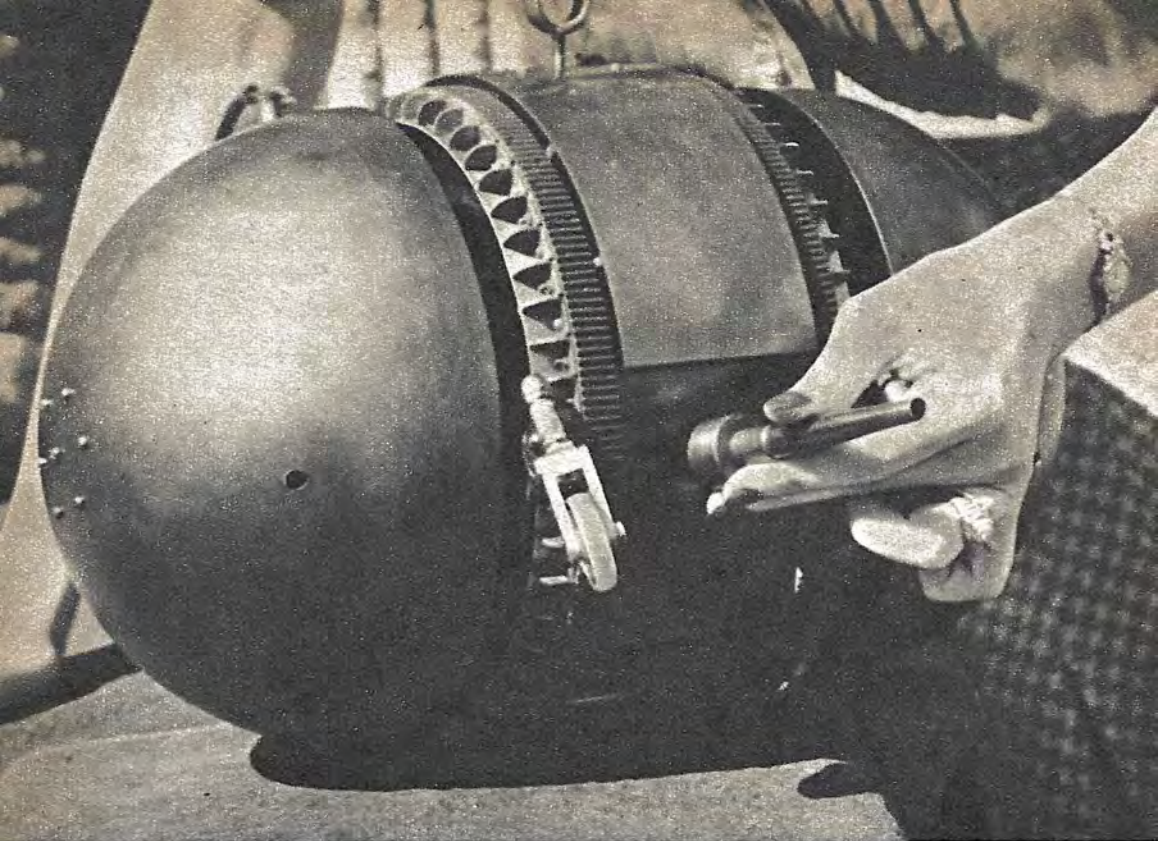
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- 22—Device for protection against flame throwers
- 23—Automatic parachute opening device
- 24—Small, lightweight gasoline engine
- 25—Method for sealing cracks in cast iron

Revolutionary tank submitted to the Council is propelled by two hemispherical wheels on each end. The middle part, prevented from rolling by trailer wheels, carries engine, crew and guns.

## U. S. ARMED FORCES

**A**merican inventors are on the verge of handing Russia a major defeat on the propaganda front. The Soviets have been jamming our Voice of America broadcasts and for the past year the nation's top electronics scientists have been working on a method to counter the Red's activities, at the suggestion of the National Inventors Council. And now officials report that success is near.

What is the National Inventors Council and how is it that the suggestion came from them? Well, the Council acts as an open door to inventors who want to submit ideas to the armed forces. Its job is to acquaint you with the problems confronting the military services and refer potentially valuable ideas to the appropriate agencies. Periodically, it issues lists of needed inventions.

The Council was organized just before World War II and evaluated 250,000 ideas during the war. The Armed Forces recognized its peacetime value, too, and it has continued as a division of the Department





Mother bomb, top, holds five smaller bombs which scatter in all directions on impact. Rocket propeller ship, above, has a hollow hull to insure greater speed by cutting down wind resistance.



Inventor A. Y. Dodge, top left, submits blueprints and finished product of a combined bearing and clutch. Chairman Charles F. Kettering, above, accepts Medal for Merit on behalf of the Council.

## WILL BUY YOUR INVENTION

of Commerce. At present, ideas are being received at the rate of 8,000 a year—but the Korean war has caused an enormous spurt in submissions.

While the National Inventors Council must be most concerned with problems of the moment, it manages to look ahead, too. Take the case of Robert C. Harris, an inventor from Fort Wayne, Ind. Back in 1940 Harris sent in a device he had perfected—a small magneto operated by the closing of a hand. It didn't provide a continuous current—only a spark. The Council agreed that Harris' invention was ingenious, but what could the spark be used for? Neither Harris, the Inventor's Council nor the armed services could figure that out so it was shelved.

Several years passed and the army discovered that the bazooka's original ignition system was unreliable. What was the solution? They asked the National Inventors Council and the board remembered Harris' whatzit. His "useless" invention saved the day and brought Harris a fortune.

Perhaps you have some little gadget kicking around which you think is of no importance now. It may prove to be tremendously valuable to you and your country. During the last war, Dr. Borris Berkman, civilian scientist, suggested to the Council that milkweed floss should be substituted for kapok because supplies of this material had been cut off by the Japanese. As a result, Dr. Berkman got a government contract, set up the Milkweed Floss Corporation of America and formed an army of boy scouts to gather the floss and help win the war.

Another invention which did not sound at all military was Harry N. Peavey's plastic carburetor. But the army eventually found it useful in teaching mechanics the principles of repairing and maintaining carburetors.

Scoutmaster Charles Learned devised a signaling mirror which he regarded as little more than a plaything, good for occupying the minds of his scouts. Then early in the war the nation was stirred by the story of





Hedden mine detector was devised by Charles A. Hedden to help locate a buried treasure. He submitted it to the National Inventors Council and the invention itself turned out to be worth a fortune to him.

Dr. Boris Berkman, below left, thought of using milkweed floss to line Army clothes during the war when supplies of kapok were very short.



Captain Eddie Rickenbacker's ordeal while adrift for 23 days on a raft in the South Pacific. Search planes had passed overhead without sighting the party despite the desperate efforts of Rickenbacker and his companions to draw attention.

The armed forces were anxious to find some simple signaling device to attract fliers on similar search missions. A mirror seemed the obvious solution but sunlight reflected from a mirror cannot be seen unless the beam is focused directly on the searching plane, something difficult to accomplish with an ordinary mirror. Learned's signaling mirror seemed to do the trick and the Inventor's Council passed it on to the proper authorities. Learned refused to take money for his invention and it was some time before the Council convinced him that only by tying up the patent rights himself could he be sure that some greedy stranger would not be able to sting the Government.

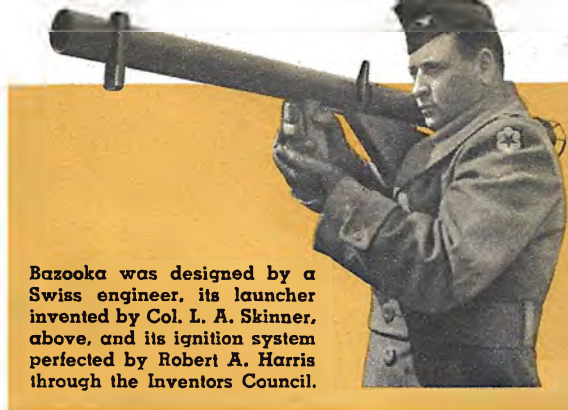
Members of the Council, which screens all incoming ideas, are outstanding American inventors, scientists and industrial re-



search men together with the U. S. Commissioner of Patents and representatives of all the armed forces. Chairman is Dr. Charles F. Kettering of General Motors and secretary is Lawrence Langner, one of the country's top patent attorneys.

If you present an idea to the Council, it first attempts to determine whether it is scientifically practical and whether it has advantages over existing devices serving the same purpose. For this it often asks the aid of the Bureau of Standards, the Patent Office and other Government agencies. If your idea is believed to be sound, the Council then approaches the proper authorities in the armed forces to discover whether they feel that the new invention would be useful to them. A battery, for example, might be called to the attention of the Signal Corps, the Navy and the Air Force. Certain types of guns would be presented to the Navy while others might be shown to Army Ordnance. Once the armed forces show interest, the Inventors Council's job is done. Arrangements for actual development and manufacture are taken care of by the armed forces and your payment will come from them.

If you want to propose an invention, here



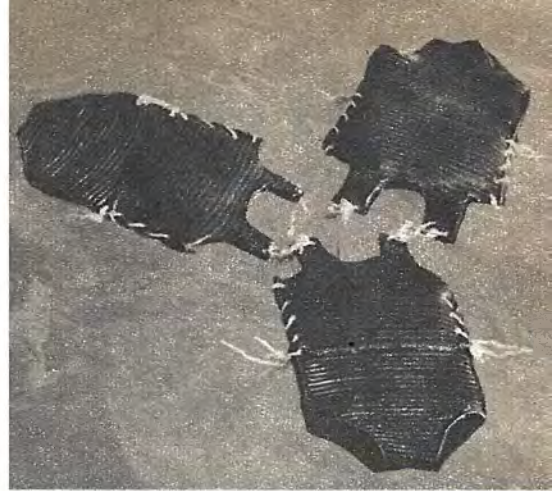
Bazooka was designed by a Swiss engineer, its launcher invented by Col. L. A. Skinner, above, and its ignition system perfected by Robert A. Harris through the Inventors Council.

is the way to go about it: Write to the National Inventors Council, Department of Commerce, Washington 25, D. C. No special forms are needed for submitting ideas—just submit each suggestion as a separate document. Typewrite if possible and be sure to give your name and address. State the title of your invention, give a brief statement of its general nature and specific uses, explain the particular point of novelty or superiority of your invention in comparison with existing devices serving the same purpose. [Continued on page 180]

Scoutmaster Charles Learned devised this signaling mirror as a plaything for his troupe. Then, Eddie Rickenbacker's ordeal on a lifeboat convinced him of its usefulness and he submitted it to the Council.







## NEW in SCIENCE

***Sink-Proof*** bathing suit manufactured by a West-German textile firm is called "Florida Swimmer." The secret of its construction is a pattern of air-filled rubber strings woven into its fabric. It is useful for teaching non-swimmers. At top left it supports a child. Three suits float by themselves, above. Made by Strickwarenfabrik, Grueneberger, Rheydt, Germany.

***Lounge Seats*** installed in 50 new coaches of the Union Pacific Railroad are the last word in comfort and will fit the lankiest passenger. Just reach down, pull a small fabric loop and a leg rest appears from beneath the seat as if by magic. It can be made to disappear just as easily. The seat backs recline in ten different positions. All cushions are made of sponge rubber.

***Catchment Basin*** is the name given this peculiar tower built in the high mountains behind Pasadena, Calif. It is one of 53 water collectors used by the U. S. Forestry Service in fire fighting. Each consists of a storage tank surmounted by a concave platform with a perforated grating in the center. Capacity is 5,000 gallons which can be supplied by a winter's rainfall.





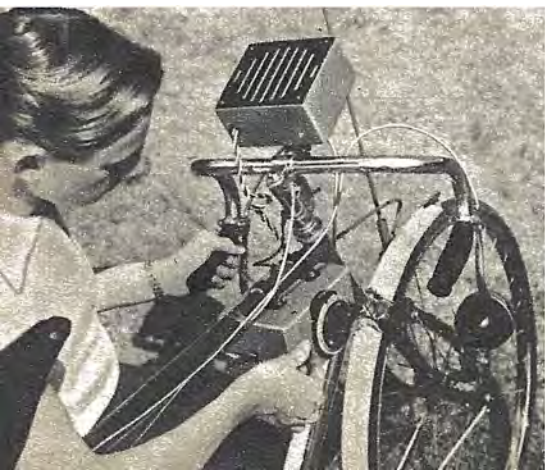


**Aqualung** is a new diving device demonstrated recently in the swimming pool of the French liner *Liberte*. It carries one, two or three tanks of compressed air, each of which enables the swimmer to remain under water for 30 minutes. Here Jacques-Ives Cousteau, co-inventor of the lung, makes an adjustment before tests. It has been used at a depth of over 300 feet.

**Midget Caterpillar** is designed to take the "pack off the back" of Ontario's Forest Rangers. It is driven by a six-hp motor and can carry an 800-lb. load. It is intended primarily for use during the fire season and in a demonstration has carried a complete power pump unit including pump, motor, hose, couplings, tool kit and fuel. It also can carry injured.

**Bike Radio** was designed and built by 17-year-old Nigel Deeks of Little Clacton, England. It has five tubes and operates on dry batteries which last three months and are carried in the rear saddle-bag. The loudspeaker is fastened on the handlebar and the aerial is attached to the bike's front fork. Total weight of the set is three pounds. He also built his own TV set.

**Electrical Index** in this encyclopedia finds the answers to questions automatically. The book, which contains 100 pages, has a list of questions each followed by a colored symbol. When you push a button the color of which corresponds to the symbol of the question, a section of the electrical index lights up, indicating answer. Bergonzoli, Milan, Italy.





# Fit to Fly a Jet?



**O**UR jets are the hottest things in the air and it takes hot pilots to fly them. Even the fighters cost a few hundred thousand dollars each and Uncle Sam makes certain he doesn't put a muttonhead behind the stick whenever there's flying to be done. It's easy for him to select good pilot material, however. The Air Force has formulated a series of tests which reveal a candidate's mental and physical alertness in short order. It's all done with lights, levers, noises and, of course, the necessary laboratory measuring instruments. There are vision testers, wobble meters and spinning chairs. A few are explained here. Think you could qualify? •

**SWAY COMPENSATOR** measures sense of balance and instability caused by height. Cadet stands on moving table and tries to keep stylus centered in hole.



**CODE SHAPES** determine the ability of a blind-folded candidate to identify objects by touch. Sometimes plane's controls must be selected by feel.



**COORDINATION TEST** requires hands and feet to balance stick and rudder pedals respectively until red and green lights on front panel form straight lines.

**DISCRIMINATION TIME TEST** requires the cadet to switch on a colored light corresponding to one on master control. A clock records reaction time.

**BI-MANUAL TEST** has a peg which travels in a triangular groove. Perfect coordination keeps it on course and out of notches which might stop it.





# spray-gun artist

**W**E wonder if the old masters, da Vinci, Rembrandt and Rubens writhe in their graves when Ralph DeGayner takes up his spray gun in pursuit of the Muse! For he seems to have reduced art to a mechanized process far removed from subtle nuances with a brush.

In his studio he has a battery of spray guns with which he can blow out a landscape in five minutes. In one year he produced the amazing number of 1,500 paintings but now he limits his annual output to 300. This permits more time for lecture tours.

"I'm the only painter in the world who doesn't own a brush," says DeGayner. "And I practiced for six years to get the right trigger touch."

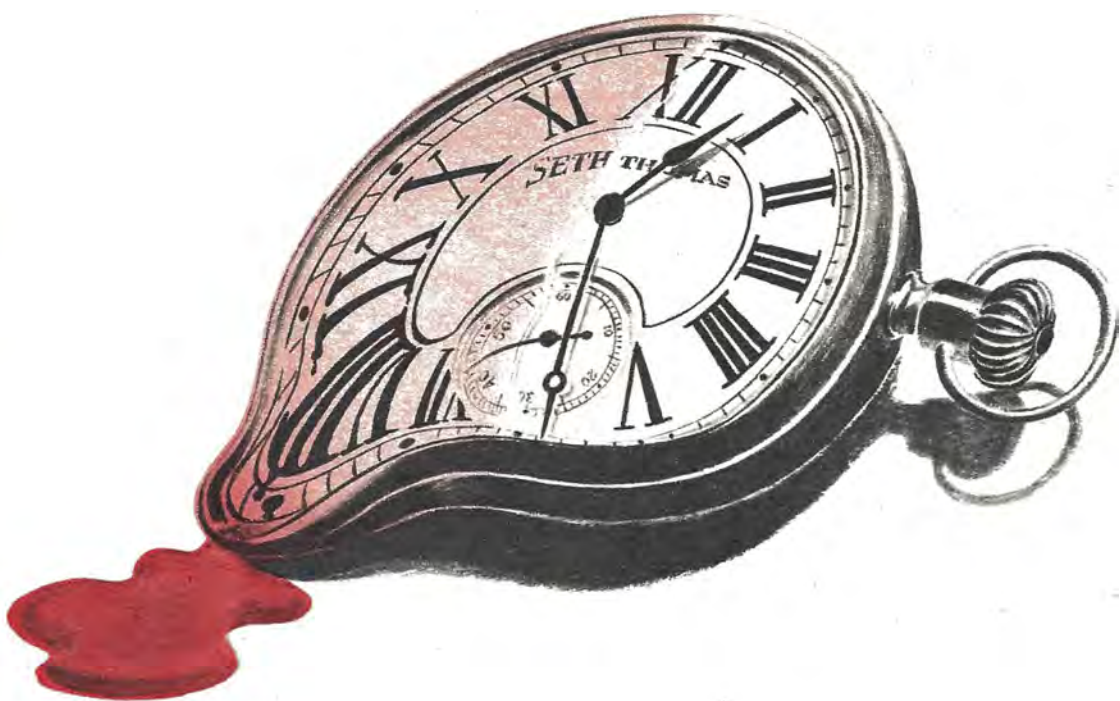
There's one startling difference between his work and that of the masters. A simple DeGayner sells for 20 bucks. •



# atomic watch

**A** wrist radiation meter is a new device developed by Drs. C. and T. Lauritsen, father and son, of California Institute of Technology in Pasadena. Its most important function, say its creators, will be to detect the presence of radiation and so prevent mass hysteria which might result from atomic "scares."

This meter operates like a high-school gold-leaf electroscope. Winding the knob places a static electric charge on two aluminum strips which thereupon repel each other and separate. If atomic radiation in dangerous quantities is present, the instrument discharges and the strips come together again. •



# The Most Important 30 Minutes of Your Life

*By Lester David*

**A**T 12:30 p. m. an atomic bomb is going to explode in your city! Radar has spotted an enemy airplane and disclosed its course, speed and the arc on which it is traveling.

It's noon now and you have 30 minutes—1800 crucial seconds—to prepare for the bomb. What will you do?

*You and your family can survive if you take the proper precautions at the proper time.* Atomic scientists, civilian defense authorities, army officials and Red Cross disaster chiefs agree on this.

But what *are* the proper precautions?

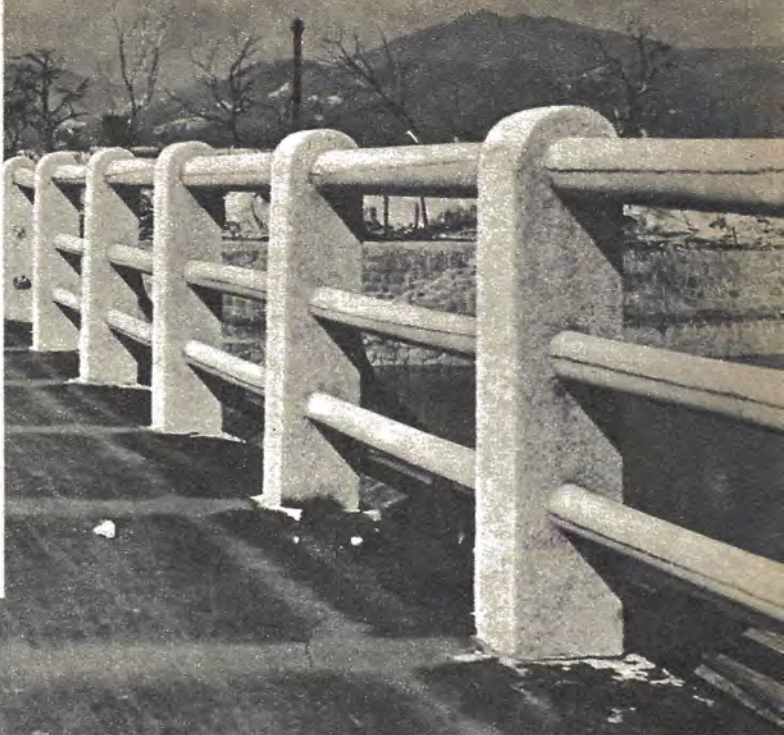
How can you best utilize those precious 30 minutes once the siren warns of an attack?

Out of the mass of data offered by the experts, a specific pattern of action emerges. Here are the three basic rules, more vital than any you have ever read.

1. Do not try to run away.
2. Get to a shelter.
3. Stay in your shelter until it is time to leave.

Your first impulse in the face of an atomic attack would be to run somewhere,





Hiroshima railing, above, protected the area immediately behind it from flash burns. So, if you're in the open country when an A-bomb is dropped, take cover behind nearest tree, insert.

Well-built concrete structure, below, remained standing in Hiroshima amid rubble of trailer buildings. So, if you're in the city streets when bomb falls, take cover in nearest building, insert.







Target area at Hiroshima was completely leveled except for a few reinforced concrete building frames. That's why American builders of A-bomb shelters concentrate on the use of thick concrete walls.

as far and as fast as possible. But it won't help—first, because you couldn't get far enough away to be any safer; second, because the resultant stampede would endanger everyone's life and impede rescue efforts by clogging roads at the very time when they should be free. How far and how fast can you go during a simple holiday traffic jam? Multiply that a thousand times and take stock.

Arthur W. Wallander, former police commissioner of New York City and now director of the city's civilian defense program, told *MECHANIX ILLUSTRATED* "I cannot stress too strongly the importance of remaining calm. Panic and stampeding can cause more injury and damage than enemy action."

Therefore the first rule: *Do not try to run away.*

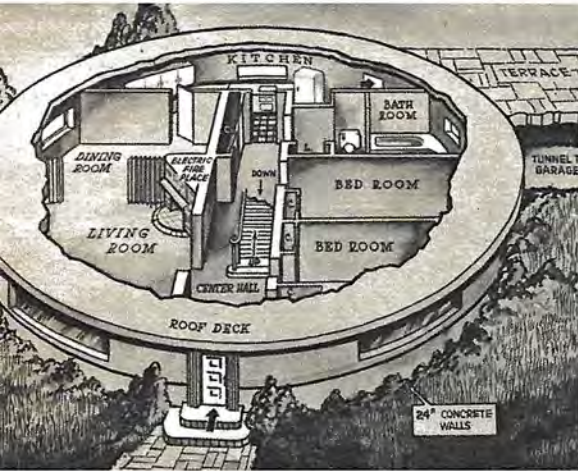
Shelters can protect you from the four deadly horsemen of the atomic bomb—blast, heat flash, gamma radiation and falling debris—if they are thick enough and

far enough from the scene of the explosion.

The U. S. Strategic Bombing Survey No. 5 undertaken by the U. S. Air Force, states flatly: "The most instructive fact at Nagasaki was the survival of the few hundred people who were properly placed in tunnel shelters. Without question, shelters can protect those who get to them against anything but a direct hit."

The best protection from shock, radiation and heat is reinforced concrete; almost as good is closely packed earth. The thickness required to protect you fully depends, obviously, on the distance from the blast. How much protection and at what distances? Well many other factors influence the effect of an atomic blast, including height of the burst, direction of the blast and types of buildings in its path. The government handbook, *The Effects of Atomic Weapons*, estimates that at a half-mile from the explosion, a 12-inch reinforced concrete wall inside a building would provide enough protection.





Sub-basement bomb shelter, top, with reinforced concrete walls eight feet thick was recently built in California. Round A-bombproof house, above, was planned by Boston architects. Cost: \$50,000.

Squat house, top, is designed as protection against atomic attack by Clarence Booth of Lakewood, N. J. He feels the thousands of tons of concrete and steel make him secure in his home-made shelter, above.

The following thicknesses of concrete or closely packed earth will prevent death by radiation:

inches of concrete	inches of earth	distance from blast
26	43	1,500 feet
22	37	2,000 feet
12	20	3,000 feet
2	3	4,000 feet

Shelters should be located in fireproof, reinforced concrete or steel frame buildings that are resistant to collapse. They should be on lower floors, in basements, halls or in the interiors. Outside shelters should be located well clear of buildings to avoid falling debris and fire.

The British government recommends construction of raid shelters on the order of the Anderson-type, built outside many British homes during the Hitler blitz. These

were steel arches, six feet high and four-and-a-half feet wide, half buried in the ground. Civil defense authorities assert that if three feet of earth were piled above the arch, the shelter could protect all inside from the four main causes of death and injury.

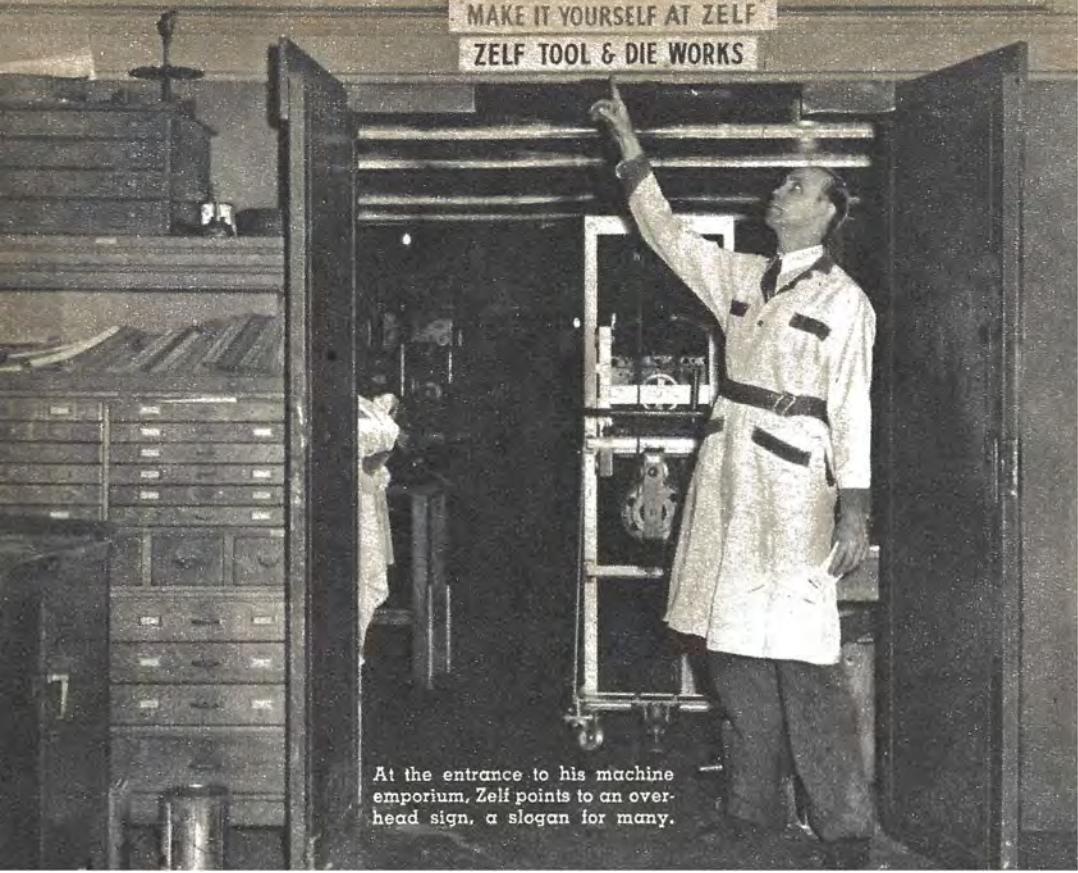
So, the second rule: *Get to a shelter.*

Don't be in a rush to emerge from your hideout—stay there until you have been assured the bomb will not be dropped, long enough for radiation outside to wear off.

How long should you wait? Fifteen minutes after the blast there is about one-fifteenth the amount of radio activity which existed a minute after the explosion. After an hour it diminishes to one-sixtieth.

Don't get into an unreasoning panic about radioactivity. The human body can absorb a great deal of it without serious injury. Imme- [Continued on page 166]

MAKE IT YOURSELF AT ZELF  
ZELF TOOL & DIE WORKS



At the entrance to his machine emporium, Zelf points to an overhead sign, a slogan for many.

# Make-It-Yourself Machine Shop

*By Harry Kursh*

THE heart of New York's crowded textile district is the last place in the world you would expect to find a farmer from Arkansas, but such is the case. Every day dozens of people ranging from engineers to shipping clerks and hobbyists walk through the doors of the Zelf Tool and Die Works at 682 Sixth Avenue for one specific purpose—to rent one of Zelf Dugal's machines.

Here it is possible for you to work with machines which never could be made available to you in any other way. Most of them you could not afford to buy. And even if you could, you probably would not have a place to install them.

At Zelf's you can buy time on one of seven engine lathes or several drill presses. You can choose from cylindrical grinders, surface grinders, bandsaws, buffers or engravers. You can rent a hydraulic press for hub sinking. Or if you just feel like exper-

imenting you can use any one of several workbenches with all the accessories any professional machinist could hope for.

There is no minimum rate, no cover charge, no butting into what you're making. Previous experience to work on any machine is unnecessary. Instruction, advice and technical assistance, if wanted, is free. You may come in just once on a single job, like drilling a hole through a hard-steel rod, or you may come often, stay as long as you like and make the shop your office. You even can make the shop a meeting place for dates or just come down to chew the rag in its clubhouse atmosphere.

In fact, not long ago one expert machinist came in and asked if he could use the place after his regular working hours to make a little extra income. The lean and lanky 40-year-old Zelf told him to go right ahead if it would make [Continued on page 188]





Zelf's shop occupies an area 22 feet by 70 feet. Unusually strong floor holds the heavy machines. 30 of them, with a total value of about \$30,000.



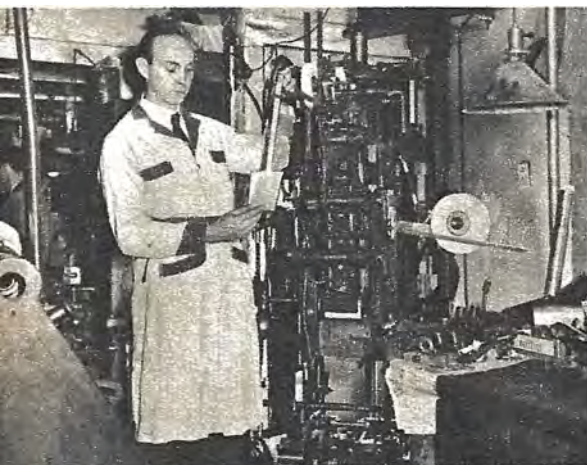
David Hirsch, professional toolmaker, gets a caliper from Zelf, seated. He makes plastic injection molds. Some of them weigh almost 500 pounds.



The master instructs Walter Berman in the use of vertical milling machine. Berman won't reveal his secret project. "I'm just experimenting," he says.



William Plisco works with Hirsch, above. His desk is near the shop's entrance and he wrote the notice on his back so newcomers wouldn't bother him.



James Griffin built this one-gallon tea-bag machine for Standard Brands. Its cost: \$20,000.



Edward Hilker built eight of these plastic-bag making machines. He sold them for \$1,075 each.

# Meet Mr. Typewriter

He's also known as Martin K. Tytell, the man who can provide you with a machine in any one of 147 languages.

Илюстрована Механика

Bulgarian

Μεκάινξ 'Ιλλουστρήτετ

Greek

Mécanique Illustrée

French

Механикс Илюстрэйтэд

Russian

ميكا نيكس ايلو ستريت

Arabic

Cò-giòi-hoc Đò-hoa

Viet Namee

Mesin Menjerangkan

Indonesian

Illustrierte Mechanik

German

Ілюстрована Механіка

Ukrainian

Ilustrirana Mehanika

Slovenian

Mechanika v obrazech

Czech

A Képes Mechanika

Hungarian

Here's Tytell himself, the world's leading typewriter man. At left is the name of your favorite magazine in different languages.



機

械

畫

刊

Chinese





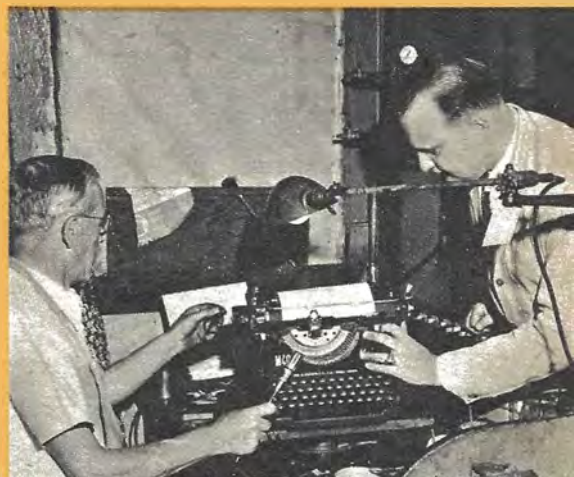
Mechanic William Ball has quite a job cut out for him with this Japanese typewriter. He must put 3,000 characters in their place on the keyboard.

Japanese typewriters operate on a unique principle. You push a knob down on the character and a lever picks it up and presses it against the paper.



This is a model of Tytell's streamlined machine which he hopes to market soon. It has a recessed space bar placed on the same level as the frame.

John Uyttebroek, who has worked with typewriters for 39 years, discusses a damaged Italian model with his employer Martin K. Tytell, right.



At least once a month, New York postal authorities get a letter addressed to Mr. Typewriter, New York. But they stopped consulting their directories long ago—the letters now go automatically to Martin K. Tytell. As sole owner of the Tytell Typewriter Company, he rents, buys and sells typewriters but his specialty is making a typewriter do what its manufacturers never thought it could do.

In the past decade alone Tytell has converted more than 10,000 standard keyboard typewriters into machines that can be used for 147 different languages. He is probably the only mechanic in the world who can boast of shaking hands with college professors, ambassadors, Arabian sheiks, bishops and generals in one day.

Shortly after Tytell got into the business, he was paid a visit by Nazi Ambassador Franz von Papen. The monocled German spoke English and at least half a dozen other languages fluently. "The guy wanted me to fix him a typewriter that could do correspondence in German, Italian, Spanish, French and English," Tytell recalls. "But he said he was leaving the country immediately and was in a great rush. I had the machine ready for him the same day. A few weeks later we got the news about Pearl Harbor."

Since then such jobs have become merely routine for typewriter wizard Tytell. Only a few months ago Professor J. D. Edwards, of Columbia University's East Asia Institute, came to Tytell with a special problem.





When Tytell cleans his typewriters, they get a complete bath which removes all the carbon, ink and erasure refuse found on the machine.

Typewriter morgue contains skeletons of many old relics. Tytell uses portions of these machines to replace scarce parts on broken typewriters.



The professor could speak more languages than you could count on both hands and wanted to know if Tytell could get him a typewriter that could be used for half as many. Tytell took the professor's own standard American typewriter and the very next day gave it back to him with

what Tytell calls an international keyboard—one that can be used for writing in 14 different tongues.

And talking about jobs, Tytell claims he is the only GI who got the right job classification in the Army during World War II. They had him fixing and repairing typewriters. But when they found out what he could really do to a keyboard, they put him in civilian clothes and for nearly half a year assigned him to top-secret projects with the OSS. He redesigned and rebuilt standard typewriters that were parachuted to underground fighters all over Europe. Many of these were used to turn out secret correspondence and psychological warfare leaflets in 17 languages. "Now I can tell you," Tytell discloses, "that every time there was about to be a new invasion, I knew where to look for it by the kind of typewriter I was asked to make up."

Today, Tytell has the closest thing to a monopoly in providing Arabic and Persian typewriters for commercial firms and government agencies with dealings in that part of the world. And now he is practically the sole provider of Hebrew typewriters for emissaries of the new Israeli Republic. Tytell also has built the only two Korean typewriters in this country. Like some of the Chinese and Japanese typewriters he has built, they are intricate contraptions that can place Oriental characters in their traditional vertical reading places. One of them is at Yale University. "But I don't think anyone up there knows how to use it yet," Tytell admits.

Tytell can boast of having at least one typewriter with his label in every country in the world. Many times he never sees his customers, since he gets orders by mail from every corner of the globe.

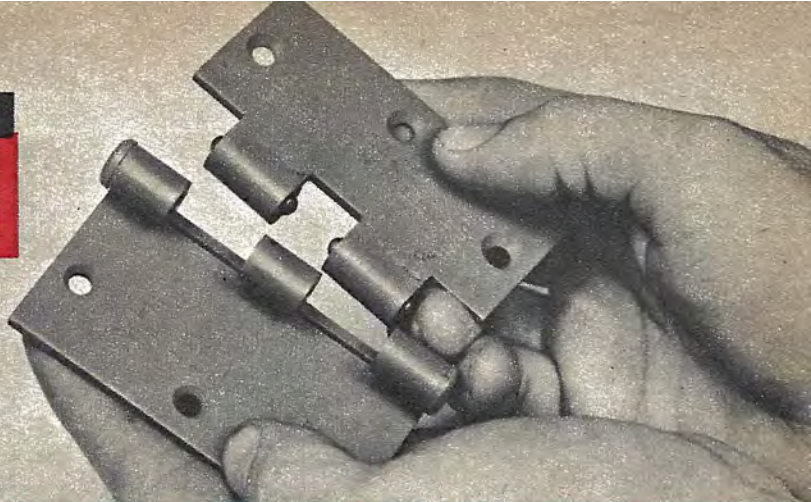
But once in a while when Tytell does see his customers, they are a source of embarrassment to him. The last time this happened a small army of FBI men surrounded the entrance to Tytell's shop and lined the two flights of stairs leading to his office. They were the advance bodyguards for a prince from Saudi Arabia. All decked out in his desert-style uniform and jewelled dagger, he came to Tytell for an Arabic typewriter. When the [Continued on page 190]





THIS MONTH'S

**prize  
gadget**



## Safety Door Hinge

Spring-loaded pivots, in place of conventional hinge pins, are the secret of snap-apart hinges.

**"DADDY, Daddy!"** muffled cries reached Warner Steinbach, a business man of Cranford, N. J. just as he was settling down to the evening paper after a hard day's work. There was a desperate quality in those sobs, so he raced to the scene. Water was spilling from underneath the bathroom door which he found was locked from the inside.

"I can't turn the key and the tap won't close either," wailed his youngest daughter. Clearly there was but one thing to do. Steinbach gave the door the old heave-ho. Finally it splintered and he carried the little girl to safety.

That was many years ago but Steinbach never forgot the experience. Hearing of similar episodes in other households, he invented the Safety Hinge for just such emergencies. Safety Hinge-equipped doors require only a sharp push on the joint side to open. To replace the door, you just tap the hinge back into place.

And thereby hinges this month's \$50 prize gadget award. •



Warner Steinbach, below, turned a frightening experience into a well-paying proposition by inventing and manufacturing a new device that permits instant opening of doors in emergencies.



**WIN  
\$50**

If you're a whiz in the workshop, or even a run-of-the-bench craftsman, chances are you've got a pet-gadget project on your mind. Well, when you've got it perfected, send pictures and description to Gadget Editor, *Mechanix Illustrated*, 67 W. 44 St., New York 18, N. Y. The best entry each month in the opinion of MI's editors will be given a Prize Gadget cash award of \$50.



## idea



# He's a Plastic Baker

*Somebody forgot to tell Spencer Smilie that it couldn't be done. So he went on cooking plastics and developed a recipe for fortune.*

*By Louis Hochman*

Like a baker, Smilie pushes into the oven ordinary pie tins which serve as molds. In the foreground are finished plastic sheets.

**I**F Spencer Smilie of Beverly Hills, Calif., had studied chemistry and physics, he might still be plodding along at his job in a plastics factory. But, unhampered by sound scientific know-how and not realizing how impossible it was supposed to be to fuse incompatible combinations of plastics, Smilie solved an unsolvable problem. Today his plastics art business—the only one of its kind in the world—is worth a small fortune.

It all started about three years ago when Smilie was working in a plastics plant where a dazzling variety of colorful plastics fired his imagination with ideas for original buttons and pins. To other workers in the plant the last trickle of plastic that fell from the extrusion machines when they were shut off at the end of the day was just so much waste. To the artistic eye of Spencer Smilie, however, these bits of waste which oozed and hardened into an infinite variety of twisting swirls and curves, were things

Beautiful flowers and leaf formations are preserved indefinitely in Smilie's plastic sheets. Note thousands of tiny bubbles in the plastic.





of beauty and unusual modern design.

One night he took one of these drippings home, trimmed off some rough edges and stray ends, cemented a pin to its back and presented it to his wife as a brooch. Before he knew it he found himself in a small sideline business, selling these remodeled waste products to others.

Soon, Smilie's daily practice of taking home a suitcase full of waste drippings aroused his boss' curiosity but Smilie refused to divulge his newly-found-use for the discarded plastic. The boss then tried to charge him for the waste whereupon Smilie quit.

By this time he was deep in experiments, mixing various combinations of plastics and baking them in the family oven. But it was eight months before he had anything worth keeping. By that time the oven itself wasn't worth keeping.

As molds he used small tin-can covers and flat cups made from thin slices of brass and copper pipe and embedded all sorts of flora, fauna, insect life and odd objects in his new plastic. These he made into unique and distinctive buttons, pins and earrings and wholesaled them at from 25c to \$1.25 each.

In a short time, Hollywood dress designers and manufacturers were swamping the Smilies with orders. From people all over the country came requests for buttons with such bits of personal treasure encased in them as a lock of hair, a tiny bloom from a home garden, [Continued on page 190]



Mural depicting a hand reaching for a bottle was done for psychiatrist's office. It took much planning, above, to complete the work of art, below.



Sheet of half-baked plastic is laid over leaves in a pan mold prior to baking. Leaves are later scraped off, revealing impression on back of sheet.



Lifelike Smilie screen, below, which contains assorted plants and butterflies, stands in back of coffee table with yarn design and leaf bowl.





# Helicopters for Everybody







**The Hoppicopter is evolving into a comfortable single-seat helicopter that will supply you with cheap air transportation.**

**By Frank Tinsley**

**B**ACK in the 30's, a Seattle aeronautical engineer named Horace T. Pentecost became convinced that he could design a set of personal wings. As an engineer and student of aviation history, Pentecost was well aware of the shortcomings of man-made flapping wings, so he gave the problem an entirely different solution. In place of rosy opinions, he substituted the whirling blades of the modern helicopter.

His first machine, designed for army

paratroopers, was intended to supplant the clumsy and uncontrollable parachute. Strapped to the wearer's back, it was christened "Hoppicopter" because the trooper literally hopped off and landed on his own two feet. It consisted of little more than an engine, rotors and control stick, mounted on a tubular frame that was strapped over the flier's shoulders and back.

The Hoppicopter's dependence upon human legs as landing gear proved its





Second version of the Hoppicopter design had a tripod landing gear with motor mounted behind the pilot's head. It was better than the original "back strap" model but weight distribution was unsatisfactory.

ultimate undoing. Landing on rough terrain, the wearers frequently stumbled and fell, smashing the whirling vanes against the ground. This was not only embarrassing but expensive.

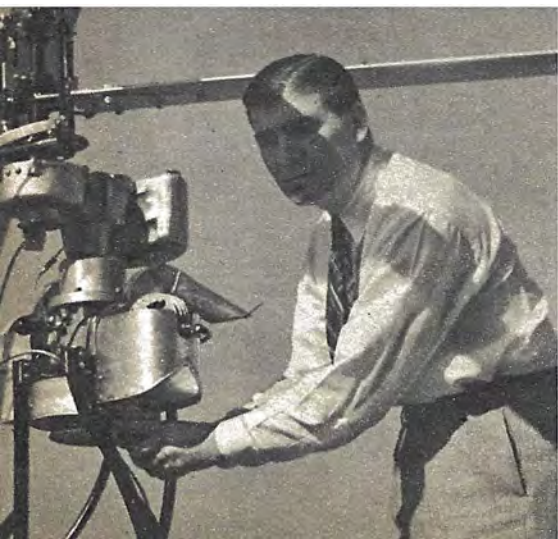
The next model boasted a light tube-and-canvas seat and three landing wheels arranged in a triangle, supported on spindly, insect-like legs. In flight, the pilot felt somewhat more at ease, not as though he were hanging in space like a fish on the end of a line. The working parts were unchanged, however. A hot, noisy motor still nestled coily against the back of the pilot's neck. The gas tank was suspended directly above him with no fire protection.

