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POPULAR MECHANICS

MAGAZINE

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SEE PAGE 856

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4. **COMFORT**—Plymouth's Floating Ride plus 11 new comfort improvements.

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"Seems to me it's something worth while—putting in a telephone. People always seem happier when I tell them

they are connected and everything is O. K. Especially if they have been without the telephone for a little while. Most everybody says the same thing—'We missed it.'

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

December, 1935

Vol. 64, No. 6

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The Land of Gold and Mystery

MEXICO, often called "the world's treasure house," contains vast mountain areas almost as wild and primitive as when Cortez invaded the land of the Aztecs. Here Indians still hunt with bows and arrows and maintain their tribal customs of centuries ago. Here gold is a common metal and wives and children of the native men wash it from the gravel in just sufficient amounts to satisfy their needs. There are stories of hidden mines containing fabulous riches. In the January issue a man who has spent years in the isolated sections of Mexico describes this land of gold and mystery for you. Eight pages of pictures in full color illustrate the article.

Next Month

HOW did a Kentucky farm boy dress in 1835? What type of blunderbuss did the Puritans use? These and hundreds of similar questions must be answered daily by those who supply the clothes for the movies. These costumers have in stock enough clothes to dress 500,000 actors, actresses and extras. Watch for the story about them next month.

Higher--and Faster

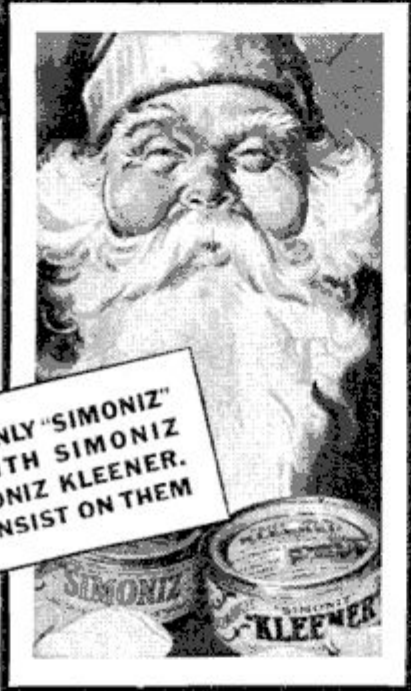
THE higher you go the faster you fly. Pilots have known that for years but they faced difficult problems in piloting aircraft in the rare atmosphere three miles or more above the earth. Factors like engine power and propeller efficiency had to be considered. An article in January explains how high altitude flying is being reduced to an exact science, with increased safety and increased speed as a result.

Pirates of the Air

PIRATES of the ether are at work "jamming" the air lanes to prevent you from listening to radio broadcasts—particularly international programs—for one reason or another. While science can trace an interfering station, no mechanical means have been found as yet to prevent intentional "jamming." An article next month describes the tricks of these air pirates.

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MOTORISTS WISE
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3 Ingram's famous cooling action banishes burning and smarting, prevents irritation after shaving

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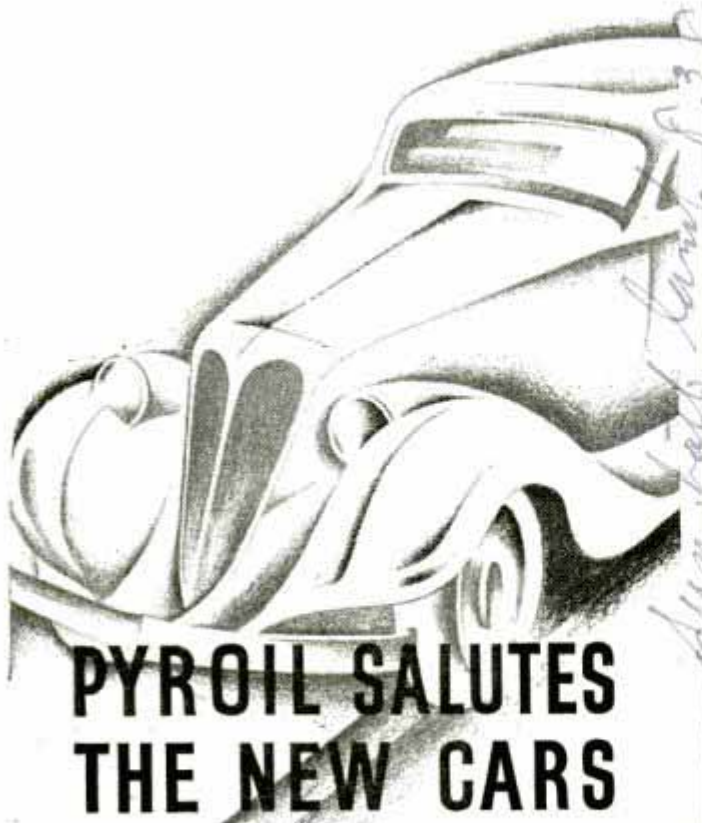
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When jobs are looking for men -that's news!



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TEST *Yourself*

How many of these questions about automobiles can you answer correctly?

1. How can you make your car ride safer at high speeds?
2. Do modern engines run at higher or lower winter temperatures than the old ones?
3. What should you be careful of when inflating front tires?
4. Why was last winter a severe test of anti-freezes?
5. What is the best way to drive out of deep mud or snow?
6. How can you find out how much anti-freeze your car requires for protection in zero weather?

ANSWERS

1. Have pressure in front tires a few pounds higher than the rear.
2. Modern engines run at much *higher* winter temperatures.
3. Be sure both tires carry the same pressure. Uneven inflation causes shimmy and hard steering.
4. The weather was as changeable as a seesaw. Warm one day... cold the next. Ordinary "cheap" anti-freezes boiled away during warm spells and didn't give protection when freezing weather returned. Eveready Prestone won't boil off or evaporate no matter how changeable the weather.
5. *Back* out, if possible. This pulls rear wheels *up* and out. Going forward tends to push wheels in deeper.
6. Turn to Page 15A and find *your* car on the chart. It shows how little—at the new low price—it will cost to have *guaranteed* Eveready Prestone protection in your car this winter.

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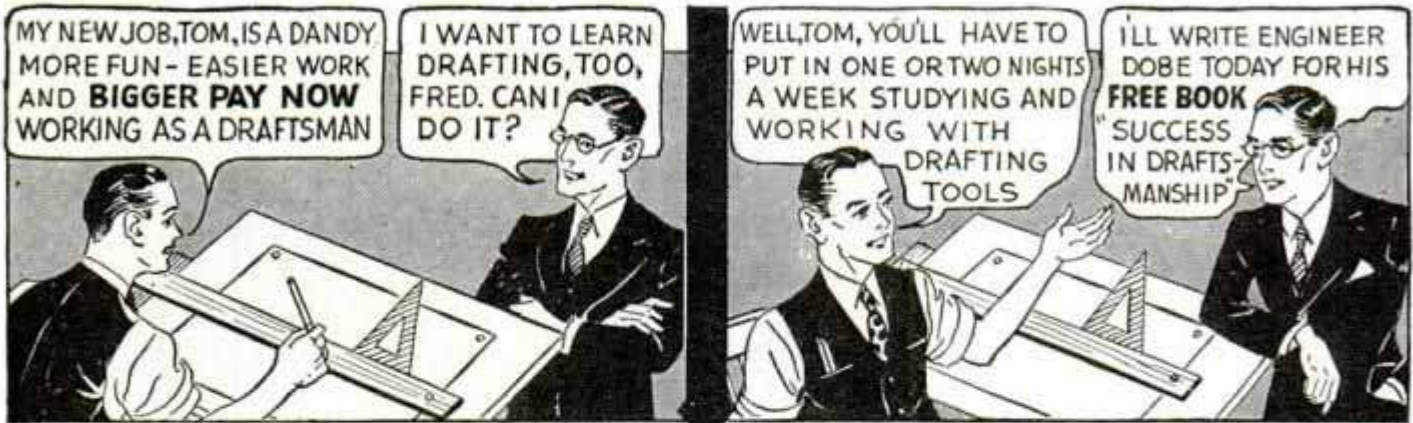
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Government efforts to help are making things hum. In one factory town, a shortage of draftsmen is already reported. Many trained draftsmen will be needed—at better pay and shorter hours.

Who'll get those good jobs? Of course, the men who have prepared—so, prepare now!

For **MORE PAY** Learn **DRAFTING** FROM AN ENGINEER
LEARN BY MAIL AT HOME

Time is money. Learn drafting in your spare time. It's high time now to prepare. Don't wait another day. Send coupon for Dobe's free book.

ENGINEER DOBE, Div. 33-79, Libertyville, Ill.

Send me your free book, "Successful Draftsmanship" and please explain how you assist your graduates to good positions as draftsmen.

Name

Address

Town

State Age

Better Jobs Now

are ready and more expected soon in auto work, aviation, electricity, machinery and certain building lines.

For those who learn drafting now!

It's the way for a quick start to a better paying, much bigger job. Send at once for Engineer Dobe's Book.

Free Book

Outfit
20x25 in.

These **TOOLS** and Other **EQUIPMENT**
Given When You Start

For 34 years (since 1900) Engineer Dobe has taught drafting by mail. Thousands of students, aged 16 and 18 to past 50, have won **SUCCESS!**



Write **NOW** while this offer lasts.

Here's a valuable set of tools—sent at once (also a drawing table), all without extra charge the day you enroll.

HERE is an opportunity that's open to those who know how to grasp it:—

At a few dollars a month, students get complete training in drafting by mail in surprisingly few months—Engineer Dobe teaches his students until thoroughly trained and until placed in a good paying job. Trained Draftsmen enjoy good salaries. If you don't get a satisfactory job:—all your money back. That's Engineer Dobe's guarantee.

With Engineer Dobe's method no previous experience is necessary. High School education not needed. Everything made plain. Practical work right from the start until you're in position.

If you're a mechanic, a knowledge of draftsmanship may make you a superintendent in short order. Get out of overalls and draw the pay of a boss. If you are a boss, learn draftsmanship; a foundation stone of many a line of business.

In every walk of life, practical training in draftsmanship will prove valuable. Even if you never accept a job as a draftsman, will you not be money ahead by taking Engineer Dobe's course?

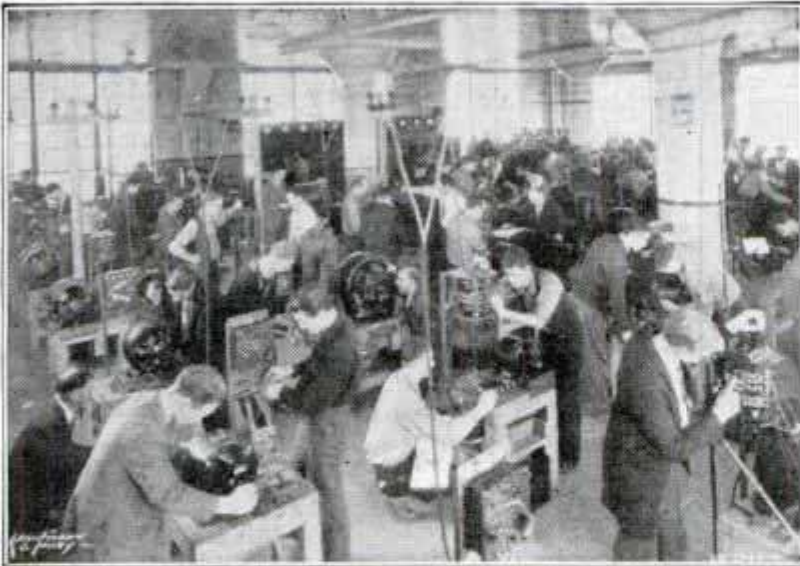
You'll be amazed at the speed with which you can learn in your spare time by Engineer Dobe's **practical method**. Send coupon **TODAY** for free book entitled "Success in Draftsmanship".

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**SEND TODAY FOR DETAILS OF MY
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Get training in 90 days, right here in the big Coyne Shops — **not by correspondence** — but on real electrical machinery. **Mail the coupon below.** If you are short of money I'll send you all details of my finance plan and consider your application. If accepted, you won't have to start paying tuition back until **five months from the date you start school**, and then you'll have **over a year** to complete your payments.



STUDENTS BUSY AT WORK IN LARGE COYNE SHOPS

Tremendous Developments Ahead in Electricity!

HERE is YOUR opportunity to cash in. Every day brings news of new developments in every branch of Electricity, with more opportunities, more jobs, and a greater future for the trained man than ever before. I consider the fellow who is ambitious enough to want to get ahead by taking my Training, worthy of my help. **MAIL THE COUPON BELOW** and you can prove to me that you are willing to spend just **THREE MONTHS** in the Coyne Training Shops Learning **ELECTRICITY**. Then, I'll tell you about my finance plan, which has enabled many to get complete Training and pay tuition back later. *H. C. Lewis*



Learn By Doing In 90 Days

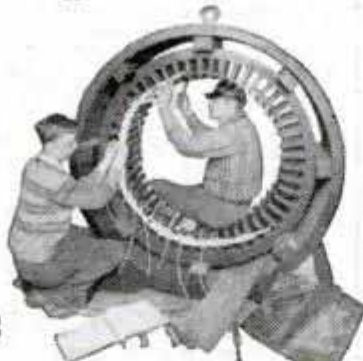
Lack of experience or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! It makes no difference! Don't let lack of money hold you back from getting all details of my amazing plan.

MANY EARN While LEARNING

If you need part-time work to help pay your living expenses and will tell us your problems we may be able to help you as we have thousands of others. Then in 12 brief weeks, in the great roaring shops of Coyne, we train you as you never dreamed you could be trained... on one of the greatest outlays of electrical apparatus ever assembled... real dynamos, engines, power plants, auto, switch-boards, transmitting stations... everything from doorbells to farm power and lighting... full-sized... in full operation every day!

TRAINING By Actual Work

No dull books... you get individual training... real actual work with only the theory you will need. Building seal batteries... winding real arma-



Prepare for Jobs Like These

Here are a few of hundreds of positions in the electrical field. Our free employment bureau gives you a lifetime employment service.
**ARMATURE EXPERT
 SUBSTATION OPERATOR
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 INVENTOR
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 SERVICE STATION OWNER
 RADIO EXPERT**



Home of Coyne School

This is our fireproof modern home where-in is installed thousands of dollars' worth of Electrical equipment of all kinds. Every comfort and convenience has been arranged to make you happy and contented during your training.

tures, operating real motors, dynamos and generators, wiring houses, etc. That's a glimpse of how we help to make you a master electrician, and fit you to qualify for jobs leading to the biggest pay.

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"I owe my Electrical success to your 12 week shop course," says R. B. Umbarger of Tennessee. "Two weeks after leaving school I took a wiring job," reports E. O. Berndt of Illinois, "and the profits from this one job alone more than paid for the entire course." A. C. Hoehnle of Ohio says "Received several raises in pay, due to the training I received at Coyne." And I could quote from hundreds of letters of successful Coyne Trained Men, *What they have done, you should be able to do!*

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Right now I am including my new Electric Refrigeration and Air Conditioning course at no extra cost.

GET THE FACTS

Coyne is your one great chance to get into electricity. This school is 36 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book with photographs... facts... jobs... salaries... opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. So act at once. Just mail coupon.

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Book



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Address.....

City..... State.....

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Address

Age

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That's the kind of big pay earned by airline pilots!
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You should have the unexcelled Lincoln training if you want to qualify for these better pay positions in aviation. 14 years success teaching aviation and 25 years successful experience as a mechanics' trade school recommends this famous Government Approved School to you as the school better able to train you properly.

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I'll train You Quickly for Radio's GOOD spare time and full time Jobs . . .



Broadcasting Stations employ managers, engineers, operators, installation and maintenance men for jobs paying up to \$5,000 a year.



Set servicing pays many N. R. I. men \$200 to \$1,000 a year for their spare time. Full time men make as much as \$30, \$50, \$75 a week.



Making, installing and servicing Loud Speaker apparatus is another growing, money-making field for Radio trained men.

Some Other Jobs N.R.I. Trains Men For

- Broadcast Engineer.
- Operator in Broadcast Station.
- Aircraft Radio Operator.
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- Government Radio Operator.
- Radio Operator on Ships.
- Serviceman on Loud Speaker Systems.
- Installation Engineer on Loud Speaker Systems.
- Sales Manager for Retail Stores.
- Service Manager for Retail Stores.
- Auto Radio Installation and Serviceman.
- Television Broadcast Operator.
- Television Engineer.
- Set Servicing Expert.

Mail Coupon for FREE Information

Why slave your life away in a no-future job? Why skimp, why scrape, trying to pay your bills? I'll train you quickly for a live-wire field with a future—**RADIO**. \$30, \$50, \$75 a week—that's what many Radio Experts make. \$5, \$10, \$15 a week extra money—that's what many of my students make in their spare time while learning. My free book tells you about Radio's spare time and full time opportunities—about my tested training—about my students and graduates—what they are doing and making. Get this book. Be a Radio Expert. The Radio field is big enough to absorb many more properly trained men.

Many Radio Experts Make \$30, \$50, \$75 a Week

Spare time and full time Radio Service, Installing, Operating, Maintaining Broadcast, Aviation Radio, Commercial, Ship and Television stations, a Radio service business of your own—I'll train you for these and other opportunities in the manufacture, sale and service of Radio, Loud Speaker and Television apparatus. My FREE book tells you about the many money-making opportunities in Radio. Get a copy. Mail Coupon today.

Save—Learn at Home in Your Spare Time

You don't have to leave home and spend \$500 to \$1,000 to learn Radio. I'll train you quickly and inexpensively right in your own home and in your spare time. You don't need a high school or college education. Many of my successful graduates didn't even finish grade school. My practical 50-50 method of training—half with lessons, half with Radio equipment—gives you broad practical experience—makes learning at home easy, fascinating, practical and rapid.

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

My book shows how my special training, instruction material, plans, ideas, and my twenty years' experience training men for Radio careers has helped many students make \$200 to \$1,000 a year in their spare time. My Course is famous as "the one that pays for itself."

Your Money Back if Not Satisfied

I'm so sure you will be satisfied with my training that I agree in writing to refund every penny of your money if you are not entirely satisfied with my Lesson and Instruction Service when you finish.

Find Out What Radio Offers You

Act today. Mail the coupon. My 64-page book will be sent free to any ambitious fellow over 15 years of age. It tells about Radio's opportunities—explains the eighteen star features of my Course—shows letters of what others are doing and making. There is no obligation. Mail the coupon in an envelope or paste on 1 cent post card.

J. E. SMITH, President
National Radio Institute
Department 5NP
Washington, D. C.

Here's Proof

Made Up To \$400 a Month



"I was working in a garage with no future in sight. My wife and I decided to put aside enough to pay for your Course. We have not regretted it. I have made as high as \$400 a month in Radio."—**E. G. WOLFE**, 1202 Eden St., Elkhart, Indiana.

\$10 to \$25 Weekly in Spare Time

"I am making from \$10 to \$25 a week in spare time, while still holding my regular job as a machinist. I have earned enough to pay for your Course many times over. Only a trained man can service sets nowadays. I owe my success to N. R. I."—**WILLIAM F. RUPP**, R. F. D. No. 1, Conshohocken, Penna.



Chief Operator in Broadcasting Station

"When I had completed the first twenty lessons, I had obtained my license as a Radio Broadcast Operator and immediately joined Station WMPG where I am now Chief Operator. I do not hesitate to recommend N. R. I. Training to anyone."—**HOLLIS F. HAYES**, 85 Madison St., Lapeer, Michigan.



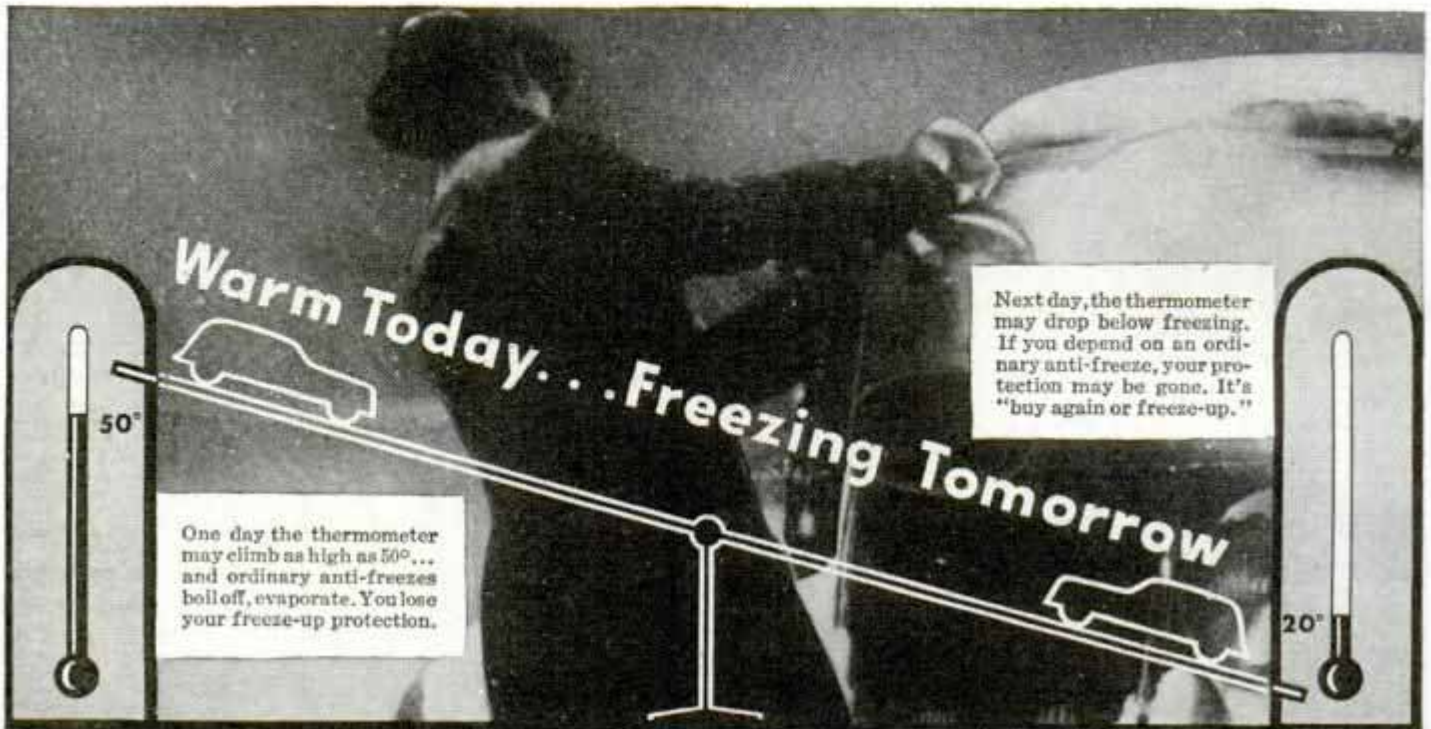
ACT TODAY

Dear Mr. Smith: Without obligation send me your free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please Write Plainly)

NAME.....
ADDRESS.....
CITY.....
STATE.....

The Tested Way to BETTER PAY

DON'T GET CAUGHT IN



Put in EVEREADY PRESTONE

the GUARANTEED* ANTI-FREEZE

One shot, put in now, will guard your car against freeze-up and rust all winter. Eveready Prestone won't boil off no matter how warm the weather gets between the cold snaps. Has no odor. Specifically guaranteed.

Ask Your Dealer This One Question

Of more than 100 brands of anti-freeze on the market, most are based on alcohol—but are not plainly labeled as such. So ask your dealer this question about any anti-freeze you consider buying: "How much of this product is alcohol?" That is important, for alcohol, no matter how disguised or what it is called, is subject to evaporation, leaving you without adequate protection.

Your dealer will tell you that Eveready Prestone contains no glycerine, no alcohol... and that it will not boil off or evaporate. Back of every drop of Eveready Prestone is the following guarantee... your definite assurance of all-winter protection.

* A DEFINITE GUARANTEE

"National Carbon Company, Inc., specifically guarantees that Eveready Prestone, if used according to printed directions, in normal water cooling systems, will protect the cooling system of your car against freezing and clogging from rust formations for a full winter, also that it will not boil away, will not cause damage to car finish, or to the metal or rubber parts of the cooling system, and that it will not leak out of a cooling system tight enough to hold water."

Special Offer... A "Weather Wheel" which will help you to forecast the weather. Also "Weather as a Hobby"—a 48-page illustrated book, prepared by weather experts. Full of fascinating weather facts. Send 10¢ (stamps or coin) to National Carbon Co., Inc., Box 600, Grand Central Station, New York, N. Y.



UCC

Unit of Union Carbide and Carbon Corporation Address _____ (P. M.—12)

THE WINTER SEE-SAW

FIND YOUR CAR ON THIS CHART

IMPORTANT! The price per gallon of an anti-freeze means nothing unless you know how many gallons you will need during the entire winter. You can't get that information on a boil-away anti-freeze. But you can get it for Eveready Prestone...and here it is. See how reasonably you can get two-way protection all winter long against both freeze-up and rust with one shot of Eveready Prestone—one shot because it won't boil off, no matter how warm the weather gets between the cold snaps. If your car isn't on this chart, your dealer has a chart showing all cars; and amounts needed for temperatures to 62° below zero.

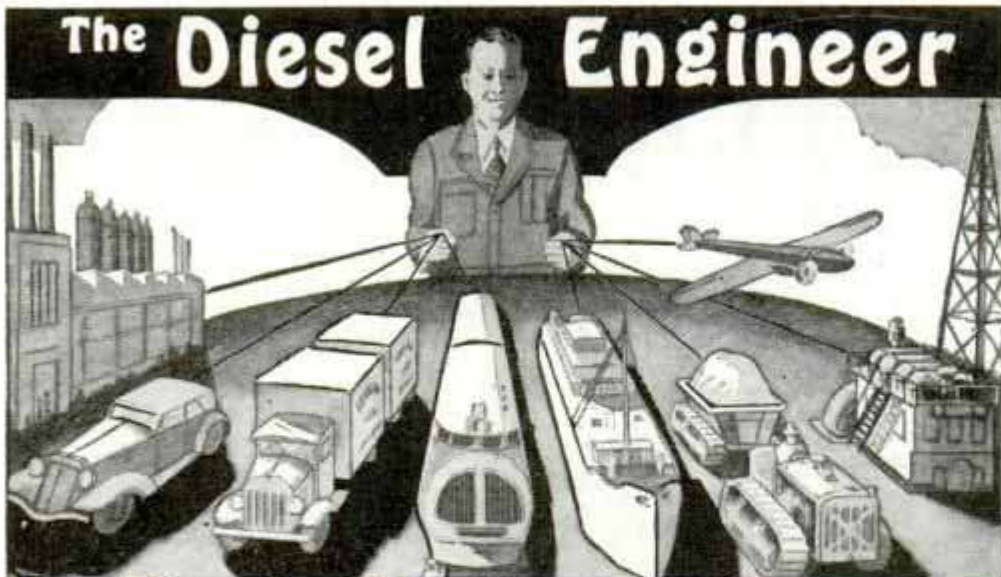
Find your car and read from left to right. The first figure shows the protection you get with one gallon of Eveready Prestone in the cooling system; the second with one and a half gallons—and so on. "+" means above zero. "-" means below zero. If your car has a hot water heater, add 1/4 gallon to the quantity called for.

	1 GAL.	1 1/2 GAL.	2 GAL.	2 1/2 GAL.
Auburn				
6-52, '34; 6-53, '35	+12	-4	-27	-59
8-100, '32; 6-101, 8-105, '33	+15	+2	-16	-42
8-95, '30; 850, '34; 851, '35	+17	+0	-9	-28
Buick				
40, '34, '35;	+6	-18	-54	
60, '32; 50, '33, '34, '35	+10	-8	-34	-62
80, 90, '32; 60, '33, '34, '35	+15	+2	-16	-42
80, 90, '33; 90, '34, '35	+19	+9	-3	-19
Cadillac				
340-D, '34, '35	+14	Zero	-21	-50
355-D, '34, '35	+16	+4	-12	-34
452-D, '34, '35	+19	+9	-3	-19
370-A, '31; 355-B, '32; 355-C, '33	+21	+13	+3	-9
Chevrolet				
Stand, '33, '34, '35	-12	-62		
Master, '33, '34, '35	-6	-47		
Master, '31, '32	Zero	-34	-62	
Chrysler				
6-, '32, '33, '34, '35	+12	-4	-27	-59
8-, '31, '32, AF, IMP, '35	+15	+2	-16	-42
Roy 8, Imp 8, '33; Air 8, '35	+16	+4	-12	-34
Imp, '30, '77, '30, '70, '31	+18	+8	-6	-23
De Soto				
6, '31, '32; '33; 8, '31	+10	-8	-34	-62
6, '34	+16	+4	-12	-34
Airflow, Airstream, '35	+12	-4	-27	-59
Dodge				
6, '32, '33, '34	+8	-12	-43	
See 6, '30; New Six, '35	+12	-4	-27	-59
8-'32, '33	+15	+2	-16	-42
Ford				
A, '30, '31; B, '32, '33	Zero	-34	-62	
V-8, '32, '33, '34	+18	+8	-6	-23
V-8, '35	+16	+4	-12	-34
Graham				
73-Spl 6; 72-8, '35	+14	Zero	-21	-50
6, 8, '33; 6, 8, '34; 75, '35	+16	+4	-12	-34
Hudson				
8, '31, '32, '33; 6, '35	+12	-4	-27	-59
8, '35	+17	+6	-9	-28
8, '34	+19	+9	-3	-19
Hupmobile				
18, '31; Cent. 8, '32; 321, '33	+10	-8	-34	-62
417, 421, '34; 521, '35	+10	-8	-34	-62
Hupmobile (cont)				
322, '33; 422, '34; 518, '35	+17	+6	-9	-28
326, '33; 426, '34; 527, '35	+19	+10	Zero	-15
La Fayette				
1934; 3510, '35	+15	+2	-16	-42
La Salle				
350, '34; 35-50, '35	+15	+2	-16	-42
345-B, '32; 345-C, '33	+21	+13	+3	-9
Lincoln				
136, '33, '34, '35; 145, '34, '35	+23	+17	+10	-2
Nash				
60, '31; 960, '32, '70, '31; 970, '32	+3	-25	-62	
1130, 1070, 1170, '33; 1220, '34	+12	-4	-27	-59
1280, '34; 3580, '35; 1080, 1180, '33	+17	+6	-9	-28
Oldsmobile				
F-30, '30; F-31, '31; F-35, '35	+3	-25	-62	
F-32, L-32, '32; F-33, '33, L '35	+12	-4	-27	-59
L-33, '33; L-34, '34	+15	+2	-16	-42
Packard				
120-'15	+12	-4	-27	-59
Sup. 8, '33, '34; 8, '33, '34, '35	+16	+4	-12	-34
Sup. 8, '35	+18	+8	-6	-23
745, '30; 845, '31; DeL '32	+21	+13	+3	-9
Pierce Arrow				
41, 42, 43, '31; 54, '32; 836-A, '34	+21	+13	+3	-9
840-A, '34; 845, '35	+22	+15	+6	-5
Plymouth				
30, '30; PF, PG, '34	+6	-18	-54	
PA, '31; PB, '32; PE, '34; PJ, '35	+10	-8	-34	-62
PC, PD, '33	+3	-25	-62	
Pontiac				
'30, '31; 6-'32, '35	+6	-18	-54	
8-'33, '34, '35	+8	-12	-43	
Reo				
6-21, 6-25, '32; FC '35; Roy, '35	+15	+2	-16	-42
8-25, '32; S-2, '33; S-6, '34	+16	+4	-12	-34
Studebaker				
Com 8, '31, '32, '33; Dict 6, '34, '35	+10	-8	-34	-62
Dict '31, Com 8, '34, Pres 8, '33, '34	+14	Zero	-21	-50
Pres 8, '31, '32, '35; Com 8, '35	+17	+6	-9	-28
Terraplane				
6, '32, '33; 6 Spec, '35	+3	-25	-62	
8, '33; 6 DeL., '35	+10	-8	-34	-62
6, '34	+14	Zero	-21	-50

PRICE REDUCED AGAIN

Eveready Prestone was used by a million more motorists last winter than the winter before. Thanks to by far the biggest volume in its history, the price has been reduced again to only \$2.70 a gallon.

\$2.70
A GALLON



The Diesel Engineer

Is Your Job Safe

Just as the gasoline engine changed or wiped out the jobs of thousands who depended on horse-drawn vehicles for their living—just as electricity changed the entire set-up in the fields of light and power—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands of workers.

If jobs in your line are steadily growing scarcer, you owe it to yourself to investigate this new, progressive, uncrowded line, that will offer good openings for many years to come.

Diesel—The Newest, Fastest-Growing Power

Diesel engines—because of their high efficiency, dependability, and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, tractors, dredges, drills, pumps, etc.—opening up an increasing number of well-paid jobs for Diesel-trained men. The field of Diesel Engineering is on the upgrade and continually expanding. It will provide steady employment and advancement for those properly trained in this new industry—as long as they need to work. You get complete information on all the latest Diesel developments—two- and four-stroke cycles; low- and high-speed and heavy-duty types; Diesel-electric generating systems, etc.—in our course. Includes all text material—with special diagrams for quick understanding of this new power.

Now is your chance to get into a big new industry and grow up with it to an important position. Today there is practically no competition in the Diesel field, but the increasing use of Diesel engines will result in keen competition for jobs in the near future. By starting your training now, you can keep ahead of such competition.

What This New Field Offers You

Get our Free Diesel Booklet and learn all about this newest, fastest-growing line—its opportunities and requirements. Find out what the Diesel field offers you—how rapidly the Diesel industry has developed during the last three years—the large number of Diesel engines and accessories being manufactured today—how quickly you can obtain a complete understanding of Diesel engine principles and operation by home study during your spare time—without interfering with your regular work.

Asking for information involves no obligation—but it may mark the turning point in your life. Write TODAY for full information.

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There's Quicker, Bigger MONEY for YOU-in POULTRY

Earn \$1,000 to \$2,500 a Year or Have a Business of Your Own!



Whether you want a job at good pay or a highly profitable business of your own—the Poultry Industry offers you more than any other. There's a shortage of poultry meat and eggs—a shortage of trained poultrymen. I'll train you quickly at home—to fill a good job in Poultry—and our FREE Students' Employment Dept. will help you get one!

Spare Time or Full Time YOU CAN Cash-in BIG No matter where you live—city, town or country—or what you do now, my proved methods will assure your success right from the start. I'll help you make from \$1,000 to \$2,500 a year and UP! And, if you choose to start your own business, I'll show you how to make your tiny investment multiply itself automatically. What I've done for thousands of others—I can do for you.

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Mail coupon below TODAY—for my Big NEW FREE Book, "How to Raise Poultry for Profit." My forty years of experience are yours. The Poultry Industry needs YOU. You need my book. Get it—and get in line for the BIG Money that's waiting for you in POULTRY.



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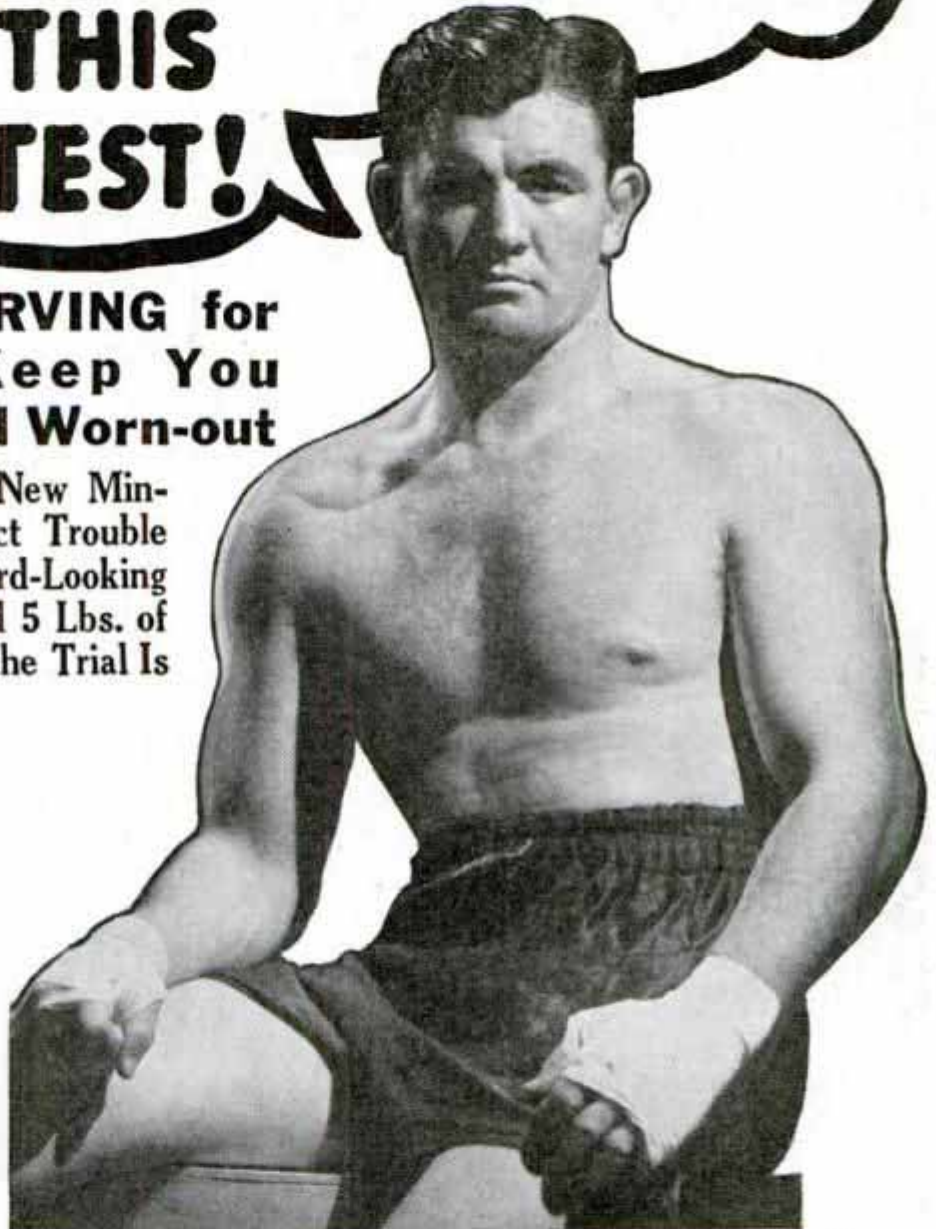
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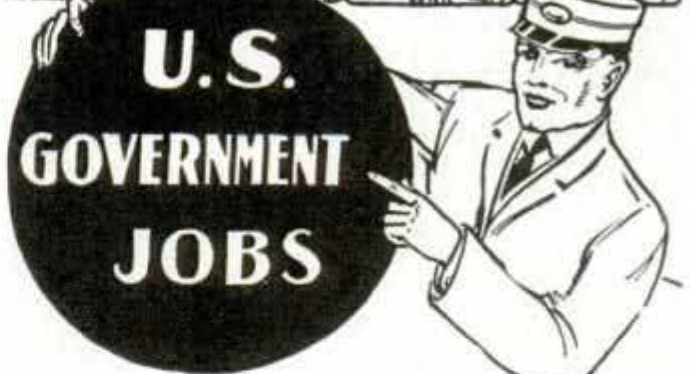
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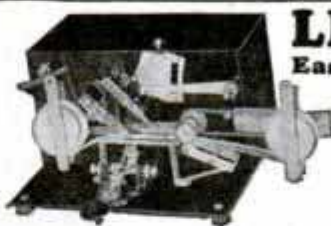
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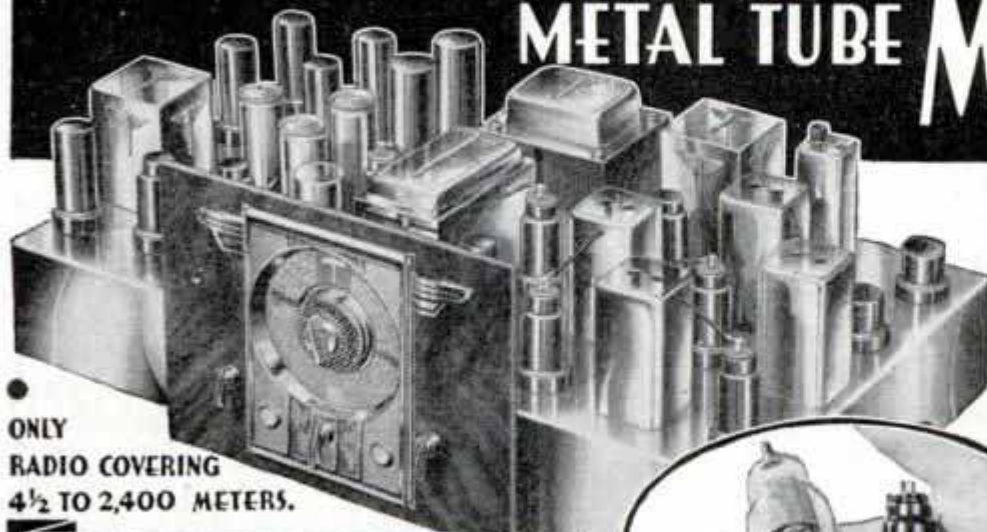


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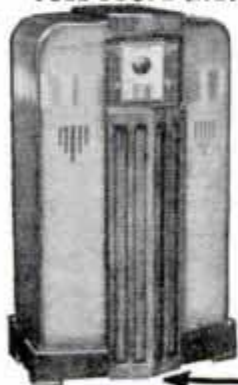
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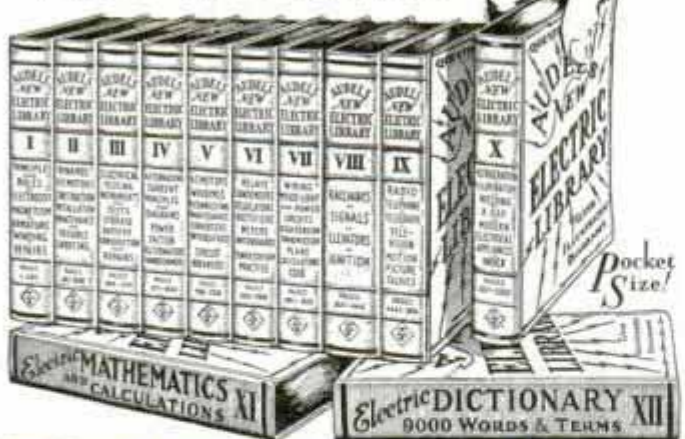
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(Continued to page 58A)

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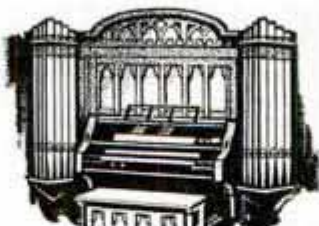


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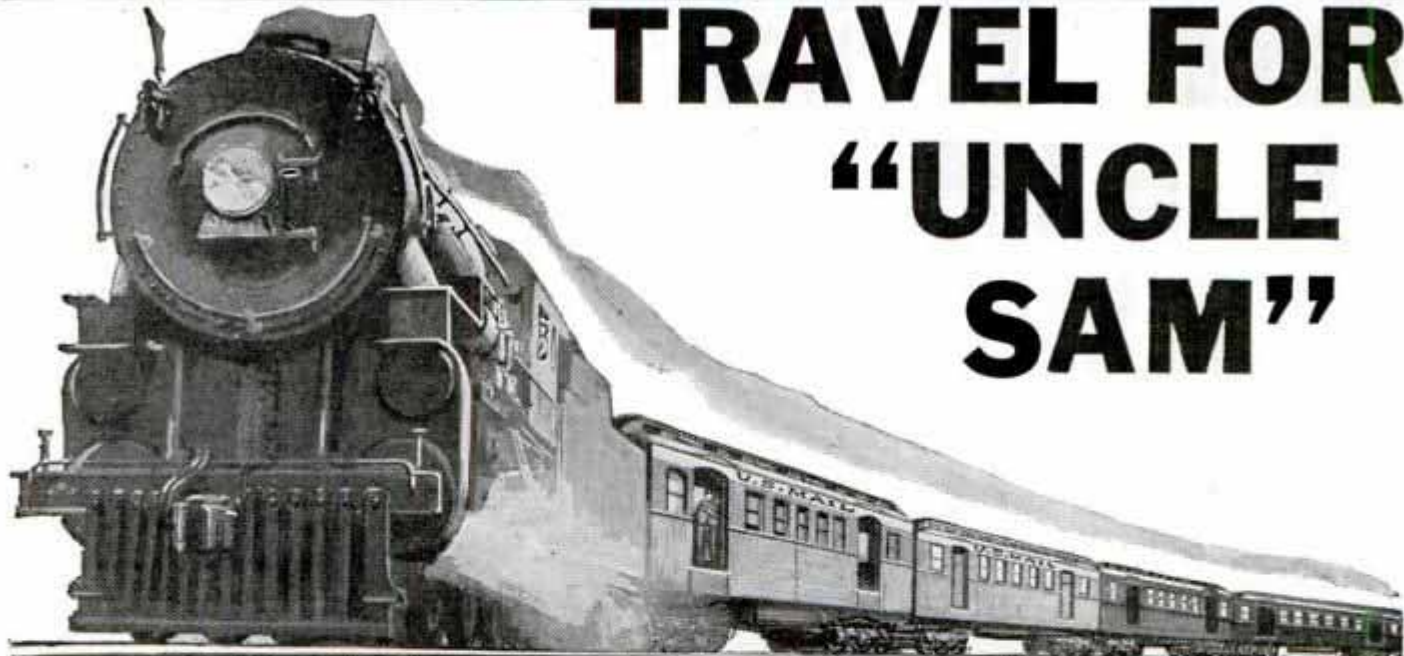
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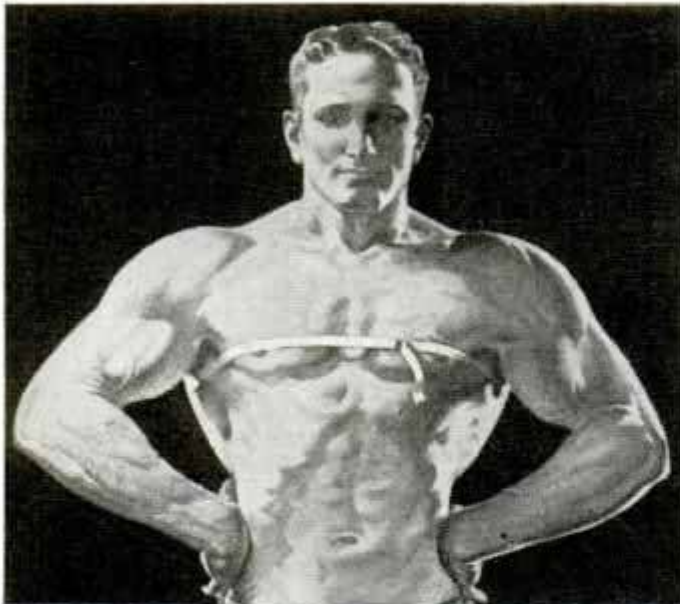
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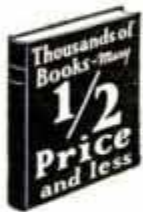
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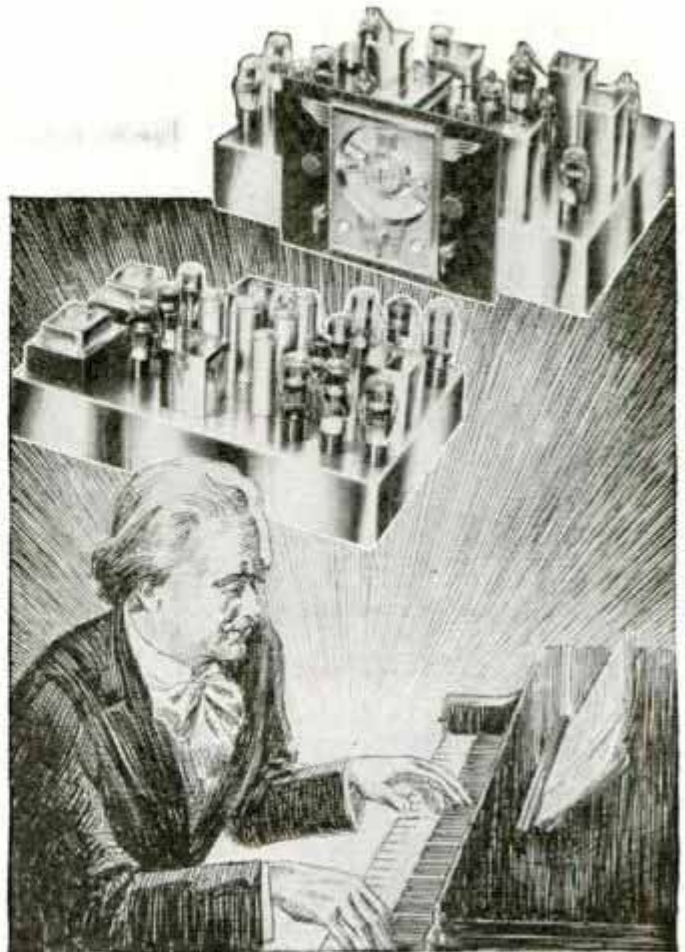
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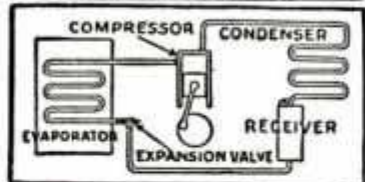
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NEW Professional catalogue, 10c. Frank Lane, Little Bldg., Boston, Mass.

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LONDON. Once again a magnificent bargain. Send dollar bill for beautiful large lot of scarce stamps worth eight times as much. Money back if unsatisfactory. I sell no junk. Bileski, 38 Myddleton Square, London, E.C-1, England.

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EXCELLENT Foreign approvals. 50 different British Colonial stamps 6c to approval applicants. H. Wilcox, Box 142, Torrington, Connecticut.

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POLAND Mourning, Greece charity set, 30 others, 5c with penny approvals. Lejac, Chowchilla, Calif.

INTENSIVE Approval service. Stamps by countries and airmails. Great assortment at 1/2c, 1c, 2c, etc. Application blank free. Stamp Studio, 68 Nassau St., New York City.

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CANADA Treasure packet. Fifteen cents. Frontenac Stamp Company, Kingston, Ontario.

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COMMEMORATIVE Album 50c, 100 selected quality stamps \$1.00. McGull, 2077 Wallace Avenue, Bronx, New York.

STAMP Collections bought! A. Kalber, 452 Ewing Court, Akron, Ohio.

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JAPAN—25 Different only 2c with attractive approvals. Garcelon, Calais, Maine.

SPAIN, Set 5 airmails 10c. Approvals. References. Begin, 48, Sous-le-Fort, Quebec, Canada.

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SILVER Jubilee, Ethiopia, Italy, 25 different, 10c, approvals. Collectors', 166 High Street, Reading, Mass.

UNITED States: 15 commemoratives and pricelist 10c. We buy stamps. Doak, Fresno, Ohio.

GRAND Gift for approval applicants sending dime to Overbrook, 1719 Felton, Philadelphia, Pa.

APPROVALS! Price lists! Postage 3c. Ideal Stampco, 418 Maumee, Toledo, Ohio.

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MOST Notorious stamp ever issued! Famous Nude Spain (Goya's masterpiece), plus giant bicolor Caymans, \$5 U. S., imperforate "Park"—everything 10c to approval applicants. Viking Stamp Co., Dept. 816, Williamsburgh Bank Building, Brooklyn, N. Y.

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1000 **MIXED** U. S., 25c. Rare Vatican commemoratives only 5c to collectors requesting foreign approvals. Lee, Bridgeport, N. Y.

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FREE—25 British colonies with approvals. Harlan, 5307 South Marshfield, Chicago.

PENNY Approvals by country! Hoerning Stamp Exchange, Kansas City, Kansas.

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SILVER Jubilee packet. 25 varieties, 5c with approvals. Lincoln Stampco, 5535 May, Chicago.

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200 DIFFERENT 10c. Approvals. Sachse Stampco, 1057 Trafalgar, London, Canada.

25 DIFF. Stamps, cat. \$1.00 for only 5c with approvals. T. Ahlquist, 1565 Nostrand Ave., Brooklyn, N. Y.

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WAR Declared! Abyssinia 5 diff. 10c; 15 diff. 45c. Scott's 1936 catalogue \$2.15 postpaid. Approvals. Victor Katzman, 630M West 141 Street, New York City.

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UNITED States mixtures 50c, Belgium 90c, Canada 75c lb. postpaid. Mission Co., 4512 North Racine, Chicago.

1000 STAMPS 10c, with approvals. Elbert Hale, Dept. P, Palestine, Texas.

MAGNIFIER, Stock book, stamp album, hinges, watermark detector, perforation gauge, millimetrescale, packet scarce stamps. Price 5c with approvals. Atlas Stampco, Box 4025, Culver City, California.

SCARCE Morocco airmail. Eritrea camel stamp, maps of stamp countries, watermark detector, hinges, perforation gauge, stamp album, many scarce stamps, 5c with approvals. Superior Stampco, Box 8276, Palms Station, Los Angeles, California.

FREE! 15 Different Peru to approval applicants, enclosing postage. Ranson, 3555 Fullerton, Chicago.

NEWFOUNDLAND, 15 Different 5c with approvals. Hudson Co., Plainfield, N. J.

KOREAN Red Cross stamp! Egyptian airmail 5c! Approvals. References. Stamp Center, Rt. 10, Sta. F, Milwaukee.

PACKET Of Guatemala 5c with approvals. Dunn, 2255 Winnemac, Chicago.

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300 DIFFERENT 20c; 1,100, \$1; 2,000, \$2.50. Fred Onken, 630 79th St., Brooklyn, N. Y.

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BIG Diamond Russian games set (5) 10c, approvals sent. Tonka Specialtyco, 3336 Ainslee, Chicago.

SILVER Jubilee mixture. 500 British colonies (125-150 different), plenty jubilees 50c. H. Beckman, Box 21, Station J, New York City.

METAL Perforation gauge 5c to approval applicants. References. Buckley, 35 W. 5th, Dayton, Ohio.

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25 JAPAN For 3c. Beverly Stamp Co., 9337 Vanderpoel, Chicago, Ill.

AIRMAILS! Pictorials! 65 different stamps from strange countries (no Europe), including beautiful New Guinea airmail, smallest stamp, Tasmania, Zanzibar, etc., 10c to approval applicants. Bargain Co., Box 39P, Starlon H, New York.

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LIBERIA Snake triangle, \$10 United States stamp, 30 others. 5c. Crowder's, 127E North, Baltimore, Md.

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UNITED States approvals. Sullivan, New York Building, St. Paul, Minnesota.

INTERESTING List of bargains, collections, free. F. Hughes, Peterborough, England.

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WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

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CHEMISTS'—Students' slide rule solves equations, gives formulae. Only two dollars postpaid. MWC Company, 508 Andrus Bldg., Minneapolis, Minn.

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CHEMICAL Set. Performs 35 experiments, 25c. Fleischer's Laboratories, Everett, Mass.

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GUARANTEED Factory rebuilt instruments for rent (with purchase option) or sale (cash or terms). Largest selection in United States. Ten day free trial. Liberal allowance for old instruments. Save money by buying new. Write for new list M-912. Warren-Knight Co., 136 North 12th St., Philadelphia, Pa. Manufacturers Sterling Transits and Levels. Headquarters for repairs any make surveying instruments.

AGENTS WANTED

MAKE Big money with Christmas specialties. Buy direct at lowest prices. Xmas cards, Xmas tree outfits, colored lamps, gift sets, exclusive novelties. Particulars and illustrated catalog free. Bengor Company, 10 East 17th, New York.

CASH In on holiday demand for choice papershell pecan nuts from world's greatest pecan center. Fireside Foods, Albany, Ga.

CALIFORNIA'S Newest sensation—Instant Jelly—True fruit flavors—No fruit juices needed. Exclusive territory. Big profits. Quick repeats. California Jelly Kwik, Burbank, Calif.

AGENTS—Sell our luminous crucifix for handsome Christmas profits. Hannan Co., 2620 South Parkway, Chicago.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 12A, 4503 Ravenswood, Chicago.

SPLASHLESS 25c Filters save glassware. Valuable proposition. Free introductory try-out. Barnett, Box 63, Times Square Station, New York.

EXCELLENT Trouserpresser, stretcher, creaser, hanger, \$1.00. Agents 60c. Widness, 1461 Fulton St., Brooklyn, N. Y.

MAKE Commissions daily—Sell Good-year raincoats, jackets; union made; lowest prices! Outfit free! Goodyear, BB1133, Milwaukee, Chicago.

100% PROFIT In the "Self Starting Cigar Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 25c. Costs \$1.75 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-36, New Method Bldg., Bradford, Pa.

MAKE More money taking orders shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Outfit free. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

ALUMETAL Valve insides last a lifetime. Plisek Tire Company, Plisek, N. Dakota.

BE Your own boss! Operate quality-used-clothing business from store, home or auto. 200%-300% profit. Everything furnished. Great Western, AX-566 Roosevelt, Chicago.

250% PROFIT. Everybody interested. Free premiums, samples. Reynolds Mfco., 1709 Mango, Chicago.

SELL Men's neckwear, 100% profit. Four sample ties \$1.00. Free catalog. Artstyle Neckwear, Elmira, N. Y.

CASH Income daily silvering mirrors at home. Plating autoproducts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 128, Marion, Indiana.

\$6.85 HOURLY! Amazing No-Flatz fixes punctures without patching; makes tire puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. T-172, Cincinnati, Ohio.

WANTED—Direct purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

\$6.00 HOURLY. Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. T-8, Cincinnati, Ohio.

FREE Plans, books, circulars. Make thousands of dollars selling by mail. Home, Spare time. Mail Order Institute, 609-W, Marcy Ave., Brooklyn, N. Y.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PMM-36, Bradford, Pa.

\$2.00 HOURLY With new, scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sewnomore, T-744, Cincinnati, O.

FREE! Descriptions, 450 newest money making opportunities. Metromalls, P-12, Cincinnati.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

SNAPPY Cartoon booklets—Fast selling side line. Our cartoon booklets are easy to sell. Every man, young and old, will buy them. 300% profit. Don't wait. Get started today on a sure seller. Send 50c for six samples and wholesale price.

STRANGE Discovery! Amazing mineral soap cleans fabrics rugs, clothes, dishes. Fast seller, big profits. Simmons & Simmons, Box 247, Newport, R. I.

AGENTS—Sell our safety pulley line support. No more falling from windows. Write for circular. Safety Pulley Line Co., 1522 Miller St., Utica, N. Y.

ADDING Pencil. Adds mechanically; fast moneymaker; agents wanted immediately. Add-O-Graph Co., Dept. 25, Saltito, Miss.

HOSIERY Agents wanted for men's and ladies' hosiery. We operate complete mill. Elmo Hosiery Mill, Box 2067, Chattanooga, Tenn.

SHOW Sensational new silk hosiery line. Guaranteed to wear without holes for months or replaced free. Quick sellers. Big profits. Samples supplied. Send size. Wilkmit Hosiery, Desk P-37, Greenfield, Ohio.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 12-PM, Chicago.

I'LL Give you groceries at wholesale besides splendid opportunity to make \$60 a week. Brand new Ford sedan given as bonus. Details free. Albert Mills, 9102 Monmouth, Cincinnati, Ohio.

SELL Men's ties, razor blades, etc., big money for you. Heil Premium Co., M3, Gaylord, Minn.

WINDOW, Windshield cleaner. New. Free sample. Glas-Glo, Dept. PM., Phelps, N. Y.

WHOLESALE Catalog free. 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

INTRODUCE Perfumes. Super-quality. New plan. Pays you daily in advance. Write for free samples. Big money proposition. International Industries, Culver City, California.

BIG Earnings selling, installing kitchen range oil burners. Bennett Co., Islip, N. Y.

SELL Tinselled Xmas show cards to stores. Catalog. Roscoe Lynch, Bausman, Pa.

\$5.00 DAILY Easy selling Christmas cards. Samples furnished. Write M-W, 614 Jennings, Ft. Worth, Texas.

AGENTS—Engraved name plates, number plates, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

GENUINE Gold leaf window letters. Easily applied. Sample. Paramount Letter, Box 74, Station A, New Haven, Conn.

MEN—Women \$3 to \$6 daily. Selling 25c household necessity that repeats. Three to ten sold in every home. Free sample. Write Puro Company, 3107 Pine St., Dept. W-2045, St. Louis, Mo.

DOLLARS Daily! Start profitable mail-order business. Details. Duffy, Covington, Ky.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

COIN Money selling colored people. Give away free pictures of Joe Louis with hair preparation. Valmor 5249-NM Cottage Grove, Chicago.

WE Manufacture and bottle under your own brand and name, vanilla, furniture polish, cosmetics, etc. Gassol Mfg. Co., Troy, N. Y.

SPARKLING Tinselled Christmas signs. Cost 6c—retail 25c. Sample free. Also boxed 21 Christmas cards 35c—retail \$1.00. Make Christmas money. Lowy, Department 67, 8 West Broadway, New York.

CARDED Specialty salesmen handle side-line nationally advertised. Repeat item. No competition. NoDoz Awakeners, Dept. M, Sacramento, Calif.

MANUFACTURER Offers big daily commissions, steady employment, liberal cash bonuses. Complete new fall line tailored shirts, neckwear, sport jackets, pants, uniforms, work pants, bowling shirts. Experience unnecessary. Part or full time. Outfit free. Write today. Packard Shirt Corp., Dept. S364, Terre Haute, Ind.

RUG - NO - WRINKLE. Rug - no - slip. Combination. New invention. 50c. Send 15c for sample and selling plans. Schroeders Specialty Co., 1610 West 62, Los Angeles.

GIGANTIC Christmas sellers! Lucky Seven cellophane wrapped packages, \$5 hundred. Twenty-one piece Christmas boxes \$18 hundred. Samples 35c. Bulletin free! Eifko, 525 South Dearborn, Chicago.

AGENTS—Lowest prices—Top profits on carded aspirin, razor blades, handkerchiefs, laxatives, shoe laces, etc. Details free. Better Products Co., Marion, Ind.

\$3.00 HOURLY! Amazing automobile accessory. Produces revolving colored light. Free offer. Propell-o-lite Company, Mt. Washington, Ohio.

GOLD Letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, 3004 Lincoln Ave., Chicago.

DISTRIBUTORS. New scientific remedy quickly heals eczema, ringworm, other skin diseases. Free samples. G. Moreau, 509 Fifth Ave., New York.

FAST Mail seller—Free sample. Plans. Circulars furnished. Seewigen, 2328 W. Pico, Los Angeles, Calif.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

MEXICAN Feather pictures. Christmas novelty. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

U-KAN-PLATE Really replates old brassy bath room fixtures, auto accessories and other metals with silver. Agents wanted. 3-oz. 50c; 8-oz., \$1. Justice, 904 Walnut St., Philadelphia, Pa.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 18 West 22nd, New York.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

SELL New food specialty. Spicy butter. Colavit's Co., Perkasie, Penna.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

CALIFORNIA Flower beads sure fire fast sellers. Big profits. Low prices. Catalog free. Mission No. 16, 2328 W. Pico, Los Angeles, Calif.

BIGGEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 45 East Eleventh Street, New York.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Deatur, Ill.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

CLOTHING Salesmen wanted. To represent the world's largest manufacturing retailers of men's clothes. All the newest fabrics and styles. Liberal commissions. An opportunity to make a good income and establish an increasingly profitable business. Write The Richman Brothers Company, Cleveland, O.

SELL Firex—Fully automatic fire extinguisher and alarm. Endorsed by fire chiefs. Prospects everywhere—good commissions. Write for territory and testimonials. Firex Corporation, Dept. L-100, 516 S. Broadway, St. Louis, Mo.

STEADY Substantial income taking orders for complete line printed business necessities, gummed labels, advertising novelties, calendars and sensational business stimulators. Experience unnecessary. Complete sales outfit free. Northwestern, SF-625 Jackson, Chicago.