The third model has corrected some of the above mentioned faults. The engine

now is slung under the seat directly beneath the center of gravity. This warms the pilot in cold air and improves the machine's balance. The model at present is being tested. There still remains, however, the sense of insecurity—of riding a flying swivel chair with no visible means of support. Pentecost and his associates are perfectly well aware of this natural reaction and have planned a weatherproof enclosure for the machine.

In the illustration one version of such a streamlined housing is shown. With this addition, our Hoppicopter becomes a vehicle of true utility. Such a machine would be practical, cheap to buy and maintain and could easily be the answer to the demand for a "Model T" helicopter. •

Pentecost prepares to start his engine by spinning it with a starter cord in the flywheel's base.



Present model, the third, has the engine situated under the pilot's seat. This gives it better stability.







**Springless Mattress,** dreamed up by a Swedish inventor, is light, bouncy as innerspring types. It's been tested for durability, is said to have orthopedic values. Secret is the core of air-filled plastic. Susquehanna Mills, N. Y. C.



**Damp-Champ Super** takes the backache out of laundry days. The plastic bag holds two machine loads of wash, leaves hands free. For dampening clothes evenly, just add some water and seal bag. Humphrey-Callander, Clinton, Ill.

## NEW for the HOME

**Range-Refrigerator,** all in one, is a dollar and space-saver for small apartments. This one features a four cubic-foot electric refrigerator, gas cooking top. All-electric models also are available. General Air Conditioning Corp., Los Angeles.



**Orange Peeler** does a neat job of undressing citrus fruit. First, you cut a groove around the center. Second, you reverse the plastic gadget and use the curved blade to work the peel loose, as shown. Dillon-Beck Mfg. Co., Hillside, N. J.



# ON THE COVER

## CUSTOM CARS



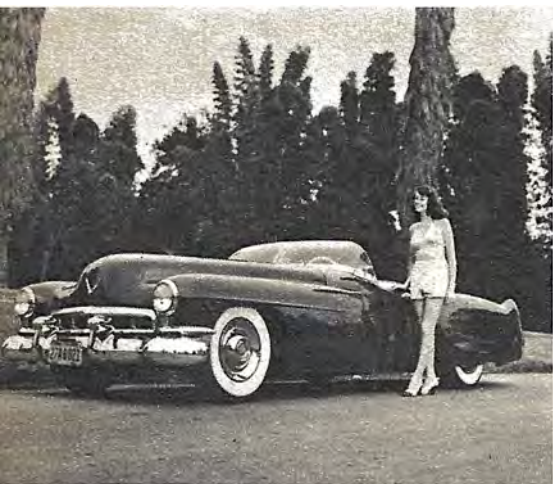
Beautiful Lisa Ferraday inspects MI's cover car with our not-so-beautiful Tom McCahill. The car? It's an \$18,500 custom Cadillac designed by Saoutchik.

**J**UDGE a man by the company he keeps" is a proverb which has managed to survive the years. But nowadays you can substitute "the car he keeps" and still be on the right track.

For more and more motorists are getting bored with the production-line beauty and middle-class standard performance of our stock cars. And more and more of them—are actually doing something about it.

What are they doing? Well, the next time you take a spin down Lincoln Highway, take a good look at the cars that whiz by. You'll be startled to realize the high percentage of unusual vehicles. For America's auto enthusiasts are buying and building custom cars and hot rods as never before.

These special jobs reflect not only the individuality of their owners but the basic individuality of America. •



Lon Hurley built this \$8,000 dream car in eight months. Hood, grille and fenders are Cadillac parts while rear deck and doors are original design.

This Packard model never got past the experimental stage. Built to make over 125 mph, it represents an investment of more than \$200,000.



Small German auto which looks like a racing car is called the Porsche. It has a four-cylinder engine in the rear of the two-seater coupe body.

Built in 1939, this French custom car has a body designed by Figoni & Falaschi and a Delahaye V-12 chassis. Owner says it can make over 115 mph.

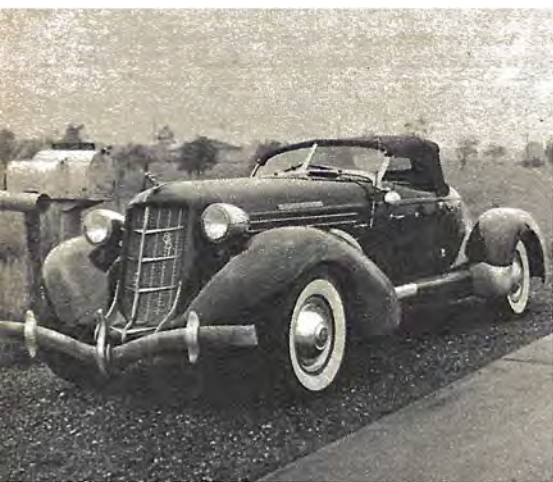






Photo courtesy Shirley Mitchell

**This 17-year-old double-cowl Duesenberg phaeton is a supercharged show model with a body which was specially built by Brunn of Buffalo, N. Y. It was later listed and sold as a 1934 model.**



**One of the classic cars of the 1930's, this Auburn super-charged speedster can make over 100 mph—and there's a plaque on dashboard to prove it.**

**Recent motor show in Paris displayed this Super-leggera Ferrari, a long nosed Italian car. It's only a two-seater although it has a sports coupe body.**



**J. S. Inskip of New York just built this Rolls-Royce Silver Wraith (late model) for Tommy Manville and wife, shown with him. Price tag was \$22,500.**

**Le Baron of Detroit built the body of this Chrysler Newport in 1939. It has a wide separation between the front and the back seat and sold for \$25,000.**





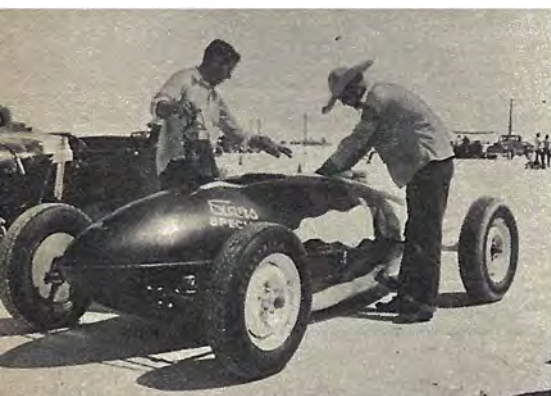
# ....HOT RODS



This beauty, built as a gag by Noble Heuter, has made 112 mph. It's a 1929 Model A Ford body with roof chopped off and rear fender retained for laughs.



Bob Pierson's chopped off '34 Ford coupe with a '46 Mercury engine is probably the fastest coupe in the world. It holds Bonneville record of 142.98 mph.

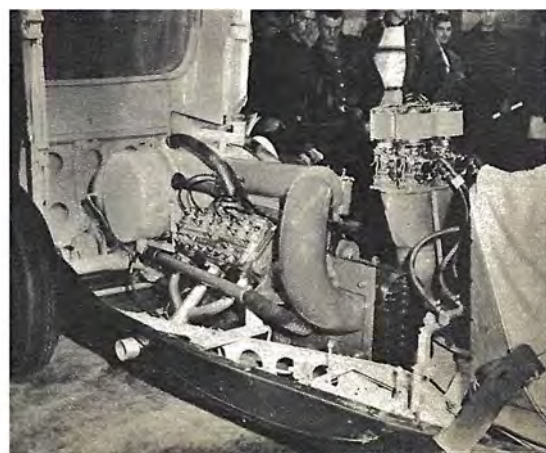
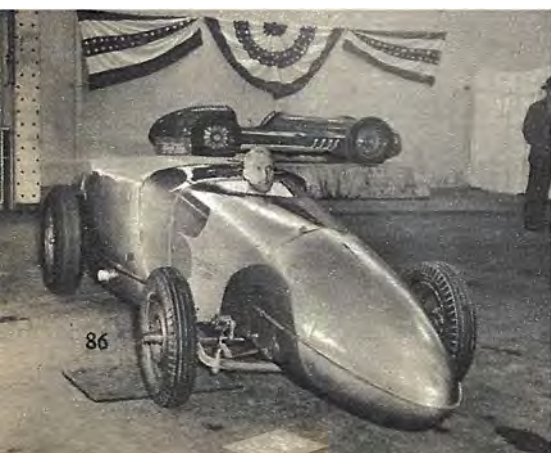


Evans special, a Class C Lakester, placed second recently in the Bonneville National Speed trials. The little belly-tank hot rod made 174.75 mph.



Only the top was built to order on Les Callahan's '22 Dodge body set on a '32 Ford frame. The car has regular Ford axles and a '46 Mercury engine.

Ant Eater, which has been called the world's faster roadster, was clocked at 152.54 mph. The entire body swings up on hinges to expose the engine and cockpit, below right. Belly-tank nose seats the driver, below left, while the 268 cubic inch modified Mercury power plant is located in the rear.





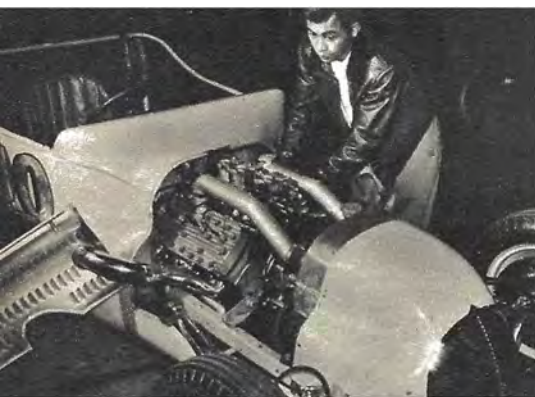
# ON THE COVER



Carash Custom is a '36 Plymouth with a Ford rear and a modified '32 Cadillac V-16 motor. It's hand-made from sheet steel over tubular framework.



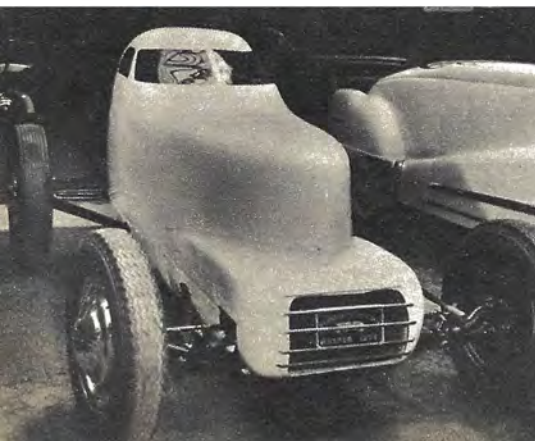
Three-quarter midget car built by Bob Feuerhelm has an all-plastic body and a motorcycle J.A.P. 30.50 cubic-inch rear engine, seen at left. Association which regulates three-quarter midget races specifies that all entrants must agree to sell cars for \$2,000 in order to keep investment down.



Yellow racer built by Fred Ige has a '25 Model T Ford body and frame, a '28 Hudson axle and a '41 Mercury motor, shown at left. The car is all hand-made with aluminum shell and grille, full belly pan, bucket seat upholstered in plastic, louvered hood, Ross steering wheel and safety hubs on the wheels.

Screwdriver, a hand built streamliner owned by Bob Arner of Culver City, Calif., has had many motors in it—now a '45 Mercury. It's done 139 mph.

Designed by American GI Pat Leighton in a Jap prison camp, this '32 Ford channeled roadster with a '42 Mercury engine has made 117.64 mph.





# MI Tests the '51 Studebakers

*A V-8 overhead-valve engine is the big news at Studebaker this year and our expert Tom McCahill finds it is very welcome news indeed.*



A flat skid at 55 mph, top, nearly wrecked Tom and a 1951 Champion convertible (see story). Main change in appearance this year is redesigned spinner (arrow).



NOTRE Dame's Frank Leahy and his Hoosierized Hibernians used to be the front page items around South Bend, Indiana, but as of now the big news coming out of that city is the Studebaker 120-horsepower V-8 valve-in-head engine. This power plant transforms the maidenly Stude of recent years into a rip-roaring, hell-for-leather performer that can belt the starch out of practically every other American car on the road. And do it with much less effort than it took Purdue's football club to dump the Irish out of the undefeated class.

Studebaker was the original notch-back kid, the only old-line automobile manufacturer since V-J Day to give us a radically different body design. Now, barring another war, we Americans are about to get the post-war cars all the builders promised but never produced so long as they could get away with passing off grille changes, super-blooper balloon tires and chubbier silhouettes as "sensational improvements."

Ninety per cent of the engines in new American cars being sold today were designed and first introduced when your old



man was spiking his near beer with rubbing alcohol, Babe Ruth was the Sultan of Swat and Max Baer was getting ready to cop the heavyweight crown from Primo Carnera. In short, nine out of ten new cars sold since the war are powered with engines that are, from a design standpoint, old enough to vote.

A little over two years ago Cadillac and Oldsmobile broke the ice with something really new in engine design. These power plants, to which Studebaker's can now be added, are the finest and most efficient in the history of our automobile industry. For instance, the Cadillac's 160-horsepower engine, developing more than 300 foot-pounds of torque, has to push a much heavier body and chassis than any of the Big Three small cars—yet it gives much better gas mileage than any of them. That's *really* improved engine design for you and, believe me, it's long overdue.

Before we get into Studebaker's new V-8, let's take a look at the V-type situation as a whole. I've read lots of letters in the past from readers who told me that V-type power plants were no good. Of course, many of these well-meaning guys had never owned a V-engine but somewhere they had heard that the cylinders were egg-shaped, the blocks had a tendency to pull apart, and a number of other equally silly and false rumors. Well, if they knew nothing else the Germans, and particularly Mercedes, knew how to build great sports and road-racing cars. And all the really hot Mercedes race cars had V-type engines.

Actually, most good engine men feel that the four-cylinder, overhead-valve-and-cam engine is the finest from the standpoint of [Continued on page 161]

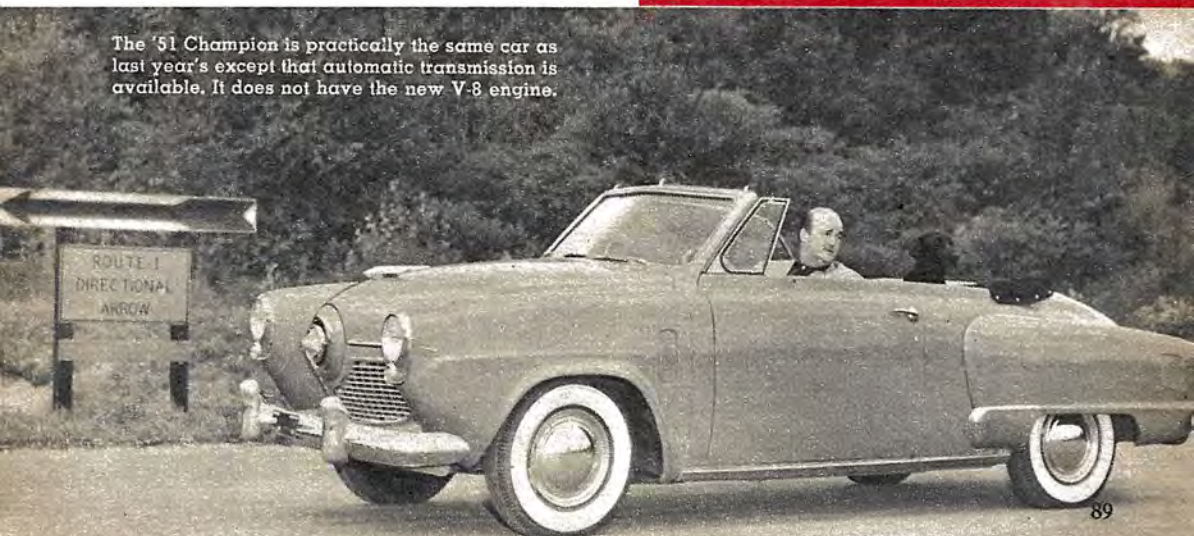


Inside the bonnet of a new Commander, Uncle Tom finds the 120-hp power plant which makes the '51 line of cars "rip-roaring performers."



On cars equipped with automatic transmission Studebaker has widened the brake pedal, thus letting the driver operate it with either foot.

The '51 Champion is practically the same car as last year's except that automatic transmission is available. It does not have the new V-8 engine.

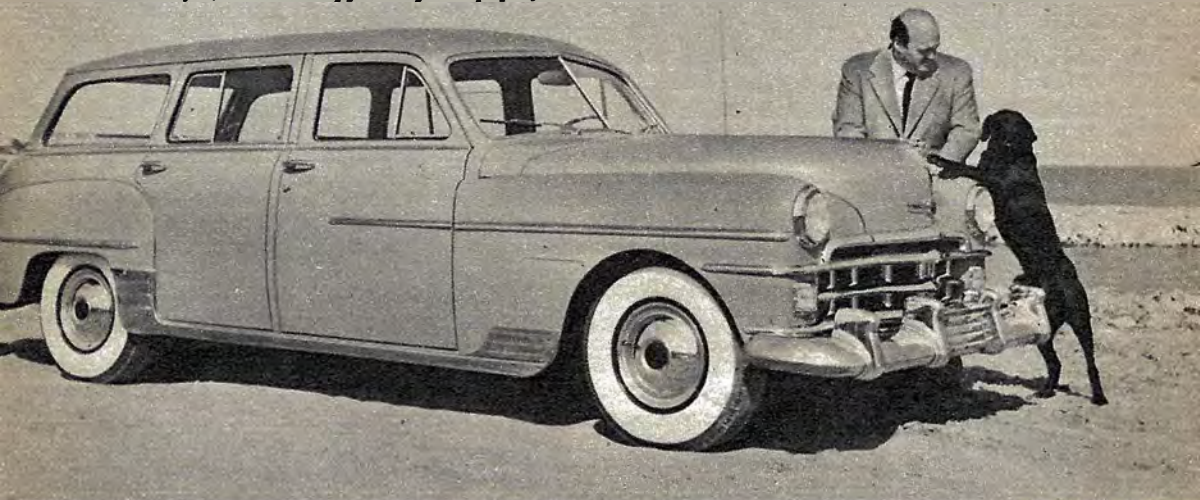


# McCahill Drives the **CHRYSLER** Station Wagon

*MI's auto expert finds the Town and Country  
all-steel wagon a really luxurious equipage.*

---

"Like to go hunting in this job?" Uncle Tom asks  
Labrador Joe. "You're doggone right!" quips Joe.



**I**F you are entertaining any thoughts of joining Lord and Lady Marmaduke Mousetail for an upland game drive in the near future, the Chrysler Town and Country all-steel wagon is definitely the barge to turn up in. I can picture Lord Mousetail's face now as you step down from this luxurious trap with your deer stalker's hat at the correct Sherlock Holmes angle.

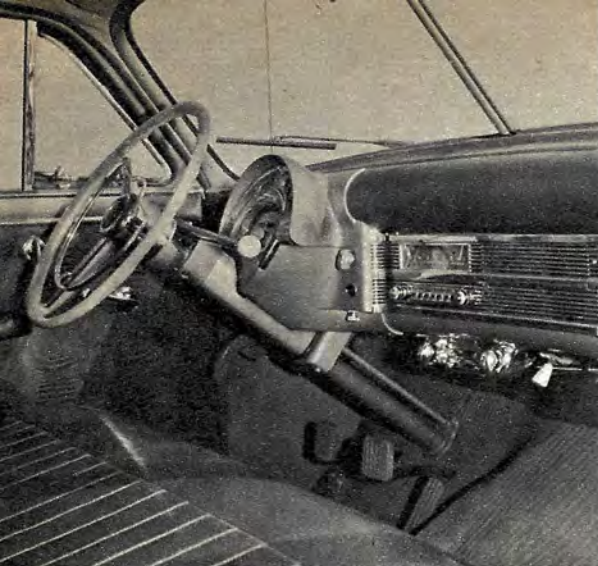
"Gad!" old Mousetail may very well exclaim, "what a vehicle for the brush and bear!" Or, mayhap, if he is in a pettish mood, "Begone, varlet—groceries are delivered at the service entrance!"

Some months ago (April 1950 MI) we brought you a report on the Plymouth all-metal Suburban that I drove to Florida and

back. We stated at the time that this was the hottest station wagon buy in the country and that undoubtedly Chrysler's plusher offerings would practically rip the hinges off kid brother Plymouth's box of marbles, trying to get into the act. Well, now we have the Town and Country version and a more luxurious utility wagon never rolled over the highways.

Like the Plymouth, this new job is all-steel and offers the same features on a much larger and more expensive scale. For instance, on the rig I took out to test, the imitation alligator plastic upholstery was so real looking you could almost smell the Everglades and hear Little Black Sambo whistling Bongo on the Congo. This is the



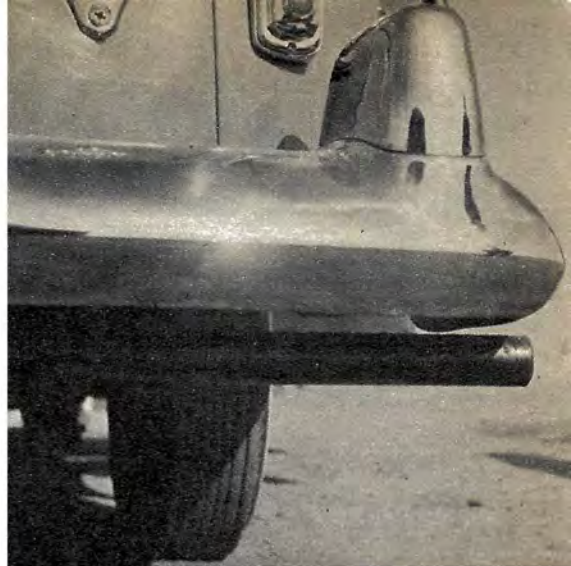
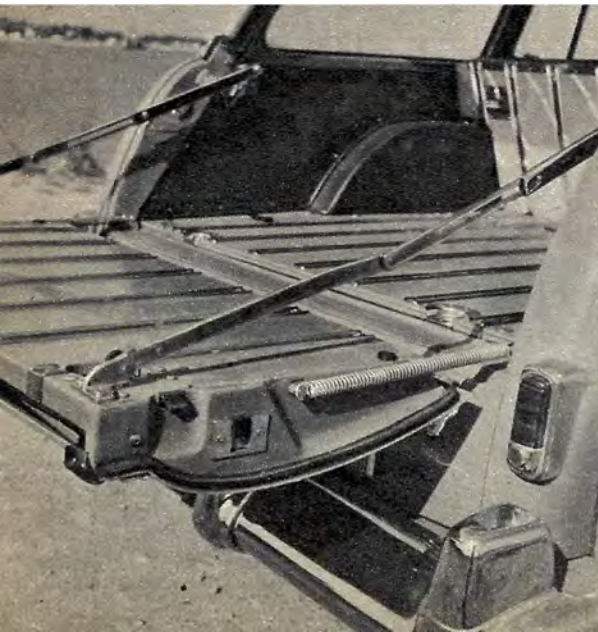


Interior appointments of the Town and Country are as well finished as those of many limousines.

Plymouth Suburban blown up to vast size, but dignified, like a guy in an expensive blue serge suit. Before working up any more enthusiasm, however, let me drop you gently on your head by mentioning the price. Three thousand fish *plus* is what you must have in your grimy fist before the man says, "Take her, Jackson, she's yours." (Okay, all you bookmakers and politicians—now that we're alone, let's get on with the pitch.)

One day Ken Purdy, or some other Boswell of the automotive business, will work up a treatise on how the high-society station wagon evolved from a horse-drawn buckboard whose original function was to

Massive, strongly-reinforced tail gate is almost husky enough to support a horse, McCahill finds.



Starboard-pointing tail pipe diverts the exhaust fumes well away from the car, preventing "seasickness."

serve as a low-society combination manure spreader and sheep dip inspection table. I don't have the facts at hand but I'll take a wild swing and guess that maybe old Henry Ford the Original started this motorized buckboard stuff with his first Model T station wagon.

Anyway, my uncle Charlie's Model T station wagon, which I Joie Chitwooded through a hay stack that had some silly poles in the middle, was the first one I remember. It so happens I can recall the outcome of that ride rather clearly. When it was over, Uncle Charlie's wagon looked like a short-legged horse with its mouth full of hay. [Continued on page 172]

Rear seats can be folded upside down to form an exceptionally large baggage-carrying compartment.







Here's what a stock 100-hp Ford engine looks like with the Ardun overhead valve assembly installed but with cylinder heads removed to show details.

McCahill and Yura Arkus-Duntov, far right, who designed the kit with his brother Zora, inspect the rig. Stock carburetion and ignition are used.



## 175 HP For Your V-8

A nice guy named Zora Arkus-Duntov, whom I first met while he was trying to qualify a Talbot at Indianapolis in 1946, has designed and is selling (under the more easily pronounceable name, Ardun, an abbreviated version of his own handle) an overhead valve kit for V-8 Fords that is really a dilly.

A car with a straight Ardun engine tried to qualify at Indianapolis last May and averaged 124 mph, not quite enough to get in the big race but perhaps the fastest time ever recorded out there for a hot Ford.

Ardun claims 175 horsepower at 5200 rpm for a standard, unrebored and untouched Ford block, simply by adding his overhead valve assembly with a compression ratio of only 7 to 1. He says he gets 150 hp at 3600 rpm, as against 100 hp for the stock Ford

at this speed. He further claims 225 foot-pounds of torque at 2500 rpm and says that his engine runs as cool as your mother-in-law's scowl when she finds you in the local bar and grill on payday. I don't know how he squeezes 5200 rpm out of a standard Ford ignition system but that's his claim.

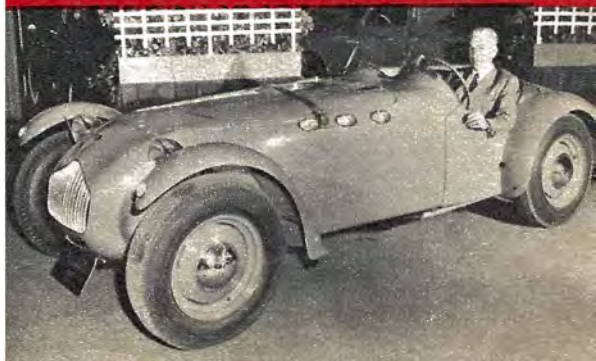
The day I saw this job there wasn't a car around to test so I asked Ardun to make checks for me later. Here they are: in a standard 1949 Ford business coupe, with just the head equipment added, zero to 60 averaged 9.8 seconds, he reported. Zero to 70 went 14 flat. These are very fast times.

This is a slick conversion. I suggest you look into it if you are interested in such things. The price runs around \$475 and no special tools are needed to install it, which takes 6-8 hours.—Tom McCahill. •



Ardun aluminum heads, far left, are English-made. Valves are enclosed in oil-tight covers. With added modifications, 14 to 1 ratio is possible.

Zora Arkus-Duntov, below, sits behind the wheel of an Ardun-powered English Allard sports car which he has raced at better than 145 miles an hour.







**Spout Can** for cars has a built-in funnel which doubles as a handle. To pour, the cap is released and the funnel folds back as shown. Strainer can be removed for cleaning. Can's compact shape makes it easy to store in auto trunks or boats. Made by a firm in Stuttgart, Germany, it is destined for U. S.



**Cuter Scooter** is this super-streamlined model being tested by pretty Jane Casey. The place was the First U. S. International Trade Fair in Chicago and its origin is Austrian. Note the unusual rumble seat, rear tire and parking stand. Headlight, horn are built into the steering column. Vents admit cooling air to engine.

## NEW for the ROAD

**Royal Rolls Royce** made for Princess Elizabeth and her husband, the Duke of Edinburgh, is the snazziest in England. Note the radio controls in the center arm rest, the handle for adjusting the seat position, and the heater vents. Through the glass-panel roof, Britons can look down on their royalty.



**Kleen 'N' Tint** is a complete kit for reconditioning your car's interior. It takes care of the upholstery, steering wheel, dashboard and even the rugs and rubber floor mat. Photos below contrast treated and untreated floor mat (top) and roof and visors (bottom). Made by Kleen 'N' Tint Co., Arndt-Palmer Labs, Melvindale, Mich.





# HUNTING RUSSIANS in NORTH CAROLINA

*By Raymond R. Camp*

*Rod and Gun Editor, N. Y. Times*





**T**HERE are Russian bores in the United Nations and they cause us peace-loving citizens a lot of trouble. The residents of North Carolina have a Russian boar situation, too, but they get a lot of fun out of theirs. As a matter of fact, people visit there from all over the country just so they can join in the sport.

Although the UN bore makes a lot of noise and doesn't have too much bite, the North Carolinian boar is just the opposite. He's a really tough customer. The wild boar of the Great Smokies is considered by veteran hunters to be the most dangerous game animal in North America.

The hunter who goes out after big grizzlies or Alaskan brownies usually has a chance to get in two or three shots in the event his first one fails to down his trophy. But the boar hunter gets in one quick shot and if it isn't a good one, he had better be quick on his feet and a fast climber. Even when mortally wounded, the big "Roosh-ians" are extremely dangerous for they have amazing speed, vitality and agility. The experienced boar hunter is much happier when he is close to a stout tree with low branches. One flick of those long, sharp tusks can lay open a leg from calf to thigh and many a boar hunter carries deep scars that were inflicted by a heart-shot boar.

"When you shoot," my mountain guide advised me on my first boar hunt, "don't wait to see what happens. Get out of there! If there's a tree handy, climb it. A boar may be dead on his feet, but still moving. While he's able to move he's dangerous."

The country in which the boar is hunted favors the animal rather than the hunter. The cover is heavy and a shot at 50 yards is considered to be extremely long range. The heavy thicket is the boar's protection and he knows it, so if you are going to hunt him you have to do it on his terms, a fact that has made the sport very unsavory to many sportsmen.

Due to the country they inhabit, it is impossible to hunt boar without dogs and the mountain hunters insist there are no dumb boar hounds.

"A stupid hound never gets a reputation as a boar hound for the very simple reason that he doesn't survive his first hunt," one of them explained. "When a boar gets tired of running ahead of the hounds he will stop and take on a couple of his closest pursuers. The dog that rushes in lasts just as long as it takes the boar to flick his head once. A smart hound waits at a safe distance until three or four others arrive, then they circle the animal, making quick rushes



The photographer who took the photo above either was a brave man OR used a telephoto camera lens OR visited a museum. What's your guess?



Four hunters with Plotts and guide prepare to loose their dogs on a boar trail. Below, the quarry is held at bay until the guns arrive.



only when another hound distracts him. We often use 12 or 15 dogs on a hunt and I've never been on one where at least four or five hounds weren't killed or injured."

There were 16 hounds used in the first boar hunt I made and as far as I could tell they were of no particular breed. There were a few foxhounds, several mixed breeds and four of the famous Plott hounds. These hounds, bred by the Plott family near Asheville, N. C., were originally intended for bear hunting. I had heard of this breed which is noted for stamina, nose, courage and intelligence, but I was surprised to find it was such a small dog. Those I saw were larger than a beagle, but smaller than the average foxhound.

They were trained to handle boar just as they did bear, running the animal till it came to bay, then circling it at a safe distance and giving tongue loudly to inform the hunters of its location. Since black bear are plentiful in the Smokies, only the experienced hunters are able to tell which of the two has been jumped during the first few minutes of the chase. A bear often heads for the ridges when jumped, but the boar is inclined to keep to the heavier cover of the low ground and his course is more erratic.

On the hunt mentioned, a bear was jumped first and when the hounds set up their first frantic cries, we spread out immediately in order to cover as much of the area as possible. Walt, a friend who had accompanied me on the trip and whose enthusiasm had dwindled considerably after hearing some of the talk around the fire the previous night, moved off to a vantage point about 100 yards on my left.

At this stage no one knew whether the dogs were running a bear or a boar, but since we were hunting boar, everyone but Walt was hoping it was the latter. A few minutes passed while we listened to the



End of the hunt finds this hunter with a nice head and pelt to take home. Note the tusks. A slash from these can inflict painful wounds.

hound music fading into the distance. Then the sound increased in volume and it became apparent that the quarry had made a circle and was heading back toward the line of hunters.

For a few moments it seemed that the quarry, bear or boar, was headed straight for us, but then it moved to our left through a dense thicket of rhododendron. Walt had taken up a position at the foot of a big beech tree on the fringe of this thicket and when the animal began crashing through the cover a few feet from him, he went up the beech like a monkey. As far as he was concerned, boar hunting left him cold.

When the hounds passed, all of us with the exception of Walt took up the chase and it was almost an hour later that our animal, which turned out to be a bear, ran across an open area in front of one of the hunters and was tumbled. When noses were counted, Walt was found to be missing and it was another half hour before we were able to trace the sound of his shouts to the beech tree.

"I'm going to do my boar hunting right in camp," he announced. "And if any boar manages to break into that cabin I'll give him a hell of a battle. Otherwise, I'll stick to Virginia hams. You guys can eat all the wild pork. I could feel that boar breathing down my neck all the way up that tree."

Shortly after noon one of the Plott hounds set up a shrill baying and a few seconds later another one took it up. The owner of these dogs nodded with satisfaction.

"That's a boar," he announced. "I know the difference in the hounds' cry."

A few minutes later the entire pack was in full cry and the boar lead the dogs a merry chase back [Continued on page 176]

Santa Catalina Island, near Southern California, also has its Russian boar. This is a young one just bagged by Dr. Robert Kennedy of Hollywood.







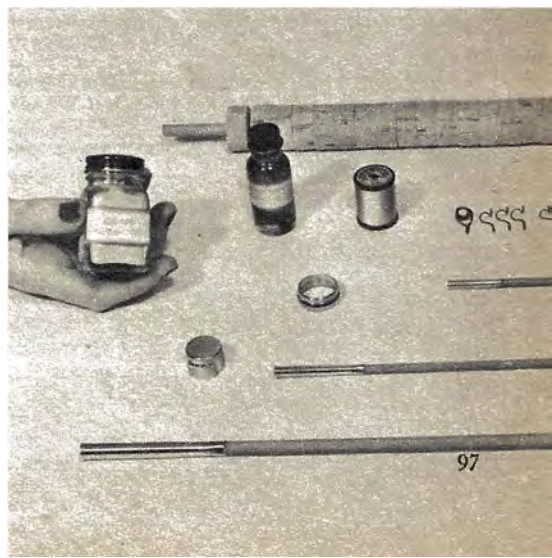
**Head Light** for hunters and fishermen has a battery case which clamps on the pants belt and a light which fastens around the head by means of an elastic strap. Power is supplied by eight standard flashlight batteries supplying over 7,000 candlepower. Radio battery can be used. Justrite, North Southport Ave., Chicago.

**Saf-T-Clamp** ski bindings take the danger out of ski falls. Thin steel plates are screwed to the heels and toes of the boots. These fit in spring clamps attached to the skis which release instantly when feet are tipped. Force can be adjusted up to 250 pounds and can be set light for novice skiers. Cubco, Box 22, Belleville, N. J.

## NEW for the SPORTSMAN

**Fish Mitt** will grip the big ones so they can't slip out of your hands. It is made of thin, flexible, annealed spring steel with sharp prongs on the grasping surface to hold the fish securely and is donned like a glove. Should be just the thing for holding fast to a slippery eel. Al Alston, Capitol Sporting Goods, Green St., Albany, N. Y.

**Rod Building Kit** has all the materials you'll need to build your own fly-rod, including glued and sanded rod sections, unfinished handle, reel butt, reel seat, guides and tip, ferrules, varnish and even winding silk. Here's a good winter-evening pastime while you wait for opening day. Usan Inc., Box 389, Spring Valley, N. Y.



# CLOWN TOWN, TEXAS

Gainesville school girl Pat Reagan really does her part. She's an aerialist and a bare-back rider as well as an upside-down walker.



*In the Gainesville circus everybody from  
housewife to minister gets into the act.*

*By Joe Whitley*

**T**HE night nurse gasped as a circus clown burst into the emergency ward wheeling an unconscious man whose white satin tights were stained and rumpled.

"Just a moment and I'll get you a doctor," she said.

"I am a doctor," he snapped and started ministering to the patient.

The clown was Dr. S. M. Yarbrough, a leading Texas physician, and the injured man was Portis Sims, city park director. Both were performers with the Gainesville (Texas) Community Circus, an organization made up of judges, housewives,

teachers, students and other assorted citizens of Gainesville, a pleasant little town of 12,000 located 70 miles north of Dallas.

Park director Sims had fallen off a tight-wire during his circus act. But it's seldom that accidents like this occur.

The Gainesville circus was started in 1930 to pay off debts of the failing Little Theatre. But it has grown into a community enterprise that is without parallel anywhere else in the world. Each year from April through September it plays towns all over Texas and Oklahoma. Last





Permanent home of the community circus, top, spreads out over a whole square block in Gainesville. It all started as the town's Little Theater.

Aerialists Ralph Gerneth and Morris Hansen work together in packing plant. Their female partners working on the trapezes are also their girl friends.

At top is one of the eight fireproof tents which the circus takes with it when it hits the road to give shows in towns all over Texas and Oklahoma.

While Dodge dealer Frank Schmitz tries out his oversized cigar, postman Paul Neiball waits in the car for their funny clown act to get under way.

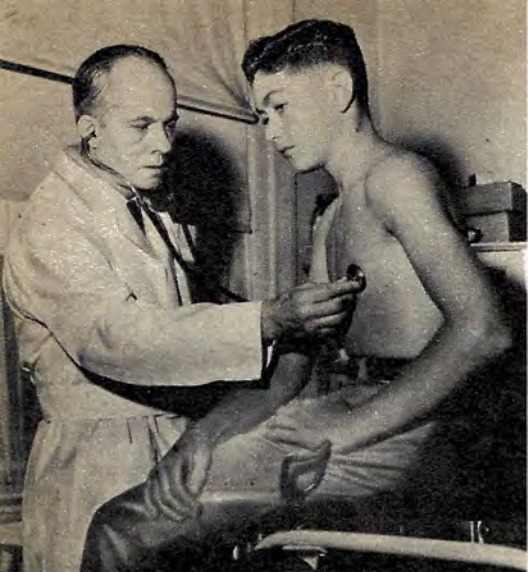
season it traveled between four and five thousand miles, often outdrawing the largest professional shows. Sixty thousand once attended in Dallas and the 52,000 that turned out for a performance in Ft. Worth comprised the largest crowd ever gathered under a single roof in that city.

Gainesville is a circus fan's dream, for not only do they *live* circus the year around but practically everyone gets in the act. The ringmaster, for example, is Roy Stamps—manager of the ice plant. Alex Murrell, power-plant engineer, presents a dog act and his blonde wife, Gerry, rides

bareback over flaming hurdles and works a high-wire act with Vern Brewer, a breeder of fancy ponies.

The aerial star who spins suspended from the big top by her teeth is Evelyn Kaps, a pretty high school student. Teaming with Dr. Yarbrough in the clown troupe are such unlikely circus types as A. G. Wells, mathematics professor, and the Reverend Johnstone Beech, rector of St. Paul's Episcopal Church.

Profits go to buy new equipment and costumes and none of the members, who range from five to 70, are paid for perform-



Acrobat Jack Williams has his heart checked by Dr. S. M. Yarbrough. But it's all in the business because the Doc is a clown—and that's no joke.



Mother-and-son clown act makes fun of the monkey in their family tree. That's Mrs. Louise Smith, center, her son Dan, right, and Jimmy Smoot, left.

ing. They are, however, amateurs only in the technical sense that they receive no salaries. They present most of the traditional and more difficult circus acts. A leading theatrical publication once reported that their performances compare favorably with those of the best professionals. Most of the feature acts, such as Pat Reagan (a teen-ager who walks upside down in small rings suspended from the top of the tent) have received sizable pro offers. Billy Rose once tried to hire the entire troupe for one of his productions. However, they prefer living at home and keep their performing strictly in the hobby class.

Nothing can stop the troupers from performing. A few years ago, while playing in Ardmore, Oklahoma, a cyclone de-

stroyed their new big-top and damaged most of the equipment. The following day, however, they replaced everything. Then before the next performance, there was a virtual cloudburst. The tent sagged with the weight of the water and threatened to collapse. But the problem was solved when the ingenious Murrell put pails in place and the clowns punctured the roof. It was a little damp thereafter but the show went on.

During the years, the Gainesvillians have managed to work out a routine for carrying on normally both city and circus business in such a way that there is a minimum of interference on either side. One of the best examples of this happened a few years ago when the late County Judge Benjamin

Housewife Gerry Murrell is one of the star riders and tight-rope performers in the circus. Here she rehearses putting her horse through its paces.



Husband Alex Murrell does his share in the community circus, too. Here, he holds the ladder for his high-diving dog Dexter during the act.







High school freshmen Joy Bowles, left, and Kay Fellers, right, practice their balancing-ball act in circus barn. Both are veterans of several seasons.



Backyard practice makes perfect. Here Mrs. Peggy O Neil watches aerialist Evelyn Kaps demonstrate tricks for two young future members of the circus.

Franklin Mitchell was a member of the clown troupe.

The Judge was featured in an act in which he jumped from a burning house into a net held by the clown fire department. One night a clown dropped a corner of the net and the Judge broke three ribs. Justice didn't suffer, though. For the next three weeks, the judge held court at his bedside at home. He returned to the Circus and to the courtroom the same week.

The Gainesville Community Circus is now big business—a season's profits often run into Wall Street figures. The Circus owns eight fireproof tents, performing animals, steam calliopes, a fleet of ornamental wagons for spectacle numbers and parades plus a square block of buildings.

In fact, in Gainesville it's practically impossible to get away from the circus. Half the homes in town have circus rigging in the backyards and you often see mother and daughter trying out new trapeze or tight-wire acts together while father and son are teaching the family dog to ride on the back of Junior's pony.

Most citizens believe the circus has been the greatest asset Gainesville has ever had. Not only has it made the little city known all over the world but it has welded it into one of the most closely knit towns.

After all, when clergymen, policemen, city officials, teen-agers and other citizens swing together on the flying trapeze there is bound to be mutual understanding of problems. •

Town youngsters love this two-day-old pony born in the circus tent. Clown holding him is John Cunningham, in real life an F.H.A. administrator.



Only money paid to performers is for expenses. A. Morton Smith passes out \$10 bills to take care of train meals on the recent trip to Corpus Christi.







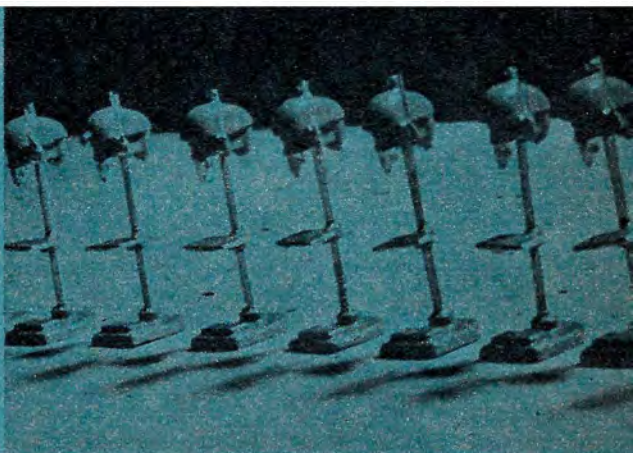
Homer H. Dasey, president of Visual Planning Equipment Company, checks scale specifications for some model equipment made in his own plant.



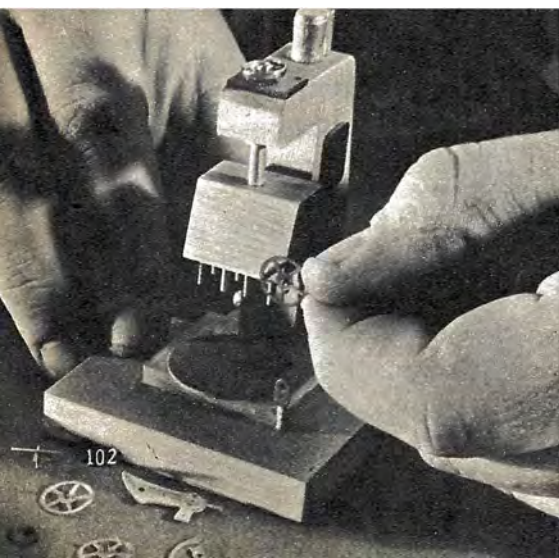
Small quantities are made completely by hand but for larger orders molds are prepared into which the liquefied materials are then carefully poured.

# Toys For Engineers

MI photos by Alfred Eris



Snap fasteners were found to be perfect for simulating wheels and machine parts so Dasey uses them by the thousands. He buys up watch parts, too.



**T**HREE years ago Homer H. Dasey was sure he had a million-dollar idea—but he was laughed out of one engineering office after another. His plan was to mass-produce scale models of production lines and factories for industrial planners.

Today, Dasey gets a big kick out of walking into those same offices and selling thousands of dollars worth of his equipment. For the “toys” he makes are being used by some 500 firms to help them plan construction more efficiently.

Dasey based his idea on the premise that there is often a blind spot between a stack of blueprints and the actual layout of the production line. Often when a plant is set up from blueprints, costly errors are discovered—errors which show up only in three dimensions.

Now, that's where Dasey comes in. Given

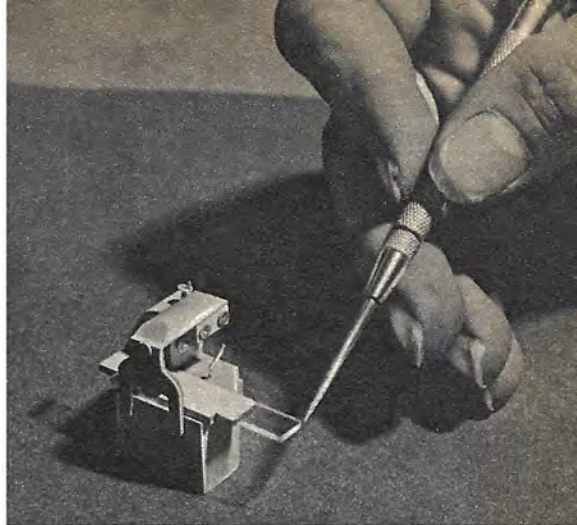
*Mechanix Illustrated*



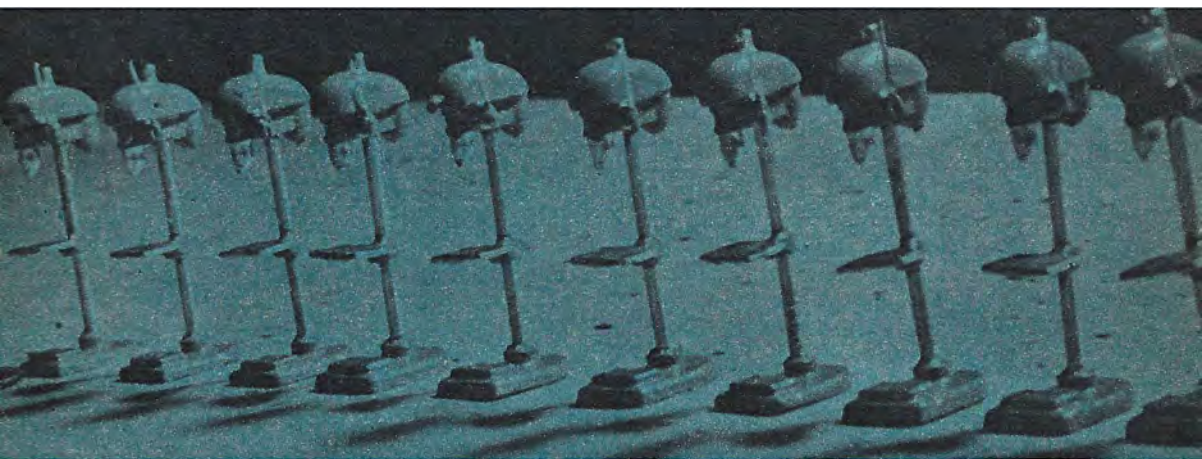
a client's blueprints, he builds a miniature factory—complete to the last machine tool. When it is finished, the engineers can move the tiny conveyors and machines about like toy soldiers and are thus able to foresee any possible bottlenecks.

The U. S. Navy uses Dasey's models to help plan its training courses at stations where space is limited. Eighteen universities also use the models for engineering courses and a leading dairy and food equipment manufacturer in Chicago has a model kit in each of its 25 district offices for selling as well as for planning. District managers say they now make only one drawing for a customer's layout instead of the eight trial-and-error sketches they used to make.

Yes, Dasey's models may look like toys—but American engineers will tell you they are doing a man-sized job! •

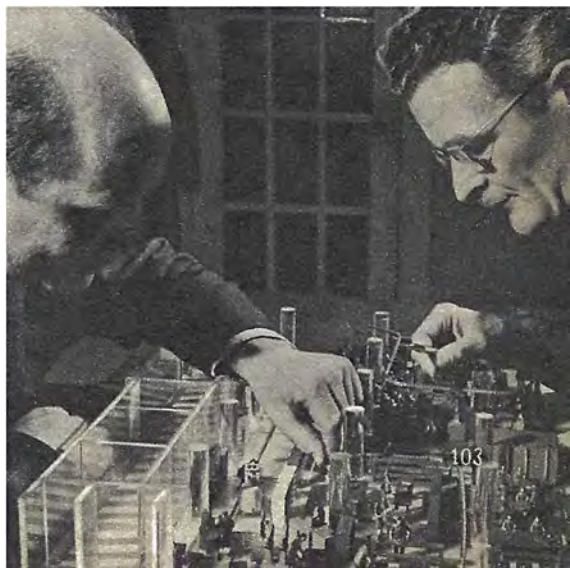


To show engineers how much space they must allow for a machine to "travel" Dasey fits small bits of plastic to the edges of the moving parts.



Tool drawing specifications are checked against models of various machine tools. Note the tiny conveyors, rolling mills and multiple drill presses.

Here's one of Dasey's model factories complete to the tiniest detail. Now it's easier for the engineer to visualize every possible problem.







## GE's Vincent Schaefer Shoots Clouds

**W**HEN snow fell on a four-mile stretch of Massachusetts countryside in November, 1946, it was Dr. Schaefer and not the elements who was responsible. He was the first scientist to develop the cloud seeding method of producing snow.

Dr. Schaefer began his career with the General Electric Company as a drill press operator, worked and studied at night till he became a noted scientist. One day he had occasion to film some billowing clouds. They changed so slowly, he rigged his camera so the shutter would click every two seconds. This made the cloud formations that seemed almost motionless to the eye appear like animated cartoons. Since then he has shot 200,000 cloud frames and he finds it not only fun but worthwhile for its applications in meteorology. •

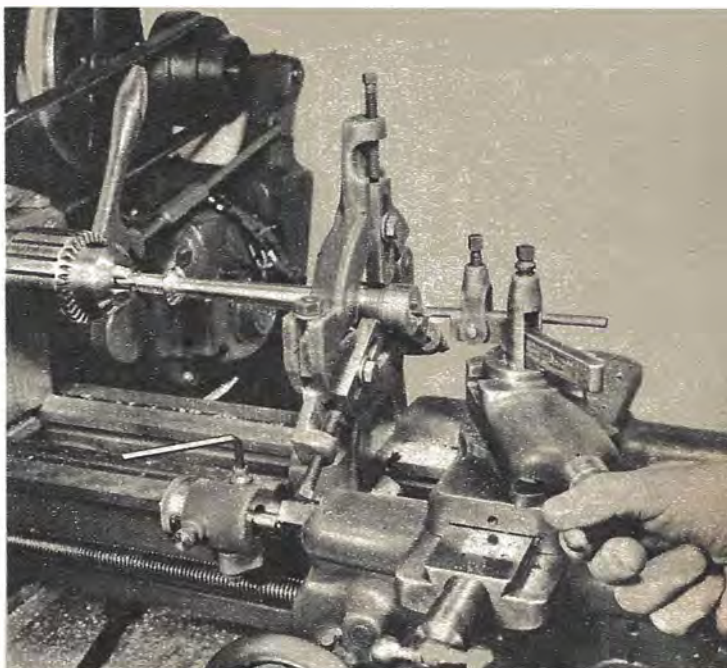


With a small movie camera Dr. Schaefer uses his new technique to record the movements of clouds, top, on movie frames shown at the right. When films are projected, clouds rapidly grow, change and disappear. Left, Dr. Schaefer produces a supercooled cloud by blowing into a home freezer. Then, by seeding with dry ice, the cloud will be turned to snow. Drs. Langmuir and Vonnegut watch experiment closely.



### Get Started On The Screw-Cutting Lathe

By keeping your eye on MI guy as he machines a candle holder, you'll get a good idea of the versatility of this important shop instrument. Starts on page 110.



### For That Wasted Corner Space . . .

. . . make this highly practical unit. It will hold magazines, a small radio and books without crowding or confusion. Turn the page for full construction information.

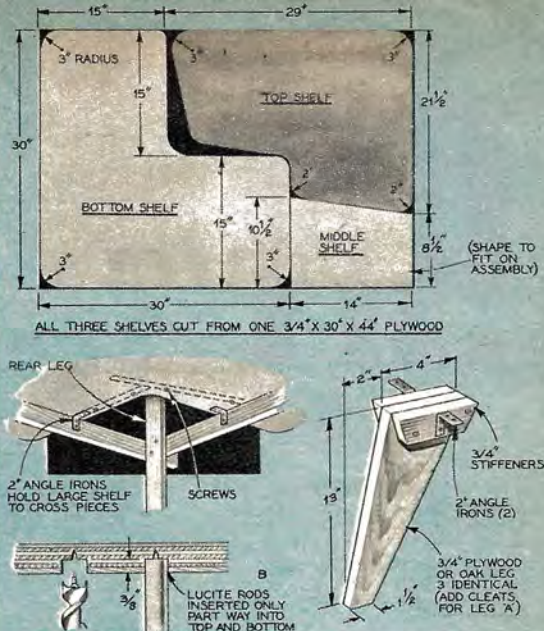
### Sikorsky Amphibian

A tailor-made project for you model-makers who are interested in trying out the new "baby" engines. Complete plans for this beauty begin on page 132.



### Spruce Up Your Juice . . .

. . . with the MI Battery Charger. You won't have to sweat out those cold snaps with this useful gimmick in your garage. Details are on page 136.



# triple-tiered table

**Tired of clumsy conventional corner units? Then build this roomy table that offers ample and instantly accessible space.**

**By Robert Hoppough**

**D**ESPITE the tricky appearance of this cleverly designed unit, there's not a complicated joint required in the entire assembly. In fact, you can't even see where most of the elements join unless you turn the table upside down. And if you've discovered how impractical those commercial corner units are with their triangular dust-catching shelves, this job will really appeal to you. It provides ample space for magazines, a niche to hold a few books or a small radio and a surface for a lamp. Also,

the entire affair is plenty high enough to clean under. The space behind the risers has been deliberately left open. If you can use an extra hidden compartment, modify the bottom shelf accordingly.

Here are the main steps: Cut out the legs and 1x3-in. cross pieces and join them so that the glue will have a chance to dry while you cut and sand the shelves.

You'll note from the cutting diagram for the shelves that material can be saved by making the cuts as shown. Another saving

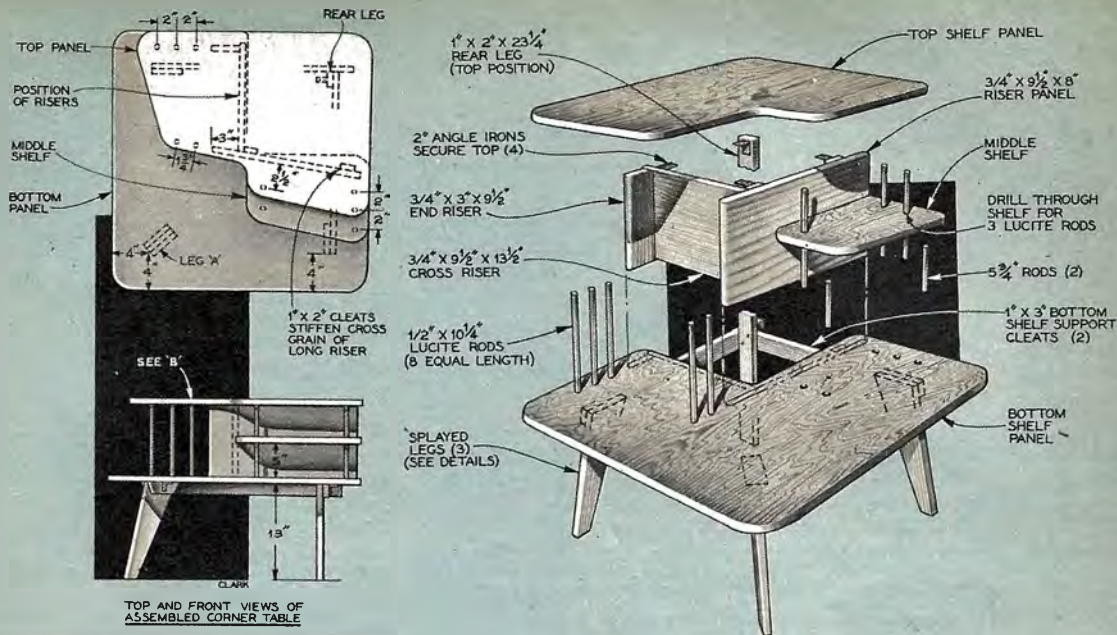
**1** Rear view shows 2-in. brackets that reinforce glue and screws. Empty space can be adapted to your own needs for storage or even a radio chassis.

**2** Squaring legs and reinforcement pieces with a disk sander. Note scrap piece on table which keeps the leg perpendicular to the disk surface.

**3** Holes for Lucite rods in middle shelf and lower table surface are made simultaneously. Do not penetrate the lower piece more than about 3/8 in.







can be made by substituting 1/2-in. dowels for the Lucite rods. The Lucite will add considerably to the appearance of the table, though, and will probably cost only a few dollars extra.

Next cut out the riser boards, round the ends as shown, sand all outside surfaces, and attach to the bottom shelf. Some glue in addition to screws will help to make the table rigid. Be careful not to dab any glue on the exterior surfaces where it will interfere with a good finishing job later.

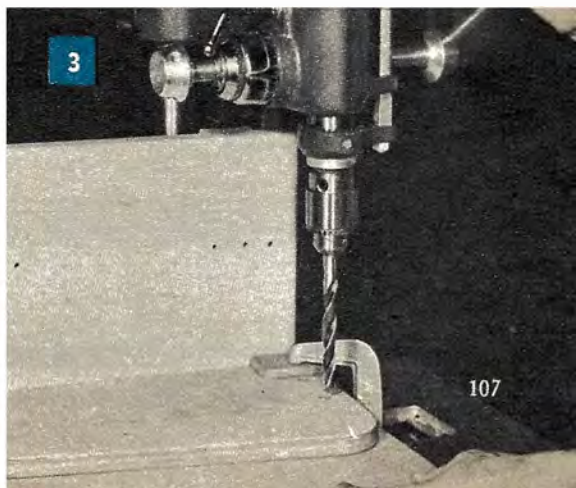
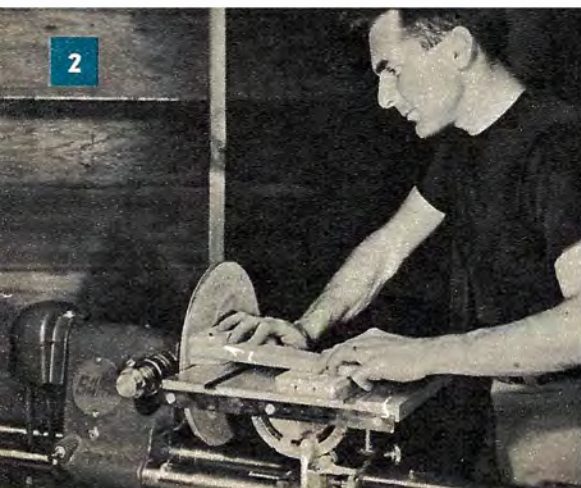
Now drill the holes 3/8-in. deep in the bottom shelf for the rods. Lay the small middle shelf right over these holes to mark where to drill next. (If you have a drill press the job is of course simplified, but be sure to make these holes before attaching the legs to the bottom shelf.) Note that the two short outer rods do not penetrate clear through this shelf, but just far enough to keep them secure.

The glue on the leg assemblies should be set by now. Therefore attach the legs and temporarily screw on the top shelf after first inserting all the rods.

Be sure that you adjust all the rods into their proper parallel position. Mark off the circles where they touch the top shelf. Remove the latter and bore the holes.

Next remove the rods and complete the surfacing of the wood. Remember that No. 0 or 00 steel wool gives a smooth satiny finish as a finale to a good sandpapering. From there it's a matter of choice. The paint-on, wipe-off system gives a good modern touch when followed by a few coats of shellac rubbed down between coats with steel wool.


You're ready for the ultimate thrill of accomplishment now. Insert the rods, attach the top shelf and work each rod into its proper place. Then set your table in that gaping corner—and put it to work! •

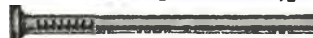



# The Great Joiner


 2D—1 in. x No. 15

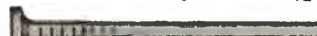
 3D—1¼ in. x No. 14


 4D—1½ in. x No. 12½

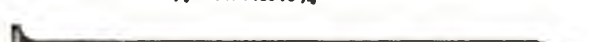
 5D—1¾ in. x No. 12½

 6D—2 in. x No. 11½

 7D—2¼ in. x No. 11½

 8D—2½ in. x No. 10¼

 9D—2¾ in. x No. 10¼

 10D—3 in. x No. 9

 12D—3¼ in. x No. 9

 16D—3½ in. x No. 8

 20D—4 in. x No. 6

 30D—4½ in. x No. 5

 40D—5 in. x No. 4

 50D—5½ in. x No. 3

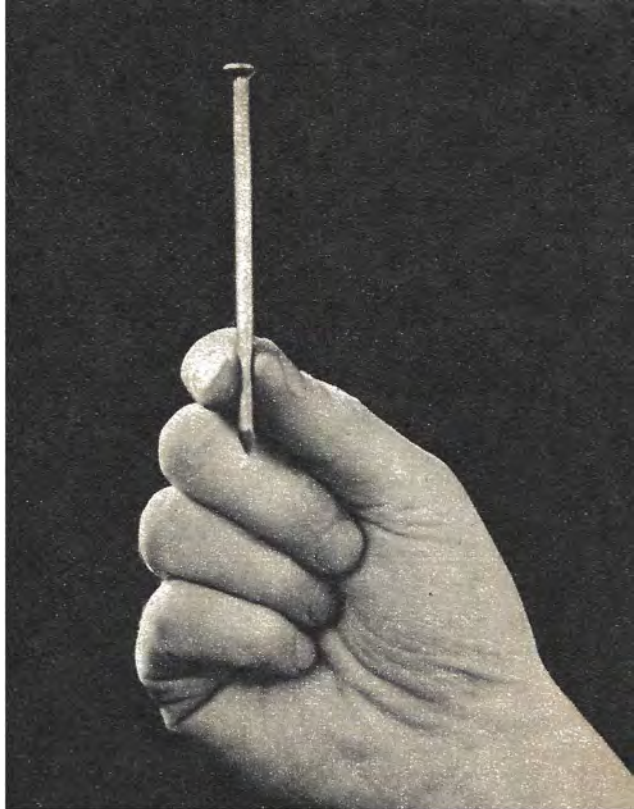


Photo by G. Tewksbury

Why is the 10-penny nail designated as such? Why, for that matter, are pennies mixed up with the nail business at all?

Some hold that nails were sold by the penny in England, a 10-penny nail being one that cost 10 pennies per 100 nails. Others claim that 1,000 such nails weighed 10 pounds. The English measure of 1,000 nails to the penny-weight may also have had a bearing in its origination.



**By Clarence A. Martin**  
*Chairman, Industrial Arts, Erasmus Hall  
 High School, Brooklyn, N. Y.*

**T**HE popular saying that one is as sharp as a tack but just as flat-headed could also apply to the needle-pointed nail. This little sharpie is only one of more than 1100 types and sizes of nails that are being manufactured today.

The nail, one of the greatest of joiners, is now so commonplace that its importance to the world of today is generally overlooked. The shortages during World War II spotlighted its importance. The lack of nails was felt especially in the building trades as about 400 pounds of them are used in the construction of the average home.

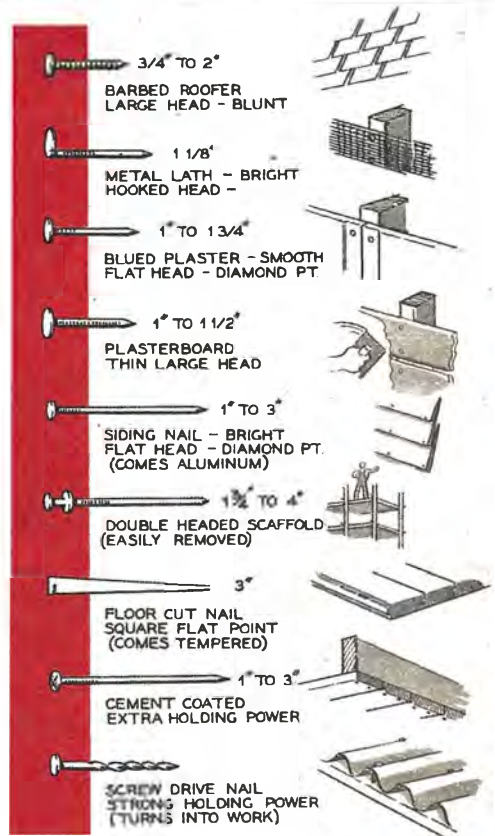
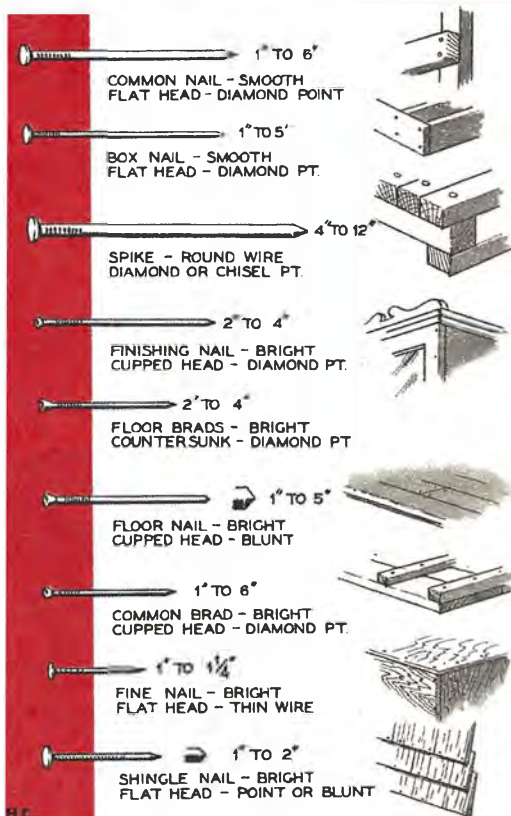
In 1948 the steel mills made about a million tons of nails that ranged from  $\frac{1}{16}$  of an inch to 15 inches in length. Most of them however were between three-penny ( $1\frac{1}{4}$  inches) and twenty-penny (4 inches). The majority of these are made of steel wire, in fact, about 20 per cent of all of the steel wire that is produced is used in the manufacture of nails.

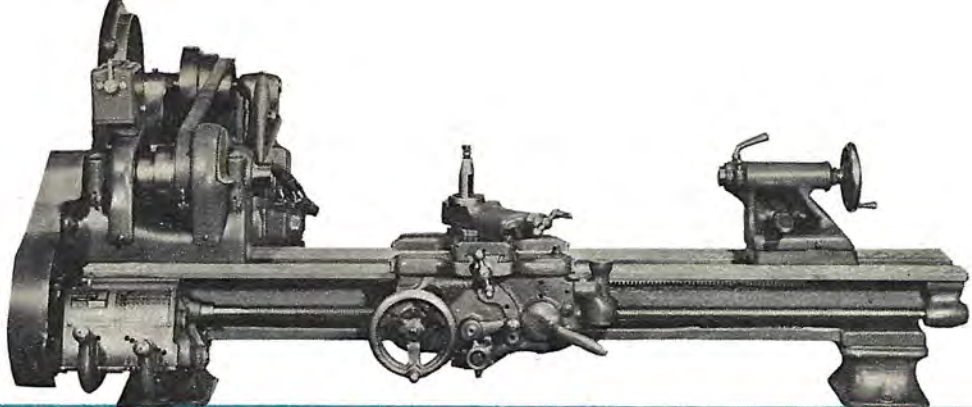
A primitive form of fastening that was used by prehistoric man was a leather

thong made from the hide of animals. This method is still in use today where civilization has not penetrated. Fastening with thongs was followed by the use of wood pins. These same kind of wood pins were still being used for holding together large timbers until quite recently when large size spikes were made generally available.

Probably the first reference to nails was made about 1055 B. C. in Chronicles XXII, 3 "And David prepared iron in abundance for the nails, for the doors of the gates, and for the couplings."

For centuries nails were formed by hand on an anvil. This was a home industry in which all members of the family participated. During the seventeenth century the methods used in producing the nail rods were improved to such an extent that the industry grew tremendously. The heads of the nails however were still forged by a hand operation. In Birmingham, England, the center of the world nail industry at the beginning of that century, more [Continued on page 170]

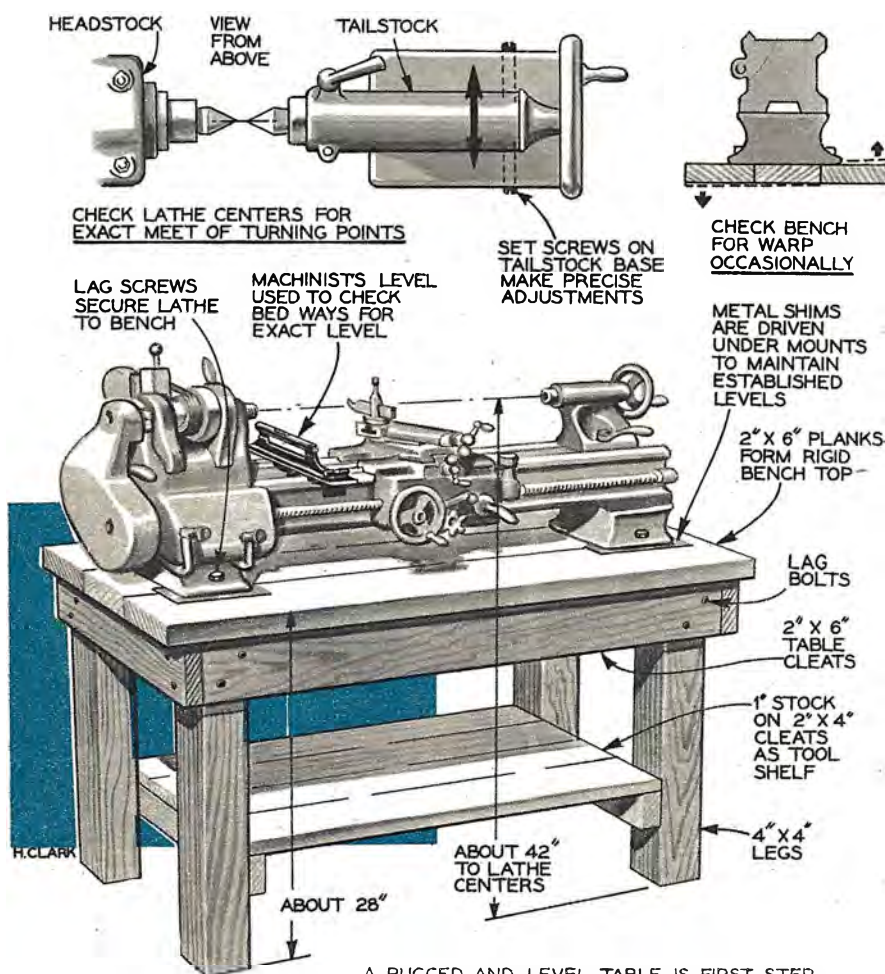




# The Screw-Cutting Lathe

***Want to operate one of the most versatile machines going?  
Then put on an apron, roll up your sleeves and stand next  
to our author as he undertakes a simple but thorough project.***

***By Robert Hertzberg***



A RUGGED AND LEVEL TABLE IS FIRST STEP  
TOWARD GOOD SUPPORT AND TRUE OPERATION





Ends of the brass rod for the upright will have to be squared off and drilled for center holes. The rod will be gripped in this three-jaw chuck.



Supporting free end of candle holder rod, tighten chuck. Jaws are self-centering so that they all move simultaneously when key is turned.

**"K**ING of the machine tools" is what happy owners call the back-geared screw-cutting lathe. It well deserves the title because of its almost endless applications in home and industrial shops of every conceivable nature. Using the identical lathe, a hobbyist makes camera accessories and wheels for model locomotives; an auto repair man resizes pistons and smooths down commutators; a factory hand turns out gun barrels and airplane fittings. Although the screw-cutting lathe has existed for more than 200 years, new uses for it are cropping up every day!

For home and small machine shops, the most popular lathe sizes are 9 and 10 in. These figures represent the maximum diameter of work that can be accommodated. Actually the practical limit for turning between centers is less because the tool carriage has to slide under the work while the latter is revolving. This means limits of approximately 5 and 6 in. The length of the work that can be handled depends on the over-all length of the machine, which runs from 3 to about 5 ft. A good compromise size is 4 ft., which takes work 28 in. between centers.

An electrical rather than a mechanical consideration fixes the "small shop" lathe

at 9 or 10 in. In these sizes the machine works satisfactorily with a  $\frac{1}{3}$  or better yet a  $\frac{1}{2}$ -hp motor, which is about the most powerful motor that can be run safely on an ordinary house power line. Larger lathes require larger motors, which in turn may require special power lines.

The back-geared lathe is intended primarily for machining metal. It has also proved to be highly successful on plastics. However, it shouldn't be used for wood turning except as a matter of sheer necessity. You won't find this bit of advice in any of the standard lathe instruction books, but every experienced operator will agree with it heartily. The clouds of shavings produced during a wood-turning job form a sticky, messy combination with the oil and grease on the bearings and gears. Removing it all is a time-consuming chore, and you'll find that wood had better be left to the machine for which it was intended.

Any intelligent person can learn to use a back-geared lathe by himself. If your first impression is that the machine is complicated, compare the controls or adjustments on it with those on an ordinary car. On my South Bend 9-in. lathe, pictured on page 110, I count 16 handles,

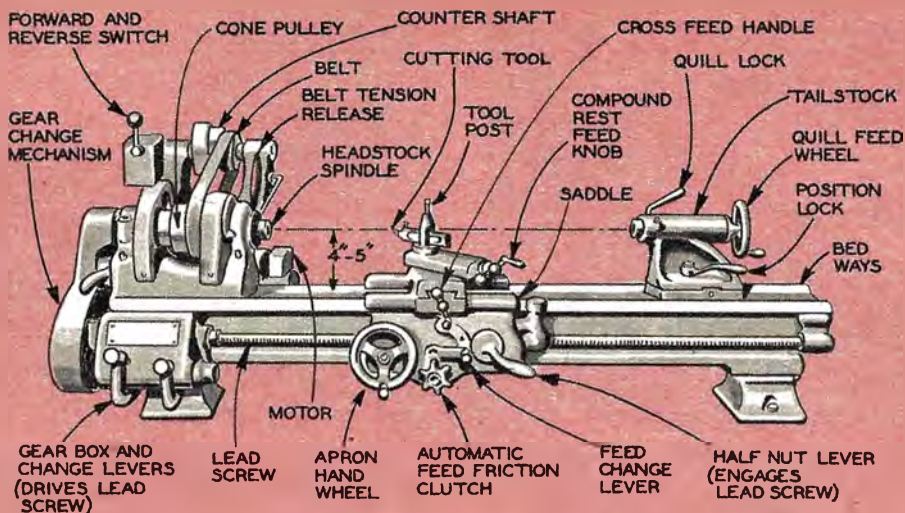
End of rod is retained by this steady rest, which has individually adjusted jaws. After jaws are positioned by end screws, tighten bolts as shown.



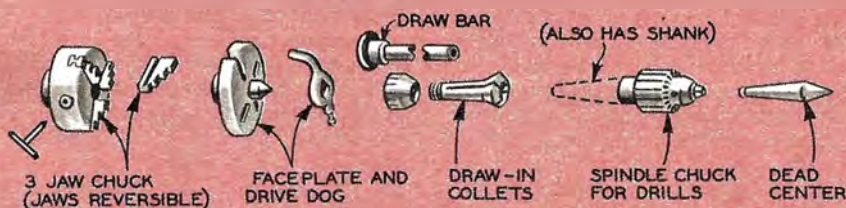
Since tool holder takes force of revolving work it must be well tightened. Side-facing bit is in holder preparatory to facing end of the rod.



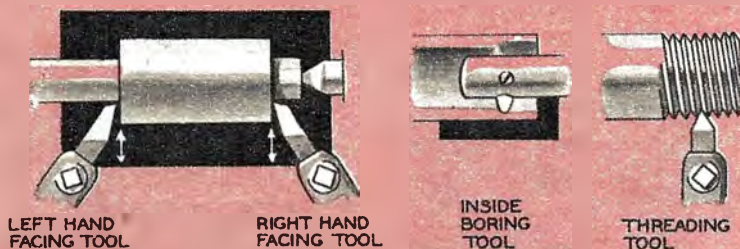
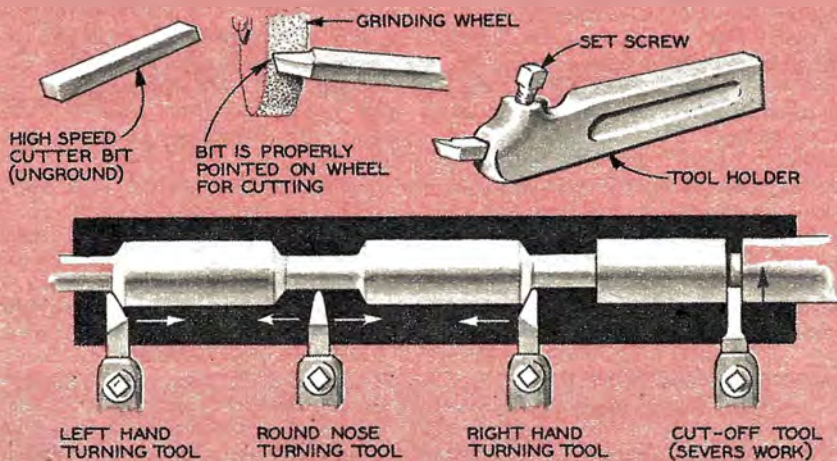




### CONTROL UNITS ON SMALL WORKSHOP METAL SCREW LATHE

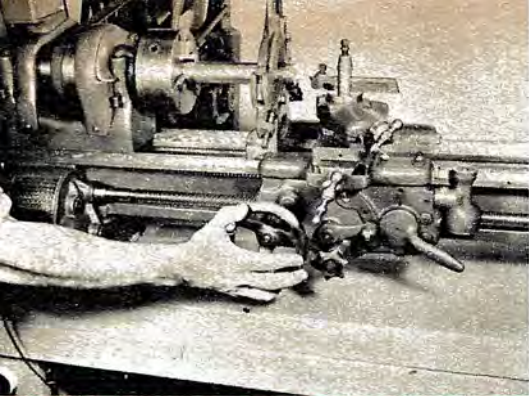


### AN ASSORTMENT OF DRIVE UNITS FOR USE ON THE HEADSTOCK

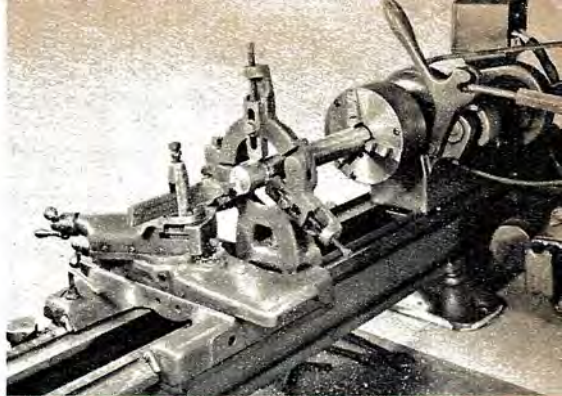


### A FEW OF THE MOST POPULAR TOOL BITS AND THEIR CUTS

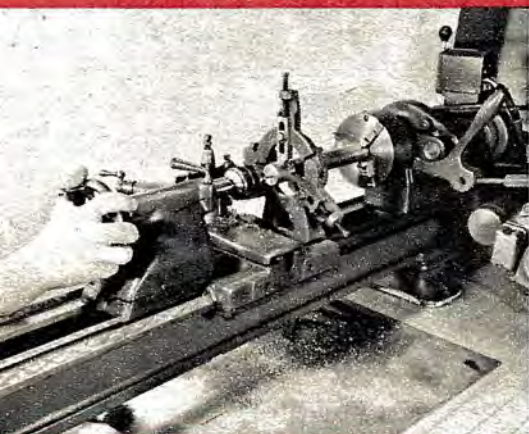




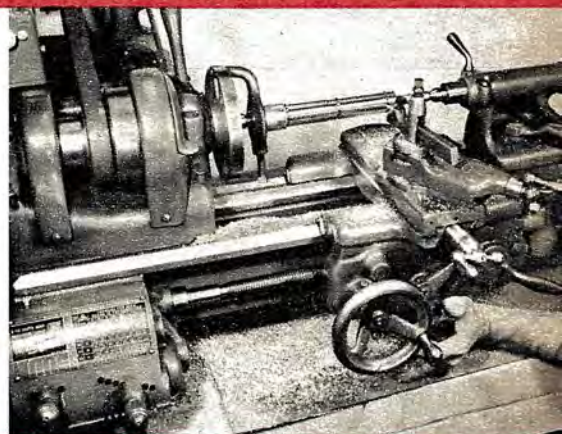
With holder properly adjusted, the carriage is moved to the left by means of the apron hand wheel until the cutter bit just touches the metal.



Squaring rod ends. Carriage is locked and tool is advanced, then faced across rod with cross feed knob. Later turning removes score markings.



Combination drill-countersink in tailstock chuck is used to make holes. The drill is advanced into the brass as tailstock wheel revolves slowly.



In turning, rod is held between centers, tool is automatically moved from right to left by the lead screw. The bed is swept clean periodically.

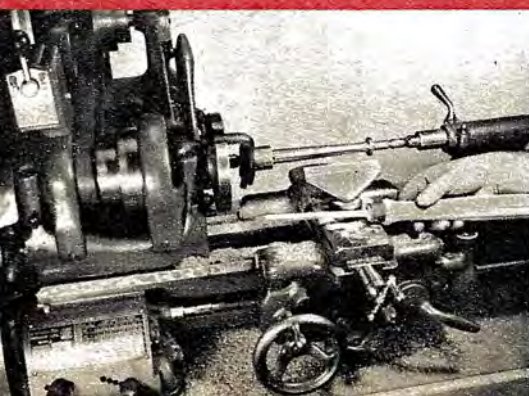
wheels, levers, etc., that can be moved or turned. On my Ford there are 25 controls of one sort or another on the instrument panel, and four more on the floor board. The lathe is anchored to the cellar floor; the car moves at speeds up to 90 mph. Frankly, I think a metal-turning lathe is easier to use than a wood-turning machine.

In the former, the cutting tools are securely clamped into position and for the most part are moved in the desired direction by the gear trains actuated by the headstock spindle. Straight turning and threading operations are virtually automatic.

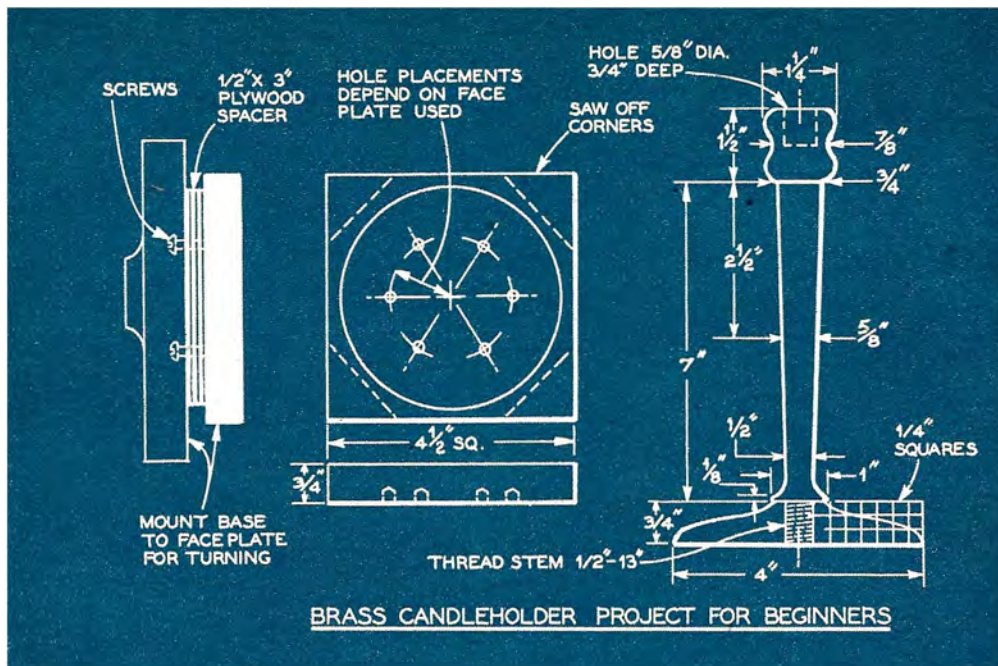
To give you an idea of what metal lathe technique is like, let's put the machine

Compound rest is replaced by T rest. Long taper was made with  $\frac{1}{4}$ -in. carbide-tipped chisel. Soft brass has no noticeable dulling effect on edge.

Bead at lower end of candlestick is formed by rolling sharp file over brass while lathe turns at high speed. Light strokes will prevent clogging.







Cutting off corners on the candlestick base will make it easier to trim. Base is attached to faceplate with 1/2-20 screws driven into threaded holes.

through a few of its paces. A good project is a solid brass candle holder. Brass is nice stuff because it turns readily, looks really beautiful as the cutting tool exposes a new surface and is easily obtainable in round and flat forms. For the upright we'll want a rod about 1 1/4 in. in diameter and 9 in. long. The base is formed from a flat piece about 3/4 in. thick and 4 1/2 in. square. We'll do the upright first, then the base, and finally assemble them by screwing the two pieces together. The finished unit appears on page 116.

The following operations will be performed: facing, drilling, boring, turning, tapering, shaping to a curve, threading, polishing and cutting off. Standard accessories and tools will be employed throughout. Follow the step-by-step pictures and

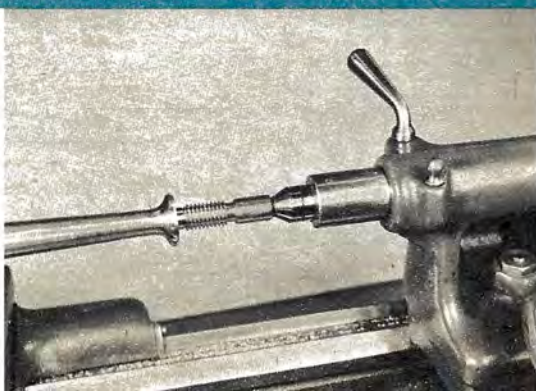
you'll finish with a pretty good idea of basic lathe work.

Making straight cuts is easy. The cutting tools can be adjusted to shave off metal along the length of the work or parallel to its face. With the compound rest, short cutting at angles between 0 and 90 degrees is likewise simple. The real problems are making straight *tapered* cuts and curved forms.

The instruction books tell you to offset the tailstock to make a long taper. Machinists cry "Don't!"—for it's very difficult to get the tailstock back on exact dead center. The voice of experience is right again. If accurate taper turning is to be done, the lathe carriage should be fitted with a taper attachment. This controls the depth of bite of the cutting tool without

Secret of clean, sharp threads is proper setting of 80° cutting tool square onto work at dead center. The gauge shown below is indispensable.

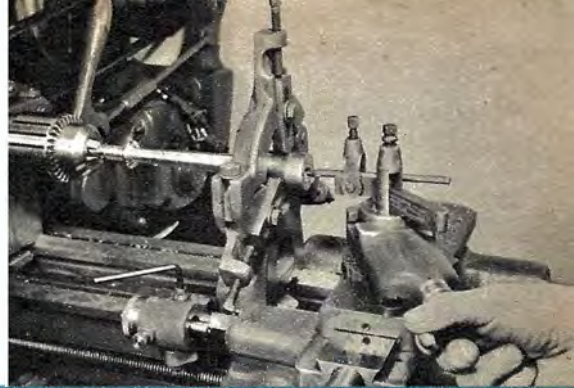
Note slightly undercut sections on both sides of threads. Extension at right will be cut off so that candle holder can be screwed to the base.







Free end beyond threads is fastened into chuck and unfinished end is held by steady rest. A 1/2-in. drill is fed to depth of 3/4 in. to hold candle.



Since 1/2 in. is not quite wide enough for most candles, hole must be bored out to about 5/8 in. with this short boring bar, using light cuts.



Carbide-tipped chisel curves curves as bored end of holder is supported by tailstock dead center with a brass plug turned to fit the hole snugly.



Strips of progressively finer emery cloth provide smooth finish. Use highest spindle speed and slowly move the cloth back and forth across work.