VIRGIN Territory on product with proved saleability. Makes frost designs on glass doors, windows, light bulbs, bric-a-brac. Free particulars. Dept. 3, Keen-Rick Co., 710 W. Jackson, Chicago.

RUBBER Bag cap. Flits into top of tobacco bag. Fast 10c seller. Counter card salesmen wanted to sell stores. Actual sample and details 10c. Dan-Dee Specialty Co., Box 614D, Glendale, Calif.

MAKE Big money steady. High grade overalls, shopcoats, pants, shirts, melton jackets. Advertising on back. Fast sellers. Free outfit. Strong Mfg. Co., 901 West Jackson, Dept. N-9, Chicago.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2638 N. Third St., Milwaukee, Wisconsin.

DON'T Be a job hunter. Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. L-U-PPM, Freeport, Ill.

MAKE More money taking orders shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Outfit free. Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

ALL Mirror beauty powder box set delights women the world over. Write for free information, cash in before Xmas. Madame Chalons, 20 E. Jackson, Chicago.

SELL At wholesale—Radios, electrical appliances, novelties, gifts, etc. Dealers or direct. Establish profitable business. Moork, 1618 Roosevelt, Chicago.

AMAZING Profits representing large manufacturer graphite motor lubricant. 90% repeat business. Para-Graf, Dept. M-1251, Dayton, Ohio.

SELL Dealers a necessity auto radiator stop leak and flush. Some low as eighteen cents dozen packages in quantities. Zenith Factories, Minneapolis, Minn.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mdse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 12810, Spencer, Ind.

NEW Drycleaning clothes brush. Revolutionary invention. Cleans clothes like magic. Homes, offices buy instantly. Phenomenal profits. Outfit free. Kristee, Dept. 262, Akron, Ohio.

NEW Farm radio—\$7.95. No-cost sample. J-20th Century Co., Kansas City, Mo.

IT'S A sensation! Especially designed for placing in cafe booths—the beautiful new Moderne Peanut Vendor is making big money for distributors. Write quick. Walzer Company, Northwest Terminal, Minneapolis, Minn.

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GIVE Away free 1936 short wave and home radios, also full electric automobile radios with our unique "Punch Sales Card Plan." 2 sales daily pays \$203.88 weekly profits. Write for our free starting offers. Deluxe Mfg. Co., Dept. 231, 173 W. Madison, Chicago.

SALESMEN: Sell complete line gummed labels, calendars, memo books, and business stationery. Special features. Free deals. Write quick. Big comm. daily. Attractive sales portfolio free. Lionel, Dept. FZ, 312 So. Hamilton, Chicago.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 779 Burkhardt, Dayton, Ohio.

\$76.50 IN Cash commissions paid Nash on one order from one firm on one sale is unusual, but we did it and stand ready to do it for you because we protect our salesmen. If you can devote your personal attention to business, sell truck and fleet owners and appoint salesmen, you, too, can earn a high income with Graf-ex, the new super lubricant. Every car owner a prospect. Big commissions to distributors. Rush name. Coffield Protector Company, 1212 Harshman Street, Dayton, Ohio.

MEN—Make \$12 daily, selling stores 5c and 10c necessities on beautiful counter displays. Demand everywhere. Over 75 fast sellers and sure repeaters. Craig's Laboratories, Suite 377, Memphis, Tenn.

SALES Tax law forces merchants keep records; men averaging good daily commission; exclusive territories open. Mill-Green Publishing Co., 370 Seventh Ave., New York.

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

LARGE Steady profits. Make-sell amazing 30 below non-evaporating auto anti-freeze. Cheaper, better, easily-quickly made. Formula 30c. Allied Research, 2217 North Kilbourn, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

ART Calendars—Leading line, many subjects. Sell on sight. Every business a prospect. Samples free. Flemming, 6541 Cottage Grove, Chicago.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

SOMETHING New in fire extinguishers. Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write Red Comet, 404 Comet Building, Littleton, Colorado.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

SELL Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. Outfit free. United, F-6155 North State, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

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LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. Z-217, 500 Throop, Chicago.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 476, Toronto, Ont.

BIG Money growing mushrooms, cellar, idle places. Supplies furnished. We buy. Free book. Mushroom Growers, LA-433 N. Clark, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

I WANT Men for local tea and coffee routes. Make up to \$42.50 a week to start. No experience needed but must give prompt service to families on your route. Automobile given if you qualify. Write Albert Mills, 9098 Monmouth, Cincinnati, Ohio.

NEED Cash? Raise new, patented all-season mushroom; cellar, shed. Wholesaler (ten branches) supplies materials; instructs, buys crops. Details free. United, 3848-A176 Lincoln Ave., Chicago.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36RD, 1956 S. Troy, Chicago.

AGENTS—Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfits. The Moss Company, 54 Searle Bldg., Rochester, N. Y.

SALES Engineer wanted, capable of taking complete charge of and organizing Diesel sales organization, specializing in small Diesel engines and Diesel-electric plants. In answering give complete information as to previous employment, salary expected, age, etc. Witte Engine Works, Kansas City, Mo.

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MEN Wanted to learn machinist trade, tool and die making, automatic screw machines. Get experience on actual work. Employment help. Days-evenings. Write for free booklet. Allied Screw Machine Co., 601 Lake St., Chicago.

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"G-MEN" Booklet. Send 10c for mailing. International Secret Service Institute, MP-125, Hoboken, N. J.

INCREASE Your earning capacity. Become successful. Use the "Law" \$1.00. Money back guarantee. Particulars free. Otis Browne, Box 53, Berwyn, Illinois.

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BARGAIN Catalogue educational matter 10c. Hanfling, Y-799 Broadway, New York.

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HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

MODERN Refrigeration. New industry needs trained men for installing, servicing, repairing. If you seek a new field with larger opportunities get latest book by Alt-house and Turnquist. \$4.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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DRAW Heads easily with our posterettes send 25c for sample and list of available stars. Rapid Motif Display, 272 Genesee St., Utica, N. Y., Dept. P-1.

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SELL Your cartoons. "Cartoonists' Guide" tells where! 25c. Ridiman, 3235-E Jefferson, Cincinnati.

CARTOONING Course. Very latest method with 700 illustrations and 50 large drawing sheets. Complete outfit 50c postpaid. Lawrence Publications, 143-A West 100th St., New York.

60c CARTOONING Course, simplified charts, pencil, pen, etc. Miller Studio, 1218 Maple Street, Vancouver, Canada.

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including practice sheets, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

YOUR Portrait cartooned, in colors, 50c. Send photo. Sketches supplied for advertisements, music covers, art work. B. Nendick, Maywood, Ill.

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ADVERTISING AGENCIES

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 343-B, Chicago.

INCH Display advertisement 30 magazines, year \$24. Wood's Popular Services, Atlantic City, N. J.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

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ADVERTISE! Forty words in 127 monthly magazines \$6.00. Sample copies 25c. Morrisco, 2138 Carlisle, Philadelphia.

24 WORDS, 40 Newspapers, \$2.00. Good-all Agency, Box 1592, San Francisco.

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ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4650 Drexel, Chicago.

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Before me, a notary public in and for the state and county aforesaid, personally appeared Willis S. Brown, who, having been duly sworn according to law, deposes and says that he is the business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill., Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill., Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill., Business Manager, Willis S. Brown, 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Mechanics Company, 200 East Ontario St., Chicago, Ill., L. B. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Willis S. Brown, Business Manager. Sworn to and subscribed before me this 30th day of September, 1935. J. GRAHAM, Notary Public. (My commission expires June 16, 1936.)

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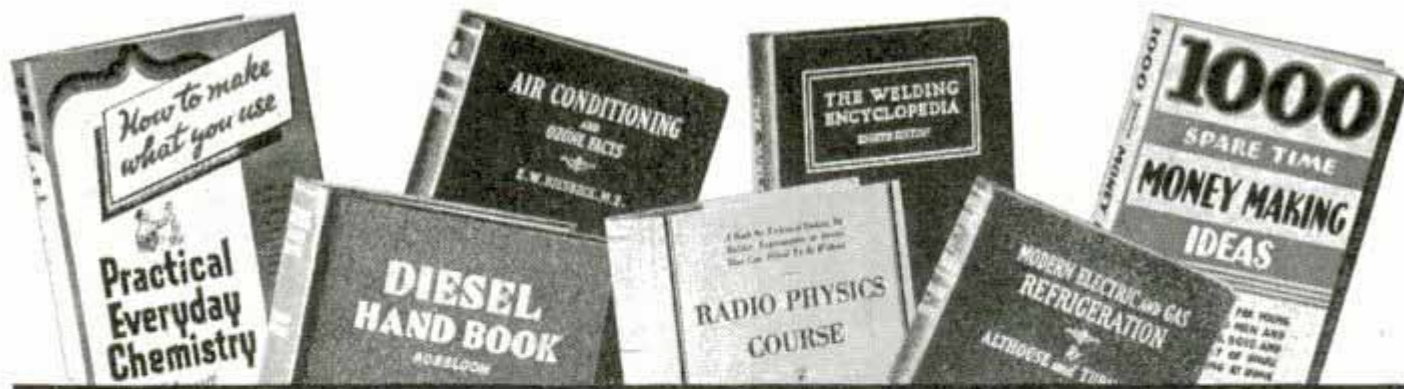
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The Editor's



MAIL BAG

(Continued from page 26A)

thirteen years of missing it, I was more than delighted."—*Frank Roelants, Morocco, North Africa.*

Crocodile Catcher



Mr. Collens and His Catch

"Here is a picture of a crocodile that I helped capture in northern Zululand. We used a six-inch hook attached to a 100-foot flexible wire. The hook was baited with a fish and the wire tied to the branch of a tree. When the crocodile was hooked, the branch acted as a fishing rod to tire him out. Taking hitches in the wire pulled the crocodile's head to the surface and we shot it with a .303 rifle. It was one of six we bagged. Natives of South Africa use part of the crocodile for medicine."—*H. Collens, Johannesburg, S. Africa.*

Satisfied Builder



"This is a snapshot of my Little Giant a.c.-d.c. receiver that I built from the article in Popular Mechanics at a cost of about seven dollars and fifty cents. I find it very satisfactory. Your blueprints are easy to follow. I only use a five-foot antenna with this set and am able to receive stations up to 1,800 miles."—*Platt R. Lasiter, Hialeah, Fla.*

May 1933

Change the Index?

"Instead of listing your index in the front of each copy along with the advertising, why not put it all on one page, using both sides. Then we could remove it and file in loose-leaf folder for easy reference. That would save time and index cards."—*George L. Mann, Toledo, Ohio.*

Mr. Gilligan's Answer

"In answer to Jerry Gilligan's question about whether the old cars weren't better than new ones: Present motors have much better material in them, but they are smaller and deliver more horsepower, bearings fit closer and require lighter oil, consequently more frequent oil changes. Speeds are higher. I feel sure that remodeling the driving to fit the new car will result in less trouble. I have a 1935 car that I have driven 63,587 miles and my bills for repairs amount to \$58.75, including \$13.50 for damage done by a tire that blew out when I tried to run it 'just one more trip.'"—*Howard Richards, Mexico, Mo.*

Here's Speedy Kayak



Builder in the Kayak

"I send you a snapshot of my kayak which I constructed from instructions in your magazine. I am pleased with its comfort and speed."—*Louis Jacques, St. Mary, Beauce, Canada.*

He's a Model Fan

"Your magazine is great, but please give us more about models and machinery tools."—*L. McIntyre, Montreal, Canada.*

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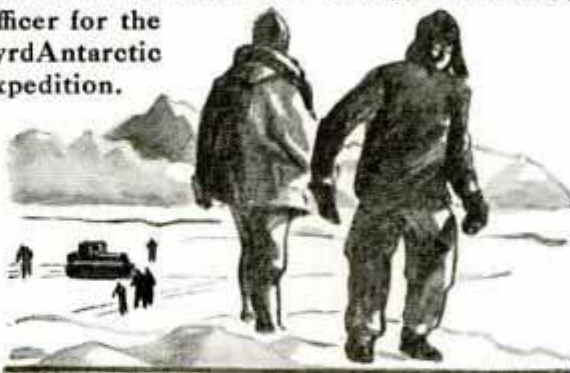
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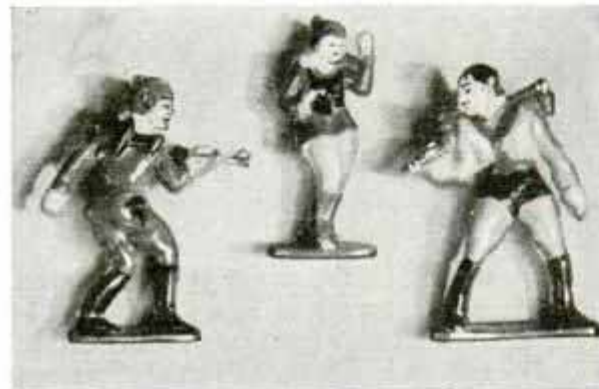
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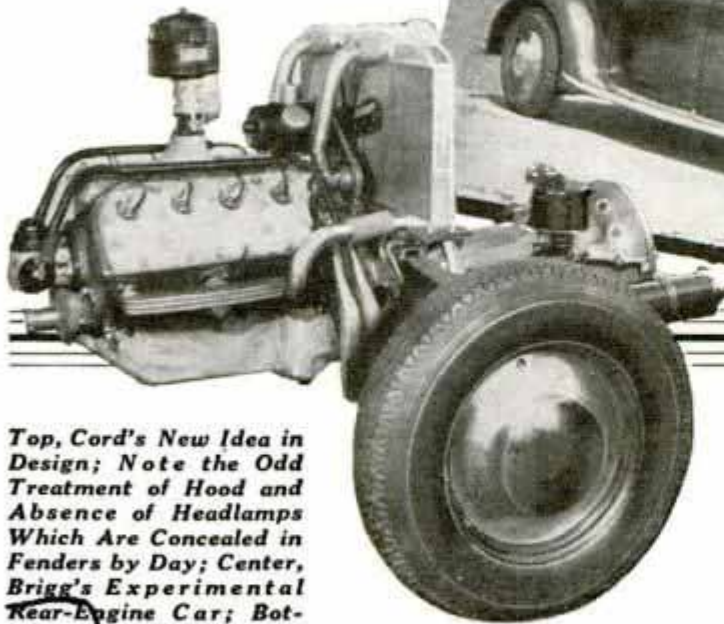
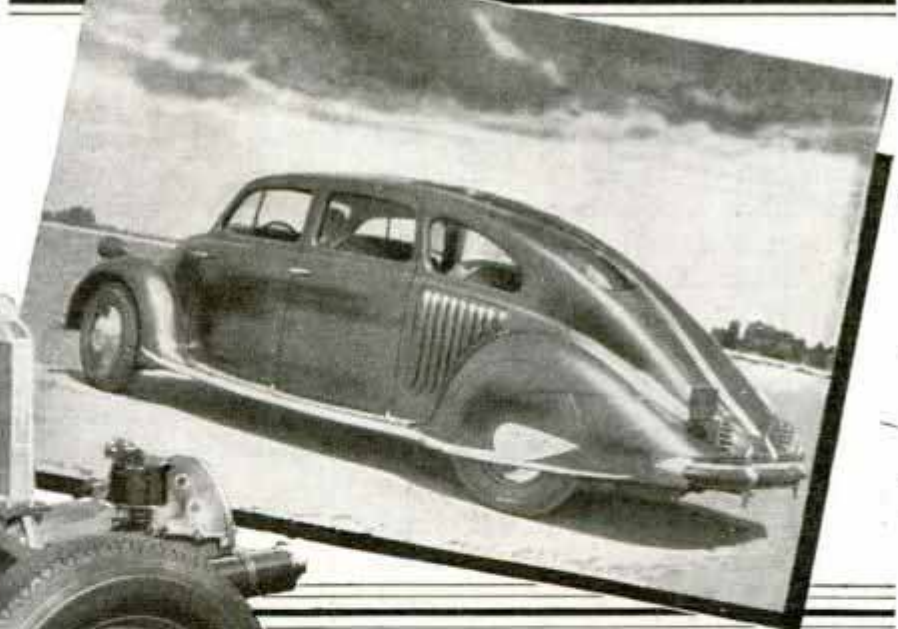
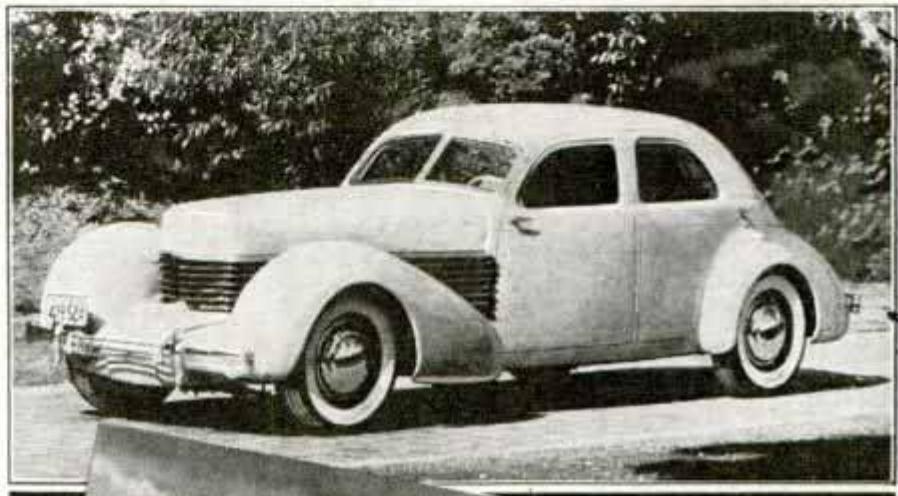
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The 1936 CARS

By JULIAN LEGGETT

CAREFUL examination of the 1936 cars reveals the general adoption of features which have been in the trial stage and uncovers tips on the car of the future.

New from stem to stern, a vastly different version of the front-drive Cord, which was discontinued several years ago, makes its appearance this year. A touch of the bizarre is found in the Venetian blinds treatment of the lower engine hood, a slotted effect running completely around the



Top, Cord's New Idea in Design; Note the Odd Treatment of Hood and Absence of Headlamps Which Are Concealed in Fenders by Day; Center, Briggs' Experimental Rear-Engine Car; Bottom, the Motor-and-Transmission Unit with Rear Wheels Is Shown Removed from Body of the Briggs Car. This Facilitates the Making of Major Repairs

hood to both sides of the cowl. Retractable head lamps, which swing into conventional position at night and back into their recesses beneath the fenders by day, are introduced for the first time.

A remote-control shifting box, patterned along the line of Hudson's "electric hand" of last year, eliminates

Technical Editor
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the gear lever. The front compartment floor is cleared completely by placing the hand brake at the left of the dash. An elaborate airplane-type control panel even contains a tachometer to show the number of revolutions at which the engine is operating. Door hinges and gas-tank filler tube are concealed. Built-in tail and stop light also illuminates the baggage compartment at the rear when the lid is raised.

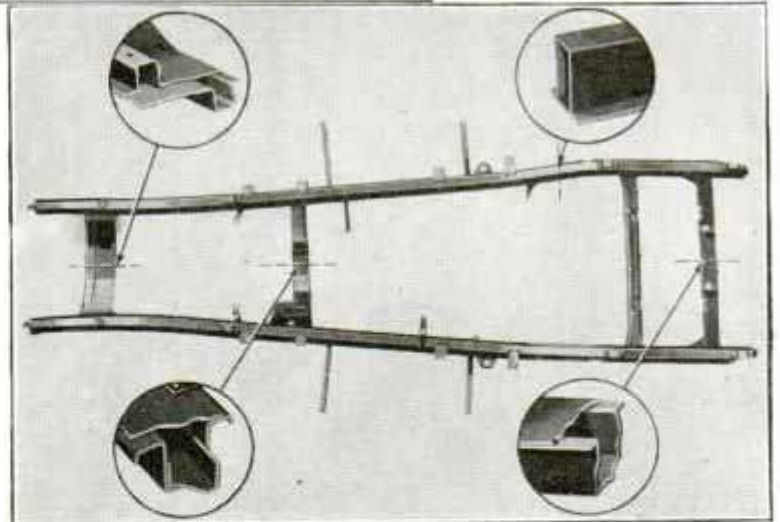
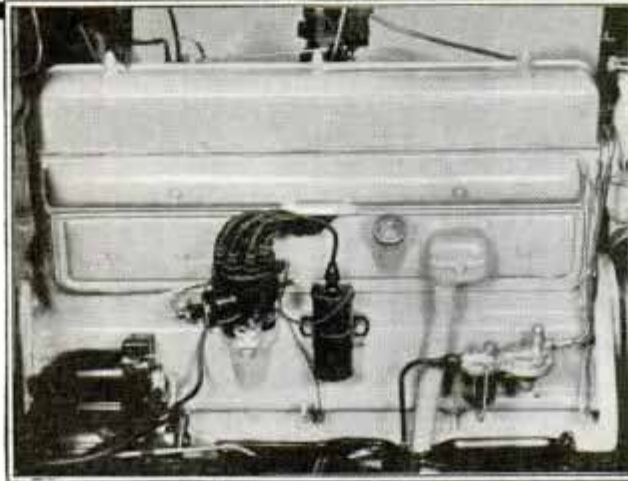
There are no running boards or step plates because the Cord is built very low, only sixty inches from ground to roof. Front drive makes this possible, since it eliminates rear transmission housing and drive shaft. Many of these features probably will find their way into other automobiles in the future.

The unit power and driving plant, which includes the V-8 Lycoming engine which delivers 125 horsepower and is fitted with an aluminum cylinder head, can be removed easily for servicing. The four-speed transmission has the conventional three forward speeds plus a "cruising" gear for the open highway.

Another newcomer is the Auburn Diesel car, built on order, which burns inexpensive fuel oil. No ignition system or carburetor is used. The fuel is "gasified" before injection into the engine.

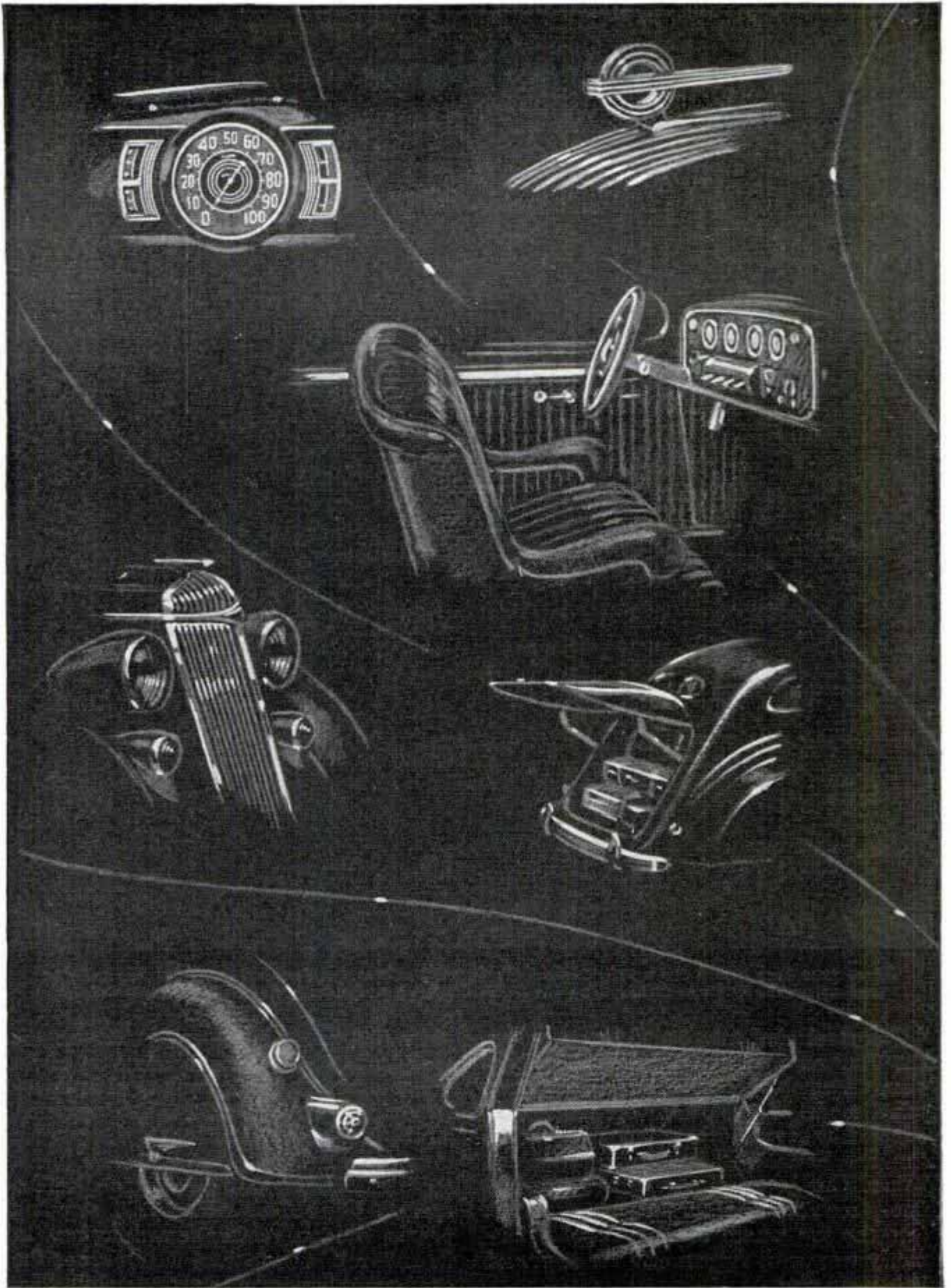
One definite trend is supported by introduction of Cadillac's small-size V-8. It has a wheel base of 120 inches, making handling exceptionally easy, but has a high-power motor. This practice is continued this year in the Packard 120, which has more horsepower than the same car had last year. With various types of wheel suspension, engineers are finding it possible to build splendid riding qualities into short wheel-base cars, making it unnecessary to have rail-way-car length for comfort.

Generally, the 1936 cars have such safety features as steel roofs, powerful brakes, doors hinged at the front, safety glass, stronger frames and easier steering, and such adjuncts to speed as higher

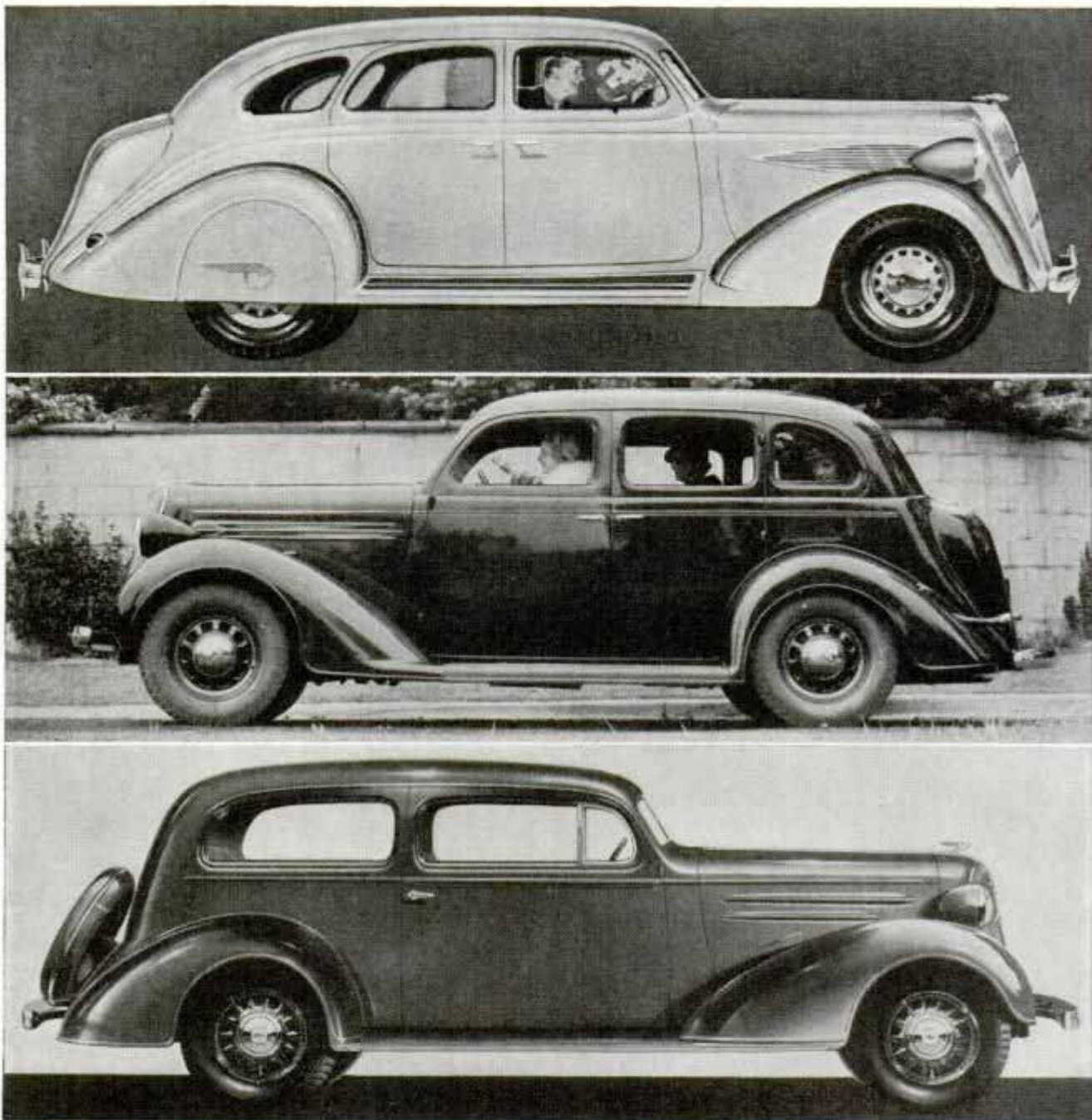


Top, Clearing Driving Compartment by Placing Hand Brake at Left under Dash; This Is the Olds; Center, Buick's Motor of Clean Design; Bottom, Chevrolet's Box-Girder Frame with Only Three Supporting Cross Members Is Strong but Simple

compression and more horsepower, aluminum or other lightweight alloy pistons, better lubrication of motor, anti-vapor lock carburetors and improved cooling systems. All the cars have more beauty and comfort.



Features That Increase 1936 Car's Beauty and Convenience; Top, Left, Easy-to-Read Olds Instrument Grouping; Top, Right, "Speed" Emblem on Pontiac "8"; Below, Cord's Driving Compartment with Airplane-Type Control Panel; Center, Left, and Bottom, Left, Front and Rear Views of Chrysler's Beauty; Center, Right, and Bottom, Right, Nash Baggage Compartment That Is Spacious and Easy to Reach



Three 1936 Cars Which Reflect the General Styling; Note Sweeping Fenders, Increased Streamlining and Attractive Radiator Grilles; Top, the Nash, Center, the Plymouth, and Bottom, the Chevrolet

The steel roof introduced last year on the Hudson and three General Motors cars, Oldsmobile, Pontiac and one Chevrolet model, is retained by these and adopted by several others, including Buick, Cadillac, LaSalle, Dodge, Nash and Studebaker. One group of engineers favors the one-piece roof, another the steel panel set into the top where the fabric panel formerly was used. Apparently the steel roof is here to stay.

While hydraulic brakes have been in use for several years, general adoption has been delayed until 1936. New converts include Chevrolet, Buick, Hudson, Terra-

plane and all Cadillacs except the largest model, the V-16. Hudson offers an additional safety idea in a hookup of hydraulic and mechanical brakes, both working off the same pedal. Until the pedal reaches three-quarter level, the hydraulic brake operates. From that point, both brakes operate to produce exceptional stopping power. Studebaker has something new in its anti-roll back feature which keeps the car from rolling when starting uphill. The brake holds the car until the clutch engages and the motor takes hold. Cast-iron brake drums are almost universal. After the hydraulic may come the air brake. One

engineer says that better brakes are available, but the additional cost has delayed their introduction temporarily.

The hand brake, with few exceptions, is removed from the floor or toeboard to the left and under the dash, giving more space in the driving compartment. The trend to clear this space is becoming more noticeable and introduction of an automatic transmission, already forecast for next year, will give it great impetus.

Compressions are climbing a bit. Hudson has six-to-one standard and offers an aluminum head that will produce seven to one. Plymouth offers 6.7 to one, about the top for this year. Charles B. Bohn, a pioneer in raising compression through the use of aluminum engine heads and scientifically designed combustion chambers, finds that compression is limited at present by the greater load placed on the bearings by increasing the output of the cylinders. New alloy bearings, such as the silver incorporated into the Pontiac, will carry this increased load, but their usefulness is restricted because they are damaged by the fatty acids in the present lubricating oils. Mr. Bohn points out that properly refined oils, free from acids, will increase the use of these alloy bearings which are designed to deliver thousands upon thousands of miles without attention. The new bearings include the leaded-bronze or copper-lead and the cadmium-silver alloys.

Cast-iron pistons appear doomed. Buick has adopted a lightweight piston of a material called anolite, Oldsmobile is using an aluminum alloy, Pontiac has a lighter piston, the Chrysler line and Hudson offer aluminum and others are moving in the same direction. The outlook for lighter

(Continued to page 144A)

Spiral Walk around the Earth Makes Geography Class Fun



Geography Class of Young Parisians Makes "Personally Conducted" Tour around Globe, Studying Earth While Climbing Spiral Ramp

When you can walk around the world in a minute, geography lessons are fun. At a school in Paris, France, is an immense relief globe surrounded by a spiral ramp. The teacher of the school stands on the ground near the big globe and conducts Parisian youngsters on "world tours" that dramatize geography better than any miniature sphere could.

Charcoal Gas Runs Car

GAS generated by burning charcoal has proved so efficient a fuel for automobile engines that the Italian government has ordered all passenger transport vehicles to be adapted to charcoal burning by the close of 1937. In a demonstration tour across Europe, a sport model car traveled 3,720 miles at a fuel cost of less than a quarter cent a mile.

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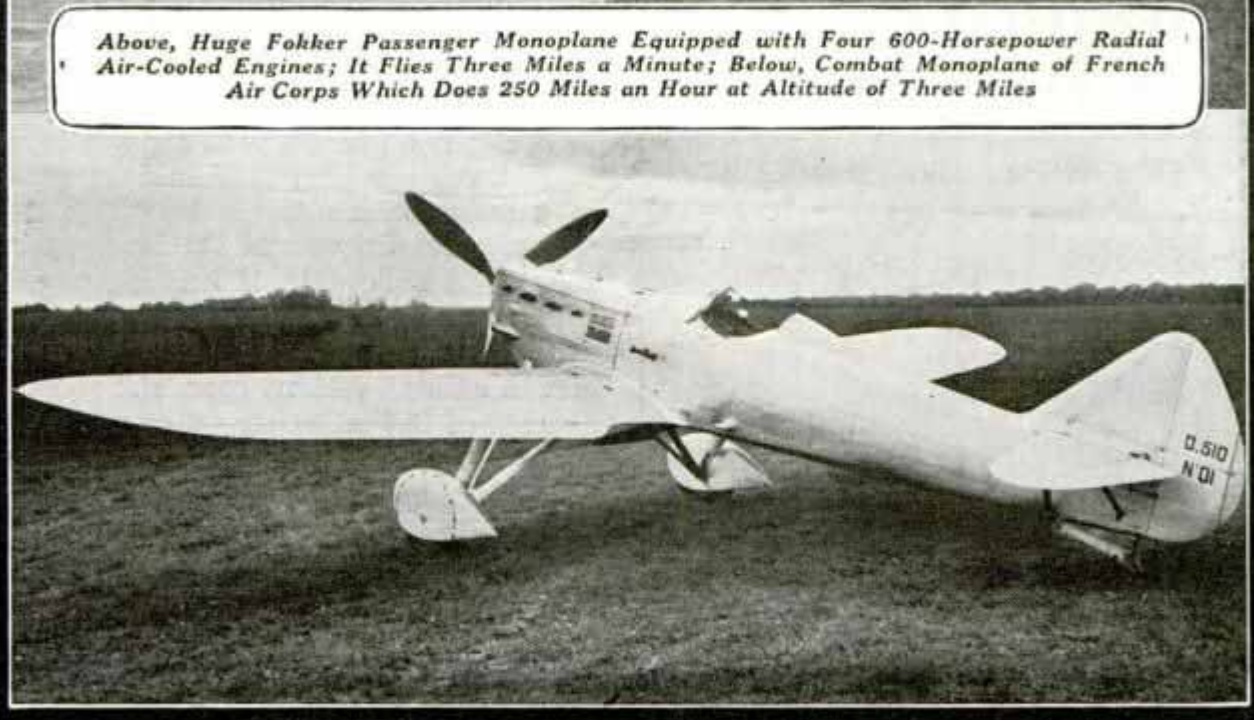
High-Speed Planes Ready for Peace or War



Three High-Speed Planes Developed for Europe; Above, Italian Transport Monoplane, the "Caproni," Which Has Speed of 200 Miles an Hour with Twelve Passengers

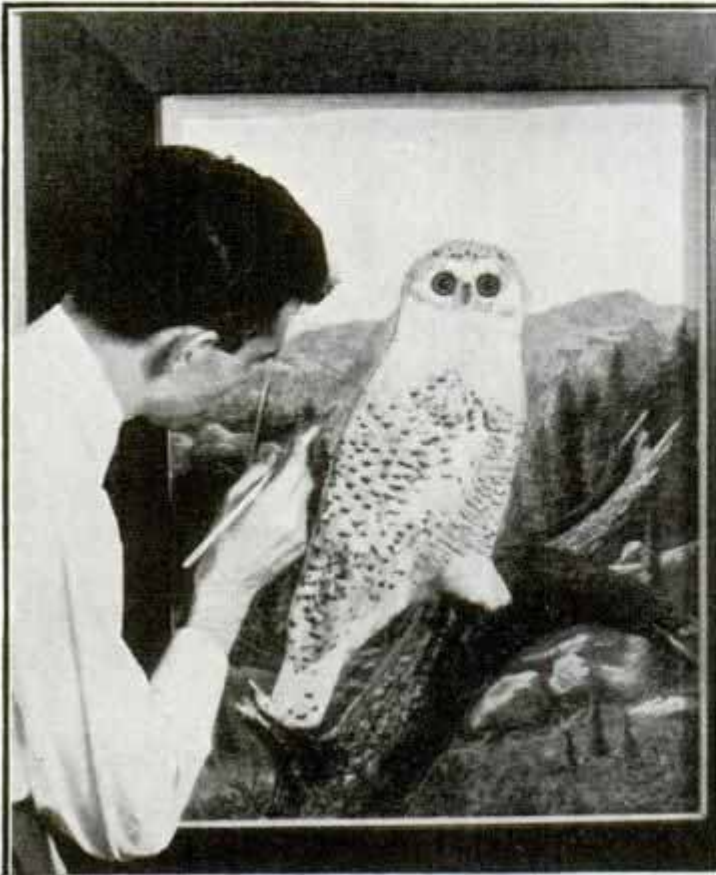


Above, Huge Fokker Passenger Monoplane Equipped with Four 600-Horsepower Radial Air-Cooled Engines; It Flies Three Miles a Minute; Below, Combat Monoplane of French Air Corps Which Does 250 Miles an Hour at Altitude of Three Miles



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Omaha, Neb.
Animals Pose in Comic Roles for Taxidermist



Left, Taxidermist Puts Finishing Touches on Owl Mounted on Branch of Tree against Natural Habitat Background; Right, Frog Poses as Serenader, Strumming Tiny Model of Banjo

Dressing animals for human parts both comic and dramatic is an entertaining field for the amateur taxidermist and the home craftsman. Birds and frogs, squirrels and rabbits and other small animals can be posed in humorous attitudes, or

mounted to illustrate advertising slogans or stories such as "Alice in Wonderland." In addition to mounting specimens for this novelty taxidermy, the home workshop can be used for building the "props" for the various sets.

120 **Miles per Gallon Increased by Using Clean Spark Plugs**

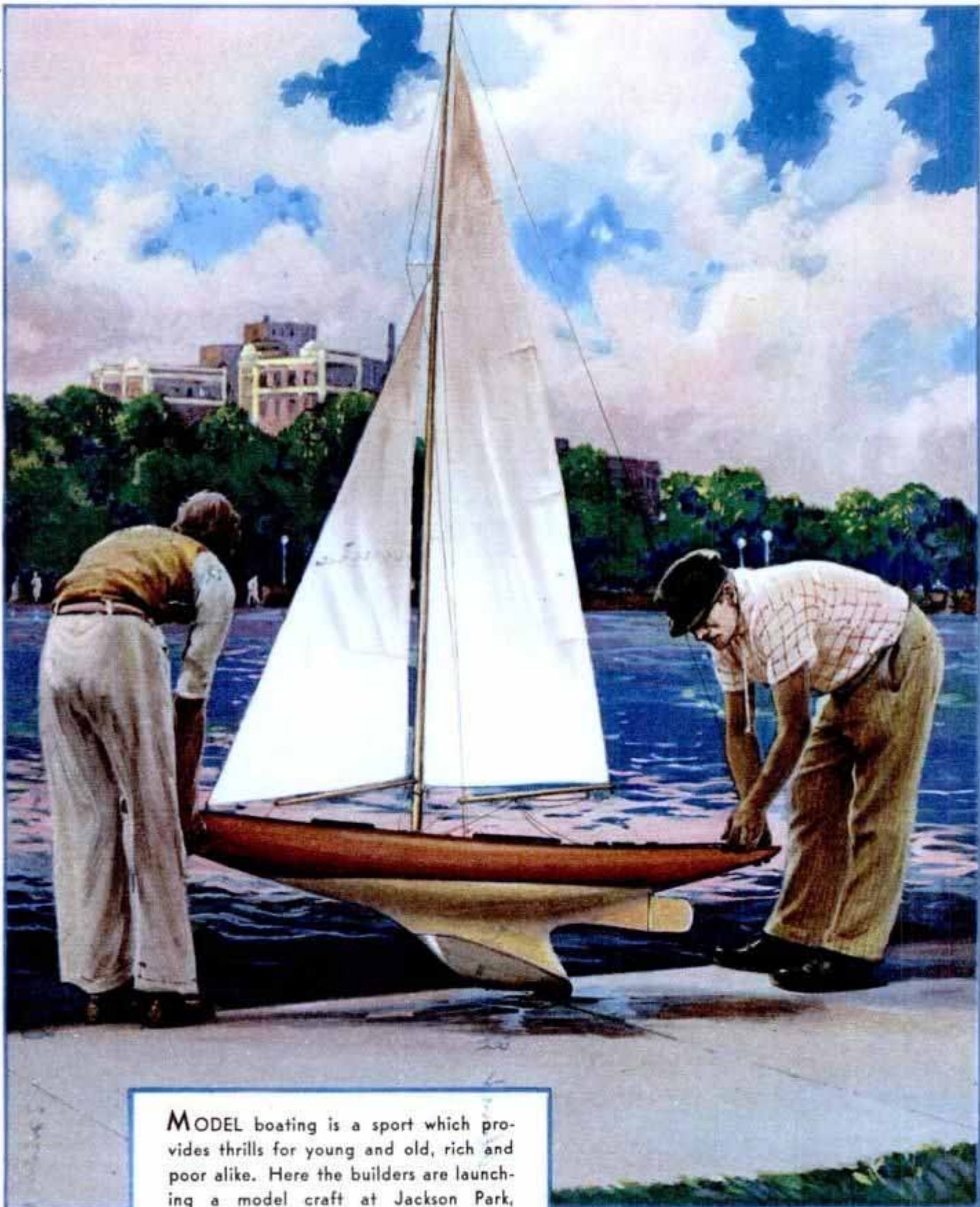
SPEED MILES PER HOUR	AVERAGE MILES PER GALLON	
	DIRTY OR WORN SPARK PLUGS	CLEANED OR NEW SPARK PLUGS
20	21.1	23.2
30	18.9	20.5
40	17.6	18.4
50	15.8	16.5
60	10.3	14.8
AVERAGE MILES PER GALLON	16.7	18.7
AVERAGE FUEL SAVING 10.7%		
Cleaned or new plugs save 1 gallon of gas in 10		

At a mile a minute, your car will travel forty-three per cent farther on a gallon of gasoline with clean spark plugs than with worn or dirty plugs. At slower speeds there is a noticeable, if less spectacular, increase in efficiency with new spark plugs. A test of engine performance on eleven cars at various speeds showed an average of 16.7 miles per gallon with dirty plugs compared with 18.7 miles per gallon with clean ones. The average fuel saving by installing clean plugs was 10.7 per cent.

☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

A.C. Spark Plug Co. Flint, Mich.

Thrills and Fun in Making MODEL BOATS



MODEL boating is a sport which provides thrills for young and old, rich and poor alike. Here the builders are launching a model craft at Jackson Park, Chicago.



8985

SOME of the model boats entered in a recent contest at Chicago for the Popular Mechanics' trophy.

By L. F. MARKAERT

MILLIONAIRES, newsboys, mechanics and staid business men have turned to miniature craft as a sport, having learned that if they cannot spend a million on a yacht, they can take their fun by proxy with miniature floating palaces, or with hydroplanes that duplicate all the speed thrills of the real thing.

Maynard Clark, an Arcadia, Calif., youth, has built hydroplane models which top thirty-five miles per hour. Only thirty-nine and three-quarter inches in length and but sixteen pounds in weight, these cleverly designed hulls are built of one-eighth inch basswood plywood to simulate a wooden shoe, and they are driven at these high speeds by a small engine of Clark's design and build that has but thirty cubic centimeters piston displacement. The bore is one and three-eighths inches and the stroke one and one-eighth inch. The little motor turns 8,000 revolutions per minute and drives a two-bladed propeller of three-inch diameter and six-inch pitch.

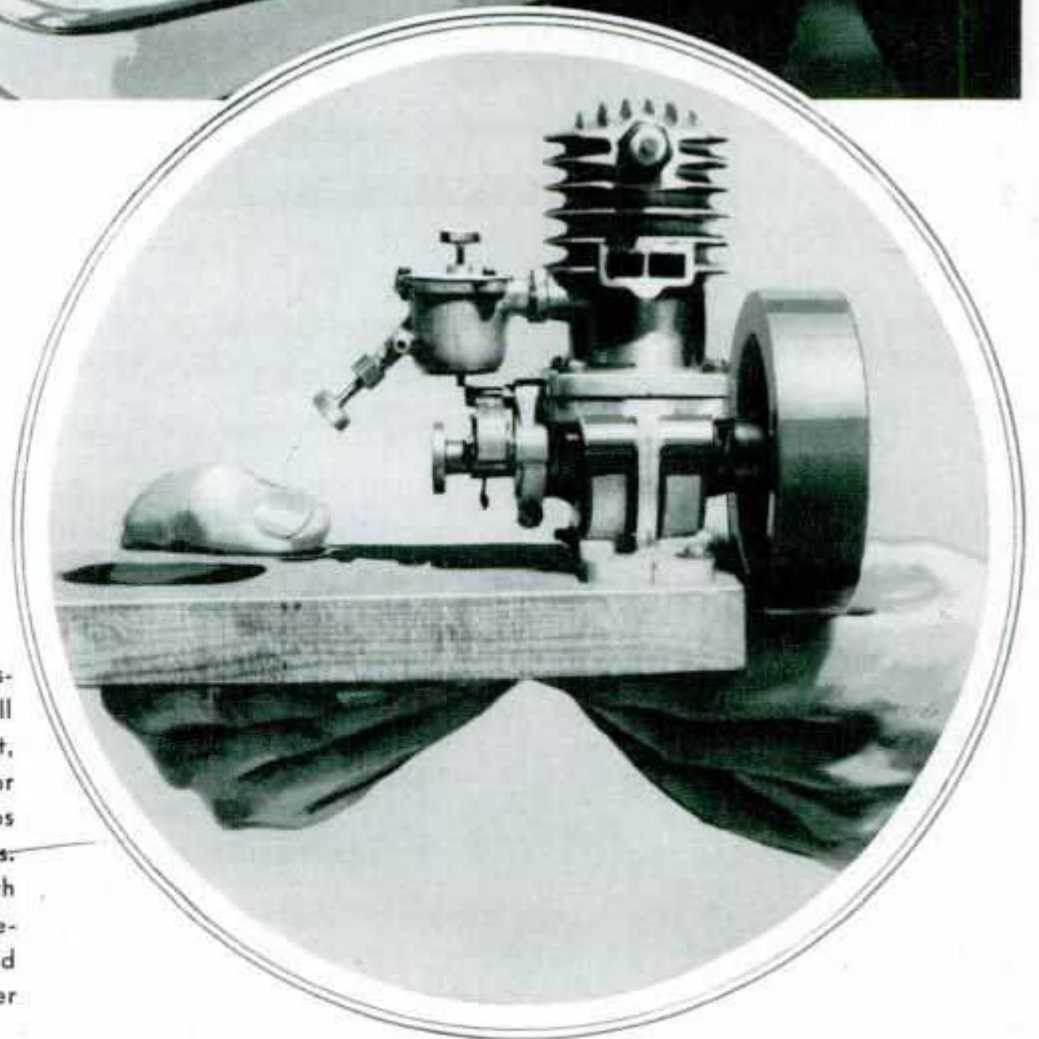
So terrific is the strain on the propeller shaft that the three-sixteenth-inch drill rod at first snapped off, and later had to be casehardened to stand the punishment.

Floyd Erickson, of Los Angeles, a companion of Clark's, has built a thirty-inch hydroplane powered with the well-known Brown midget airplane motor, which develops one-fifth horsepower as against the one horsepower delivered by Clark's engine. This little white hull, similar to "Miss England," will plane at ten miles per hour and has turned in runs of over twenty-four miles per hour. The hull is carved from a solid block of balsa, and with engine, fuel and batteries weighs eight pounds. The motor has a special flywheel and the fins of the familiar air-cooled cylinder have been shaved down and replaced by a brass water jacket.

Much has been learned of hydroplane performance through the observation of these miniature speed demons in action. They are raced against time on a circular

Beverly Hills
4713 Santa Monica Blvd
Los Angeles Calif
Los Angeles Calif
Home

3-Princh Model



CALCULATING the displacement of a model hull made of cardboard. Right, air-cooled marine motor for model boat built by Los Angeles high school boys. It has a one and one-eighth inch bore, one and three-eighths inch stroke and turns 5,000 revolutions per minute.



6098
 ABOVE, hydro model which determined form of full size boat. Right, F. E. A. Brock, St. Louis, and his boat which won model yacht race for Popular Mechanics' trophy.

course. There is a brass rail to the starboard side of the hulls to which a stout fishline is attached. The motor is started, the carburetor and timer set for maximum speed, and the hull is placed in the water with a gentle shove. After a few coughs the craft comes up to speed as it puts out from the "mother ship." Line is payed out from this mother ship, which is anchored in the center of the lake. Round and round a fifty to sixty-foot radius the little craft speed. The roar of the motors sounds like an outboard, and crowds are instantly attracted.

Steam power plant.
 acting as fuel valve.
 1 hull - 6 ft long.
 speed 25 mph





BOAT builders testing sail balance and ballast placing on a scale model before spending thousands of dollars to build a full size craft.

8985

Crescent copper magnet

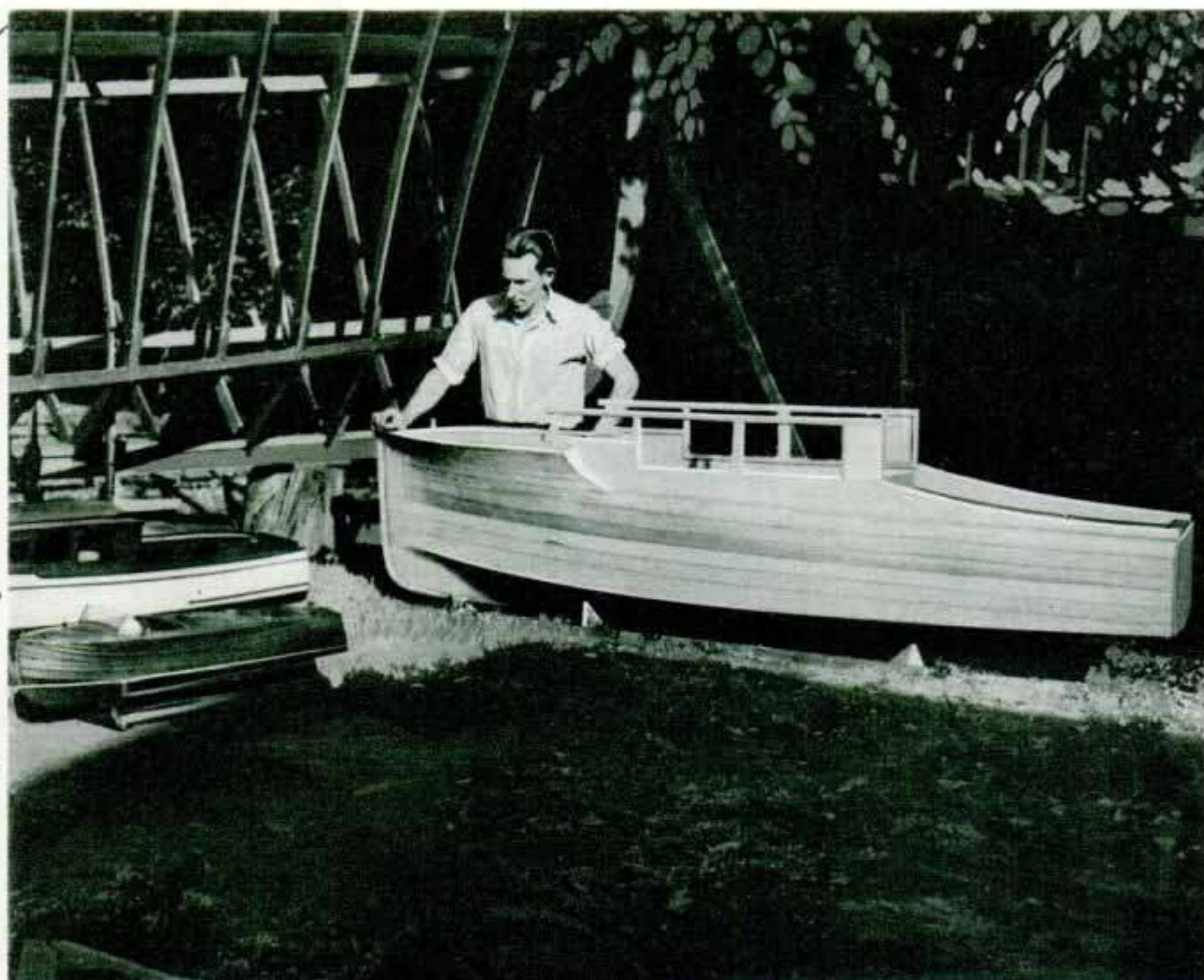
joying the thrills of owning a magnificent yacht at a fraction of the usual cost. Brandon Hendricks, of Los Angeles, spends his spare time modeling the yachts of other millionaires. Already he has constructed a scale model of Geo. F. Baker's "Viking" and a model of Vincent Astor's "Nourmahal." These models are shown in action. The "Viking" is seventy-four and three-quarter inches long, ten and one-half inch beam, and weighs forty-five pounds. It is complete, down to compass, steerable rudder, furniture, lights, and anchors. Even the auxiliary boats on davits work and float to their designed waterlines. This model travels as fast as a man can row, and is driven by steam at ninety pounds pres-

sure in a water-tube boiler fired by gasoline. It has a two-cylinder double-acting engine which drives twin screws through a gear box. It can steam for about twenty minutes, the length of time it takes to burn up the gasoline blowtorch fuel.

The "Nourmahal," modeled by Mr. Hendricks, is slightly smaller than the "Viking," and it, too, is built on a scale of one-quarter inch to the foot. It is sixty-five and three-quarter inches long, nine and three-quarter inches beam, weighs forty-two pounds and has a twin double-acting steam-engine power plant. This plant also runs at ninety pounds of steam, with a boiler of the water-tube type, fired by gasoline torch. No off-

6985

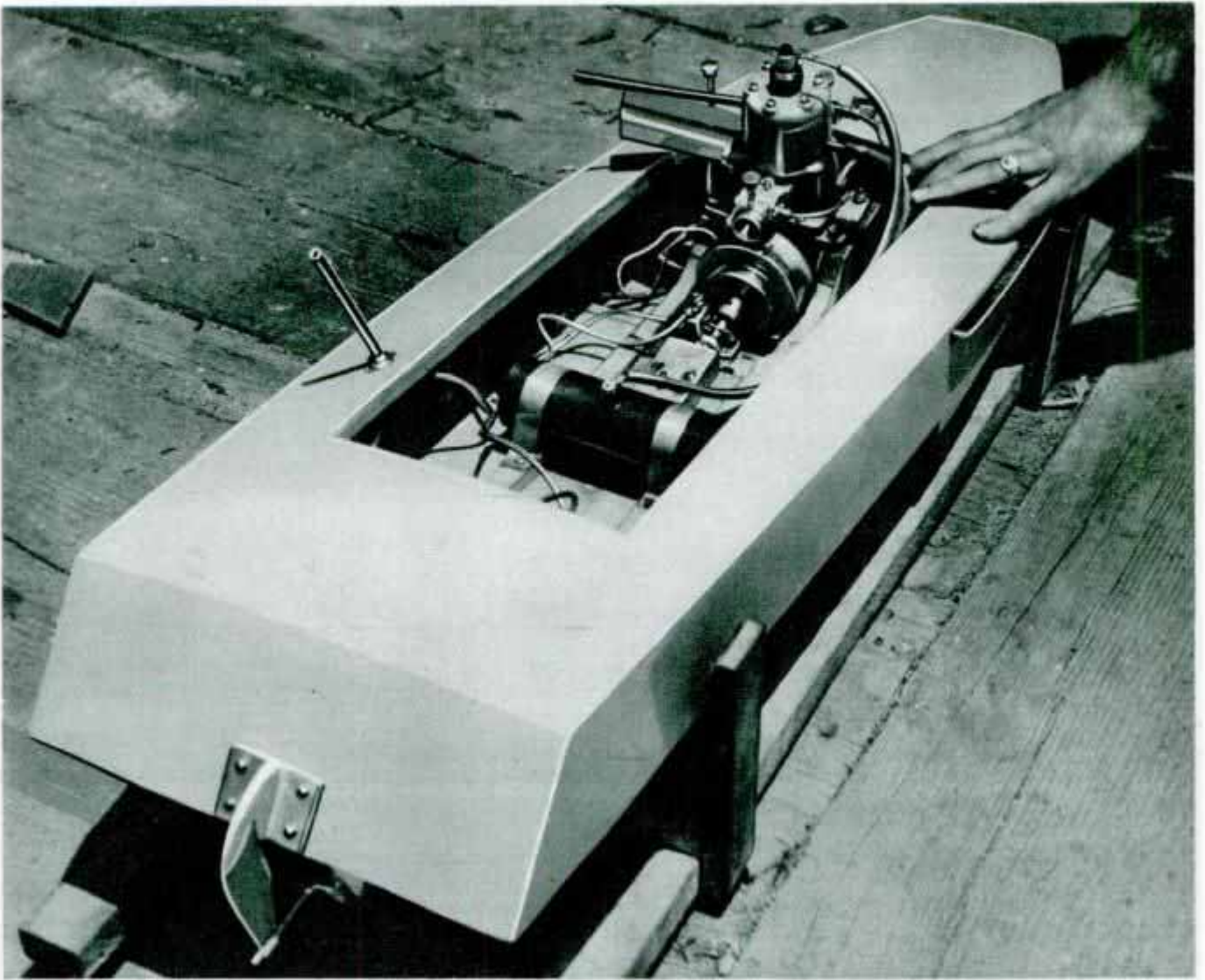
no refer-



2893



BUILDING a model craft such as the one above may require weeks and months of tedious effort, but it's all real fun for the boat lover. Below, using delicate scale to check displacement of a model one-sixteenth the size and weighing about one four-thousandth as much as the full size boat.



POWER plant of a model boat which performs in the water exactly like its full-size counterpart.

scale steam puffs escape the "Nourmahal" when running, for the exhaust is under water. This model, too, is complete in every detail, and the anchors, falls, davits and lifeboats actually operate.

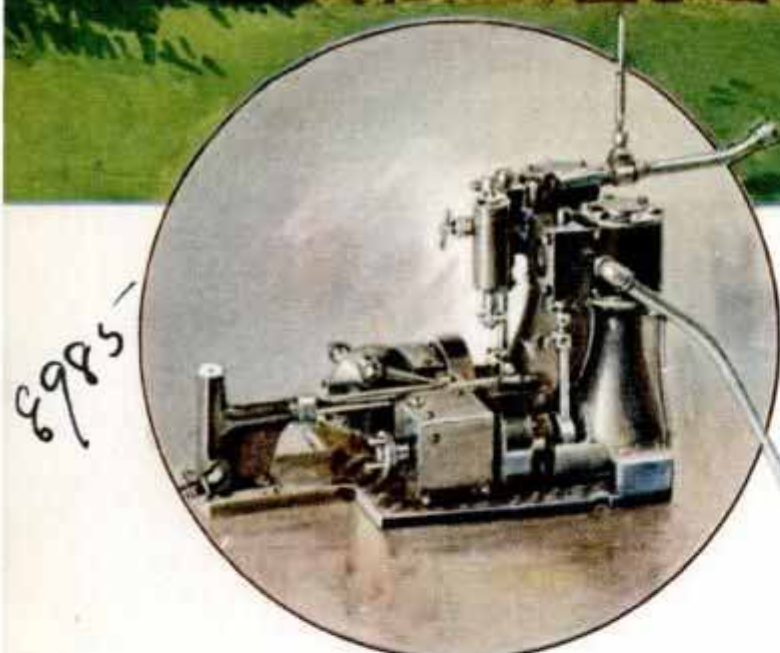
Steam power is sometimes used in model hydroplanes, though not as frequently as formerly, because "flash" steam plants must be used in this type of craft and flash steam is temperamental. Alexander Wood, of Hollywood, has, among the many models he has built, a five-foot hydroplane, "Doreen," which can step twenty-five miles per hour using this type of power plant, which takes up most of the hull. The engine is a four-cylinder single-acting aluminum and steel affair of one-inch bore and one-inch stroke. Three gasoline burners on one control jet furnish the tremendous heat necessary to generate sufficient steam.

The burner jet is so arranged that a swipe of a stick in the hands of an operator near by can turn the flame off.

"You can call this fleet of models the 'foolish' fleet if you want to," says Mr. Wood, "but I've discovered they are the most practical of all boats. They don't cost a fortune to build, and they behave proportionately exactly as the bigger hulls will. If there is a fault in the big boat it is better to bring it out with the small, cheap one. Architects are using these models in certain forms to check their design figures."

Ted Geary, west coast designer, and others model their beautiful floating creations in the miniature and check their weights and trim against the full-sized boat, saving money from costly errors.

"We've learned a lot about pitching and galloping from these models," explains Maynard Clark. "For instance,



MODEL of the "Nourmahal" which was built by Brandon Hendricks of Los Angeles, and the synchronized twin screw steam power plant of this model yacht.

take the struts. No one knows what a good streamline form for water should look like. We found we could take our cooling water in through a thick strut, boring holes in the front face of it, and resistance of the whole unit was lowered. And by experimenting with a whale's tail fin on the strut we can take the galloping tendency right out of the meanest bucker of them all.

"The resistance isn't affected as far as

we can measure it, but the hull rides smooth."

So the foolish fleet is most practical. At a cost estimated by Mr. Clark at from \$10 to \$75, one can own the finest of midget racing hydroplanes. Yacht models of the "Viking" and "Nourmahal" order cost from \$100 to \$500, if you exclude the tremendous amount of time required to build them. Mr. Hendricks has a model of J. P. Morgan's famous "Corsair" now building which will take two years to complete.

"I've owned both the models and the big fellows," says he, "but the models are more practical for the boat lover. He can cover more ground in a given time and learn more on less money."

Two Thousand Private Planes Fly Air Lanes

In 1899 there were 2,000 horseless carriages chugging along the streets of America. Twenty-four million are registered to-day. And today 2,000 privately owned airplanes take their owners on sky



Typical of the Small Cabin Planes Operated Privately by American Sportsmen and Business Men Are Those Shown Above

trips to business and to play. Their ships cost from \$7,500 to \$15,000 at the factory and ten cents a mile to fly, including hangar space, insurance, depreciation, everything. The selling point for the air is "quicker transportation." Planes are sold through distributors, like automobiles; the display room is usually a corner of an airport hangar. Four American factories are building for the private trade. Four-place

ships, open or cabin type, are most popular. They average 3,000 hours of flying life over a five-year period, but are likely to need a new motor after 1,500 hours. Six to a dozen of America's 2,000 private owners have private airports, the rest pay \$25 to \$35 a month storage fee. Two-way radio, night and blind flying equipment are customary. Executives carry a desk, dictating machine and typewriter.

Waco Airplane Co. Inc.

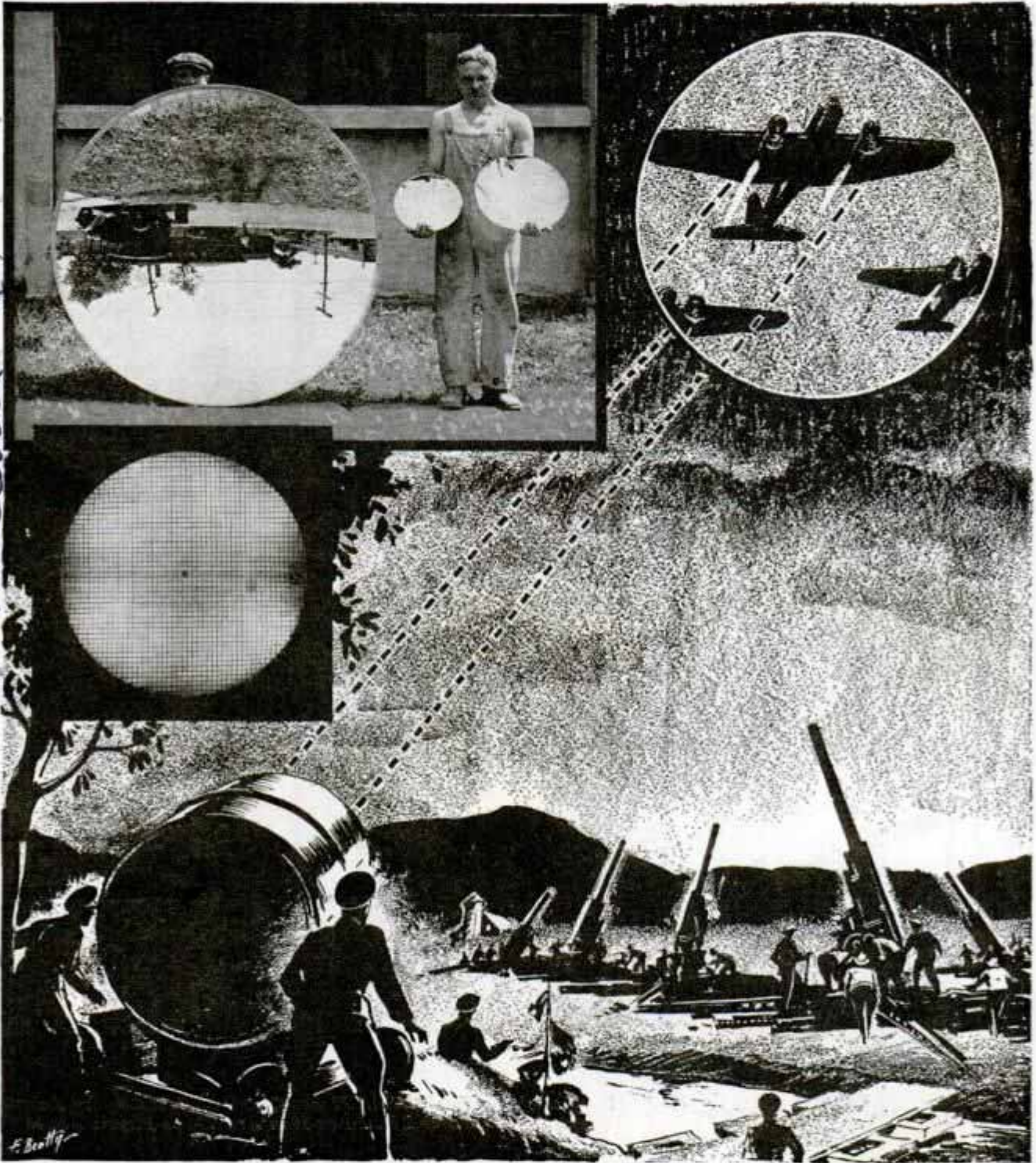
*Em. Sprimari
Mulle 216
Dad Dayton Ches*

Bellville, N.J.

INVISIBLE RAYS FIND ENEMY SHIPS

Detector Locates Planes or Boats Many Miles Distant

Ent. Spencer A. Jones, 20 Tiora Ave. Bellville, N.J.



Top, Left, Holding Forms from Which Reflectors Are Made; Note Clarity of the Inverted Image; Bottom and Circle (Top), Drawing of Equipment for Detecting Planes by Picking Up Heat Rays

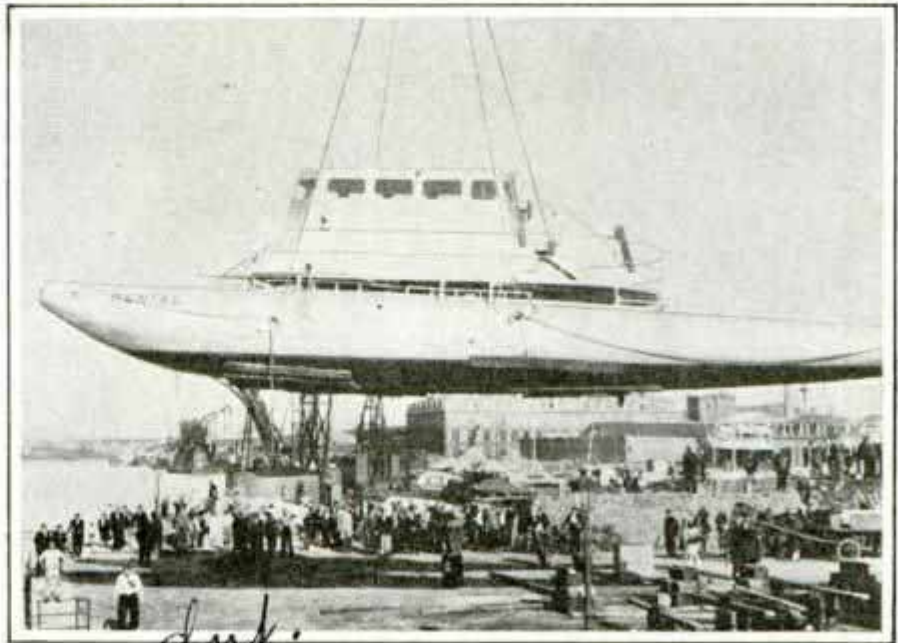
Do you know that the heat from a candle fifty miles away can be detected? It sounds like a stunt, but military experts are applying its basic principles in apparatus designed to reveal the location of enemy airplanes or battleships. By employing the most sensitive galvanometer

and amplifying unit available or by concentrating the heat rays with a huge lens or concave mirror focused on a photoelectric cell, the scientist "finds" the distant candle. In the same way, the military man may pick up the heat rays from the motors and exhausts of air or sea craft,

SPENCER A. JONES

Ocean Glider Cuts the Waves at Speed of Twenty-Two Knots

plot the exact location and train anti-aircraft or short batteries on the approaching ships long before they are within range. These heat rays, also known as infrared rays, travel at the speed of light, about 185,000 miles per second, but are invisible. Since sound waves move at only 1,080 feet per second, heat rays can be detected many miles before the sound of plane or ship can be picked up by the most sensitive detector. Equipment probably similar to the candle detector has been tested in secret by the U. S. army, with unusual results. Some type of range-finding apparatus was used to locate "enemy" vessels far at sea in the darkness and to enable "gunners" to score direct "hits" with powerful searchlights. A New Jersey laboratory is known to have produced gigantic searchlight reflectors, with sixty-inch concave metal mirrors so near perfect they require no machining or polishing. Rhodium, a metal more expensive than gold, is used for the reflecting surfaces because it is practically immune to atmospheric corrosion and to the terrific heat of searchlights. Rhodium has high reflection characteristics over a wider color range than other materials, reflecting all light waves, from ultra-violet through the visible spectrum and including the invisible infrared or heat ray. So it is possible that rhodium searchlight reflectors were used to concentrate heat rays from "enemy" ships on the photo-electric cell, enabling range-finding crews to fix the location with their instruments. It also is possible that rhodium reflectors were used to direct the invisible rays against the distant ships, then to pick up the rays when they bounced back. Commander P. MacNeil, English inventor, has devised simple detectors that are remarkably sensitive to heat rays from ships and planes. Operation is almost as instantaneous as direct sight, even in dense fog or in darkness.



Derrick Is Used to Launch the "Genial," Fast Passenger Ferry Built for Service between Havre and Trouville, France

Plying the ferry lane across the mouth of the Seine between Havre and Trouville, France, is a speedy "ocean glider" that cruises at twenty-two knots. Of novel design resembling a "whaleback," the glider carries seventy-five passengers.

81135

CHIMES ARE GROUND TO SCALE FROM OLD AUTO DRUMS

Brake drums of old automobiles are the chimes in a church tower at Addison, N. Y. The seventeen chimes in the set were ground to the proper pitch by drilling away metal from the drums. The chimes are played with a small hammer.



These Brake Drums Are Tuned for Chimes

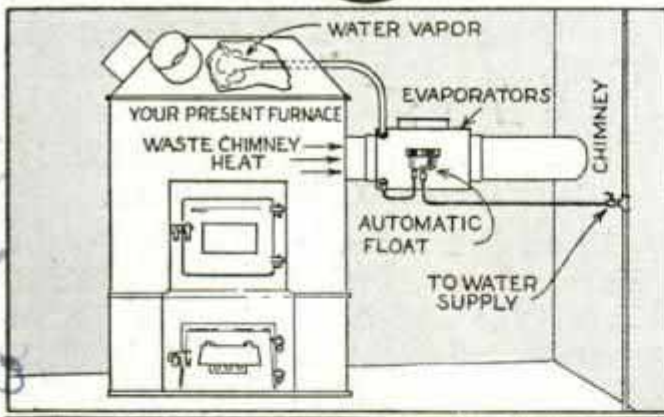
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d. no. up W. Polles, B. ...

Em. George & Fabrice, 65 P. de la Place, Rouen, France

81114 Leggett

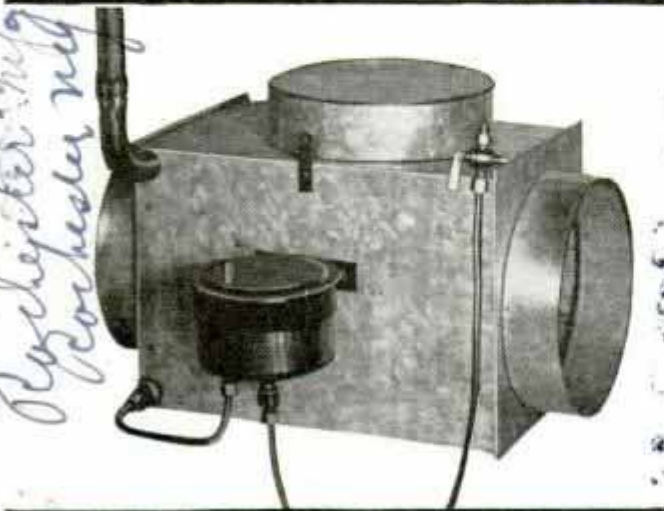
FUEL SAVERS that



Top, Proportion of Heat Losses in Average House; Center and Bottom, Simple Humidifier That Installs in Pipe Near Furnace

CHILLING winds of the fall months are reminding many a home owner of last winter's battle to keep warm. Whether the cause was a "sick" furnace, faulty piping or poorly insulated house, keeping comfortable meant extra coal, oil or gas, and the memory of those fuel bills is still unpleasant.

But has the home owner kept those vows to "do something" about it? Probably not, because he fears that replacement of the entire heating system is the only cure and that the cost is too great. In cases where the furnace may be worn beyond repair or piping and registers or radiators may be so old that they retard the flow of heat, installation of a new plant is recommended. Savings due to the greater efficiency of the modern heating system over the old will be a pleasant surprise. Some new oil-burning furnaces cost no more to operate than coal-burners of yesterday.




Pay for Themselves

For the man who is operating his furnace at a cost that almost makes it a luxury, there are ways to reduce fuel bills. Perhaps the house is to blame. Heat losses can offset a highly efficient furnace if the house is not properly equipped for the winter. After tests of 200 houses, C. G. Segler reported to the American Society of Heating and Ventilating Engineers that the proportion of heat losses is twenty-seven per cent through walls, sixteen and two-tenths through roof, twenty-five and eight-tenths through glass (windows), four and three-tenths through doors and twenty-four and six-tenths by infiltration, gradually escaping through cracks, around windows and door frames and other places.


These losses can be reduced sharply. Prof. Alonzo P. Kratz of the University of Illinois found that properly fitted storm windows and doors reduced fuel bills twenty per cent, in comparison with the previous winter's operation without them at a residence sponsored by the National Warm Air Heating and Air Conditioning Association. In these tests, the house was completely equipped with storm windows and doors. Installing them on two sides from which come prevailing winter winds will result in a saving but it will not be so great as if the house had them all around.

Proper insulation of walls and ceiling will reduce heat losses still further. In many houses, mineral wool or similar insulating material can be blown into walls without major changes. One to two inches of this insulation in side walls will accomplish the desired result, Prof. Kratz finds, while three inches of insulation in the ceiling will be sufficient to keep

Electronic Co. Markaba
PEP UP THE OLD PLANT *Maria*




"Electric Janitor," One Type of Furnace Control Which Takes the Work Out of Heating and Assures Correct, Steady Heat at All Times; the Thermostat Is Set at Temperature Desired

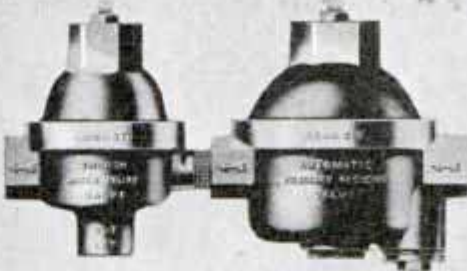


FOR HOT WATER SYSTEMS *Bell and Gossett*
3000 Wallace
Chicago

Booster Pump Improves Circulation Where Pipes Are Small or Installed Incorrectly, Giving a More Even Flow of Heat to All Rooms in the House





Dual Control Unit Which Relieves Home Owner of Maintaining the Water Level in Boiler; This Valve Arrangement Automatically Controls the Pressure





FOR STEAM SYSTEMS

Efficient Valves on Steam Radiators Mean Quicker, Safer Heating and Perhaps a Saving on Fuel; Old, Clogged Valves Retard the Flow of Heat Considerably

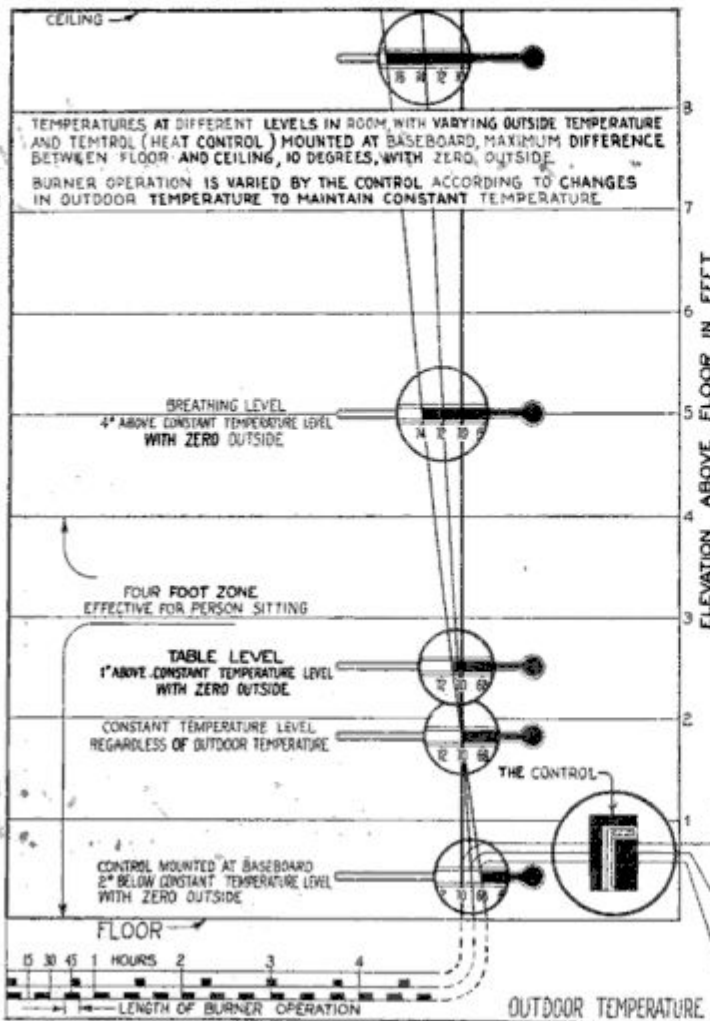
Crane Radiator Shield, for Steam or Hot Water. Slips into Place between Radiator Sections; Shields Direct Heat Currents into Middle of Room at Low Level

Courtesy The Crane Co.

886 Michigan
Kainer & Co. Chicago

Orville Ohio



Courtesy Penn Electric Switch Co.

Des Moines Iowa
 out winter's cold and summer's heat. Oakum caulking around window and door frames, applied during redecorating, also will save some heat.

So far as furnace and piping are concerned, several "fuel savers" are available, many of which will pay for themselves in a single winter. An automatic stoker for coal-burners results in more economical operation, with savings from ten per cent up, the result of improved combustion, ability to use cheaper fuel, and substitution of an automatic-controlled system for a manual-uncontrolled system.

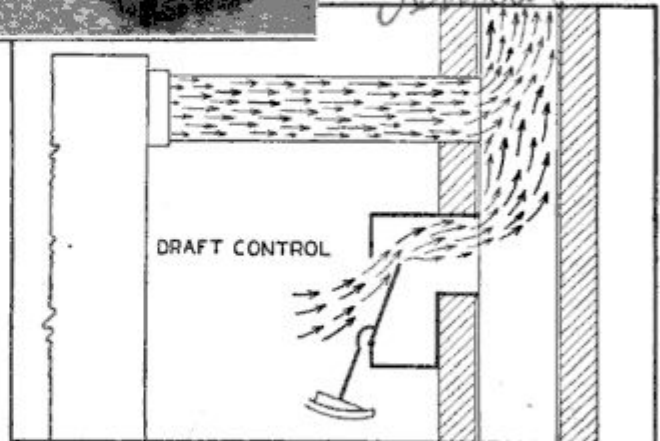
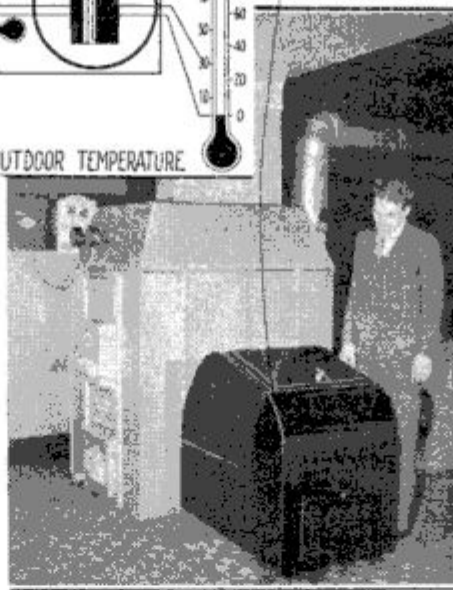
Prof. Kratz believes many excessive fuel bills can be traced directly to poor control. If a coal furnace is fired properly and its draft and flow of heat regulated by thermostat or other type of control, efficiency will be considerably greater and fuel costs lower. One temperature regulator, the Temtrol, is designed for mounting below the four-foot level in the room.

This keeps the heat flowing more regularly and produces a comfortable temperature around the feet. A built-in device slows up the furnace and avoids overshooting the seventy or seventy-two degree setting on the instrument. This regulator is intended to produce more economical service from the furnace than conventional plain or clock-type thermostats.

Chimney draft regulators may be classified as fuel savers. On systems without perfect control, a regulator may save about five per cent because it prevents an overrun of heat. But if the system is controlled properly, addition of the device would not increase economy appreciably, according to Prof. Kratz. This holds true for the aquastat, offered for hot-water plants.

Booster pumps for hot-water systems may cut fuel bills where

circulation is poor. Prof. Kratz points out that positive circulation is very desirable. The booster may prevent overheating the whole house in an attempt to get radiators hot in one or two rooms where the piping is faulty. The pump permits the use of smaller size pipe. The circulating fan for



Top, How Control Located at Baseboard Keeps Temperature Even in Whole Room; Center, One Type of Automatic Stoker; Bottom, Automatic Draft Control; Arrows Show Flow of Gases from Boiler and Control; Installation Is Simple but Must Be Done Properly for Best Results

81114
warm-air plants does little to save on fuel, but it produces more even heat to every room without forcing the furnace to operate at excessively high temperatures. If warm-air ducts are faulty the fan may reduce the fuel bills somewhat by improving the circulation. Certainly it will make the house more comfortable.

A blower, consisting of a centrifugal fan to produce forced draft in the ash pit and thus improve combustion in the coal furnace, is recommended by Crane company engineers as one means of saving. The blower permits the use of cheaper fuel in addition to forcing the furnace to burn a larger percentage of the coal or coke used, resulting in less ash and clinkers. It does not circulate the air through the heating pipes.

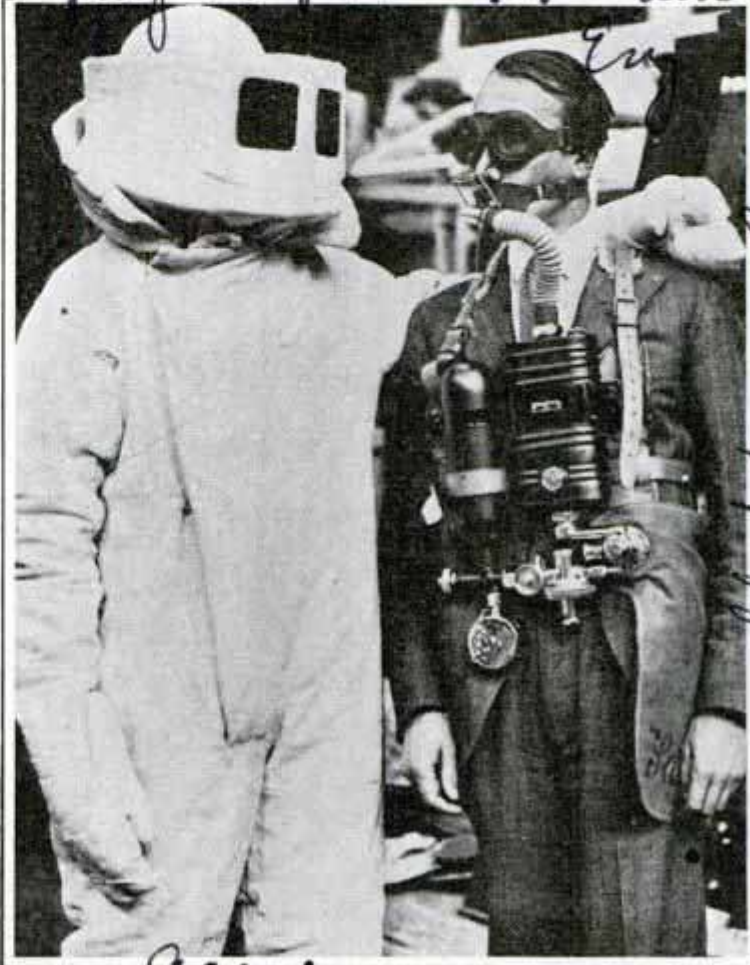
On steam systems, the radiator valve is important because inefficiency at that point retards the heat flow. Radiator shields of various types may not result in a fuel saving, but they will make the home more comfortable because they force heat into the room at the three or four-foot level and prevent that chilly feeling around the ankles. The Crane shield, which slips into a groove between sections of the radiator, is scarcely noticeable, yet it accomplishes the same thing for which larger and more expensive cabinets and radiator covers are designed. However, it fits only the slotted radiators made by that company.

One device which eliminates the necessity for keeping constant watch on the water level in the boiler is a set of valves that controls the flow from water mains into the boiler. A small tank used with the unit serves as an overflow tank in the hot-water system. The valves and tank are installed at the furnace.

If the furnace is "sick," it may be made more efficient by stripping off the old jacket and installing a new, well-insulated one. Insulation wrapped around the hot-water or steam pipes may be another means of improving the heating system,

(Continued to page 142A)

81127.
Fire Suit and Gas Mask
Worn on Perilous Duty
Olympia Palace London



Acme
Latest Types of Fireproof Suit and Gas Mask Designed for Firemen, Rescue Crews and Wartime Defense

Latest styles for fire fighters and rescue squads include asbestos uniforms that cover the entire body and gas masks that furnish oxygen. The gas helmet also is equipped with protective goggles.

81165
"STREAMLINE" BICYCLE SEAT HAS BUILT-IN TOOL CASE



"Streamline" saddles for bicycles and velocipedes are being built with a tool compartment that opens at the back of the seat. A ruby glass reflector on the hinged door of

the tool case acts as taillight. The saddle spring is all but concealed.

Engineering
employed in shipping
and machinery

Brooklyne, C.

6 7092. ...

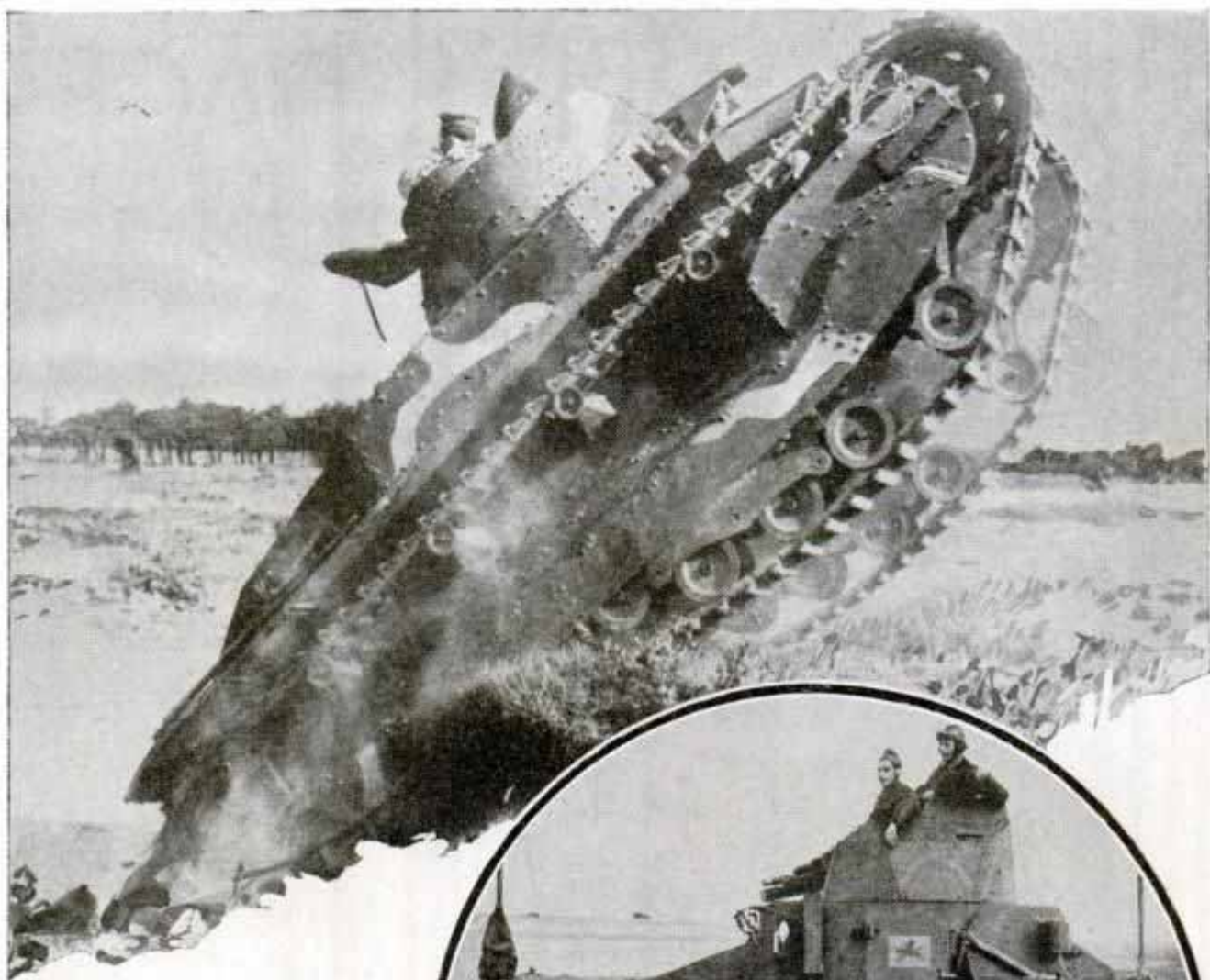
The WORLD'S RACE to ARMS



"Land Destroyers"—Part of England's Fleet of Tanks Ready for War Orders; This Photo Indicates Trend to Robot Armies the World Over; Bottom, New Type of Heavy Artillery Developed by French Military Experts



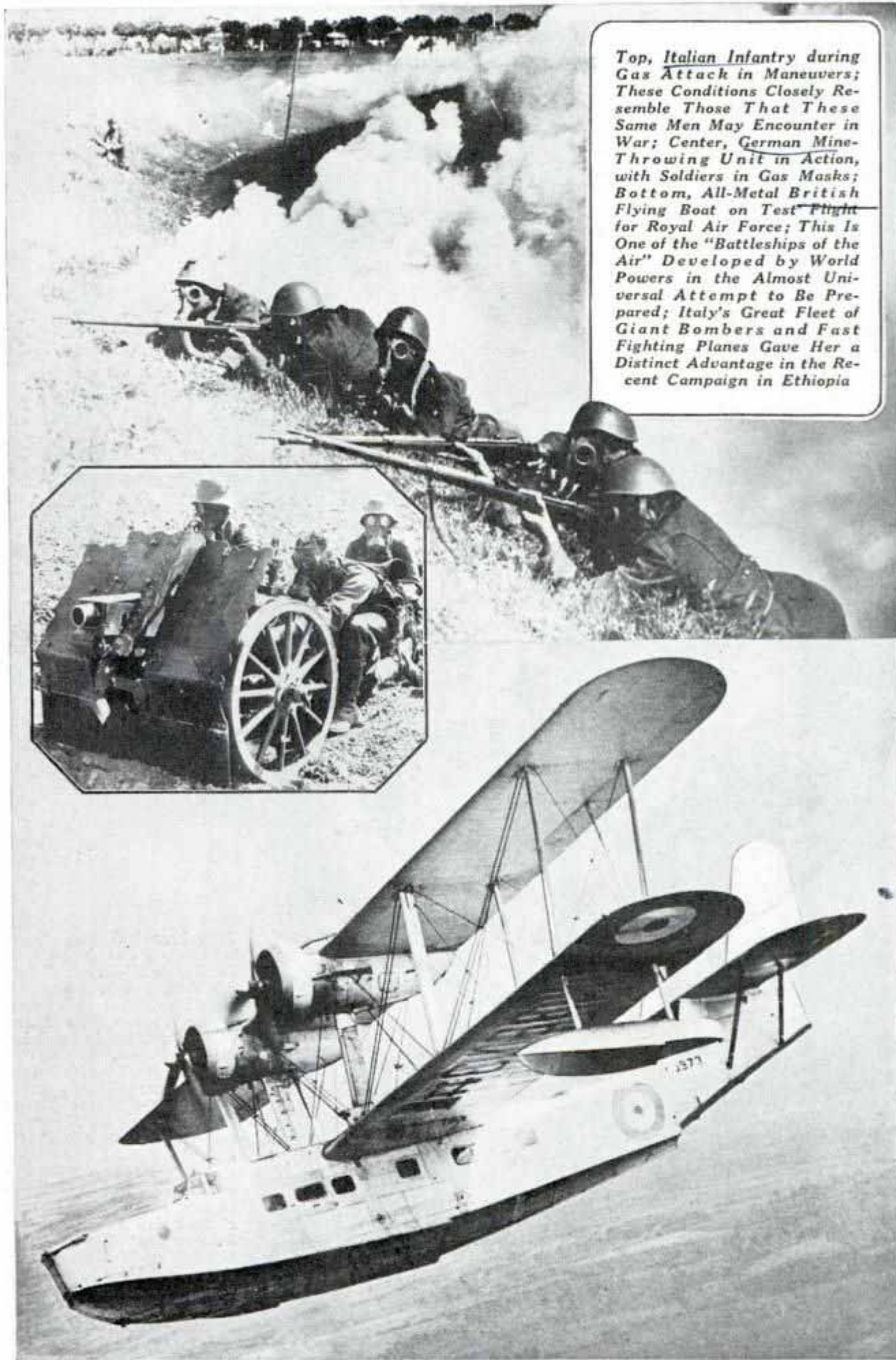
826
E 1092



Top, Japanese Tank Climbing Steep Hill in War "Game";
Center, One of France's Heavily Armored Cars;
Bottom, Young Italians at One Stage of Intensified Military Program



Top, Italian Infantry during Gas Attack in Maneuvers; These Conditions Closely Resemble Those That These Same Men May Encounter in War; Center, German Mine-Throwing Unit in Action, with Soldiers in Gas Masks; Bottom, All-Metal British Flying Boat on Test Flight for Royal Air Force; This Is One of the "Battleships of the Air" Developed by World Powers in the Almost Universal Attempt to Be Prepared; Italy's Great Fleet of Giant Bombers and Fast Fighting Planes Gave Her a Distinct Advantage in the Recent Campaign in Ethiopia



81092

International



Top, French Battery Commander's Post in Test of Artillery's Ability to Evade Air Attack; Circle, Realistic War Maneuvers of Young Italian Troops Who Learn about Gas Attacks by Being Subjected to Clouds of Gas Expelled by This Motorized Equipment; Bottom, Royal Air Force Gunner Trains His Weapon on the "Enemy" in Mimic Air Battle between Sections of Great Britain's Flying soldiery; These Photos Show How Seriously the Various World Powers Are Training for International Emergencies; the Italian-Ethiopian Crisis Speeded Up the Race to Arms

DRIVE, SEATTLE, WASH. Post-
 2 LBS. United States mixture 30c. Ind.
 age extra. John Nagle, North Judson, Ind.
 FREE Premium with approvals! Ideal
 Vacuumed, Toledo, Ohio.

Anternational

6 10/24

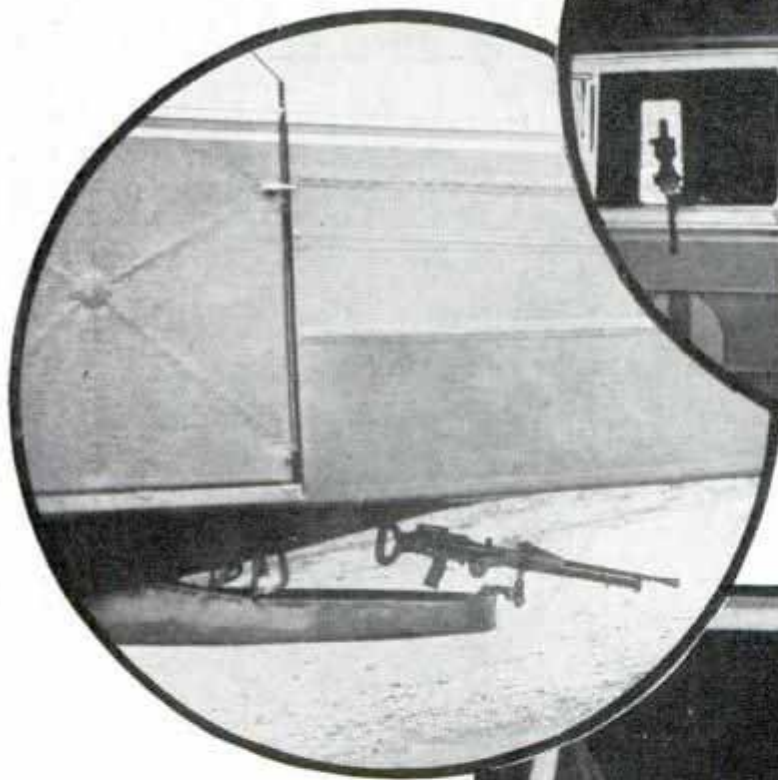
Bristol engine



Top, "Savoia Marchetti" Bomber, of Type That Italy Sent to Africa for Service against Ethiopia

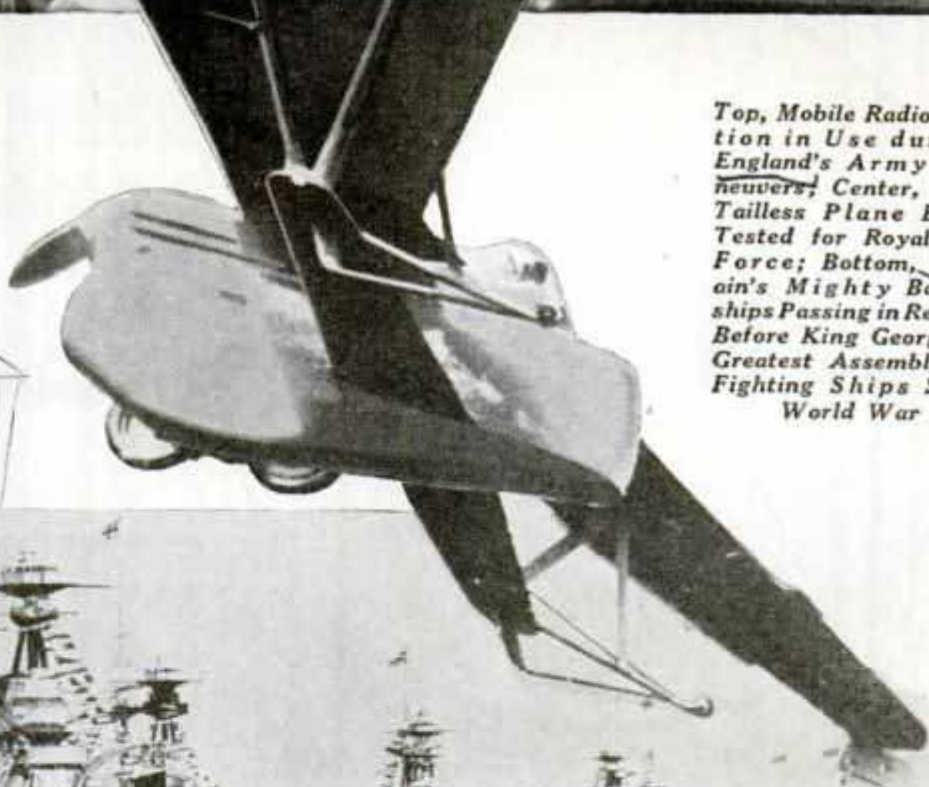
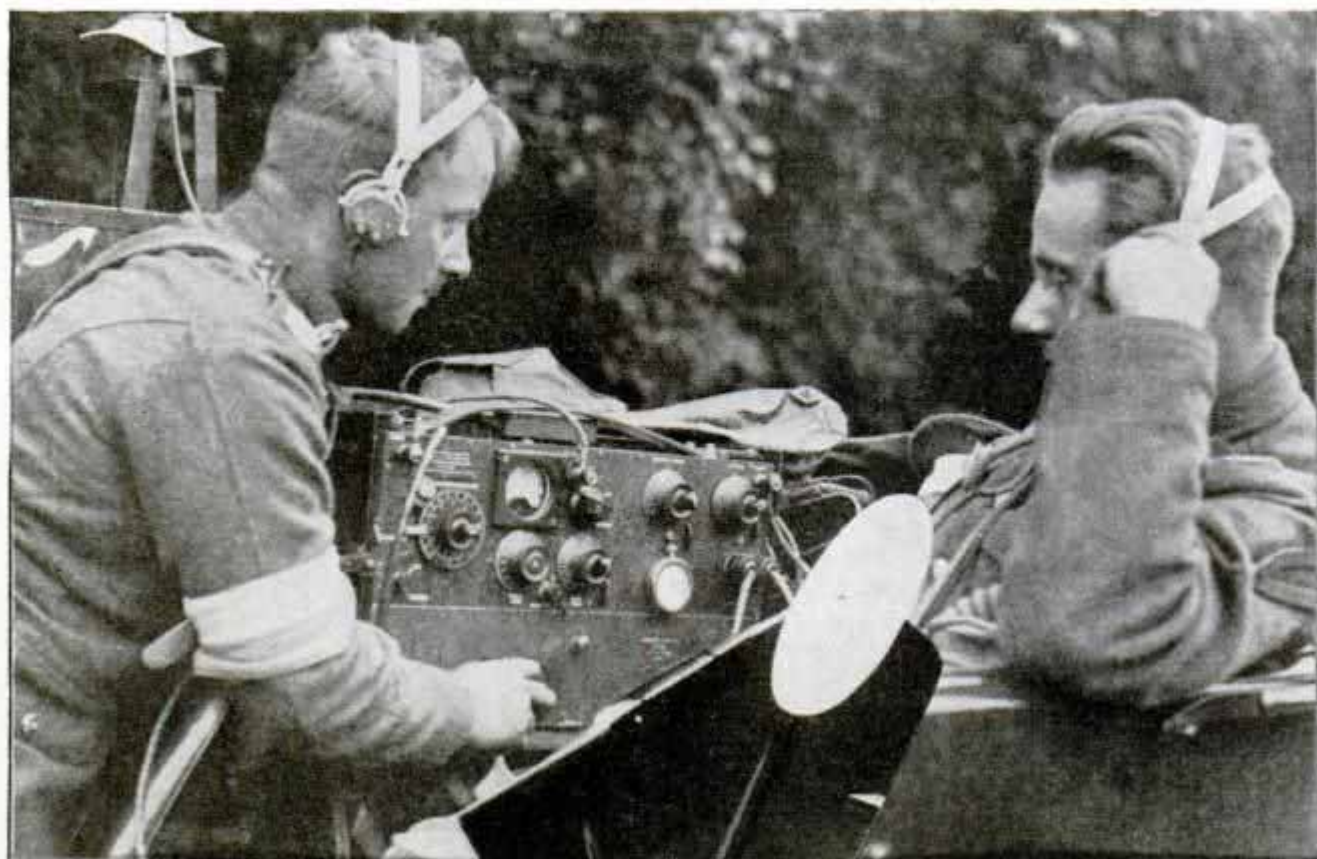


Close-Up of the Savoia Marchetti Bomber; Note Gun Turret on Top of Ship

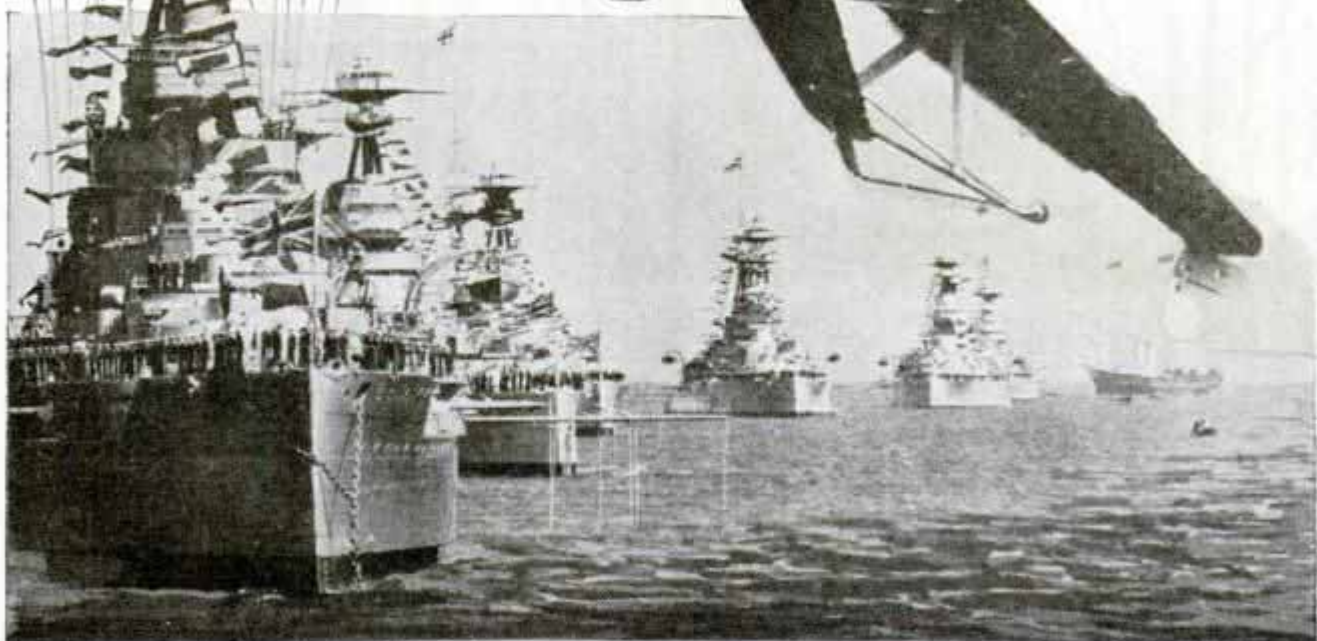


Above, Gun Mounted Below Italian Bombing Plane to Ward Off Attacks from Beneath the Ship; Right, French Officer Testing a New Device Designed to Detect Approaching Enemy Aircraft; Scientists and Inventors Are Doing Their Part in the Accelerated Program of Preparedness as War Clouds Seem to Swirl over a Number of Great Nations





Top, Mobile Radio Station in Use during England's Army Maneuvers; Center, Odd Tailless Plane Being Tested for Royal Air Force; Bottom, Britain's Mighty Battleships Passing in Review Before King George in Greatest Assembly of Fighting Ships Since World War



E 1138

Emergency Radio to Direct Army of Rescuers

In case of an emergency in Los Angeles, 25,000 organized relief workers can be galvanized into action by a special force of amateur radio operators directed by the city's "emergency" station, **W6KJJ**, housed in a quakeproof, fireproof tower. This short-wave communications system has been fortified against breakdown in any imaginable catastrophe. At headquarters are two stationary radiophone transmitter-receivers in a steel and concrete building, independent of outside power. A gasoline engine directly connected to a motor generator in a steel-vaulted basement chamber supplies two kilo-



Top, Directing Rescuers from Emergency Headquarters; Center, Gasoline Engine Generates Power for Radio; Bottom, Field Rescue Station Keeps Touch with Headquarters



watts to the short-wave station. At the first alarm, amateur operators speed to fifteen designated concentration posts with their portable four-tube, dry-cell operated two-way radio sets, ready to handle messages guiding the relief forces. At the

central bureau is a detail map of the Los Angeles area set on plate glass, illuminated from

behind by an arrangement of electric-light bulbs to indicate any rescue station calling for help. Radio-equipped police and fire cars can tune in on the emergency network during the rescue work.

E 1138

BREAD IS KEPT FRESH A WEEK AT FREEZING TEMPERATURE

Bakers have found it possible to keep bread fresh and sweet a week at temperatures below freezing. Bread stored hot, at temperatures around 150 degrees Fahrenheit, became stale more slowly than at normal temperatures but the flavor and color were pronounced "discouraging" after experiments. In a test of freezing, cereal chemists tasted bread baked the previous day and bread that had been frozen a week. A majority preferred the aroma and flavor of the week-old loaf.

American Association of Cereal Chemists.

Com. Mel W. Harton 1144 S. Brandeis St. Los Angeles

330 W. 42nd St. New York

8 708

Sept. 25 1932

Cobble Stones Vacuum Cleaned by Neat Dutch Housewives



Wade Works
Dutch Housewife Vacuum Cleaning the Walk in Front of Her Door in Her Everlasting War on Dirt

Holland has gained the enviable reputation of being the cleanest country in the world because of the pride taken by the people in keeping their cities spotlessly clean. With the Dutch housewife, cleanliness is really godliness, and she not only keeps her floors so clean one might eat off them but carries her war on whatever dirt may be left into the sidewalks in front of her home. In Holland it is nothing unusual to see a housewife vacuum cleaning the cobblestones in front of her door with the same implement she has just finished using in the house.

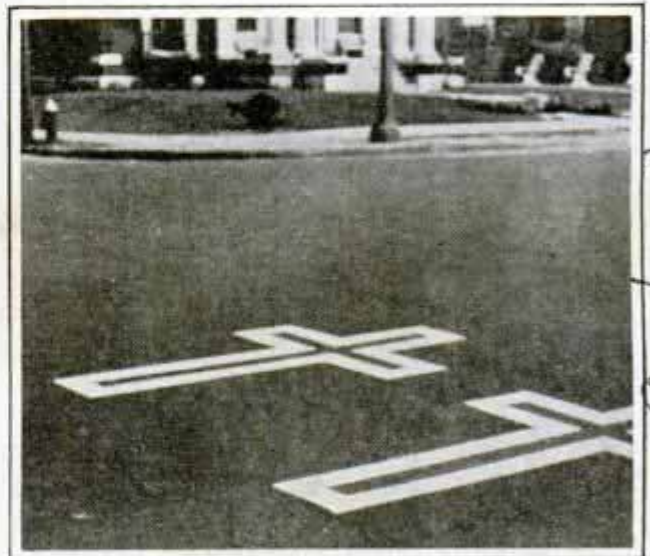
RECESSED AUTO DOOR HANDLES WOULD INCREASE SAFETY

When the ancient Egyptians drove their chariots into battle, they mounted sharp knives in the wheel hubs to sideswipe the

enemy if they couldn't run him down. Automobile drivers today unknowingly carry similar weapons in the form of protruding door handles. The car door handle is described as a "menacing and dangerous projection," causing disfiguring injuries and occasional deaths, by Dr. Samuel McLanahan, of Baltimore, who made a recent report on accidents involving door handles to the American Medical Association. Door handles have been driven through the skulls of victims and the sharp-pointed kind in modern streamline cars are particularly dangerous. Handles pointing toward the rear are less dangerous than those pointing to the front, but the ultimate solution is a handle without sharp projections or one that is countersunk in the side of the door.

DANGER SPOTS ON STREET SHOWN BY CROSSES

Large crosses painted on the streets where traffic fatalities have occurred are being employed in St. Louis to impress on motorists and pedestrians the need for extra caution at such places. Other states have also used the crosses for similar purposes, placing small wooden crosses at the roadside where people have been killed in accidents.



Crosses Painted on Pavement as Warning to Motorists That Fatal Accident Has Occurred Here

in Lindell Blvd.

Comp. 1146

Middelburg

*Frankfort. 1146
Kovel. Box 105,
Emt. Bernard*

Radio Ashore Runs Lightship without Crew

Operated by remote control from a land station eight miles away, a lightship without a crew is serving shipping in Lake St. Clair, between Lake Erie and Lake Huron. The ship has a powerful masthead light, a gas-operated fog bell, a compressed-air fog signal and a radio beacon. When fog comes up, the lighthouse keeper ashore manipulates radio controls to start the fog signals on the ship. The radio beacon normally operates automatically, sending out its signal for fifteen minutes out of each hour, day and night. When there is no fog, the masthead light can be observed by the lighthouse keeper eight miles away. A receiving set at the lighthouse checks on the radio beacon, picking up the dots and dashes. A check on the fog signal is kept by a microphone on the ship which "listens" to the signal and also controls the radio beacon. If the microphone "hears" the fog signal, it permits the beacon to transmit a full sixty seconds out of each operating minute, otherwise it cuts off the beacon for five seconds each minute. If the lighthouse keeper hears the radio beacon only fifty-five seconds out of the minute, he knows the fog signal has failed and he starts the second signal. The U. S. Lighthouse Service worked five years on the lightship.



Top Photo, U. S. Lighthouse Service; Bottom Photo, Detroit Free Press
Lightship Controlled by Radio and (Below) Testing the Remote-Control Instruments

Windshield Is Cleared of Ice by Heat of Electric Wiper



Electric Current Passing through Blade of Wiper Heats It Sufficiently in Two Minutes to Melt Ice

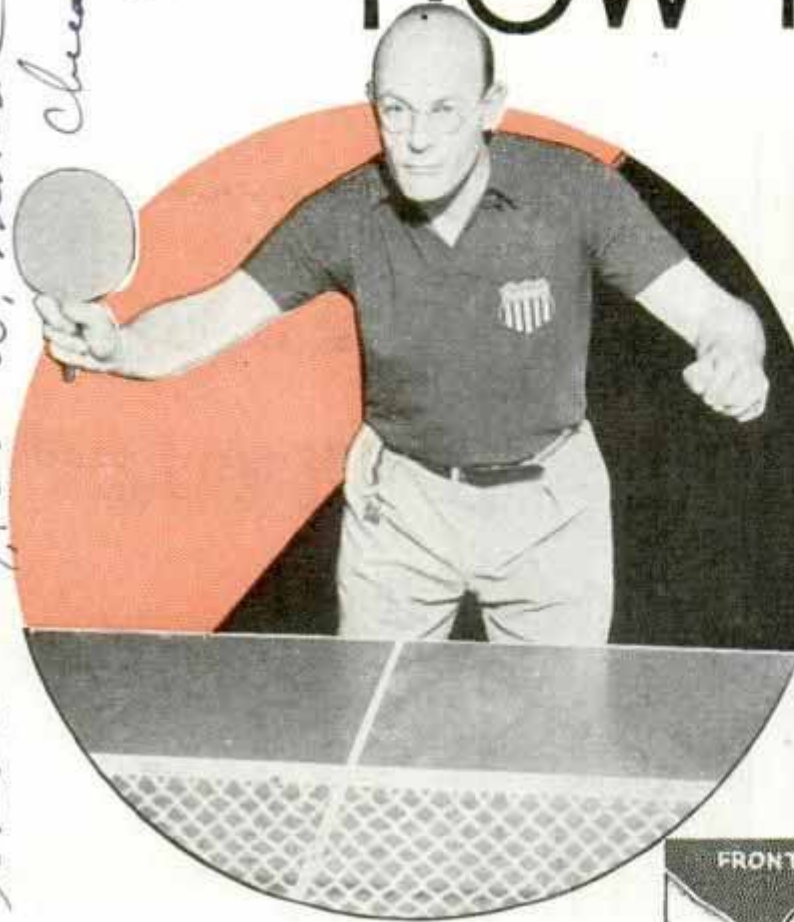
Ice and snow that clog windshields and make winter driving perilous can be defeated by an electric windshield wiper that melts the film of ice from the glass. The heat is in the blade, which is inserted in place of the ordinary rubber blade of the wiper. Two minutes after it is turned on, the blade is hot and a few swipes over the windshield will clear it and keep it clear. The defroster operates on a six-volt battery and uses four and one-half to four and three-quarters amperes.

Handwritten notes:
 2 10 3 2
 2 1056
 Pat # 1, 790, 544
 Hoover, Shriver Co., Kans
 c/o Hoover, Shriver Co., Kans

8945

W. G. C. Alley's Investment Securities, 100 W. Monroe Chicago

HOW to PLAY

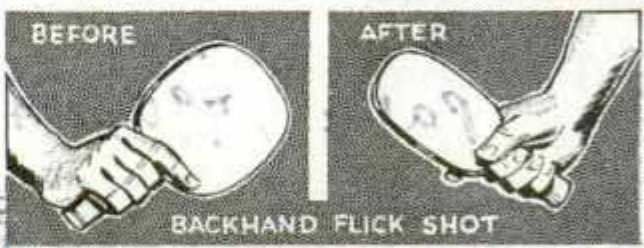
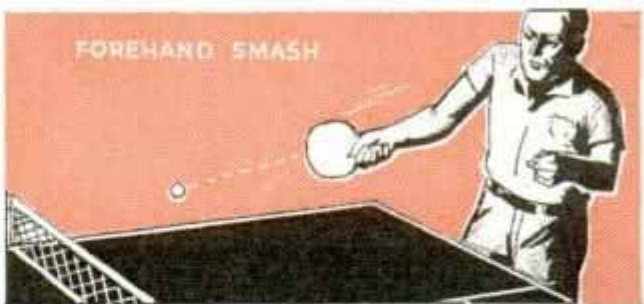
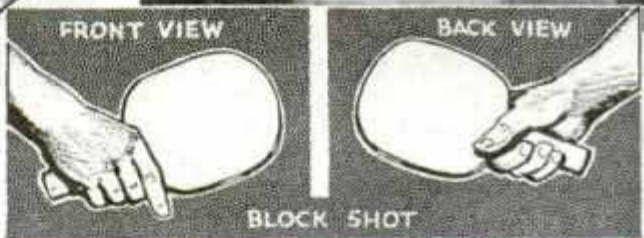


By **COLEMAN CLARK**
Former National Champion

AMERICAN games live in cycles and table tennis, now in its third revival, today is riding the crest of the popularity wave.

Indoor tennis, as it first was called, appeared shortly after the turn of the century. It was played in leisurely fashion in the parlor with crude wooden paddles and a firm, light ball, covered with a knitted web to protect the furniture. When the sport was carried to England, a celluloid ball was substituted but indoor tennis retained its aura of femininity and after a few years, it nose-dived into oblivion.

The game's comeback in 1915 was brief but after the world war it gained a foothold in Europe. Since then it has elbowed its way into the sport circles of virtually every civilized country. Twenty-three nations are affiliated with the International Table Tennis Federation and Carl Zeisberg of Philadelphia, president of the United States Table Tennis Association, already organized in twenty-three states, estimates that between two and three mil-

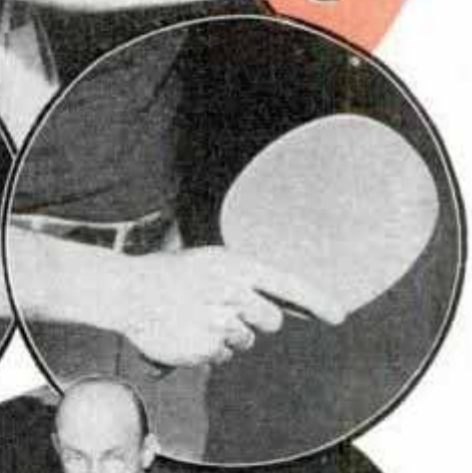
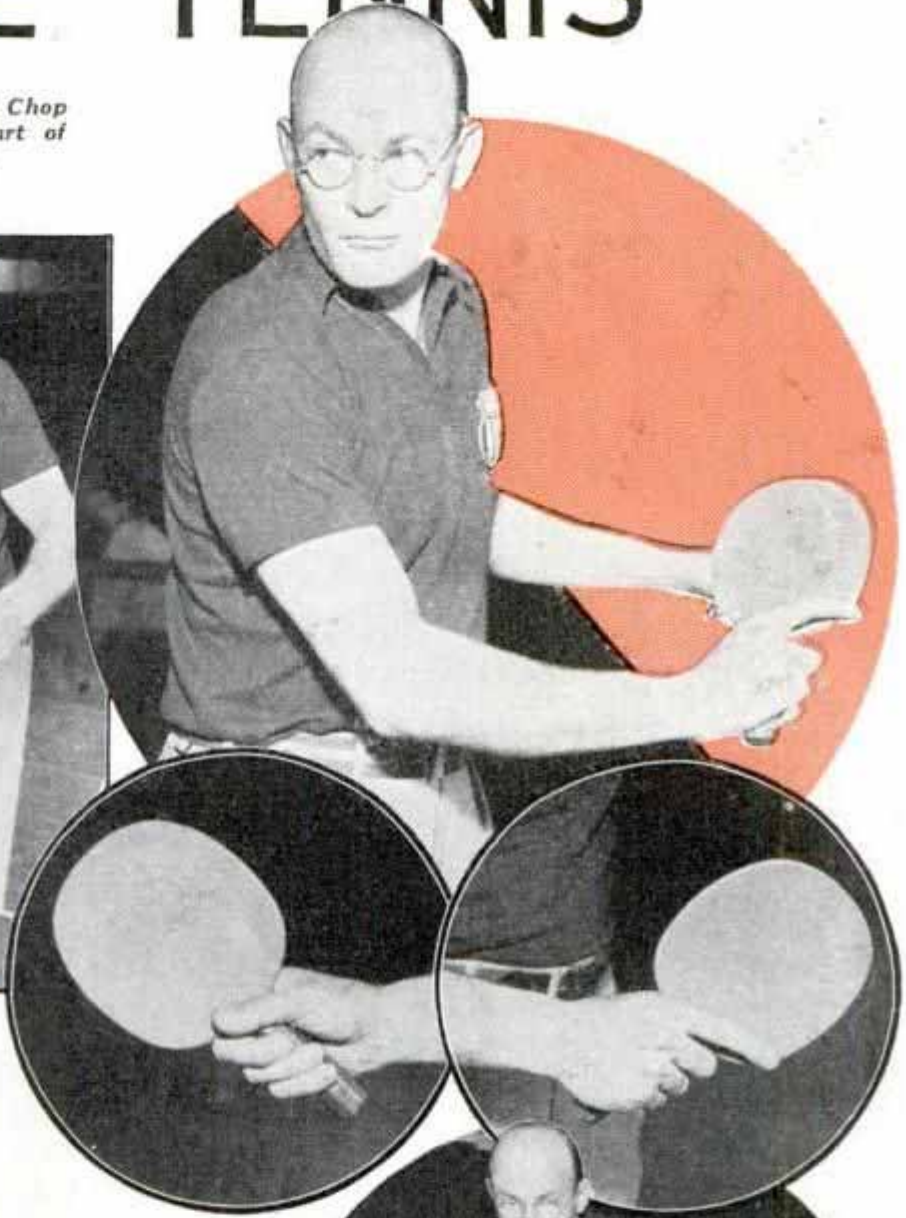


Top, Left, Ready to Block a Drive, and, at Right, in the Middle of a Backhand Drive

see no. 1100
669
8945

TABLE TENNIS

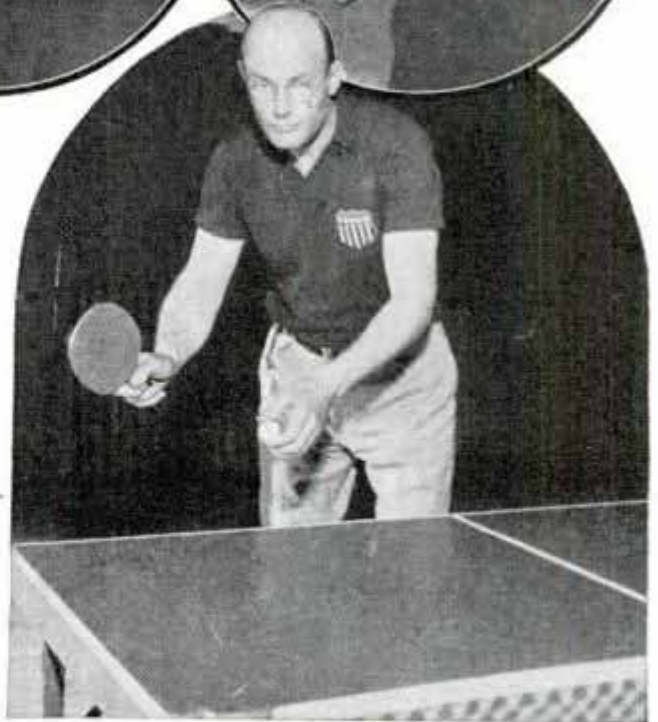
The Author Showing Forehand Chop at Middle of Stroke and Start of Backhand Chop Stroke



lion Americans are playing the game. It is about the only active sport that can be played in the home and is an excellent form of exercise as virtually every muscle of the body is used during a fast game.