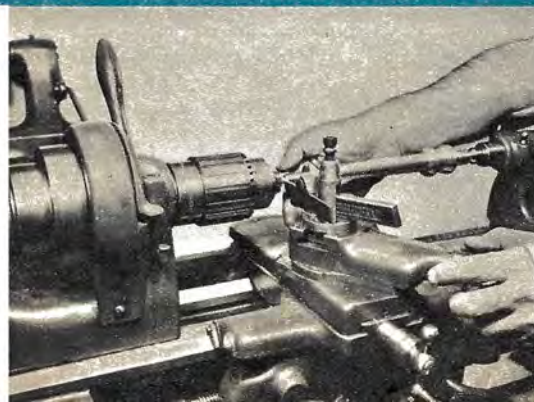
requiring any offset of the tailstock. For our demonstration purposes, we'll do the tapering by hand, with some of the new carbide-tipped hand tools with long handles, just like those found on regular wood-turning chisels. We'll use these same tools for making the curves of the candle holder and of the round base. On the market only

a relatively short time, carbide-tipped tools are a real boon to the craftsman. Brass, aluminum and various plastics give way to them like so much hard butter. Even iron and steel can be shaped into delicate curves with them if light cuts are taken.

For these hand-forming steps, the com-

Dead stock below threaded end is now removed with a parting tool. Hand is held under rod to catch it as it falls. Touch up end with a file.

Now for the base. To the faceplate attach flat stock with corners cut to ease turning. Plywood spacer protects plate from possible tool damage.







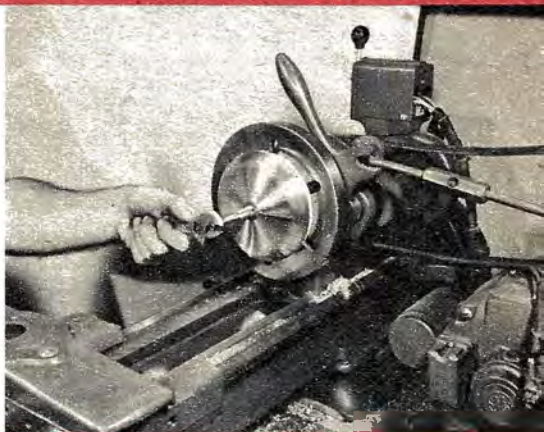
After base is rounded off, compound rest is set and base is roughly tapered. Although operation could be done with hand tool, this saves time.



Final rounding of base to shape is done with  $\frac{1}{4}$ -in. round-nose carbide-tipped chisel supported on T rest. Note tool angle and position of left thumb.



The center hole in the base is now made, but it must be tapped with a  $\frac{1}{8}$ -13 tap to accept the threaded end of the upright element of the unit.



Back gears lock headstock. Tap is inserted with a wrench. After polishing with emery cloth, remove base, screw units together—and that's it!

compound rest is removed and replaced by a T rest, intended for wood turning. The point of the tool is merely pushed straight into the brass at dead center. It is important of course to keep the body of the tool firmly on the T rest. This is done with the fingers of the left hand, while the right hand adjusts the cut.

In order to make concave or convex shapes with conventional tool bits clamped in the tool post of the compound rest, it is necessary to manipulate the apron hand wheel, the cross feed knob and the compound rest knob, sometimes all simultaneously. This is a good trick—if

you can do it at all. But with only a little practice on the carbide tools, you can form

delicate curves, beads, indentations, grooves, etc. Lathe owners who use these tools for the first time usually go slightly overboard and put too many curlicues into their work, but that's a pardonable weakness.

You will find that it's not necessary to work on ornate or complicated plans to achieve good-looking results. The project covered here proves that. Although this candlestick was kept simple in both design and construction detail, you'll agree that it's an attractive accessory for any table or mantelpiece. •





Hammer out this modern  
napkin tray as your next

# Weekend Project

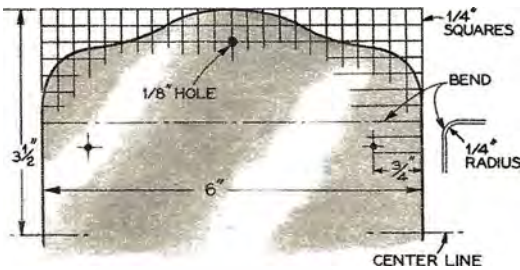


**A**NY non-ferrous metal that can be polished to a pleasing luster is fine for this job, especially aluminum, copper or brass. If either of the latter two are used they should be lacquered to prevent tarnishing.

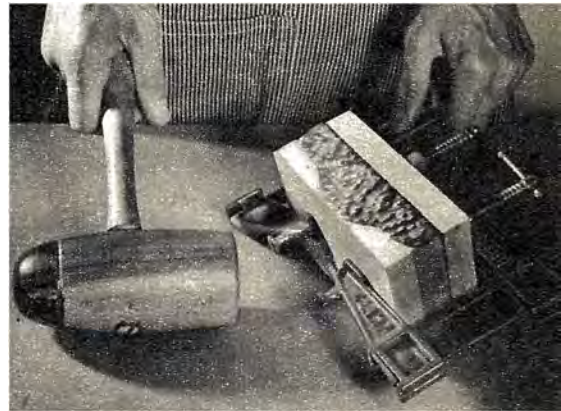
To make the tray itself cut a piece of sheet metal 6 in. wide by 7 in. long. Snip out the shape indicated in the diagram be-

low. The handle is made from 1/4-in. round rod, which is bent to the contour shown. Hammer both tray and handle, then bend the former between two blocks of wood.

A 1/2-in. diameter metal ball acts as a weight which keeps napkins in place. It is retained by a length of 1/8-in. wire passed through the center and attached to the tray sides.—*Bertram Brownold* •

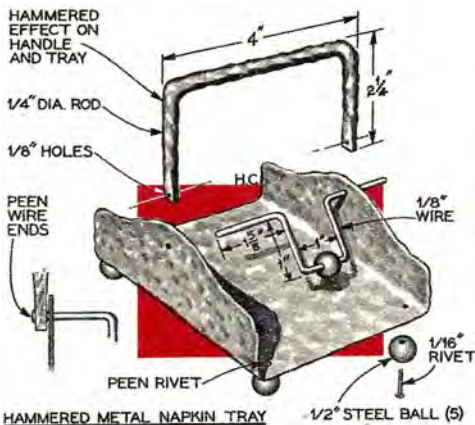


PATTERN BLANK FOR TRAY



After peening metal, bend between two clamped blocks of wood. Use mallet to get proper angles.

Optional ball feet may be riveted to tray body. These may be turned or bought in hardware store.



HAMMERED METAL NAPKIN TRAY

1/2" STEEL BALL (5)



# WORKBENCH AWARD *Winners*



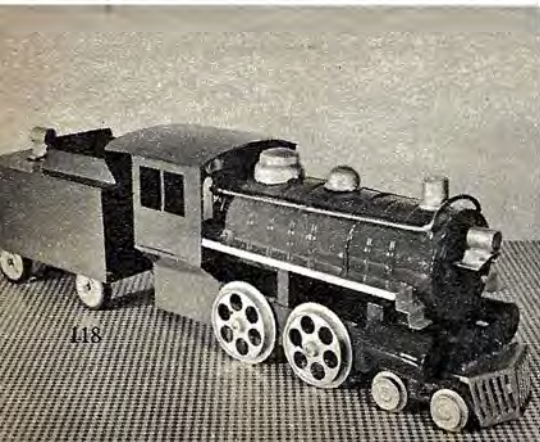
**E**ACH of the craftsmen whose projects are pictured here will receive a \$5 check and a *Workbench Award* certificate. Why not send us a photo of *your* latest project? Even if it isn't one of the winners, it may receive a runner-up *Certificate of Merit*. Send entry, with return postage, to

MECHANIX ILLUSTRATED Workbench Awards, 67 W. 44th St., New York 18, N. Y.

***Around and Around*** she goes. C. P. Parker, an Oakley, Ohio, barber, provided this unique merry-go-round for the kiddies in his neighborhood. Driven by a  $\frac{1}{4}$ -hp. motor, the carrousel will carry six passengers. The turntable has a span of eight feet and is covered with a 12-foot canopy. (Data supplied by Roy Tichenor.)

***Tin-Can 4-4-0***, built by John Janaulis of Grand Rapids, Mich., for his son, is an unusually fine example of what can be done with odds and ends and a little ingenuity. The boiler is made from tomato cans, the steam dome is a Model T hub cap, the sand dome is the top from a grease gun, and the stack, lights, and cylinders are old bushings.

***Midget Sport Car***. John Melnick, three-year-old son of Stephen Melnick, Pinawa, Canada, is the lucky owner of this fine roadster. His dad writes that the 2x5-ft. aluminum job is driven by a  $\frac{5}{8}$ -hp. Johnson engine, which is geared down to do but 3 mph. Steve spent approximately \$60 and took about 250 hours to build it.







***Twin Cabinets,*** one housing a radio-phonograph combination and the other providing record-storage space, were designed and built by F. F. Attard of Toronto. The cabinets are constructed of  $\frac{3}{4}$ -in. mahogany plywood and each is 18x18x34 in. The radio is mounted on two separate chassis and the record player is of the three-speed type.



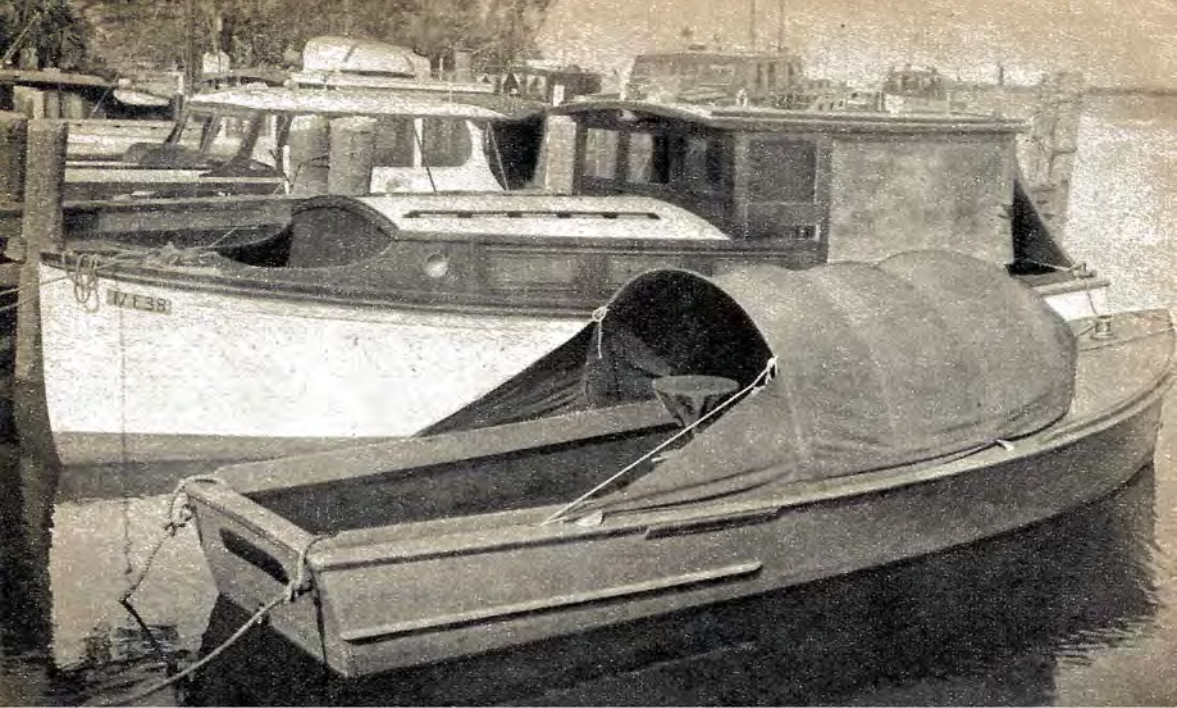
***Let There Be Light*** decided Joe Salter of Arlington, Ga.—and then he set to work. In the past three years, using material salvaged from the local junk yard and requisitioned from his father's hardware store, he has made over 100 lamps. Give Joe anything from a bird cage to a water tap and he'll transform it into a lamp!

***Model Chris-Craft.*** One of the most completely detailed models we've ever seen is this 33-in. project recently completed by Eugene Hellmer of Plymouth, Wis. Below decks it has two bunks, a lavatory, a dinette, and a galley. There are even Venetian blinds at the windows. Two small electric motors are used for propulsion.

***Miniature DC-3.*** MI Plan No. 391 was used by Ralph Webb of Des Moines when building this beautiful flying scale model of the famous Douglas DC-3. It is powered with two Ohlsson and Rice 23's. The wingspan is 48 in. Ralph installed plastic windows and added a crew and passengers for realism. The finish is silver with black trim.







# How to Make a Spray Hood

***When the spray flies or the rain falls, you can be dry and comfortable if your boat is equipped with one of these hoods.***

**I**F your boat has a forward deck, by all means make yourself one of these old-and-tried melon-style spray hoods. Either of the types shown will make the boat much more comfortable in rough water, for driven spray will be kept out. In a rain, even the simpler type will provide a protected, dry place to crouch. With the shelter type, the boat can be used for overnight trips—you can load air mattresses and a liquid-fuel camp stove aboard and sleep and eat right on the boat.

Both types use the same principle, of arched bows fitted in pockets in a canvas cover and canvas side wings to hold the hood or shelter erect. With either of them, releasing the wings and shoving the bows forward and down will leave the whole thing folded flat on deck, out of the way but always ready for use.

All the bows should be the same shape and size. This is best determined by using a length of  $\frac{1}{4}$ -in. iron rod bent to make a master pattern. If the boat has the usual side decks, shape the rod as in the sketch to have it come outside the coaming. Cut

off the ends to give the desired height above deck, usually about two feet. If the boat has no side decks, the sides of the bows should come just over the gunwales so fittings for pivoting the ends can be fastened to the inner sides of the gunwales rather than to the deck. If you are installing a shelter-type hood, the pair of travelers should also be fastened inside the gunwales. This will allow the sides of the hood to extend over the gunwales.

With all bows made from your pattern, and their ends flattened and drilled as shown, make the other needed fittings and fasten the latter to the boat. Then secure the bows in place with pins made from short lengths of  $\frac{5}{16}$ -in. rod, drilling each end of each pin for a cotter pin.

The cover can be professionally made or you can make it yourself, preferably of khaki or other waterproof duck. If you have a local professional, such as an awning maker, do the job, let him take his own measurements; but if you must order it done by mail from, say, a sailmaking concern, send them patterns as well as meas-



urements. You'll need patterns, too, if you are going to do the work yourself.

When making the patterns (from stiff paper or old canvas), raise all the bows and hold them about in the positions shown by supporting with sticks and twine. Rather than attempt to make the cover from a single piece of material, get it out in sections and sew these together. An ordinary sewing machine fitted with a heavy needle and coarse thread can be used for much of the seaming, but the heavier stitching, where several thicknesses are folded over, must be hand-sewed with a heavy needle and waxed twine.

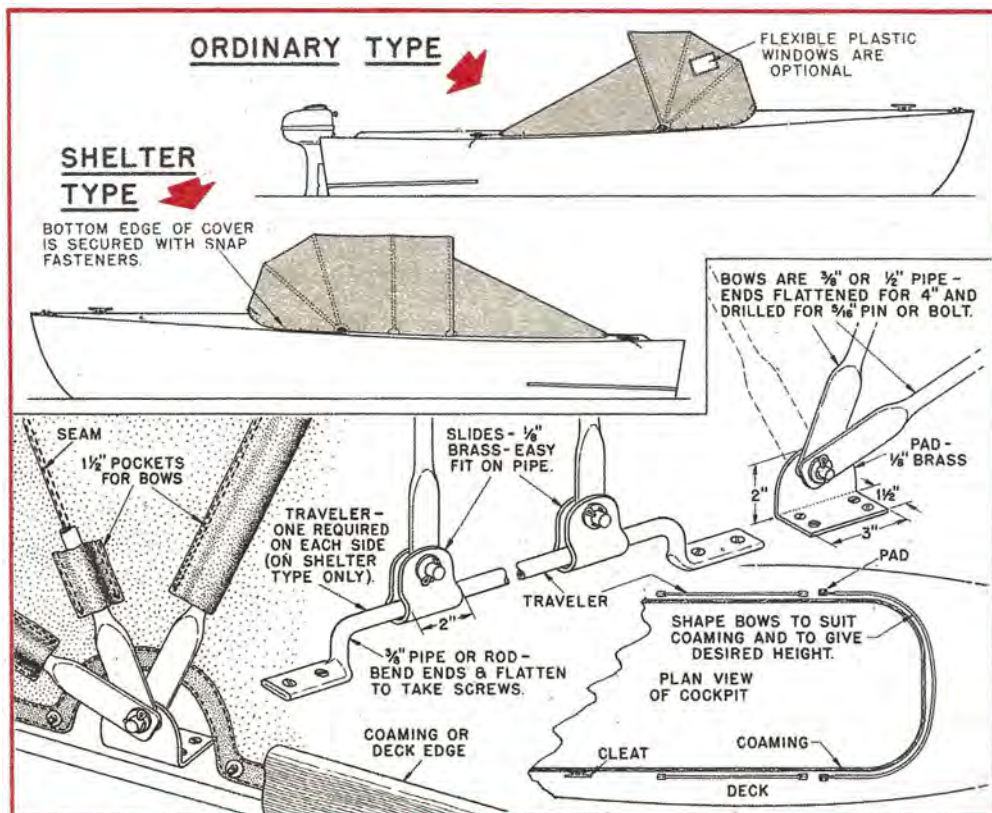
The first pattern to be gotten out is that for the section between the forwardmost bow and the deck. Allow one inch extra along the edge of the bow for seaming and three or four inches along the coaming or deck edge for turning under or hemming to take the snap fasteners that hold the bottom in place. Making sure to have the seams over the erected bows, prepare the remainder of the patterns, with edge allowances as described above. For the shelter-type hood, the straight after part can be in a single section.

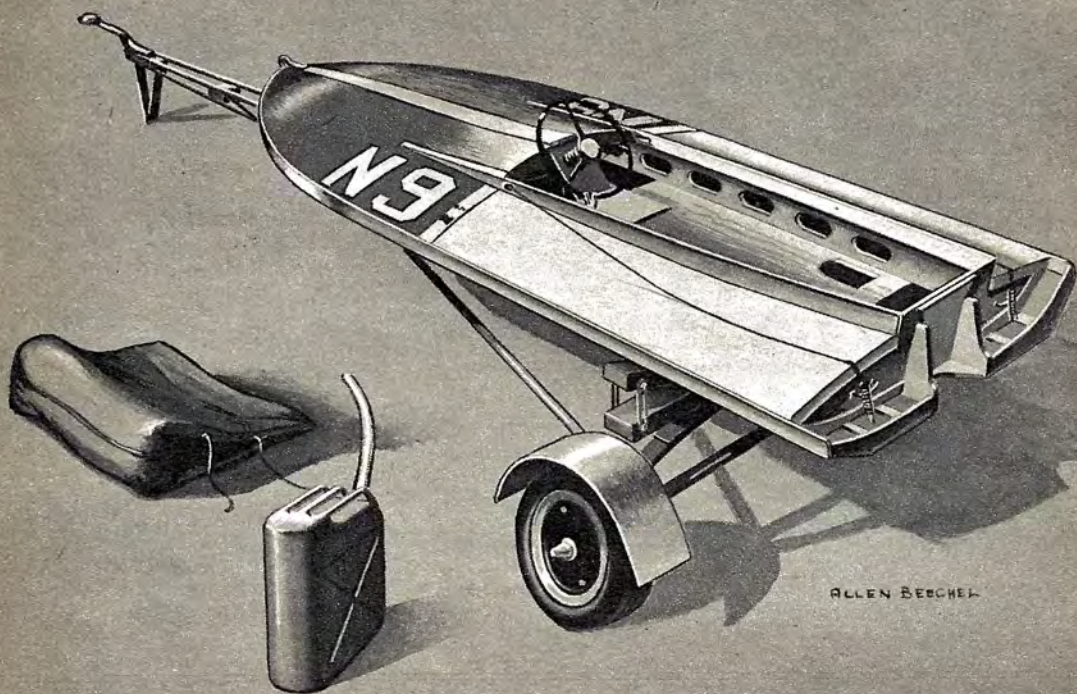
The sections, all but the wings, should then be sewed together. The seams serve as guides when sewing in place the 1½-in. pockets for the bows. Note that these all end well up from the tips to allow the cover to fold down without binding. The after edge of the hood is finished as a 1½-in. hem to take the after bow. Leave enough excess material for this when getting out the pattern.

Remove all the bows from the boat and coax them through their pockets. Put the assembly in place on the boat and adjust the cover to have it set smoothly. This will show how much the edges must be turned under to have them pull down tight. Fold the hems in place and temporarily secure them with pins; then pin the wings in position, adjusting them so the ties attached to their tips, when made fast to cleats, will pull the hood taut.

The whole thing will then have to come off for the final sewing. With this done and the hood is back in place, you're ready to fasten the forward edge. Snap fasteners are used so the hood can be removed from the boat easily at the end of the season.

—J. A. Emmett.





# VAMOOSE...Class B Outboard Hydroplane

**Over-all length: 10'-2 $\frac{5}{8}$ ". Weight: a little over 100 lbs.**

**Beam: 4'-3". Speed: about 50 mph with Class B racing outboard.**

**By David D. Beach, Naval Architect**

**T**HE summers of 1949 and 1950 saw the growth of a nationwide interest in outboard-motorboat racing. The majority of those whose interests were aroused started their racing careers with stock utility boats, which are conventional, family-type hulls with ordinary outboard motors, just as delivered from the manufacturers. For the beginner, that combination is satisfactory. For the real racer, however, who has an inherent dislike for the strictly stock type of craft, the hydros are more appealing. And for the man who wants a really hot hull—one that will allow his carefully tuned motor to perform best—this little craft is the answer.

The American Power Boat Association, 700 Canton Drive, Detroit 7, Mich., which

is the outfit that registers raceboats and sanctions races, defines a Class B hydroplane as one that weighs at least 100 pounds, including steering gear, motor controls, and permanently attached hardware. The boat is used in combination with a motor having a piston displacement of between 14 and 20 cubic inches.

The hull design of *Vamoose* closely follows several of my previously designed hydroplanes, all of which are enjoying modest success in eastern and midwestern racing circuits. It is a single-step job with a flat after plane that has substantial nontrips and parallel chines. With a 150-pound driver and a really hot motor, the boat is a 50-mph craft and will keep well up in the fleet. She weighs a mite over the minimum



of 100 pounds, all the surplus weight being in structural members designed to make the boat capable of taking the rough water of a well-churned race course. The frames are closely spaced and ample battens in the bottom provide a good measure of strength.

Let's look at the lines drawing. The first step in building the boat will be to reproduce this full size on a 4x12-ft. panel of  $\frac{1}{4}$ -in. white-painted plywood. Frame lines are on the after faces of the bottom frames. When the full-size lines are completed, frame templates can be made directly on the body plan. Allow for the  $\frac{1}{4}$ -in. thickness of the plywood bottom and the laps as indicated on the several framing details. One feature of this boat that makes the construction easier is that the bottom frames from step to transom are identical.

There is a preferred sequence in constructing a hydroplane like this. If it is followed, the boat will be rapidly and easily completed.

(1) In the drawing labeled Assembly Details, note the preliminary-framing sketch. This shows the fixture upon which the boat will be built and the two stringers that are her main structural members.

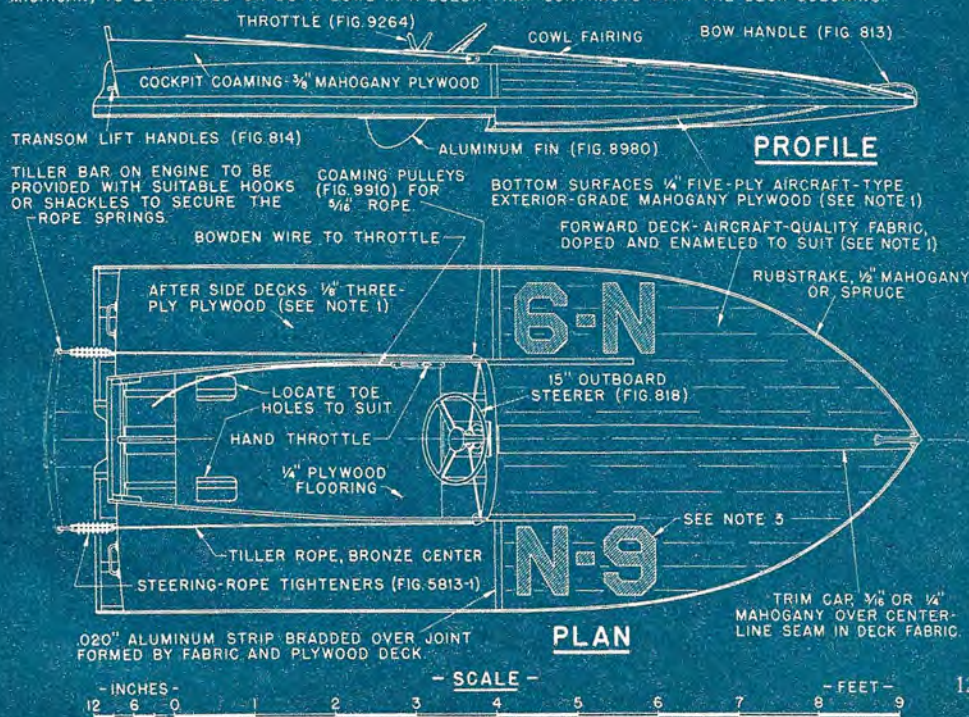
On a piece of two-by-six, erect on edge seven equally spaced one-by-sixes and level, square, and securely chock them in place. Tie strips along their ends will help. Draw a center line from end to end of this fixture.

(2) On the one-by-six crosspieces of the fixture, lay out the curve of the stringers as given on the lines drawing and construction plan. Erect suitable uprights to which you can clamp the stringers.

(3) The stringers are as shown on the construction plan and profile and are of  $\frac{3}{4}$ -in. exterior-grade mahogany plywood. They should be templated from the lines layout and carefully cut to shape. Note that the bottoms are perfectly straight from the step aft. Also note that the after ends are raked at the same angle as the ransom. Lightening holes are cut between frames. Care should be taken when cutting these holes to leave at least 2 in. of material above and below the holes and 4 in. between holes.

(4) Remembering that the boat is to be framed upside down, clamp the stringers to the uprights erected on the cross members of the fixture. Take special care that the aft ends are perfectly horizontal be-

**GENERAL NOTES:** 1. DECK FABRIC, DECK-FABRIC DOPE, ENAMEL, AND AIRCRAFT-TYPE PLYWOOD CAN BE PURCHASED FROM: AIR ASSOCIATES, TETERBORO AIR TERMINAL, TETERBORO, N.J. SEE THEIR CATALOG NO. 20.  
2. ALL DECK HARDWARE AND EQUIPMENT, IDENTIFIED BY FIGURE NUMBERS, TO BE AS SHOWN IN THE W.C. CATALOG, AVAILABLE FROM BIRBARIE MARINE SALES, BOSTON POST ROAD, BRANFORD, CONNECTICUT.  
3. RACING NUMBERS (ASSIGNED BY AMERICAN POWER BOAT ASSOCIATION, 700 CANTON AVENUE, DETROIT 7, MICHIGAN) TO BE PAINTED ON BOTH BOWS IN A COLOR THAT CONTRASTS WITH THE DECK COLORING.



cause they determine the flat after plane on which much of the performance depends. Now the work should look like the sketch labeled Preliminary Framing Detail.

(5) Cut the bottom frames from single widths of  $\frac{5}{8}$ -in. spruce. The material should be carefully selected to have straight grain with no checks, cracks, or knots. All the frames from No. 6A at the aft side of the step to No. 11 are identical. The transom frame is similar except for the angle at which it is set. Each frame forward of the step must be made from an individual template. The frame at the forward side of the step (No. 6F) is extra deep, its top coinciding with the top of the frame on the after side of the step (No. 6A).

(6) Carefully locate the frame lines on the stringer bottoms and place the frames in position, starting with No. 6A and working aft to the transom and forward to No. 3. Check the center line of each frame and then fasten a  $\frac{3}{4}$ x1 $\frac{1}{2}$ -in. tapered bracket to each stringer and frame as shown in Section C-C. Use plenty of clamps to secure the members while driving the screws. Here and in all other joints in the structure apply good marine glue to the contacting surfaces before securing in place. Immediately after driving the screws, wipe off all excess glue. If it gets a chance to harden, it'll be extremely difficult to remove.

(7) When all the frames that land on the stringers are secured, cut the notches for the keel, which is of spruce, finished  $\frac{3}{4}$ x4 in. With the keel properly fastened down into frames No. 3 to 6F and hanging out forward, fasten suitable uprights to the fixture to pull the forward end into its proper curve; then fit the forward frames to the keel. Leave the keel clamped to the uprights until the side strips are fastened to the outboard ends of the frames. Fasten the after section of the keel into frames No. 6A to the transom, using two 1 $\frac{1}{2}$ -in. No. 12 screws at each frame.

(8) When all the frames are fitted and the keel pieces fastened to them, the next piece to be incorporated in the slowly growing structure is the transom. Cut it to the proper shape from a piece of  $\frac{3}{4}$ -in. plywood. Secure it to the stringers with 1 $\frac{1}{4}$ x2-in. oak transom brackets. Drive four 1 $\frac{3}{4}$ -in. No. 10 screws through the transom into each bracket and two similar fastenings through each stringer into its bracket. Note that the brackets notch over the transom frame. The inside transom knee and outer doubler should be fitted later, after the planking is on.

(9) The next step is to install the two 1-in.-thick side strips. These are of a tough, resilient wood such as hemlock or steam-

bent oak or spruce. They extend from the nose block to the end of the after planing surface. The nose block should be shaped as shown on the construction plans and rabbeted over the keel. The side strips are beveled together at the center line on the forward end of the nose block and are secured to it with two 1 $\frac{3}{4}$ -in. No. 12 screws. Fasten each strip to each frame with a single 1 $\frac{3}{4}$ -in. No. 8 wood screw. Work from forward aft on this job, alternating from one side to the other and boring an under-size hole in each frame for each fastening so as to prevent splitting.

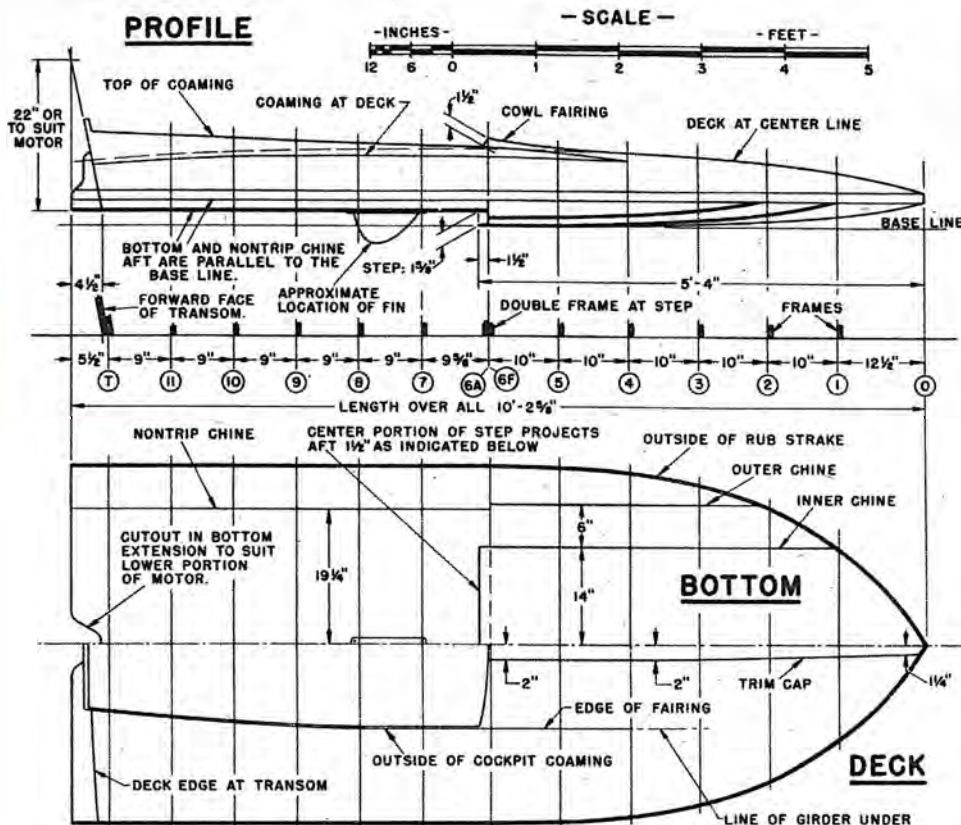
(10) The chine strips are next to be fitted. These are  $\frac{3}{4}$ x1 $\frac{3}{4}$ -in. clear spruce and are notched into the frames and beveled to suit. Note that there are two chines on each side forward of the step and but one on each side aft. The chines forward are butted to, or half-lapped into, the side strips and each is fastened with two 1 $\frac{1}{2}$ -in. No. 8 screws. Use care when beveling to have the chines match the frames, as good landings for the bottom planking are essential for a tight and strong boat. The chines are extended beyond the transom 4 $\frac{1}{2}$  in., as indicated on the construction plan. At each chine-to-transom joint, put a short length of glue-impregnated cotton wicking between the contacting surfaces. This will help keep the transom tight under the heavy vibration and pounding from the motor.

(11) Fit the  $\frac{5}{8}$ x1 $\frac{1}{4}$ -in. bottom-stiffening battens into the frames as indicated on the construction plan, extending them beyond the transom like the chines. Lap or butt them to the side strips forward and bevel them on the bottom to permit the planking to lie flush. As you did at the chines, apply cotton wicking to each of the batten-to-transom joints.

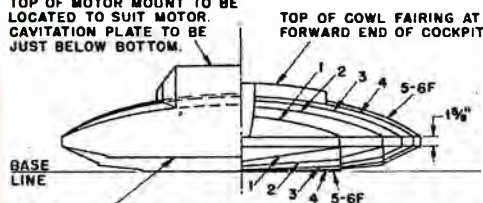
(12) The hull is now ready for the planking. Before starting to fit the  $\frac{1}{4}$ -in. five-ply aircraft plywood, recheck all beveled members. Since the planking is the tie that holds the bottom together, it must have a good surface to lie on. With a straightedge, make closely spaced athwartship and longitudinal checks. If part of the structure is too high, plane down the offending section; if part is low or hollow, carefully fit a filler and plane it down to the proper height.

(13) The first planking panels to be fitted are the after nontrip planes. These lie between the chines and the side strips and each measures about 7x60 in. Secure them to the side strips, frames, transom, and chines with glue and 1-in. No. 8 flathead wood screws on 2 $\frac{1}{2}$ -in. centers. When the glue has set, plane down the inside edges to provide flush landings for the center



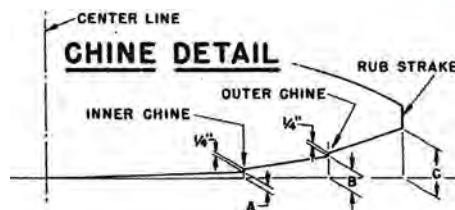


TOP OF MOTOR MOUNT TO BE LOCATED TO SUIT MOTOR. CAVITATION PLATE TO BE JUST BELOW BOTTOM.



NOTE: AFTERBODY FRAMES 6A, 7, 8, 9, 10, 11, & T ARE IDENTICAL EXCEPT FOR DECK CAMBER.

## BODY PLAN



DETAIL ABOVE INDICATES HOW HEIGHTS ARE GIVEN IN TABLE OF OFFSETS.

## TABLE OF OFFSETS

OFFSETS GIVEN IN INCHES AND EIGHTHS OF INCHES TO OUTSIDE OF PLANKING AND TO TOP OF DECK.

FRAME NUMBER	1	2	3	4	5	6-F	6A	7	8	9	10	11	T
HALF BREADTHS													
RUB STRAKE	13-7	19-4	23-0	24-5	25-3	25-4	STRAIGHT						25-4
COCKPIT COAMING							12-0	12-0	12-0	11-6	11-2	10-4	9-6
HEIGHTS ABOVE BASE LINE													
KEEL AT CENTER LINE	1-4	0-6	0-2	0-1	0-0	0-0	1-5	STRAIGHT					
INNER CHINE "A"		1-6	0-6	0-2	0-0	0-0							
OUTER CHINE "B"			2-1	1-3	1-1	1-1							
RUBBING STRAKE "C"	3-6	STRAIGHT											3-6
CENTER LINE OF DECK	8-0	9-2	10-0	10-5	10-7	11-0	11-0	11-0	11-0	10-7	10-6	10-3	9-5

panel, which is a single sheet from chine to chine. Take special care to see that this sheet fits snugly against the after face of the deep frame at the step. The edges at the chines are left square, as indicated on the sections, and the after end extends beyond the transom frame as shown. Use ample glue and clamps along the landing at the transom and stagger the fastenings into the transom and transom frame. Make certain that the plywood is pulled down hard on the transom frame and that a tight joint is obtained. This is where the boat takes the worst pounding and leaks are most likely to develop. Two staggered rows of fastenings are driven into the keel, one on each side of the center line.

(14) The bottom planking forward of the step is made up of six panels instead of three. These panels are fitted in the same order as those aft of the step, working from the sides in toward the center line. The chines are parallel to the center line, so fitting the panels will be simple. The center panels, as you will notice from the upside-down view of the completed bottom, extend  $1\frac{1}{2}$  in. aft of the step. This allows air to get in behind the step, quickly killing suction drag. Take special care when fitting the center panels to have the plywood land square and full on the bottom of frame No. 6F. Like the transom, this is where leaks are prone to develop, so a bit of extra attention is warranted.

There are just a couple of little items to be taken care of before the bottom will be completed. First, fit a filler and five brackets beneath the forward-step extension, as shown on Section D-D. The  $\frac{1}{4}$ -in. mahogany-plywood filler strip is  $1\frac{3}{8}$ x28 in. It is glued and screwed in place and should bear snugly against the forward and after-plane bottom planking. Do not force it into place, but carefully plane it to fit. The five brackets help keep the step aligned and the limber holes in them allow proper step ventilation. Place each outer bracket about 3 in. from the edge and space the remainder equally.

Second, trim off the planking panels so they are flush with the outside edges of the side strips. Since you are edge-planing plywood, go at it carefully and slowly.

(15) Before going on with the construction, the entire bottom will have to be sanded smooth, first with a medium-grit paper and finally with a fine paper. Carefully fill all the depressions over the screw heads with a good filler such as Wood-Dough. Apply it liberally with a stiff putty knife, pressing it down into the slot of each screw. Let it dry overnight.

(16) Since there are about 700 screws in the bottom of the boat, you have about 700 filled holes to be smoothed off. Sounds discouraging, doesn't it? It really isn't too bad, so let's go to work. Wrap a piece of coarse paper on a suitably shaped sanding block and, using fore-and-aft strokes, start in. The coarse paper will knock off the high spots and clean up the traces of remaining glue. Then, when you feel satisfied with the looks of things, switch to the lighter stuff and go over the bottom again. The best smoothness gauge you can use is the palm of your hand—an occasional pass of your palm over the work will advise you as to your progress. When further effort brings no further noticeable increase in smoothness, the job is finished. Carefully wipe off the dust and sweep up the chips and shavings on the floor because next we tackle the bottom varnish. Nothing is more detrimental to the "skin you love to touch" than dust in the air when varnish is going on; so do a good job of cleaning up.

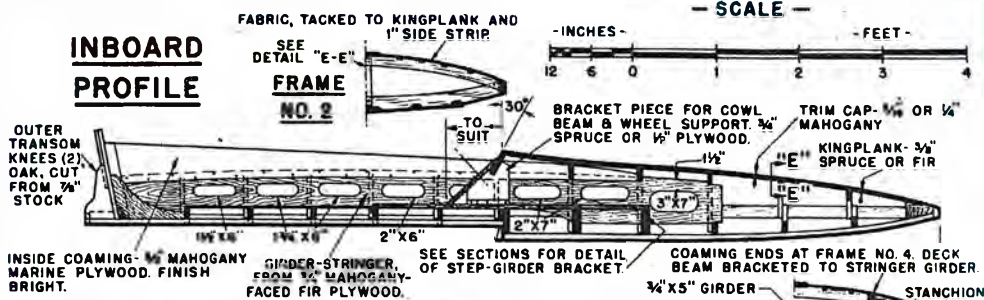
(17) When the dust has settled, put on a coat of filler and follow that with a sealer. Use non-grain-raising types, checking after they are dry for roughness of the surface. You may have to sand the bottom lightly again—you be the judge of that. Apply the first coat of varnish and let it dry well, allowing at least a couple of days. When dry, lightly sand it down with very fine paper and apply the next coat.

(18) After the second coat is dry, unclamp the boat from the fixture, carefully turn it over, and place it on a pair of well-padded horses. Saw the deck beams from  $\frac{1}{2}$ -in. spruce, as indicated on the sections, and secure them to the after faces of the bottom frames with glue and three 1-in. screws at each joint. Attention is directed to the note on the construction plan indicating that only beams Nos. 1, 2, and 3 are continuous from side to side. The remainder of the beams in the forward deck are cut for the stringers. Small chocks are fitted on the stringers to provide landings for the beam ends. Section C-C shows a detail through the short beams in way of the cockpit and indicates that the brackets are notched at the top to permit the beams to land solidly. Two  $\frac{3}{4}$ -in. No. 8 screws are driven through the top of each bracket into each beam.

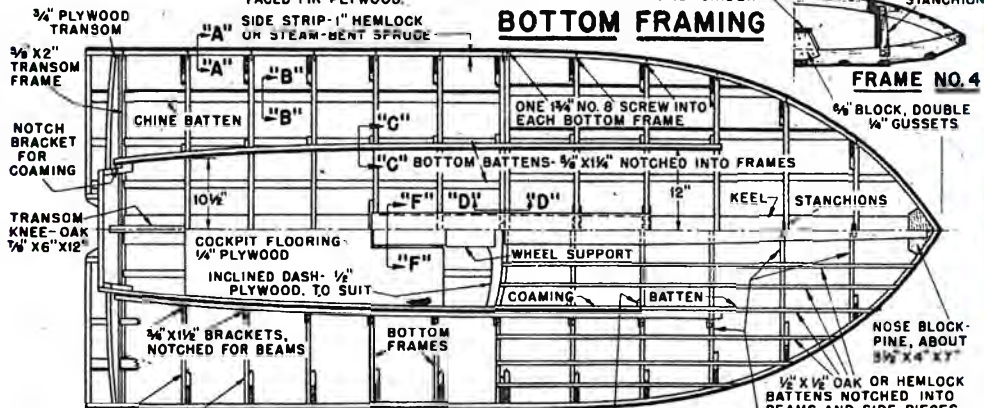
Note on the construction plan that the cockpit coamings extend from the transom to the beam on frame No. 4. These are cut from  $\frac{3}{8}$ -in. mahogany plywood and are 6 in. deep at the transom, tapering to  $1\frac{1}{2}$  in. deep at frame No. 4. They are fastened to the tops of the stringers as shown in Sec-



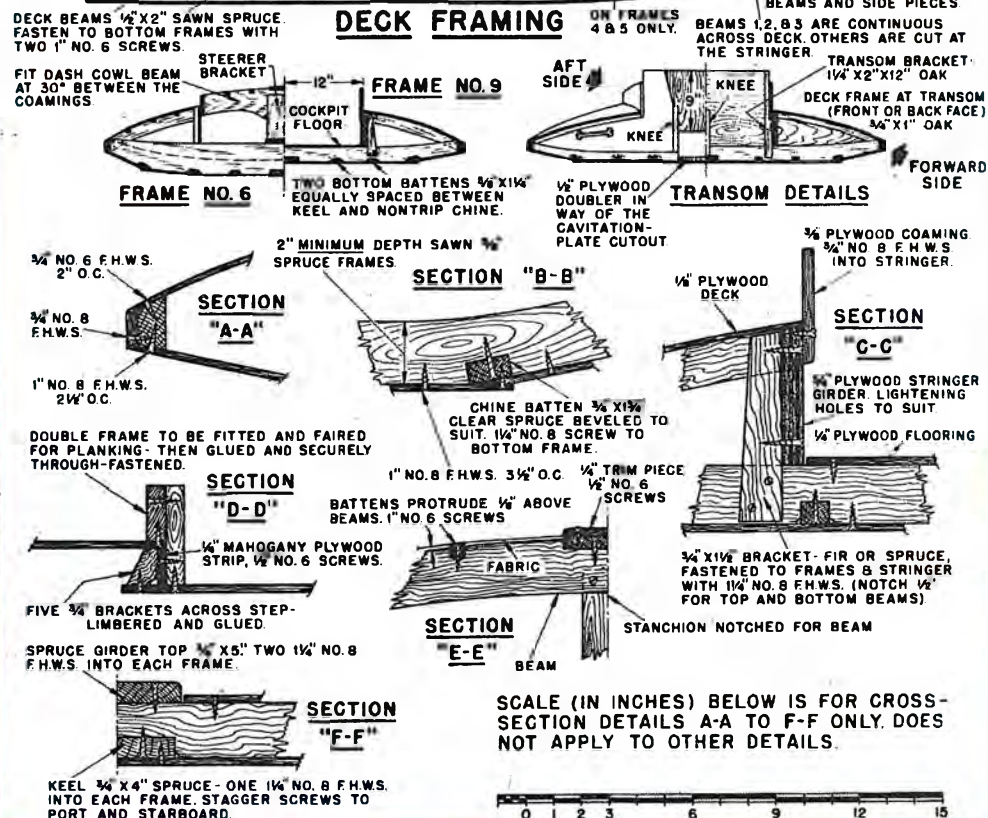
## INBOARD PROFILE



## BOTTOM FRAMING



## DECK FRAMING



tion C-C and must be fitted before installing the center deck beams on frames Nos. 4 and 5 and the inclined dashboard at frame No. 6. Note that the center portions of the last three deck beams in the forward deck are lifted slightly (see section at frame No. 6) to form a cowl. The inclined dash is cut from  $\frac{1}{2}$ -in. plywood and should be of ample depth to take the speedometer. End fastenings through the coaming secure the dash until the steerer bracket can be installed between it and the step girder, which will be fitted later.