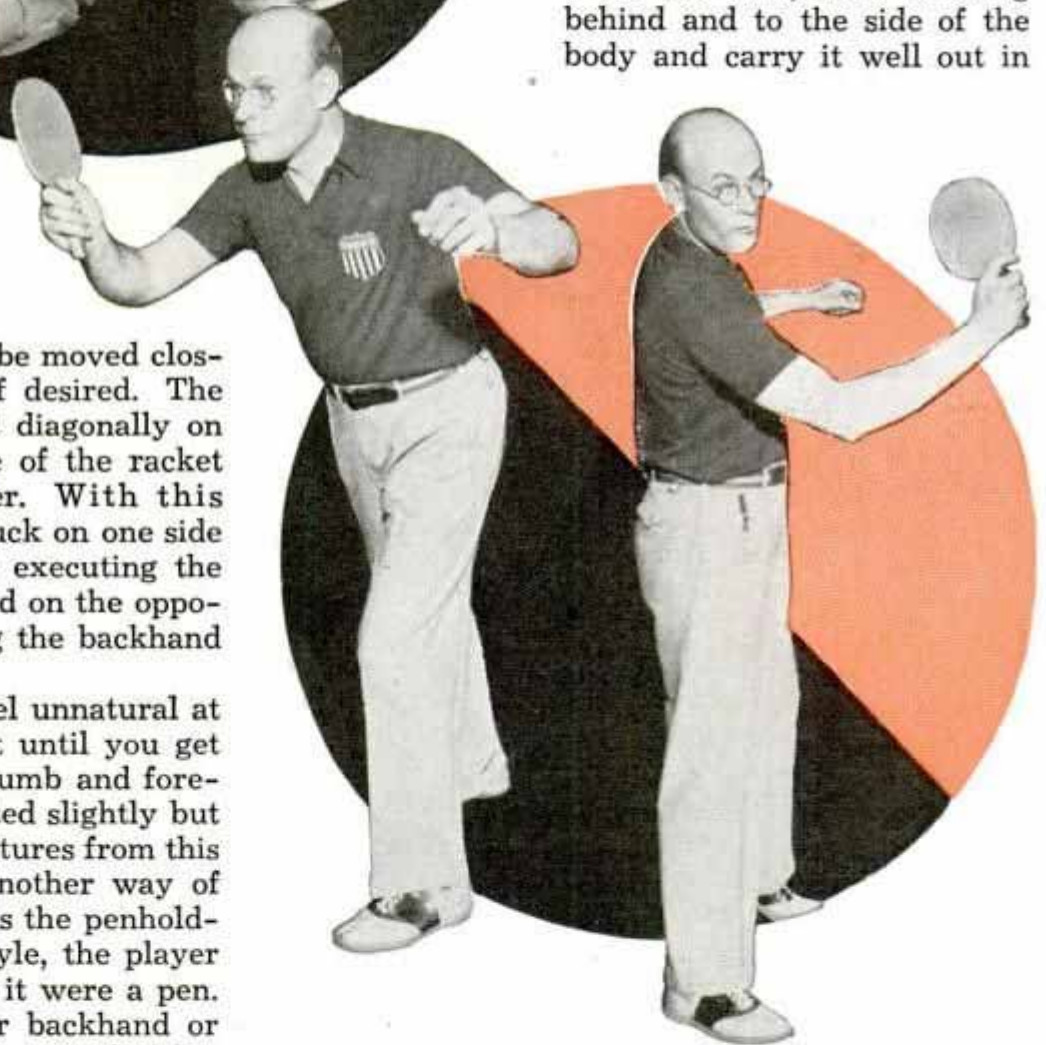
To get the maximum enjoyment from this sport, play on a regulation five-by-nine table. Insist on the three-quarter inch, five-ply model, as it gives a higher and more uniform bounce than the three-ply type. Use the large size pebbled rubber racket in preference to sanded bats. On the offensive, the rubber bat aids in putting the cut and spin on shots, and in defensive play, it tends to absorb the shock of a hard-driven ball.

As in tennis, the grip of the racket is important. There are many ways of holding a bat, but perhaps the most practical is the tennis grip. The racket is held high up the handle and the index finger extends outstretched close to the edge of the blade,



Forehand Serve and Back and Front Views of the "Tennis Grip"; Note Position of Fingers

*Cont. James Mcweeney
2471 Hartmouth Road
835*



Top, Mr. Clark in Action; Below, Left, Finish of Forehand Drive; Right, Beginning of Backhand Drive

or pull-up determines the degree to which the ball takes the desired nose dive after passing the net.

In making a forehand topspin drive, the wrist should be firm and the hand around the bat steady but not too tight. The body should be in a comfortable, slightly crouching position, two or three feet behind the middle of the table. To obtain proper balance, spread your feet and keep on your toes. Because of the ball's size and the rapidity with which it travels, keep your eye on it until it strikes your racket.

On the shot, start stroking behind and to the side of the body and carry it well out in

although this may be moved closer to the center if desired. The thumb should rest diagonally on the opposite side of the racket from the forefinger. With this grip the ball is struck on one side of the racket in executing the forehand stroke and on the opposite side in making the backhand shot.

The grip may feel unnatural at first but stick to it until you get used to it. The thumb and forefinger may be shifted slightly but avoid radical departures from this tested formula. Another way of grasping a racket is the penholder grip. In this style, the player holds the bat as if it were a pen. In executing either backhand or forehand shots, the penholder player strikes the ball on the same side of the racket.

A topspin drive—a fast, low ball—is, perhaps, the fundamental stroke. Strike the ball with a quick upward and forward movement together with generous follow through. The extent of the necessary lift

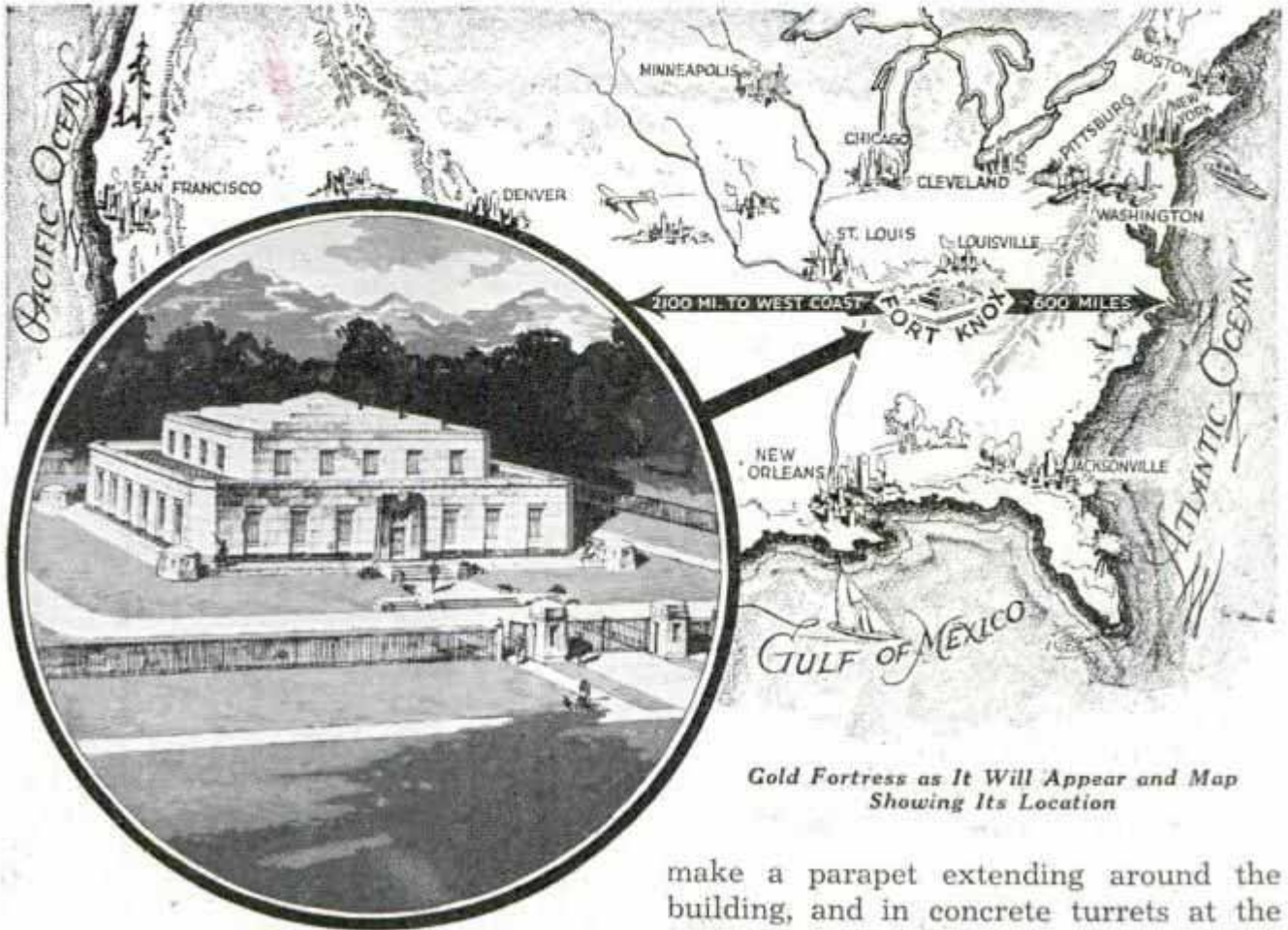
front and across the body a foot or two above the table. For the best results, the upper edge of the racket blade should be tilted at the moment of impact, although

(Continued to page 118A)

67076 Com. John F. Comby,

Steel and Stone Fortress to Guard Our Gold

Route 4, Anacostia D.C.



Gold Fortress as It Will Appear and Map Showing Its Location

Gold worth nine billion dollars, the greatest accumulation of the yellow metal ever gathered in one pile, is shortly to be moved by the government to Fort Knox, Ky., there to be cached in a fortress of steel and stone, ringed around by armed forces and the most deadly weapons of science. The gold storage building will occupy 10,000 square feet and the gold itself will be placed in a giant vault forty by sixty-four feet and rising through nearly two stories of the building housing it. Walls, roof and floor of the building will be of granite two feet thick and the vault walls will also be two feet in thickness. In them will be fabricated steel coils so close together that a human hand could not be inserted between them even if the concrete about the steel could be removed. Around the vault, above and below, will be an eighteen-inch space clear to the vision from every angle. These spaces, spotted with mirrors, will give guards an uninterrupted view of the vault from every side, day and night. The top floor of the fortress will set back far enough to

make a parapet extending around the building, and in concrete turrets at the four corners machine guns will be mounted. Inside sensitive microphones will connect every part of the vault with the main guard room. In the office of the captain of the guard will be an annunciator with its warning drops, signal lights and bells. This will be augmented further by an elaborate telephone communication system. Outside the building, in the fort proper, is a motorized cavalry unit with armored trucks and cars standing as the first line of defense. The gold is being moved inland from the eastern seaboard to provide extra protection in case of a foreign invasion. Another cache of gold has been established at Denver. Both Denver and Fort Knox are protected by the natural barriers of the Allegheny and Rocky mountains, making the points very difficult of access to an invading force, except by planes. The gold being "salted away" is not coin but is in the form of bars about three and one-half by six and three-fourths by one and three-quarter inches. At \$35 an ounce each has a value of about \$14,000 and each bar weighs something less than 400 ounces.

[Handwritten scribbles and signatures at the bottom of the page.]

Electric Timer Clocks Plane on Record-Smashing Flight



Wide World
Using Telephone, Printing Chronograph and Camera to Check the Time of Howard Hughes When He Broke World's Record for Land Planes

When Howard Hughes, California speed flyer, broke the world's record for land planes with an average of more than 347 miles per hour for seven flights, an elaborate electric recording system was set up to clock his plane as it raced at nearly six miles per minute. The timing equipment included a telephone, a printing chronograph and a camera which snapped the ship as it whizzed over the three-kilometer course. On his last lap, Hughes' motor choked and failed but he landed safely.

so that no darkroom is required and pictures may be made at home, school or office. The camera has a fixed focus lens, a shutter with bulb and time exposures, a light lock to protect the microscope eye-piece and the camera lens, and a bracket to hold the camera in position above the microscope. After focusing the microscope as usual, with proper light on the object, the camera is placed in position and the picture taken.

SUN BATH IS GIVEN WITHOUT A BURN BY HEALTH BULB

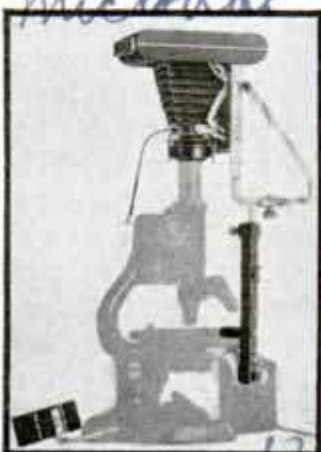
All danger of sunburn from over-exposure has been eliminated in an ultra-violet lamp devel-

oped by a Cincinnati inventor. You can read and work under its light, all the time absorbing its health-giving sun rays without fear of burning the skin. The bulb fits an ordinary light socket.



Electric Bulb That Sheds Sunlight without Burning

MICROSCOPIC CAMERA SHOT MADE EASY FOR AMATEUR



Amateur photography through the microscope no longer requires any particular skill, a camera being available for this special work. It uses ordinary roll film of two and one-quarter by three and one-quarter-inch size,

1086

1942

1118

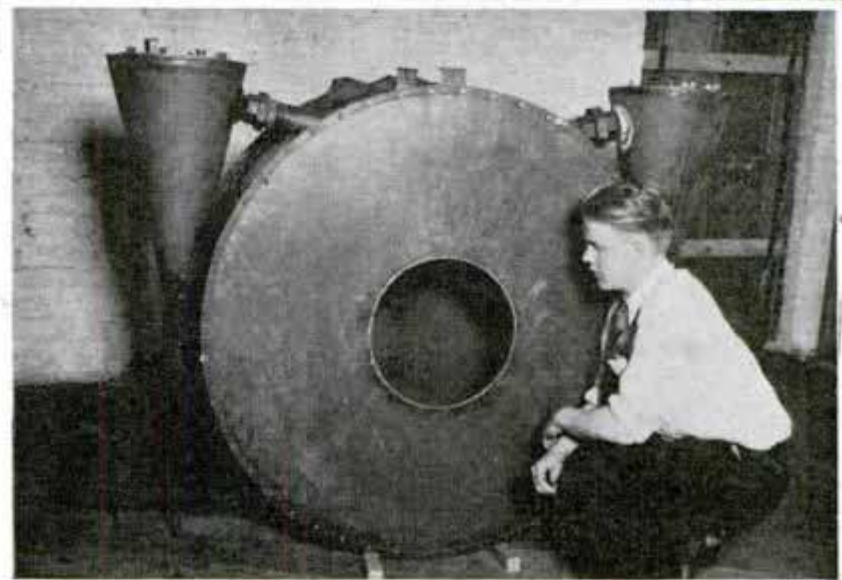
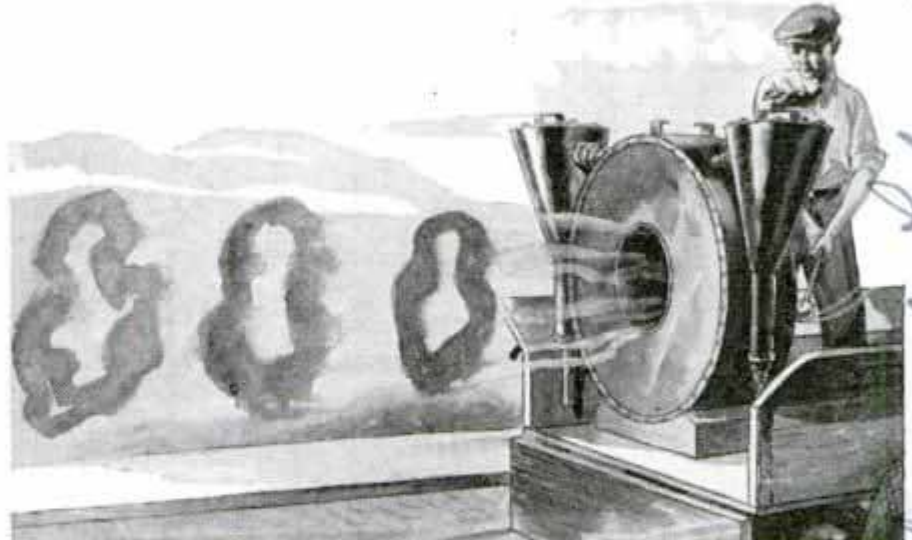
Science Laboratory 424 E. 4th St Cincinnati Ohio
see March 1942
Beckman, Cincinnati, Ohio

Eastman Kodak Co. Rochester, N.Y.

George S. Spencer

Smoke Rings Like Auto Tires Made by Drum

If you can't produce smoke rings with your pipe or cigar, you can be sure of doing it with a big smoke drum which makes huge circles about the size of automobile tires. The smoke machine is mounted on a truck and is used for advertising purposes. The drum is five feet in diameter, two feet thick and has a center opening of eighteen inches. Mounted on each side are two cones containing the smoke-making material. At the base of the cones are agitators and electric heaters to keep the smudge material rotating and convert it into smoke. The smoke by air pressure is forced to the tops of the cones and from there through pipes to the drum, the interior of which is like another cone with the smaller part toward the front. The rings are produced by striking a leather diaphragm at the rear of the big drum.



Big Drum Which Blows Smoke Rings as Large as Auto Tires When Leather Diaphragm in Rear Is Struck; It Is Used to Attract Attention for Advertising Purposes

2 cent type development
 928 Fullerston Parkway, Chicago

16th St. N. W. 11-10
 Wash. D. C.
 1200-

Razor Blades of Glass!

FROM the glass artisans of Czechoslovakia comes word that glass razor blades are being produced, finely edged and as sharp as the highest-grade steel. The brittleness of glass, which has a tendency to break too easily, has been a handicap but experiments to correct this fault are progressing. As soon as it is possible to manufacture fine glass that is proof against chipping, it is expected that glass razor blades, phonograph needles and similar articles will be placed on a mass production basis.

at Khabling.

METAL SHIELD ON AUTO MIRROR CUTS OUT THE GLARE

Glare produced by the lights from cars behind shining in the rear view mirror of your car is eliminated by a metal shield for the mirror which can be attached in a



Metal Shield for Rear View Mirror Which Cuts Out Glare of Lights of Following Cars

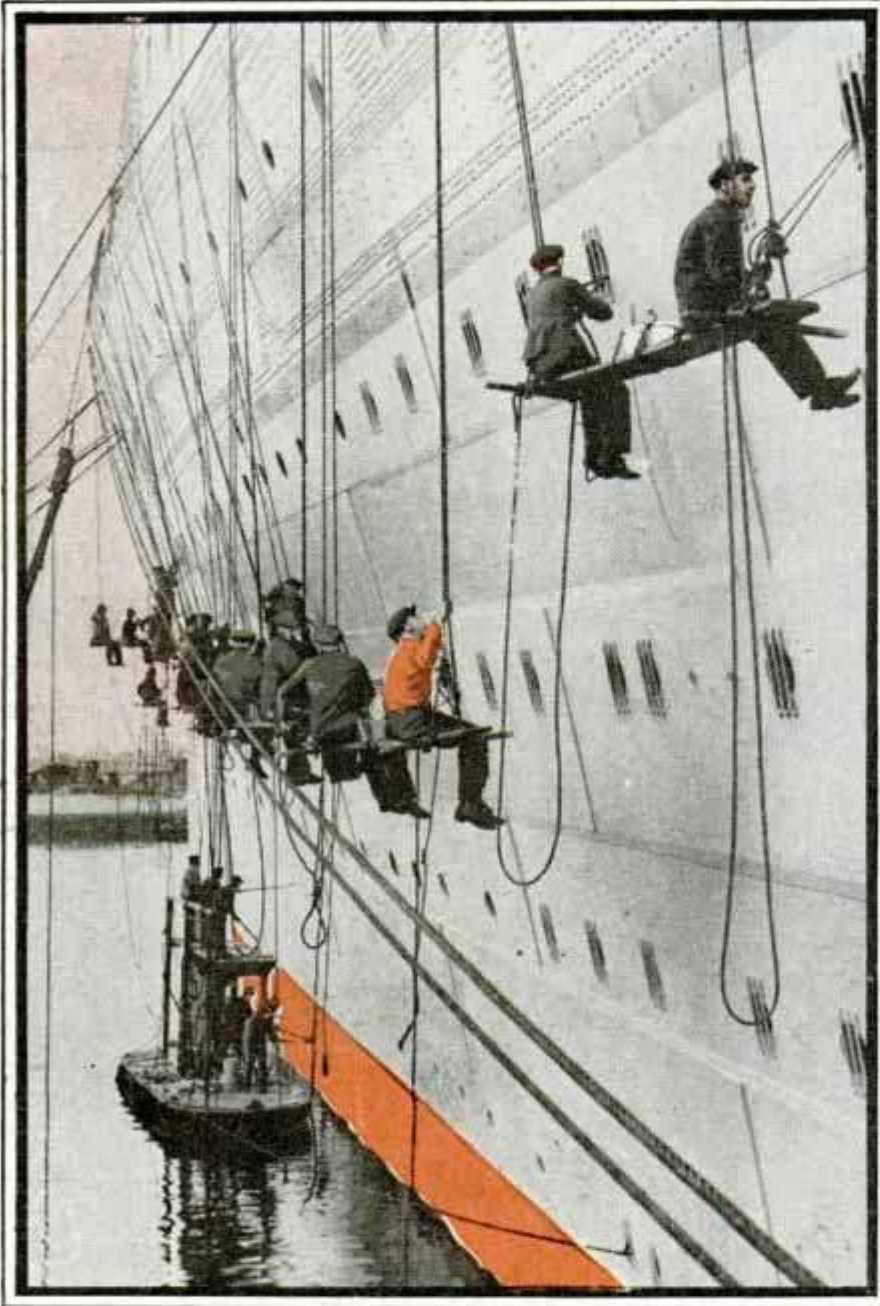
few minutes. The slotted shield can be adjusted at any angle and when properly set cuts out reflected glare of lights behind.

E 1113
 E 1068
 E 1.990, 222

no. 1246 shield, chm.
 2711 E. Florence Ave.

6497
1360 W. Clifton Blvd
Lakewood Ohio

PAINT MAGIC *and*



© Planet News
Ships Must Be Protected by Frequent Coats of Paint; Here Painters Are Shown at Work on the "Empress of Britain"

factories, airplanes, and anything that needs color or protection.

When Prof. Piccard made his first flight into the stratosphere in 1931, he painted the gondola of his balloon black, reasoning the black paint would absorb the sun's rays and help to keep the occupants of the compartment warm. But when the balloon reached the stratosphere, he wished he had left his black paint at home, for with a temperature of seventy-five degrees below zero outside the gondola, the men within suffered from the heat of 100 degrees Fahrenheit. For the second trip into the stratosphere the gondola was painted white. This time Piccard shuddered with cold. The interior of the cabin was seventy-two degrees colder than on the first ascension.

Paint engineers have turned the fact that white paint reflects light and heat into valuable sayings in the oil industry. One test made on 12,000-gallon gasoline storage tanks of different colors for a four and one-half

HAVE you ever heard of a paint engineer? He is a new and very distinct type, a combination of salesman, painter, chemist and engineer.

He may be called into council on a better finish for bobby pins or asked to recommend the best coatings for the steel beams of the San Francisco Bay bridge or what colors should be applied to the gondola of a stratosphere balloon. His problems concern the painting of gasoline tanks, pipe lines, steamships, machinery,

month summer period showed a loss by evaporation of 257 gallons more in a red tank than in a white one. The red paint absorbed so much heat from the sun's rays that the temperature of the gasoline within rose to a point where evaporation was great enough to force vaporized gas through the expansion vent. Of course, a similar action took place in the white tank, but the absorption of heat was not nearly so great.

A more striking example is represented in tests conducted on 55,000-barrel crude

8411.

what it MEANS to YOU



oil storage tanks. Over a period of a year the saving in an aluminum painted tank compared with a black tank was approximately 200 barrels or easily a tank-car load of oil.

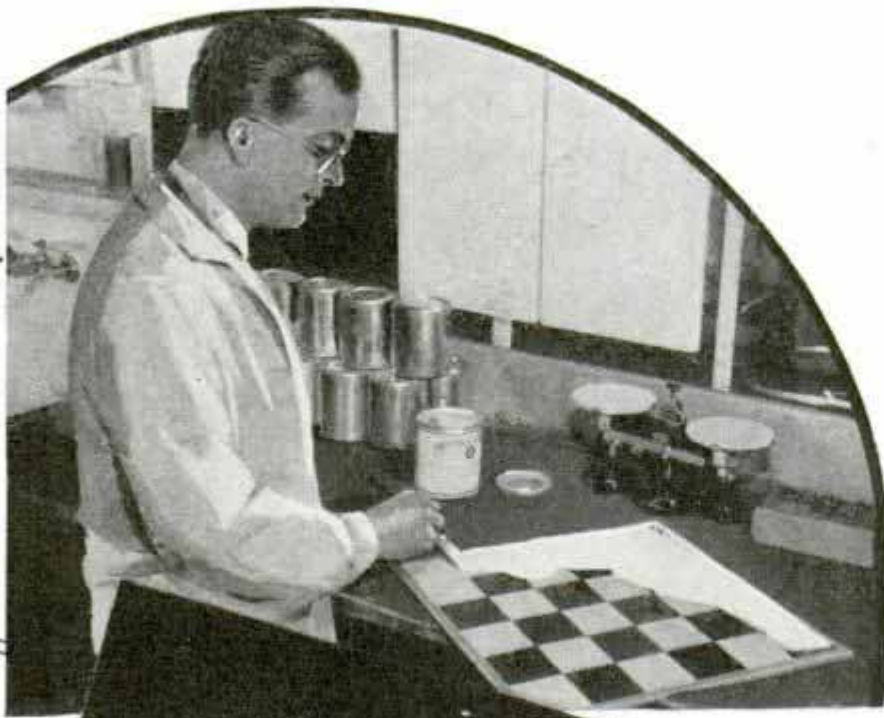
White paint on ships sailing tropical seas has a more utilitarian value than mere appearance. The "Mauretania" with a coat of white was from eight to ten degrees cooler on a tropical cruise than she previously had been with a black hull. This fact has been turned to real advantage by the United Fruit liners.

The bottom paints for ships are even more important than hull coatings. Without these bottom paints great shreds of sea growth would fasten themselves to the bottoms, impeding progress to such an extent that fuel bills would climb to figures that would prohibit the operations of these vessels. Paint engineers are ever on the alert to make these paints serve their purpose more completely and over longer periods of time.

White enamel will even make a steam



Light and Dark Paint Job on Stratosphere Gondola, and Painters at Work Redecorating the Capitol Dome in Washington



Top, Testing Covering Power of Paint on Checkerboard; Below, Scrubbing Machine Which Tests Sticking Qualities of Paint on Concrete Floor

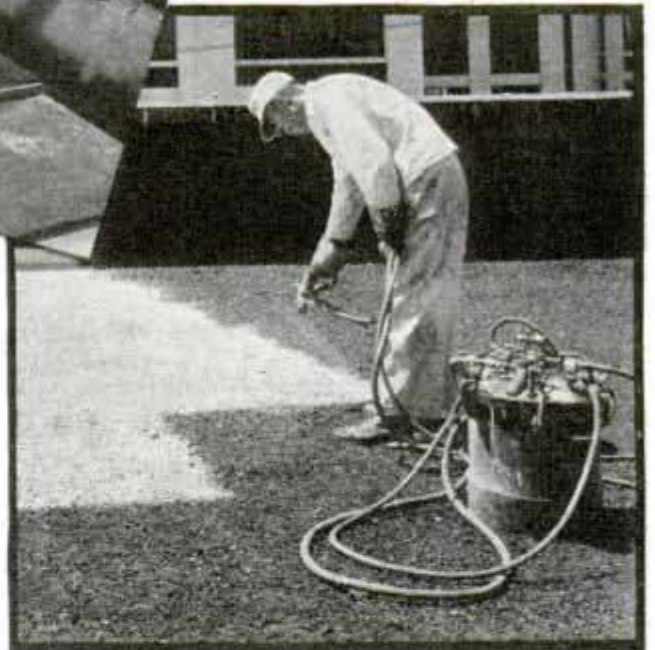
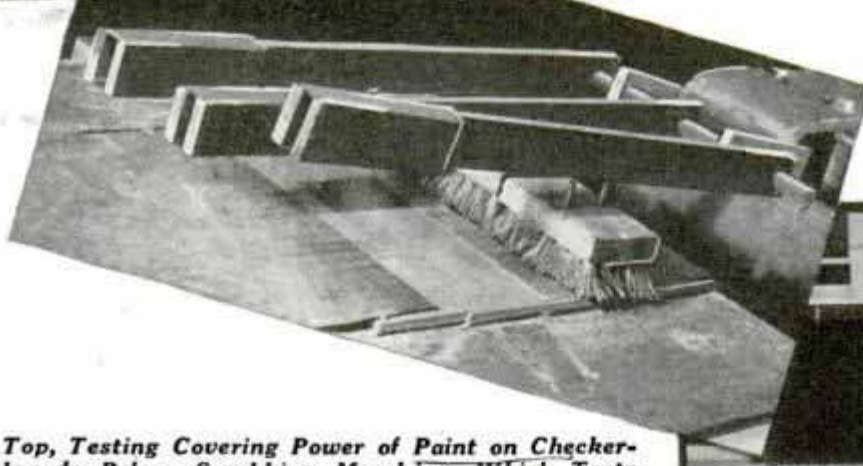
radiator more efficient. Tests have shown it will radiate one-sixth less heat when painted with aluminum or copper bronze than when coated with white.

Of course, white paint is not the only color with which a paint engineer has to deal. Consider the bobby pin. Originally these pins were finished in shiny black. Now, in addition to being made up in the shades of the hair in which they are to be used, manufacturers coat them with what is known as a wrinkle finish which allows the color of the pin to blend into the color of the hair.

There are many places where colors have distinct advantages. We need brilliant yellows for traffic zones, aviation towers and lighthouses. Outdoor advertising demands no end of durable colors, and industry and home life are constantly demanding new and varied shades to

please or quicken the eye. Paint engineers are finding new uses for insulating varnishes to insulate motors and generators, mill white paints for better illumination of factories, metal protective finishes to combat rust and corrosion, and fume-resisting paints for chemical plants and localities where sulphide fumes are present.

Metal protective paints play an important part in saving the surfaces they cover. It has been estimated that in the United States alone \$100,000,000 is lost to rust and corrosion each year. Paint is the most practical weapon we have to check this



Spraying Tar Roof with Aluminum Paint to Deflect the Heat and Keep Building Cool

loss. Since rust is an electrolytic action, paint engineers are called upon to formulate different types of paints to meet the special requirements of different surfaces. High-tension towers should not be painted with a graphite or metallic primer. In the coal industry acid-resistant paints must be used because coal dust, which

(Continued to page 134A)

Cretecote - Penolq inc. Pullborough, Pa.
 Chicago - 2840 E 95th St

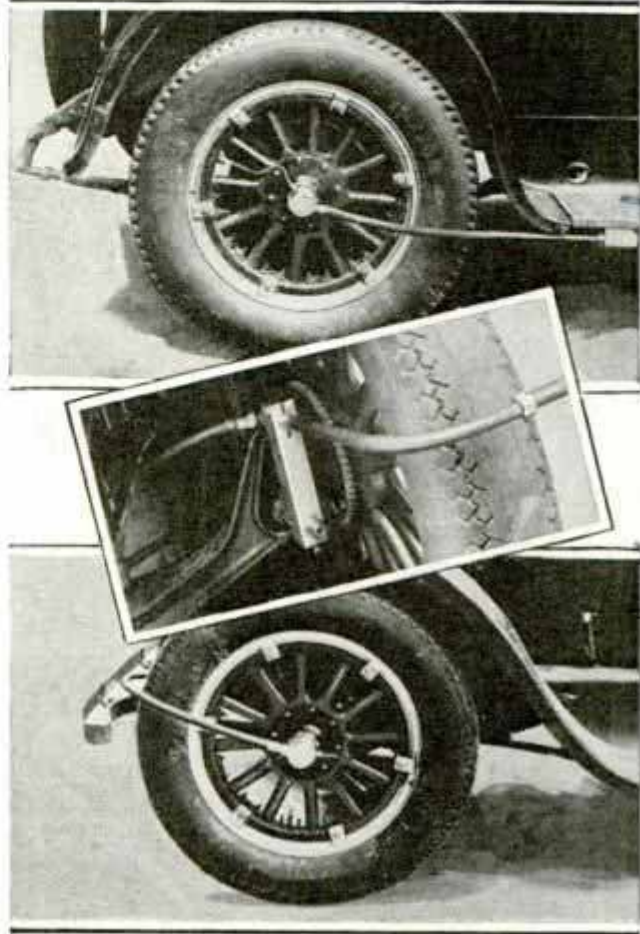
*Mixed Fuel Aids Campbell
 in Smashing Record*

WHEN Sir Malcolm Campbell made his record run of 301 miles per hour in Utah recently, he used a special fuel made of benzol, gasoline, ethyl and methanol. The mixture had tremendous explosive force which enabled the Bluebird's engines to develop full power. Experiment might adapt similar mixtures to other types of racing engines, but full benefit from their use could not be obtained without adjusting the timing to handle the fuel.

*CYLINDERS WITH TWO PISTONS
 USED IN MOTORCYCLE ENGINE*

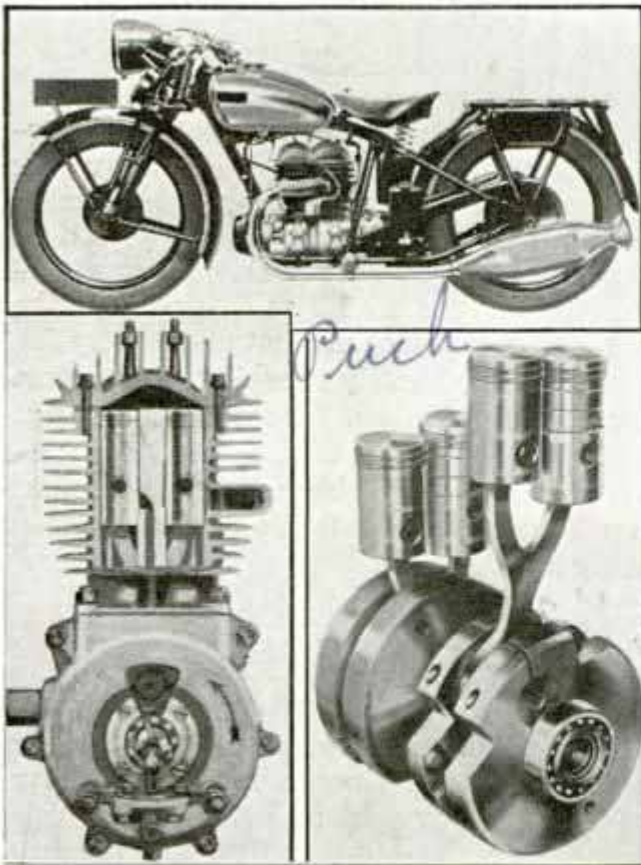
Motorcycle engines having two pistons in each cylinder block are being used widely in Austria. The air-cooled two-cycle engine is efficient in operation and has an output of fourteen horsepower when two blocks are used.

**Tire Pressure Is Kept Up
 by Air Control on Dash**



Rotating Pressure Unit on Hub Feeds Air to Tires; Top, Rear Wheel Connections; Others, Front Wheel

Constant control from the dashboard of air pressure in all four tires of an automobile has been accomplished. When a tire falls below the desired pressure or is over-inflated by heating, a signal light or bell warns the driver and by simple control, either manual or automatic, he can increase or decrease the air. Of especial value to motor bus or truck operators to safeguard against unnecessary wear on tires or car and to help prevent accidents, the continuous inflation system now being manufactured comprises a rotating pressure joint in the wheel hub, air pumps and tanks, valves and gauges, regulators and, if desired, alarms. Leading to the intake of the inner tube is a rubber hose tapping air from the rotating pressure unit, which replaces the ordinary hub cap. Air reaches the hub unit from a compressor, either through tubes extending around the front or rear or the tire from beneath the body, or through a hole in the axle.

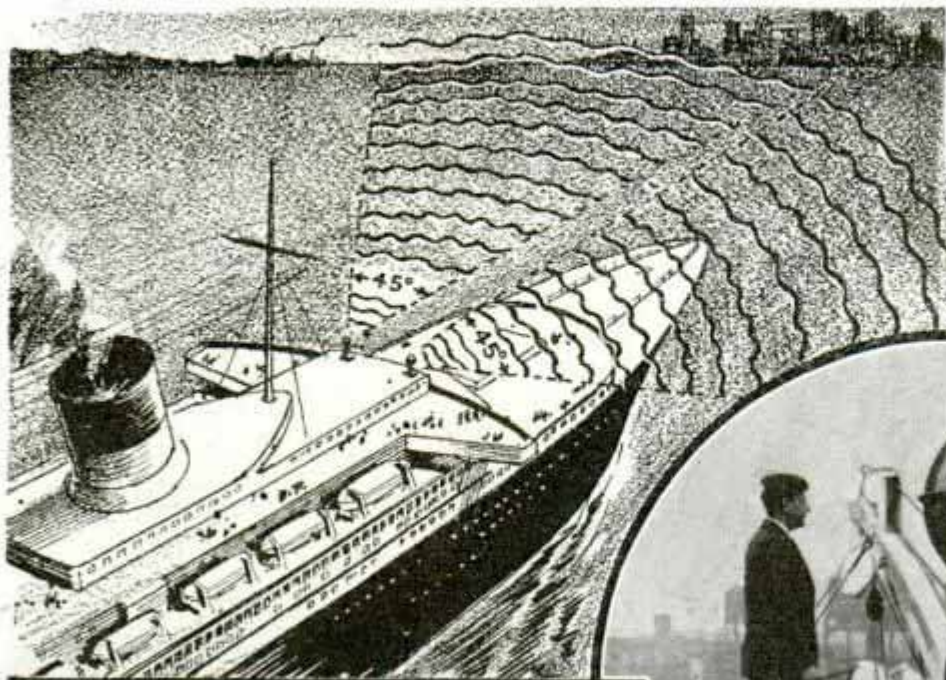


Motorcycle Engine with Two Pistons in Each Cylinder Block; Note the Unusual Arrangement

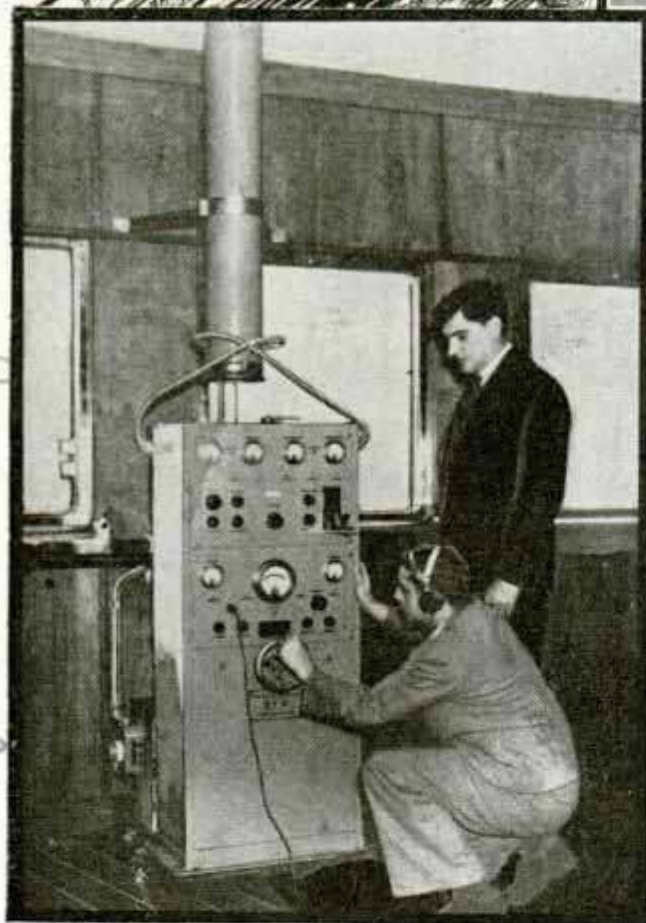
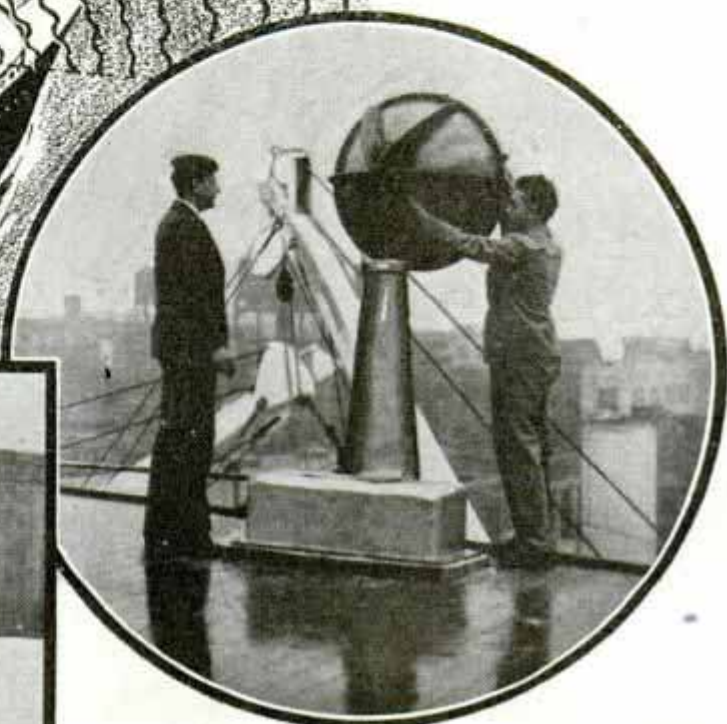
A. Schrader's Son, 470 Vandewater Ave, Brooklyn, N.Y.

*Austro-Hungarian
 Puchwerke A.S. Patent - A. W. ...*

Radio Waves Warn Liner of Obstacles in Path



Short-Wave Transmitter on the "Normandie" and, Bottom, Apparatus on Bridge Which Warns of the Presence of an Obstacle in Liner's Path



forty-five degrees on the port and starboard course of the ship. When the waves encounter an obstacle, they are reflected into a delicate receiver and amplified so as to be made audible in an ordinary telephone receiver used by the officer on the bridge. The waves are not affected by fog or rain or, generally speaking, by adverse weather conditions. The effective range varies with the size of the object encountered. An average ship can be detected at a distance of four miles and a channel buoy at two miles.

81136.

DUAL DOORS IN TALL BUILDING ARE MORE EASY TO OPEN

It is easy enough to open the front door of your home, but try pulling open a door of the same weight and size at the entrance of a fifty-story skyscraper. It takes effort! There is a thirty-pound pull against you. Why? Office-building doors must

Obstacles in the path of the French liner, "Normandie," are detected by an ultra-short wave radio transmitter and receiver which sounds a warning long before an object can be seen in fog. The apparatus, on the bridge, includes a transmitter sending a beam of six-inch waves which sweep the horizon at an arc of

French Line 610 74th Ave New York
 4 W. 105th St. New York
 1930

open outward on the street for safety. A tall building is a great "chimney" drawing air in at the bottom and expelling it at the top. The suction on the ground floor pulls the door tight, and you feel an inrush of air as you drag the door open. To counteract this, engineers who built the sixty-six story "Sixty Wall Tower" in New York City devised a companion transom door over each entrance. As a caller pulls a door open, a door of equal size and weight opens inward in the transom above, "balancing the vacuum" by letting air flow into the building and relieving the suction. A child can easily swing these doors.

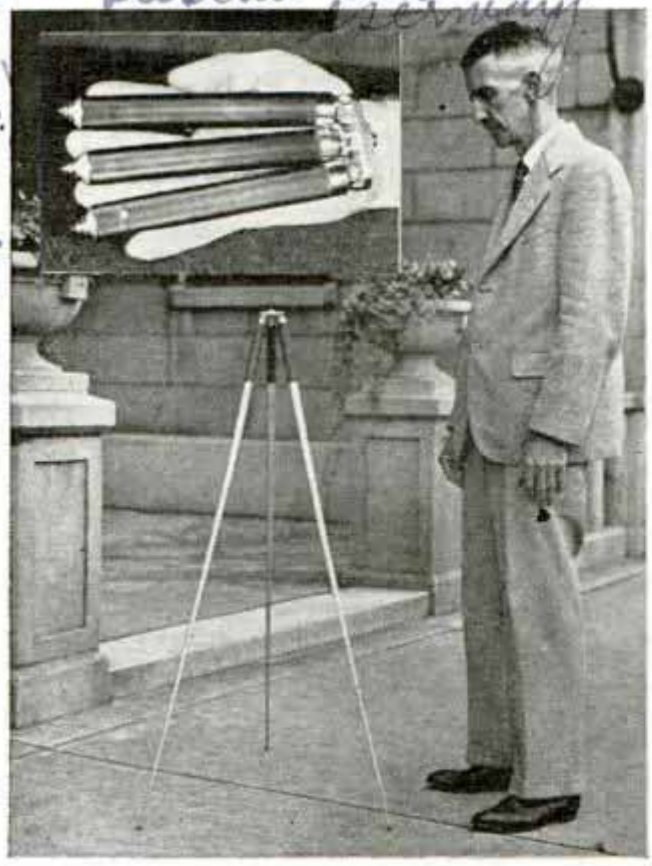
Speed of Auto Is Measured by Stationary Recorder



Speed Meter Which Utilizes the Electric Eye to Check the Speed of Passing Cars

POCKET-SIZED CAMERA TRIPOD WEIGHS A HALF POUND

Easily carried in a pocket when telescoped, a camera tripod of sturdy construction will carry a heavy camera at working heights of a few inches to forty-three inches when extended. Its legs are built of lightweight alloy and the connecting piece of stainless steel, the complete tripod weighing about one-half pound. Sharp, conical steel feet hold the instrument in place.



Telescoping Camera Tripod Extended to Full Height; Inset Shows It Contracted to Pocket Size

Speed laws can be enforced more effectively with the aid of an electric speed meter which can be set up at the roadside in a few minutes and measures the speed of each passing car. It is intended to supplement the efforts of motorcycle officers. On one side of the road two fifty-candlepower lamps are set up to throw two small concentrated light beams, eighteen inches apart and parallel, across the road into the photo-electric cells of the recording instrument. The lamps are operated by an automobile storage battery. When a moving car interrupts the first beam, this starts the charging, at a uniform rate, of a condenser in the recording instrument. The interruption of the second light beam stops the charging. This charge represents time and is read directly in miles per hour on a recording dial which holds the reading until the operator makes a note of it. The pressure of a button resets the timer for the next car and the throwing of a single switch enables the operator to measure the speed of cars passing in either direction. Experiments have been made with an automatic camera to photograph both the license number of the car and the speed reading of the dial on one plate.

A. J. Chocler + Sons, Portland, Me

Desired Ansberg

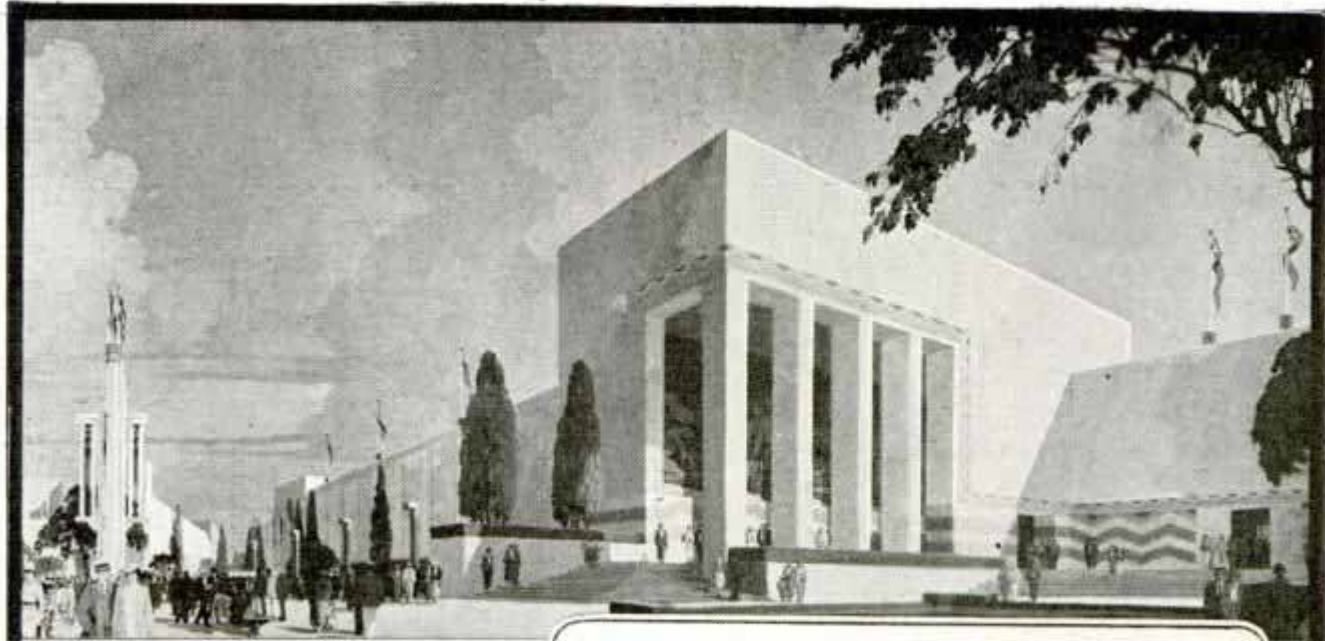
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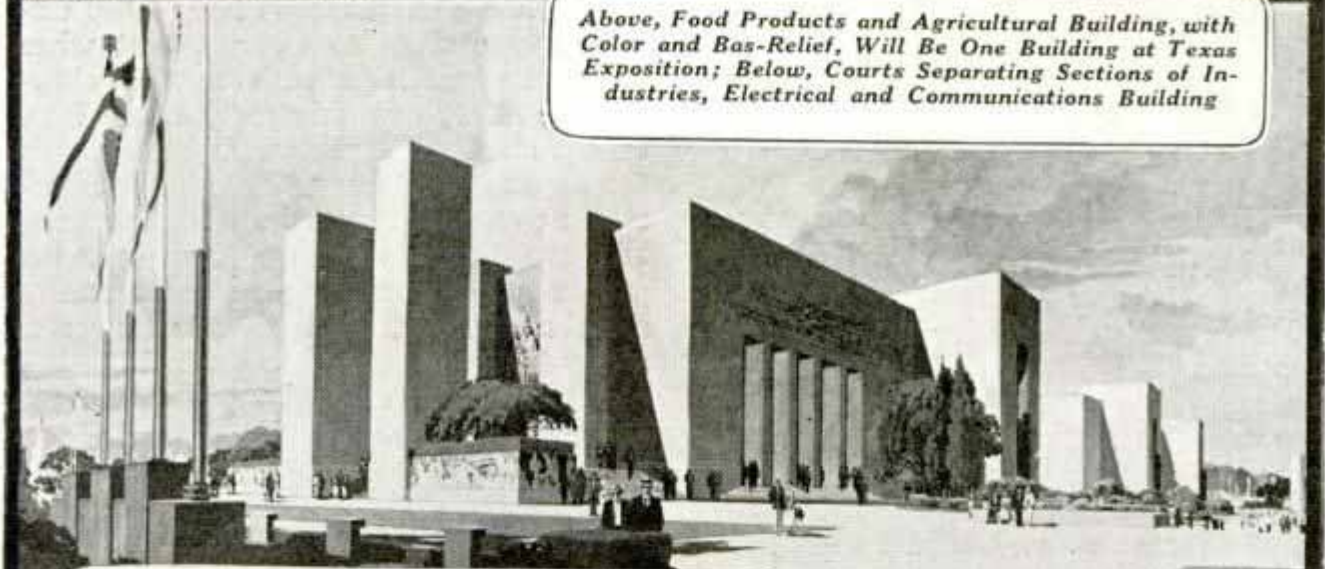
Edw. Dr. Harry Silver
Worcester College
Boston (2) Mass

U.S. Agents wanted

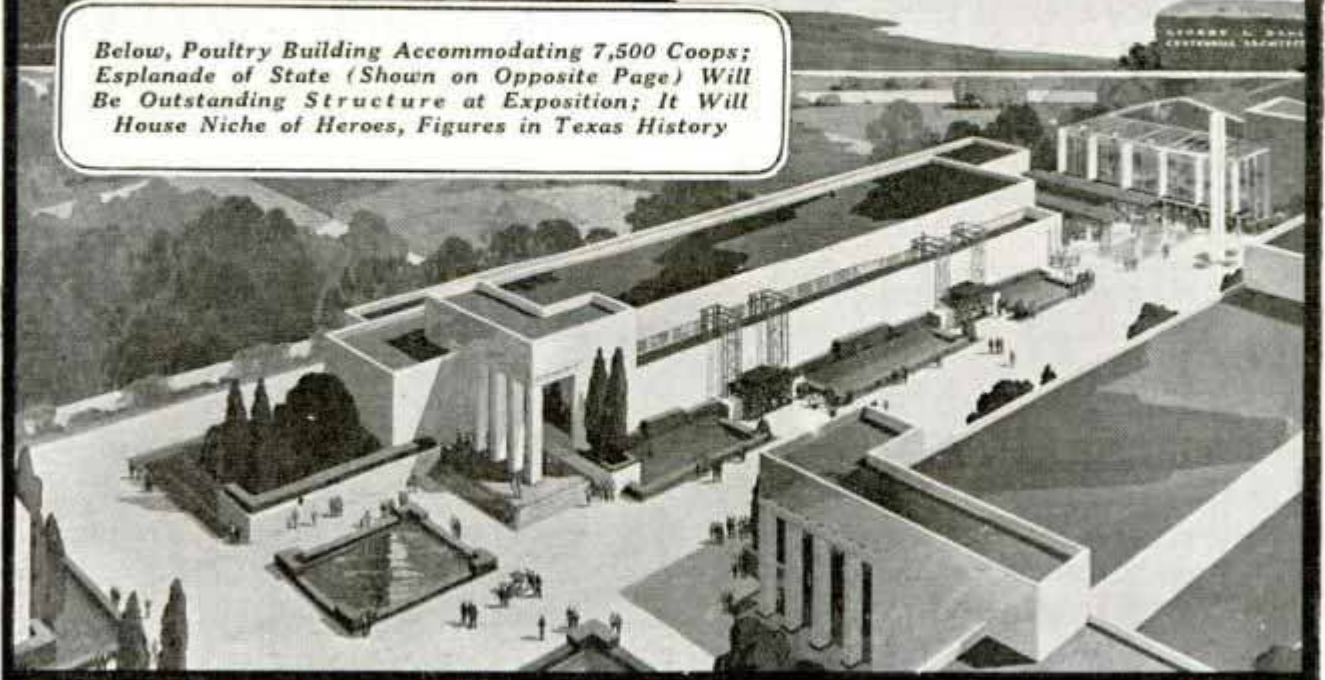
Builders' Art Helps to Tell a State's History



Above, Food Products and Agricultural Building, with Color and Bas-Relief, Will Be One Building at Texas Exposition; Below, Courts Separating Sections of Industries, Electrical and Communications Building



Below, Poultry Building Accommodating 7,500 Coops; Esplanade of State (Shown on Opposite Page) Will Be Outstanding Structure at Exposition; It Will House Niche of Heroes, Figures in Texas History



Handwritten notes at the bottom of the page, including the word 'Esplanade' and other illegible scribbles.

Records Produced for Blind Play More than an Hour



Portable Case Contains Radio and Phonograph Which Plays Wide-Diameter Records for the Blind

Phonograph records for the blind, produced on wide-diameter disks that last an hour and a quarter, have made it possible to dramatize entire books and reproduce complete plays and operas at small expense. The long-winded record required development of a special phonograph whose tone arm starts at the center of the record and works toward the rim. As the arm moves outward, the revolving speed of the disk is slowed down so that the linear speed of the record at the needle point remains constant. Standard-size records can also be played on the instrument. In its portable case is included a radio.

BOLD BUTTERFLIES FIGHT BIRDS AND INSECTS

Butterflies that fight among themselves, wage war on wasps and bees and insects twice their size and even attack birds have been observed in the northeastern

states by Austin H. Clark, of the Smithsonian Institution. The little buckeye butterfly has an eternal feud with the pearl crescent species, and also dislikes intensely the Carolina locust and chases it, flying behind or beside it but always two to four inches away. If the locust alights, the buckeye also stops a few inches away and waves its wings menacingly. The pearl crescent darts viciously after grasshoppers, bees, flies, and its special enemy, a large brown butterfly. The Camberwell beauty boldly attacks small birds and sends them to cover, and the common "milkweed butterfly" has a special hatred for humming birds.

TYPING A LETTER IN JAPANESE TAKES TWO THOUSAND SLUGS

Japanese stenographers have 2,000 different type slugs to worry about when they use a typewriter with Japanese characters. There are only forty-seven keys on the standard American typewriter. In the Japanese machine, the slugs are carried in compartments in a sliding tray. The typist manipulates a knob over the proper compartment, presses it and a metal arm pushes the type upward, across a tiny ink roller and then against the paper. The paper is rolled on a drum which shifts and revolves for the vertical Japanese style of writing.



Moving Selector over Case Holding Two Thousand Japanese Characters, Typist Presses Knob to Ink and Prints Type Slug

6/24/42
Cmt. George J. Sawett, 29 23 Reno Ave
Los Angeles, Calif

656 N. Vermont Ave
Hollywood, Calif

Bulletin 9/19/42

81055

81103

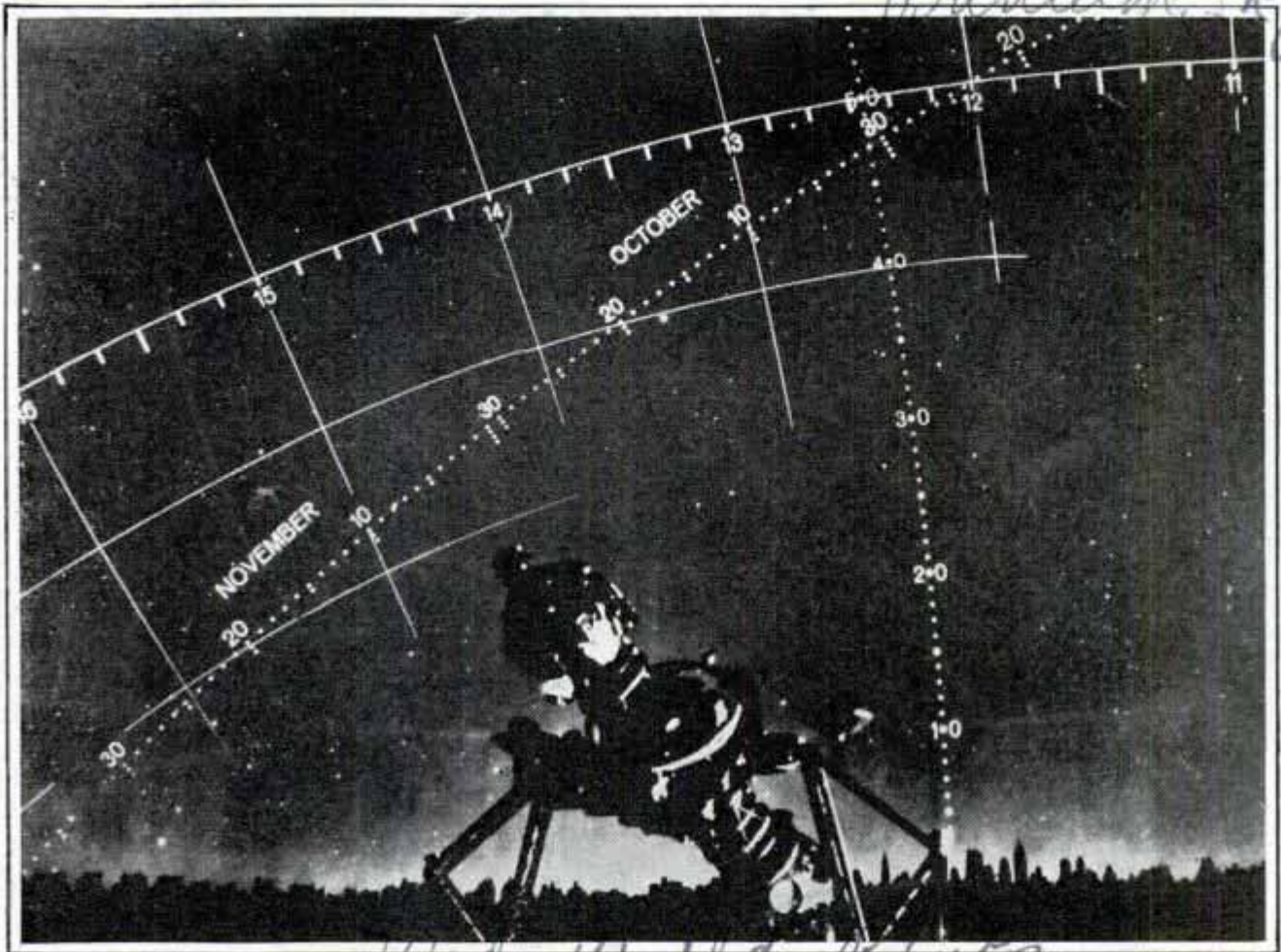
Used by Japanese

Japan, Japan

621122
E1132

by Prof. Henry Norris Russell, Princeton University

Odd "Yardstick" Measures Position of Stars



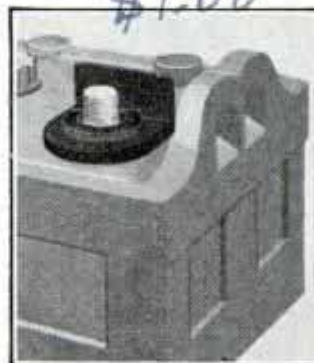
Apparatus Used by Hayden Planetarium in New York to Show Positions of Stars on Any Given Day; Crossing of Dotted Lines Shows Constellations as They Appeared October 1, 1935

Proper positions of the stars on any given day over a period of many thousands of years are shown at the Hayden planetarium with the aid of an odd celestial "yardstick." The crossing of the two dotted lines in the accompanying picture, for instance, shows the constellations exactly as they appeared on October 1, 1935. The latest determination of the size of the galaxy of which the earth and sun are a part indicates the diameter of this single group is so great that a ray of light, traveling 186,000 miles per second, requires about 100,000 years to cross it, according to Prof. Henry Norris Russell, Princeton astronomer. The whole galaxy, he adds, is rotating about a center some 30,000 light years from the sun and one revolution of the galaxy is completed in about 200,000,000 years. The mechanism which makes possible the pouring of radiant energy into space, which the stars have been doing for millions of years, is still a mystery but the enormous energy released is too great to

arise from any known source except atomic transformation. Such transformations have been produced in the laboratory and this leads Prof. Russell to believe that real advances in understanding the subject may come within a few years.