(19) Next, finish up the transom. Note on the construction plan and on the transom detail that two knees are fitted on the after side of the transom, one either side of the cutout in the bottom extension. As indicated on the lines plan, that cutout is made to suit your motor. It should be just large enough to permit the motor to swivel without hitting the bottom extension. Before the knees can be fitted, stiffeners, sawed from  $\frac{3}{4}$ -in. oak and notched for the bottom battens and chine, are fastened at the after end of the bottom extension. Secure each stiffener to its adjacent side strip with two  $1\frac{1}{2}$ -in. No. 8 screws and to the bottom planking with 1-in. No. 6 screws on 3-in. centers. Fasten each knee with four 2-in. No. 10 screws driven through the transom, two 1-in. No. 8 screws through the bottom planking, and one  $2\frac{1}{2}$ -in. No. 10 screw through the stiffener. Fit a  $\frac{1}{2}$ -in. plywood doubler between the knees on top of the bottom planking and a second doubler on the transom itself. Secure each doubler with glue and a quilting of screws. Cut small limber holes in the knees and in the stiffeners at the battens and chine to let water drain out of the bottom extension as the boat gets underway.

(20) The step-girder top is a piece of  $\frac{3}{4}$ x5-in. spruce, 41 in. long, which is fastened to the tops of frames No. 8, 7, 6A, and 6F and to the tops of the brackets on frames No. 5 and 4. These brackets are detailed on the section at frame No. 4 and are simply blocks that are double-gusseted to the frames with  $\frac{1}{4}$ -in. plywood. The girder ties the forward and after planes together. See Section F-F for fastening details.

(21) Now let's tackle the foredeck battens. These are  $\frac{1}{2}$ x $\frac{1}{2}$ -in. hemlock, oak, or spruce, spaced equally from the  $\frac{3}{8}$ -in. spruce king plank to the deck edges and are parallel to the center line. The king plank and battens protrude  $\frac{1}{8}$  in. above the deck beams. Temporarily tack them down while you check for fairness, which is important as high or low spots will cause the

fabric decking to wrinkle. When certain that all is smooth and fair, permanently fasten the battens and king plank in place.

(22) Before closing in the boat with decking, clean the inside structure and give it a couple of coats of varnish. Nothing works quite so well for cleaning out the dust from between the frames as a good tank-type vacuum cleaner.

(23) Now you're ready to put on the decking. The  $\frac{1}{8}$ -in. plywood after deck goes on first. Carefully cut each side to fit from the transom to the beam on frame No. 6. Spread glue on the stringer tops, beams, and side strips and clamp the decking in place. Fasten it with  $\frac{3}{4}$ -in. No. 6 screws, spacing them 2 in. apart in the stringers and side strips and 3 in. apart in the beams.

The fabric deck forward is put on one side at a time, with a seam on the center line. Secure one piece along the center line with copper or Monel tacks on  $1\frac{1}{2}$ -in. centers. Pulling the fabric taut, stretch it over the edge of the side strip and tack it down from the stem to about frame No. 4. No tacks are to be driven into either the beams or the battens. Next, carefully stretch the fabric over the cowlings battens from frames No. 4 to No. 6. When there are no wrinkles, drive a line of tacks into the top of each coaming forward of the dash. This will permit you to cut the fabric carefully along the outer edges of the coamings and tack the loose edges to the stringers below. Now repeat the stretch-and-tack procedure for the remainder of the side, back to frame No. 6. Tack the after end of the cloth along the inclined dash and to the top of the plywood after deck at frame No. 6. The final touch is to glue on some pinked gummed tape along the coaming-stringer cut, over the tacks. Repeat this process on the other side.

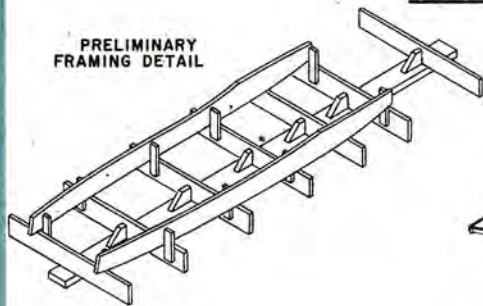
Finish the fabric with a couple of coats of good fabric dope, followed by two or more coats of colored lacquer. This is where you can come forward with a distinctive color scheme. There are no rules on the subject except that your racing numbers must be of a contrasting color to the deck. The after deck and coaming are varnished, of course, and the name of the boat is applied over the varnish.

Now she's complete except for the trimmings. Fit the wheel bracket, the inside transom knee, and the  $\frac{1}{4}$ -in. plywood flooring and ceiling; then add the hardware and trim. The fin is located about as shown, but may be moved a couple of inches forward or aft to suit your own ideas. The throttle is placed where shown on the deck plan. The wheel should be tried in several loca-

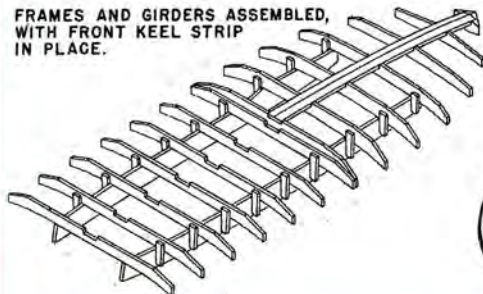


## ASSEMBLY DETAILS

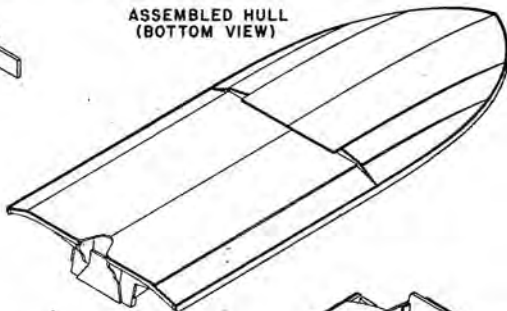
PRELIMINARY  
FRAMING DETAIL



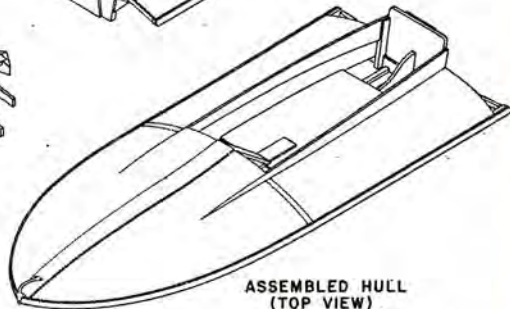
FRAMES AND GIRDERS ASSEMBLED,  
WITH FRONT KEEL STRIP  
IN PLACE.



ASSEMBLED HULL  
(BOTTOM VIEW)



ASSEMBLED HULL  
(TOP VIEW)



tions on its bracket to determine the most comfortable position. That may take several runs to determine.

That's about all. You built it—now race it; but before entering competition, get lots of practice. Engage in impromptu races whenever possible. Good luck and good racing! •

## LARGE-SCALE PLANS

will greatly simplify construction. Send \$3 to  
MECHANIX ILLUSTRATED Plans Service,  
Fawcett Building, Greenwich, Connecticut.  
Please specify Plan No. B-193.

## LUMBER LIST

(Approximate Quantities Required)

### Exterior-Grade Mahogany Plywood

Cockpit Coaming: 1 sheet,  $\frac{3}{8}$ " x 12" x 7'-0"  
Dashboard, Transom Doubler, and Bottom-Extension  
Doubler: 1 sheet,  $\frac{1}{2}$ " x 24" x 24"  
Stringers and Transom: 1 sheet,  $\frac{3}{4}$ " x 4'-0" x 8'-0"

### Aircraft-Type Mahogany Plywood

After Side Decks: 1 sheet,  $\frac{1}{8}$ " x 4'-0" x 6'-0"  
Planking, Flooring, Ceiling, Gussets, and Step Strip:  
3 panels,  $\frac{1}{4}$ " x 4'-0" x 6'-0"

Specify that all wood listed below is to be used for boat-building and is to be air-dried to a maximum of 15% moisture content. All hardwood is to consist of first, second, and select grades only. All softwood is to consist of A and B grades only.

### Spruce

King Plank: 1 piece, S2S  $\frac{3}{8}$ ", 5" wide, 5'-6" long  
Deck Beams: 4 pieces, S2S  $\frac{1}{2}$ ", 6" wide, 10'-0" long  
Bottom Battens: 2 pieces, S4S  $\frac{1}{2}$ " x  $1\frac{1}{4}$ ", 16'-0" long  
Step-Girder Brackets: 2 pieces, S2S  $\frac{1}{2}$ " x 2" wide, 7" long  
Bottom Frames: 60 lineal ft., S2S  $\frac{1}{2}$ " x 6" wide  
Step Brackets: 1 piece, S4S  $\frac{3}{4}$ " x  $1\frac{1}{2}$ ", 12" long  
Chines: 2 pieces, S4S  $\frac{3}{4}$ " x  $1\frac{1}{4}$ ", 14'-0" long  
Keel: 1 piece, S4S  $\frac{1}{2}$ " x 4", 12'-0" long

Step-Girder Top and Steerer Bracket: 1 piece, S4S  $\frac{3}{4}$ " x 5",  
5'-0" long

### Fir or Spruce

Stanchions: 1 piece, S4S  $\frac{3}{4}$ " x  $1\frac{1}{2}$ ", 6'-0" long  
Brackets: 2 pieces, S2S  $\frac{1}{2}$ " x 2" wide, 10'-0" long

### Pine

Nose Block: 1 piece, about  $3\frac{1}{2}$ " x 4" x 7"

### White Oak

Transom Deck Beam and Bottom-Extension Stiffeners:  
1 piece, S2S  $\frac{1}{2}$ " x 4" wide, 7'-0" long  
Transom Knees: 1 piece, S2S  $\frac{1}{2}$ " x 6" wide, 3'-0" long  
Transom Brackets: 2 pieces, S4S  $1\frac{1}{4}$ " x 2", 12" long

### Hemlock, Oak, or Spruce

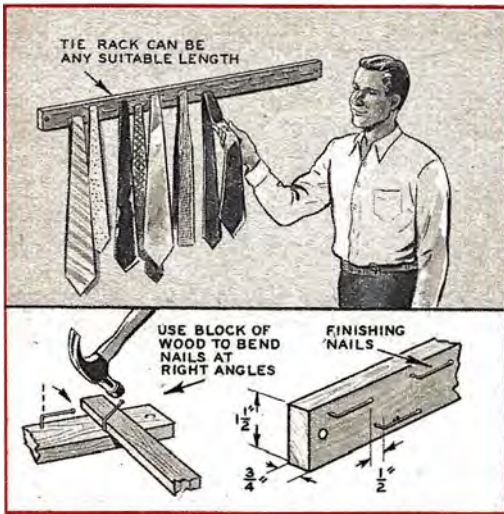
Deck Battens: 6 pieces, S4S  $\frac{1}{2}$ " x  $\frac{1}{2}$ ", 10'-0" long  
Side Strips: 2 pieces, S2S 1" x  $2\frac{1}{2}$ " wide, 16'-0" long

### Mahogany

Trim Cap: 1 piece, S2S  $\frac{1}{4}$ ", 5" wide, 5'-6" long

### Mahogany or Spruce

Rubstrakes: 2 pieces, S2S  $\frac{1}{2}$ ", 2" wide, 16'-0" long



**Simple tie rack.** This has no moving parts to wear out and does not use any hard to get materials. A piece of wood with finishing nails driven in and bent to one side and painted, does the trick.



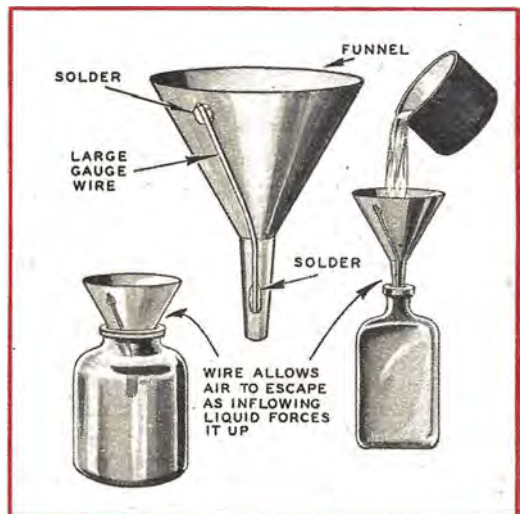
**A check** to find out how much liquid remains in that butane tank. When the tank is relatively cool pour about a gallon of water, just as warm as your hand will comfortably bear, down the outside of the tank.

## around

**Stop squeak.** Is that creaking floor getting on your nerves? It's sometimes caused by the rubbing of one floor board against another. They can often be stopped from squeaking by sifting talcum powder.



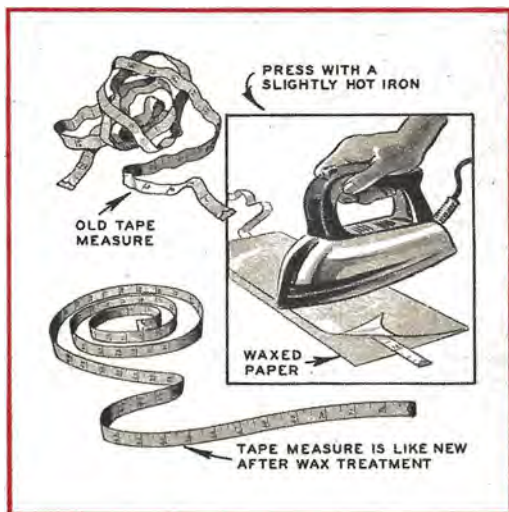
**Wire on funnel** allows the air to escape from the neck of a bottle. A piece of large gauge wire, such as solid galvanized clothes line, soldered to the side of a funnel will solve your pouring problems very quickly.







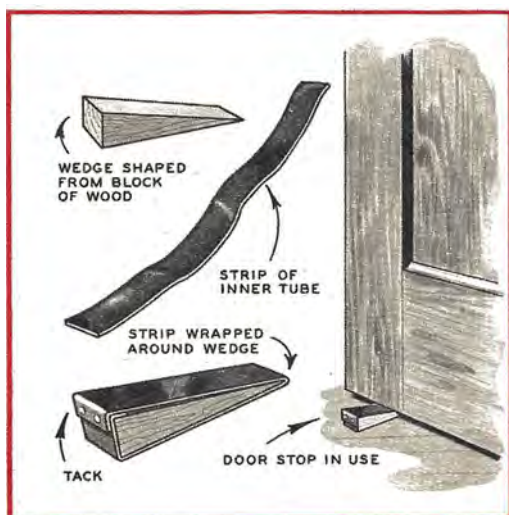
After pouring the water on the tank, wait about ten or fifteen seconds, then run your hand slowly down the side of the tank. Quite a sharp change in the temperature will easily be felt at the liquid level.



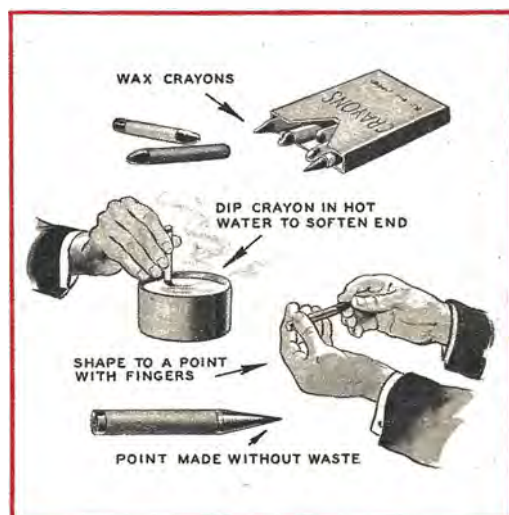
**New life** for the limp tape measure. You can give it a new lease on life again if you place it between two sheets of waxed paper and press it with a slightly hot iron. It will be stiff and easy to use once more.

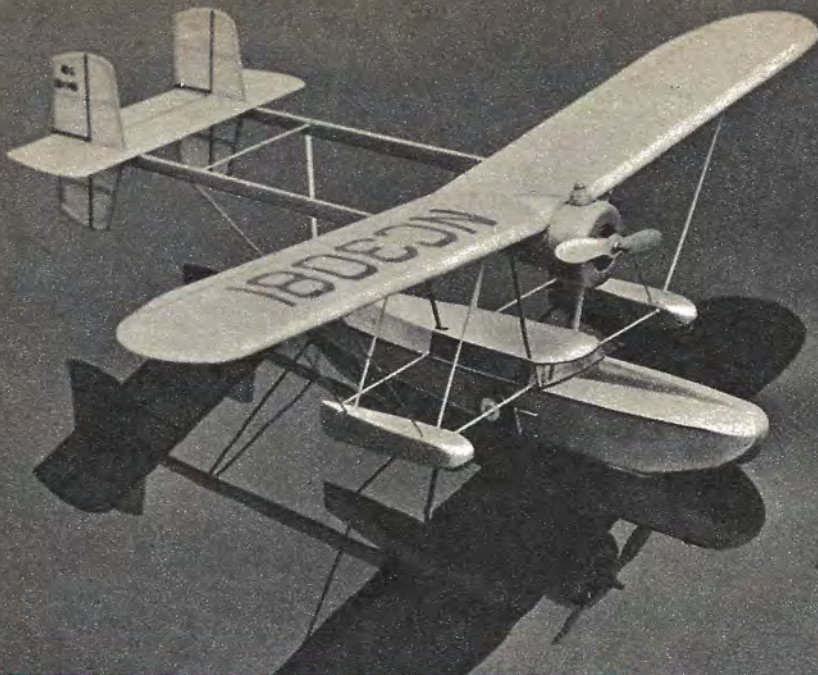
## the house

**To make** a good door stop use a wedge shaped board and a strip of inner tube. Stretch the rubber strip tightly around the thin end of the wedge and tack the ends firmly to the thick end, as shown below.



**Economical way** to sharpen wax crayons, is to get a can of hot water and dip the crayon's tip in it for a minute or two. You can then easily shape them into a good point. They will last longer and work better.





# Sikorsky Amphibian

The finished model after it had successfully completed twelve test flights with no mishaps.

***This twenty-eight-inch free flight scale model is a sterling performer over land or lake. Power with any .020 to .049 engine.***

***By Dick Ealy***

A WHOLE new field of model building was created by the production of the baby engines which are especially good for powering scale model flying ships. We decided to build a model of the Sikorsky S-38. It satisfied the desired qualities of good appearance, with a high wing for stability and simple construction. The general appearance of the original plane has been retained, but some small changes have been made for simplicity and to improve the model's performance.

Igor Sikorsky's flying boats were both rugged and reliable, so that quite often they were chosen for pioneering new air routes.

It was the Sikorsky S-38 that Colonel Charles A. Lindbergh used on his Central American trail blazing flight for the Pan-American Airways.

Study the drawings and read the instructions carefully before starting construction.

Start to work on the hull first. It is built inverted on the top view of the drawing. Cut out  $\frac{1}{16}$  in. sheet formers and place in the proper position over the  $\frac{1}{8} \times \frac{1}{4}$  in. backbone spar. Make sure the formers are vertical while the cement dries. Next cement  $\frac{1}{4} \times \frac{1}{8}$  in. keel from B to the tail end. A piece of  $\frac{1}{16}$  in. sheet is used for the keel from A to B. Place the  $\frac{1}{16}$  in. square sheer and chine

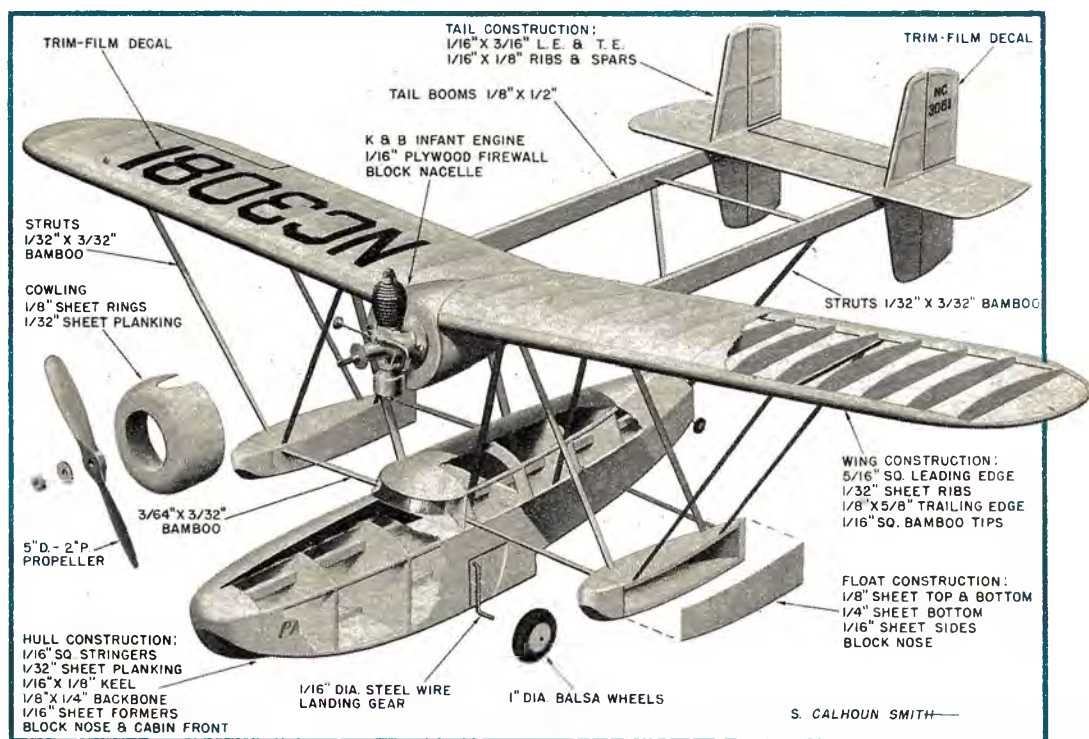


stringers and cement well. Make the retractable landing gear and install as shown in detail. Plank bottom of hull with  $\frac{1}{32}$ " x 3 in. sheet balsa. Work forward from E with another piece. Make paper templates of cut-out for landing gear on the side planking. Slip side panel, made from  $\frac{1}{32}$ " x 2 in. stock, over gear and cement in place. Now you can lift the hull from the board and turn right side up. Cement formers AT, BT, etc. in place. The dash board is the same as CT. Add the cabin stringers made from  $\frac{1}{16}$ " in. square balsa. Make the tail post from  $\frac{1}{16}$ " x  $\frac{1}{8}$  in.

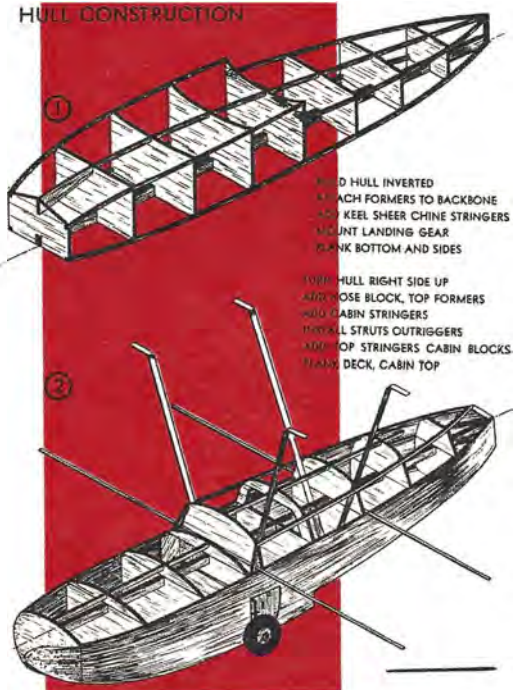
Split bamboo is the best for the main struts. Bend as shown over a candle flame or gas jet. You might substitute .040 in. steel piano wire. Cement these struts with several coats of cement. Mount the outrigger bamboo or .040 in. wire as struts as indicated in the plan. Place the  $\frac{1}{16}$ " x  $\frac{1}{8}$  in. top stringer in its place and cement it. Plank deck and cabin top with  $\frac{1}{32}$ " x 3 in. sheet balsa. Cement oversize nose block and the fore and aft cabin blocks in place. Trim on assembly as illustrated. Sandpaper the entire hull with some No. 4/0 sandpaper and then brush on two thin coats of clear dope, then sand again. Cover hull with Jap tissue and give it three coats of thin silver dope, sanding it between each coat. Cement

.010 in. celluloid windshield and windows on last.

Make the wing next. Cut the ribs as indicated and assemble the frame on a flat surface. Omit the center rib until later. The wing tip should be made of bamboo. Bend a piece  $\frac{1}{16}$ " x  $\frac{1}{8}$  in. over a flame and split to make two identical tips. Balsa tips made of  $\frac{1}{16}$ " in. sheet may also be used. Notch spars at the center and crack, to form  $\frac{1}{4}$  in. dihedral at each tip. Add  $\frac{1}{16}$ " in. sheet balsa gussets and flush bottom inserts for boom and nacelle attachment. Round off the leading edge and sandpaper the frame. Mount the wing as shown in attachment detail. The bottom of the wing and the base line should be parallel. Make the tail booms from  $\frac{1}{8}$ " x  $\frac{1}{2}$  in. stock and taper as shown. Cover them with Jap tissue and clear dope. Give them three coats of thin silver dope, sanding lightly between each coat. The horizontal tail and two vertical rudders are made next and covered with yellow Jap tissue. Brush on two thin coats of thin clear dope. Cement both booms in place on the bottom of the tail. Slip the vertical rudders over the tail from the rear and cement them in place. Mount the boom and the tail assembly to the underside of the wing. There should be zero incidence between the tail and wing under surface.



## HULL CONSTRUCTION



Carve the engine nacelle and hollow it out as shown. Make the firewall from  $\frac{1}{16}$  in. plywood and drill to fit your motor. Attach your engine to the firewall. Give both surfaces several thin coats of cement before cementing the firewall to the nacelle permanently. Cover the nacelle with strips of Jap tissue and clear dope. Brush on three thin coats of silver dope and sand between each coat. Use the same cementing procedure in attaching the nacelle to the wing bottom as used for the firewall.

Cover the wing frame with yellow Jap tissue and shrink with water before brushing on four thin coats of clear dope. Make balsa engine cowl and cover with tissue and clear dope. Give it three coats of thin silver dope and attach to the tank as shown.

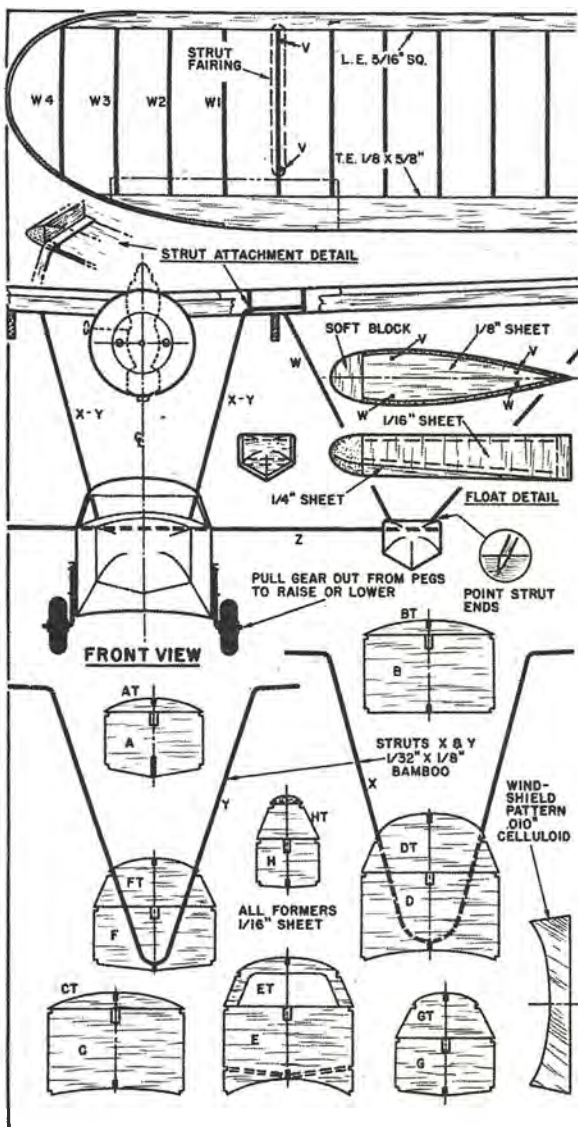
Build the floats inverted and cover them with tissue and clear dope and then apply three thin coats of silver dope. Attach the outrigger struts and add the remaining struts and paint them silver. Cement the

## FULL-SIZE PLANS

of this model can be obtained by sending 50c to MECHANIX ILLUSTRATED Plans Service, Fawcett Building, Greenwich, Connecticut. Please specify Plan No. 421.

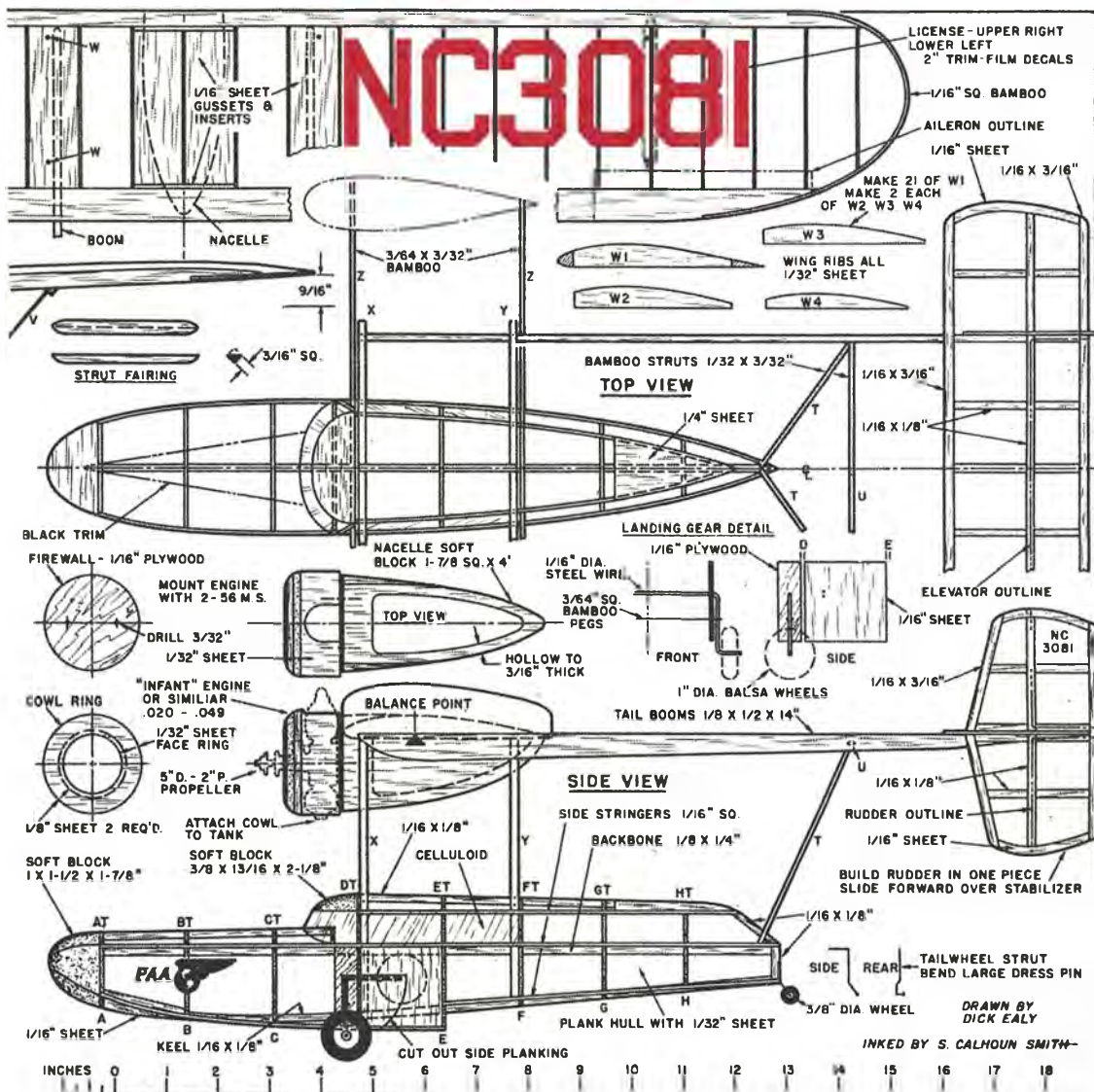
tail wheel to the rear end of the hull.

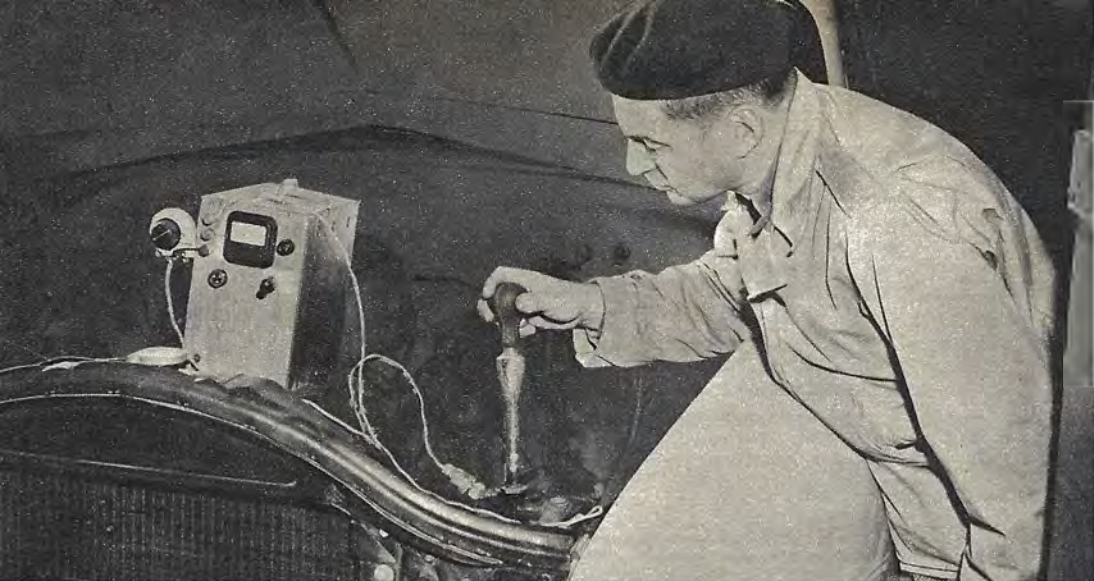
Decorations such as the Pan-American insignia, window frames, ailerons, rudder and stabilizer, outlines and license can be cut from black tissue or Trim-Film decal. A coat of hot-fuel proofer over the entire model will preserve the plane much longer and it is recommended. The original model balanced at  $\frac{1}{3}$  of wing chord. Glide by hand over grass before you make a power flight to check its balance and stability. A little right rudder may be used to circle the model. Hand launch your model for test flights before trying flights from ground or flights from water. The ship will climb fairly fast and glide nicely so be ready to chase your flying boat.





One of the important things to remember when flying your scale model plane is the same thing that pilots of all amphibians worry about, the landing gear. You can get into as much trouble on a smaller scale if you have the gear in the wrong position for a landing. More than one pilot has had quite a surprise as he tore the belly out of his plane by not having the gear down. •





# mi battery charger



***Winter weather is no threat if you make this heavy-duty unit, which also doubles as a variable low-voltage supply plant.***

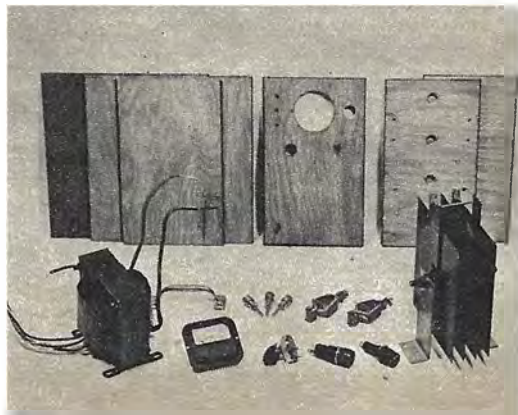
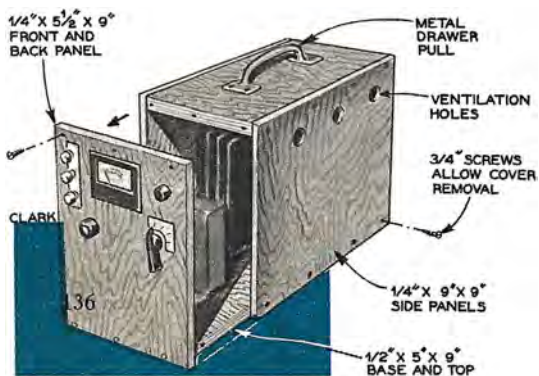
A sudden cold snap has descended overnight. As you open the garage door with shaking fingers you recall that you haven't been doing much driving, and you pray under your breath that the battery still has enough strength to kick over the motor. As you timidly press the starter

button your fears are realized: all you hear is a short, stifled groan as the congealed oil in the crankcase and the stiff grease in the transmission succeed in resisting the weak efforts of the starting motor.

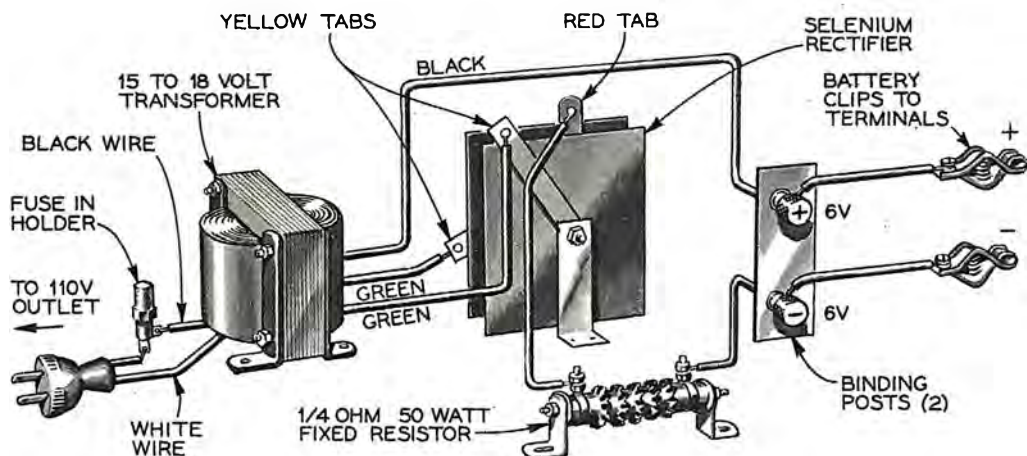
You won't go through this exasperating experience again [*Continued on page 184*]

The convenient carrying case is built from 1/2-in. and 1/4-in. plywood. Finish with a coat of shellac.

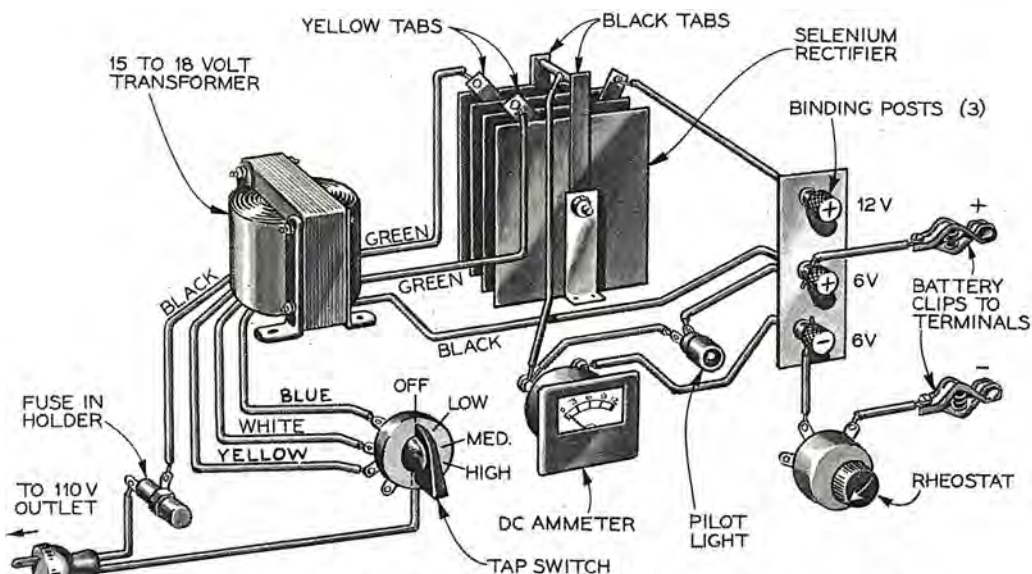
The main charger parts before assembling. Note series of ventilation holes on panel at right.







A transformer, rectifier and resistor are the three basic elements of this simplified battery charger.

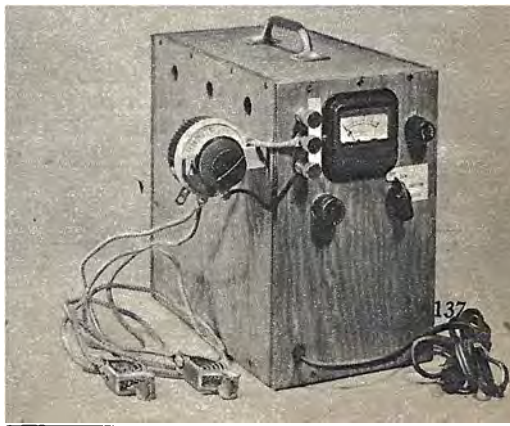
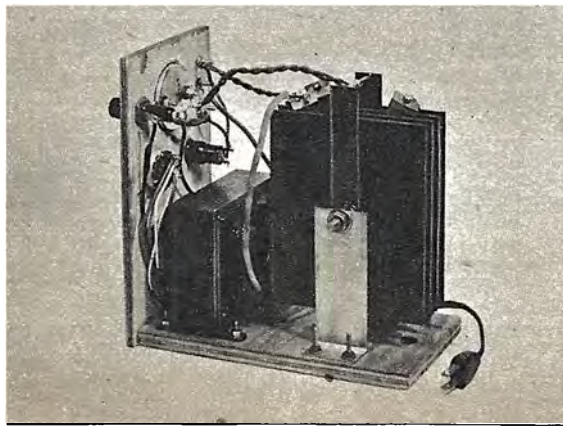


The basic unit can be adapted for low-voltage current supply by adding new parts shown above. Minus lead from rheostat is common to 6 and 12 v.