E1147

LIFE OF BATTERY IS PROLONGED BY CORROSION GUARD



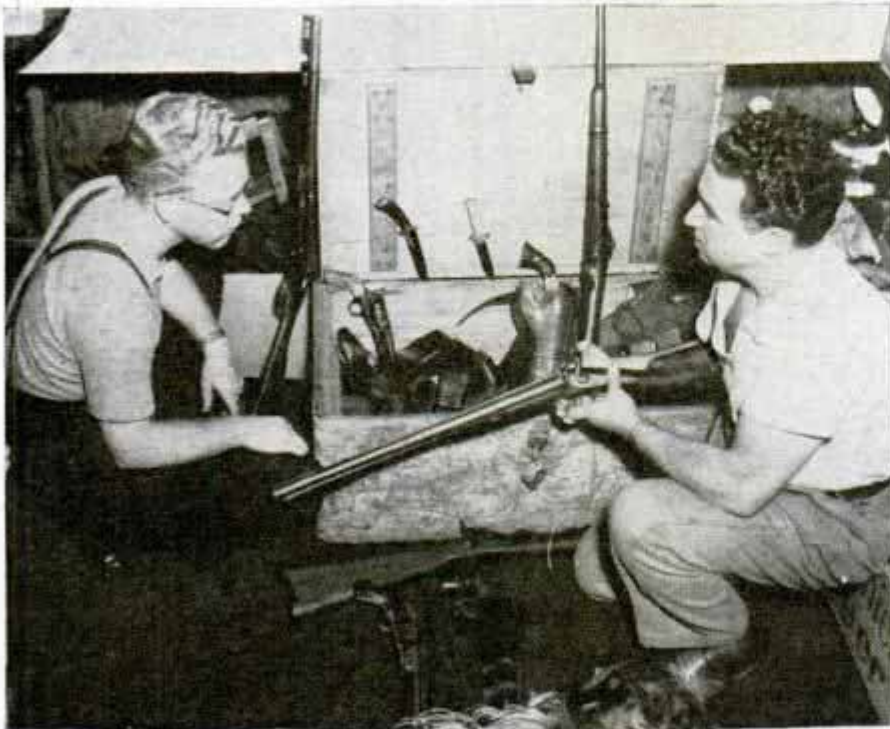
Corrosion of batteries and the resultant breakdown of ignition systems can be prevented by installing acid guards on the battery posts. These guards, made of lead, weigh less than two ounces

and fit any battery. Knife-edge flanges keep acid from climbing the terminal posts.

Isard's Battery
Union St. St Paul Minn
692

10555 Holman Co
Los Angeles Calif

The ALADDIN



THE order called for four potato bugs, some baggage labels from the "Ile de France," a Scotland Yard warrant, a litter of kittens and a book of English airplane tickets.

Even Aladdin would have a hard time collecting items like these on short notice but any Hollywood property man can do it. In fact, he will get you anything from a 1903 calendar to a trained canary if given a little time. Ask Irving Sindler, "master of properties" for Samuel Goldwyn, for a set of French 1923 auto license plates, a pre-war airplane, or even a sea lion, and the chances are they will be on their way to you inside an hour. No matter what is needed in filming a picture, the property man's job is to have it on hand at the right time.

"If a director on a desert location suddenly decides he wants a bicycle the property man literally must extend his hand and pull it out of thin air," Sindler says. "It's up to him to anticipate everything that might be needed. 'No' is the one word he doesn't know."

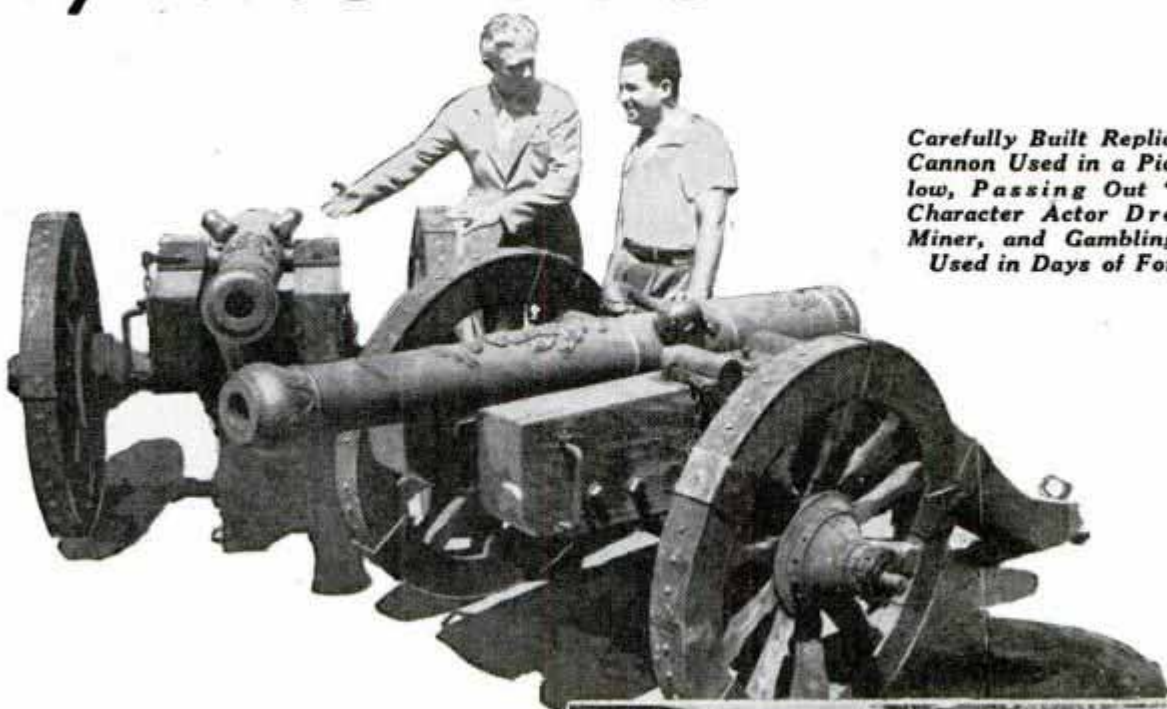
Once when shooting a scene on the desert the director suddenly decided it would be better for the star to hold a red rose instead of a book. The nearest town was ten miles away and roses don't grow in the desert. But Sindler remembered having seen a wax rose in an automobile that morning and ten minutes later he placed the rose, still wet with red paint, in the director's hand.

Not only does the property man fill orders ranging from gold teeth to sword

Guns, Pistols, Fans, Vases, Statuary and Saddles
Are a Few Items in the Property Department

Samuel Goldwyn
since 1941

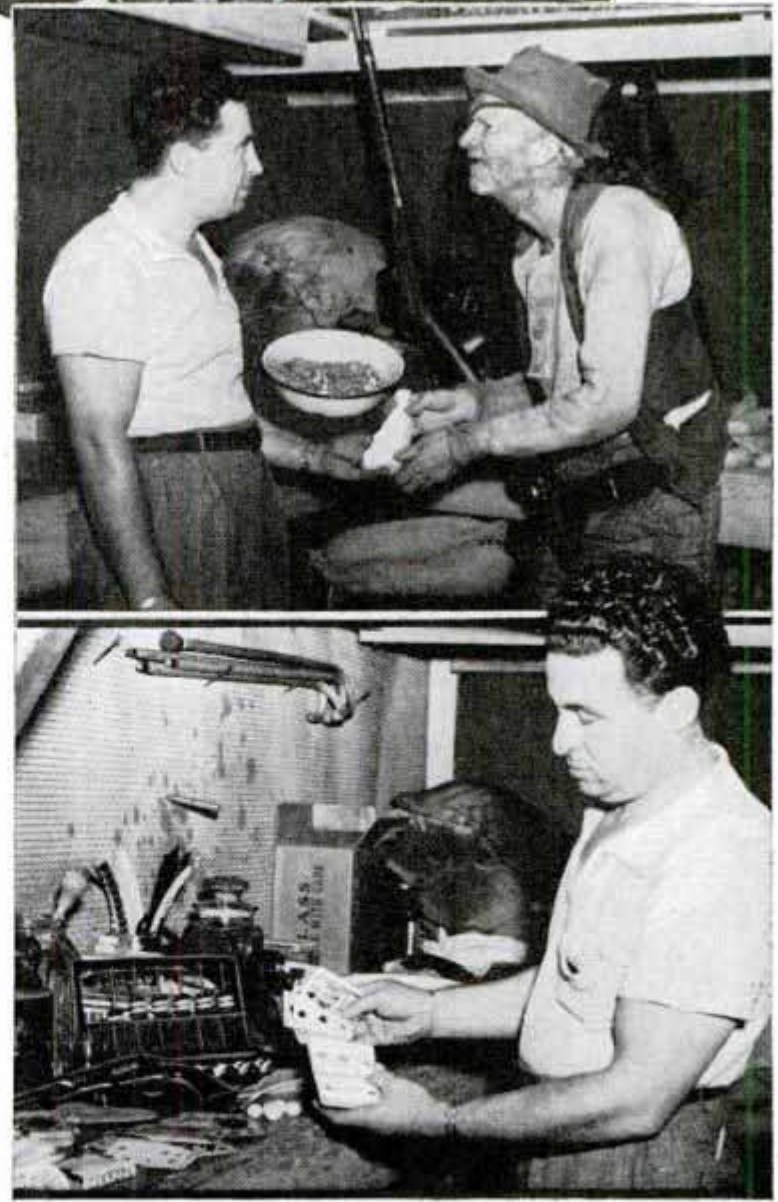
of the MOVIES



Carefully Built Replicas of Old Cannon Used in a Picture; Below, Passing Out "Gold" to Character Actor Dressed as Miner, and Gambling Devices Used in Days of Forty-Nine

canes, but he makes sure the articles are the right kind for the place and period of the picture. Every detail must be correct. In one picture Sindler found the garbage pails for a New York City set had horizontal flutings. He knew that in that city pails with vertical flutings are used, and the substitution was made.

In preparing to film "Barbary Coast," a picture of early San Francisco, Howard Hawks, the director, and Sindler studied the time, place and characters in each scene and made a full list of the properties needed. Sawed-off shotguns, rifles, and pistols of the period were rented, old newspapers were prepared so special news articles could be inserted, carpet bags and saddle bags were picked up in secondhand shops, and gambling devices were resurrected from the studio's property department. Even insignificant details like old-fashioned sulphur matches and the brown cigarettes of the period were tracked down. Early kitchen utensils, pocket-books, cash boxes, mirrors, and paintings were procured. Gold scales and copper mugs were on





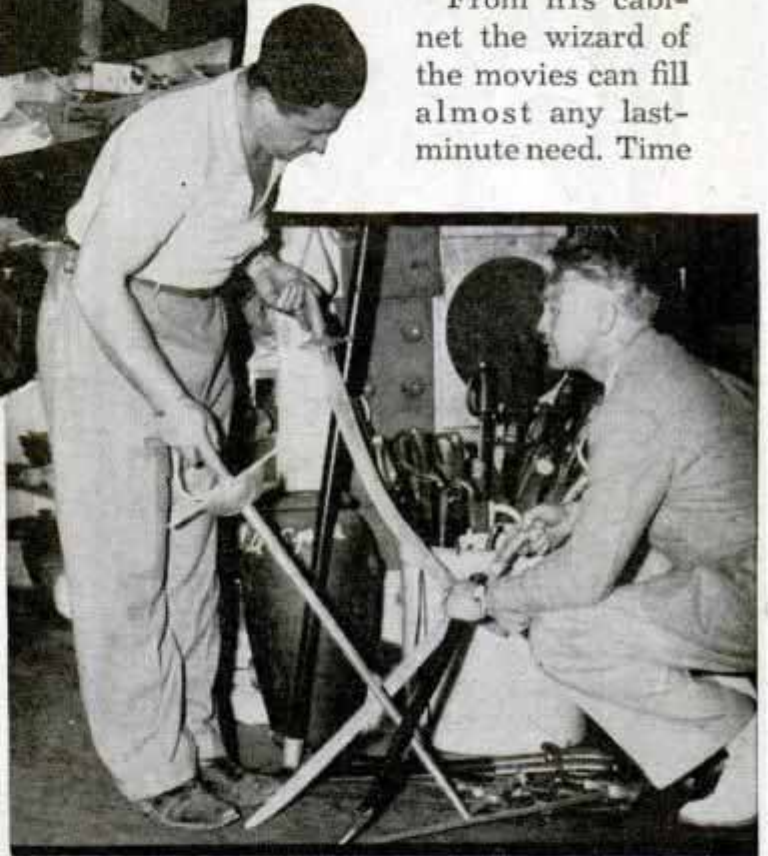
and another contains milk, sirups, floor polish, paints, and liquid coloring. Sound effects like bird whistles, police whistles, and a battery board for doorbells and desk buzzers are carried. On one side of the cabinet is an emergency dressing table that consists of a shelf that unfolds and reveals a mirror.

From his cabinet the wizard of the movies can fill almost any last-minute need. Time

hand, and picks and shovels for the miners were purchased and "antiqued" by banging them up and applying special paint. Sand and pebbles were dipped in gold paint to suggest gold dust. At the same time, the property man assembled an assortment of rubber fish because the real article would not last for the time required.

The property man also collected special effects and "breakaway" articles manufactured in the studio shops. Rubber replicas of cap and ball pistols and light chairs made of balsa wood look quite real to the camera and can be used without injury in hand-to-hand fights. Sindler has even provided soft rocks, nicely padded and realistically painted, when the script called for a rock fight.

Near the property man you will find his bulky "magic box," a cabinet that contains anything that might be needed at the last minute. In one drawer is a first-aid set. Another contains pens, pencils, inks, chalk, blank checks, and rubber bands. In another compartment are drinking glasses, bottles, handkerchiefs, towels, and needles and thread. Cigars, cigarettes, playing cards, pipes, eyeglasses, and a Bible are standard equipment. One drawer is filled with tools and kitchen ware



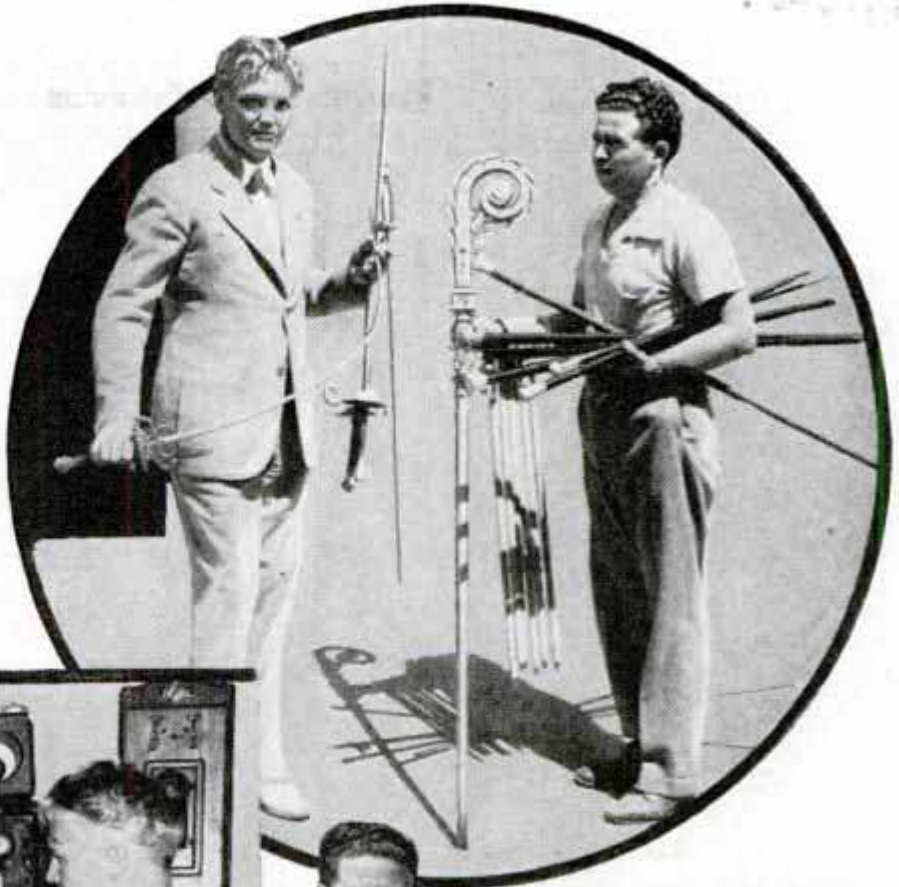
Above, Irving Sindler and His "Magic Box"; Below, Property Men Checking Over Sword Collection

is a vital element in making movies and even a ten-minute delay may cost thousands of dollars. A director may decide one of the actors should hold a whisk broom or that a vase should be placed on a table. It might take half an hour to find such items except for the property box. Sindler even carries an air rifle to scare away birds that might interfere with the sound recording on outside locations.

If the cameraman decides a straw hat or a shirt is too light to photograph well the property man changes the color with his liquid coloring. If an actor has a headache or rips his coat Sindler takes a pill out of one drawer or a needle and thread from another. If someone faints from the

heat of the lights the property man provides the first aid.

The heat from the sun arcs and spotlights leads Sindler to provide duplicates of perishable properties. Apples hung on trees in an orchard scene inside a sound stage were half baked and wrinkled at the end of the first day and Sindler replaced them each morning until the scene was completed. In another picture hundreds of candles used to



The Property Department's Stock of Telephones and Canes; Right, Mr. Sindler and His "Magic Box"

light up the interior of a cathedral softened and slumped from the heat, so the property man ran wires through their centers to keep them upright.

When a director wants an actress to cry, Sindler takes an atomizer filled with menthol and sprays it gently in her eyes, creating perfect stage tears. If a pool of blood is needed he takes a can of chocolate sirup from his magic box and pours it on the floor. The color and consistency of the sirup are exactly right for screen purposes.

Training animals for the screen is one of Hollywood's professions and Sindler can get a tame lion, an elephant, or a trick dog at a minute's notice. If the animal stars don't act right, the property man



lends a hand. A trained cat was supposed to climb a flight of stairs and prowl across an attic floor but a trainer, director, and cameraman worked over the scene half a day without success. Finally Sindler brought the studio's pet cat. On the first trial the cat climbed the stairs and walked

(Continued to page 137A)

10/1/35

81128. **Glider Towed by Balloon to Height of Two Miles**



acme
Russian Balloon Towing Glider Aloft, Preparatory to Releasing It at Height of Two Miles

Russia is experimenting with balloons as a means of towing gliders aloft. At Moscow recently a glider was attached to a balloon and carried to an altitude of more than 11,000 feet. It was then released and the balloon crew brought their craft to earth while the glider descended with a pilot at the controls.

81189 **LIFELIKE FIGURES ARE SHAPED BY SCULPTURING IN LATEX**

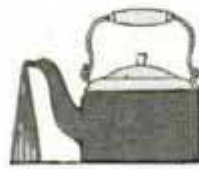
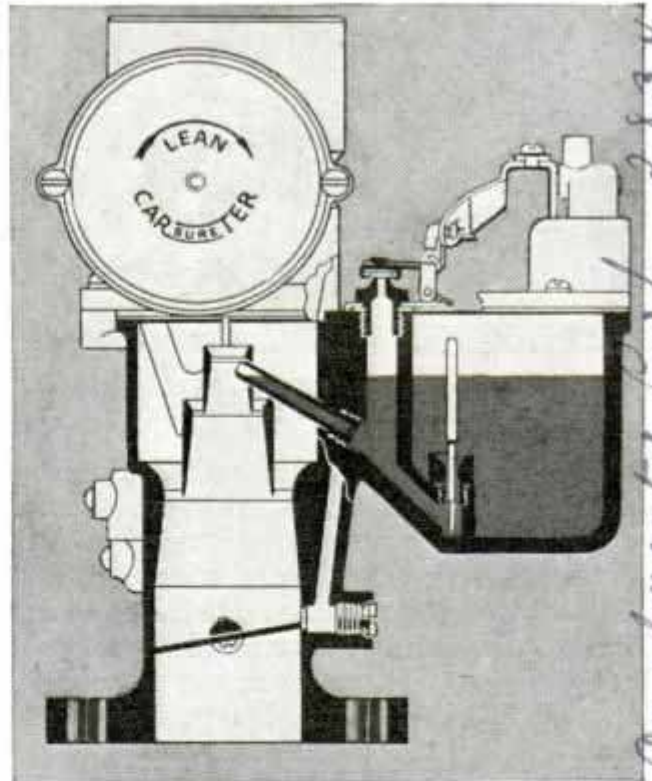
Collapsible duck decoys, artificial hands that look and work like the living member, and lifelike models for display windows are some of the products of latex, latest raw material of the sculptor. Suitably processed, latex, the raw milk of the rubber plant, is readily adapted to sculpturing into products both pliant and indestructible. Molds are made similar to the preparation of plaster of Paris forms, latex is introduced, and then is dehydrated and

Rubber Displays Inc.

vulcanized. The products can be extremely thin-walled and flexible yet durable. Dolls, mannequins, advertising novelties, and working models of the human body for anatomical study by medical men are practical uses of latex today.

81022 **SUMMER STARTING MADE EASY BY "LID" ON CARBURETOR**

Starting a car in hot weather is made easier, fuel is saved and the danger of vapor lock is minimized by an automatic lifting "lid" now being built into a down-draft carburetor, which prevents the gasoline from percolating. The principle is similar to a boiling teakettle which blows water out the spout when the lid is on, but does not when the lid is lifted. Similarly, gasoline in the bowl of the carburetor is boiled by the heat of the motor and runs down into the intake manifold, wasting fuel and making it difficult to start. The anti-percolating unit overcomes this by automatically lifting the lid when the throttle is closed.



PERCOLATING



ANTI PERCOLATING

Carburetor with "Lid" to Prevent Percolating; It Operates Like Lifting Lid of Teakettle

U. S. Army Corp. 2834 U. S. Army Corp. Carter

Hot Wire "Saw" Carves Scrollwork in Wood



Model Coach and Other Articles with Decorative Scrollwork Cut Out by Electrically Heated Wire of "Saw" Shown in Lower Right Corner

Intricate scrollwork patterns are being carved in wood by an electric scroll saw that has no teeth to chip or split even the poorest kind of wood. The cutting blade is a fine wire heated by electricity, the saw frame having a pistol grip with a trigger switch that controls temperature of the wire. A specially wound transformer supplies low secondary voltage and corre-

spondingly high current, preventing any shock to the operator. The hot wire cuts with great speed, leaving a charred black finish that gives a distinctive appearance. There is no sawdust, no vibration or noise. The blade is easily directed, following a metal template or pattern or merely a tracing on the wood, and a spotlight mounted on the grip illuminates the work.

Airplane Flown by Man Power Is Pedaled Like a Bicycle

Hailed by German aviation experts as the most important development in aviation since the Wright brothers made their historic flight, a heavier-than-air craft propelled through the air by human power recently was tested successfully in that country. The man-powered plane is equipped with pedals and gears something like those on a bicycle by means of which the pilot can rotate the propeller at sufficient speed to drive the ship through the air. A German gliding expert recently succeeded in flying the craft for several hundred feet a short distance above the ground.



Airplane Pedaled through Air Like a Bicycle

at Frankfurt Aerodrome

81052

The Romance of



ahead. Then they began to talk to each other, to their brakemen back in the caboose, to trainmen in sidings and yards. Now they're talking—and singing—to the public. Streamliners, the prima donnas of the rails, are being equipped with musical voices—air horns of distinctive tones that tell the world for miles around "Here comes the '400'" and "There goes the 'Zephyr'." Listen with a railroader as one train hails another on a double track perhaps seven or ten miles away. "That's the Pennsy," he will say; for, as you learn their language, you recognize their voices. Every

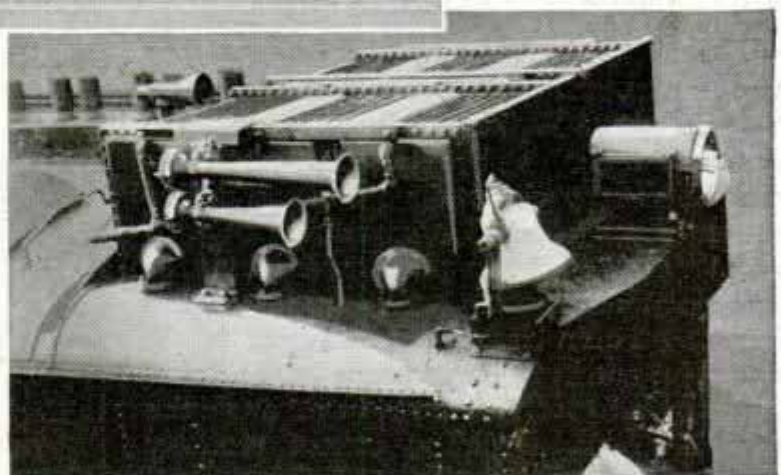
railroad has whistles made to its individual specifications, their distinctive tones varying with the diameter and length of the tubes.

(Continued to page 122A)

HAVE you ever heard two locomotives gossiping? Down the line roars the crack streamline train, snorts a curt "How d'ye do?" to a rural station, shoots past a freight waiting on the sidetrack and bellows from her deep throat: "Hi, there! Notice my two green flags? Stay on the siding! My second section will be along in ten minutes."

To you it sounded like three blasts of a whistle, a medium and two short toots. But it meant something in engine parlance. Locomotives started learning to talk just one hundred years ago. At first they could only whistle a warning to the fellow on the track

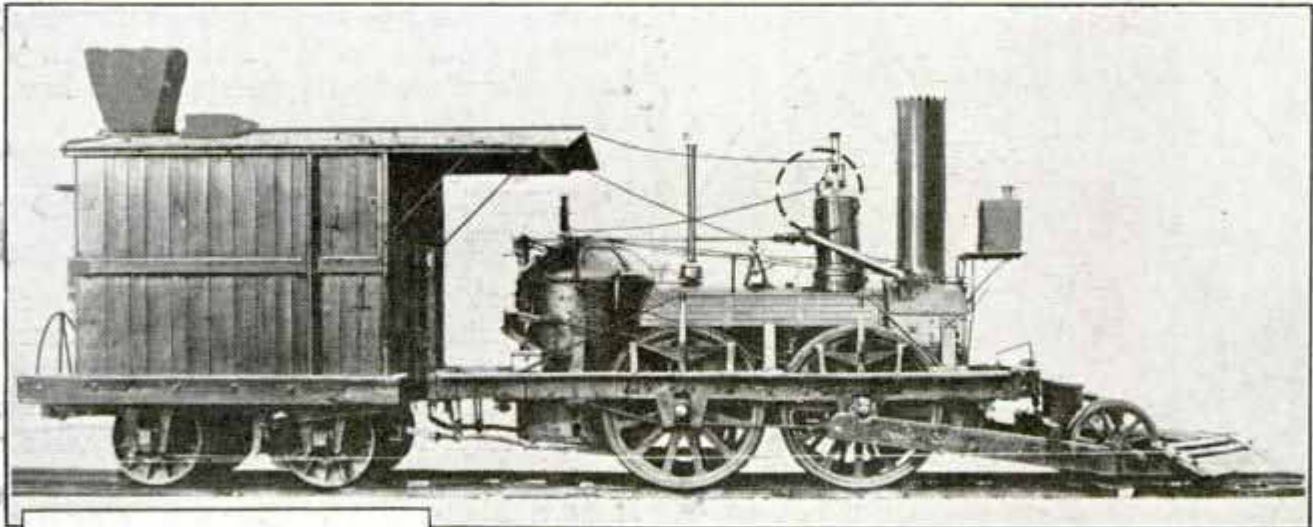
WHISTLE	INDICATION
○	APPLY BRAKES. STOP.
-○○○	FLAGMAN PROTECT REAR OF TRAIN.
-----	RECALL FLAGMAN FROM WEST OR SOUTH.
-----	RECALL FLAGMAN FROM EAST OR NORTH.
○○	ACKNOWLEDGING SIGNAL.
○○○	BACK-UP TRAIN.
--○○	GRADE CROSSING WARNING.



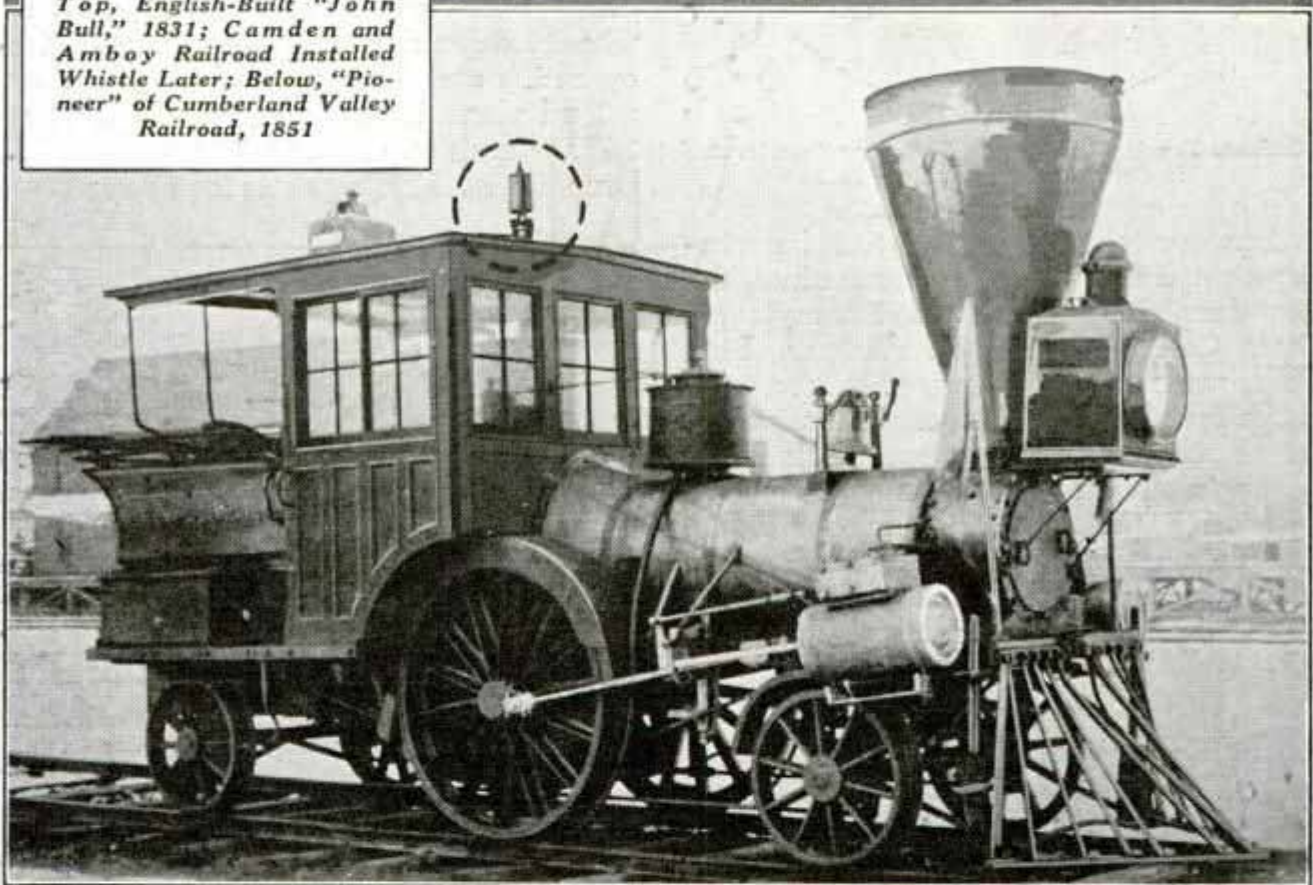
Top, Diesel Locomotive of Baltimore and Ohio Railroad Equipped with Air Whistle; Center, Some Standard Signals in "Locomotive Talk"; Bottom, Battery of Air Horns Atop Engine

2049 N. Park Ave. Philadelphia Pa. 19102

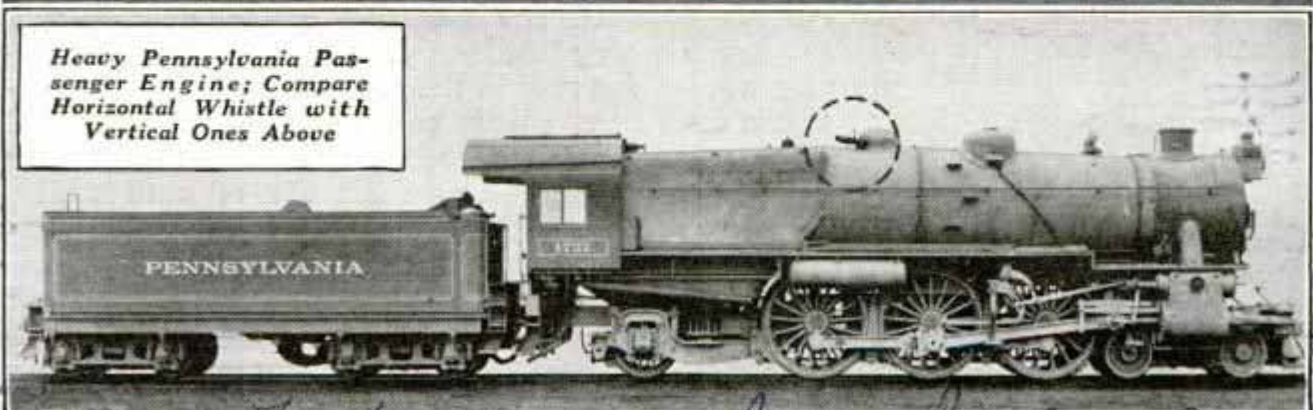
LOCOMOTIVE WHISTLES



Top, English-Built "John Bull," 1831; Camden and Amboy Railroad Installed Whistle Later; Below, "Pioneer" of Cumberland Valley Railroad, 1851



Heavy Pennsylvania Passenger Engine; Compare Horizontal Whistle with Vertical Ones Above



For signal - Leslie Co. Lumber Co.

Learning to Build Telescope Is College Course



Students Testing Homemade Telescope Constructed in College Course at Low Cost

Amateur telescope-making has been incorporated into a college curriculum, the first class being taught at the Pennsylvania State College during the summer. Students were instructed how to build a telescope for about twenty dollars that would be as powerful as commercial telescopes costing eight times as much. The students purchased the materials and made the complete assembly of the six-inch instruments, demonstrating that studying the stars can be brought within the reach of the average man.

POWER OF BATTERY IS SAVED BY CELL CONNECTION

Longer life, faster, surer starting power and a hotter spark are claimed for a battery now being introduced. Loss of power in transit between battery cells is accomplished by connecting them directly through partitions inside the battery case, eliminating all outside cell connections and thus cutting the distance the current



must travel. Thus, engineers say, the loss in voltage between cells has been reduced by 45.3 per cent, and battery power stepped up by the equivalent for four additional battery plates. Protection against corrosion is achieved by placing vent plugs farther from the battery posts, which have a lead-welded cover.

"FLYING BOX CAR" IS EQUIPPED TO LAND ANYWHERE

To meet the special requirements of miners, prospectors, trappers and others operating in remote areas and in all kinds of weather, the Fairchild Aircraft Limited has developed a "flying box car" which also can be used as a passenger transport. It is a high-wing, single-engine monoplane which can land on floats, skis or wheels, depending on the nature of the operation and the season of the year. As a land plane it can carry a pay load of 2,000 pounds and as a seaplane, about 500 pounds less. Folding seats for eleven pas-



"Flying Box Car" Which Can Carry Ton of Freight and Can Land on Floats, Skis or Wheels

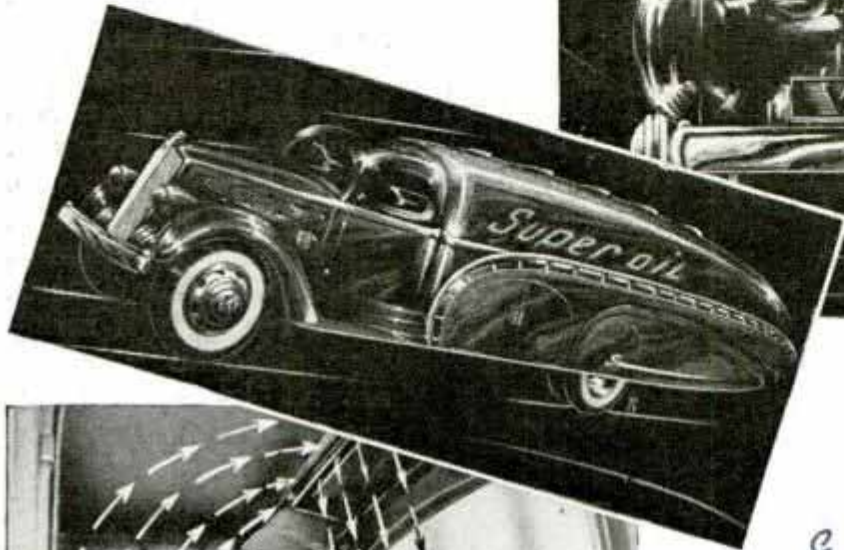
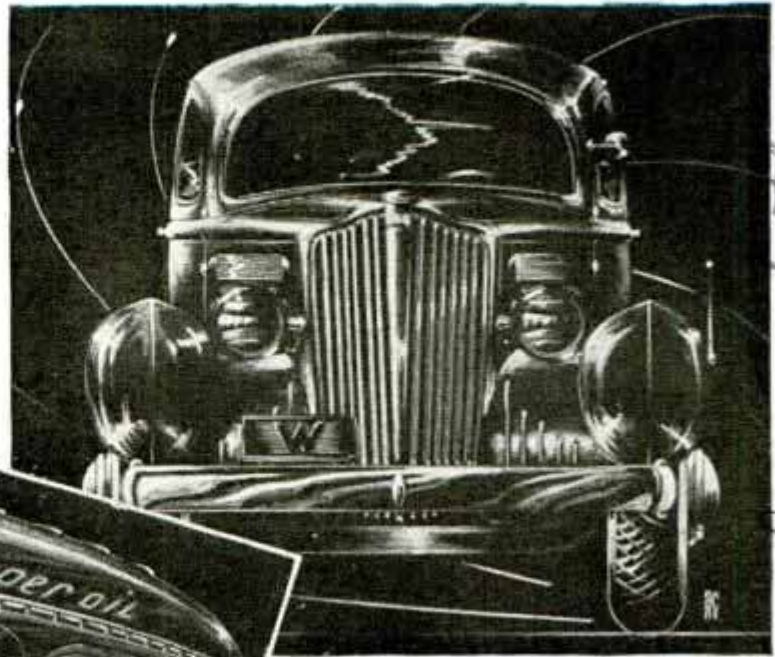
sengers can be installed. It is powered with a 500-horsepower engine and as a land plane has a cruising speed of 125 miles per hour. Extra large doors permit easy handling of bulky freight and a sliding roof in the top of the pilot's compartment allows easy access to the top of the wing for refueling or handling lines when approaching a dock. The oil tank is fitted with an automatic thermostat control which reduces the warming-up period. Two emergency exits in the roof can be opened by rip cords. A canoe can be attached to the under side of the fuselage and carried by air.

Prof. Henry L. Yeagley, Dept. Physics, Pennsylvania State College

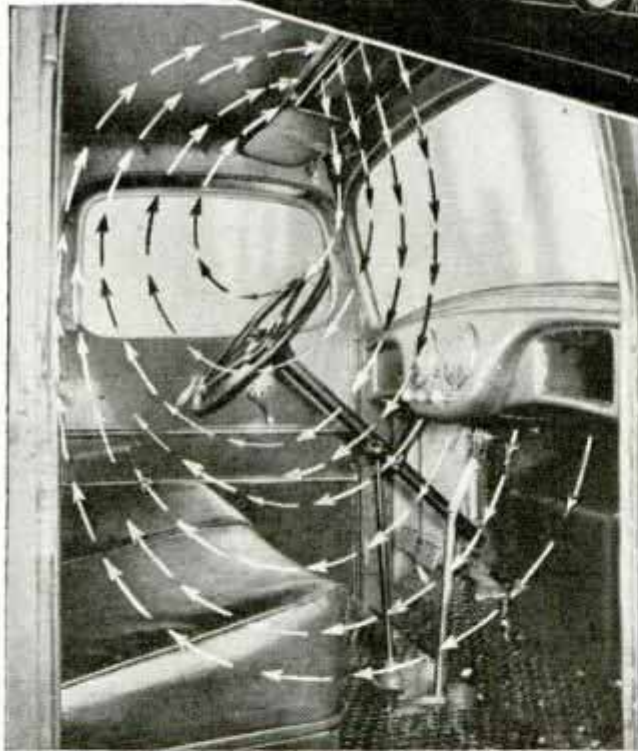
Canada, Montreal, Woodstock, New York, Fairchild Aircraft, Ltd.

Streamline Truck Has Air-Conditioned Cab

Combining beauty of line with economical performance, a streamline truck has been designed by Count Alexis de Sakhnoffsky, industrial stylist, for a Cleveland manufacturer. In addition to streamlining, the design boasts easy accessibility and better vision and comfort. Provision

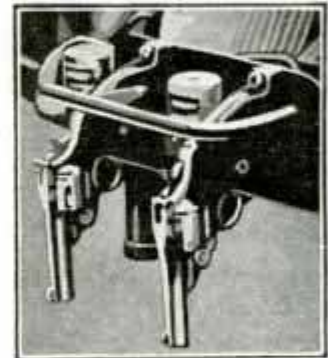


Front and Side Views of Streamline Truck Design Which Combines Symmetrical Lines with Economical Performance; Below, Arrows Show Circulation of Air Provided for the Cab



TIME NEEDED TO APPLY BRAKE IS MORE THAN HALF SECOND

When you see potential danger ahead while driving, your eye telegraphs a warning to the brain, your brain orders your foot to move from accelerator to brake pedal and your foot then makes the shift. How long does it take you to begin to stop after you decide to do so? The Minnesota public safety committee made tests to determine how far a car travels before an expert driver applies the brakes after noticing a hazard. Kelly Pettillo who won the Indianapolis race in 1935 made the best record. Marks on the pavement made by a two-gun paint indicator showed the car traveled twenty-five feet while going at thirty-six miles per hour before Pettillo's foot struck the pedal, so he required slightly more than half a second to react.



is made for automatic air-conditioning of the cab by a system which exhausts air when the truck is in motion. One of the features of the engine is a "stew pan," a hot spot in the manifold which "cooks" and thoroughly vaporizes the gasoline.

☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

842 E 79th Cleveland Ohio

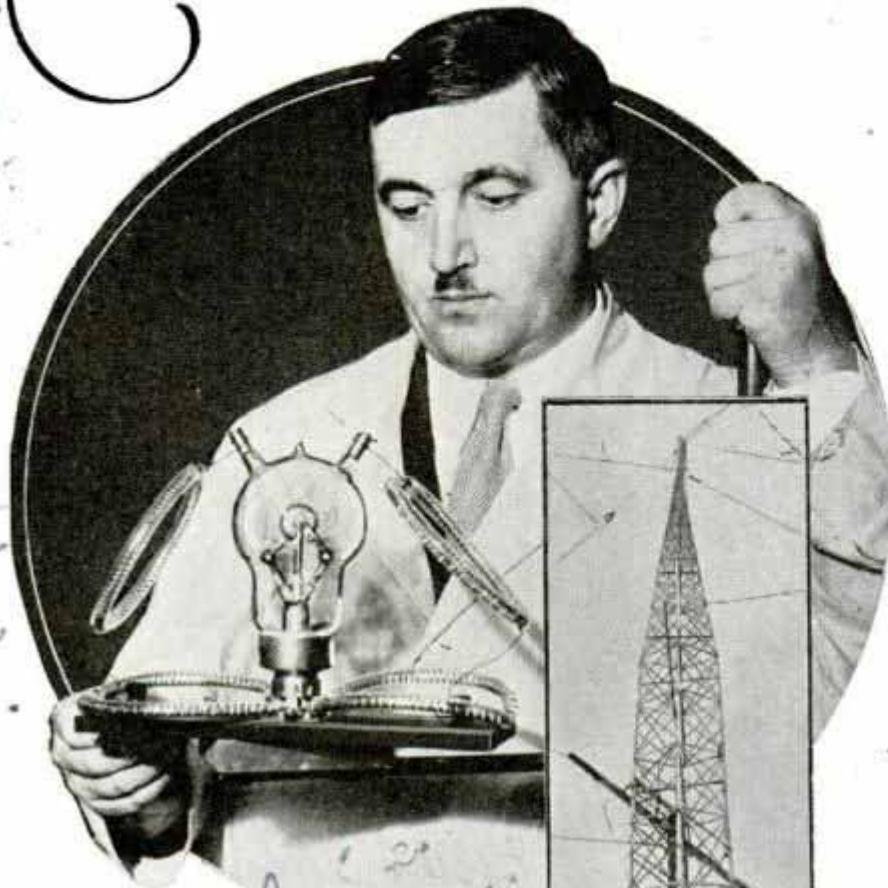
Emb James Scotland
20 N. Wacker Drive Chicago

E 1065

Public Safety National Institute

20 N. Wacker Drive Chicago

The WONDERS of



Adjusting Oscillator Tube of Ultra-High Frequency Generator Which Creates Three-Centimeter Radio Waves, and Short-Wave Antennas

throw open the windows and sit in comfort in his shirt sleeves because the high-frequency waves would keep his body at a comfortable temperature. Plants would flourish in the room at all seasons. After dark a person could reach for a neon-type globe and carry it around the room like a candle, placing it on any convenient table."

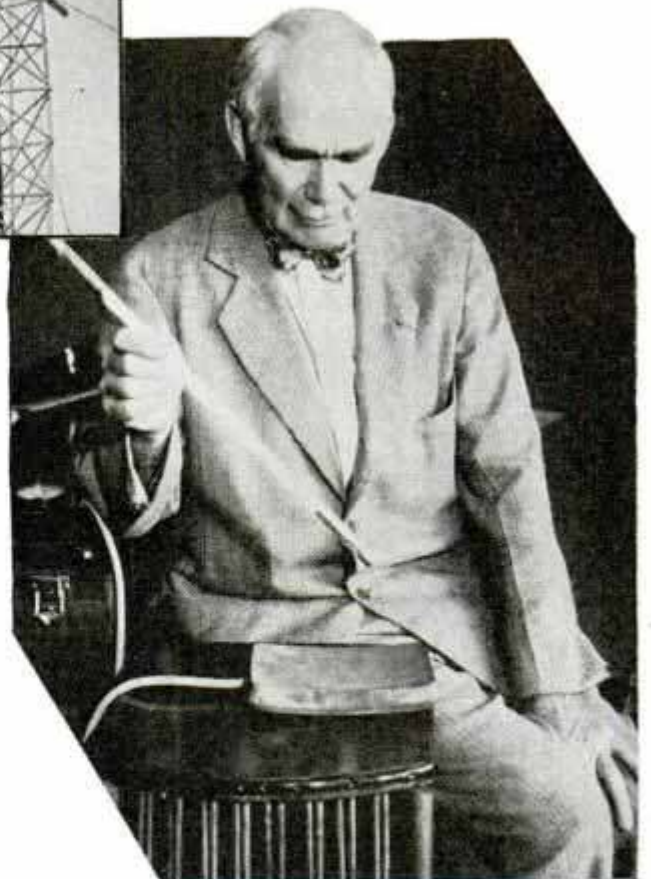
A light that receives its energy directly through

By **THOMAS E. STIMSON, JR.**

MAN'S mastery of electricity is one of the marvels of the twentieth century. But, not content with the present, science is seeking new ways to produce and use electrical energy. Better radio frequencies are in the offing. Uses are being sought for so-called mystery rays, and investigators are pretty well convinced that actual "death rays" can be produced. High-frequency waves are being studied that may play an important part in the elimination of disease.

Dr. Lee De Forest, creator of the audion tube, visualizes a magic health room in every home where "a few minutes a day will keep the doctor away."

"In this room," he says, "high-frequency waves would radiate from wires concealed in the walls. The effect would give persons in the room a healthful, stimulating therapeutic treatment in comfort. Even in the middle of winter a person could



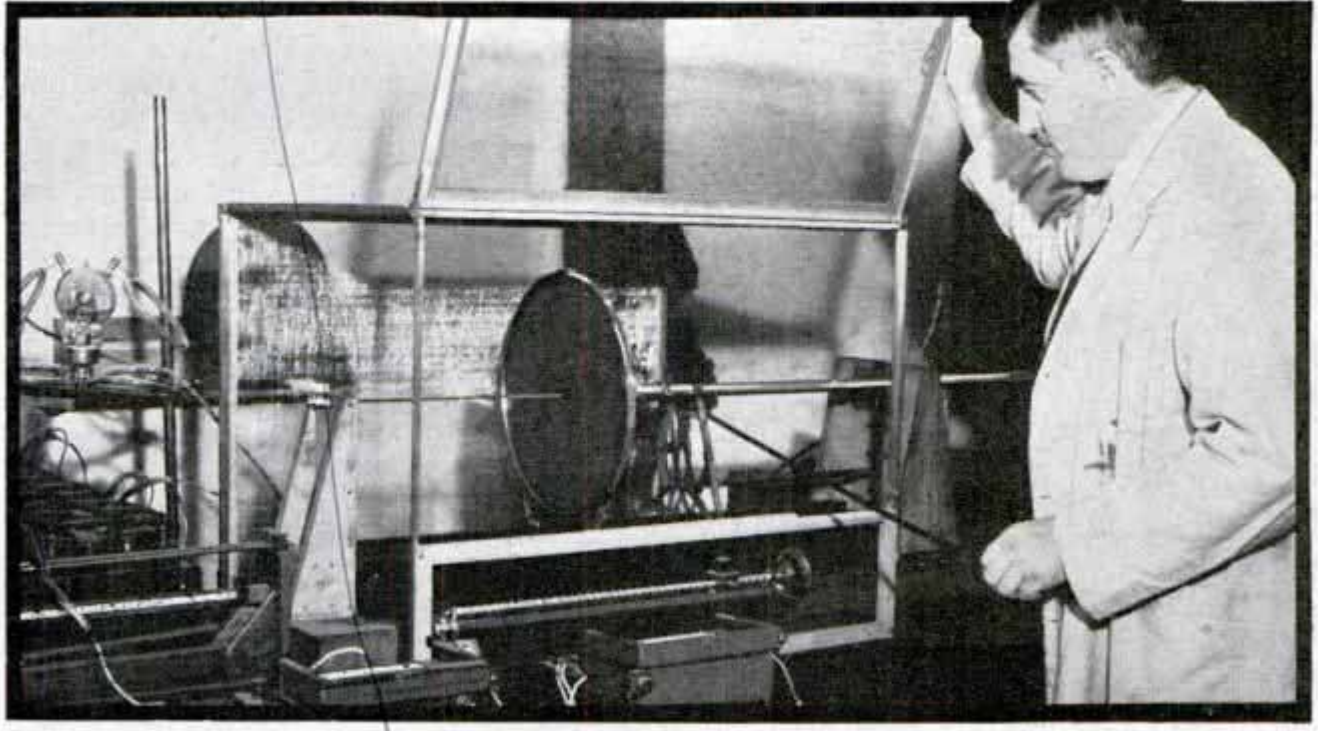
Light by Radio; Dr. De Forest Holds a Mercury Tube above the Condenser Pad of a High-Frequency Machine to Produce This Effect

5106 Melchior Blvd. Los Angeles, Calif. 10555 Holman

California Institute of Technology
Pasadena, Calif

8/10/49

HIGH FREQUENCY



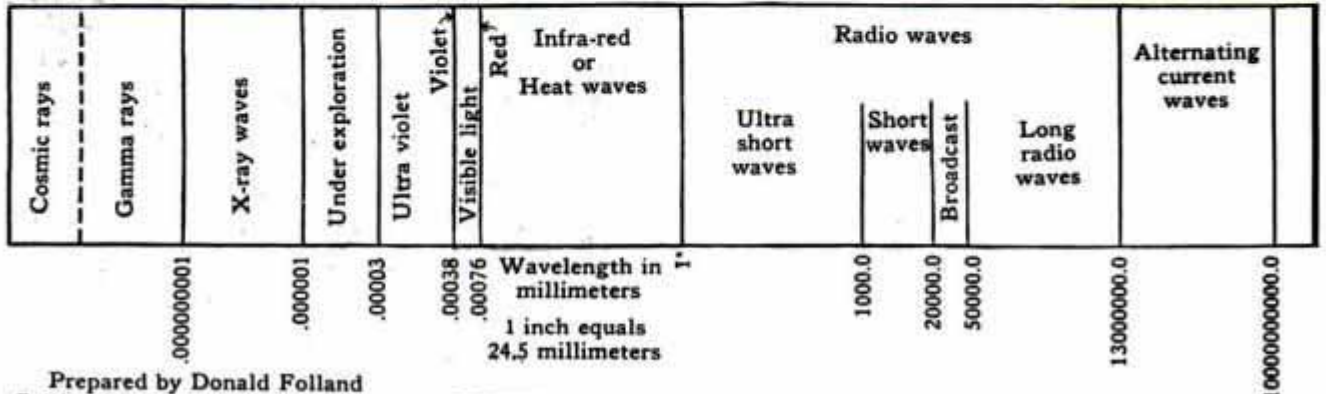
Dr. Potapenko and the Ultra-High Frequency Apparatus Which He Uses to Generate Waves Three Centimeters in Length

air represents power by radio, which has been the dream and despair of experimenters for years. But with high frequency this is already an accomplished fact, although economists question whether power by radio will ever be practical with our present knowledge.

"The great trouble in sending power through the air under present conceptions is its tremendous expense and what might be called its lack of selectivity," Dr. De Forest says. "Science is able today to radiate power from a central station that would illuminate every home in a village. The objection is that a staggering amount of power would have to be radiated and

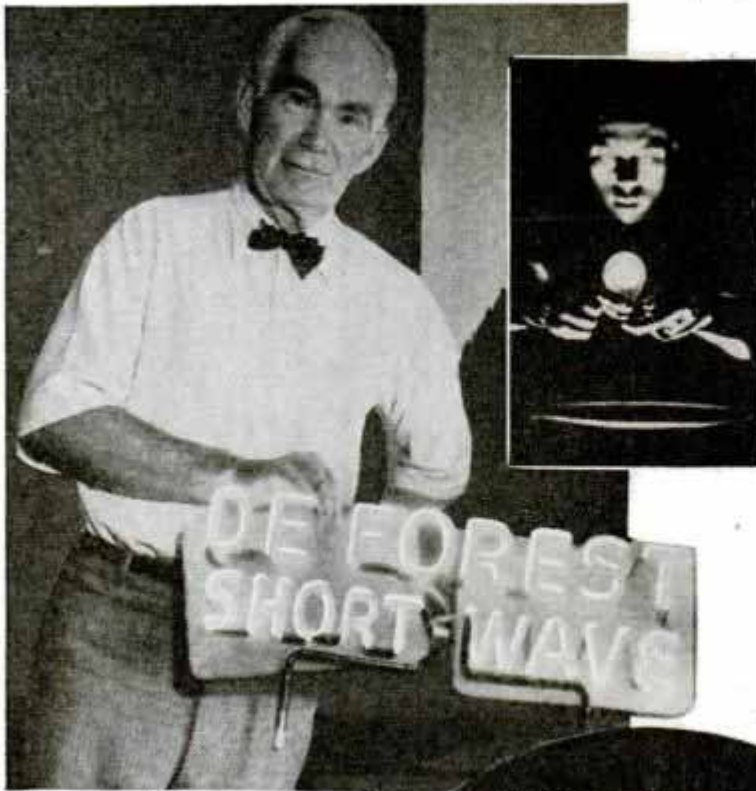
all but a tiny fraction of it would go to waste. Even if a shield were provided to prevent the power being thrown up into the air uselessly, the cost would still be tremendous.

"In the same way, we could provide radio power to operate an airplane and reduce the power wastage by throwing it as a beam. But an operator would have to swing the beam apparatus to keep up with the plane and he would never be able to direct it past the horizon. Also, all metals within reach absorb some of the energy of most high frequencies. If you should happen to walk past a radio power transmitter you might find your watch



Prepared by Donald Folland
California Institute of Technology

COMPLETE SPECTRUM OF ELECTRO-MAGNETIC ENERGY



Lighting Neon Light by High-Frequency Radio, and Picture Taken by Glow of Mazda Lamp Excited by High-Frequency Current

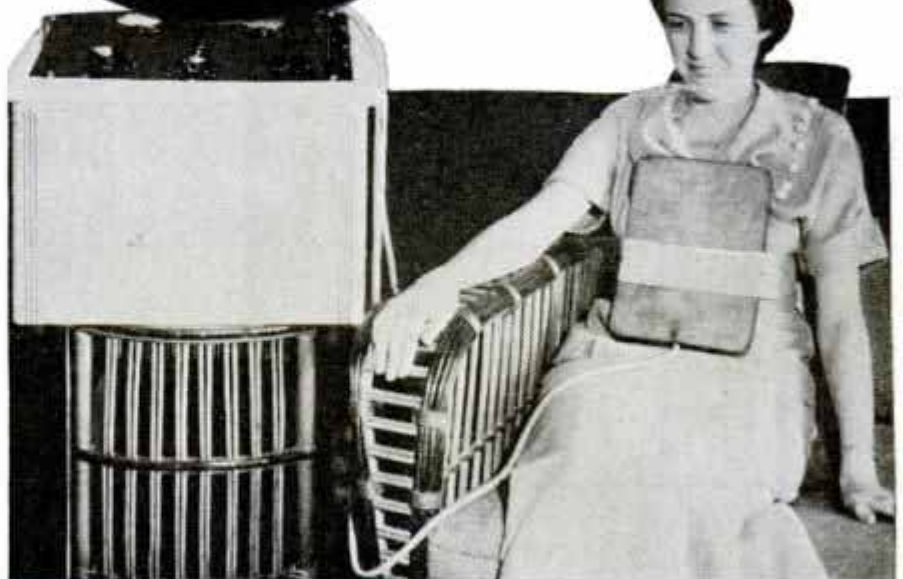
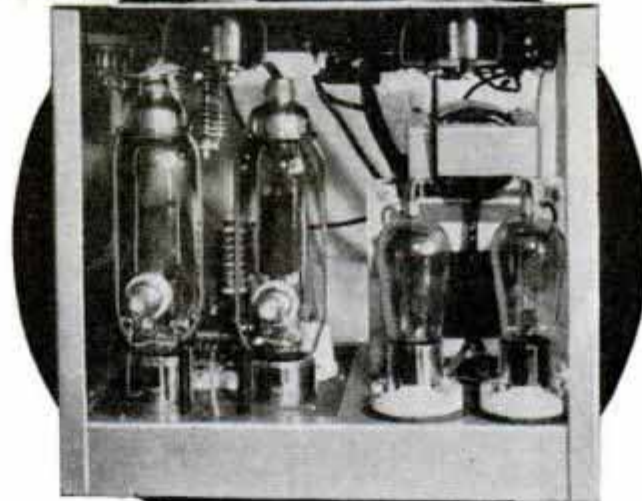
and the coins in your pockets had become uncomfortably hot."

The newest kinds of high-frequency electricity are giving us furnaces for melting elements in a vacuum, private radio communication, television, and are opening fields of study for "cheap" electricity for the home. High-frequency machines have been built that can destroy electric-current generators, and Marconi has recently announced that studies in the ultra-high frequency field may enable him to halt various types of motors, including those of aircraft, a tremendous asset in warfare. Experimenters in the ultra-high frequency field work

cautiously with very low amounts of power because they expect eventually they will tune into frequencies vibrating at the same rate as the molecules of the body's tissues, and the effect of these waves would be to disorganize the molecules, causing death.

Familiar kinds of electricity such as alternating current are merely different types of electromagnetic energy. Heat radiations, light rays, radio waves, the electricity used in telephone circuits, and cosmic rays are essentially the same thing except that the energy waves are of different lengths. That is the same as saying we see by means of an extremely high-frequency electric-

ity, or that the current from an automobile battery, the light from a match, and the heat from a candle are the same kind of energy vibrating at different wave lengths. Alternating currents have the longest wave lengths. Radio waves are shorter, or of higher frequency, then



Center, Tubes of Fever Machine; Bottom, Treating Patient with Radio Therapy to Raise the Body Temperature

Inter-Room Radio Provides "Remote Control" for House

come infrared or heat waves, then light, with cosmic rays at the extreme short end of the energy spectrum. Direct current is merely alternating current of infinite wave length.

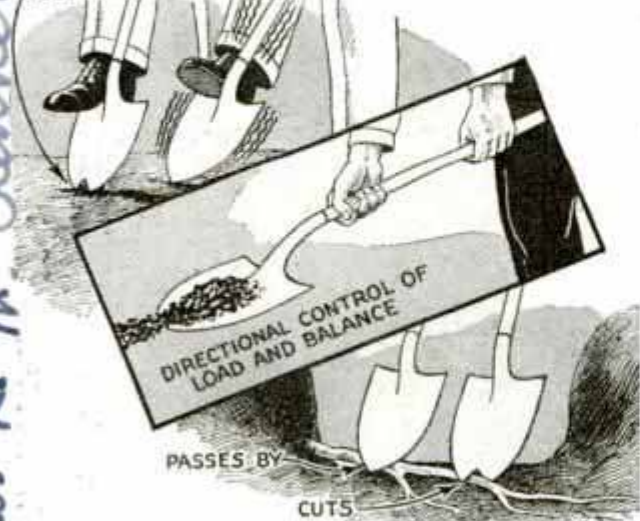
Merely by changing the length of the energy waves you change their characteristics and uses. For example, low-frequency waves such as those of sixty cycles can be conducted along wires and very little of the energy leaks away. But if you step up the frequency of the waves by shortening their length the energy tends to radiate in every direction and is difficult to confine to wires. That is the chief difference between the energy you use to light a room

(Continued to page 149A)

SHOVEL WITH TWIN POINTS "BITES" INTO GROUND

Several advantages are claimed for a shovel with a V-shaped tip. The twin points of the tool "bite" into hard or frozen ground and can be used to cut roots and weeds. In shoveling, more bottom area is in contact with the ground than is the case with the ordinary implement.

LESS EFFORT TO HANDLE



Shovel with Twin Points Which Can Be Used for Cutting Hard Ground or through Roots and Weeds



Top, Giving Orders from Office by Turning on Transmitter; Bottom, Voice Is Amplified in Shipping Room

"Remote Control" of the nursery, workshop or office is the latest duty of the radiophone. A convenient communications system for factory or home has been devised which saves many steps, for no mouthpiece is required. Talk in an ordinary voice from any corner of the room and the transmitter faithfully amplifies it at any desired receiving point. Even a whisper is plainly audible at a remote point. Executives can talk to employes in distant noisy machine shops; orders can be transmitted between offices, and between dining room and kitchen. When things are happening in the home playroom, mother hears downstairs. The system operates on alternating current.

In a twelve-day flight an albatross is said to have traveled 3,150 miles.

dw. H. M. Reimer 212 Federal Bldg. Oklahoma City, Okla.

81146

Vocal phone

81090

The Loochian Mfg Co, 3763 Franklin Ave Los Angeles, Calif

Diligent Beaver Put to Work In Fight to Stop Soil Erosion

J. Mahawk, Wis.



du.
This Beaver, Trapped in Oregon Where the Animals Are Pests, Will Soon Be Working for Uncle Sam

Beavers are being put to work building dams for Uncle Sam. These industrious animals are being trapped in Oregon where the farmers complain they become pests by diking irrigation canals and destroying fruit trees. The trapped animals are being transported to the national forests where their natural proclivities for building dams can be employed to advantage in the fight to halt soil erosion.

YOUR DOG IS IN CLIMATE APART WHEN PAVEMENTS ARE HOT

On a hot summer day you are living in a different climate from that in which your small son and his dog live. The temperature at the level of your shoulders may be in the upper eighties, while down near the sidewalk it is twenty or thirty degrees hotter. Pavement temperatures in one large city were above 100 degrees

when the air was only 90. In a courtyard, the temperature on the grass was 103 degrees, on granite-block pavement 124, while a dark wood-block pavement registered 153 degrees. Some stone in a shaded alley near by was only 81.

E 1152

"BICYCLE BUILT FOR TWO" NOW PULLS A TRAILER

Tandem bicycles were the height of chumminess in the gay nineties. The modern counterpart of the "bicycle built for two" is an ordinary two-wheeler that hauls a trailer. A Rome, N. Y., cyclist built his own trailer of two twenty-eight inch bicycle tires set twenty-one inches apart, with cushioned seat and back, springs beneath the rear of the seat, foot rest for the extra passenger and a parcel compartment for lunch, camera, shopping and extra coat or slicker. The wheels run on their own axles hung in an angle iron bolted to the frame. The trailer wheels are covered to protect the rider. The cyclist can pedal himself and the sixty-pound trailer with a passenger aboard at six miles an hour.



Two Extra Wheels Make a Bicycle Trailer

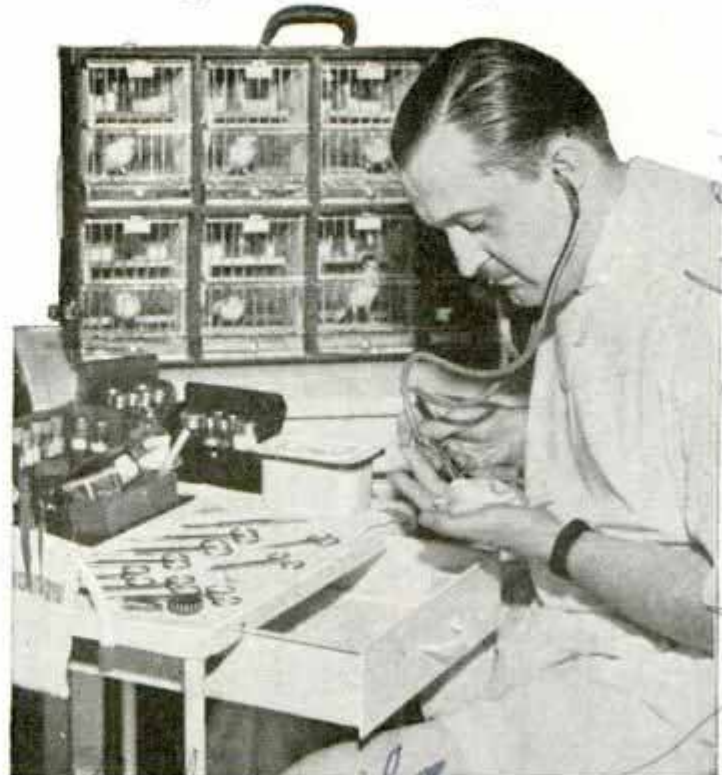
Frank A. Shepard

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Science Service
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Tests Indicate Canaries Have "Horse Sense"

Canaries are teaching psychologists new facts about how learning takes place. Billie Burke, a bird with a broken wing, disliked her isolation on the floor at feeding time while other canaries were eating on a table top. So Dr. Gustav Eckstein of the University of Cincinnati built a spiral staircase of sticks fastened to the table leg. On the third morning Billie used the stairs. Later a similar stair was built to a tree and in thirty seconds Billie was up there. Is this evidence of reasoning? Dr. Eckstein says it at least shows the bird recognized the essential characteristic of her first experience and was able to use it instantly to a new end. It has also been found that a bird can learn to sing alone without hearing other birds. A canary was kept isolated in a sound-proof cage, yet by listening to its own notes and improving on them, this bird learned to perform the amazingly swift rolls of the trained canary. The breeding and raising of canaries has become such an important



Treating a Patient in a Canary Clinic Which Specializes in Doctoring Sick Birds

business that a Los Angeles ornithologist has established a canary clinic where he has treated more than 15,000 birds.

Your Ability as Auto Driver Shown by Reaction Meter



Sir Malcolm Campbell Taking Test Which Indicates Time Required for Driver to Apply Brake

You can test your own ability as an automobile driver with the aid of a reaction meter which measures the time you require to do something after making up your mind to act. The apparatus consists of a box on the top of which are model cars in motion. The foot of the person being tested rests on what would be the accelerator of an automobile. At a signal he is told to step on the brake pedal. The time required to change from the gas pedal to the brake pedal is measured accurately and is your reaction time. Sir Malcolm Campbell, British race driver, who recently set a record of more than 300 miles per hour, required only one-fourth of a second to step on the brake, but at 300 miles an hour, he would have covered 110 feet in that quarter second.

Nearly one million pounds of copper are used by the mechanical refrigerator industry each week.

Built in machine Dept.
 Pat. C. ...
 ...

Service 9/13/35

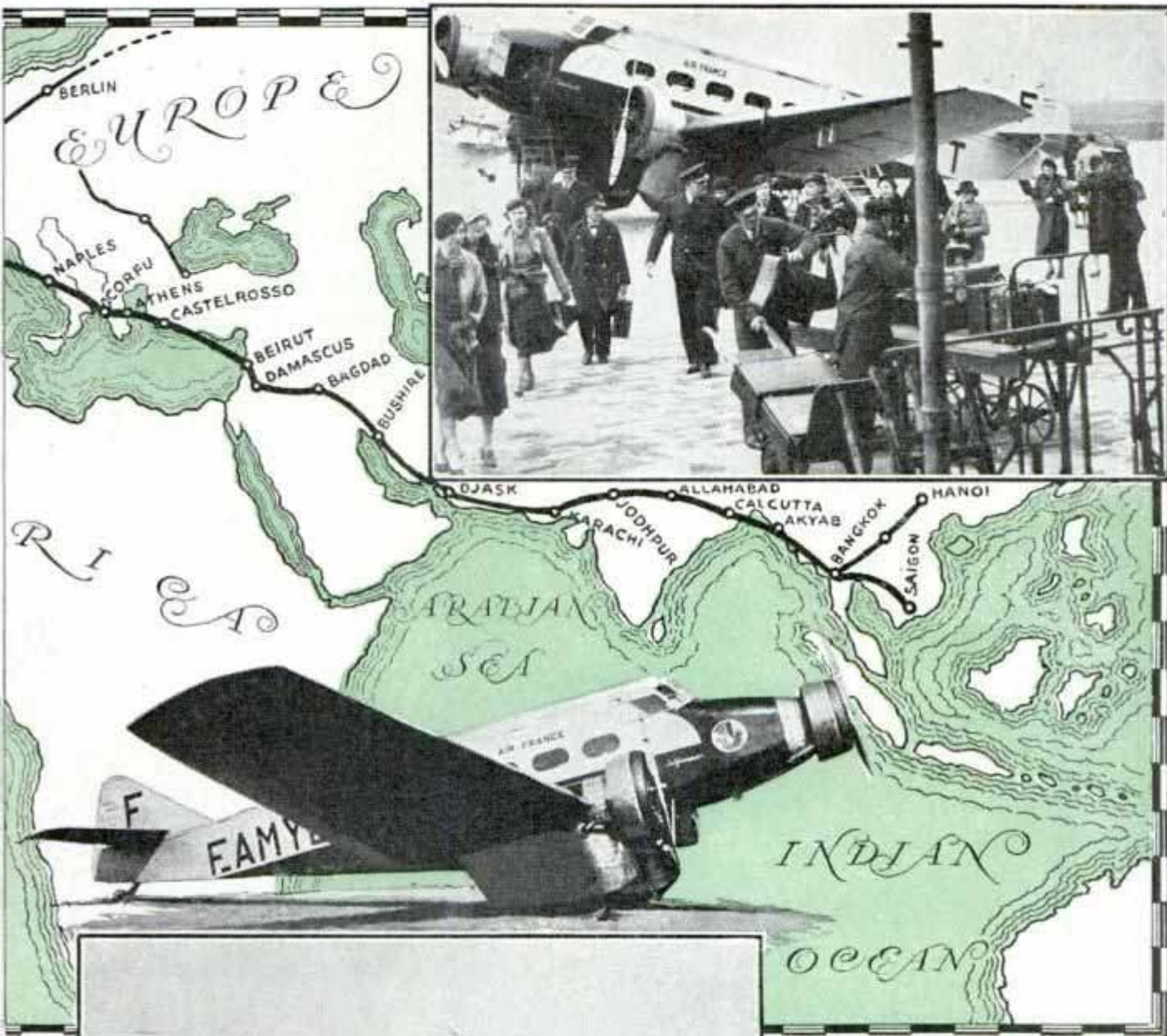
U. of Southern California
 Los Angeles, California

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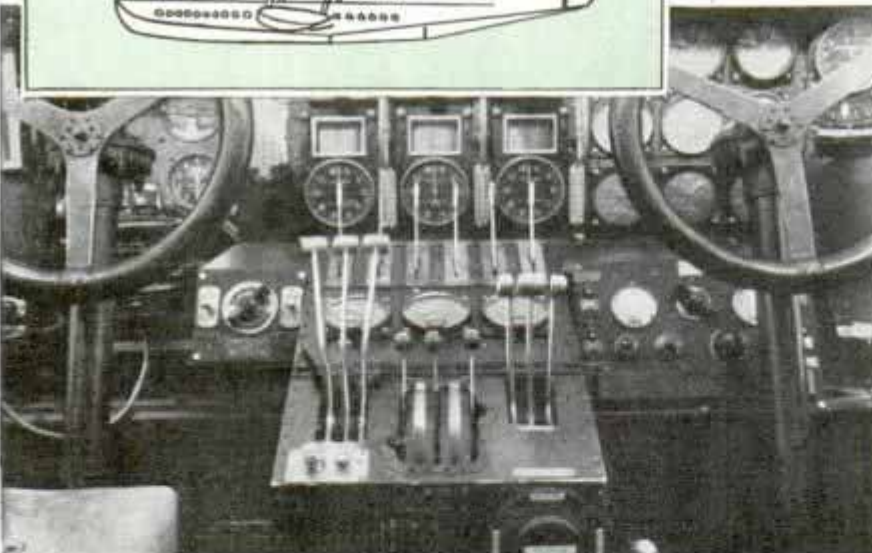
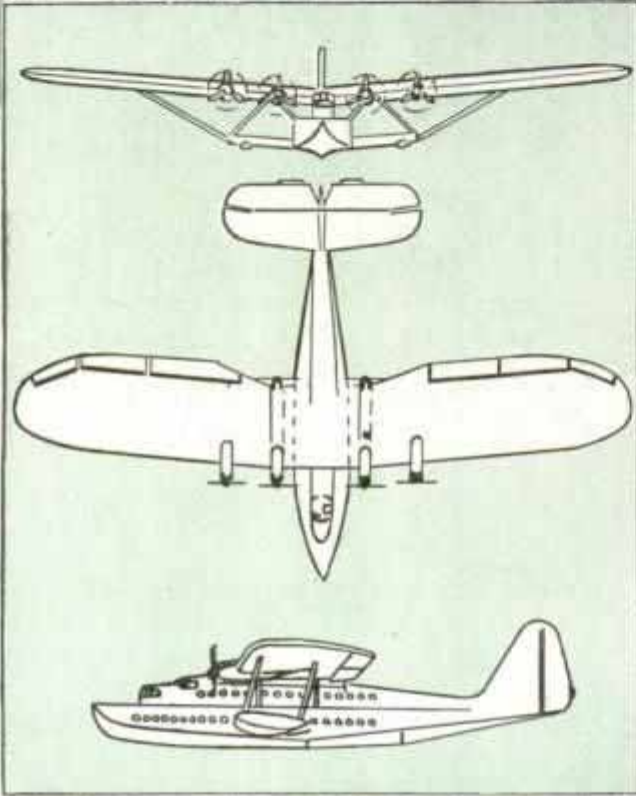
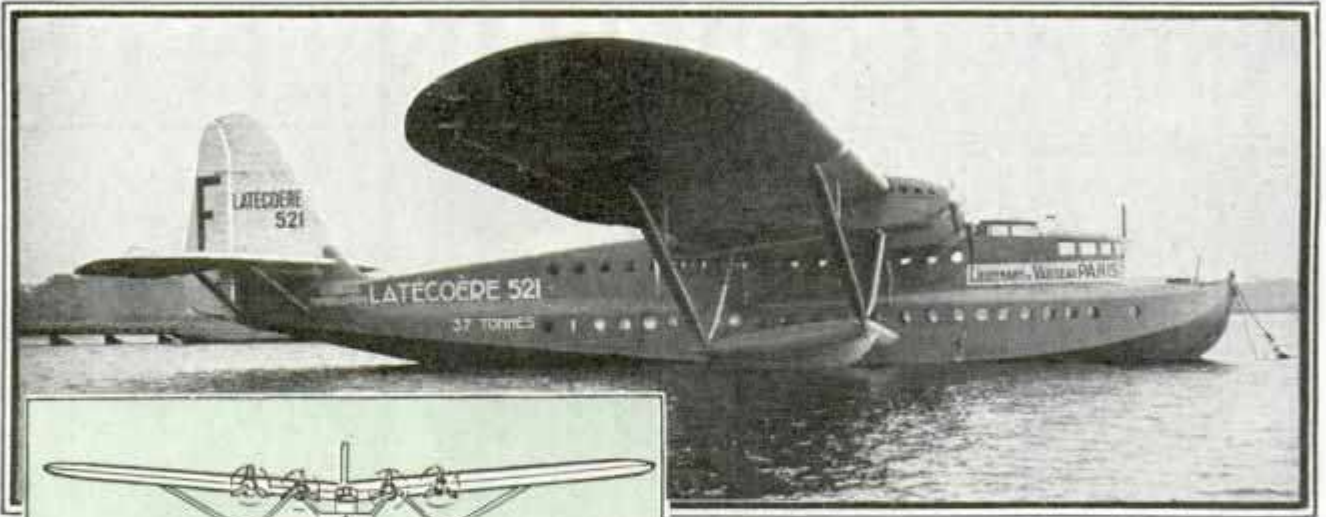
Top, Passengers Disembarking at Air France Airport; Center, Air France Passenger Transport; Bottom, Freight Plane with Three Motors in Front and One in Rear

major accomplishments in the field of modern aviation.

The monsters owned by Air France beat down the western coast of Africa until they strike Dakar; then they turn southwest and leap across the south Atlantic in

a single hop. The line runs along the east coast of South America until it strikes Montevideo and Buenos Aires; then it heads west toward Santiago on the Pacific coast, following along the path of many famous explorers.

All the French air lines united in 1933. After England, France is the great mother of colonies and Air France runs lines wherever the mother country has an established interest. In the Far East, Air France touches the colony of Indo-China and maintains a terminus at Saigon. Syria, a colony in the



Top, Thirty-Seven-Ton Flying Boat Which Will Carry Crew of Eight and Seventy-Two Passengers; Center, Scale Plans of Boat; Bottom, Pilot's Cabin of Air France Liner

mother country looks to the future development of the vast interior, which is almost as large as Europe itself. Near the tip of Africa, France owns the huge island of Madagascar, which is also awaiting development.

At present Air France is seeking to assure its place in the rich South American market by establishing night flights between the Old and the New World. Since the cost of installing beacon signals along the coast of east Africa would be prohibitive, the company is experimenting with the use of flares, flash bombs, and intermittent light signals.

So primitive are the countries which Air France touches, that in most cases it is necessary for the company to lay out and construct its own airports, then build roads to connect the airports with adjacent towns. Thus, out of forty-six landing fields used by Air France, only nine have been built by the country in which they are situated.

At one forsaken spot on the east African coast where an airplane hangar was constructed,

Near East, is also served by Air France. In Africa, the company serves Algeria and Morocco and the Sahara.

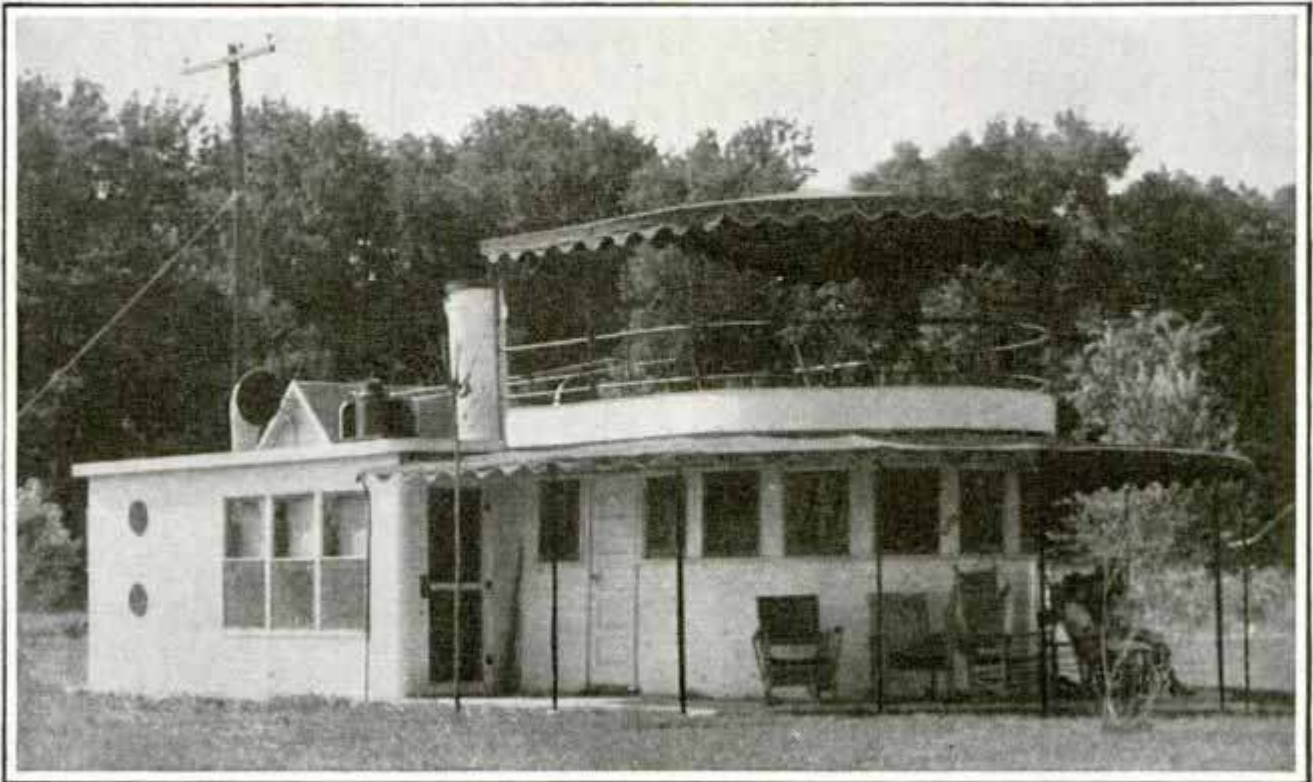
Air France plans to exploit still more territory. Its expeditions have crossed the Sahara desert in all directions for the

every drop of water used by the workmen and in the construction had to be freighted in from the Canary islands. In parts of South America, engineers found the roads impassable and the vegetation impossible

(Continued to page 126A)

2643. 3rd St
Wyandotte, Mich

Pilothouse of Boat Makes Summer Cottage



Summer Cottage Which Once Was the Pilothouse of a Boat; Note the Awnings Which Provide a Porch in front and a Balcony on the Roof; the Funnel Is Now a Chimney

Near a Michigan beach stands a summer cottage which originally was the pilothouse of a Great Lakes steamer. The pilothouse was transformed into a land home by removing it from the boat, placing it on foundations and laying a tile floor. Inside partitions were built to provide comfortable rooms, and steel pipe frames were employed to support awnings which provide a porch in the front and a balcony on the roof. A boat funnel, running lights, wheel and compass were added to the cottage to carry out the marine appearance.

Stony Point

ONE MAN HANDLES TON LOAD IN BALANCED DUMP CART

One man can push a load of 1,900 pounds or more easily by using a metal material cart designed for easy balance. The cart is equipped with balloon tires and is mounted on roller bearings. It is dumped by the handler just as easy as it is moved about.



One Man Moves a Ton in This Cart

Les Morris, Cleveland

MALARIA OUTBREAK IS TRACED TO ROCK-GARDEN POOLS

Malaria and rock gardens are on the increase in Ohio, and health authorities see a connection between the two. Hollows and crevices in rock gardens furnish a breeding place for the anopheles mosquito, carrier of the malaria parasite, and unless there are fish to destroy them mosquitoes breed rapidly in garden pools. There were 104 cases of malaria in Ohio during 1934 and the number may be surpassed when 1935 records are complete. The disease formerly was rare in this region.

E 1122

Review Service 9/18/35

Ohio Health News

Pittsburgh - Les Morris Steel Co

Amphibian Flies Nearly Four Miles a Minute



Major Alexander P. de Seversky in Low-Wing Monoplane He Designed and Flew Nearly Four Miles a Minute, Fastest Time Ever Achieved by Amphibian Aircraft

Just under four miles a minute, the fastest time ever achieved by an amphibian is still two miles slower than the speed record of land planes. The heavy drag of an amphibian's pontoons and land gear accounts for the contrast in speed capabilities. When Maj. Alexander P. de Seversky, one time Russian war pilot, flew his low-wing monoplane with single 710-horsepower motor an average of 230.03 miles an hour recently—his fastest lap was 235.96 miles an hour—he broke the old amphibian record by thirty-nine miles. His pet cocker spaniel "Vodka" rode in the baggage compartment of the plane on the record flight. The land plane record is 353 miles an hour.

(Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

50/1108
CYLINDER RIDGE IS REMOVED BY HAND-OPERATED CUTTER

Ridges caused by the wear of piston rings on cylinder can be removed by a hand-turned cutting head designed to follow the contour of the cylinder wall and smooth down the obstruction without chattering or digging into the wall. If the ridge is not removed when installing new piston rings, these rings may be damaged. In cutting the ridge away, the guide roller and cutting blade are held against the cylinder wall with spring pressure to assure an accurate cut and

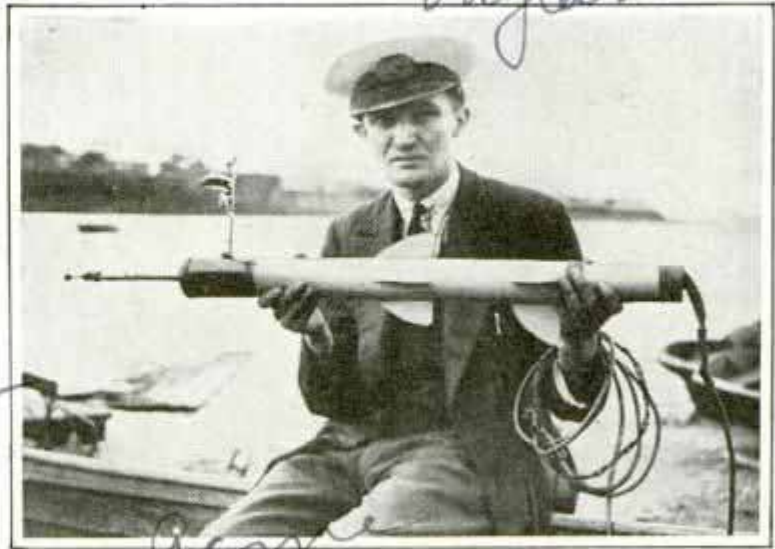


guide roller and cutting blade are held against the cylinder wall with spring pressure to assure an accurate cut and

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 Sacramento, Calif.
 Sacramento
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 Kurb. Oute
 Kline - Rogers
 Machine Tool Co.

Torpedo for Merchant Ship Can Blow Up a Submarine

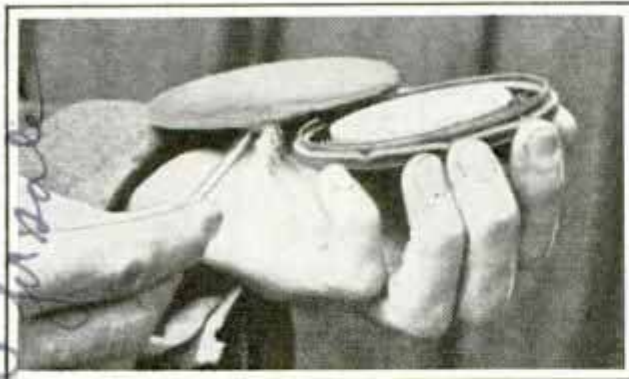
smooth, continuous power is delivered to the cutter by a hand crank through reduction gears. A centering device with sloping sides is placed on top of the cylinder, the cutter is bolted to a stud on the engine head, the cutting head is lowered and centered and the bolt then tightened to hold the cutter in perfect alinement with the cylinder bore. With the centering device removed, the cutting head is lowered into the cylinder and as the hand crank turns, the cutting head moves up and smooths away the ridge.



© Planet News, Ltd.
Model of Torpedo for Merchant Ship Which Is Said to Be Capable of Blowing Up a Submarine

TINY POCKET STOVE BURNS CHARCOAL DISKS

Burning seven hours on one-third of an ounce of fuel, a tiny pocket stove without flame, smoke or odor consumes disks of concentrated, highly compressed, purified charcoal. The charcoal starts to smolder as soon as a match is applied and the cover is replaced after about one minute. The burning portion of the disk becomes a cherry red, gradually turning to a fine powder which is easily removed. The heater provides an even warmth and can be carried in the



Small Pocket Stove Which Burns for Seven Hours

pocket or hand without discomfort. A spring in the top presses the charcoal disk down upon sharp metal points to prevent shifting when the case is carried edgewise. The two parts of the metal case are covered with thick plush and the case itself is about one-half inch thick and three and a quarter inches in diameter. The pocket heater is useful for winter sports and with the cover removed, it can be used to reheat liquids.

Merchant vessels can protect themselves or be converted into fighting ships in time of war, it is claimed by a British inventor who recently has produced a special rocket-torpedo, intended particularly for the merchant boats. This torpedo is only about half as large as those generally used, but it is claimed one of them can blow up a submarine. It can also be used against other enemy craft.

CLIPPER DROPS POWDER BOMB ON SEA TO MEASURE DRIFT

Glass bombs containing finely ground aluminum bronze powder are dropped on the ocean to mark a spot from which planes can measure their flying speed and drift. Smoke bombs formerly were used, but their visibility was limited to five or six miles in good weather while the powder bomb, bursting when it hits the water, spreads over the surface a shiny film of aluminum dust that can be seen ten or twelve miles. The bomb is fitted with stabilizer vanes to make it drop straight down.



Used by Pan American Airways 135842nd

American agent wanted U.S. flight

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Burton
England

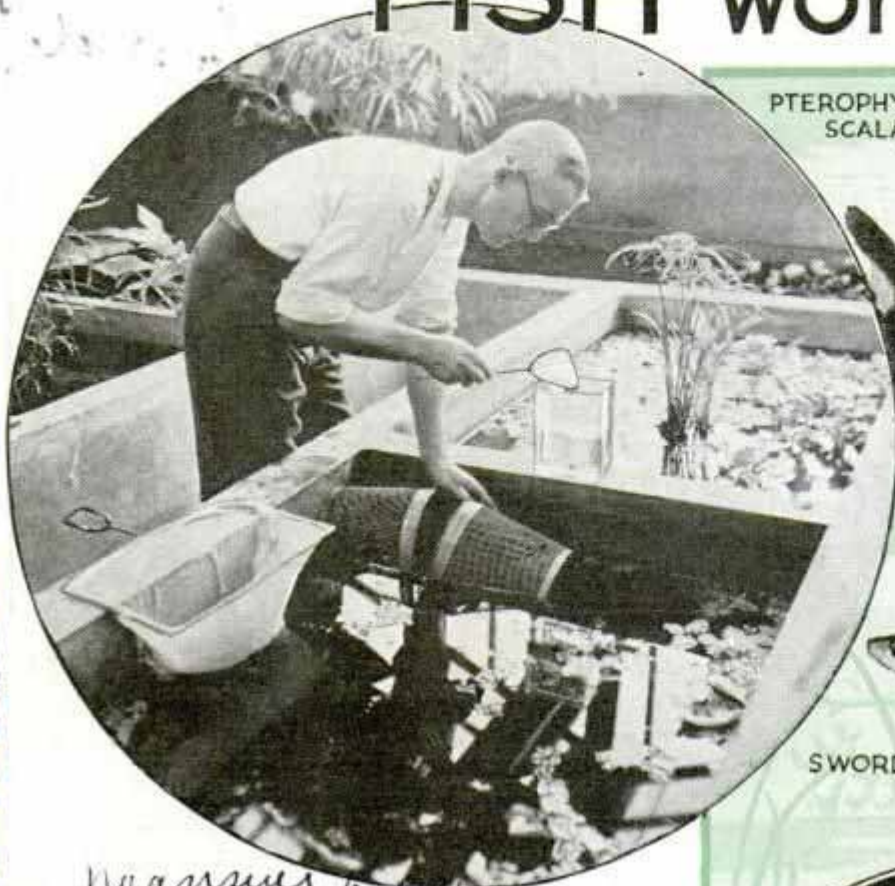
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Araton

S. Aki Shoten Co.

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FISH worth their

2523 N. Major St. Chicago
Ill. Berkeley 8162



No answer to letter.

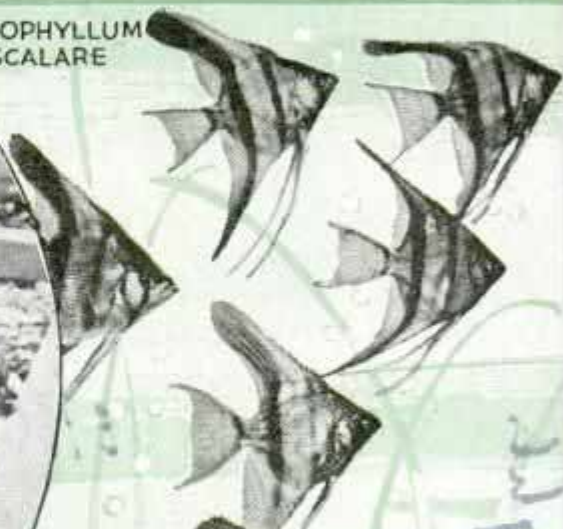
THERE'S gold in tropical fish—gold and fun. There's a thrill in creating new, exotic colors and strange shapes by interbreeding fish. You can do that in your own parlor—at a profit!

Eight years ago Alfons Heintze, was an electrician. Business was not so good, but tropical fish were thriving in the glass bowls in his living room. He quit his job, and soon the sunroom of his little home in Chicago was full of glass jars of fish, the basement was one big aquarium and he had to build a greenhouse for more glass and cement tanks. Now his hobby is his full-time job, he's the biggest breeder of tropical fish for the Chicago market and in spare time builds heaters and thermostats he invented to control aquarium temperature.

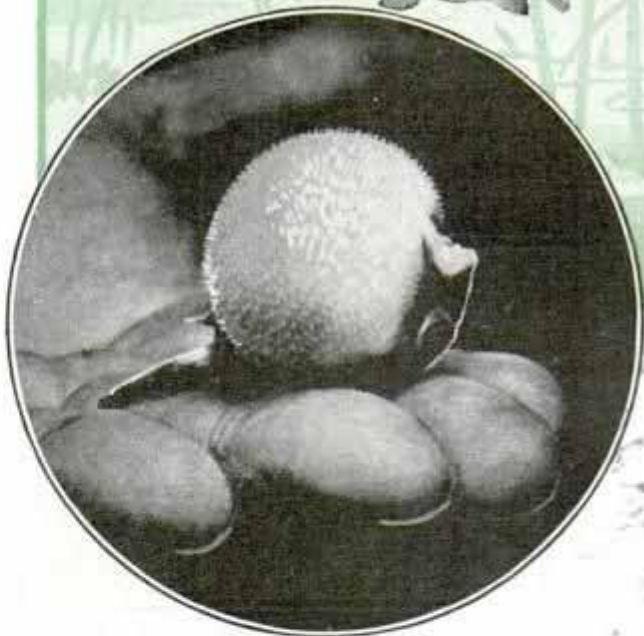
Fish are temperamental, but you can learn their likes and dislikes and they will bring good returns on the investment. Besides, there is endless fascination in watching the parade of color as iridescent tetra, red helleries, gold and green and blue striped zebra fish and feathery Siamese "fighting fish" dart around the bowl.

If you mean to start a fish colony for

PTEROPHYLLUM SCALARE



SWORDTAILS



Upper Left, Sorting Fish by Size with Sieve Trap; Right, Angel Fish (Scalare) and Swordtails; Bottom, Blowfish Inflates Itself When Held in Hand

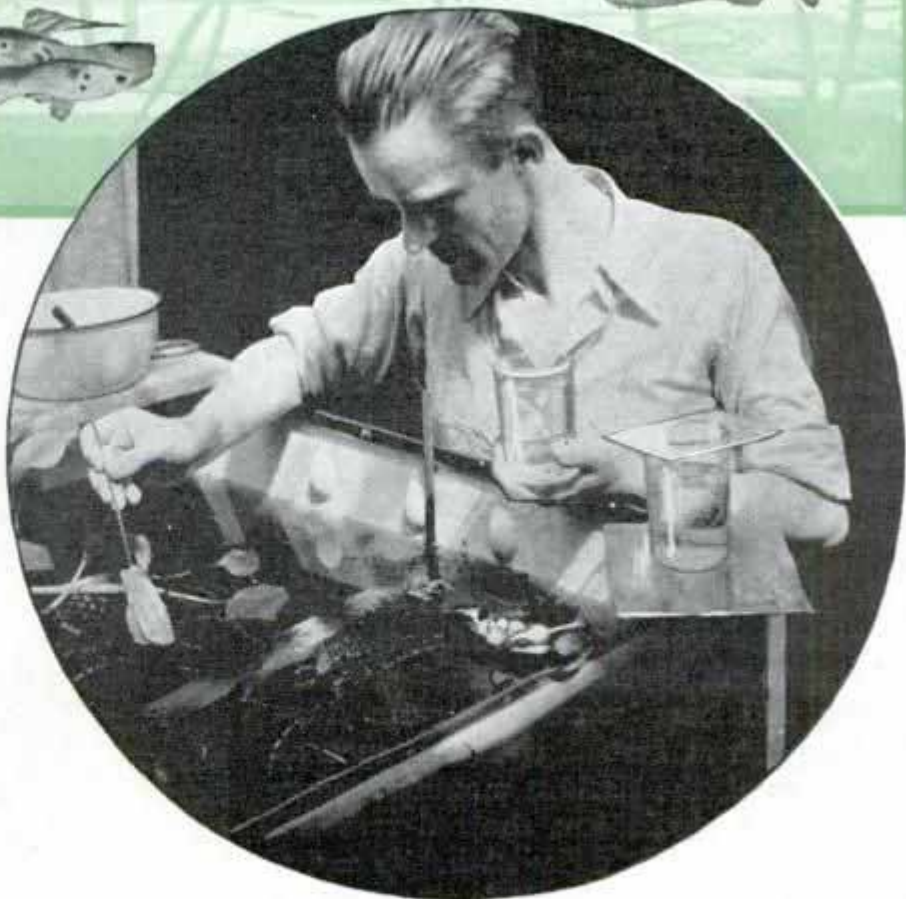
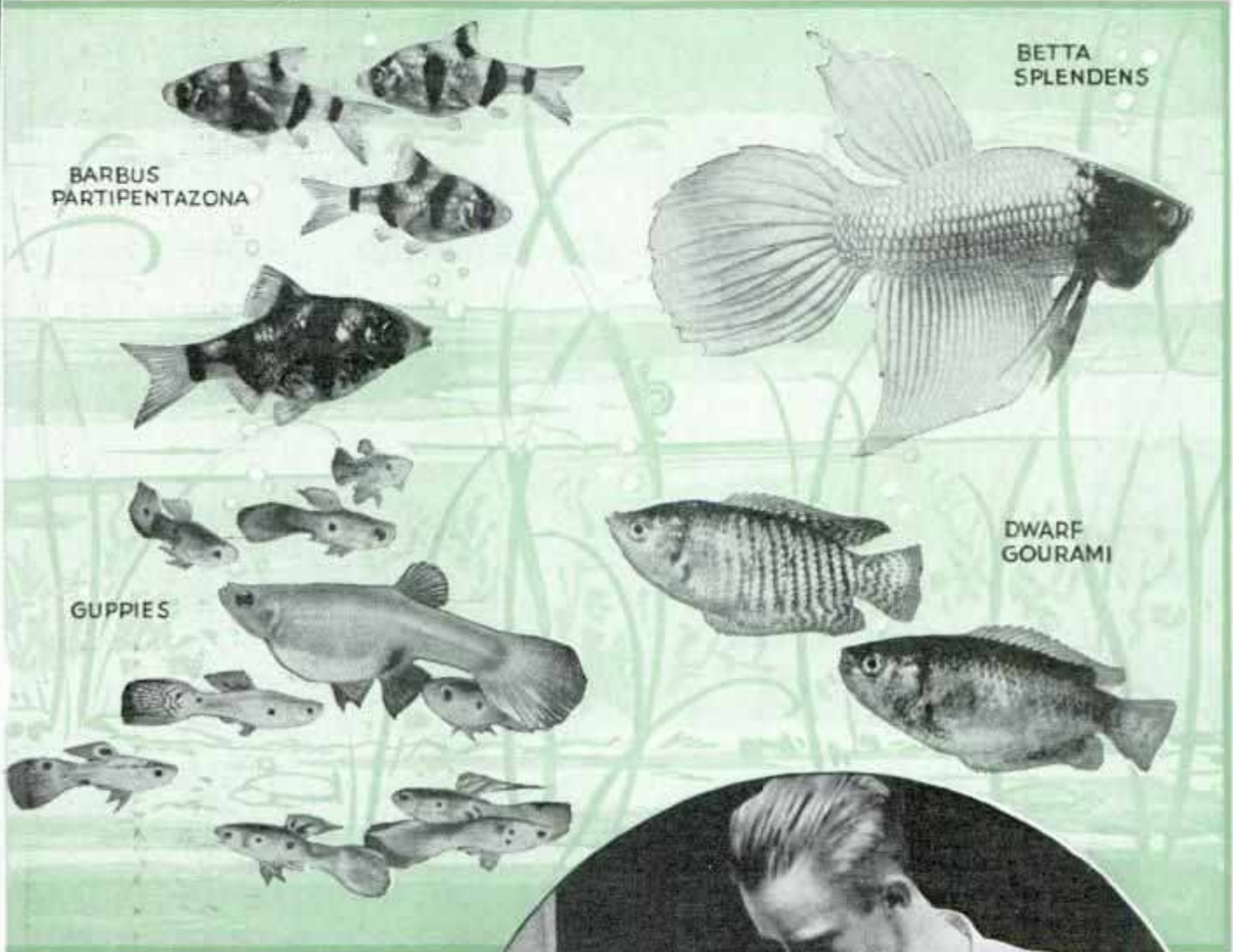
profit, you'll need a glass container, pure water and plenty of green plants; heat enough to keep a constant temperature around seventy-five degrees Fahrenheit; a small air pump and hose; light, and the right food—live water fleas, tiny white worms you can raise in jars of mud in the cellar, dried shrimp and canned food.

Start with a pair of black mollies—those

Makee unknown

2905

Weight in GOLD



velvet beauties with a tinge of orange along the dorsal fin. These are the biggest money-makers for Alfons Heintze. A pair costs \$2.25. Make them feel at home and they'll multiply your money! Eighty to eighty-two degrees Fahrenheit is the best temperature for breeding. If conditions are right, those mollies will present you a new brood of about forty babies every month. Fully grown, they may bring \$2.25 to \$10 a pair.

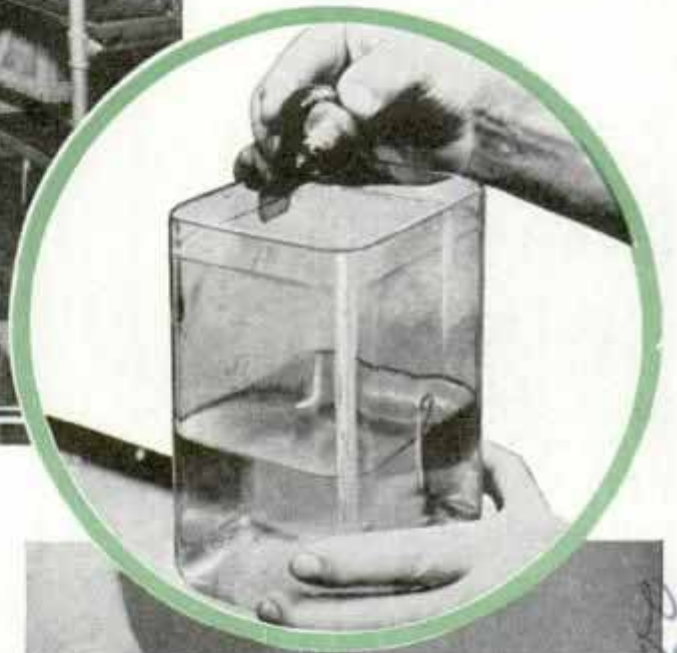
Once you have learned how to keep a fish family productive, try mixing

Top, *Barbus Partipentazona* Is Recent Importation; *Betta*, or "Siamese Fighting Fish"; Female *Guppy* Is Surrounded by Courting Males; *Gourami* Builds "Bubble-Nest"; Below, Removing Young from Breeding Tank



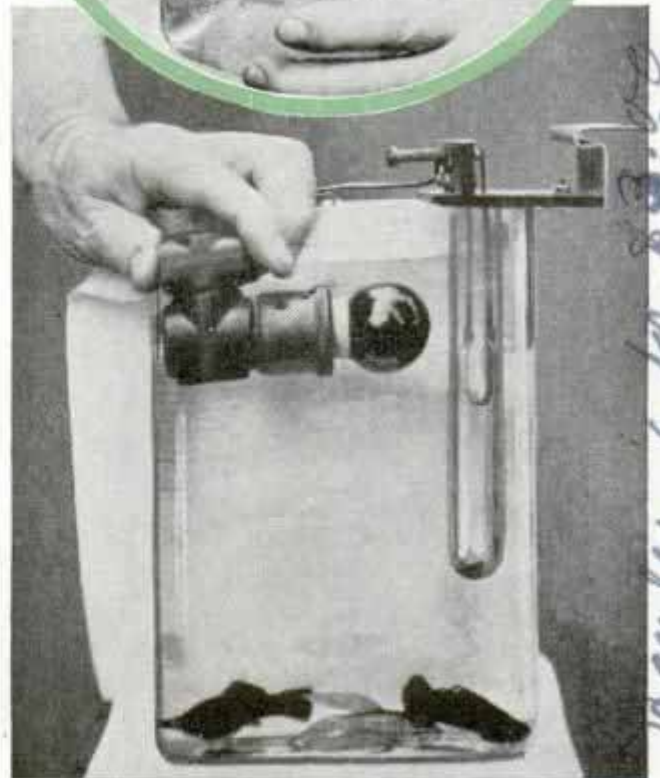
bearers. The female mouth-breeder places her eggs in her mate's mouth, and he keeps them there until they hatch. Whenever their young are threatened, the parents open their mouths and the babies swim in for shelter. The cichlid digs a hollow in the sand bottom to lay its eggs, and both parents swim about belligerently as if with a "chip on the shoulder," ready to fight

(Continued to page 128A)



new colors. With a little luck, you can develop hybrids of gorgeous hues and splendid outlines that bring fancy prices. The red-tailed molly, worth \$5 a pair, is a beautiful type created by mating the black molly, native of the Florida keys, with a platy variatus, a many-colored, spotted fish. The tiny guppy is sometimes mated with the hellery or swordtail. But it's always "take-a-chance week" when you mix paints for fish. You can't mate a blue with a canary-colored fish and confidently expect a green infant. You may instead get a hundred baby fish of nondescript pattern, many dying, less than a dozen survivors wearing an original color scheme worth developing.

You will have more luck with live-bearing fish at first. Egg-layers, such as the gourami, the African mouth-breeder, the pristilla riddlei and the red-breasted cichlid have vastly different habits and a thorough study must precede any attempt to raise them. But the egg-laying fish are even more fascinating than the live-



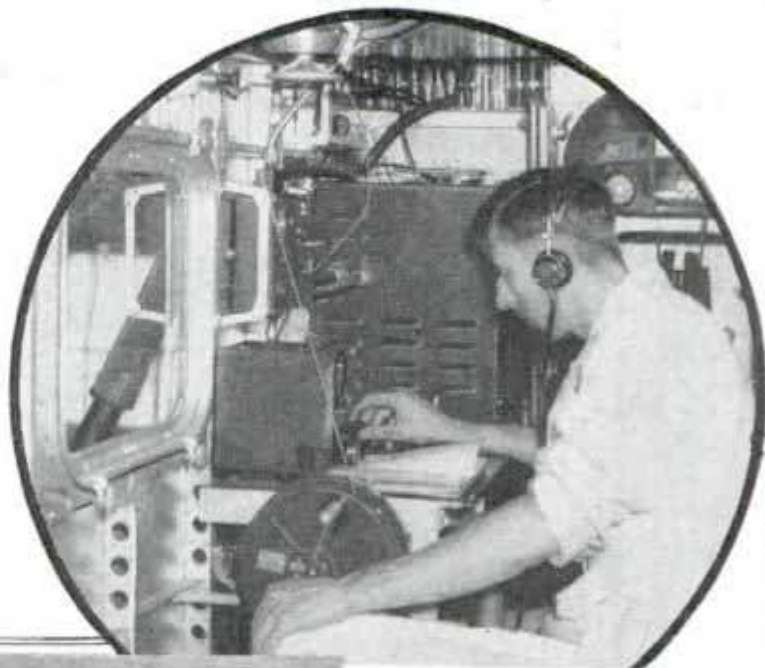
Top, Alfons Heintze in His Sky-Lit Aquarium; Center, Giant Snail Helps Clean Bowls and Feed Fish; Bottom, Thermostat Controls Aquarium Temperature

6 for \$9.00

See also 6 for \$9.00

Coast-Guard Planes Guided Home by Radio

Coast-guard planes are being equipped with radio apparatus intended not only to allow constant communication between ships and shore while the planes are on patrol but also to bring the ships safely home, regardless of the weather. A fifteen-watt main transmitter, handling code only, has a range of 1,500 miles with fixed antenna and an "unlimited" range, according to conditions, with trailer antenna. An auxiliary five-watt transmitter and receiver with a range of about 200 miles can be used for both



Coast-Guard Plane with Loop Antenna and Some of the Radio Equipment Which Assists Crew in Finding Way Home

ted to bring it to that station. It is accurate up to about 120 miles and is remotely controlled by means of a compass. A loop antenna is located outside on the tail section. A frequency indicator for calibrating the transmitters and an antenna control panel box complete the equipment.

voice and code. The "homing" device is a radio direction finder, a receiver which can be tuned to any desired station after which the course of the ship can be plotted

A direction finder similar to those used on the coast-guard planes led one of the rescue ships to the "Dixie" when the latter was in distress during a recent storm.

Auto Equipped with Bathtub Helps Sell Plumbing Ware

Passenger automobiles now are being built to accommodate bathtubs—but there is no hot and cold running water. A fleet of cars equipped with the bathtubs is being used by a company which manufactures plumbing ware to aid salesmen in exhibiting and selling the tubs to plumbers and jobbers. Room for a large-size tub in a small car is provided by omitting the rear seat and luggage compartment. Access to the tub is provided by a door built in the rear of the body.



Automobile of Plumbing-Ware Salesman Built to Accommodate a Full-Size Bathtub

Excursion trains to the White mountains now carry bicycles for the use of passengers on week-end trips to resorts.

Boston and Maine

Arnold Photo & Yachting
 Lloyd Bennett
 21094

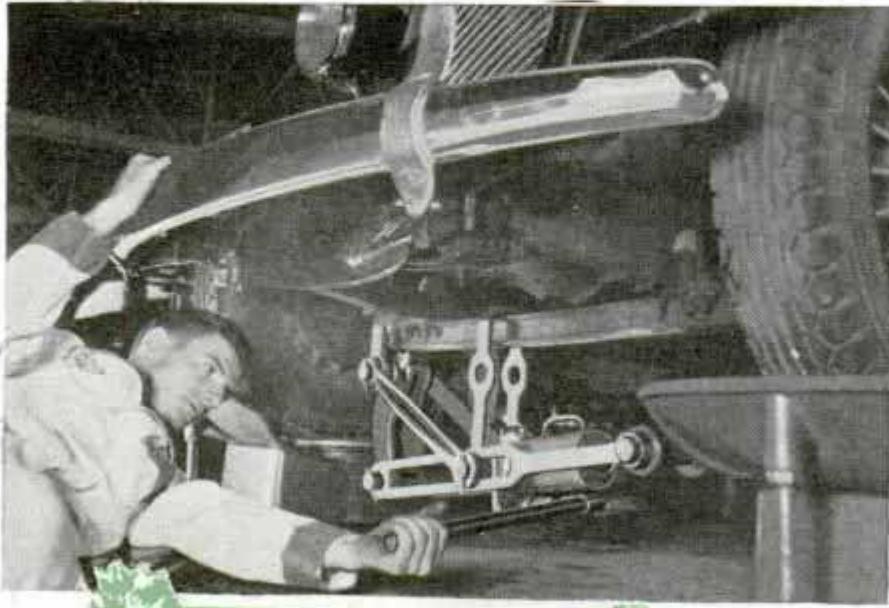
Sarimani Aircraft Engineering Co.
 Farmingdale N.Y. Calif.
 Long-Las Aircraft Co.

Buggs Mfg. Co.
 116 1/2 Black Ave.
 Leebrook, Mich.

Capt. Walter E. Burton
 1032 Floude Ave
 Akron, Ohio

8/10/18

The Secrets of



Left, Hydraulic Jack Equipment for Bending or Twisting Axle to Correct Front-End Trouble; Small Jack, with This Arrangement of Adjustable Arms, Produces Tremendous Force; Note Mechanic's Hand on Handle of Jack (Photo Courtesy Northmoor Motor Co.)

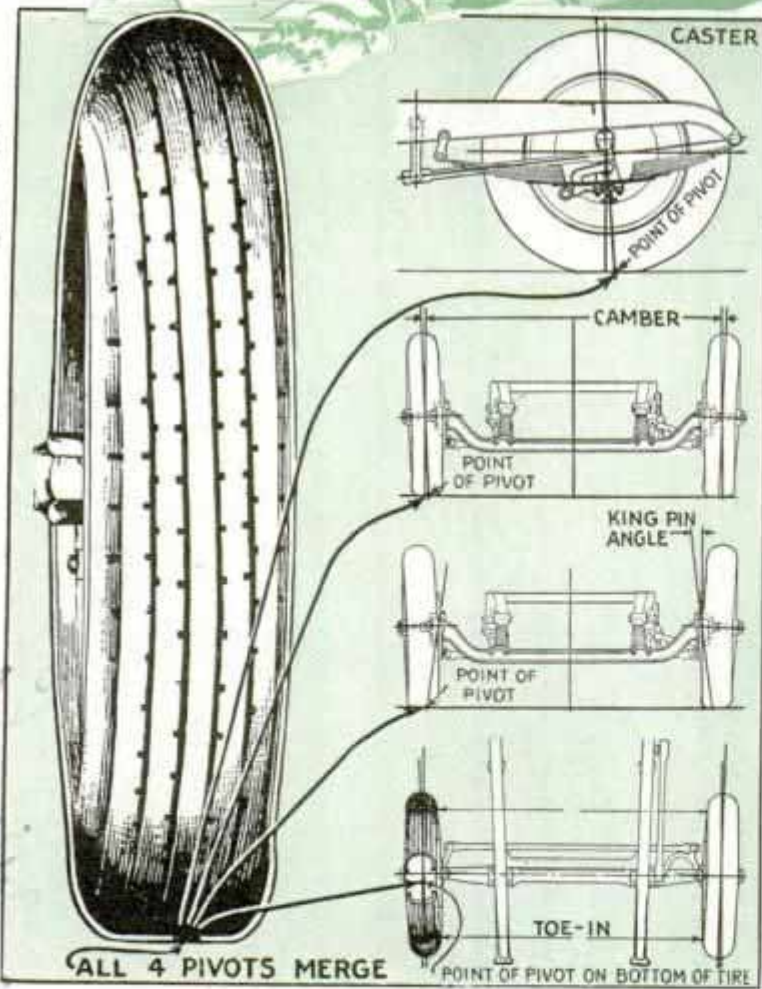
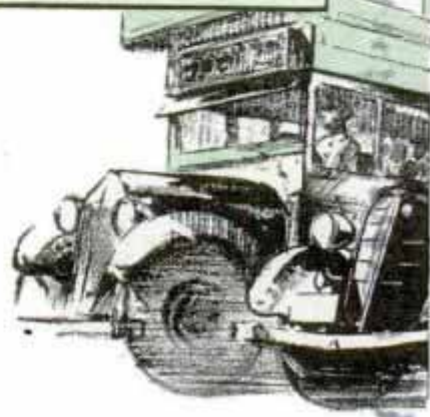


Illustration of How Each Factor Affects Operation of Front Wheel; Proper Camber, Caster, King-Pin Angle and Toe-In Cause Lines of Force to Merge at Point Where Tire-Wear Is Reduced to Minimum and Steering Is Easy

REMEMBER how tired you were after driving the "home-stretch" of that long trip last summer and how your back-seat passengers complained of the rough ride? Or have you ever puzzled on why your car developed "shimmy" and the front tires began to show strong evidences of wear?

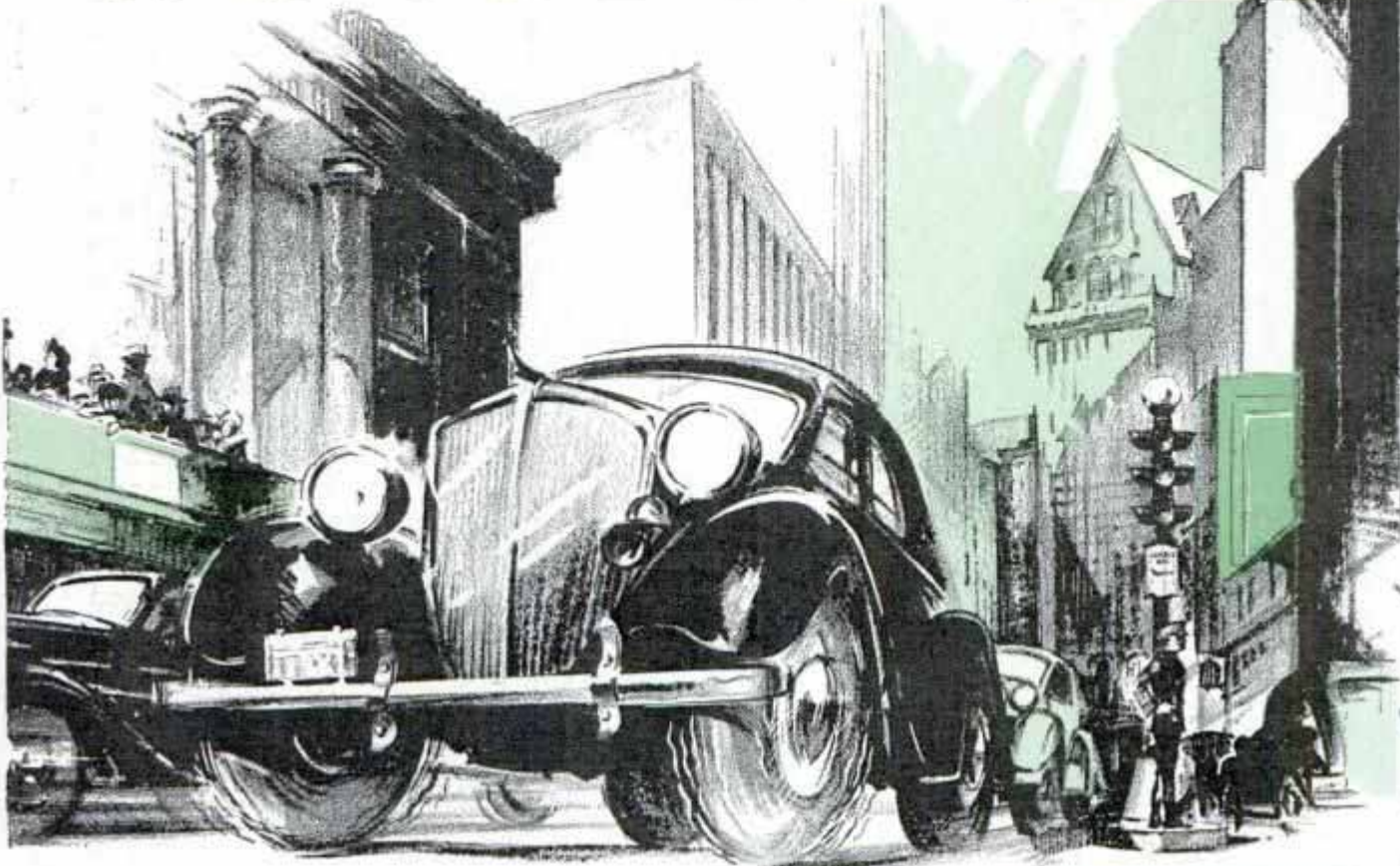
Any number of things could have been wrong, but engineers say ninety per cent of the trouble is traceable to lack of balance in wheels, tires, front-end assembly and loose steering gear.

If one of your tires was off balance as much as five ounces at one spot, a force equal to forty-five pounds was tugging at your car at sixty miles per hour. That's the cause of many accidents. At the same time, this unbalanced condition was setting up vibration through the steering gear that left your arms tired, and through the whole frame that fatigued the

B. F. Isodarsch...

E 10/18

a SMOOTH RIDE



passengers. But this is only part of the story. If the wheel and tire had been balanced, your ride would have been just as uncomfortable if the front end had been out of balance, requiring adjustment of the various parts that keep the wheel running smoothly and the steering easy. An unbalanced front end causes hard turning, loose steering, weave or wander, jerky steering, shimmy, excessive tire wear and generally uncomfortable driving and riding, in addition to increasing the chance of accident.

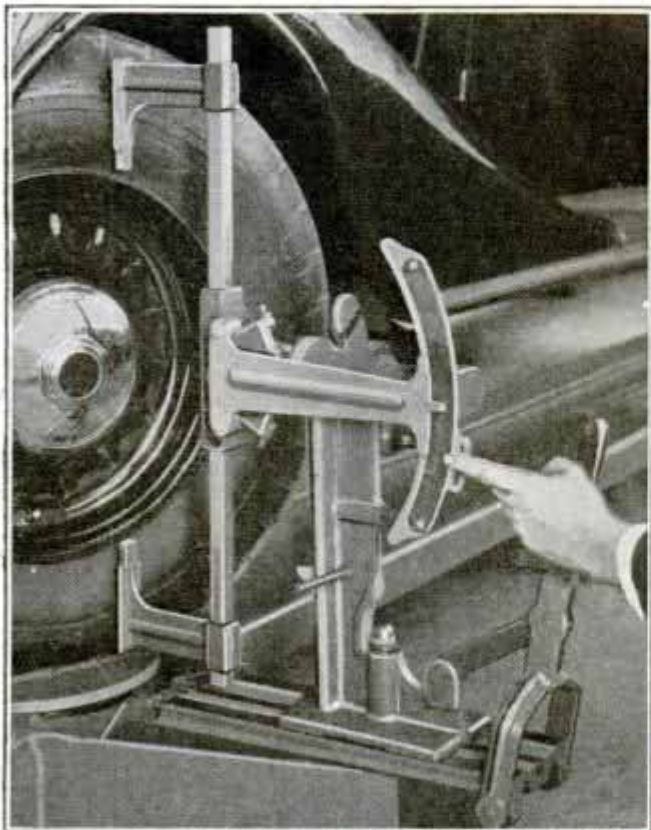
What should have been done to make that return trip comfortable? C. S. Phillips, engineer of the John Bean Manufacturing company, says the entire front end should have been checked carefully, tires, wheels and hubs balanced, as a unit on each side, and necessary adjustments made to the axle assembly so all parts worked in proper relationship. It



Top, Illustration of Shimmy; Bottom, Showing Car Owner How Simple Are Examination and Correction of Front-End Trouble; This Equipment Indicates Maladjustment; Pointer Shows Degree from Normal (Photo Courtesy Northmoor Motor Co.)

Wheel body can be made by General Motors or United Motors - Service Stations

Lansing, Mich.



make the proper adjustments, using special shims between axle and springs, adjusting the steering gear and twisting or bending the axle with a small hydraulic jack that exerts a force of 24,000 pounds. This jack is used in connection with a set of steel arms to bend the axle up or down just as you bend a wire with both hands.

Balancing the tires and the wheels is equally simple, special machines doing the mathematics for the mechanic. Static balancers, showing where two or three weights should be clamped on the rim to true up the assembly, have been in use for some time, but the latest machine for this type of work indicates the dynamic balance, showing whether the wheel runs true in actual use. A wheel balanced statically still might operate on the road at an angle away from the line of travel, thus exerting a force to pull the car to one side of the road and resulting in increased

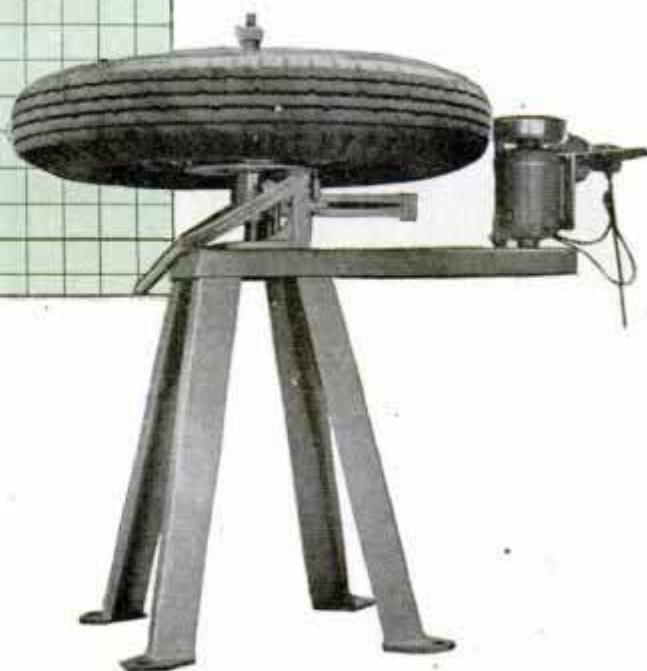
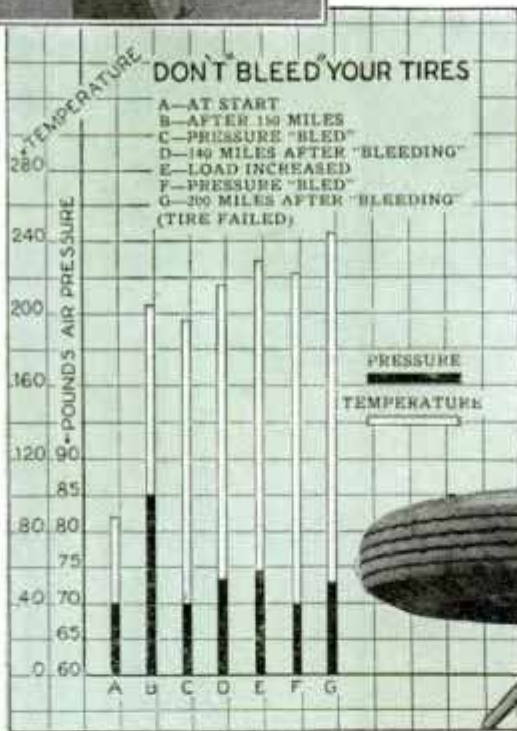
wear on tire and wheel bearings. Steering-wheel wobble and shake are noticeable when dynamic balance is poor. Attachment of weights to the rim will correct this condition and give better steering and a smoother ride.

Rear wheels require the same attention as the front wheels, particularly in this day of air wheels and "knee

will save you money to make such a checkup every 8,000 miles. But be sure to take your car to a properly equipped service station because special machines are needed for this type of work. It cannot be done with a measuring stick and spinning the wheels on the car.

If the owner neglects this periodic checkup, he soon will notice his front tires are wearing faster than the rear ones—a sure sign the car has lost balance. Under normal conditions, the rear tires wear the fastest. Balancing the whole assembly at the first sign of excessive front-tire wear may save a big repair bill—perhaps even a life. A high-speed shimmy is absolutely uncontrollable and oft-times builds excessive temperature in the tire, causing a fatal blowout.

After your car has been tested on a good alinement machine, the mechanic will



Top, Alinement Gauge in Place; Bottom, New Dynamic Wheel Balancer Simulates Road Conditions

John Dean Manufac.

HEEL AND TOE WEAR

Heel and toe wear is a saw tooth effect with one end of the tread button worn more than the other. High speed driving and excessive use of brakes will cause this type of irregular front tire wear.



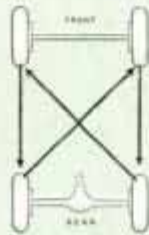
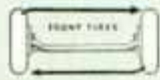
Mild Case of Heel and Toe Wear. To correct use Method A



Severe Case of Heel and Toe Wear. To correct—
Use Method A if car is equipped with Rib tires front and All-Weather rear
Use Method B if car is equipped with All-Weather tires front and rear.
Use Method B if car is equipped with Rib tires front and rear

METHOD A

Do not dismount tires. Interchange front wheels.