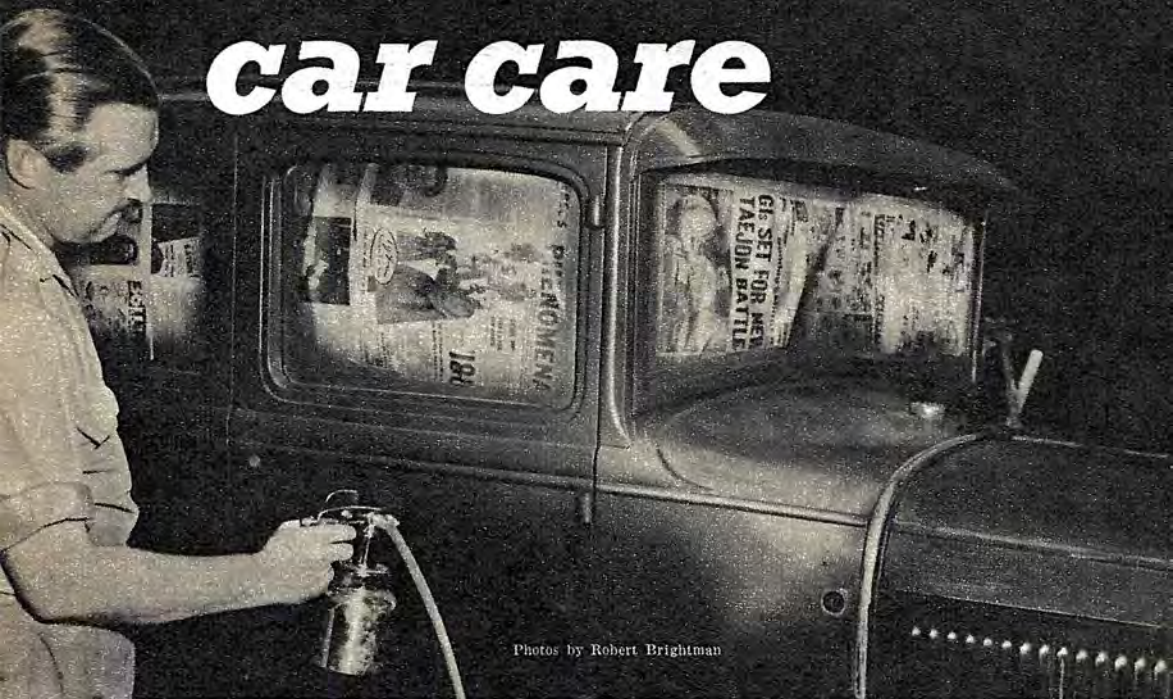
H. CLARK

Inside view. The wiring is very simple and the entire job shouldn't take more than an hour.

Ready to go. The sturdy finished instrument has been designed to give you service for years.



# car care



Photos by Robert Brightman

## ***Spray—for a factory finish***

**By Frederick C. Russell**

**R**ESTORING the old car's showroom complexion may seem like a project to consider after you've finished paying for last year's vacation and the new television set but, take it from MI, you can do the job yourself at surprisingly low cost. The know-how is so easily acquired there's no excuse for driving around in what used to be the family's pride and joy.

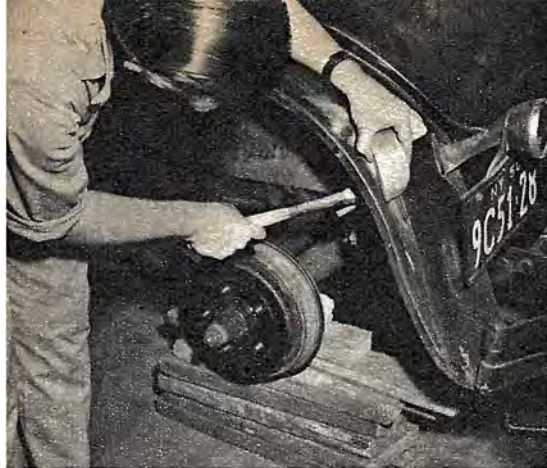
Let's assume your case is average and that you are starting with a car already painted and not from bare metal. There will be some bumping out to do on that fender that nudged a stray telegraph pole and this will result in getting down to bare metal in spots. Rusted areas should also be removed. Check first to find out how the metal surface of your car was originally treated at the factory. Should this surface be bonderized, for instance, it is best not to sand as this removes the protective coating. Instead, wash with cleaner's naphtha. All this is tedious when you're eager to shoot the spray gun, but remember that the better the preparation of the surface the more the neighbors will be inclined to holler, "Where'd you get the new bus?"

In the trade it is considered good business to refinish in lacquer if the original

finish is that type; or in synthetic enamel if this was the assembly line covering. Color coats can be applied directly to the present finish after going over the surface with a good cleaning preparation that will remove all grease, wax and polish, or it can be added after a coat or two of primer surfacer. Right here is where you have the choice of making the job ordinary or de luxe. Considering the time spent on smoothing out the evidences of collision and the interest you are putting into the project there's much to be said for the latter. Incidentally, it is this matter of priming which largely accounts for the big difference in prices quoted by Gasoline Alley for paint jobs.

If the original paint is a color likely to bleed, such as maroon, you can use a coat of aluminum before the finish color. But, regardless of the color scheme be sure to go over the old surface as carefully as possible in order to feather out all spots made by chipping or rusting. A disk sander would be a good investment at this point because you can use the buffer for waxing later. The best job is had by applying a primer surfacer (which has some pigment) and then sanding with wet sandpaper. A good primer is quite





It is best to remove wheels in order to get plenty of working space when beating out dents. Use a pair of axle jacks or heavy blocks to support car.



No primer can substitute for good metal work. A hammer and a pair of dollies can be purchased for as little as \$1.29 at many auto chain stores.



The next step is to go over the entire body with No. 320 emery cloth, moistened with water. Do a panel at a time and wipe dry with a cloth.

For best results follow manufacturer's instructions for mixing. In this case one gallon of lacquer is being reduced with three gallons of thinner.



In order to remove all polish, grease, wax and fingerprints, entire body is wiped down with a cleaning preparation such as Dupont's Prep-Sol.

Adjust the air and lacquer mixing valves and test the results on a large piece of cardboard. The machine is a Speedy Sprayer, made by W. R. Brown.







Masking is a tedious but essential job. Use newspapers and masking tape. Fittings, which are not to be sprayed, should be covered or removed.

If you haven't a mechanical polisher, you will have to do your compounding by hand. Go over the entire car if you want that factory finish.



effective for filling and dries quickly.

What the primer does is to prepare a smooth finish for the color coats. If you are doing the de luxe job you'll also want to use a glazing putty for filling in those small imperfections, which may not look like much in the rough state, but which may be cause for apologies later. Preferably select No. 320 sandpaper and use it on the surface after first wetting in water. Naptha wetting may soften the under coat.

The rest of the job is clearly pictured and detailed in the captions, but the project must be smoothed out with some consideration for painting difficulties. Dupont uses five pages in a refinishing book for dealers in order to point up the causes and cures for the odd things that may happen when the spray gun goes into action. For example, there are shrinking and splitting of the primer surfacer which may be due to



Spraying requires a knack. Start from the top and work down. If old color bleeds through, a light coat of aluminum lacquer may be necessary.

After compounding, waxing is in order. Use a good grade of automobile wax. Apply with a dampened cloth and polish a single panel at a time.



careless preparation of the surface, too little time for drying between coats, fanning of the air to force drying or applying on a too cold surface. Orange peel is just what the term applies. It is due to improper atomization, too much air or gun too far from the work. Lifting results when lacquer is applied to a car whose previous finish may have been an oil base paint. If such is the case with your car it will be necessary to seal the old paint with aluminum lacquer. Crazing, cracking and checking result from applying top coats before the undercoats are dry.

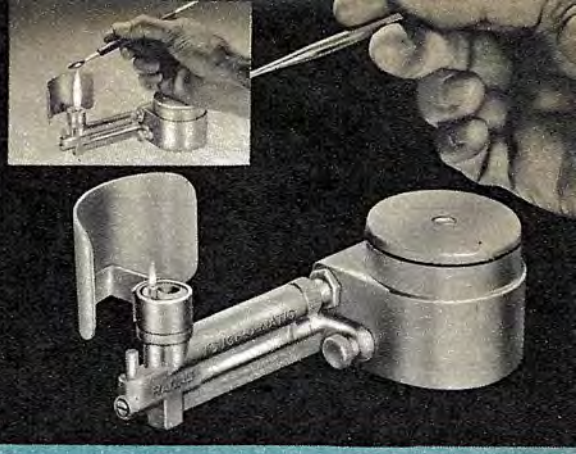
Chalking is a rather natural condition, a result of the gradual breaking up of the film when the surface is exposed to sun and weather. One way to retard this action if the car has to be left outdoors a lot, is to use a mist coat that is mixed with a slower-drying [Continued on page 175]



# NEW for the SHOP



This E-Z tool is designed to strip the insulation from wires used for electrical work in one operation. Can also be used for stranded copper wire. Made by Ideal Industries of Sycamore, Ill. Sells for \$5.25.



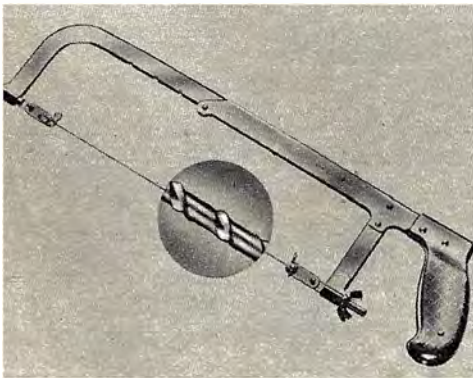
An automatic Bunsen burner that flames only when needed has been introduced by Hanau Engineering Co. of Buffalo. Slight pressure of the hand on the platform causes a pilot light to ignite the gas.



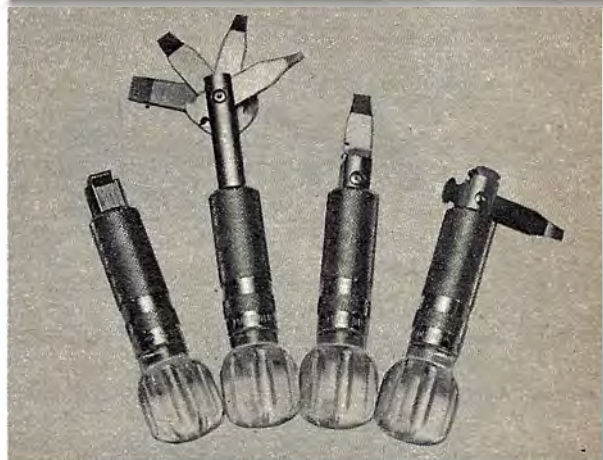
Unusual bolt cutter that operates in a vise has a pair of spring-loaded hardened steel cutters. Sells for \$2.95. Will cut bolts and mild steel rods up to  $\frac{1}{4}$  in. in diameter. In-A-Vise Co., Compton, Cal.



New gear-driven saw attachment for  $\frac{1}{4}$ -in. drills has an adjustment to control depth of cut. It is designed to be used with one hand. Manufactured by Federal Engineering of N.Y.C. Sells for \$9.95.



Spiral blade hack saw set made for cutting sharp curves in metal is offered by Dock's Tools of Los Angeles. Set of adapters and three hardened blades sell for \$1.00; blades are 25 cents each.



Pocket screwdriver has four heat-treated retractable blades to fit screws from No. 1 to No. 14. Can be used with blade at offset position. Made by the Shelton Plane and Tool Co. to sell for \$1.50.





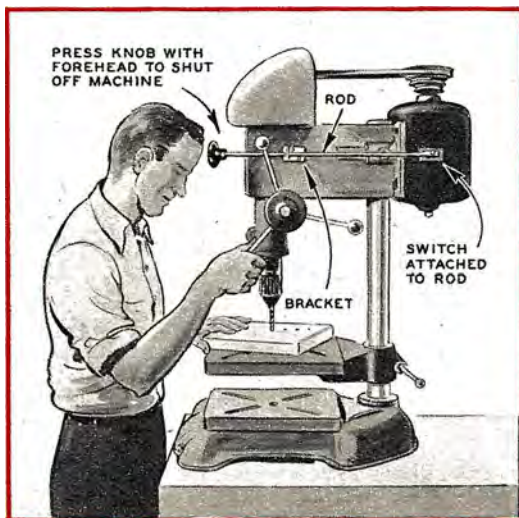
**Liquid hide glue** will always be ready for instant service if the can is kept warm on the top of your furnace. Fasten a small brush to the can with a rubber band so that you always have an applicator ready.



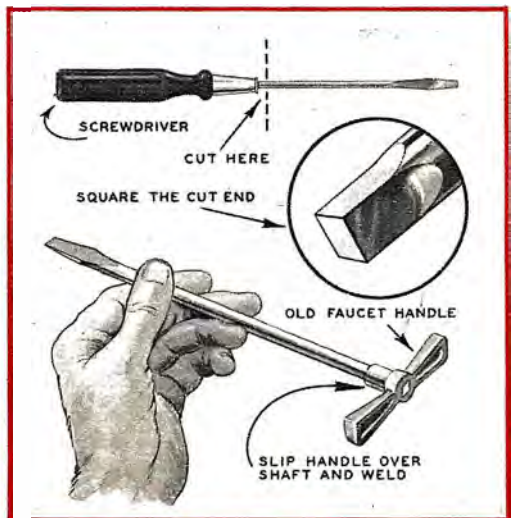
**Chain painting** is always a bit of a problem. However, if you reverse ordinary procedure and bring the chain to the paint, the job is a cinch. Wipe off the excess and hang chain on a clothes line to dry.

## SHOP SHORTS

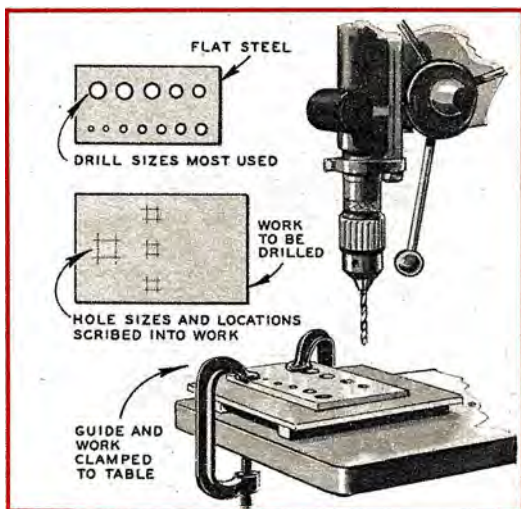
**Drill press accidents** occur if your hands are too busy holding work to turn off the switch in time. Such mishaps can be averted by rigging up this emergency switch. Forehead pressure stops machine.



**Heavy duty screwdriver** can be made from a water faucet handle and a screwdriver whose handle is split or battered beyond use. Cut off blade and square the end so that handle fits snugly. Weld together.





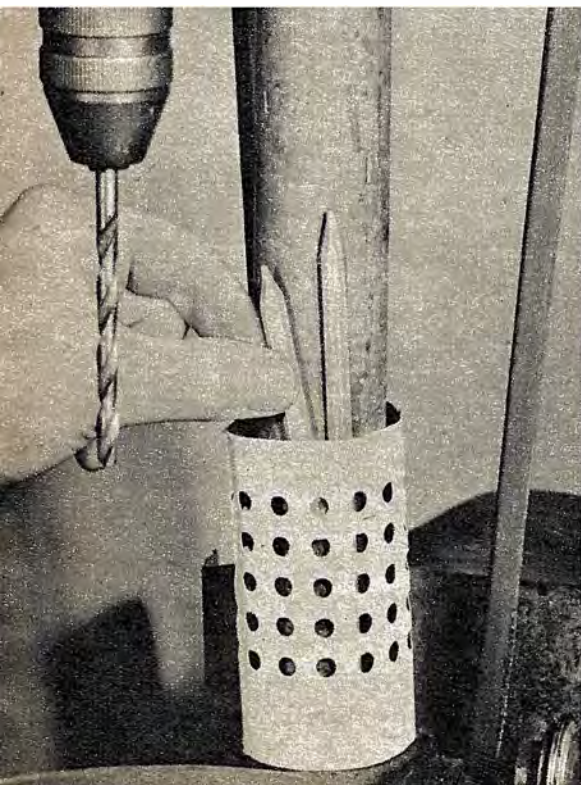


**Shop-made guide** increases accuracy in making holes. Drill series of holes through a piece of steel. "Box in" desired hole size on your work and place respective hole in guide over it. Clamp before drilling.



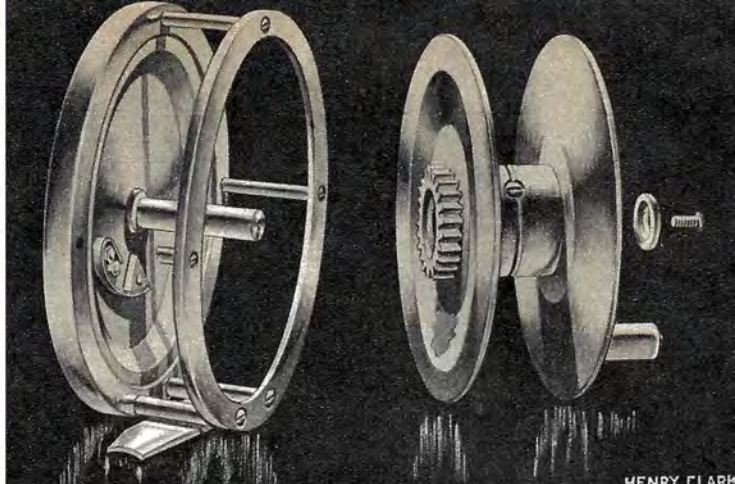
**Oil can into lamp.** Cut off the spout of a can about one inch above the joint. Fill with alcohol and insert cord as a wick. If you use coal oil, this rig will make an excellent supplementary camping lamp.

**Why is it** that there never seem to be enough pencils around your shop? Here's one way to keep them on hand. Split the shield from an old radio chassis, then force back in shape around your drill press post.



**Cleaning small parts,** as well as tiny bolts, screws, etc., is conveniently done by placing items in a common strainer and swishing the sieve around in a pan filled with kerosene or other cleaning solutions.





# Machine Your Fishing Reel

*You will be well prepared for the coming season  
if you start on this smooth-running job now.*

**By Frank E. Shallenberger**

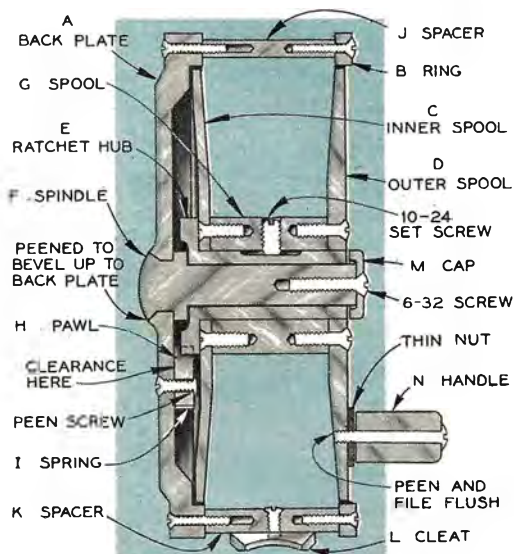
**I**F you're an enthusiastic fisherman and have a lathe in your workshop, we'll say no more. Here is a duck soup assignment just for you! You may want to refine this reel here and there, but it's a top-

notch instrument as it is, and is simply made. The plate, spools and ring were cut from easily worked  $\frac{1}{8}$  in. flat surplus aluminum. The back plate was assembled from  $\frac{1}{8}$  in. sheets, bolted while machining. But you may prefer  $\frac{3}{8}$ -in. stock which would eliminate the extra holes around the face.

*Jig:* Because perfect alignment is absolutely imperative, construct a simple combination jig and fixture. This insures accuracy, fit and alignment. Use a steel plate about  $\frac{1}{4}$  in. thick turned to a 5-in. diameter. Face one side. Turn over and clamp in a 3-jaw universal chuck, seating the faced side snugly against the jaw steps and marking the jaw numbers around the rim to enable reclamping later in exactly the same position. Drill a  $\frac{1}{2}$ -in. hole in the center, scribe circles  $\frac{13}{16}$  in.,  $1\frac{1}{2}$  in.,  $1\frac{3}{4}$  in., 2 in.,  $2\frac{1}{4}$  in. and  $3\frac{1}{2}$  in. in diameter. Using the index head, with tool still set absolutely level with the center, cross-feed by hand scribing two perpendiculars across the plate.

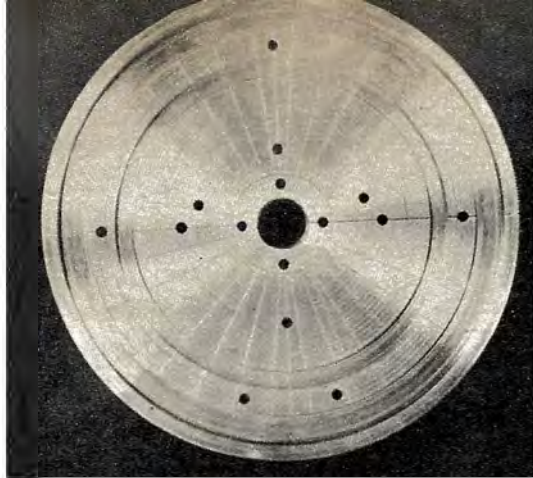
Prick-punch the necessary holes as indicated on parts A, B, C and D. Drill these holes with a No. 33 drill. This completes the layout drill jig, which also acts as the fixture by which the parts are held.

*Back plate:* [Continued on page 160]

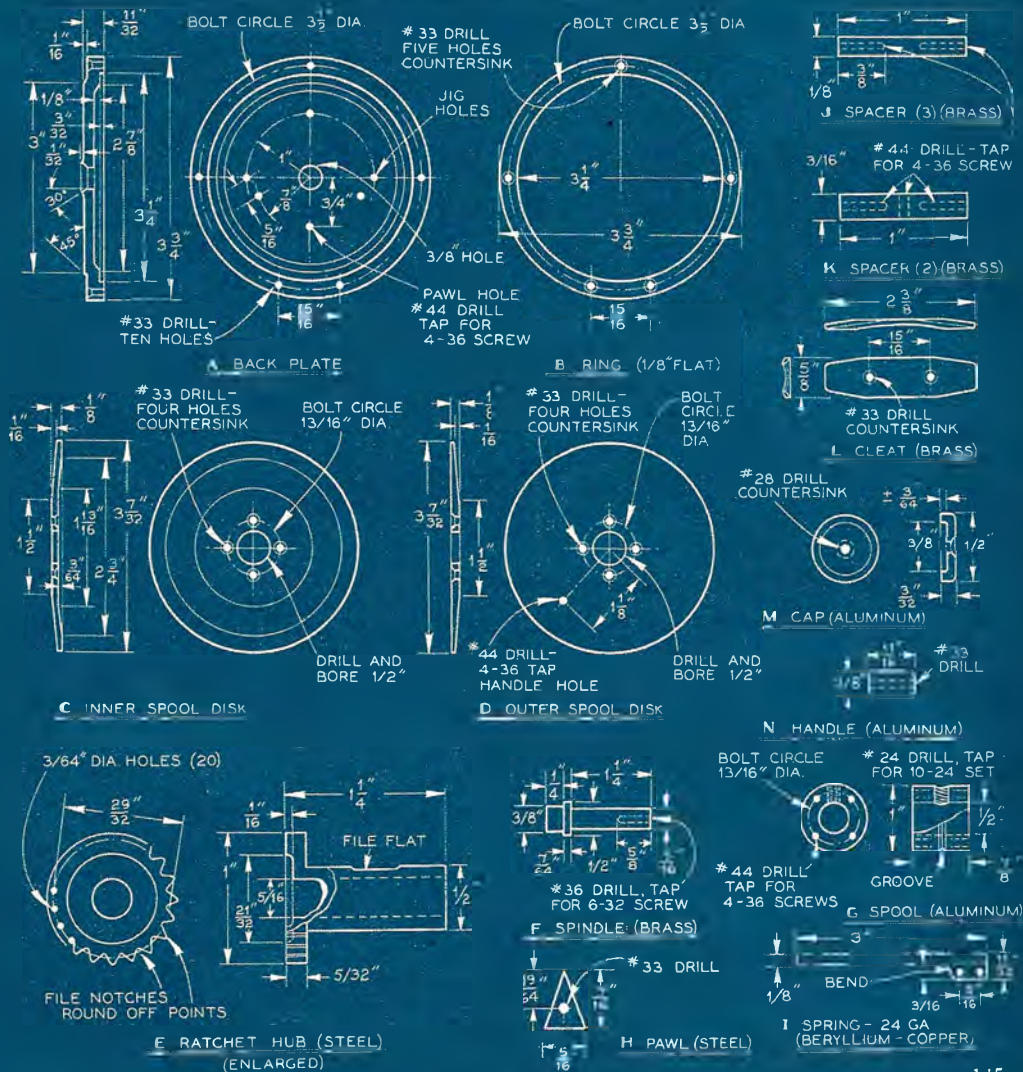


SECTION THROUGH REEL ~  
(BLUEPRINT DETAILS ASSEMBLED)





**Left: The 5-in. diameter jig fixture to which all the disks are screwed while machining. Right: Parts ready for assembly.**







## Monthly Photo Contest

Please put your name, address and picture-taking data on back of each print. Wrap with cardboard stiffeners and enclose a self-addressed stamped envelope or postage for return of unused photos. Prize-winning pictures are not returned. Judges are MI Editors. Duplicate prizes awarded in case of tie. Please address your entries to: Photo Contest, *Mechanix Illustrated*, 67 W. 44th Street, New York 18, N. Y.

**1st Prize (\$10.00)** ..... **Lazy Panda**  
A giant panda at St. Louis Zoo obligingly posed for Helen Brush of Los Angeles, Cal.

**\$5.00 Award** ..... **Summer Thirst**  
Arthur Schoeni of Falls Church, Va., used a Graphic with Super XX at 1/100 and f-5.6.

**\$5.00 Award** ..... **Meditation**  
An interesting design by Ernst Ebbefeld of Jackson Heights, N. Y. Shot with Argoflex.

**\$5.00 Award** ..... **Just Fishin'**  
A familiar summer scene by Wellington Lee of The Bronx, N. Y., on Super Pan Press film.







The completed flash unit works well with the No. 5 bulb. It is possible to hand hold the gun but it works easier with a clamp.

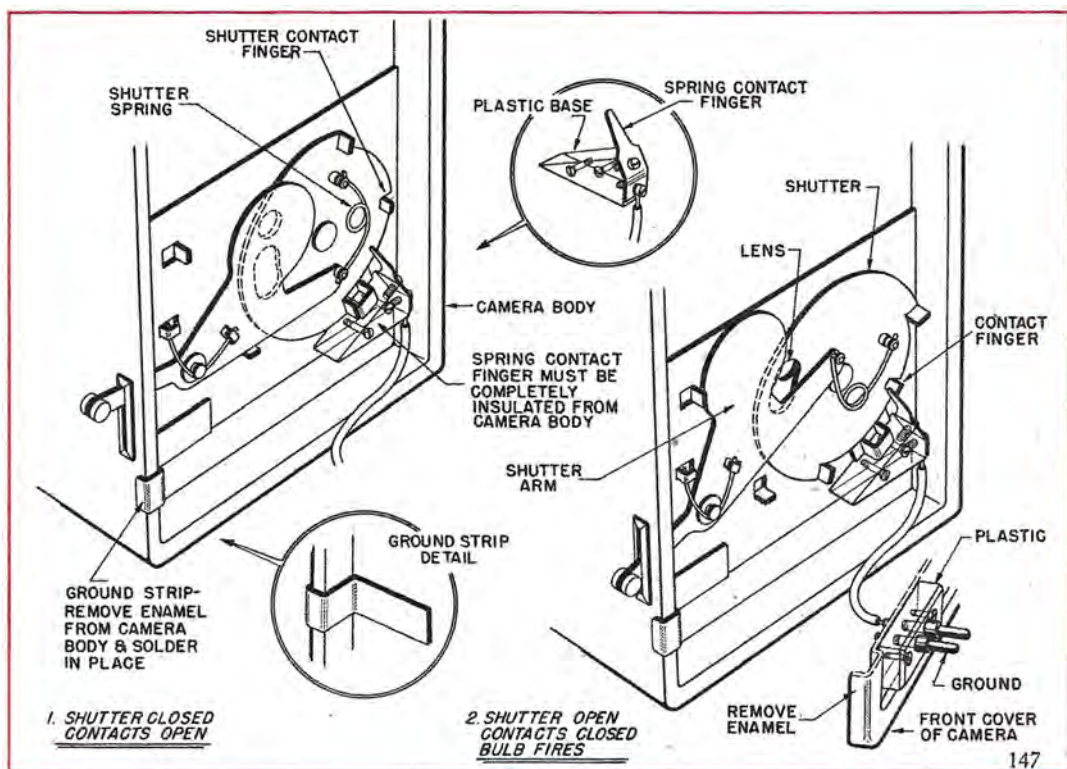
# synchronize your box camera

By Wm. Dukeshire,  
Progressive School of Photography

**T**HE trick of transforming a plain box camera to one that can take flash pictures requires a few simple hand tools and a few cents worth of materials.

What is done, simply, is to set up an electric circuit. The circuit is open until the camera shutter is tripped, and then as [Continued on page 182]

A sample of what can be taken indoors with this unit, using no other lights. It also works outdoors as a fill in light.



# Shoot 'em In the Dark



**The key to taking really candid flash  
photographs with no visible light.**

**By James W. Kyle, Jr.**

**C**ANDID fans, here's a way to take pictures with no visible light. The secret of the process is to use infrared light. However infrared film is not enough, infrared flashbulbs or an infrared filter in front of your usual flashbulb is necessary.

The filter works quite well if your reflector is the type that will not leak light around the edges and back. It is the least expensive method.

All you need for constructing the filter is a No. 87 Wratten filter, cardboard and glue. Trace the diameter of your reflector on the cardboard and make another line  $\frac{1}{4}$  in. outside that. Cut two rings this size and sandwich the filter between them. You can use a rubber band to hold the filter firmly onto the reflector. Tape it firmly on to both edges of the filter. Also use black photo tape to seal out any light leaks around the edges.

Infrared bulbs are manufactured, but they are expensive and are sometimes hard to find. Dye dipping your own bulbs is the best way around that problem. This is the original British formula with American dyes substituted:

Eosin Yellow Certified .....	4 grams
Tartrazine .....	6 grams
Wool Violet 4BN .....	4 grams
Wool Green S .....	10 grams
Hard gelatin .....	200 grams
Glycerine .....	100 c.c.
Water to make .....	1 liter

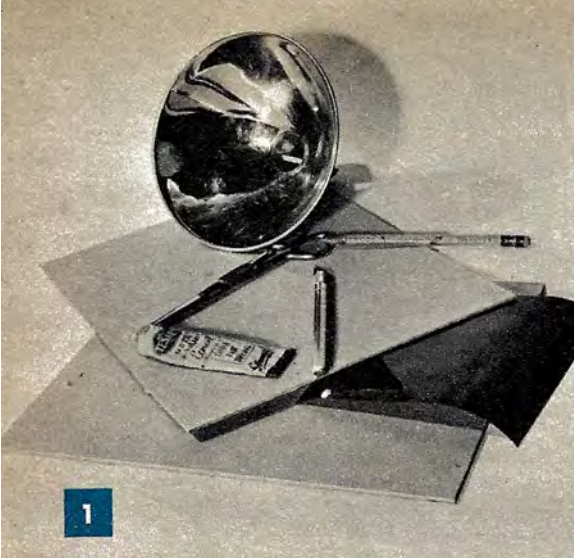
Dissolve each dye separately, adding a little gelatin solution to each. Dissolve the

rest of the gelatin separately, and add the dyes to it in order. Let this stand overnight, and if necessary, filter it through muslin. Heat the solution to 95° F and dip each bulb twice. The bulbs should be allowed 24 hours to dry.

The dyes may be ordered from the Central Scientific Company, Chicago or National Aniline Chemical and Dye Corp., New York. They should be ordered as biological stains, in ten gram lots.

It's hard to give definite exposure guides without blackout flash, since individual equipment varies so. With midget bulbs and infrared film, the guide number is 55 at 1/50 of a second. Faster shutter speeds are not recommended. If you use other sizes, you can find the guide number for the blackout flash on the regular published tables. Simply look up the guide number for the bulb and shutter speed you plan to use, for a film rating of 64 Weston. Divide that guide number by 6. The result will be the approximate guide number for the blackout flash with that size bulb. A more accurate method is to run a series of tests. Set up a scene typical of those you intend to shoot, make a series of exposures ranging from two stops on either side of your approximate guide number. Process and print them and the negative giving the best print should be taken as standard, and the aperture used to make it multiplied by the distance in feet from the bulb to the subject in the test. The product will be your own personal blackout flash guide number.





The manufacturer's recommendations should always be closely followed when processing your infrared blackout flash photographs. In general, the developing times should run about 35 per cent under normal than for other films. Ten minutes in Microdol at 68°F, instead of the usual 16 minutes. However, if at all necessary, the films can always go to the full normal developing time without worry of them going too contrasty, and over-development does add a bit of speed to the film. In fixing and washing the infrared films, they are handled in the same way that you would take care of your ordinary films. The infrared 35mm emulsions tend to be on the grainy side, but with care satisfactory enlargements are possible.

One word of warning, infrared light and heat rays are close relatives. Heat will fog your infrared film as fast as raw light. •

Your only expense in making an infrared filter, is the Wratten No. 87 gelatin filter. The cardboard, glue and sharp knife, should be in your supplies.

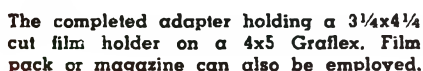
Draw two circles on your cardboard, one about  $\frac{1}{4}$  in. larger than your reflector. Cut them carefully and sandwich the filter between them.

The Saturday movie matinee should produce wonderful subjects and with your infrared flash they probably won't know that you're around.

You can mount the filter on your reflector by taping a rubber band across the back. Use black photo tape on the edges if they leak any light.



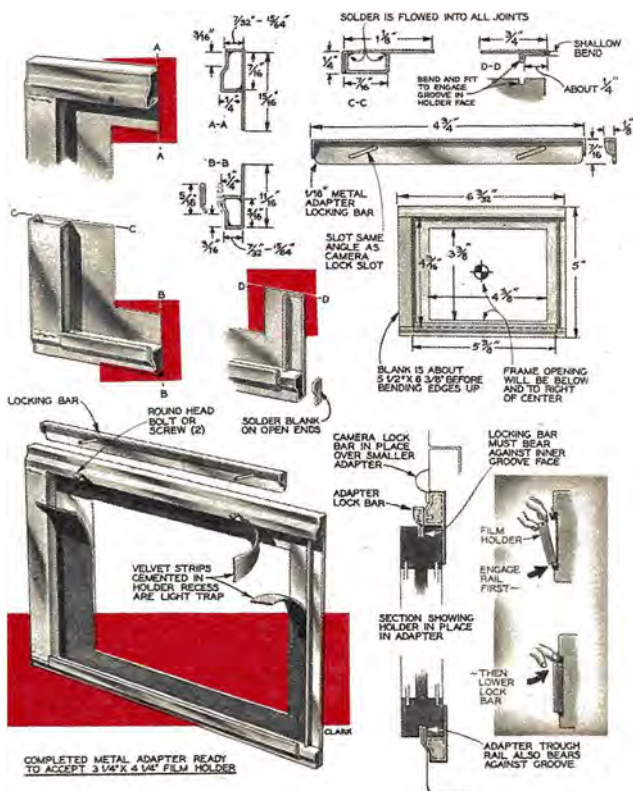
Ordinary tin can material, solder, black velvet and glue are the chief materials required. The main frame of the model was cut from the side of a large juice can. The opening is easily made with tin snips after a starting hole is cut. In bending the edges, be careful to make the outside of the frame so it fits snugly in [Continued on page 175]



# GRAFLEX reducer-adapter

Bending edges of main frame blank. Wide nosed pliers are handy but not essential. Bends are made using a vise and a hammer.

A black and white photograph showing a person's hands using a metal frame and a tool to cut a piece of material. The frame is rectangular and made of metal strips. The person is holding a tool that looks like a pair of pliers or a similar cutting instrument, positioned over the frame. The background is dark and textured.





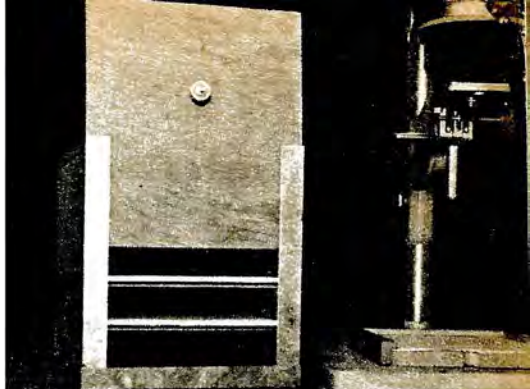
# paper safe

No more fumbling in your darkroom for photo paper.

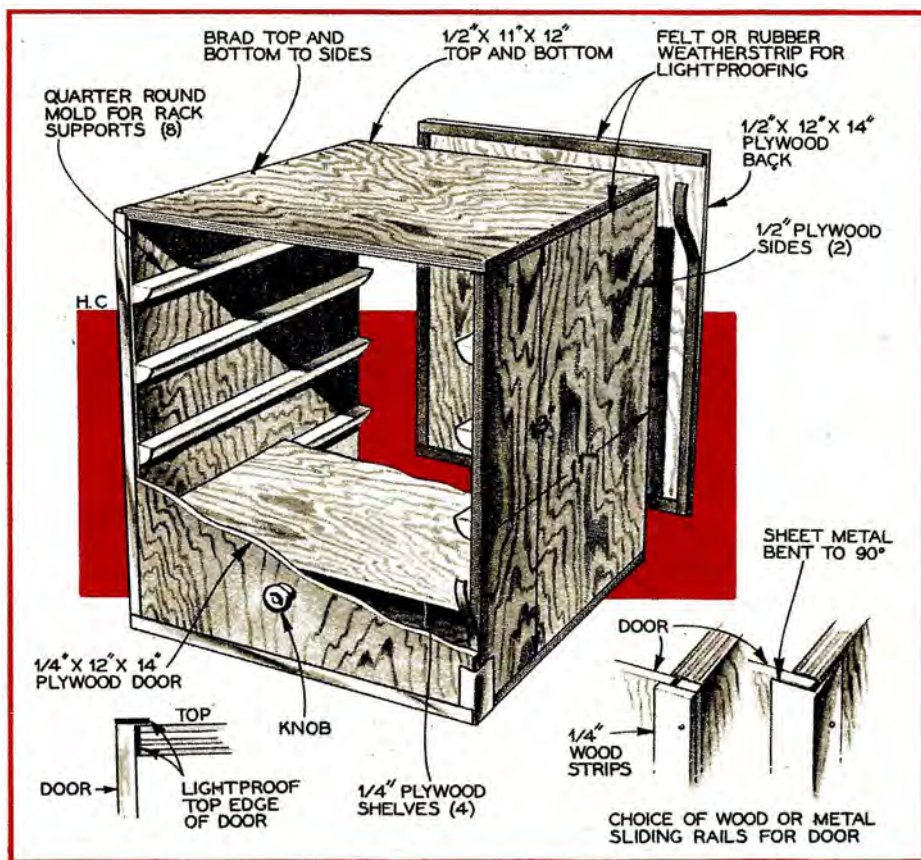
By Bill Dean

YOU will need five square feet of  $\frac{1}{4}$  in. plywood, enough plywood to make the number of shelves you want, a  $1\frac{1}{2}$  in. strip of light steel or monel metal 40 in. long, and some heavy felt or cheap weatherstripping.

Outside dimen- [Continued on page 192]

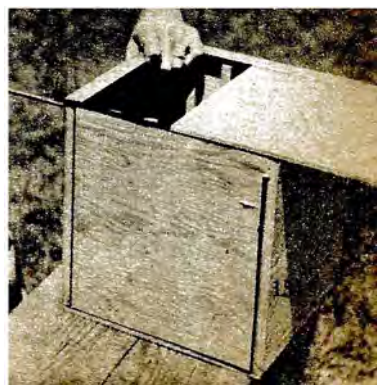
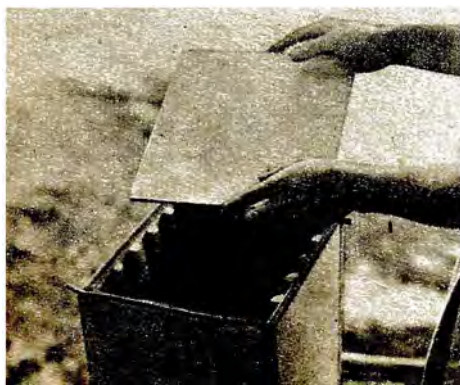


The completed paper safe being used in a darkroom. Handy as both a time and space saver.



Left: Felt or weatherstripping, in the joints and around the surfaces of the sliding door, will completely seal the safe.

Right: Sheet metal in strips, bent to  $90^\circ$  provides a good light trap and sturdy guides for the door to slide up and down on very easily.







**Marking film containers.** Print UN-EXPOSED on a strip of paper covered with transparent tape. Cut the tape in two, and after the film is exposed peel off the UN to show that the film has been used.



**Solution Cooler.** To cool a tray of developer or hypo in hot weather without diluting your solutions, fill a water glass with ice cubes and stand it in a corner of your tray or film developing tank.



**Solution Warmer.** To bring up the temperature of your solutions, mount infrared heat lamps below shelf with holes cut in it. Place your trays over the holes and your heating problem is easily solved.

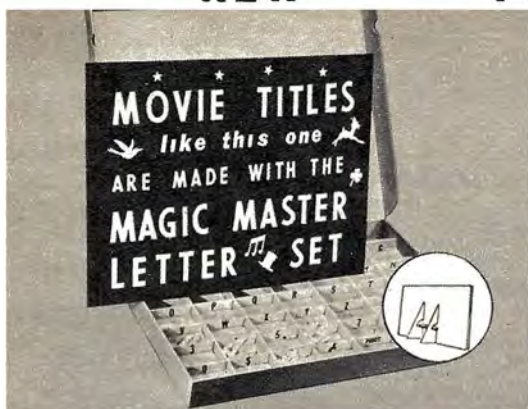


## photo tips

**Mark your slides.** By stenciling a large letter X on one side of your film slides it's easy to see which side is exposed. Bright colored airplane dope or quick drying lacquer works very well.



# NEW for the PHOTOGRAPHER



Titling your home movies is made easy with a Magic Master Letter Set. No pins, magnets, or sticky surfaces necessary and letters are washable. Sells for \$8.95; Joseph Struhl Co., N.Y.C.



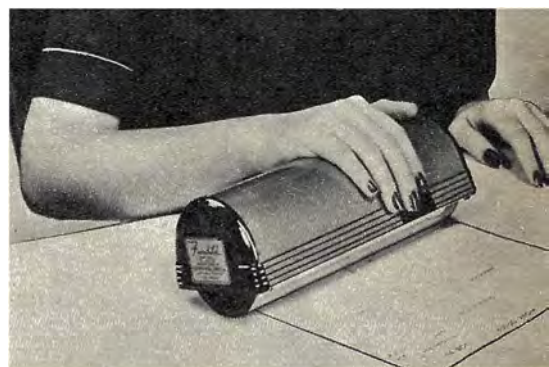
Graflarger Back with Aristo Cold Light, will quickly convert your press camera into an enlarger or transparency viewer. Available at Graflex dealers; \$38.75 for all size press cameras.

Three pound electronic flash unit using dry cell batteries bringing price per flash to less than a half cent. Guaranteed for 10,000 flashes. This model sells for \$29.95. Lumax International, N.Y.C.

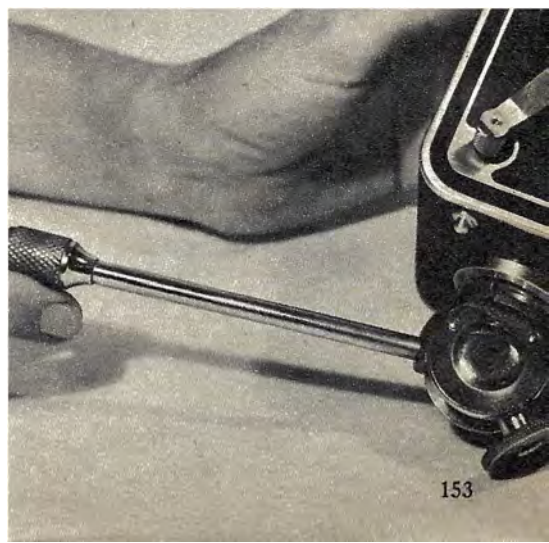
Ordinary darkroom facilities and an electrical outlet are the only necessities to make photo copies with the Copy-Roll. Priced from \$27.50 depending on size. General Prod. Co., Chatham, N. J.



Make photo bugs of youngsters with this easy to use, daylight developing kit. Print frame, tray, paper and chemicals are all included to start them off. Pic-Quick sells for \$1.49 at all dealers.



Mini-Panhead locks with one twist of the handle. It fits any tripod and will go in your pocket. Handy for all small cameras up to Rollei size. Price, \$2.49; imported by Foremost Camera Stores, N.Y.C.





# fundamentals of alternating current

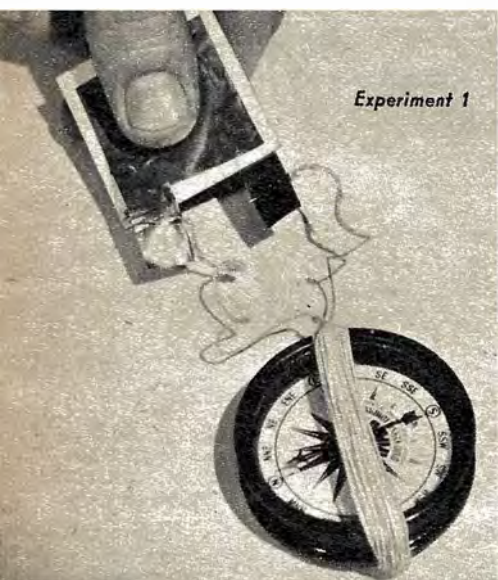
**You can unmask the mysteries of basic electrical theory by performing these simple experiments.**

**By Tracy Diers**

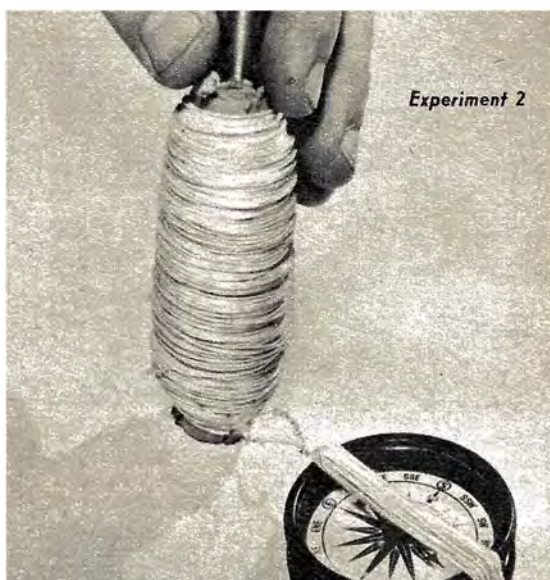
**S**CIENTISTS of a century ago knew there were two types of electric current—direct and alternating. It was quite natural that DC received more attention those days only because it could be easily produced by chemical means. As more scientists focused their attention on the radically new alternating current it became more apparent that AC simply would not play the game

under the same rules that DC employed. The following experiments point out the contrasting behavior patterns of these two different types of a single force.

*Experiment 1.* Direct current is easier to produce. Once started, it will flow continuously in one direction. Obtain a sensitive compass and wind 70 or 80 turns of No. 28 double cotton-covered wire around it. You



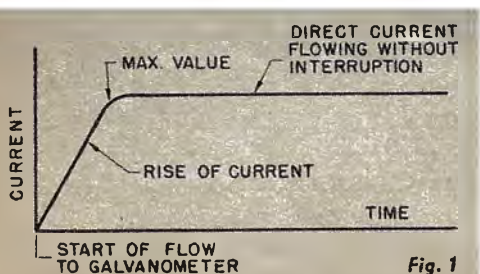
*Experiment 1*



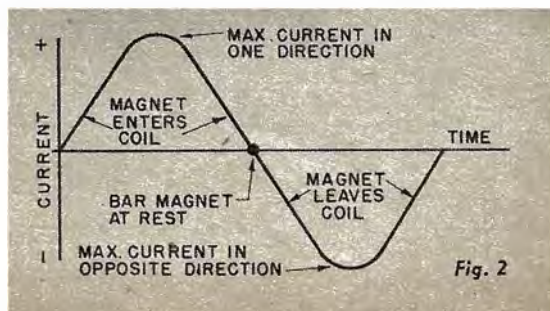
*Experiment 2*

Above: Galvanometer is formed by coiling wire around a compass and leading wire ends to plates of zinc and copper with vinegar-soaked blotter between them. Below: Resultant current graph.

Above: You can produce alternating current by regularly inserting and withdrawing bar magnet in this elementary solenoid. Below: The sine curve shows how one cycle is actually determined.



*Fig. 1*



*Fig. 2*



have made a galvanometer, which is an instrument for measuring electric current. Dip a piece of blotting paper in vinegar and squeeze it between a piece of copper and a piece of zinc. Connect the galvanometer wires to this simple cell, one wire to the copper and the other to the zinc.

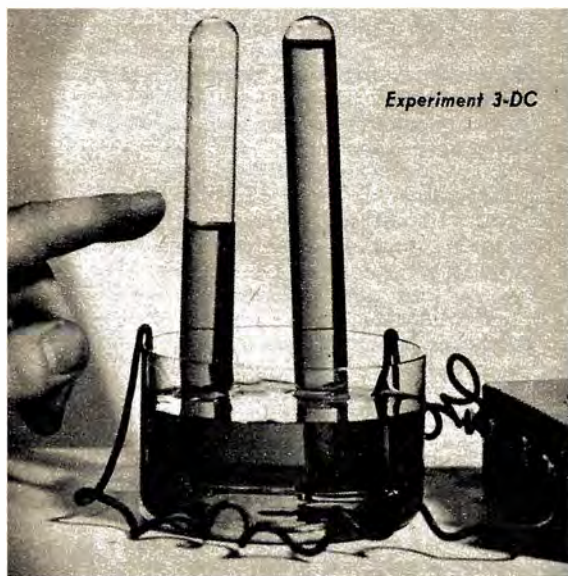
Compass needle immediately swings over and will stay in that position as long as there is life in the cell. If you reverse the wires, a direct current will flow again, but in the opposite direction—as proved by the compass needle's swing the other way (fig. 1).

**Experiment 2.** Let us see how AC differs. You will need a solenoid, which is nothing more than a coil for the production of a magnetic field. This is how it is made: wind about 300 ft. of No. 30 double cotton-covered wire on a form about  $3\frac{1}{2}$  in. long and  $\frac{3}{8}$  in. in diameter. Connect the two wires to the galvanometer wires, and obtain a strong bar magnet. Stand the solenoid upright and quickly plunge the magnet

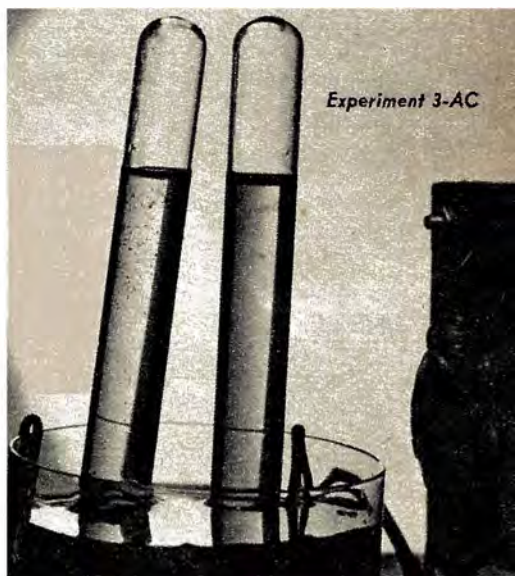
into the solenoid. The compass needle will immediately swing to one side and then return to its former position. If you suddenly withdraw the magnet the needle kicks again, but this time in the opposite direction. Thrust the magnet in and out of the solenoid with a smooth motion and you will be generating a low frequency alternating current.

If your movements have been smooth you will have produced the famous *sine wave* which engineers are always talking about. Fig. 2 shows that the current flowing to the galvanometer is rising and falling, but is also reversing itself. The sine wave shows one cycle and means you have plunged the magnet and taken it out one time. The number of times you do this per second is called *frequency*. If you have AC at home examine your meter box for the frequency marking. It will probably be 60 cycles per second.

When a current rises and falls and still

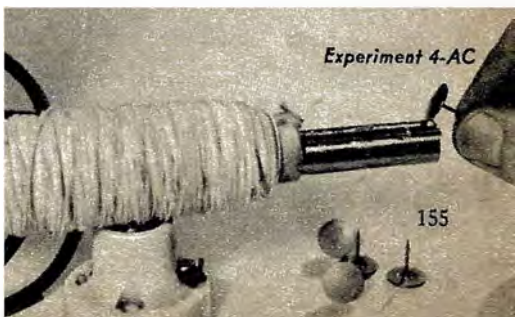
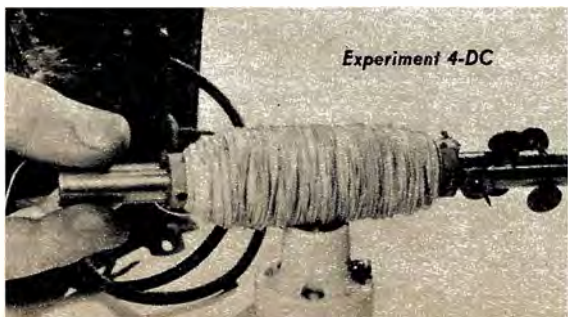


Under this experiment, DC will break water down to its two component parts, hydrogen and oxygen.

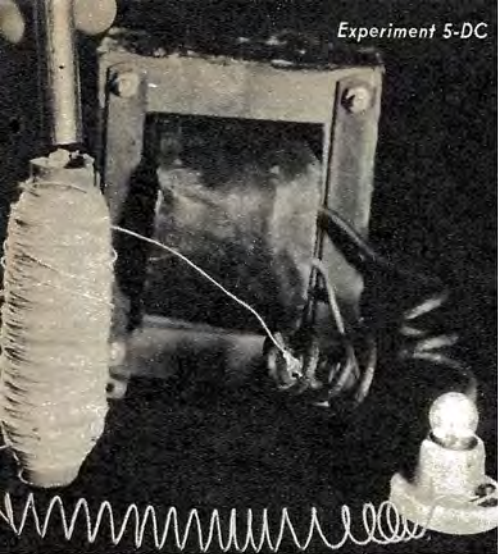


With AC, however, you get an equal mixture of both gases in tubes. See text for explanation.

Steel bar placed in solenoid becomes magnetized when direct current is introduced through it.

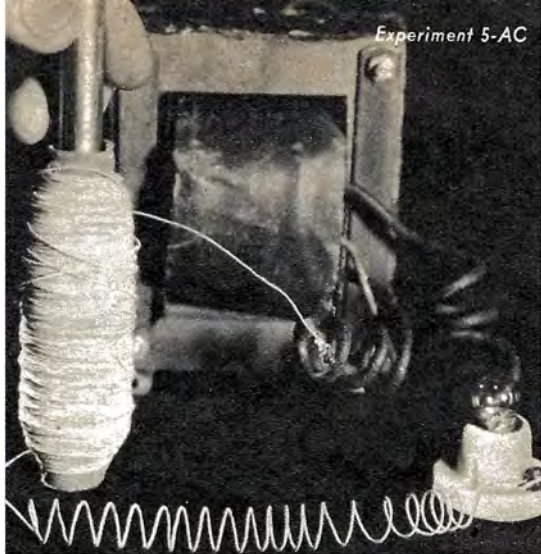


Experiment 5-DC



Bulb lights up on DC and the steel bar passed through the solenoid does not affect the situation

Experiment 5-AC



at all. But when you switch to AC and insert the same bar (above) the light will gradually die out.

reverses itself many times per second we can expect it to produce dramatic effects when compared to DC. Let us see what the electro-chemical effects are.

**Experiment 3.** Fill a large dish and two test tubes with water to which you have carefully added a few drops of concentrated sulphuric acid. (This makes the water a better conductor.) Use two rubber-covered wires with a  $\frac{1}{2}$  in. skinned from the end of each. Slip one wire under each test tube and hook one wire to the positive terminal of a 45-volt B battery and the other wire

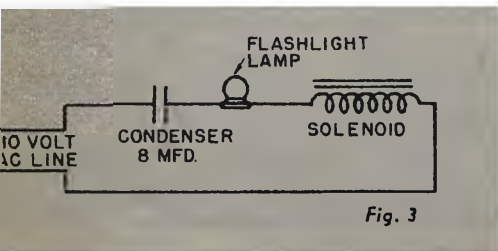
to the negative terminal. Gases will arise in both tubes and in a few minutes you will find that one of the tubes has twice as much gas as the other. The tube having the larger amount of gas contains hydrogen and the other tube has oxygen. You have decomposed the water!

Try it now with AC from a toy train transformer of about 12 to 24 volts. Now you will see that the gases are formed equally and the liquid levels are the same after a few minutes. You now have a mixture of both gases in each tube. With direct current hydrogen will always form at the negative terminal. When you use AC one terminal will release hydrogen while it is negative (first half of sine wave), then it becomes positive and produces oxygen (second half of sine wave).

For this reason AC cannot be used to charge storage batteries. Whatever chemical effect is produced in the first half of the sine wave is destroyed in the second portion when the current reversal sets in.

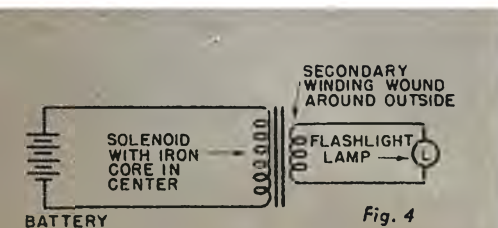
**Experiment 4.** The rise, fall and reversal of alternating current produces some interesting magnetic effects. Direct current will make a magnet, but alternating current will destroy it just as quickly. Connect seven or eight large size dry cells in series and connect the solenoid used in Experiment 2 to these cells. Now place a piece of hard steel in the center of the solenoid and leave it there for a few minutes. At the end of this time remove the steel and you will find that you now have a fairly strong magnet.

Let us see what [Continued on page 177]

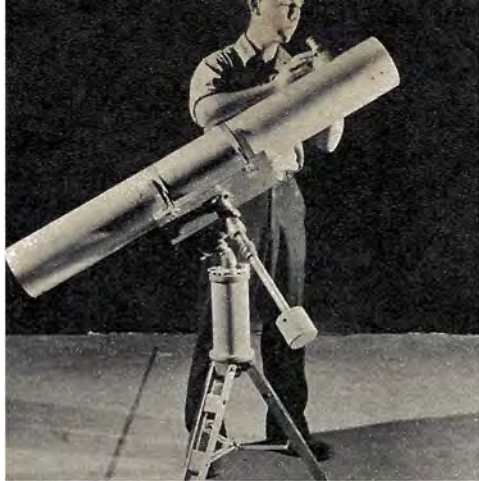


Under this set-up the bulb burns very dimly when the core is removed from solenoid (Exp. 6).

Experimental transformer is made by winding 20 ft. of wire around your solenoid. See Exp. 7.







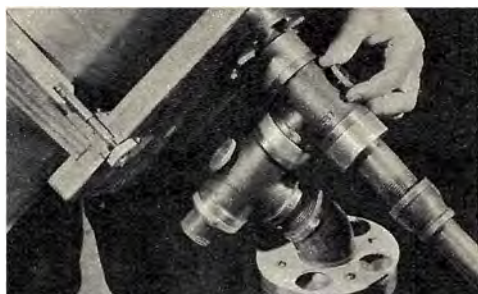
Fred Pokorny of Franklin Square, L. I., and his first telescope, a six-inch Newtonian made of an aluminum tube and brass pipe fittings.



Close-up of the eyepiece construction. The ocular he is using is one designed for richest-field observation. The adapter was turned on a lathe.

**I**N the far northern barren lands of Quebec's Ungava area, the world's biggest meteoritic crater has been discovered by a scientific expedition from Toronto. Dr. V. Ben Meen, director of the Royal Ontario Museum of Geology and Mineralogy, made the discovery. He says it is the eighth scientific wonder of the world.

With a destructive force that would make any atom bomb so far developed seem puny, a mass of material streaked through space some 3,000 to 5,000 years ago, roared into earth's atmosphere and became heated to incandescent temperature. Distorted from its path by gravity, it smashed into



Note the use of standard pipe fittings. The instrument is a fixed-latitude model designed for use in the New York City area, 42° north latitude.

## The Amateur Telescope Maker's Page

Conducted by Robert Brightman

Ungava's solid granite with an explosive power sufficient to wipe out of existence any city on this continent today.

Belief that the squat, ugly crater on the treeless tundra found birth in the crash of a meteorite was emphatically expressed by

Dr. Meen, who headed the expedition. The crater, he said, could have been created in only two ways—by a meteorite or a volcano. There is plenty of negative evidence that it was not a volcano. Dr. Meen believes that [Continued on page 192]

Ungava Crater, the world's largest meteor crater was recently discovered in Quebec. It measures two and a half miles from crest to crest and contains a lake two miles wide.



## NEW for the BOATMAN

**Prefab Pier** for small-boat owners consists of a wooden deck on steel framework. Easily erected, this heavy-duty structure can be made any length or width. The bearers, of galvanized-steel tubing, are available in several lengths to suit varying depths of water. Patent Scaffolding Co., Long Island City, N. Y.



**Boat Kit.** This 8-ft. pram is assembled from precision-cut parts. No building jig is needed. Even a youngster can follow the step-by-step illustrated directions. Weighing 68 lbs. when done, the pram can be rowed, sailed, or powered with an outboard motor. \$36. U-Mak-It Products, 701 Whittier St., New York 59.

**Yachts for Tots.** The square-rigged Buccaneer, below, and the fore-and-aft-rigged Hornet, right, are 5½-ft. nonsinkable sailboats for youngsters. A tether line is included with each boat so a grownup can keep the young skipper in safe waters. Price: about \$110. Sea Skates, P. O. Box 84, Manhasset, N. Y.







# YOU'LL HAVE A WHOLE OF A GOOD TIME MAKING YOUR OWN PRINTS

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**Perfect for the beginner—Kodacraft Printing Kit**... easy-to-follow directions for making your own prints. Packed in suitcase-type carton.

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- 1 Kodak Tri-Chem Pack
- 1 Graduate
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- 1 Kodak Glass Stirring Rod
- 1 Complete Instruction Book

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- 3 Rocker-type 5 x 7 Tenite Trays
- 1 Kodacraft Printing Frame, 4 1/2 x 5 1/2
- 1 Kodacraft Print Mask Set
- 1 25-sheet package of 2 1/2 x 3 1/2 Kodak Velite Paper
- 2 Kodak Tri-Chem Packs
- 1 8-oz. Plastic Graduate
- 1 Kodak Darkroom Thermometer
- 2 Kodak Junior Film Clips
- 1 Complete Instruction Book



**A complete outfit, including metal printer and roll-film tank—Kodacraft Advanced Photo-Lab.**

- 1 Improved Kodacraft Metal Printer... 2 Center-opening Kodak Ruby Printing Masks for 2 1/4 x 3 1/4 and 2 1/4 x 2 1/4 negatives... 1 Kodak Mask Chart... 1 Kodacraft Roll-Film Tank with 620-120 roll-film apron... 3 Rocker-type 5 x 7 Tenite Trays... 1 25-sheet package of 2 1/2 x 3 1/2 Kodak Velite Paper... 2 Kodak Tri-Chem Packs... 1 Kodak Darkroom Thermometer... 1 Graduate... 2 Kodak Junior Film Clips... 1 Kodak Glass Stirring Rod... 1 Brownie Darkroom Lamp, Model B... 1 Complete Instruction Book

Prices are subject to change without notice and include Federal Tax

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**EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.**

**Kodak**  
TRADE-MARK

# Machine Your Fishing Reel

[Continued from page 144]

Face one side if necessary. Clamp plate to jig. Using the jig as a guide, drill the holes located  $\frac{7}{8}$  in. and 1 in. from the center with a No. 33 drill. Spot the necessary holes around the rim and the hole  $\frac{3}{4}$  in. from the center. After unclamping from the jig, drill these with a No. 44 drill and tap carefully for a 4-36 screw.

Using brass screws in these tapped holes, screw the plate to the jig (which now becomes a fixture). Clamp the jig in the chuck, being careful to maintain the previous alignment. Turn the outside diameter, face, cut the recesses, chamfer the corner, then drill and bore the center hole. Reverse the plate on the jig, chamfer the corners and bore the taper in the center hole.

Remove from jig. Drill and countersink as shown. This completes the back plate.

**Ring:** For ring B, clamp a piece of  $\frac{1}{8}$  in. or thicker aluminum sheet to the jig, spot the outside holes with a No. 33 drill, drill with a No. 44 and tap. Screw to jig and bore the  $3\frac{1}{2}$ -in. diameter. Drill out the threads with a No. 33 drill and countersink.

**Spool ends:** The end disks C and D are

next. Drill and tap the inner holes. It is well to drill and tap outer holes in the scrap also for use in the roughing out. This is then cut free when turning the outside diameter as one of the last operations, leaving the spool end clamped to the jig by the inner holes. After turning, complete by drilling out the inner tapped holes with a clearance drill and countersink as indicated. Leave the single crank hole in the outer spool end tapped to receive the handle.

**Spool:** The spool G is made from 1-in. diameter aluminum rod. Chuck, face and drill the center hole. On the end scribe a  $\frac{1\frac{3}{8}}$ -in. diameter circle, then cut off. Using the circle as a guide, line up with the jig and drill and tap four holes. Then screw to jig, face the other end, turn both diameters, and scribe a  $\frac{1\frac{1}{2}}$ -in. circle on the other end. If a  $1\frac{1}{2}$ -in. mandrel is available, the piece can be turned on it to insure concentricity. In this case drill screw holes last, using the mandrel to line up center hole of spool with that of the jig. Assemble the spool on the mandrel and dress off any eccentricity of the spool ends.

[Continued on page 165]



THE MOST

*Versatile* TOOL  
ON YOUR BENCH!

**CHANNELLOCK PLIERS**

Made only by CHAMPION DEARMENT

In almost any job you can think of—Pliers are necessary—and Channellock pliers are the best you can buy. Whether you are working on your car, electrical repairs, plumbing work or just tightening nuts and bolts Channellock pliers do it better.

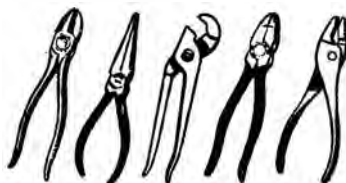
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Channellock pliers are listed  
in the Yellow Pages of  
most Telephone Directories  
under "Tools"



CHAN NEL LOCK





## MI Tests The '51 Studebakers

[Continued from page 89]

efficiency, durability and reliability. But from the consumer's viewpoint they are forced to give ground to the new V-8 type which is smoother and more flexible, especially under a load.

Engineers today have to consider the higher compression ratios already being used and the still higher ones predicted for the future, which raises tough problems in parts-deterioration and cooling. As compression ratios go up, internal heat skyrockets. Piston pressures double and triple, bearings and crankshafts are subjected to extra multiple loads. Under these conditions, the V-8 overhead valve job is far superior to the in-line engine. It's a close-coupled unit with a much shorter and beefier crankshaft. Overhead valves are the only easy answer for valve cooling. When valve stems are located right in the guts of an engine, cooling can take place only during the brief instant when the valves are closed.

In summary, these new V-8 engines are a positive step in the right direction and the start of a trend that, barring war, will sweep the industry within two years. Assuming Uncle Joe Stalin decides to take the chip off his shoulder, Chrysler will be out with a 170-horsepower V-8 job long before the trees start to bud again. Buick will have a new V-8 engine and Pontiac is about to jump on the same gravy train. Ford has had an overhead valve 6-cylinder job in waiting for some time; I drove it two years ago. And Ford also has some V-8 overhead valve plans ready to spring any time the competitive going gets rough.

But now back to Studebaker's new line. Basically, they look about the same as last year except, of course, for the annual grille design change. Right now the new V-8 grilles are available only in the Commander and Land Cruiser models. The Champion is unchanged except that you can now get it with one of the optional, automatic you-know-whats, with a direct-drive feature, which Studebaker introduced a little over a year ago. As these rheumatic thingamajigs go, this one seems to me to be less objectionable than most of the others even though, like all the others, it knocks the head off performance the way an August sun takes the head off a schooner of beer. Overdrive is still a buyer's choice at Studebaker and it is, next to a conventional drive, the most worth-while choice of all.

For my tests I selected three cars. First I drove two four-door V-8 Commander sedans, one with automatic transmission and several

thousand miles on the clock, the other with overdrive and also thousands of miles of action. As there has been little or no change in the Champion line, I picked a convertible with automatic rheumatism. All tests were made on the three-mile Studebaker track at South Bend and over their proving ground steeplechase.

The first test was of the V-8 Commander with overdrive. The moment I pressed my foot to the floor, the car shot ahead like a race-horse with a hornet on its flank. Long before I reached the first turn I was in the 80's and, since the Studebaker turns are rated at 80, I backed off a bit to get the feel of the rig. After a few warm-up laps I let her out, hitting the turns and going through them at 90, on the clock, and getting up to 100-plus on the short (less than a mile) straightaway.

I think the Studebakers offer the best forward visibility of any car on the road today. From a normal driving position you can see to within inches what's going on under your front wheels, thanks to the tiger shark nose. This gives you a great feeling of security, especially at high speeds.

With which feeling I said to myself, "Now's the time for a speedometer check" and, believe it or not, at 90 this car's clock was right on the button. Next, with a full head of steam, I made double checks over a measured half-mile. When the speedometer just topped 100, actual speed was 98.36. I sincerely believe that on a straight run, with a proper build-up, this new Studie will do an actual 100 mph.

Then came the acceleration tests. Hang on to your berets: zero to 60 through gears averaged 12.8 seconds! My fastest single run took 12.5, the slowest 13.2. As you old-time readers know, this is nitroglycerine stuff. Zero to 30 took 4.4 seconds, zero to 50 went 9.5 and zero to 70 mph used up 16.9 seconds. From a standing start I went one-half mile in 31.2 seconds. All I can add is, *Watch this car in future stock car races.* (That's the V-8 Commander with overdrive, remember.)

Next I tested the V-8 Commander with automatic transmission. Note the difference in times. In Drive all the way, zero to 60 took 18.5 seconds. Starting in Low and shifting to Drive at 35, zero to 60 took 16.2 seconds. In other words, automatic transmission cut nearly 3.5 seconds off the time.

The speedometer on this particular car was off. Sixty on the clock was actually 58.06. Ninety was 87.80. Actual top speed—or all I could get out of it on the track, anyway—was 96.77.

[Continued on page 164]



**SHOPSMITH** FOR ACCURACY

**\$189.50**  
FOR COMPLETE 5-TOOL  
UNIT WITHOUT MOTOR  
Price effective January 1, 1951

**T**AKE another look at the photo above. See those paper-thin strips? All four were sliced from the same piece of wood in sixty seconds *without changing the rip fence setting*. How? It's easy with SHOPSMITH. You can shift the *saw blade* as well as the fence—using SHOPSMITH's exclusive micro-feed blade adjustment.

There's not much you can do with wood strips. What's important is the speed and extreme accuracy of SHOPSMITH's fence-to-blade settings. And this is just one of SHOPSMITH's many precision features.

The disc sander, for example, feeds into the work, can be set to stop on a hairline.

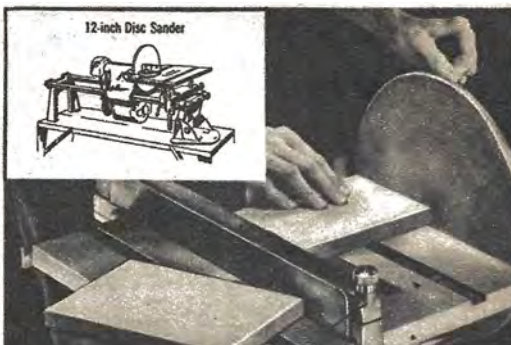
The vertical and horizontal drill presses have built-in jigs, unique micro-settings. The centerless ground steel ways are stress-tested at over a ton, assure absolute rigidity and accuracy in lathe work as well as in other operations.

Add 'em all up—accuracy, capacity, flexibility, rugged construction and precision features—and you'll begin to see why SHOPSMITH is America's most popular power tool. See SHOPSMITH demonstrated at leading hardware and department stores or any Montgomery Ward store. And for complete details and specifications, mail the coupon.





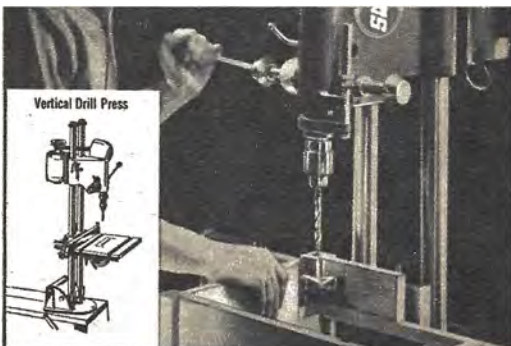
**BLADE TO FENCE—48".** You won't find many saws under \$200 that offer capacity like this. It means you can cut to the center of 8' plywood panels, handle extra-long boards, trim doors, screens, storm sash. Table tilts, raises, lowers. Maximum depth of cut 2 1/4".



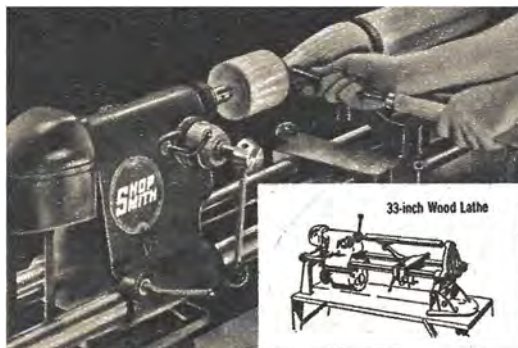
**90° ON THE NOSE.** SHOPSMT as a disc sander is so accurate you can forget about your try square. Can be used as a jointer too. Work fed through at a slight angle (by cocking fence) comes out with a beautifully jointed edge. Sand-paper discs easily replaced.



**PERFECT DOWELED JOINTS.** No jigs required. Just lay the work flat on the table, feed drill from side. Dowel holes match perfectly. Horizontal drill is especially useful when drilling large, awkward work. Its capacity is limited only by the length of your workshop.



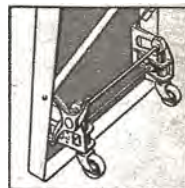
**FLOOR MODEL, TABLE MODEL.** SHOPSMT as a drill press is both. Maximum clearance, table to chuck, 27", floor to chuck, 55". Jacobs key chuck takes drills up to 1/2" diameter. Speeds range from 875 to 3500 rpm. 4" quill feed. Easy to read, adjustable depth scale.



**ROOM TO TURN IN.** SHOPSMT as a lathe has a 15" swing—4" more than most other heavy-duty lathes. It has a quick-set tool rest that always moves parallel to your work-piece. And it's the only lathe that lets you face the work while face-plate turning.

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# MI Tests The '51 Studebakers

[Continued from page 161]

My test of the Champion was a short one because the car has undergone very few changes since I last gave it a workout. I did, however, get the biggest thrill of the day when I tested this one. Here's what happened:

Mr. Butzbach, head man of the proving ground and an old friend, turned the Champ over to me just as a customer would buy it, 24-pound wonder tires and all. For safety's sake I usually pump a few extra pounds into these super-globs but in this case I didn't—and thereby hangs my tale.

The photographer wanted action pictures and we agreed on some gravel skid shots. I drove the car down a steep hill at about 40 and threw it into a long slide, as simple a trick as there is in the book, especially if you've done it for years. But the shower of gravel wasn't dramatic enough so we decided to do it over again, faster. I made several more runs but none were fast enough to give the photos the oomph they needed. These super-blooper tires were giving me trouble when I tried to bring the Champ back under control after I finished the skid. There wasn't an air pump within a mile so I decided I'd find out just how dangerous a 24-pound tire could be in a real pinch.

I came down the hill between 50 and 55 and, at the agreed-upon spot, threw the car into a long, right-hand slide. When the time came to snap the car back and straighten her out on the road, it was no go. Those low-pressure tires were dragging over the gravel like bubble gum on Junior's chin. Even my own 250 pounds of weight didn't help. And here I was with a car out of control and heading for a deep ditch and a concrete culvert.

In a last-gasp, straw-grabbing maneuver I cut the wheel for a complete spin. The Champ's tail swung around and we missed the ditch by a hair. That ditch would have rolled me over for sure. Instead, I slammed through a fence and the only damage was a streak of orange paint down the side of the convertible's body.

This car had run hog-wild—and there was no excuse for it, except those marshmallow tires. This is not a slam at Studebaker. The same thing would have happened with any car equipped with similar tires. With pre-war tires I could have controlled the skid with ease. Frankly, I feel that if the "safety crusaders" had the guts of a gnat they'd campaign against these freakish bloobs of glob and their man-killing properties.

In conclusion, I think these new Studebakers are right up there at the top with the best-performing American cars on the market

today. The new engines are swell. Comfort, performance and durability are excellent and I believe the Studebaker people are due for one of the biggest years in their history. •

## SPECIFICATIONS

### MODEL TESTED:

1951 Studebaker Commander, 4-door sedan, V-8 (with automatic transmission)

1951 Studebaker Commander, 4-door sedan, V-8 (with overdrive)

### ENGINE:

8 cylinder, V-type, OHV; bore  $3\frac{3}{8}$  inches, stroke  $3\frac{1}{4}$  inches; piston displacement, 232.6 cubic inches; maximum torque 190 foot pounds @ 2000 rpm; brake horsepower 120 @ 4000 rpm; compression ratio 7 to 1

### DIMENSIONS:

Wheelbase 115 inches; overall length 197½ inches; tread 55½ inches front, 54 rear; width 69 9/16 inches; height 62¼ inches; weight 3050 pounds; standard tire size 7.60x15

### PERFORMANCE:

	(with automatic transmission)	(with overdrive)
0 to 30 mph,	6.0 seconds (L & D)	4.4 seconds
0 to 30 mph,	7.5 seconds (D only)	
0 to 50 mph,	12.0 seconds (L & D)	9.5 seconds
0 to 50 mph,	18.5 seconds (D only)	
0 to 60 mph,	16.2 seconds	12.8 seconds
0 to 70 mph,	20.0 seconds	16.9 seconds
0 to 80 mph,	27.8 seconds	23.1 seconds

Half-mile from standing start, 35.1 seconds; 31.2 seconds with overdrive  
Top speed, 96.77 mph., 98.36 mph

## SPECIFICATIONS

### MODEL TESTED:

1951 Studebaker Champion, convertible

### ENGINE:

6 cylinder, L-head; bore 3 inches, stroke 4 inches; piston displacement, 169 cubic inches; brake horsepower 85 @ 4000 rpm; compression ratio 7 to 1

### DIMENSIONS:

Wheelbase 115 inches; overall length 197 inches; tread 56 11/16 inches front, 54 rear; width 69¾ inches; height 61½ inches; standard tire size 6.40x15; gas tank 18 gals.

### PERFORMANCE:

	(conventional transmission)	(automatic transmission)
0 to 60 mph,	17.6 seconds	23.1 seconds
0 to 70 mph,	26.6 seconds	(using L & D)

Half-mile from standing start, 35.1 seconds  
Top speed, 82-85 mph

### SPEEDOMETER ERROR:

At 60 mph on speedometer, actual speed 57.32 mph



## Your Fishing Reel

[Continued from page 160]

**Ratchet hub:** Make the ratchet hub E from 1-in. diameter steel bar stock, preferably of carbon content. Rough out the diameters, drill and ream the inside diameter. If a  $\frac{5}{16}$ -in. mandrel is available, mount the blank on it to turn the  $\frac{1}{2}$ -in. diameter to a snug fit with the spool. Recess the large end. Lightly scribe a  $21/32$ -in. circle, turning the chuck by hand. Using the lathe index head mark off 20 radial lines crossing this circle. Prick-punch the intersections and drill twenty  $3/64$ -in. holes. If an index head is not available, lay out in 18 to 22 holes as convenient. Hand-file teeth to rounded V-form as indicated. File a flat for the set screw in the spool hub. Harden if facilities are available, heating to a cherry red and quenching.

**Spindle:** Turn the spindle F from brass to a snug fit in the back plate and a free or running fit in the ratchet hub. Turn between centers to insure concentricity, allowing a little extra length for peening. Assemble with the back plate and peen to fill the taper. After peening, chuck by the spindle shaft to check alignment and face off the peened end to a rounded contour.

**Pawl:** Saw out pawl H and file by hand. Mount temporarily in a hole in the back plate  $3/4$  in. from the center with a 4-36 screw. Slide the ratchet on the spindle and shorten pawl if necessary to give free click in each direction.

**Spring:** This spring may be made from beryllium-copper, brass or steel. It is bent approximately as shown and adjusted later to the proper tension.

**Handle, Spacers, Cap, Cleat:** The handle N is turned from aluminum bar stock. Spacers J-K from brass, drilled and tapped on both ends. The cap M is turned from steel, and cleat L is made from  $1/8$ -in. brass strip, cut to shape, drilled, countersunk, bent and filed to a taper on the ends to fit the rod.

**To assemble:** Use 4-36 flathead brass screws. Chuck individually, and file to oval heads. Thread screw for the pawl through the back plate and secure with a nut filed to  $3/64$  in. thickness. Peen over to secure the pawl but allow freedom for click effect. Mount the spring and adjust tension, testing with the ratchet hub.

Assemble handle to outer spool end with thin nut for spacer. Peen on inside end and file flush. If necessary, disassemble and dress spool hub to promote accurate alignment of spool ends with back plate and ring. Dress the  $3/64$ -in. recess in cap to permit a free-running spool without end play and fasten to the spindle with an oval-head 6-32 brass screw. •

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**NATIONAL GYPSUM COMPANY**  
BUFFALO 2, NEW YORK

## 30 Minutes Of Your Life

[Continued from page 71]

diately after the Bikini tests, teams of men boarded heavily contaminated ships and pulled out the animals which had been placed on board to determine radioactivity effects. These men stayed several minutes at a time and nothing happened to them.

So, the third rule: *Stay in your shelter until it is time to leave.*

Those are the three simple, basic rules. Now, let's get more specific.

### IF YOU ARE IN YOUR HOME . . .

first you must try to make it flameproof. An atom bomb can set fires more than two miles from the point of detonation since it pours one-third of its tremendous energy into thermal or heat radiation. Take the following precautions: put dry leaves, trash, oily rags, any readily inflammable material into metal cans and cover them tightly. Shut off all utilities—the oil burner, the pilot light on the gas stove and water heater. Batten down the draft doors of your coal-burning furnace and wood stove. Then prepare for a fire just in case—make sure a stirrup pump and a hand fire extinguisher are available and place pails of sand and water at strategic locations.

Second, you must make your home as airtight as possible. Close all doors, windows, chimney vents, lock shutters and draw curtains, drape sheets or other light-colored material around them. Radioactive wastes can enter your house through the tiniest fissures.

Then go to your shelter which will be either the basement or a small area dug into the ground from the side of the basement. Even before the alert, you should have prepared your shelter with emergency equipment, including a flashlight in the event that the electricity is knocked out, a supply of canned food and an axe to chop your way out if the entrance is sealed off by the blast.

In addition, you should have a first aid kit, containing a burn salve, soft cloth, gauze, absorbent cotton and an antiseptic. If you suffer any cut, no matter how trifling, wash and bandage it immediately to prevent radioactive particles from entering and damaging the bloodstream.

You should have drawn several gallons of clean water and stored them in the shelter for use directly after the raid because there is a possibility that the water in your pipes may become dangerously radioactive. Don't boil it because boiling concentrates rather than removes radioactive particles.

[Continued on page 168]



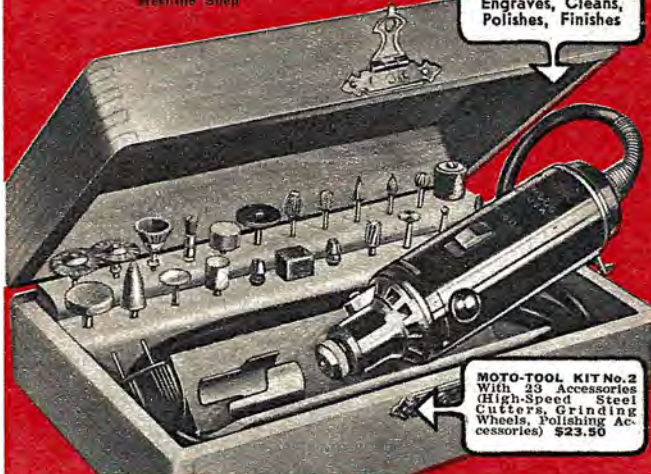
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FOLEY MFG. CO., 106-1 Foley Bldg., Mpls. 18, Minn.

## 30 Minutes Of Your Life

[Continued from page 166]

As soon as the water supply has been okayed after the raid, take a shower. But a good one! Radioactivity can cling to you, but only a bit more strongly than ordinary dust or dirt. Scrub yourself thoroughly with soap and water, paying particular attention to your fingernails and hair. Then don a complete change of clothing, burying your old ones.

IF YOU ARE IN YOUR OFFICE . . . leave the upper stories as quickly as possible. Not only are you in danger of having the floor fall out from under you, but there are few barriers in the form of steel, concrete and wood to shield you from the radiation. Head for the basement as soon as the siren sounds and remain as close as possible to heavy, supporting columns to avoid the danger of collapsing beams. Stay away from all entrances and all windows. If there are heavy steel doors and shutters, close them.

### IF YOU ARE WALKING ON THE STREET . . .

get out of the open. Remember that flash and flame burns killed 50 per cent of the 106,000 persons who died in the atomic attack on Hiroshima and Nagasaki and accounted for 75 per cent of all casualties. The bomb's heat rays travel in a straight line—so all you have to do is get inside.

Head for the nearest official shelter. If there aren't any, a subway—the deeper the better—will do as well. Or enter the nearest, strongest-looking building and head for the basement. If you are crowded out of there, get against some partition in some interior, as low to the base of the building as possible.

### IF YOU ARE TRAPPED ON THE TOP FLOOR OF A BUILDING . . .

and descent to the basement is prevented by jammed elevators and stairs, don't join the mob battling to get down. Proceed to a point as close to the center of the building as possible and lie against a wall or strong supporting column, out of line of the windows. Or crawl under a table, sofa or desk which would provide protection against flying glass.

### IF YOU ARE IN A CAR . . .

do not try to flee the scene. You will speedily find yourself caught in a maelstrom of traffic. Park your car at once, but do not obscure the traffic lanes. Leave your keys in the auto in case it has to be moved to make way for emergency equipment. Close the windows and head for shelter.



**IF YOU ARE IN A TROLLEY, BUS OR SUBWAY . . .**

follow the evacuation instructions of the engineer or driver. If you are on a subway platform, remain where you are.

**IF YOU ARE IN A CHURCH, THEATER OR SCHOOL . . .**

all these places should have shelters in their basements and specific people whose job it will be to lead you to them. If they do not or if there is not time to reach the shelters, lie down as close to the outer walls as possible.

**IF YOU ARE ON THE BEACH . . .**

the chances are that you won't be too far from cover of some sort. But get your clothes on first. Clothing will help reduce the danger of flash burns. If at all possible, wear long trousers or slacks, a loose-fitting blouse and a hat. Light-colored clothes are much more effective shields against burns than dark ones. But in any event, cover as much of your body as you can, then take cover in a shelter. Buildings around a beach are usually of comparatively flimsy construction, so judge whether you can get far enough inland to reach a strong building in the time you have. If you can't, then find shelter where you are. Get into a rock depression, behind a massive tree or, if nothing else is available, dig yourself a foxhole and lie in it face down.

**IF YOU ARE FISHING ON A LAKE . . .**

gauge your distance from shore. Can you make it? If you can, head for the nearest heavily-wooded inlet or largest rock and snuggle against it. Select a rock on the side facing away from the city, because that's where the enemy is aiming his bomb.

If you are too far out to make shore, dive into the water and stay there until the explosion comes, keeping averted the side of your head facing the city.

**IF YOU ARE A FARMER IN YOUR FIELDS . . .**

proceed to the closest atom-bomb shelter. If there is none, even a furrow in a plowed field will give you some protection if you lie in it.

If the atom bomb is ever dropped on your city, there is no doubt that it will cause devastation on a scale you have never seen before. But that is no reason for you to give up hope for your own life.

You have read about the things which you can do to safeguard yourself and your family. They will increase your chances of survival a hundredfold. When and if the time comes, remember to do them and the 30 minutes before the bomb falls will certainly prove to be the most important 30 minutes of your life! •



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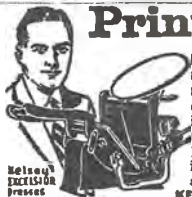
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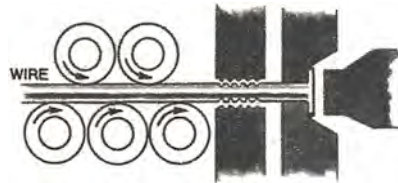
**BERTROM D. ENGINEERING AND SUPPLY CO.**  
3121 Main Street Kansas City, Mo.