METHOD B

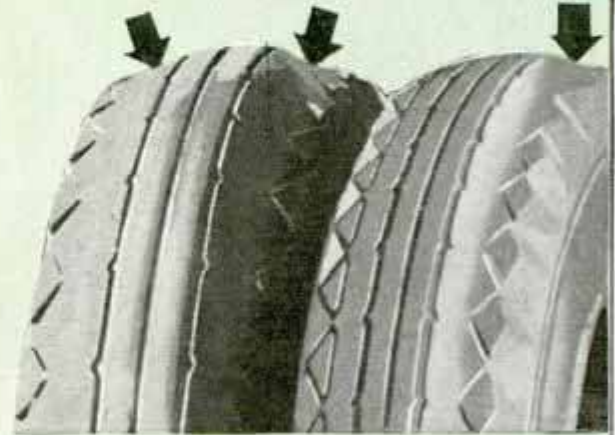
Change wheels without dismounting tires. Right front to right rear, right rear to left front, left front to left rear, left rear to right front.

SIDE OR CAMBER WEAR

There are two reasons why front tires wear more rapidly on the sides of the tread:

1. Front wheel camber causes front tires to run at a slight angle from the perpendicular, resulting in side wear
2. The side thrusts from rounding turns causes wear on the sides of the tread. In making a turn to the left, especially at high speed, the outside shoulder of the right front tire and the inside shoulder of the left front tire take most of the wear. The opposite shoulders are worn when taking a right hand turn.

Excessively low inflation will also help to cause side wear on front tires.

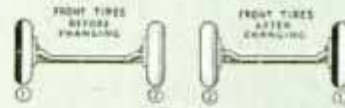


Two-Sided Wear to Correct. Use Method B

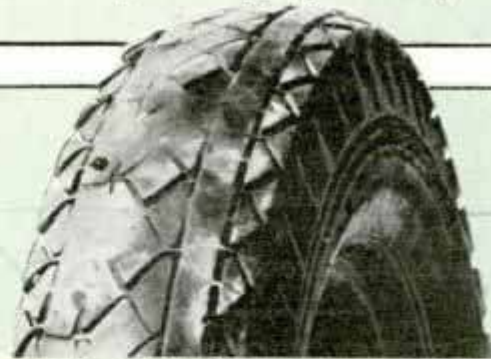
One-Sided Wear to Correct. Use Method C

METHOD C

Dismount tires from wheels. Do not turn tires around but remount on opposite front wheels without changing their direction of rotation.



Wear due to toe-in or toe-out misalignment. Mechanical correction of the car is necessary.



Uneven Wear—A mechanical correction of the car is the only remedy.

action" or other front-end suspension, due to certain tire frequencies, unsprung and sprung weight frequencies or bounces. Alinement of chassis also is important, since annoying vibration frequently is telegraphed to the driver and passengers, causing discomfort. Should one side member of the frame sag, the wheel base on that side becomes shorter, causing either front or rear wheels to shift and perhaps resulting in tight steering. Any car whose

rear wheels do not follow the front-wheel tracks on a straightaway course is unsafe. Checking the tracking will reveal a misalignment and this is something the owner can do. But the correction should be left to the skilled mechanic and his alinement and balancing equipment.

Shimmy in the front wheels probably is the trouble with which drivers are most familiar, since it occurs on all cars at times,

(Continued to page 155A)

Smokeless Diesel Engines

Save Fuel for Street Buses



First of Diesel Bus Fleet to Be Operated on Boston Streets; Unpleasant Gases from Exhaust Have Been Eliminated

Elimination of objectionable exhaust gases has made possible the installation of Diesel motors in buses built to operate on the streets of Boston. More economical than gasoline engines because of the saving in fuel cost and higher operating efficiency in miles per gallon, Diesel motors have not been used until recently for bus power owing to the unpleasant smoke and odor of the exhaust gases. This has been overcome in the Boston buses by a combustion chamber which enhances complete combustion and cuts to a minimum the carbon monoxide from the exhaust.

ALL-METAL WEATHER STRIP IS EASILY INSTALLED

Bronze weather strips that can be applied to windows and doors without expert aid are now available. The metal strips are offered in various styles according to purpose,

those designed for bottoms and sides of doors and windows being folded "S" shape. This provides a double spring ac-



tion and a lasting resilience that assures perpetual insulation against dust, cold, wind and snow. Window sashes can be removed to replace glass or cords without interfering with the weather strips, and the strips may be installed without removing the sash.

STEEPLE JACK PUTS NEW HAND ON GIANT CLOCK

It takes nerve to put a new minute hand on a clock when the clock is high above the sidewalks of Times Square, New York, and the minute hand is more than three times as tall as yourself.

That was the job one man had to do. Perched on a swinging seat, he braced his feet on the hour hand and guided the twenty-foot minute hand into its place in front of the big dial.



When the Clock over Times Square, New York, Needs Repair They Call in a Steeple Jack Jeweler

Swift Coach Co., Kenilworth

Eastern Massachusetts

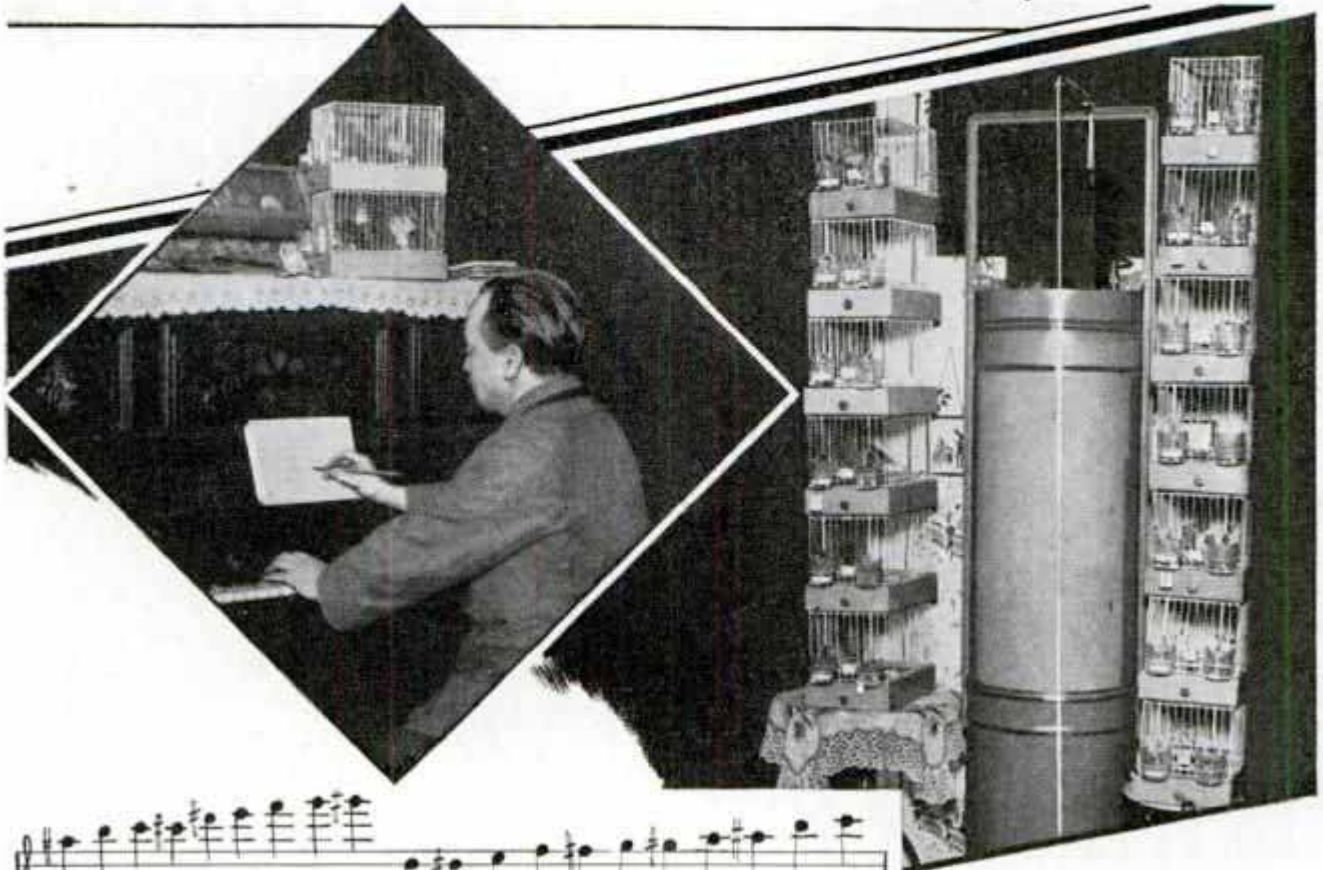
6/150 Path 6/19/29

W. J. Henzig & Co.

Paramount Theatre

Canton, Ohio

Silver Pipes Lead Singing Class for Canaries



Left, Writing Canary's Song on Musical Score, Shown Below; Right, Caged Birds Are Ranged on Either Side of Metal Cylinder Which Reproduces Perfect Warbler's Melody as Example for Songster Pupils

It is time for the singing lesson in Paul Fodor's canary school at Budapest. The pupils are canaries that bark like dogs, talk and laugh like men, mock screeching cockatoos and warble like the feathered coloratura sopranos they are. From silver pipes within a tall metal cylinder come thrilling notes stolen by this mechanical "choir leader" from a little, coal-black canary with a perfect song. Birds are not always born songsters, but they can be taught. When Mr. Fodor, noted bird psychologist, breeder and song tutor, heard this black warbler's melody he determined to teach it to his canaries. By studying the "perfect warbler" for three years he memorized its trills and arpeggios and wrote the song on a musical score. Then he improved existing song-teaching mechanisms by building in an arrangement of silver pipes inside which sensitive membranes produce the characteristic trill of the canary. The sequence of pipes tuned to reproduce the melody of his perfect warbler was then ready to teach singing class. A dozen cages holding promising

songsters are hung beside the cylinder, and from its metal throat pours the lovely carol. At first the birds listen in silence, then one after another gives a shy chirrup in imitation, and in a few weeks or months they have learned the scale and the song of the mechanical "professor." Another teacher in the canary school is a wire-haired fox terrier. He growls playfully at a little green canary, which ruffles its feathers and growls back in the same tone. When the pup barks, the canary mocks him with a bark imitating the terrier's very inflection. Several birds have learned to call the name of the boy who feeds them—"Tiby! Tiby!" when he enters the room. "That is not surprising," says Mr. Fodor. "Canaries can be taught to speak like parrots, only a little more patience is needed. A German breeder has taught a canary to speak several sentences and give a certain reply to an oft-repeated question." If you tease one of Mr. Fodor's canaries with a green leaf, he will distinctly laugh "Ha-ha-ha! He-he-he!" Others copy melodies and strange sounds.

no street address.

AMUSING

8730-166 H.M. Jamaica, L.I.N.Y.



ROLL CIGARETTE
TIGHTLY IN
"CELLOPHANE"



"TWIST ENDS OF
"CELLOPHANE"

*Left, the Sponge-Ball Trick;
Above, a Simple Stunt Anyone
Can Do*

may be turned into a pronounced hit by using correct showmanship. Don't tell your audience what you are going to do, unless it's part of the routine itself. When the spectators are kept in suspense they are less likely to detect a possible clue to the stunt.

Under no circumstances should an explanation of a trick be given. The interest in it dies if the secret is exposed. There is always one "wise guy" who wants to know all the details, not because he is interested in magic, but so he can expose the trick

*Below, the Four Simple Steps
in Performing the Rubber-Band
Trick*



CUT BALLS
FROM RUBBER
SPONGES



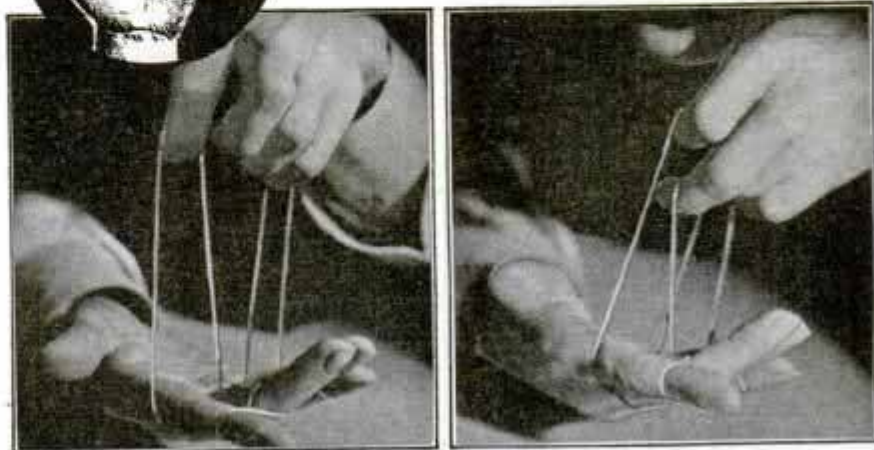
INSERT SMALLER
BALL IN OPENING
OF LARGER BALL



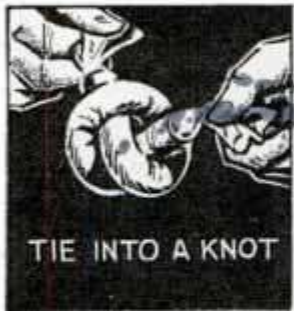
By RICHARD CARDINI
Famous Magician

SOME of the easiest magical feats are the most amusing and the average person can perform them with a little study and practice. They require no expert skill or elaborate equipment but can be made very mystifying if properly done.

The success of a trick depends largely on the manner in which it is presented. An excellent trick can be spoiled by poor handling while a comparatively simple one



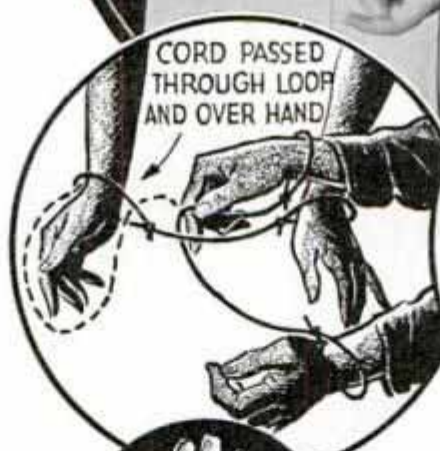
MAGIC



the next time he sees it.

For a starter, a very deceptive trick can be worked with a small ball of rubber sponge. Place the sponge in the palm of your hand so the audience may view it, then after showing you have nothing up your sleeve, pick it up and put it in the closed palm of a spectator. Ask him confidently if he feels the sponge growing larger, and when he answers in the affirmative have him open his hand. He will then discover he is holding two sponge balls instead of one.

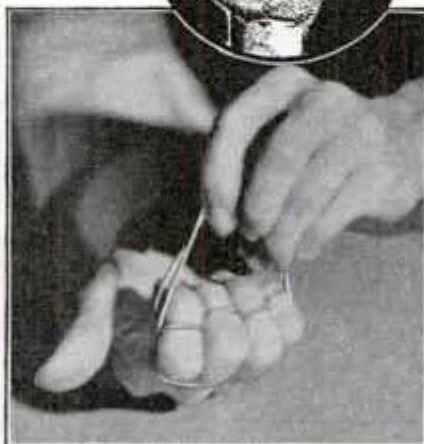
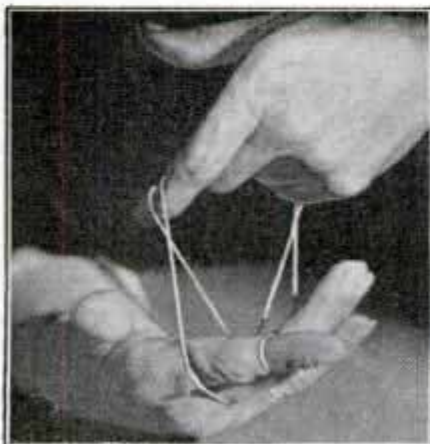
The secret lies in slitting one of the sponge balls and hollowing out a part of it so a second ball may be encased in it. To enhance the mystery use a different colored sponge



Above, "Freeing the Prisoners," an Easy but Exceptionally Mystifying Trick

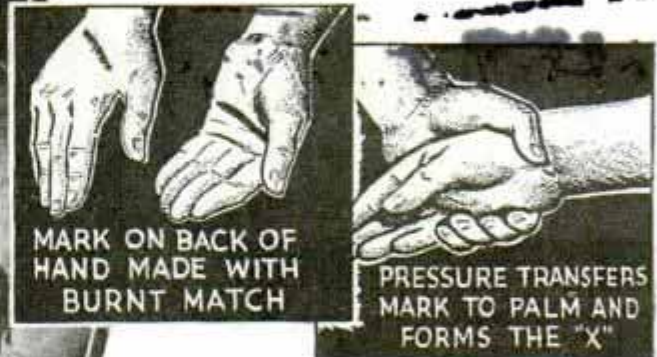
for the second ball. The second one may be a bit smaller than the first, but this will scarcely be noticed when the trick is offered. As the ball is handed the spectator it is squeezed on the side opposite the slit so the inside one will work free when the hand is relaxed at the prompting of the entertainer.

In a room where lights are subdued, a dollar bill can be shrunk appreciably. Borrow two bills from a spectator and place them on the table so they may be com-





Steps in Transferring Black Mark from Back of One Hand to Palm of Other in Forming a Mysterious "X" Where Only One Diagonal Line Appeared Originally; Bottom, "Shrinking" a Dollar Bill by Kneading It between the Hands



The rest of the illusion depends on the manner in which it is unfolded after wadding. As the trick progresses, care must be exercised not to smooth out the entire surface of the bill. Work diligently at flattening the corners, and press down the center area only lightly.

To give the trick an added punch at the finish, have a wadded piece of paper the size of a dollar bill concealed in the folds of your coat sleeve above the elbow. While working the trick, tug lightly at both your sleeves so your action will escape notice when you substitute the wadded paper for the bill at the climax. Pass the paper wad to a spectator, with the suggestion that he complete the stunt. To his dismay he will discover that the bill has turned to paper. A few minutes later you can "find" in one of his pockets the bill that has disappeared.

Can you take an ordinary cigarette, tie it into a knot, then untie it without breaking the paper? There's nothing complicated about it. Just remove a square piece of unwrinkled Cellophane from the outside of a cigarette package, and wrap it around the cigarette, leaving an inch margin at either end. These Cellophane ends should be twisted tightly before the cigarette is knotted. When straightened out and the Cellophane removed, the cigarette paper will be unbroken.

pared for size. The top one then should be crumpled into a tight wad. When it is unfurled it will appear to be a trifle smaller than the one left on the table. As this procedure is repeated the crumpled bill will continue to shrink in size.

The reason? The heat of your hand, coupled with the kneading process, brings about a temporary shrinkage in the bill.

With a burned match, draw a line diagonally from the third finger of your left hand across the crease in your palm. On the top side of your right hand draw another line going in the opposite direction. By placing your hands behind you mo-

mentarily, you can transfer the line from your right to your left hand, thus making an "X" on the palm of your left hand. When you place your hands behind you, close your left palm over the back of your right hand, press tightly, then rub the remainder of the line from your right hand on the back of your coat. The crease in your hand automatically forms the "X."

"Freeing the prisoners" is a good stunt for a party. The two wrists of a spectator are tied with the two ends of a piece of string by the performer. Another string is then passed through the loop between the prisoner's hands, and the entertainer allows his wrists to be bound in similar fashion. The object is to release the two strings one from the other, so the prisoners may go free.

This is done by the performer bringing the center portion of his string up through the loop encircling one of the other person's wrists, over his hand, and down through the part of the loop at the back of his wrist. The strings will become disengaged, and the prisoners can go free, when the performer simply brings the middle part of the string over the other person's hand.

Making a rubber band hop from the front two fingers to the last two is an ancient favorite with amateur performers, but working the same trick with bands of different colors, while the fingers are completely entwined with a band of still another color requires more than usual skill. The different steps in the operation are shown in the accompanying photographs.

The Heaviest Substance

Although it is lighter than either of its component elements, iridium and osmium, the mineral iridosmine is the heaviest substance found in nature. Iridium, used in making fountain pen tips, and osmium are the heaviest metals known, but, like platinum, they do not occur free in nature. Iridosmine weighs 21.12 times as much as water, a cubic foot scaling 1,320 pounds. A similar measure of osmium weighs 1,405 pounds, iridium 1,401.25 pounds, platinum 1,343.75, and gold 1,207.5 pounds. Iridosmine is found at Port Orford, Ore., and in the Ural mountains.

Visible Photo Developer Aids Control of Light Values



Enlarging Photograph by Visible Method Makes Perfect Timing Possible and Eliminates Guesswork

With a special developer now available, it is possible to print photographic enlargements by sight—using the eye instead of guesswork and experiment to gauge the exposure for perfect light values. Watching the picture develop, you know exactly when it is sufficiently dark to stop exposure. The bromide paper is soaked in the special developing solution for about a half minute, then placed under the enlarger with red filter closed. After focusing, the red filter is removed and the picture is brought out while you watch. The developer can be poured back into the bottle for use again.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Academy of Natural Sciences

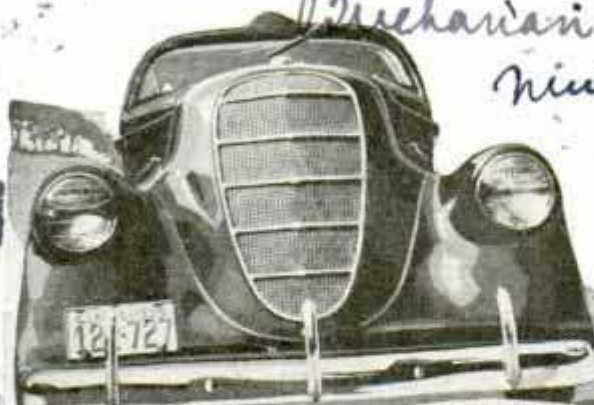
Company when on Eastern Shore

International Bureau of Information 622 W. ...

Samuel S. Gordon
Crystals & Minerals

International Bureau
622 W. ...

Odd Streamline Car Stops 'Back-Seat' Driving



Several novel features, including a periscope that gives the driver full view of the road behind, have been incorporated into an unusual streamline car designed by Willard L. Morrison of Buchanan, Mich. The body of the car is wide in front and

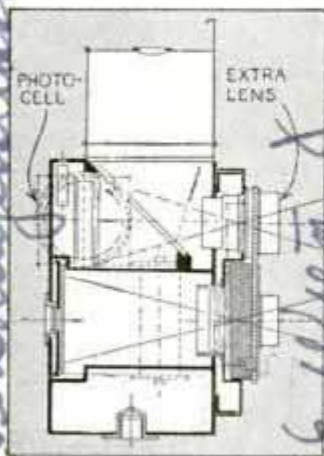


Top and Bottom, Exterior Views of Car; Note Periscope at Front of the Top; Center, Interior Showing Wheel Almost under Dash



CAMERA THAT THINKS FOR YOU HAS EXPOSURE METER

Your camera can be made to do part of your thinking in taking pictures if it is equipped with an exposure meter to measure light intensity,



The meter contains an electric eye and the photo-cell, attached to the camera, receives the same picture as the film or plate, the colors of the subject being transformed automatically by the meter into their correct light values. An extra lens above the regular lens passes the light to the electric eye.

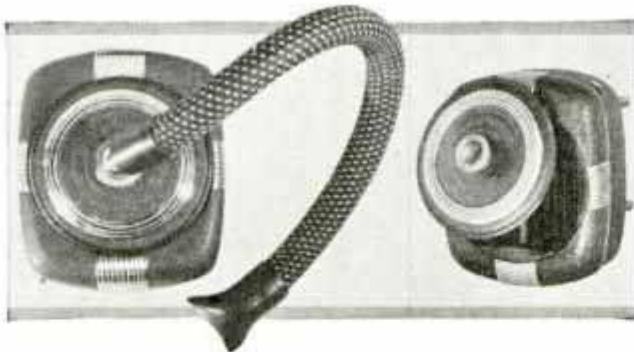
tapers toward the rear, permitting the seating of three persons in the front and only two in the back seat. But the rear seat is set so low that its occupants cannot see the road, eliminating "back-seat" driving. The windshield is set closer to the driver's face, giving him improved vision. The steering wheel is under the cowl and forward of the windshield. The spare wheel is so arranged at the rear of the car that it takes all the shock of a rear-end collision. To prevent the possibility of gasoline being stolen while the car is parked and locked, the filler cap outside can be opened only from the inside of the car. The tapering body is said to reduce wind resistance considerably, compared to the conventional automobile, particularly in the higher-speed ranges.

9/2/35
21031
\$835,000 for Paint

THE new Oakland-San Francisco bridge takes as much paint as would be required to cover 20,000 five-room dwellings—a middle-sized city. The bridge builders will have an \$835,000 paint bill to pay. Four coats are necessary, the first three being ordinary lead paint, topped off with a final aluminum coat. In all, 200,000 gallons of paint will be used.

21097
**AUTO HEATER AND DEFROSTER
KEEPS WINDSHIELD CLEAR**

Mounted so it is flush with the dash, a hot-water heater for the automobile includes a detachable hot-air windshield defroster. It is also equipped with a hot-water trap which converts the heater into a hot-water boiler which operates like a home heating system. Usually increased car speed boosts the speed of the water pump which sucks water through the heater too fast to heat properly. The water trap prevents this, for the faster the



Auto Heater and Defrosting Tube Attached to It to Keep Windshield Clear in Winter

car is driven, up to fifty-five miles per hour, the greater the actual heat produced. A deflector can be set to throw the heat in any direction and the noiseless motor requires no oil. The rubber defrosting tube is attached to the heater by removing a center ornament, and the defrosting end of the tube is attached to the windshield with a suction cup. The hot air removes frost from inside the windshield and melts snow and ice outside enough to allow the windshield wiper to operate. When not in use the disconnected tube is hung on brackets under the dash.

*The P. F. Isodred
C. P. ...*

2998
**Motor Hussar in Gas Mask
Replaces Cavalryman**

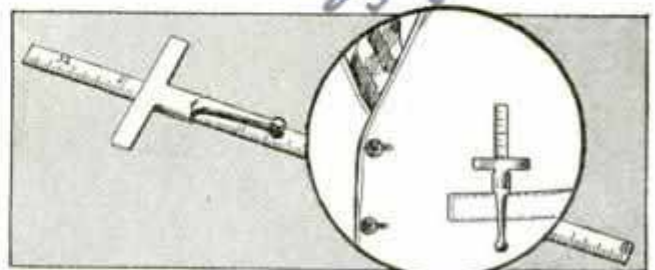


Wido Wolla
**Ready for Any Emergency, This Trooper Sets Out
on Scouting Duty in Maneuvers**

Replacing the cavalryman of other days, the "motor hussar" of Germany's motorcycle corps is a formidable fighter. Protected by gas mask, he can drive his heavy-duty cycle over rough country on almost any mission. The motorcycle is constructed to withstand the hardest usage, adapting it to war service.

21073
**STEEL RULE HAS POCKET CLIP
FOR USE AS DEPTH GAUGE**

For machinists and engineers requiring precision in a small rule, there is a six-inch steel rule with a sliding vest-pocket clip whose "T"-shaped top can be used for a depth gauge. One side of the rule is calibrated in thirty-seconds and the other sixty-fourths of an inch.



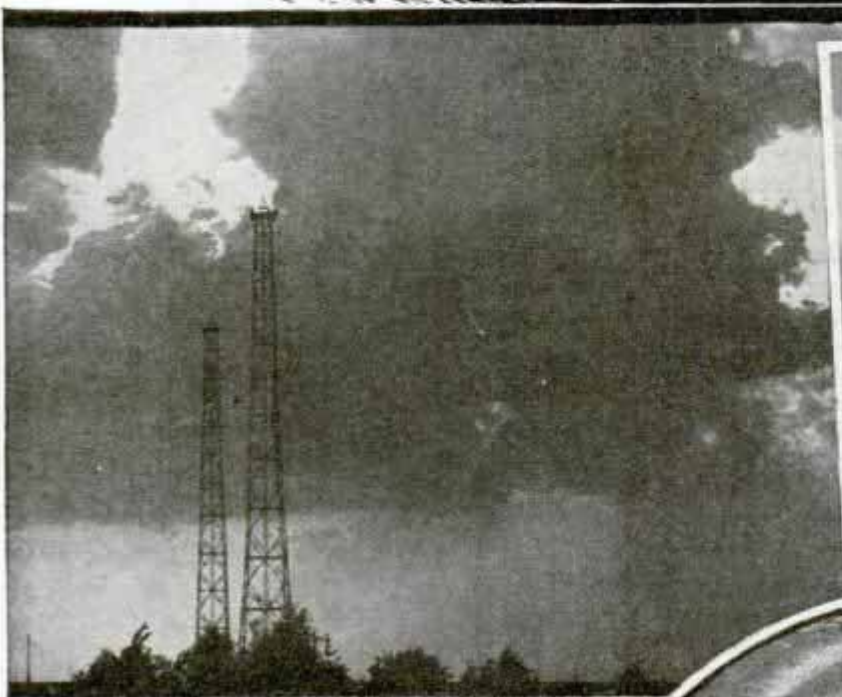
**Precision Rule Has Sliding Vest-Pocket Clip with
"T" Top Handy for Measuring inside Pipes**

*Miller Falls, C.
Greenfield, Mass*

6848

Mr. C. S. Culman
% Pictograms Co Box 682
Washington DC

WHAT'S IT



Top, Left, "Backstays of the Sun," a Sailor's Sign of Stormy Weather; Top, Right, "When the Clouds Are Upon the Hills, They'll Come Down by the Mills" —as Rain



"The Moon with a Circle Brings Water in Her Beak"

THE amateur weather forecaster, like the professional, should always make his predictions from a current weather map if possible. No amount of skill in interpreting local indications of coming weather can fully replace this picture of atmospheric conditions as distributed over the country.

It will often happen, however, that neither a map nor the information necessary to draw one is at hand. Then the prophet must depend on the old-fashioned rules for reading local weather "signs." Some of these are fairly reliable but the majority are not. Prof. W. I. Milham has divided the traditional weather proverbs and sayings into five classes, of which he writes:

"The first two are fairly well founded, while the last three are mere superstitions. The first class includes those that infer an impending weather change from the sky appearance and something connected with

the meteorological elements; for example: 'A rainbow in the morning is the shepherd's warning; a rainbow at night is the shepherd's delight.' 'Mackerel sky and mare's-tails make lofty ships carry low sails.'

"The second class of weather proverbs includes those that infer the coming weather from the behavior of animals, plants and inanimate things. The coming of a low, with its rain area and shifting

A SIGN OF ?



Top, "a Rainbow in the Morning Is the Shepherd's Warning"; Below, Mr. Groundhog, Weather Omen

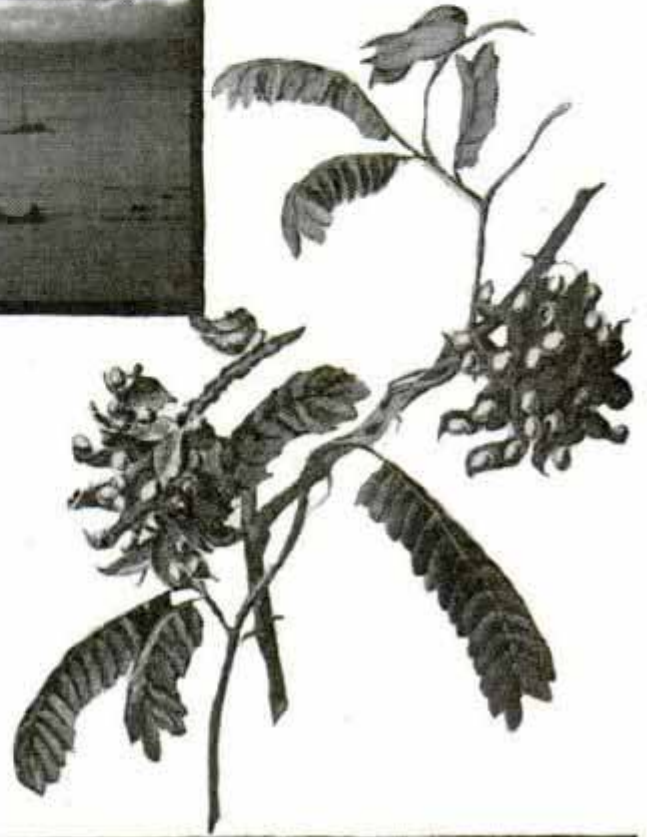
Pimpernel, the "Poor Man's Weather Glass," and Old Moon in Arms of New, Sign of Bad Weather

winds, is usually heralded by an increase of temperature and moisture and a decrease of barometric pressure. The increase in temperature and moisture often causes a change in the behavior of animals. Drains are said to smell before rain, which may simply mean that the lower pressure causes some of the air to escape from them.

"The three classes of weather proverbs



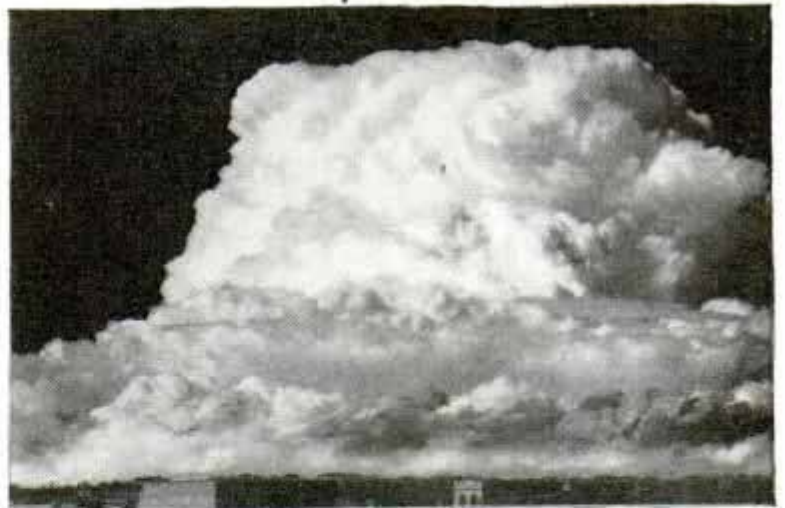
Left, a "High Dawn" or the Breaking of Day over a Bank of Clouds, Supposed to Indicate Wind; Below, Drooping of Leaves of Paternoster Pea, Supposed to Foretell Bad Weather



that have no scientific basis whatever are those that infer the future weather at some distant date from the actions of animals or plants; those that infer the distant future weather from the weather at some previous time, and those that infer the weather from some astronomical body. The following are examples: 'Squirrels gather more nuts before a hard winter.' 'If it rains St. Swithin's day, it will rain forty days.' 'The moon and the weather change together.'

Many alleged portents of the weather far in advance are familiar because the newspapers exploit them. On the fifteenth of July, the St. Swithin's day tradition figures in the papers. Every autumn we read what the rural sages say about the following winter, as inferred from observations of plants and animals. Groundhog day has received a steadily increasing amount of newspaper attention. Few realize that, except at zoos, groundhogs never see their shadows on February second, because they hibernate underground until well after that date.

The best of the sound weather proverbs do not hold good for more than a day or so ahead, and many for not more than a few hours. The facts on which they are based are mostly revealed by weather maps, which show just why certain sequences of weather events tend to occur. The maps show, for example, that cirrus clouds or "mare's-tails" often stream far

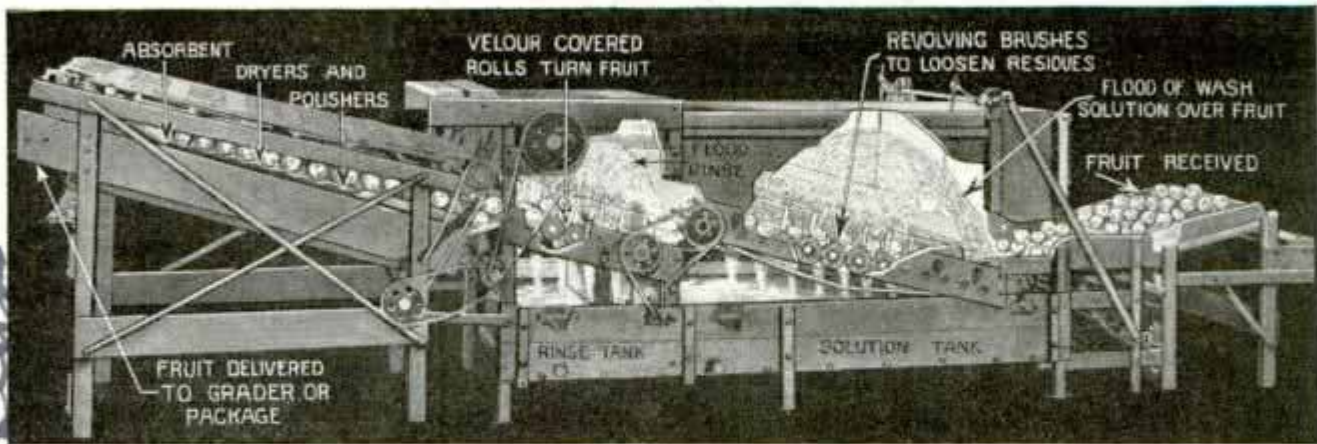


When Clouds Appear "Like Rocks and Towers," Says the Couplet, It's a Sign of Frequent Showers

out in front of a cyclonic storm, so their appearance frequently is the first token of stormy weather. Similarly, old sayings about the significance of rings around the sun and moon, the backing and veering of the wind and the formation of cloud caps on mountains merely describe details in

(Continued to page 116A)

Queer Washer Improves the Looks of Fruit



Cutaway View of the Bean Fruit Washer, Showing How Fruit Is Fed into the Machine, Scrubbed and Dried, Then Delivered to Packaging Platform; Sales Appeal Is Increased by This Treatment

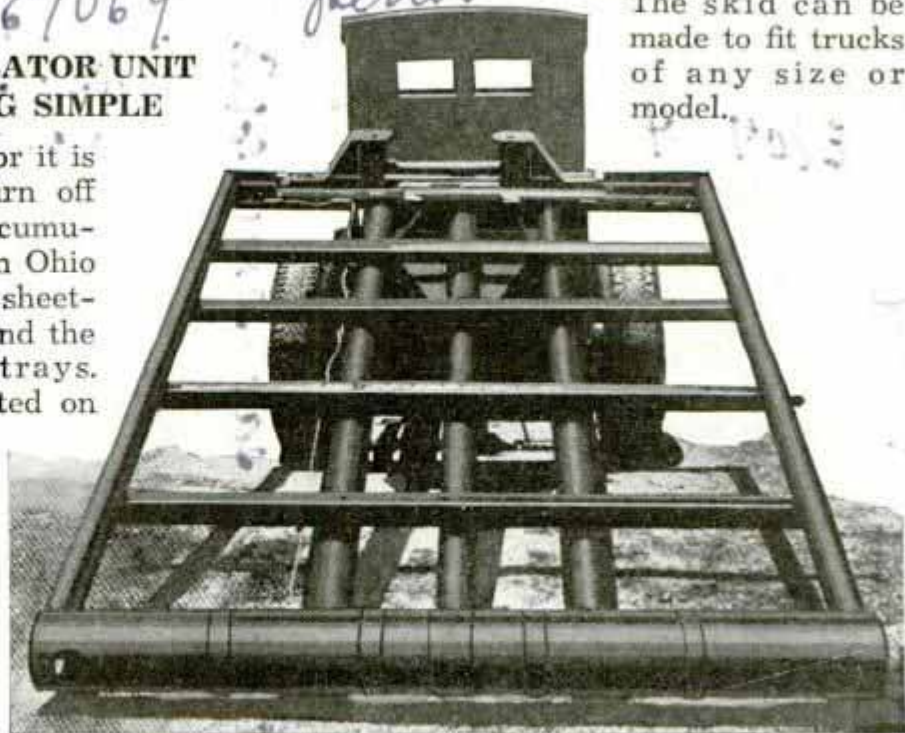
Increasing the sales of fruit by improving its appearance is practical, it has been found in governmental and growers' tests in which washing machines have been used. In addition to cleansing the fruit, these machines also dry and polish it, resulting in greater sales appeal. The flood-type washer contains brushes which help to remove dirt, insects and poison spray used to protect the fruit. The brushes provide a gentle scrubbing action that cleans all exposed surfaces. Emptied into a receiving hopper, the fruit passes through a wash solution, a rinse tank, then over a drying section and from there to a grader or packaging machine.

JACKET OF REFRIGERATOR UNIT MAKES DEFROSTING SIMPLE

To defrost the refrigerator it is no longer necessary to turn off the current and let the accumulation of ice melt away. An Ohio inventor has devised a sheet-metal jacket that fits around the cold unit containing ice trays. When the frost has collected on this jacket, the entire cover is quickly removed by turning a handle and can be cleaned under a faucet, dried and replaced within a few minutes. Refrigerator temperature is unaffected and there is no return to the food chest of vapors as the frost melts.

Sliding Truck Bed Speeds Up Loading and Unloading

By equipping the truck with a sliding bed, operators can speed up the loading and unloading of machinery and other heavy loads. In tests, weights equivalent to heavy machinery have been loaded and unloaded in two minutes by one man. The bed is a large platform built up of tubular members which slide on the truck body on the skid principle. A winch moves the platform off the truck, then pulls it back after loading. Machinery weighing from three to ten tons can be handled easily. The skid can be made to fit trucks of any size or model.



Rear View of Sliding Truck Body Which Makes Loading and Unloading of Heavy Objects Easy; It Fits Any Truck

Handwritten text on the left margin: 'Johnathan F. Fretter 3799 Monte Vista Ave Cleveland, Ohio'.

Handwritten text at the top: 'Johnathan F. Fretter' and 'Lansing, Mich.'.

Handwritten number: '21030'.

Handwritten text at the bottom left: 'Cleveland, Ohio'.

Handwritten text at the bottom right: 'Sliding Truck Bed Co.'.

Flying Dog in Parachute Box Set Free When It Hits Ground



Cylinder Attached to Parachute Is Dropped from Plane and Springs Open on Striking Land, Releasing Dog Trained to Perform Task

"Bird" dogs of a new kind are the parachute jumpers being trained by the army in Soviet Russia. Taken aloft in planes, they are flown to the scene of action, placed in cylindrical boxes with parachutes attached, and then dropped. When the "flying dog house" touches the ground, the impact releases a spring and the cylinder opens, setting the dog free to perform the task for which it has been specifically trained.

"Homing" Plane Is Guided by Team of Robots

Radio compass and automatic pilot are teaming up to take the business of flying a plane out of human hands. The navigator of the crew is the radio compass; the Sperry Gyropilot does the rest of the work. Both instruments are already in use, and now tests are progressing on a connecting link that will harness the two robots together. By means of the radio compass a plane can tune in on any radio broadcasting station and the ship will automatically turn and fly straight for the station aerials. The Gyropilot then takes over the control of the flight. Its two

gyroscopes regulate stability and keep the plane level, and when pointed by the human pilot will maintain its direction on a predetermined course.

HOME GAS SUPPLY IS GENERATED BY BURNING WASTE

Gas to heat and light your home and operate its "utilities" is now being generated in a home unit that uses purely waste materials for fuel. It is an individual gas-making plant that distills refuse, wood, paper, corn cobs, straw—anything that burns—and produces a smokeless gas that can be piped from a basement storage tank to the kitchen stove, refrigerator, radiators, lights, washing machine and power plant. Economical in its fuel consumption, it can turn two tons of farm waste or one cord of wood into gas sufficient for nearly three months of home use. The generator consists of an alloy metal retort in a semi-steel furnace, a gas purifier, steel storage tank, pipes, valves and gauges.

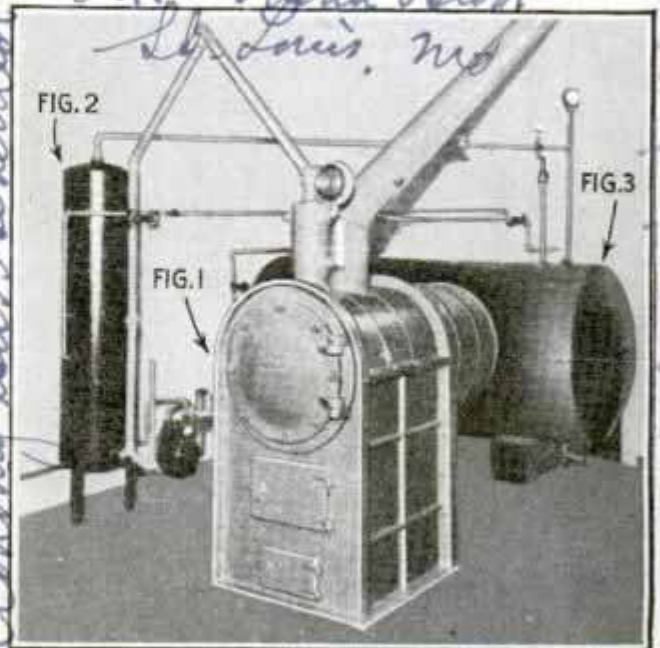


Fig. 1, Retort Enclosed in Semi-Steel Furnace; Fig. 2, Gas Purifier; Fig. 3, Gas Storage Tank

Sperry Gyrocompass Co. Inc. 1012 Broadway N.Y.

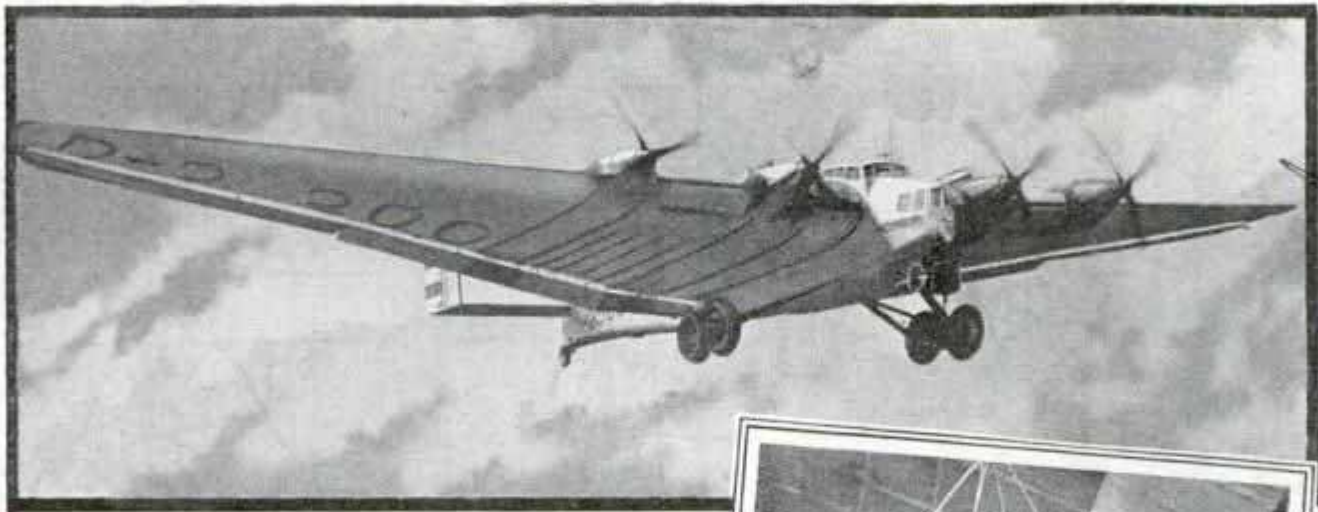
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5 N. Grand Blvd St. Louis, Mo

Out of business 10/21/37

Longer Range of Diesel Plane Cuts Fuel Cost



Diesel motors weighing 2.79 pounds per horsepower have proved themselves more economical for long-range aircraft transportation than relatively lighter gasoline engines of equal power. The "Hindenburg," latest transport built for a German air line, is powered by four such Diesel motors developing 750 horsepower at 1,620 revolutions per minute and at current prices its fuel bill is only one-fourth as high as if gasoline motors were installed. Not only is oil less expensive, but less fuel is consumed, with the result that gross weights of motor plus fuel for both types of engine are equal on a trip of about five hours. On longer flights, the Diesel shows an operating advantage offsetting the weight objections. The "Hindenburg" is a Junkers monoplane, sister ship of the "Deutschland," already in service.

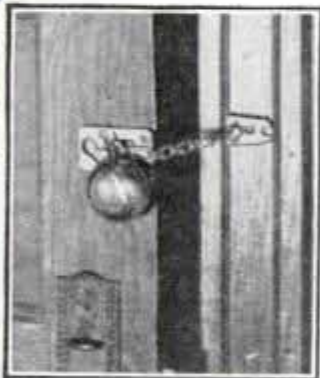


Top, Diesel-Powered German Plane in Flight; Bottom, Hoisting Diesel Unit Aboard the "Hindenburg"

Junkers Flugzeugwerke A.G. Dessau Germany

3828 N. Oakley Chicago

BURGLAR ALARM ON DOOR CHAIN RINGS WHEN IT IS MOVED



Immediate warning of the presence of an intruder attempting to force open a door is provided if the door is fitted with a burglar alarm in the form of a bell attached to a latch chain. The chain prevents the door from opening and the bell rings as the door is moved inward.

Adept Signal

Lightning Easy to Miss

LIGHTNING is beautiful and dangerous—but the rug on your parlor floor is much more likely to do you bodily harm. You might as well enjoy the spectacle of lightning and banish worry, for George Bliss of the Philadelphia weather bureau estimates that only one bolt in 100 hits the earth. As often as not, lightning courses upward instead of earthward. Your chance of being struck is less than one in 200,000—it is three times as probable you'll be hurt tripping over that rug!

Chicago Daily News 8/13/35

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DON'TS *for*



Left, This Hunter Keeps the Muzzle of His Gun Away from Himself and His Dog

ment, careless upland game hunters who blithely attempt to hurdle fences with loaded guns, and waterfowl hunters who drag loaded guns into boats are in the group that cause hurry-up calls for the ambulance. The "I-didn't-know-it-was-loaded" boys do their part to pile up the hunting accident list as do the "I-thought-it-was-a-

EACH autumn approximately 7,000,000 sportsmen in the United States take to the open to hunt. The open season unfortunately marks another "opening," the beginning of casualties that bring death and suffering to the hunting army.

Hunters, careless in the handling of rifles, shotguns and rowboats, annually cause many accidents and deaths in the ranks of sportsmen. In some sections of the country there are hunters actually afraid to go afield because of too many "quick trigger" artists. Nearly every state which licenses hunters faces this problem of reducing hunting accidents.

The majority of accidents are preventable, especially those involving guns. Rookie hunters handling new guns, inexperienced shooters suffering from excite-

ment, careless upland game hunters who blithely attempt to hurdle fences with loaded guns, and waterfowl hunters who drag loaded guns into boats are in the group that cause hurry-up calls for the ambulance. The "I-didn't-know-it-was-loaded" boys do their part to pile up the hunting accident list as do the "I-thought-it-was-a-

deer" group. There have been so many quick trigger shooters in parts of the wild deer country that some hunters consider it dangerous to even carry a white handkerchief in the woods during the open season, because a careless hunter may take the flash of white for the flag of a deer, shoot in haste and repent later.

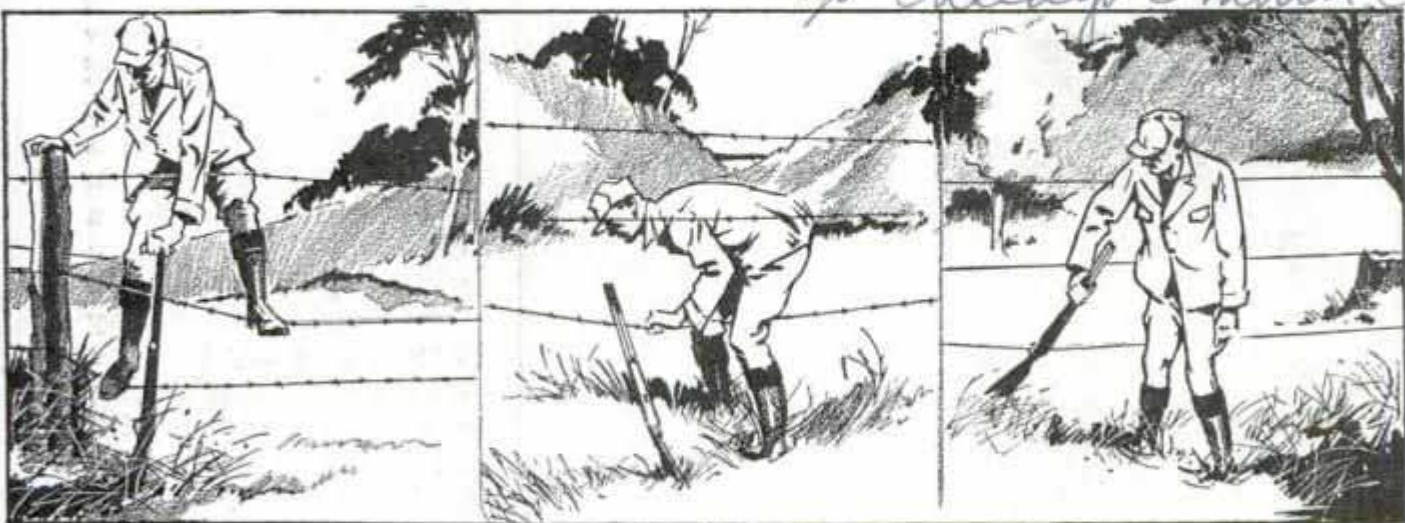
Here are some practical "hunting don'ts" which all of us who like to hunt should keep in mind. The "don'ts" refer to the common ways in which hunters get into trouble while on a shooting trip. All represent carelessness of the first order and point the way for the hunter to wear a halo and a harp if he doesn't change his tactics. For the small game hunter these hints are important.

Don't climb over a fence while using

HUNTERS

By
BOB BECKER

c/o Chicago Tribune Chicago



Above, Don't Do Any of These Stunts with Your Gun if You Want to Get Home Alive

your loaded shotgun or rifle as a support. This is an excellent way to get rid of one of your hands. The real hunter never uses his gun for a "pole vaulting stick" or as a crutch to climb over a barbed-wire fence. A shotgun should not be used as a support or as a hammer to pound a nail.

Don't take a "rest" by leaning on the muzzle of a loaded gun. This is a too common practice among careless or inexperienced hunters. If you want your arms or hands to remain with you, it's a good idea to keep them a safe distance from the muzzle.

Don't crawl through a fence and then pull your loaded gun, muzzle first, toward you. The fact that a twelve-gauge shotgun can blow a three-inch hole in a piece of wood should be enough to discourage any rookie hunter from trying to pull one through a fence. If hunting with a partner, hand your gun to him to hold while you go through the fence. Then he can hand your gun and



These Prairie Chicken Hunters Are Not Careless; They Have Loaded Guns but They Are Carrying the Weapons Safely

his over the fence, muzzle up and at an angle, and pointed away from both of you. The safest way is to unload both guns. When using a double-barreled gun "break" the gun so no discharge can be made while the weapon is being handed around. If hunting alone, place the shotgun or rifle on the ground parallel with the fence and underneath the lowest strand



their gun almost horizontal with the ground, the muzzle pointing toward the next fellow in line. The sudden flush of a bird, the involuntary tightening or jerking of the trigger finger due to excitement—and there is another accident. If you want to be ready for a quick shot, carry the gun almost perpendicular to the ground. Another easy way is to carry the gun on the right shoulder, or carry the weapon with both hands on the gun and point the muzzle down.

Don't rest a loaded gun against a tree when you sit down for a rest, especially if there are dogs in the party. Several accidents occur every year from the discharge of

of wire, cross over, then pick it up, the muzzle pointing away from you.

Don't crawl through a fence with your gun while doing a lot of acrobatic squirming in the wire. Sometimes a careless hunter parts the two lower strands of wire to open up space enough to get through. Then he rests his gun on the lowest strand and eases through, bringing the gun along, facing the risk of accidental discharge if the trigger gets caught on the wire.

Don't carry your loaded gun in the crook of an arm so it points at somebody else in your party. Many shooters walk along,

guns knocked over by hunting dogs. Guns should be rested in a safe place out of the dirt, but the wise hunter unloads first.

Don't unload your gun among hunters with the muzzle pointing anywhere but down. The reason is obvious.

(Continued to page 138A)

Top, Guns Carried Safely but Ready for Use; Center, Shotgun Pointing Away from Hunter as He Unloads Boat; Bottom, Shooter at Left Has "Broken" His Gun for Safety

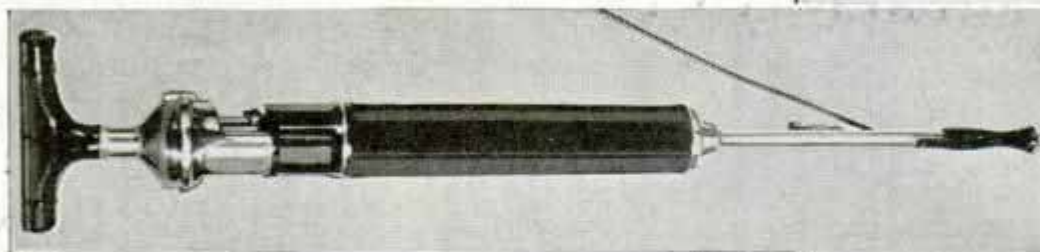
Making HOME TASKS



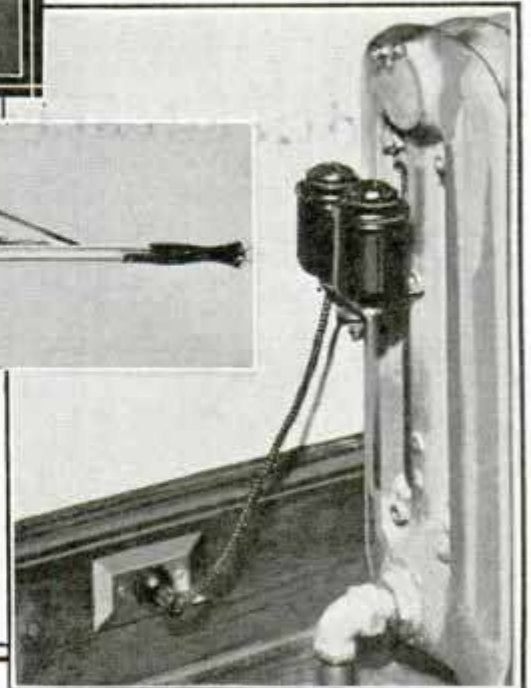
Handy Grinding Machine Turns Odds and Ends of Soap into Flakes for Washing



Above, Small Wheel on Top of Wringer Can Be Turned to Regulate Pressure of the Rolls; Left, Handy Machine for the Home Scrapes, Waxes and Polishes Floors; Below (Center), Lightweight Vacuum Cleaner Actually Is an Electric Broom; It Speeds Up the Task of House Cleaning



Left, Bucket with Partition Is Used in Cleaning; Soapy Water Is Kept on One Side, Clear Water on the Other; Right, Small Humidifier Attaches to Radiator and Plugs into Electric Socket; It Operates Silently



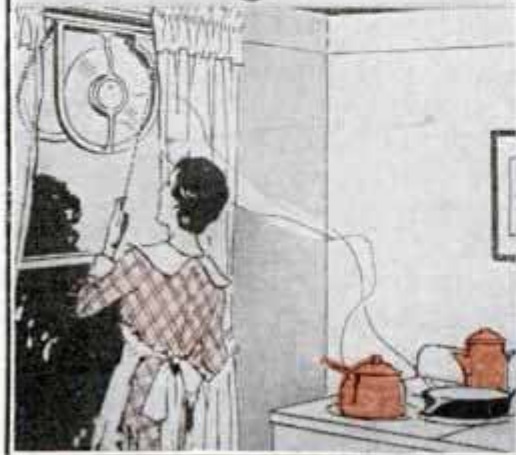
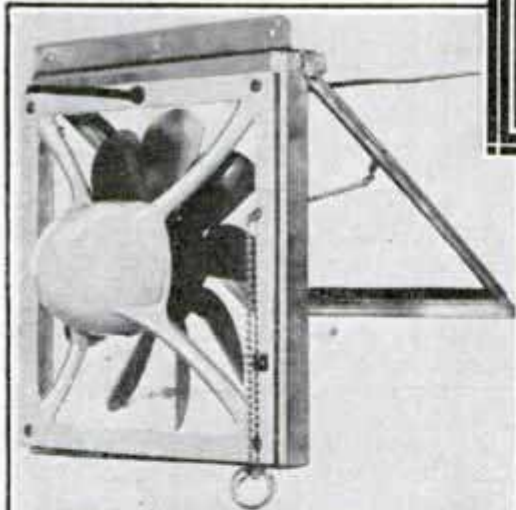
a PLEASURE



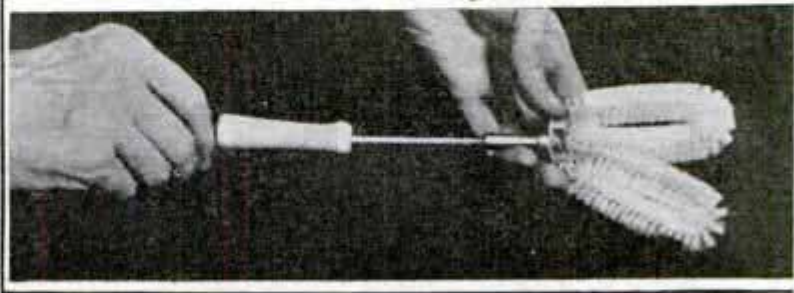
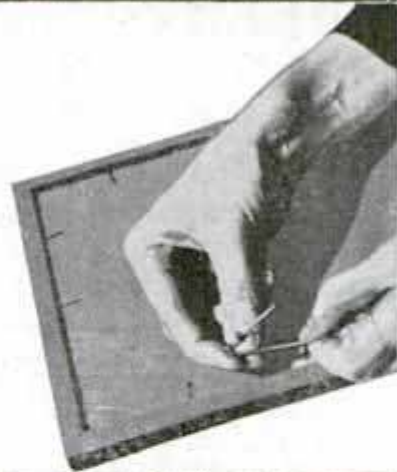
Above and Right, Two-Purpose Lamp; for Bridge, the Arm Is Inverted to Light Room Indirectly; One Bulb Is Controlled by Mercury Switch That Makes Contact When Arm Is Turned



Below, Ventilating Fan Is Installed Directly into the Window Glass; It Requires No Special Screen and Is Fully Automatic in Operation

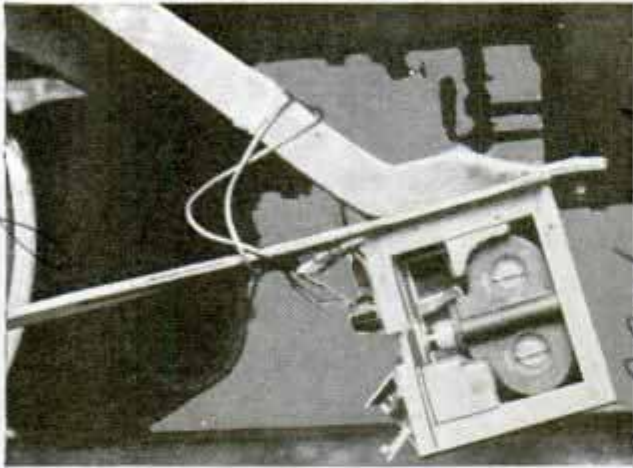


Right, Picture-Hanging Device with Two Points for Attaching to Back of Frame Has a Third Nail for Fastening to Wall; It Eliminates Wires, Screws and Brads; Bottom, Washer Expands When inside Bottle to Make Cleaning Easier; Turning Handle Lines Up the Two Brushes and Forces Bristles against Sides of Bottle



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MOVIE OF FAULTY CAR WHEEL SHOWS WHY TRAIN SWAYS



Slow-Motion Camera Attached to Car Truck Is Focused at Point Where Wheel Touches Track

Slow motion pictures of car wheels rolling along the rails a mile a minute are helping railroads improve the riding qualities of fast trains. Truck oscillations became a problem as time-tables of a railroad out of Chicago were speeded, and engineers decided to study the wheels with a slow-motion sixteen-millimeter camera. Bracketed on a troublesome truck, it was focused on the point where wheel touched rail. At sixty miles an hour, solenoid control started the camera. Pictures of a worn and a new wheel showed both oscillated. It was found the ride could be made smoother by building wheels without the taper previously standard for railway wheels. Motion pictures of the re-designed wheel showed no oscillation, and the flange seldom impinged on the rail on straight track. As a result of the photographic study, this railroad builds all new wheels without taper.