## The Great Joiner

[Continued from page 109]

than 20,000 people were employed at making nails.

The first nail rod mill in the American Colonies was built at Milton, Massachusetts, in 1710. This mill supplied rods to the pioneers who made them into the nails that were used in our early buildings. Many of these hand-made nails were found by the workmen who are now engaged in the restoration of the old original Erasmus Hall Academy. This build-



Dies close on the wire while a hammer blow is forming the head. Grooves in shank are formed by the dies.

ing was erected on its present site, the Erasmus Hall High School campus, in Brooklyn in 1787.

In 1777, Jeremiah Wilkinson of Cumberland, Rhode Island, invented a machine that could cut nails from a sheet of cold metal. In time this new process largely replaced the old hot forging method.

Sometime between 1830 and 1840 an entirely new development, nails-from-wire, originated in France and spread to Germany and to England. Within a few years Germany alone could produce all of the nails that she could use and in addition export over 50,000 tons a year. In 1851, William Hassall of Brooklyn, set up the first nails-from-wire process machine to be used in this country. He constructed his machine from ideas received from a similar machine seen in operation in Birmingham, England.

The steel wire nails began to dominate the market soon after Father Joseph Goebel of Covington, Kentucky, imported a nail making machine from Germany in 1875. As his business expanded he formed the Kentucky Wire Nail Works. In a short fifteen years' time the manufacture of cut nails had practically ceased.

The modern nail starts as a steel ingot about 6 ft. long by 20 in. square. This is run hot between the rolls of the blooming mill where it is worked down to a long bar (called a bloom) measuring 6 to 8 in. square. When the bloom becomes a 2 to 4 in. bar it is known as a billet and when reduced by further rollings, a rod The beating that the



original steel ingot has received to this point is only the beginning as the rod must now be drawn into a wire form.

The rod is pulled through progressively smaller and smaller tungsten carbide dies. The diameter is not only reduced to the desired wire size but the steel is also toughened and stiffened. This process requires powerful winching drums and near diamond hard dies.

As wire, it is now sent to the nail machines. Some of these high speed modern miracles are capable of producing nails at the rate of 550 per minute. While they are a good example of the speed possible in automatic production, the skill of the hand craftsman is still essential. These craftsmen are the master die makers who make the dies that form the heads and the points of the nails.

When the wire reaches the nail machine it is gripped by fingers and fed forward a distance that is determined by the length of the finished nail. Dies close on the wire while a hammer blow is forming the head. If the head is to be countersunk it is forced back into a tapered hole. The grooves in the shank are formed at this same time as these dies grip it firmly. If the nail is to be barbed, these are put on before the wire reaches the nail machine.

After the head is formed another set of dies pinch off and point the nail at the desired length. These pointing dies nearly but not quite meet or they would become blunted very rapidly. As a result a small piece of metal remains on the point of the nail. This is removed and the nail is also polished by tumbling hundreds of them in sawdust before they are kegged for shipping.

Most of the nails produced are given a diamond point. The gradual taper on this holds well and it will not cause splitting except in the denser woods.

The blunt-pointed nail is the one that is made for nailing in the denser woods. While a sharp point will push the fibers apart and cause the wood to split, the blunt point breaks them and eliminates this danger. It is used in laying hardwood floors, in attaching hardwood trim, and in making boxes and crates.

The chisel point looks something like a screwdriver and is used in driving large nails in hard wood as the sharp edge cuts through the fibers. This makes them practically as easy to drive as the diamond point but their holding power is not as great.

The needle point is designed primarily for fast hand nailing such as is necessary in the manufacture of boxes. A light tap from the hammer starts the nail well into the wood eliminating the necessity for guiding it with the hand.

[Continued on page 178]



## FOLEY\* automatic SAW FILER

\* Trade Mark Reg. U. S. Pat. Off.

"I did very well last year with my Foley equipment, about 950 saws and 240 lawn mowers, in my spare time. About \$900 for me." Leo H. Mix. Len Crego says: "I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."

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## Chrysler Station Wagon

[Continued from page 91]

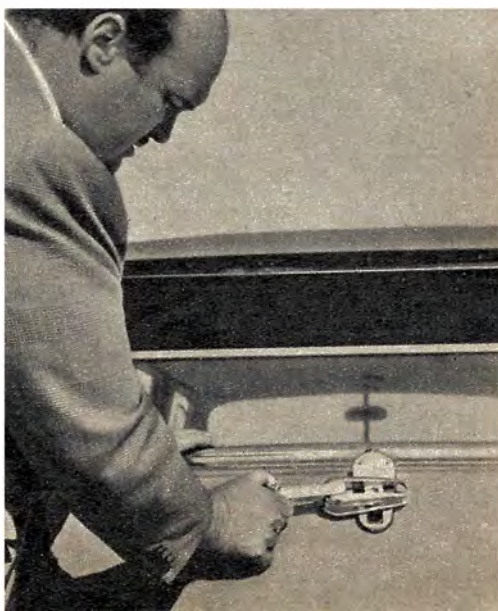
Unfortunately, and for some unexplained reason, the hay caught fire at this untimely instant and when Uncle Charlie died a few years later, leaving quite a sizable bundle, my name was strangely missing from his will. I guess he was really sore.

Regardless of who invented the species, all modern station wagons started out to be trucks for dudes. When the polo-and-petunia crowd latched on to them, they painted whimsical slogans on the front doors, like Mulligan's Half Acres, or Briar Patch Farm or, perhaps, Howard's Home for Wayward Girls. As the years rolled by the original name "station wagon" persisted but the vehicle itself assumed two distinct and different forms, one for genuine utility work and the other for impressing the neighbors.

Today the real station wagon is a rough-and-tumble, all-around working farmer and rancher's vehicle used for hauling the kids to school or fetching the old man back from the saloon on Saturday nights, for carrying heavy loads and doing hundreds of he-man jobs. Most of us know it as a quarter-ton or half-ton pick-up truck. Meanwhile, the other kind of "station wagon" has become more and more of a Fancy Dan passenger car which could haul the cement bags and manure if it had to but generally doesn't. Chrysler's Town and Country is a fine example.

The Town and Country is exactly what the name implies. No limousine made in America offers more luxurious appointments. The huge handle to lower the rear window in hot weather looks like a winch you might expect to find on a millionaire's racing sloop. The

An ingenious tail gate latch is one of the minor "Chrysler touches" that auto expert McCahill likes.





hardware is all definitely masculine with faint overtones of Crane plumbing. The tail gate is built like the Golden Gate Bridge and if your favorite polo pony would fit inside, I'm sure his weight wouldn't strain it in the least.


A good Chrysler touch is the side venting of the tail pipe which, unlike so many other wagons, diverts the exhaust fumes so they don't make the passengers seasick. Another Chrysler invention is the crash pit, or padded bolster, around the entire dash which this company introduced more than 20 years ago in its Imperial roadster. Chrysler dropped this feature for a number of years only to have Tucker and others pick it up again. As for headroom in this Town and Country, I believe you could wear a king-size top hat to the local horse show without a ruffle to your aplomb. The all-steel body is far safer in a crackup than a wooden one and is as easy to clean as a sedan—whereas wood, to be kept right, should be hauled into dry dock like a yacht and revarnished every six months.

The rear passenger seats fold forward and upside down, making additional hardwood floor surface when wanted. Chrysler will supply a mattress for this which means sleeping accommodations ample enough for any two sportsmen or mobsters on the lam. This makes the Town and Country tops for guys who like to get away from it all with guns, fishing tackle and bird dogs. The overall length of this job is 211 inches on a 125½-inch wheelbase chassis, which means you're not driving a scooter. This is really a big-time barouche that literally screams "best of its kind" from almost any angle.

The one I tested was equipped with Prestomatic Fluid Drive transmission (this is optional equipment) which is Chrysler's answer to Hydra-phobia for guys and gills who abhor manual shifting. It is a beautiful hack to drive, providing all things such as size and functional properties are considered. You can't whip this caravan around a corner the way you can the 111-inch wheelbase Plymouth. But then, if you can afford this job you're probably at an age to be slowing down a bit on the curves anyway.

The engine is a bit under-powered. It is a 250 cubic-inch plant, developing 116 horsepower at 3600 rpm, which is on the small side for a car that may very well be called upon to carry a large number of people and hundreds of pounds of luggage. You can make book it's a heavy rig with even half a load. Actually, the engine is the Chrysler Royal whereas the 135-horsepower, 323 cubic-inch Imperial engine would, in my opinion, make it much more of a buy. Naturally, you don't buy a car of this design for flash performance

[Continued on next page]



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## Chrysler Station Wagon

[Continued from page 173]

but I feel it could stand a bit more power. For example, on my test I took this car for miles on a run north of Detroit and made a number of acceleration checks just for comparison. I found that, as with so many other automatic boxes, if you want to move out at all you must start in Low and hand shift to Drive as soon as the engine starts to peak. This, incidentally, occurs sooner with this engine than in many others. I found that shifting at about 30 was my best bet. Zero to 60 in Drive all the way, with three people in the car, took 26 seconds. Using Low and Drive dropped the time to 23.8. Zero to 30 in Drive took 8.1 seconds. Using Low it took 6 seconds flat.

### SPECIFICATIONS

#### MODEL TESTED:

1950 Chrysler Town and Country all-steel station wagon

#### ENGINE:

6 cylinder, L-head; bore 3 7/16 inches, stroke 4 1/2 inches; maximum torque 208 foot pounds @ 1600 rpm; brake horsepower 116 @ 3600 rpm; compression ratio 7 to 1

#### DIMENSIONS:

Wheelbase 125 1/2 inches; overall length 211 inches; width 75 3/4 inches; height 67 1/2 inches; weight 4400 pounds; standard tire size 8.20 x 15; gas tank 20 gals.

#### PERFORMANCE:

0 to 30 mph, 8.1 seconds (using Drive only)  
6.0 seconds (using Low and Drive)  
0 to 50 mph, 15.3 seconds (using Drive only)  
13.5 seconds (using Low and Drive)  
0 to 60 mph, 26.0 seconds (using Drive only)  
23.8 seconds (using Low and Drive)  
Top speed, 82-86 mph

#### SPEEDOMETER ERROR:

At 60 mph on speedometer, actual speed 61.22 mph

This car cruises nicely at 70 with a top speed between 82 and 86, depending on the load. This is not a race car by any stretch of the imagination and these figures should not be used in comparing this utility wagon against regular sedans of much lighter weight and, by the same token, with far fewer functional qualities. I found in driving the car over narrow and winding roads it handled remarkably well and once when I was forced to turn around on a narrow dead-end stretch down by the lake's edge, I got around with a minimum of effort. Later, much to the horror of the Chrysler man with me, I drove it onto some fairly soft sand and stopped. By slowly giving it the gas in Low, it walked right out without a break. This wagon is big enough to have real traction. The ride is as comfortable as that of any regular sedan in the country and the seats are tops. Chrysler has a way of pitching their seats that some of the other manufacturers would do well to copy. •



## Car Care

[Continued from page 140]

thinner. When using such a special thinner, follow the maker's instructions carefully.

Remember that cleanliness is vital to good refinishing. Even finger prints will show up if the unpainted surface is touched by hand. Runs and sags are not desirable either. They can result from too wet coats, too much thinner or too heavy coats. This can be avoided by greater care in regulating the fluid adjustment on the spray gun. Check by occasionally spraying a large piece of cardboard. Don't hold the gun too close to the car.

Your own safety depends on remembering that lacquer is made of dangerous stock. Its chief ingredient, according to a study made by a leading insurance company as a guide to those who spray, is pyroxylin—a direct descendant of nitro-cellulose. It is just a little less combustible than gun cotton. So do the job outside preferably, and make certain there is excellent ventilation with every precaution against fire, if the work is done under cover.

If by this time you haven't recognized the car, we'll let you in on a secret. It is none other than Mimi the Magnificent—a Model A Ford still capable of the grueling grind from Mamaroneck to Jones Beach (38 miles) without a break-down! •

## Reducer-Adapter

[Continued from page 150]

the camera. The smaller picture opening should be slightly off center. This is to make it easier to operate the  $3\frac{1}{4} \times 4\frac{1}{4}$  holder slides, and to provide operating space for the slotted locking bar at the top of the adapter. The ground glass should be masked with black material so you see the same picture the film records.

To best determine what clearances are required and where each particular piece should be positioned use the holder and camera as patterns. The difference in positions of the film surface in a 4x5 and a  $3\frac{1}{4} \times 4\frac{1}{4}$  is about  $\frac{1}{16}$  in. This amount of setback is provided by two thicknesses of velvet and one of tin can material.

The slotted bar used on the adapter is similar to that used on the camera and is attached by means of two screws, bolts or rivets that run through both thicknesses of sheet metal. Ends of the fasteners on the camera side may be secured by light peening or soldering. Paint all surfaces from which light may be reflected with dull black lacquer. Before painting be sure that you have removed all dirt and paste from the soldering. •

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## Hunting In N. Carolina

[Continued from page 96]

and forth across a swampy pocket in the valley. Then he decided to stop and fight it out. The dogs set up a frantic din, finally augmented by the high, shrill cry of one hound.

"There's one dog we won't take home," the guide explained. "Hope it wasn't one of mine."

Six of us moved in a semi-circle toward the point where the big Rooshian was at bay, and I, for one, moved very slowly and very carefully. By the time we had approached within 200 yards, however, the chase was on again, but we moved off to see what had happened to the luckless hound. The ground where the boar had paused was torn up in a ten-foot circle and one of the mixed-bred hounds lay dead on the edge of it. Another was whimpering on the edge of a small brook, a ten-inch gash across his side and shoulder. The owner of this hound administered first aid, then set off for camp, carrying the dog.

It was almost two hours later that we caught up with the boar although he had stopped twice to take on his yapping enemies, injuring two more in the process. When we arrived he was at bay in a shallow brook flowing between high cut banks and he ignored the dogs to rush for the guide, the first one to appear. The guide put two heavy 12-gauge slugs through the animal's chest and although one of the slugs tore the heart, the boar ran more than 30 yards straight at the shooter, before collapsing. The guide was reloading while he ran away from the big pig.

When dressed out, the boar weighed 260 pounds and his tusks measured  $5\frac{1}{2}$  and  $5\frac{1}{4}$  inches each.

This was considered to be a typical hunt although a boar is not killed every time as we discovered during the next three days. Only one other boar was killed during this period, although four were jumped by the hounds. At the end of four days, only nine of the 16 hounds were in sound condition. Three had been killed and four badly injured. None of the Plott hounds was the worse for wear.

Participation in a Great Smokies boar hunt is neither difficult nor expensive. The State of North Carolina conducts several hunts each fall and winter with the cooperation of the U. S. Forest Service, and Tennessee conducts similar hunts. Experienced guides with the necessary dogs are provided and the cost is \$50. Divided among five or six hunters, this charge is negligible. Hunts normally are held between October and January and since the bear season also is open at that time, most of the hunters manage to get either a boar

[Continued on page 179]



## Alternating Current

[Continued from page 156]

AC will do to our newly made magnet. Hook your solenoid up to a toy transformer having about 35 volts output. Pick up some tacks with this homemade magnet and slip it into the solenoid with the tacks still clinging. Allow the alternating current to pass through the coil for about five minutes and then shut it off. Now you will notice that the tacks immediately fall off thus proving the magnetism has been destroyed. (See photos on page 155.) Notice also that the steel is warm.

When you passed DC through the coil a North magnetic pole was set up at one end of the bar and a South pole developed at the other. The tiny magnetic molecules of steel in the bar were all organized into one big magnet. When you passed AC through the coil it set up a North pole at one end but only during one half of the sine wave. When the current reversed, the magnetic poles also had to change. The result is that the molecules are swung back and forth so much that they cannot decide which pole to become. Naturally when molecules are rubbed against each other they will create heat.

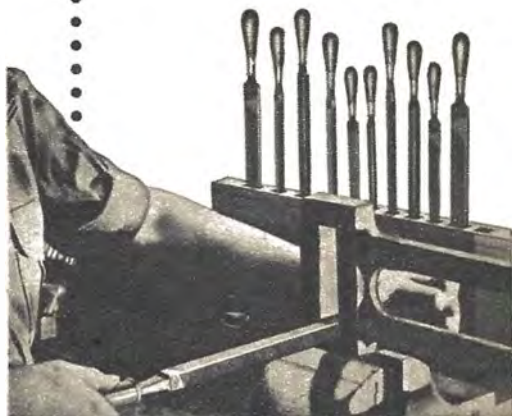
**Experiment 5.** When alternating current passes through coils of wire other strange things happen. Hook a 6-volt flashlight bulb in series with your solenoid and a 6-volt battery. You will find that although the bulb lights as usual, it might be slightly dimmer owing to the resistance of the wire. Now slip the steel core slowly in and out of the solenoid. The lamp does not change.

Substitute 6 AC volts from your toy transformer and the lamp will light with the same brilliance as with DC. Now slide the steel core into the solenoid and you will find that the lamp slowly dies out! (Second photo.) If this were DC we would say the solenoid is acting as a resistor, but in AC we don't refer to it as resistance. We call it *reactance*. What's more we call it *inductive reactance* because a solenoid with an iron core in it is known as an *inductor*.

Beneath the surface of this experiment some mighty interesting forces are at work. From your practical knowledge of DC you know that when you close the switch in a DC circuit, both the voltage and the current (amperes) jump to the job together. In this simple AC reactive circuit this is no longer true. The minute you close the switch AC voltage appears in the circuit—ready, willing, and able, but the current can't get started. When it finally does get off to a start the voltage has begun to fall and is ready for its reversal. When the voltage goes into its

[Continued on page 186]

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## The Great Joiner

[Continued from page 171]

Some nails in the smaller sizes have a duck bill point that cuts through the fibers of the wood similar to the cutting action of the chisel point. They are used primarily for holding thin veneers.

Nails with side points are used in woods that split easily. They are also suitable for clinching or bending over the point after it has gone completely through the wood. They are similar to the blunt point but less effort is required in driving.

Everyone has heard of, if not seen, the two-headed man or beast of the side show. The two-headed nail is not a freak but a very useful product of the nail manufacturers that is purposely made that way. It is meant for easy removal from scaffolding or any other temporary work. Other heads may be flat, offset, oval, countersunk, hooked, curved, or checkered. Those to be used for identification purposes have raised or depressed figures. Some nails are even headless.

Much progress, research, and development has gone into producing the high quality nails that are on the market today. Some of these have been made specifically for roofing, concrete work, roller shades, beer cases, baskets, shingles, hinges, and egg cases. Others are for hinges, boats, barrels, berry boxes, flooring, brooms, and fiberboard. Some look and drive like screws, some are barbed, and some have circular rings to aid their holding power. They may be purchased as bright, cement-coated, zinc-coated, blued, galvanized, coppered, tinned, brass plated, or stainless steel. Those that the lathers hold in their mouth while putting up lath are even sterilized.

Nails to be used in roofing are made with a zinc-coated head and a lead plate that seals the hole against possible entrance of moisture. The lead does not cover the head and so cannot be knocked loose by the hammer. To assure an absolutely tight fit, such nails are also available with a shank that resembles a screw.

A comparative newcomer to the nail industry, but one becoming more popular, is the aluminum nail. This nail is especially favored for outdoor work because of its rust-proof, stain-free quality. On a per pound basis it is more economical to buy as the purchaser gets nearly three times as many aluminum nails per pound as he would steel nails. Aluminum nails are now made for roofing, siding, lathing as well as in the common nail sizes in lengths from 7/8 in. to 3½ in. Some styles are made with Neoprene washers to assure a weatherproof seal when they are to be used on outdoor work. •



## Hunting In N. Carolina

[Continued from page 176]

or a bear. Under the present regulations, no party may use more than eight hounds, but this is enough for the average hunt.

Supervised boar hunts are conducted also by the North Carolina Conservation Department and interested hunters may obtain complete details by writing to the Department at Raleigh. An applicant must pay a \$15 fee and in the event all the permits are taken, this fee is returned.

Any deer rifle is satisfactory although the hunter wants to select the heaviest possible load in the caliber preferred. Many use shotguns and rifled slugs. The range is short and the shocking power of one of these slugs is terrific. If a rifle is used, the sights should be set for 50 yards and the hunter should know the zero of the rifle at any range from 10 to 50 yards. Open iron sights are preferable since you will require sights that will align as quickly as possible.

If you should decide in favor of a shotgun and rifled slug, before you get into boar country touch off a few rounds just to see how your gun shoots. Most novices are inclined to hold much too high.

The boar is not a native of this country, but was imported from eastern Europe about 40 years ago. A mad Englishman, having leased several thousand acres of mountain and forest in the vicinity of Hooper's Bald in the Smokies, had visions of operating a great game preserve. He had big game animals brought from several parts of the world and among them were several Russian boar. This preserve was fenced, at great expense, but when the venture proved a failure, the fence rusted away and the game spread out over the neighboring country.

The boar seemed to find the climate and terrain suitable and they multiplied, spreading out over thousands of acres in the vicinity of the Cherokee and Nantahala National Forests with some in the Great Smoky Mountains National Park and the Chattahoochee National Forest. The average boar weighs from 200 to 300 pounds, but many have been reported scaling as much as 600 pounds. The two large tusks that protrude from the lower jaw often measure seven or eight inches and they are terrible offensive weapons.

While many bear hunters insist that it is a rarity for a bear, except a female with cubs, to charge a man, boar hunters insist that most of these animals will charge a man on sight, even though not wounded. This adds considerable zest to boar hunting, so if you have a yen to hunt really dangerous game, here's your chance. •

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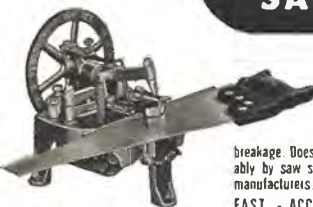
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## Your Invention

[Continued from page 63]

Give a brief outline of any tests which have been made of the invention and include a summary of its patent status and what steps have previously been taken to develop it or bring it to the attention of the armed services or other government agencies. Give a complete description of your invention including any necessary sketches, drawings or photographs. Incomplete information may not be enough to allow the Council to judge the suggestion properly.

Do not send models unless the Council informs you that a working model is needed for testing. In one case an inventor sent the Council a package containing models of two types of bomb. The outside of the package gave no indication of its contents but fortunately there was a warning notice inside. There was considerable alarm until Maj. Gen. W. H. Tschappat, a member of the Council and former chief of Army Ordnance, personally took charge. Another inventor suggested an anti-personnel bomb loaded with itching powder made from a weed and sent samples which almost completely disrupted the workings of the staff.

The Council tries to discourage inventors from going to Washington until the armed forces actually want them there to discuss development and manufacture of their inventions. One inventor made the long trip to Washington from Oregon, only to learn that his invention could not be used by the armed services. He was stranded in Washington without money for return fare.

Because of the official nature of the National Inventors Council and the high standing of its members you can be sure you will not be cheated. However, the highly secret nature of developing inventions for war has occasionally caused misunderstandings. In one case an invention was turned down without explanation only to be used later. The reason was that another inventor had proposed it earlier and consequently had the rights to it. However, the second inventor could not be told this because of security reasons.

Exactly how much the armed services have paid inventors for ideas submitted through the National Inventors Council is not known. However, estimates place this figure in the millions.

Lawrence Langner, secretary of the Council, in speaking of the royalties inventors received from the Government, says, "It's pretty plain that they were all well satisfied. If they hadn't been, they could have filed suit in the Court of Claims and I can't remember a single instance of that having been done."

Certainly Charles A. Hedden has no com-

January, 1951



plaints. Probably as much credit for the Allied victories in North Africa belongs to him as to any other single man. Hedden is no highly trained scientist but rather an ordinary American whose education was received in a country grade school in Florida. In 1934 Hedden, who owned a small radio repair shop, was approached by two strangers who had a map supposedly showing where Gasparilla, the famous pirate, had buried his treasure. They had searched the site near Charlotte Harbor, Fla., but their map had not been accurate enough to locate the exact spot where the treasure lay. Could Hedden figure out a gadget which would show the presence of buried metal?

Hedden could and did. He devised a delicately balanced electrical circuit which would be disrupted by the presence of metal nearby. With this contraption the treasure hunters prowled Charlotte Harbor for months. The gadget proved to be a whiz at locating buried metal. It found old anchors, discarded auto crankshafts, rusted stove lids—but no gold.

However, it later proved to be a treasure in itself. For when the war came along, Hedden offered the invention to the U. S. Government through the National Inventors Council and eventually it became the standard mine detector used by the Allied Forces. It played an essential part in clearing out Axis mine fields to open the way for Allied victory.

Hedden received \$50,000 from the government for his invention. But he has also adapted it for other purposes such as screening metal out of materials like tobacco and rubber.

But the great success of Hedden's invention has created still another problem—how to detect the non-metallic mines which other nation's have been forced to develop when their metallic models became ineffective.

That problem has not yet been solved and it remains high on the needed list of the National Inventors Council. Solve it—or any other of the difficult military problems listed on page 60—and you'll make yourself a fortune. And at the same time you'll be helping your country in a time of great crisis. •



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## Synchronize Camera

[Continued from page 147]

it moves it makes contact which closes the circuit and discharges the flash bulb.

In the case of the box camera, once the front plate has been removed it will be seen that the shutter travels about 180° clockwise when the shutter release is tripped. During this movement a small hole in the shutter passes over the camera lens, allowing light to enter through the lens and expose film inside the camera.

The electric circuit starts with the shutter. A small brass contact point is soldered to the shutter. This makes contact with a sweep contact which in turn is connected to one of the brass plugs which are inserted into the flash case socket. The other brass plug is grounded to the metal frame of the camera to complete the circuit.

Selection of the placing of the shutter contact is the prime problem. It must be affixed to the shutter so that it can travel through its arc without coming into contact with any other moving part. The shutter is cleaned down to the bare metal before soldering to insure good contact, and the piece of brass is bent in the shape of a right angle, with the upright  $\frac{1}{8}$  in. high. Don't make the base too big for it will add weight to the shutter and slow down its speed.

With shutter contact in place, work shutter slowly and when the hole in the shutter begins to pass over the lens and about  $\frac{1}{8}$ th of the lens surface is exposed, stop the shutter. That is the position that the shutter must be in when the shutter contact is made with the sweep contact. The lens is only partly exposed, but when the slight time lag needed for firing the bulb is allowed, the shutter will be fully open or exposed when the peak amount of light is available.

The sweep contact is a strip of  $\frac{1}{8}$ -in. wide phosphor-bronze, .006 of an inch thick, mounted to the side of a piece of plastic or hard rubber. Two No. 0-80 screws hold it in place. Use No. 53 drill on finger to allow for clearance of screw and use No. 56 drill in making holes in plastic or hard rubber base, for these holes must be tapped so that the finger can be pulled down tightly to the base. This base is then mounted onto the metal plate that holds the shutter mechanism. Use No. 2-56 screws. A No. 44 drill in base will allow clearance, and No. 50 drill in plate will allow for tapping. In locating the position for the sweep contact, place the base so that the finger makes brush contact with the shutter contact when the lens is partly exposed, as outlined in above paragraph. Be careful the screws do not touch each other,



for the sweep contact must be completely insulated.

Next come the brass plugs on the face of the camera. It is best to get your flash cord first so that you'll be able to fit the plugs into the socket. Use a piece of plastic or hard rubber as a base for these plugs, and pieces of  $\frac{1}{8}$ th inch round brass plugs. After carefully measuring the distance between the female sockets in your flash cord, drill holes at corresponding distance in your base, using a No. 43 drill, then tap the holes with a No. 4-40 tap. Also drill two holes in the base for screws, No. 2-56's which will secure base to the camera's front plate, using a No. 44 drill in the base.

Using a No. 4-40 die, thread the end of your two plugs. Thread the first plug a turn or two more than the  $\frac{1}{4}$  inch thickness of the plastic or hard rubber base. On the second plug, thread an  $\frac{1}{8}$  in. or a turn or two more. The longer threaded plug will be your ground. It must reach all the way through the base and come into solid contact with the metal front plate. The plug with the shorter thread is the plug which will be connected to the sweep contact. It must be insulated and therefore must not touch the front plate or it will cause a short.

With the ends of the plugs threaded, leave  $\frac{3}{8}$  in. of stock above the thread and cut section from rod. Use a hand file, grinding wheel or small lathe to bring the plugs down to a size where they fit snugly into the female sockets of the flash cord plug. The insertable ends of the plugs should be about  $\frac{1}{4}$  in. long, leaving a collar of about  $\frac{1}{8}$  in. between the thread and the prong.

Locate the area in which you intend to mount the base for your flash contact. Mark out holes for holding screws and also a hole for the connecting wire that will join the sweep contact and the plug. Use No. 50 drill in making the holes for the holding screws, and tap out to fit No. 2-56 screws. The hole for the connecting wire can be made with a No. 43 drill. Mount the base and then screw in the plugs. Make sure that the long threaded plug does bite firmly on the metal front plate and that there is almost an  $\frac{1}{8}$  in. between the bottom of the other plug and the side of the base that is against the front plate. Put a drop of solder on the end of a piece of insulated wire. Insert into the front plate hole leading into the hole in the base into which the short threaded plug is seated. Hold wire against plug and touch a soldering iron to the tip of the plug until the solder softens and holds. Measure the wire so that there is a bit of slack and join other end to the base of the Finger Spring with a drop of solder. •

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## MI Battery Charger

[Continued from page 136]

if you build the MI Battery Charger and use it properly. Electrically, a charger is a very simple device. It consists essentially of a transformer that steps down the 117-volt house power line to about 15 or 18 volts, and a rectifier that changes this alternating current to direct current. The greater the current that can be pushed into the battery, the shorter the charging time—within certain limitations. A charger that can deliver about ten amperes is just right for batteries now in common use. Left on overnight, say nine or ten hours, it will revive a battery that is pretty well exhausted. Connected for shorter periods at the high rate, or again overnight at a lower rate, it will keep a battery peppy.

Easily controllable output is one of the features of the MI Charger. Not only is the primary of the transformer tapped at three points to match the unit to different line voltages, but the direct-current secondary circuit is provided with a rheostat for fine adjustment of the charging rate from the maximum of ten amperes down to about two amperes. Added to this feature is the ability of the charger to handle either six-volt (three-cell) or twelve-volt (six-cell) batteries, either separately or at the same time. While three-cell batteries are standard on passenger cars, six-cell batteries are used on many commercial and on practically all military vehicles, as buyers of surplus Army trucks have found out.

The charger uses a rectifier of the selenium type. This is absolutely quiet in operation, starts instantly, and does not create interference in radio and television receivers. The rheostat and cabinet are not included. The former is readily obtainable from radio supply houses, and the latter is made of plywood.

Neither the placement of the parts nor the size of the cabinet is critical. The transformer and the rectifier, being the heavy items, are placed on the baseboard, and are fastened by 6-32 or 8-32 machine screws and nuts. The meter, line fuse, pilot light, primary switch and output binding posts are on the front panel. Because the unit becomes fairly hot during long charging periods, the rheostat is best mounted outside, where it can get plenty of ventilation. There is no danger of shock from the exposed rheostat as shown. The voltage in this part of the circuit is 18 volts at the very most, and the transformer isolates the house line from the entire secondary.

There's no point in having a charger unless you also have a way of knowing when the battery needs a boost. The ammeter on the dashboard doesn't mean a thing in this re-



spect. The only instrument for the purpose is a hydrometer. The three minutes it takes to check the three cells of a battery may save you from being stuck with an immobile car on a frosty morning.

To put the charger into service, follow this simple routine: first turn off all switches and other controls on the car itself. The only electrical accessory that is permanently in the battery circuit of most cars is the electric clock, and that draws a very small amount of current intermittently. The hood is already up, because you have just made a hydrometer check and the reading isn't as high as you'd like it to be. Place the charger on the engine block or any convenient place near the battery. Make sure the line tap switch is off. Plug the power cord into an outlet. Attach the clips directly to the terminals: minus to minus, plus to plus. The pilot light may go on dimly because current flows into the circuit from the battery. Turn the rheostat all the way to the left so that all its resistance is in the circuit. Now turn the line switch to the first low position. The first time the charger is turned on the meter may read backward and chatter a bit. If it does, snap the switch on and off once or twice and the needle will read to the right. The current indicated by the meter will be two or three amperes, depending on the line voltage and the condition of the battery.

If you want a heavy charge, turn up the rheostat slowly until the meter reads ten; for a medium charge, back it off to about five amperes. That's all. Close up the garage. The next morning turn the switch off and unhook the clips and the line cord. Don't start the car with the charger connected—the starting motor is practically a dead short circuit and the selenium rectifiers might be damaged.

Of one thing you can be certain: when your neighbors notice how your car kicks over on cold mornings they'll be around very soon to borrow the charger!—Robert Hertzberg •

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#### Other Required Parts:

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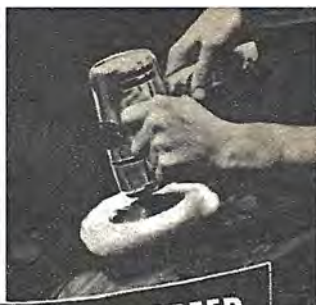
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## Alternating Current

[Continued from page 177]

reversal the slow-starting current is late again in moving in the opposite direction. We call this *leading voltage* and *lagging current* and we always have it when an inductance is placed in an AC circuit.

**Experiment 6.** Hook up an 8-mfd paper condenser with a 6-volt flashlight bulb and your solenoid as illustrated in fig. 3. You will notice that with the core out of the solenoid the flashlight bulb burns very dimly. If we add more inductive reactance we will cancel out some of the capacitive reactance and then the circuit will approach resonance. We can do this by slowly sliding the core inside the solenoid. At once the bulb begins to burn brighter proving that more current is flowing, and showing that we are knocking down the capacitive reactance. You will find that as you approach perfect resonance the bulb may burn out.

Your radio receiver owes it ability to separate the stations to resonant AC circuits. As you turn the tuning dial you are adjusting your variable condensers so that they resonate with fixed inductances in the receiver.

**Experiment 7.** Wind about 20 ft. of No. 28 double cotton-coated wire on top of the winding already on your solenoid. This now becomes the secondary winding. The primary winding is the original wire on the coil (see fig. 4). Notice that there is no connection between the coils. For this experiment the iron core should be placed in the coil.

The experimental transformer should be tried on DC first—about 45 volts. When DC is passed through the primary you will find that nothing appears to happen at the secondary end. The fact is when you first sent the DC through the coil there was a surge of voltage in the secondary caused by the build up of a magnetic field in the coils. However, to make the transformer work we need more than a momentary magnetic field surge. We need a continuously rising and falling magnetic field. The answer to the problem is to use alternating current.

Disconnect the DC battery source and connect the primary winding to a 35 volt tap-off from your toy transformer. Now you will notice that the flashlight bulb lights—and stays lit! The rising and falling magnetic field caused by the alternating current in the primary winding is inducing voltage in the secondary coil. In this case your transformer is operating "step down," that is, it is reducing the 35-volt input to 2 volts.

By going through these experiments, you will be able to clarify many of the seemingly inexplicable properties of electricity. •



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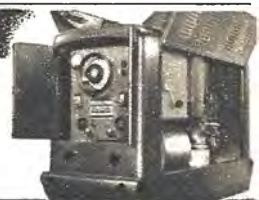
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## Make-It-Yourself

[Continued from page 72]

him happy. That year the man made himself happy to the tune of \$20,000 which is what he grossed by taking on those two-by-nothing jobs that commercial machine shops wouldn't touch. Now he spends all his time at Zelf's.

Most of Zelf's customers are men, but an exception was a young lady who dropped in last year just to learn. Now her business is making plastic dolls for window displays.

Zelf worked for seven years in the Aluminum Company of America's plant in New Jersey. Before that he worked on the first PT boats to see action in World War II. After the war he had some ideas of his own that he thought might make him some money if he could develop them.

Wherever he went his requests to "borrow" machine time for experimental work were turned down flatly. He wondered, "If I can't find a place to work out my ideas, aren't there many more like me? If I opened a shop for experimental work, wouldn't expert machinists beat a path to my door to rent the machines?" He did, and they did, and Zelf was in business.

One of his first clients—he doesn't like to call them customers—was a famous New York sculptress, Roxana. She had always had an ambition to design a modern, all-metal lamp. Expert department store buyers told her that her ideas were interesting but first they wanted to see a working model. Then she went to Zelf's, completed her model in three months and got a fat check for the design from the first manufacturer who saw it. Today, the artist-sculptress-machinist is one of Zelf's regular customers.

Zelf is an unusual businessman. He runs the shop himself, has no employees and works an average of 15 hours a day, six days a week. But since many of his clients are hobbyists who like to work after office hours and on days off, Zelf's shop frequently is open 24 hours a day, seven days a week. He turns his key over to anyone who wants to work on Sundays, holidays or during the night. He trusts everyone and his trust has never been betrayed.

"And why not?" he asks, smiling. "Everyone who comes in here does so because he is in love with his hobby and he knows that this is the only place in New York where he can rent a machine and do what he pleases. He not only sees that nothing is stolen, but he takes care of the place as if it were his own home."

Two of Zelf's clients have practically made his shop their headquarters. They have installed telephones, with Zelf's blessings, and have set up a little desk in a corner from



which they solicit work. Zelf charges them nothing more than the rental fee for the machines they use. He keeps no time slips or records. All his clients keep their own records and pay accordingly. Experts and amateurs, all pay the same fee, which averages four dollars an evening.

Zelf's biggest thrill came recently when he saw one of his clients complete the working model of a fascinating invention. The man was a British engineer and he called his device a "differential gravity meter." An extremely sensitive instrument, it was originally designed to work as an altimeter, to tell the distance away from the earth's crust without depending on atmospheric pressure, sounding devices or radar. Although its details are secret, it was based on a magnetic balancing mechanism. The Englishman sold his model to a prominent company for \$50,000 cash.

Though quite a few have been able to carve themselves a substantial reward with the aid of Zelf's clubhouse machine shop, many come just to work on their favorite hobbies. One young man from a wealthy family in Scotland came to New York as a seaman on a merchant ship and happened to meet Zelf Dugal. He said it was his boyhood ambition to build a model "pug" engine, like the kind that run in Scotland. Zelf invited him in and he finished his model. He fell in love with machines and instead of going back to Scotland took a job as a machinist in a Massachusetts plant.

Even major companies have taken advantage of Zelf's unusual setup. One national food-processing company sent an engineer over to try to develop new packing machines. After working more than a year at Zelf's, he built a machine so big they had to take it apart again to get it out. The presence of such trained men in Zelf's shop is of great value to beginners and hobbyists who often get expert advice and aid from them.

Since he has opened his shop, Zelf says he has learned that there is a gap between the engineer and the craftsman. "One gets too much paper work and not enough practice at a machine. The other gets too much practical work and not enough study or theory."

"I hope," Zelf adds earnestly, "that my shop someday will serve to bridge that gap. I would like to see engineers and craftsmen together. It does everybody a lot of good."

That's just one of Zelf's theories. Right now his biggest problem is to make his shop even larger and to add more machines. He wants to build small rooms and equip them for individual work, with small tools and drafting tables. Then, to help his clients even more, he hopes soon to be able to hire a professional machinist, engineer and draftsman to help him "dish out" advice. •

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## ***He's A Plastic Baker***

[Continued from page 79]

a lucky coin or even a gold-filled tooth from the mouth of a dear-departed husband.

But "Smilite," as Smilie dubbed his new plastic, was too good to be confined to tiny buttons and pins and soon he gave up the button business in favor of larger and more decorative items. His big break finally came in the form of an order from a Hollywood restaurant for a plastic mural measuring 18 feet wide by 6½ feet high. Could he produce it?

Smilie was sure he could, but not in his family oven. Scraping together all their assets and capital, the Smilies moved to Los Angeles, leased an entire building with overhead living quarters, bought a huge electric bakery oven, built some large 3-by-6½-foot sheet metal molds and went to work. They had just enough raw plastic to do the job and could get no more with which to experiment. It had to be right the first time—or else. Of course, it turned out to be right.

Since then, Smilie has been turning out plastic murals and decorative items for which he is paid fabulous prices. The adaptability of his secret plastic lends itself to all forms of artistic expression. Unlike laminated plastic wherein a fabric or flat object is sealed under pressure and heat between two sheets of smooth clear plastic, Smilite is molded from the raw crystalline or powdered state, being heated and melted around objects in an open pan-type mold. The result is a plastic sheet with a soft, wavy surface filled with thousands of tiny bubbles containing the design or objects encased in it. Another advantage over the laminated plastic is the fact that after coming out of the oven, Smilite can be reheated and shaped into any desired form. With laminated plastic, the fabric or materials sealed within would tend to break or tear if the plastic were reheated and bent.

When Smilie is not making plastic murals, he's busy turning out gift items such as salad and fruit bowls, serving trays, plates, lamp shades, screens, light shields, coffee tables with Smilite tops and Smilite masterpieces for furniture panels. His bowls retail for from \$3 to \$165. A 12-inch plate retails for \$7.50. Screens sell for as high as \$750 and for murals the sky's the limit, depending on the size and work involved. Smilie has received as much as \$2,500 for a single job.

On a typical day off, the Smilies can usually be found roaming the countryside collecting specimens of geological beauty or chasing some rare butterfly through the fields. Smilie insists that as long as nature sticks to its policy of never duplicating itself, he'll never turn out two identical pieces of plastic art. •

## ***Meet Mr. Typewriter***

[Continued from page 76]

excitement was over, Tytell had a tough job explaining to his neighbors.

On the other hand, it's the ordinary working American who provides Tytell with some of his most amusing experiences. There was the time a middle-aged man came in and asked for a typewriter with nothing but question marks on the keyboard. He wanted them to come out above and below the line and in different sizes. "I did the job for him," Tytell says, "but I could never find out what he wanted it for."

Probably the most interesting part of Tytell's work is that many of his customers come in without knowing how to speak a word of English. "Then we carry on our transactions in sign language," Tytell says. "I can show them samples from more than 2,000,000 type faces that took me nearly 20 years to collect."

"But once a Catholic priest came in. He couldn't speak English so he tried me in Polish. I tried him in German. Then he tried me in Russian. We couldn't get together. Just as I was about to take him to my type files, he asked me if I could speak Hebrew. It turned out that priest spoke perfect Hebrew."

Tytell takes a keen interest in the problems of disabled veterans and physically handicapped people. Together with Prof. August Dvorak, of the University of Washington, one of the world's greatest authorities on time studies, motion analysis and aptitude testing, Tytell has designed his famous typewriter for one-armed persons.

Right now Tytell is busy putting the final business touches to a dream that has held his attention ever since he's been in the business. He calls it "The Typewriter of Tomorrow."

It took him eight years of laborious research to develop. Although most of its parts are in the process of being patented and are still secret, Tytell is willing to divulge two revolutionary features. One is based on the principle of a self-generating flashlight. Every time the carriage on his dream typewriter moves back and forth, it builds up juice for tiny batteries that provide the typewriter with its own built-in source of illumination. A second feature enables the typist to adjust keyboard pressure for either side of the typewriter so that a left-handed typist, for example, can fix the keys to take the extra pressure of his left hand.

If you're ever shopping for a typewriter around Fulton Street in New York and a salesman asks you if you want to buy the dream machine of tomorrow—don't laugh! It'll probably be Mr. Typewriter himself. •

—Harry Kursh





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## Telescope Maker's Page

[Continued from page 157]

succeeding scientific expeditions will find positive proof it was a meteorite.

The crater is 297 miles northwest of Fort Chimo, about 50 miles from Hudson Straits. The area is relatively unexplored, although geodetic survey parties have traversed it. The 10 billion tons of granite boulders the meteorite threw up, strewn for miles around, served to delay its discovery.

The crater is cone-shaped and rises to 550 feet above the tundra-covered plains that extend 30 miles or more in every direction. It is more than two miles from crest to crest. Inside the cone lies a lake two miles wide and covered with ice that is three feet thick even in the summer.

The largest known meteorite's crater up till now was El Diablo in Arizona, about a mile in diameter, the target of thousands of sightseers annually and the subject of scientific study by astronomers and mineralogists from all over the world. Ungava crater now dwarfs it.—Ken W. MacTaggart.

## Paper Safe


[Continued from page 151]

sions of the box are: 12 in. wide, 14 in. high, and 11 in. deep. This size will hold 100 sheets each of four grades of paper, in the 8x10 size.

Cut two 12x14 in. pieces for the back and door, two 12x11 in. pieces for the top and bottom and two 11x14 in. pieces for the sides. 1/4 in. round strips will do for the shelf supports. Space these on the side pieces. As you assemble the box, make it completely light tight by sandwiching felt or weatherstripping between the parts.

Use a waterproof glue to cement strips of felt over the friction surfaces of the doorway. The strips of metal act as guides and light traps. Cut two 14 in. pieces and a 12 in. piece. Bend them through the middle, making sure you make a true right angle bend. •

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