LONG-WEARING PISTON RING HAS NON-FRICTION BANDS

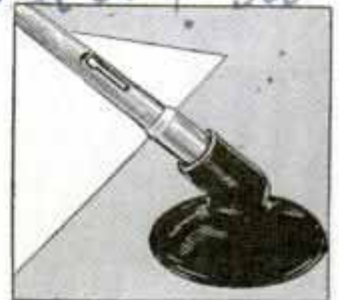


Constructed with anti-friction alloy inserts that give longer service and reduce cylinder wear, a new piston ring is available for automobile and industrial engines. The ring is made of cast iron, with bands of bearing metal pressed into the side under great pressure. When the

engine is operated, the bearing rings bur-nish the sides of the cylinder and assure better compression. The piston ring seats gradually and prevents excessive wear of cylinder walls. In case of ring breakage, the rings or bands hold the ring together so that the pieces will not get into the cylinder and score the walls.

SUCTION CUP PENHOLDER IS MADE OF RUBBER

Made of rubber, a small fountain penholder for the desk employs two suction cups to accomplish its purpose. One cup in the base holds the device securely to any smooth surface. The second cup holds the cap of any make of fountain pen. With the cap in the holder, it is a simple matter to insert the fountain pen in the cap when not in use, thus preventing the pen from dropping ink, drying up or leaking, but making it always available when needed. It is particularly adapted to those who use a pen out of the office, where it may be mislaid, since the holder can be carried easily in a pocket.



X-RAY PRODUCES REGAL LILY OF UNUSUAL BEAUTY

Experiments at the General Electric company research laboratories to determine the biological effects of X-rays on certain bulbs have resulted in the production of the Roentgen regal lily, a flower of unusual beauty for which a patent application has been filed. The new form was found among the bulbs of ordinary lilies X-rayed by Dr. C. N. Moore and is a "nondehiscent" variety, which means that the anthers do not open and shed their pollen, a great advantage for commercial growers since the pollen falling on the petals often ruins flowers for display purposes. The anthers of the X-ray lily swell but do not burst. It has been found that the X-raying produces many abnormalities and monstrosities, but once in a while a new and improved strain results.

*Regl. Howell Co 1881
Larchmont Ave Chicago*

*29th Milwaukee Ave
Chicago 52*

1091

1101

2009360

The Skinner Chuck Co.



Oscilight TELEVISION Receiver

CLEAR black-and-white television pictures, transmitted by radio and reproduced on a cathode-ray tube with accompanying sound, were exhibited recently at the studios of Farnsworth Television, Inc. Although this demonstration was highly successful, the actual introduction of television in the home will probably be delayed for many months, owing to problems of transmission rather than reception.

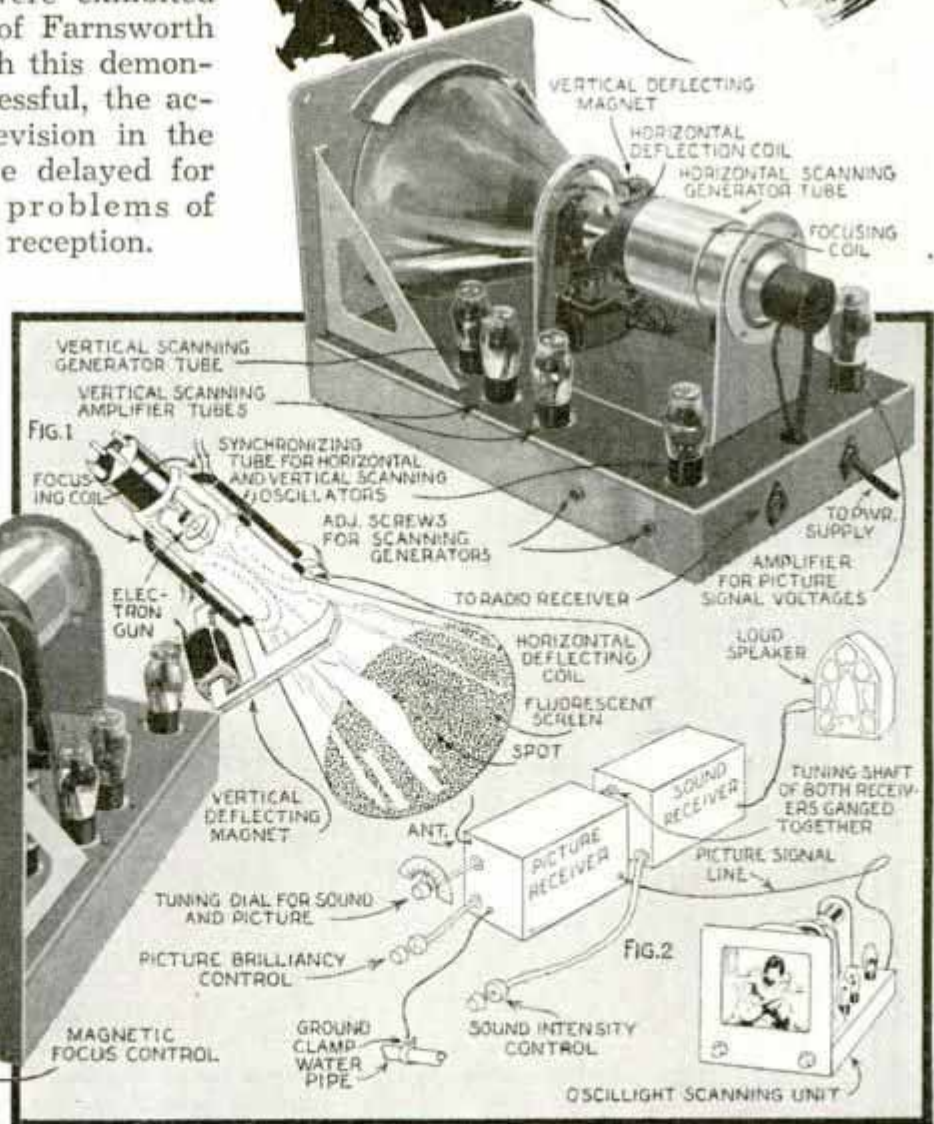
Mr. Farnsworth states that "as soon as technical information can be released, amateurs will have an opportunity to make re-
(Continued to page 146A)



FLUORESCENT SCREEN

PICTURE CONTRAST CONTROL

FRONT VIEW OF SCANNING UNIT

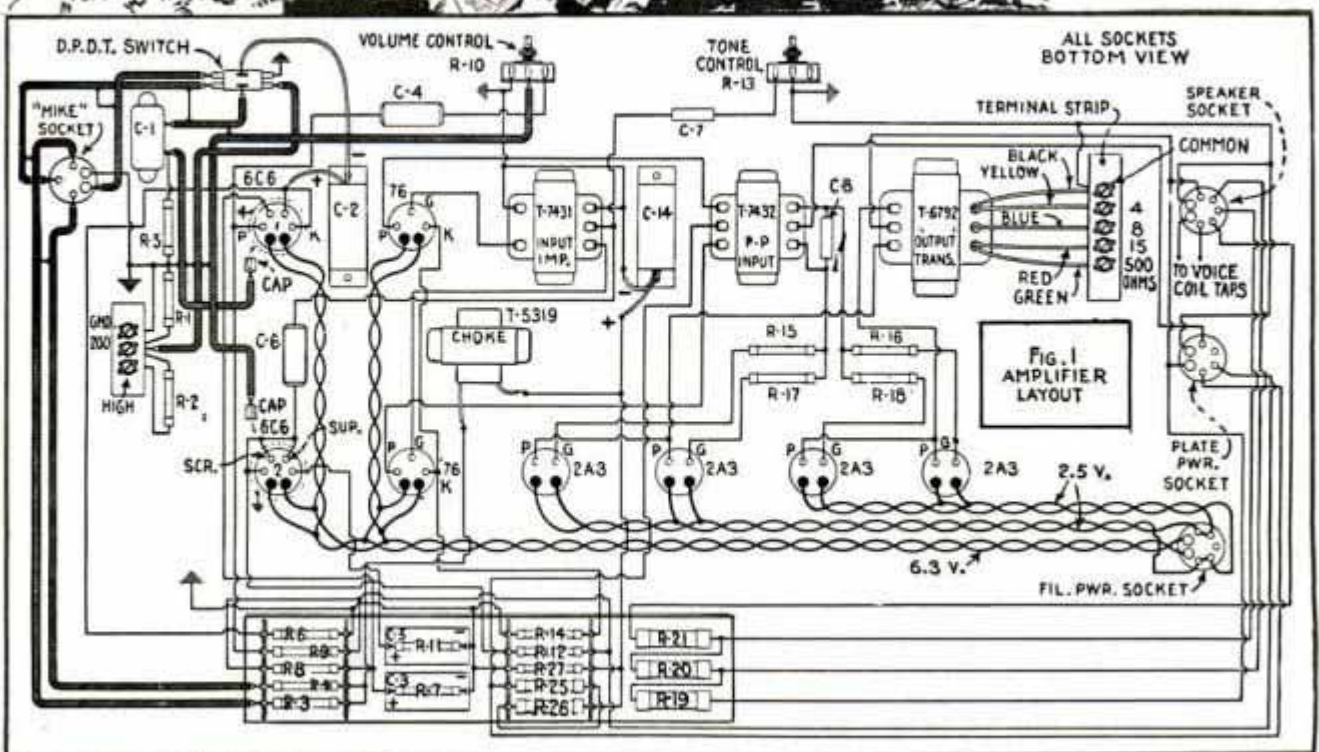
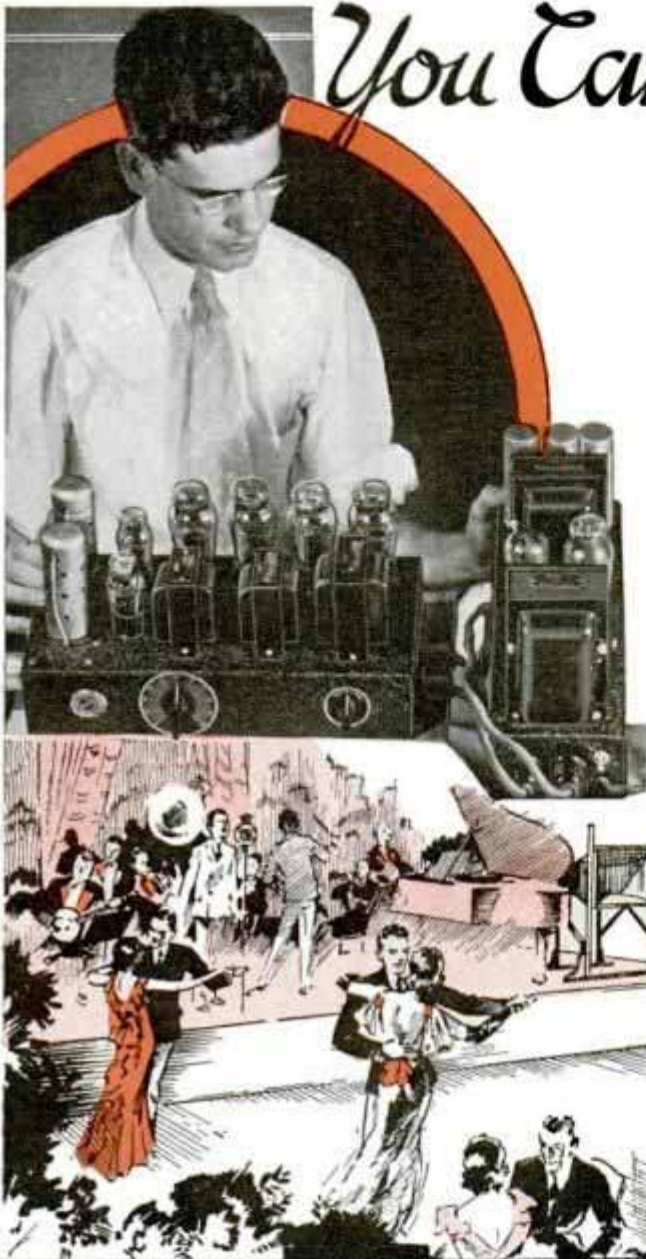


You Can Make Money

By W. C. HOWE

BUILDING your own amplifier—testing it, selling or renting it—brings to you a satisfaction of personal achievement well worth the time and effort. The 30-watt amplifier to be described is designed in two major units which can be assembled on a rack-and-panel or broad shelf for permanent installation, or it can be made portable easily by mounting in a two-compartment carrying case.

The usual rental charge for the use of an amplifier of this type with three speakers, a microphone, and a phonoturntable with an operator's service is \$15 per evening or \$75 for a week of fifty hours. County fairs, dances, bazaars, basketball tournaments, dog shows and special holiday publicity for merchants suggest a few of the ready markets for this profitable service. Capable of producing 30 watts of distortionless sound, with excellent tone, the output of this amplifier

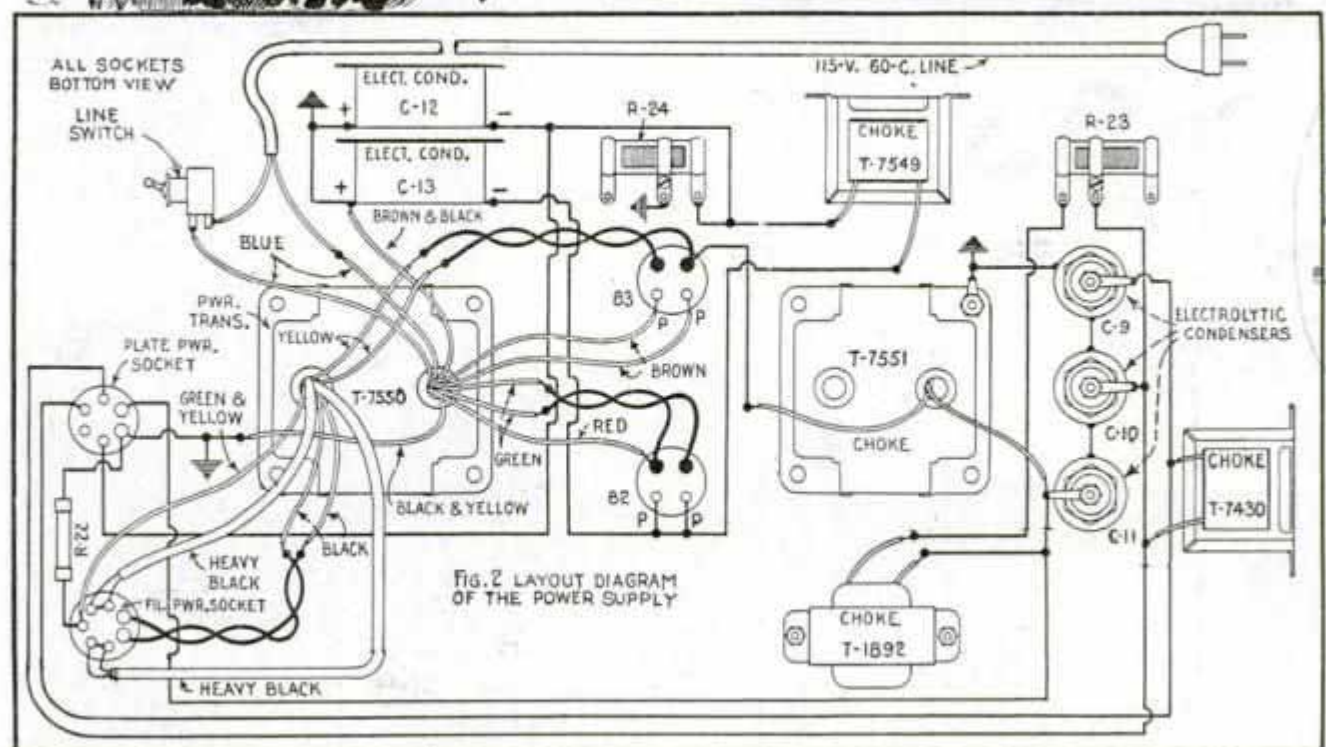


with this 30-WATT AMPLIFIER

is under control at all times and may be regulated to meet the special requirements of the location and audience

The amplifier unit is assembled on a metal base $3\frac{1}{4}$ in. high, $7\frac{1}{2}$ in. deep and 15 in. long; the power-unit base is $13\frac{1}{4}$ in. high, 5 in. deep and 15 in. long. These bases with the holes drilled and all tube

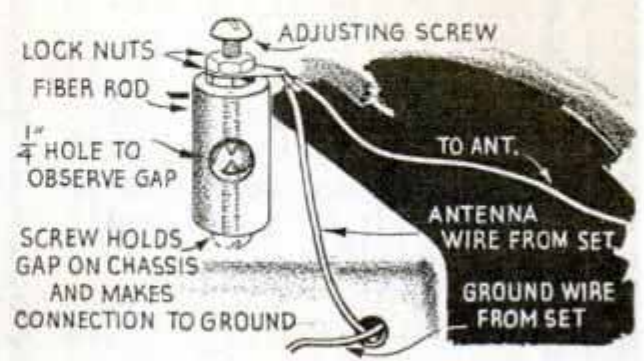
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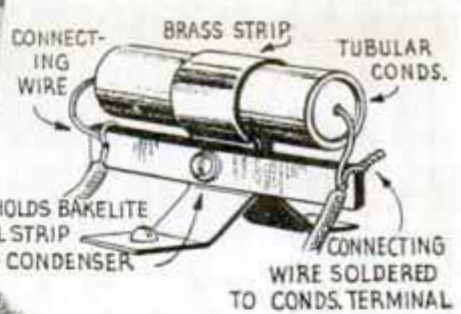
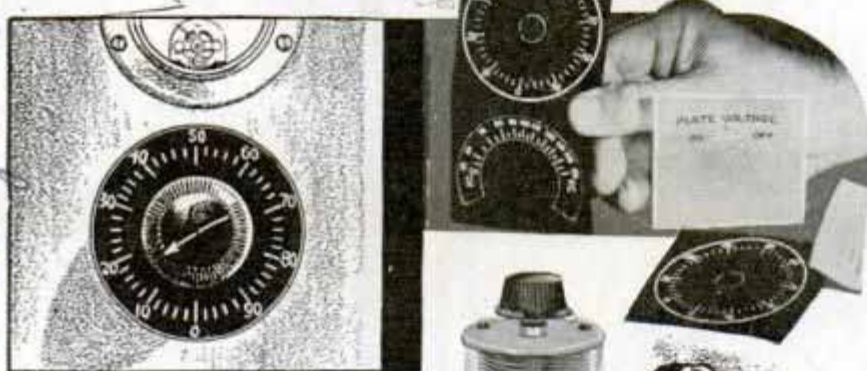
Practical Hints for the Radio Experimenter



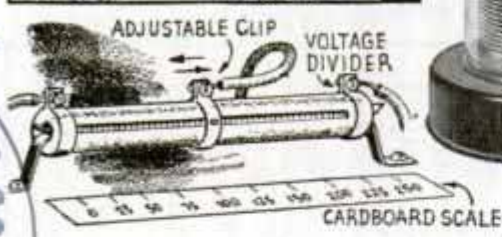
Left, Special Dials and Nameplates Can Be Made by Sketching the Desired Design on Tracing Paper Which Is Used as a Negative for Printing on Glossy Photographic Paper; Cut Out and Covered with Celuloid, They Mount Directly on the Panel



Above, Inexpensive Protective Gap for Receiver Protects Antenna Circuits from Static and Other High-Voltage Surges; a Piece of 1/2-In. Fiber Rod, 1 In. Long, Is Drilled and Tapped for Pointed 6-32 Brass Machine Screws, Assembled and Mounted on Chassis as Shown



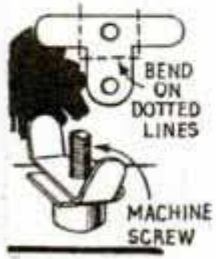
Above, Rugged Mounting for Tubular-Type Fixed Condensers May Be Made from a Piece of Scrap Bakelite and Brass Strip



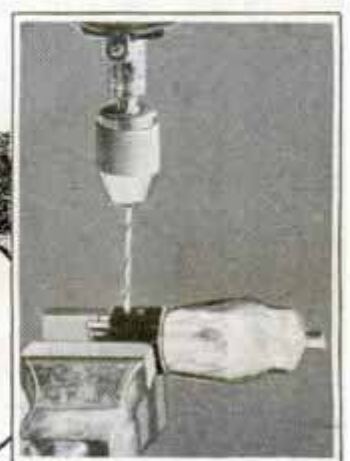
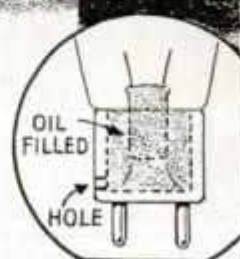
Above, Handy Scale for Variable Voltage Divider Does Away with Voltmeter Checking Each Time Clip Is Changed; Right, Wave Trap, with Shielded Coil in Base, Tunes from 160 to 600 Meters



SCREW HOLDS BAKELITE TERMINAL STRIP AND CONDENSER



Left, Homemade Wing Nut; Upper Hole Is Drilled First, Tab Is Bent Under and Second Hole Drilled, Using First as a Guide, Then Tapped; Right, Overloaded R.F. or Rectifier Tubes May Be Drilled and Base Filled with Oil to Prevent Arcing



Radio & Television
 27603/63 Alley. N. Wash. D. C.

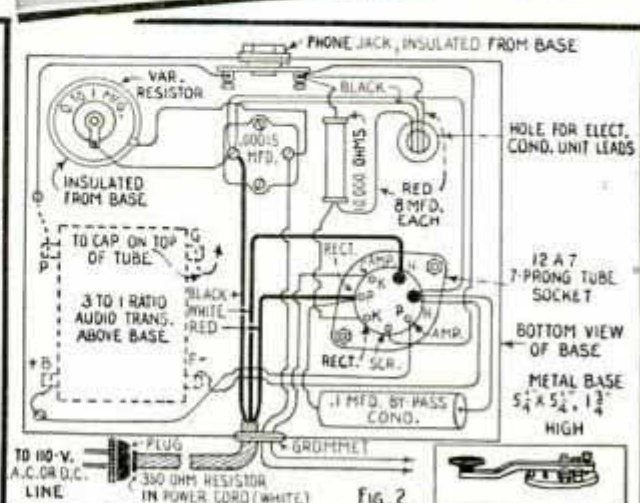
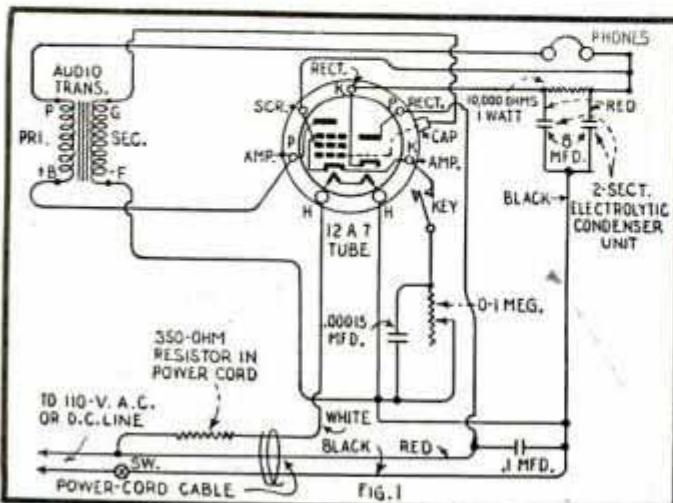
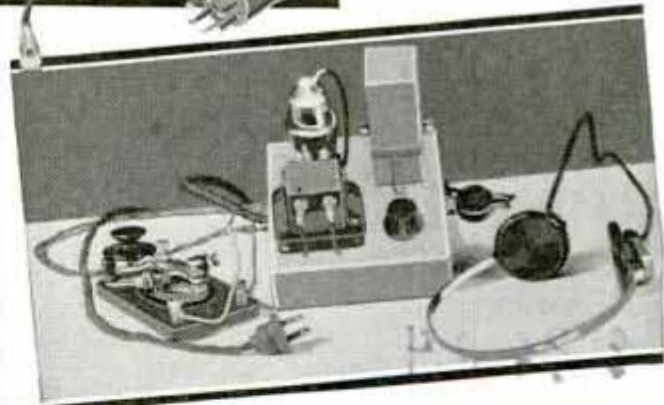
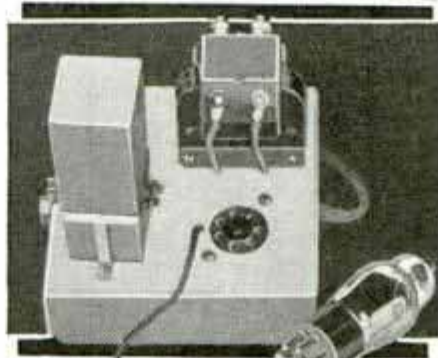
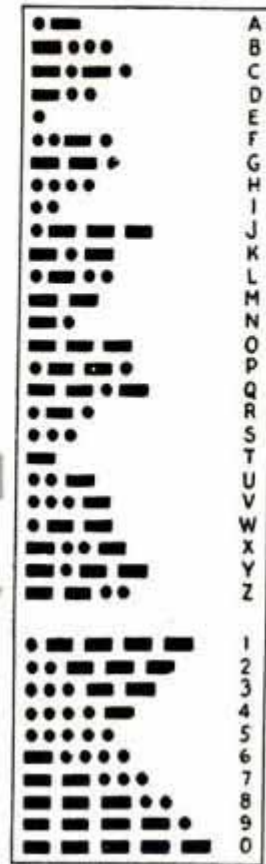
A.C.-D.C. Code-Practice Set

BEGINNERS will find this code-practice set easy to build and most of the parts are to be found in the average experimenter's junk box. No A or B-batteries are required as the set operates directly from either an a.c. or d.c. house-lighting line. Although only one tube is used, it combines an oscillator with a half-wave rectifier which eliminates the usual B-battery. The filament, or heater, of this type-12A7 tube is taken care of by a resistor built into the power-line cord which drops the line voltage to the proper value for the tube.

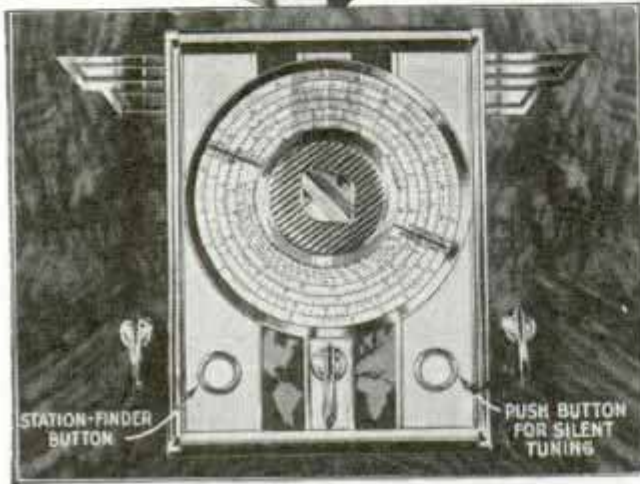
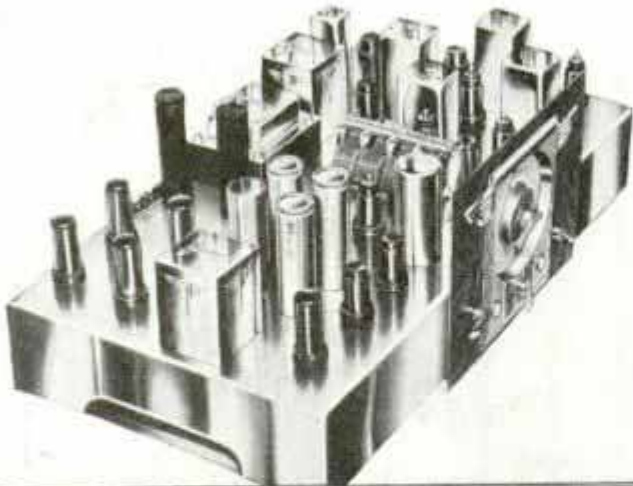
The schematic circuit diagram is shown in Fig. 1, and a simplified wiring diagram in Fig. 2. A sheet-metal base, 5¼ in. square and 1¾ in. high, is used to mount the various parts as shown in the photos. All connections under the base are clearly indicated in Fig. 2, the key leads and "cordohm" power-line cord being brought out through a hole in the rear of the metal base.

When connected, if the oscillator does

(Continued to page 146A)



Eighteen Metal Tubes in All-Wave Super



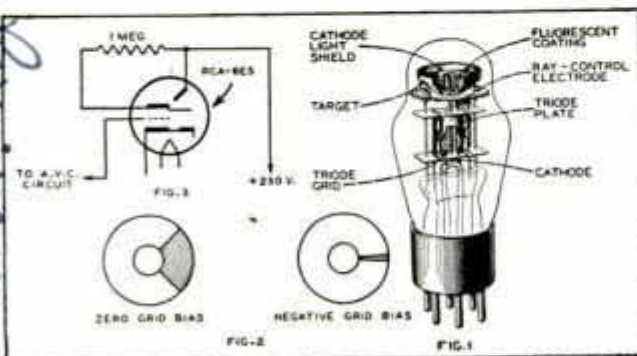
All-Metal Super Chassis; Control Panel Below

Many new features are included in this receiver which employs all-metal tubes and tunes from 4½ to 2,000 meters. Five power pentode tubes are used to deliver 20 watts of undistorted audio power to a specially designed loudspeaker. Push buttons on the control panel enable the operator to locate weak DX stations easily and silence the set when tuning.

£ 36 2 4

Electron-Ray Tube for Visual Tuning

A convenient and non-mechanical means to indicate accurate tuning of a receiver



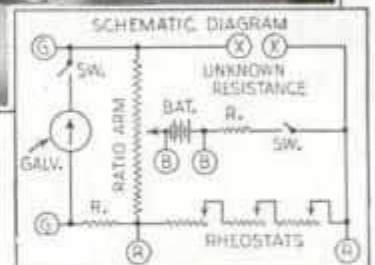
Details of Miniature Cathode-Ray Tuning Tube

to the desired station is now available in the form of an electron-ray tube known as the RCA-6E5. The visible effect is observed on a fluorescent target located in the dome of the bulb shown in Fig. 1. The tube will be located in the receiver so that the dome may be viewed above the tuning dial to enable the operator to see when the receiver is tuned to the most resonant point for each station. The strength of the incoming signal varies the shadow, indicated in Fig. 2, so that when it narrows down to its thinnest dimensions, the station is known to be accurately tuned in. Circuit connections are shown in Fig. 3.

£ 962 6

Resistance Bridge for Students and Experimenters

This low-cost portable resistance bridge measures resistance from .01 ohm to 11,000,000 ohms with a limit of error of about one per cent. All wiring is color-coded for instruction and the instrument may be quickly removed from the case; a C-battery and galvanometer are built-in.



Portable Wheatstone Bridge of Rugged Construction for Shop, Laboratory or Individual Instruction

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

RCA Supply Co
Harrison, N.J.

The Hunter Co
1255
Harrison

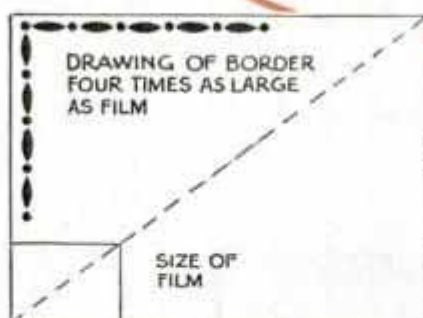
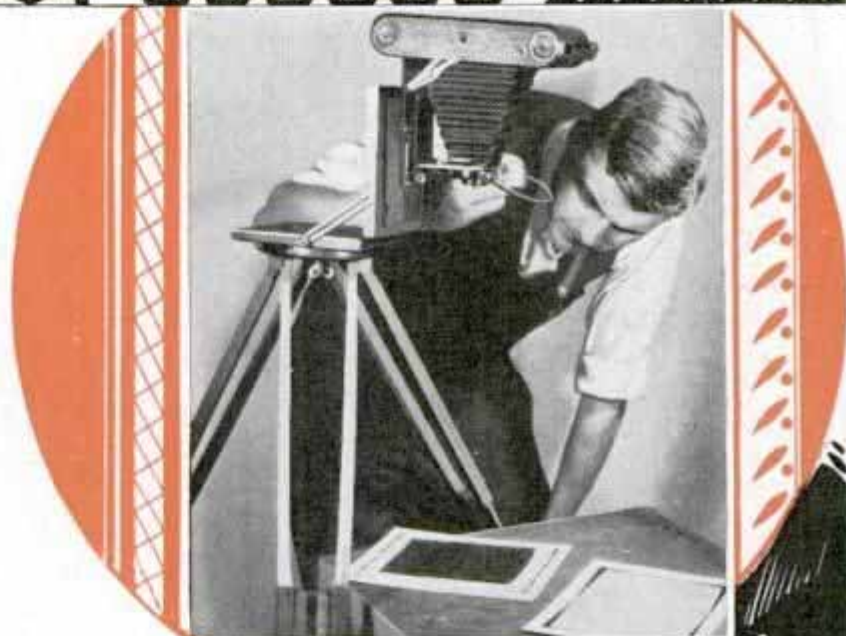


Make Your Own PHOTO BORDERS

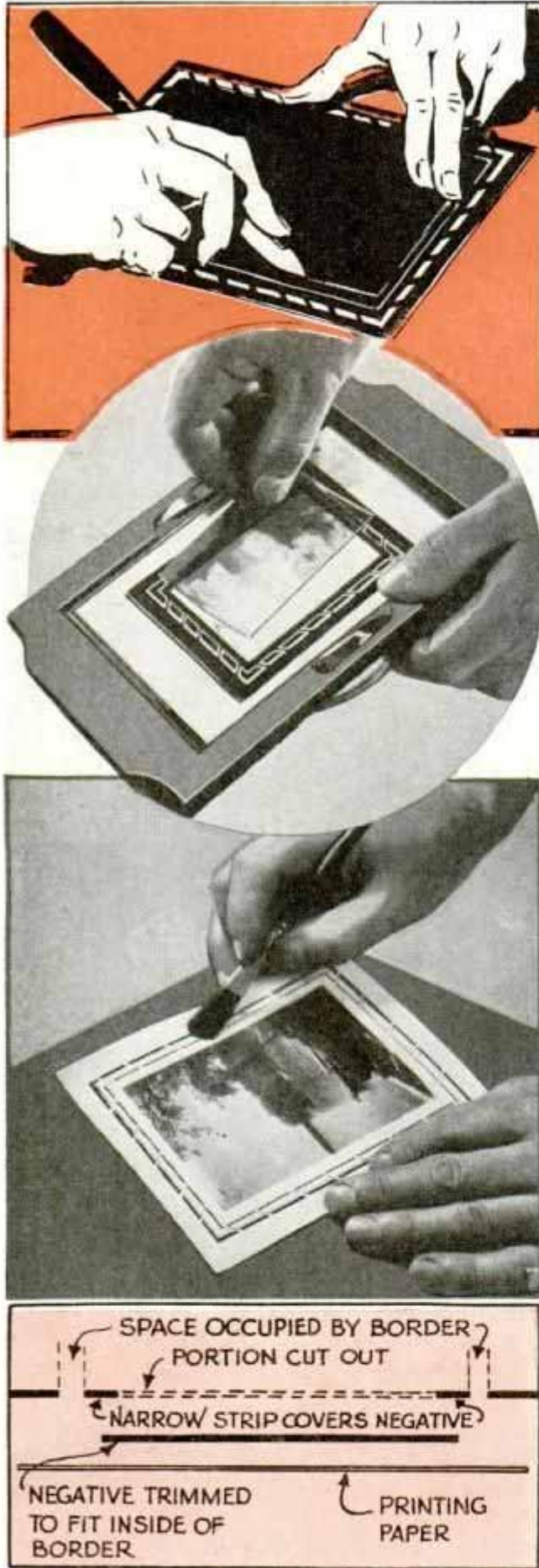


BORDER masks for your photos that you can make up in a variety of designs, either in black or in shades of gray, will go a long way in getting distinctive prints. And, the making of the borders does not involve any difficulty, as you merely make an enlarged border and photograph this to get a border mask, which is cut out to fit over the picture negative when printing.

There are a few things to keep in mind when making up such printing masks, which will make it "easy going." First get a piece of white cardboard or Bristol board, which is, say four times as large as the negative of your camera. It is important that the cardboard be exactly proportional in width and length to the print, no matter how much larger it is. One way to determine this is to lay the print on the cardboard at one corner. A diagonal line from one corner of the print to the opposite one should, if extended, as indicated by the dotted lines, coincide with the opposite corner on the cardboard if its size is proportional to the print. If the diagonal line does not coincide with the corner on the cardboard, the latter must be cut



down a trifle, trimming off the paper from two adjacent edges so that the cuts will intersect somewhere on the diagonal line. Of course, these adjacent sides must be at right angles. The next step is the appli-



The Picture Negative Is Trimmed to Overlap the Cut-Out of the Border Mask; Lower Photo, Shellac Being Brushed on Border of Print, Which Is to Remain Black While the Rest of the Photo Is Stained

cation of a larger border design along the edge of the cardboard. If you like, you can draw and ink this yourself, using black India ink, or perhaps you can find suitable printed borders in newspapers and magazines, which, when cut out, can be pasted neatly on the cardboard. Another method is to use border stencils for the purpose. Or, you can have a printer set up a number of border lines of various kinds, and print them on ordinary paper so that you can cut the borders out and paste them in place on the cardboard. Border designs in various shades of gray can be used, as these are photographed just as easily as designs in black.

Next, with the cardboard pinned to the wall, set your camera on a tripod and photograph it so that the border design will be on the edge of the negative. To get a good clear negative of this, you should focus carefully. On many types of cameras this can be done by placing a piece of ground glass or tracing paper over the film rollers. After a good focus has been obtained, substitute the film, without disturbing the focus. Use a slow film and close down the lens aperture. If you have several border designs of equal size to photograph, place each one in the same position as the first and re-focusing will be unnecessary. If you develop the roll yourself, add a fourth more carbonate than the developing formula calls for to increase the contrast. Develop the film as far as possible. The resulting negative, when thoroughly dry, is carefully cut inside the border, leaving a narrow strip of black between the border and the cut-out. The picture negative over which the border mask is laid, when printing, should be trimmed to such size that it will overlap slightly on the black strip, but not on the border itself.

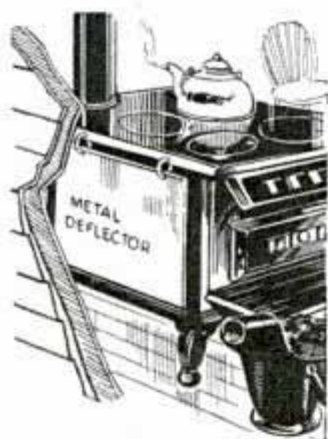
Tinting your photos with either oil or water colors is another way to make them stand out from the general run of snapshots. Inexpensive coloring outfits, with full directions, which are easy to follow, are available to the amateur. In addition, you can get interesting results with two other methods: toning, and staining either the picture or the border. If you want to leave the border black, apply a coat of shellac to the parts that are to remain untouched by the stain. After the prints

are colored and dried, the shellac is removed with alcohol.

A good method of placing snapshots in albums, with assurance that they will not become uneven or curl, is to use dry mounting tissue. Coat thin sheets of tissue paper with the following varnish, allowing the coat on one side to dry before coating the other: Liquid shellac, 5 oz., and Canada balsam in alcohol, 5 oz. The dry sheets are cut to the same size as the snapshots, and are placed between the latter and the mounting paper or album leaves. Passing a warm flatiron over the snapshot will fasten it securely to the mounting paper.

Heat Deflector Hung on Edge of Stove

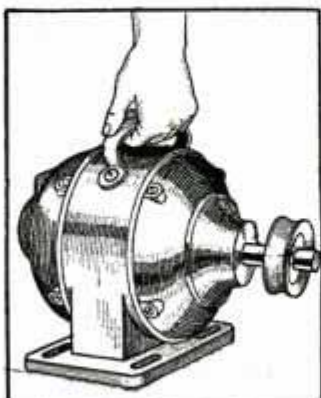
If your cookstove sets so close to a wall that it is necessary to use a heat deflector, suspend a piece of sheet metal from the top edge of the stove with a couple of rings as shown.



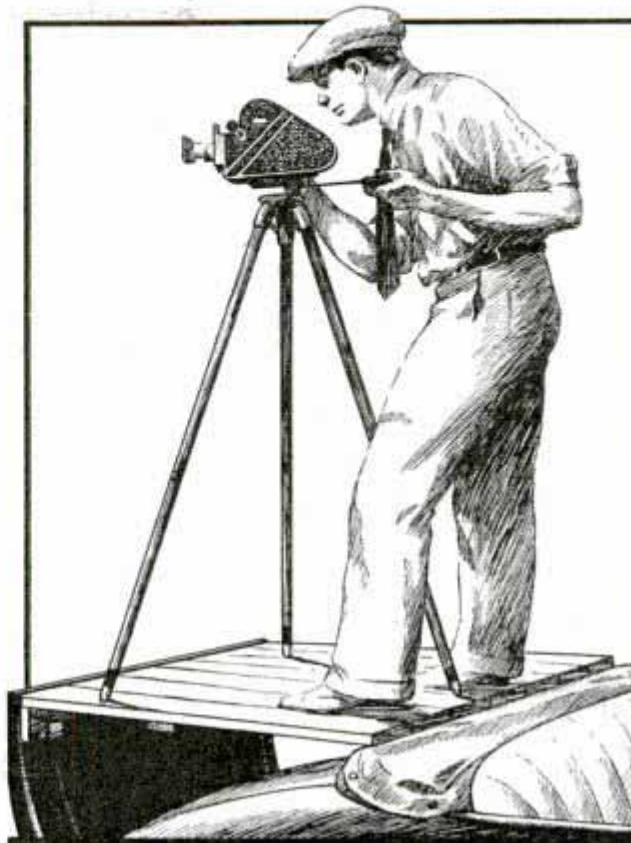
This type of deflector not only looks better than a piece of tin tacked to the wall, but it is more effective as air can circulate around it and carry away the heat.

Handle for Carrying Electric Motor

Small motors, such as are used around the home and workshop, will be easier to move about if handles are attached to them. A screen-door handle, bent to the contour of the motor and screwed to the stator frame, is suitable for this purpose. Care should be taken that no iron shavings reach the interior of the motor while drilling and tapping the screw holes, which should just penetrate the outer shell.—Glenn R. Hampton, McCamey, Tex.



Platform on Car to Take Movies of Sporting Events



Platform over Rumble Seat Elevates Camera for Taking Movies of Parades and Sporting Events

For the amateur movie maker who wishes to get shots of parades, sporting events, etc., some arrangement for elevating the camera above crowds and traffic is indispensable. The owner of a car having a rumble seat will find the construction of a platform for this simple. Most rumble seats have detachable back cushions which, when removed, expose angle brackets. These can be used to support one end of the platform, while the other end can rest on the car body. If made to lock into position on the brackets, the platform will be rigid, and will be steady even when the car is in motion. When not in use, it can be slid into the rumble-seat compartment.—F. W. Godwin, Spring Valley, Calif.

Sanding Work Before It Is Assembled

When making wood articles, it is best to first cut and shape all the parts and then sand them before assembling. This method makes the job of sanding easy and eliminates any possibility of the parts getting soiled or marred when they are laid aside after the sanding is done.

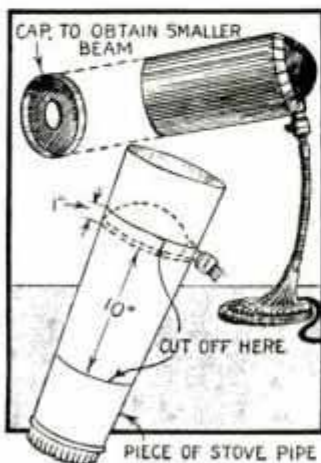
Ventilating Porch Columns to Keep Them from Decaying



Holes Drilled in Porch Columns Allow Air to Circulate Through Them and Prevent Decay

Perhaps you have wondered why your porch columns decayed from the inside when the outside was kept well preserved with paint. If so, your trouble is probably caused by moisture accumulating inside the columns and causing the wood to rot. Experiments have proved that 1-in. holes drilled through the columns near the top and bottom allow enough air to circulate through them to prevent this trouble. Disks of copper mesh cut to the proper size and hammered or pushed into the holes will keep out insects.

Photo Spotlight Improved from a Desk Lamp

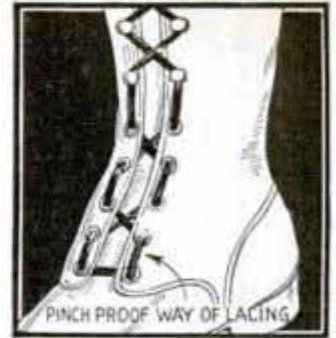


Needing a spotlight to take portraits, I made one by slipping a short length of tapering stovepipe over the reflector of a desk lamp to serve as a hood, using a photoflood bulb in the lamp. Several slits are cut around the large end of the

pipe to provide tabs, which are bent over the reflector to hold the hood in place. Both inside and outside of the pipe should be painted flat black to reduce reflection. To concentrate the light in a small spot, a cap with a hole in the center is fitted over the hood.—H. B. Heiser, Berea, Ohio.

Boots Laced to Prevent Pinching

When laced in the usual way, high boots often fold near the bottom of the laced part and pinch the feet when walking or kneeling. By lacing them as shown so that the laces, in passing from one side to the other, come under the leather strips holding the eyelets, this trouble is eliminated.



Cork Used as Socket in Emergency Electric Lamp

In an emergency, I needed an extra socket for a small 6-volt bulb and, not having any at hand, one was improvised from a large cork as shown. A small brass screw eye, to engage the bottom contact of the bulb, was used as one terminal, while a wire twisted around the metal sleeve on the bulb served as the



other. This socket is not recommended for use on high voltages, of course, but is all right for emergency use on dry cells.—C. E. Ahwai, Hong Kong, China.

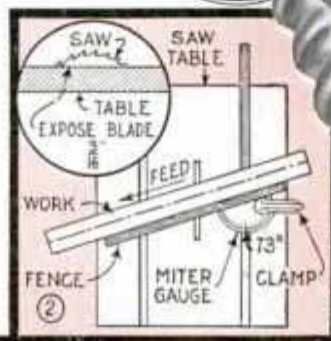
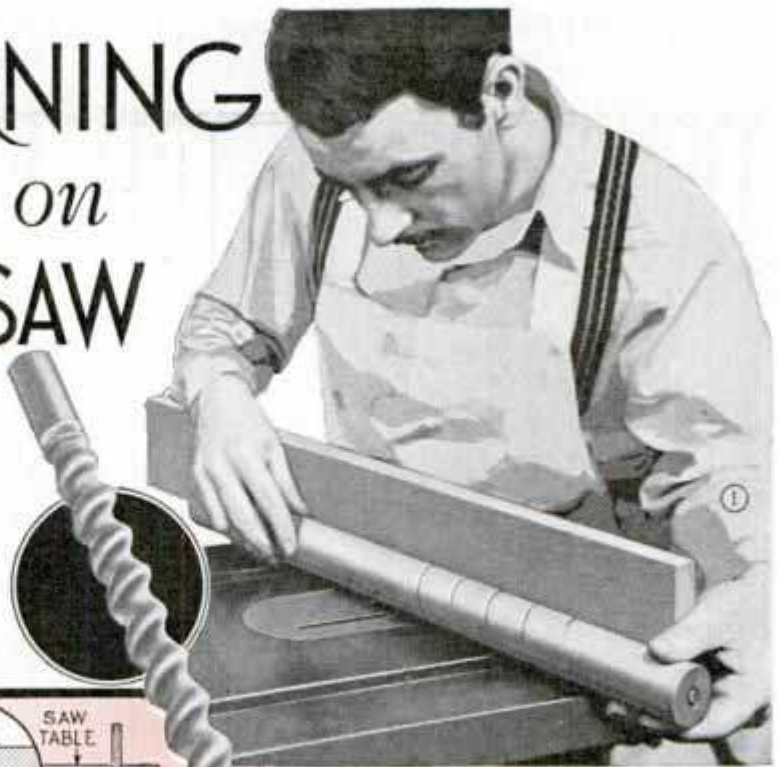
While experimenting to obtain a lubricant that would make drills last longer and cut more freely, when drilling nickel or chromium steel, it was discovered that sulphur and turpentine, mixed to the consistency of thick cream, served the purpose nicely.

SPIRAL TURNING

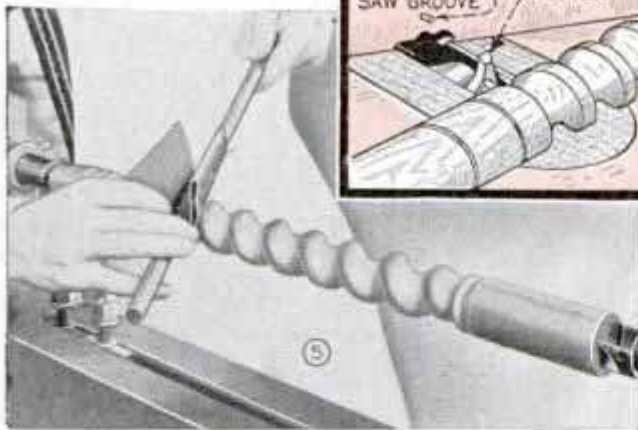
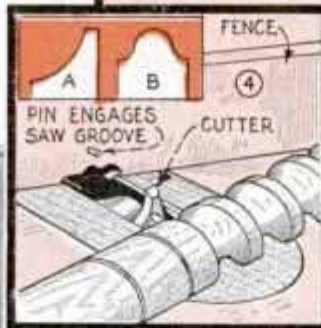
made easy on

CIRCULAR SAW

SPIRAL turnings, productive of many excellent furniture projects, are greatly simplified by the machine method of making them on a circular saw. Figs. 1 and 2 show the first operation. A board to serve as a fence is fastened to the miter gauge with screws, after which the gauge is clamped to the saw table in the position shown. The work, when pushed into the saw along this fence, will both turn and feed itself, the saw being adjusted to cut $\frac{3}{16}$ in. deep. Angle of the



Below, Finishing Operations Can Be Done on a Lathe at Slow Speed



miter gauge can be varied to give different feeds. The greater the departure from a right angle between fence and saw blade, the greater the pitch of the spiral. The cut produced in this manner will not vary over $\frac{1}{32}$ in. from any one spiral to the next in line. In the next operation, the miter-gauge fence is set at an angle of about 60° on the opposite side of the center, right-angle mark, Fig. 3. A molding cutter of the style shown at A, Fig. 4, is mounted

on the saw arbor, and a pin is fitted to the fence, to engage the saw-cut spiral. With this pin guiding the work, the latter is fed into the cutter. The cut produced is not the true shape of the cutter because of the angle of the work, but is a perfect cove cut. Next, the sharp corners of the cove-cut spiral are rounded over in a lathe. Finishing can be done with sandpaper held around a dowel stick, Fig. 5, chasing up the spiral as the work rotates at slow speed. If you care to grind your own cutters to a shape similar to that shown at B, Fig. 4, the spiral can be cut in its entirety.

Folding Shelf on Pantry Door Saves Steps



Many Uses Will Be Found for a Folding Shelf Hinged to Your Pantry Door

Hinged to the inside surface of your pantry door, this folding shelf will serve as a handy worktable and save steps when mixing pastries. In addition to this, the shelf is convenient when re-arranging or cleaning the pantry as well as when getting out dishes, or replacing them after washing, as they can be sorted on the shelf and carried in a tray at one trip.

Markers Prevent Mixing of Guests' Beverage Glasses

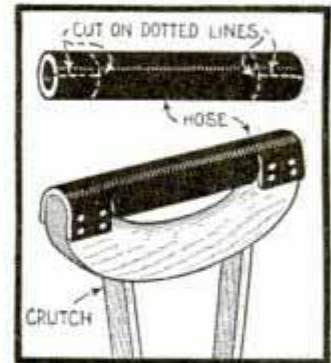
If you have had the embarrassing experience of mixing your guests' glasses on a serving tray, little celluloid markers, which are slipped over the edges of the glasses, will help solve your problem. Different colors of celluloid are used, and the markers are cut to various shapes appropriate for the occasion, such as playing-card characters for bridge parties, jack-o'-lanterns, black cats and pumpkins for Hal-



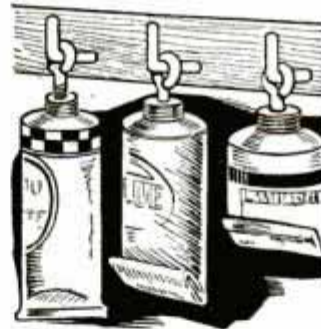
loween, etc. The markers can be bent to form clips by slightly softening the celluloid in hot water.

Arm Pieces on Crutches Cushioned with Rubber Hose

Tacked across the arm pieces of crutches, lengths of 1-in. rubber hose will make them more comfortable to use. Besides providing a cushion under the arm pits, they tend to lengthen crutches that are a little too short. The hose pieces are slit as indicated by the dotted lines, after which the ends are spread and tacked to the crutch.—R. D. Gadd, Grass Lake, Mich.



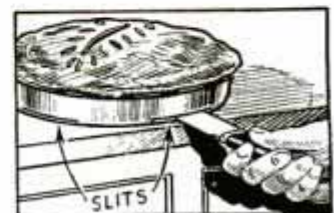
Screw Eyes to Hang Collapsible Tubes on Hooks



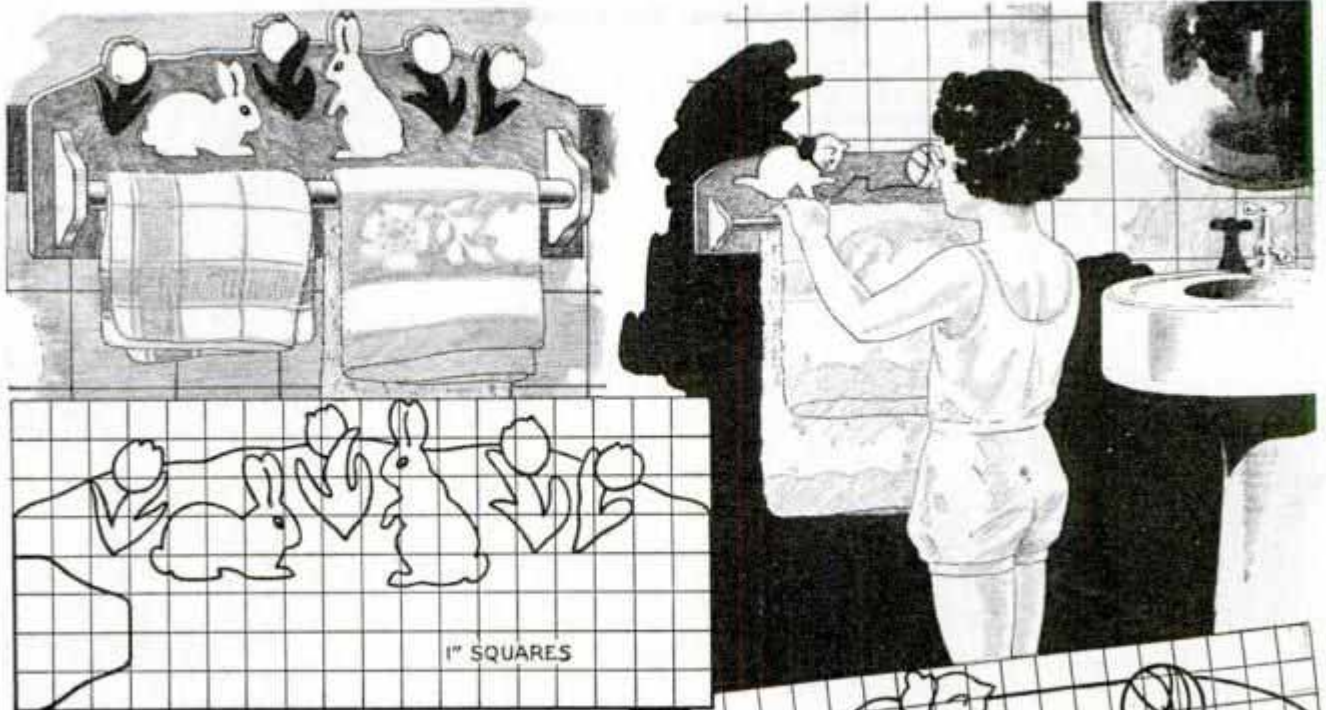
If you remove the caps from collapsible tubes containing pastes, glue, etc., and substitute small screw eyes for them, the tubes will be sealed tightly and they can be hung on hooks in orderly arrangement. The screw eyes should be slightly larger than the opening in the tubes so that the threads will bite into the soft metal.

Slits in Pie Tin Permit Loosening of Lower Crust

Cut in the sides of a pie or cake pan near the bottom, four small slits permit the insertion of a knife blade to loosen a pie or cake that has a tendency to stick. If the slits are made as narrow as possible, they will be hardly noticeable and will not damage the pan in any way.



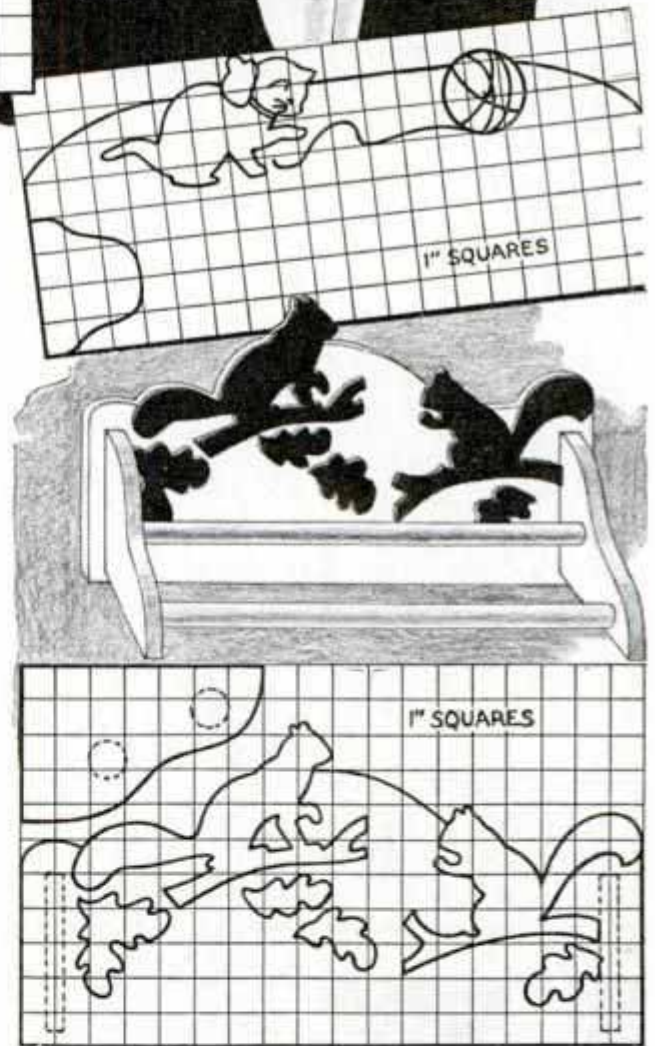
Children Like These Animal Towel Racks



Decorated with animal cut-outs, these racks will appeal to the little tots and will be helpful in getting them into the habit of hanging up their towels.

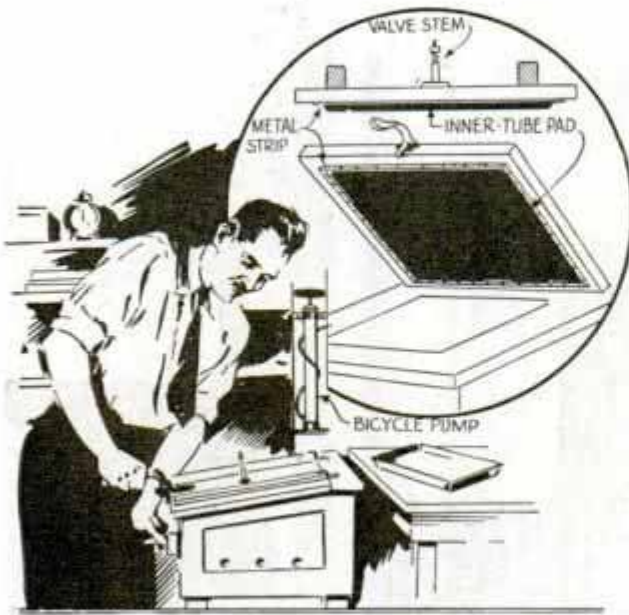
Wood $\frac{1}{2}$ in. in thickness is used for the backs and the arms, broomsticks or hardwood dowel stock for the rods and thin wood for the cut-out shapes. The back piece of each rack is shaped at the top to support the overlay decorations. To assure them fitting properly, it is best to first cut out the figures, smooth their edges and then glue them in place. Then, when the backs are scroll-sawed, you can follow the edges of the small pieces. The ends of the rods should be mortised into the arms, which, in turn, are mortised into the backs.

Various color schemes can be worked out. For the rack shown above, the rabbits, arms and rod may be white, the tulips a variety of bright colors with green leaves, and the back of the rack tan. The kitten and ball on the second rack may be white on a dull green back with a red ribbon on the kitten, and a red string on the ball. The third rack, which has two rods, may be used as a towel rack in the bathroom, or it can be hung on the inside of a closet door and used as a rack for shoes, scarfs or other miscellaneous items. If it is used in a closet, a pleasing finish is had by staining and varnishing, making



the overlay designs a much darker shade than the back. If the rack is painted, a good color scheme is reddish brown squirrels, dark gray perches and light green leaves, the back, arms and rods being finished in ivory or light tan.

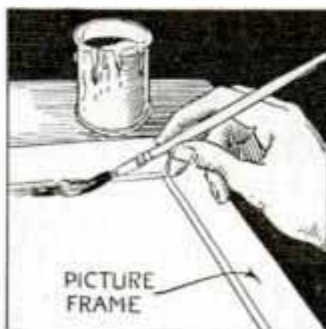
Air Pad Facilitates Printing Photos from Crinkly Negatives



Air Pad Made from Inner Tube and Fastened to Underside of Lid Improves Photo-Printing Box

Photo prints will lie perfectly flat over crinkly negatives if you use this inner-tube pad on the lid of your printing box. The lid must be made in one piece, with no air holes in its surface, and it must overlap the sides of the box at least $\frac{1}{4}$ in. to take narrow metal strips, which are tacked over the edges of the rubber to make the pad air-tight. Cut the pad from the valve-stem section of the tube, and then slit it lengthwise on the side opposite the stem, making the pad the exact size of the lid. The valve stem projects through a hole in the lid, the hole being slightly smaller than the stem to get an air-tight fit, after which the nut on the stem is driven down to hold it rigidly. A rubber washer between the lid and base of the stem will help. One or two strokes of a hand pump will inflate the pad sufficiently. —Leonard Mitchell, San Francisco, Calif.

Keeping Dust Out of Framed Pictures

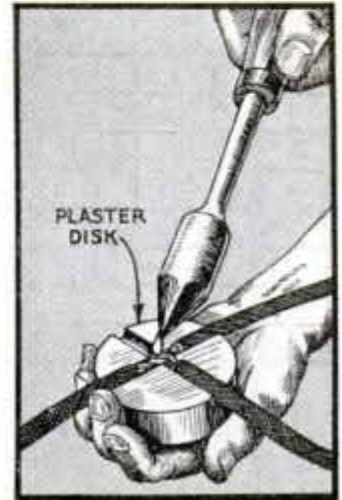


Scrap celluloid dissolved in acetone makes a useful sealing cement, which can be applied around the backing of framed pictures to prevent the entrance

of dust. This method of sealing the frame is quicker and more satisfactory than applying paper, although this may be added for sake of appearance. Enough celluloid should be dissolved in the acetone to make a rather thick solution. If the solution is too brittle, it may be made flexible by adding a little castor oil.

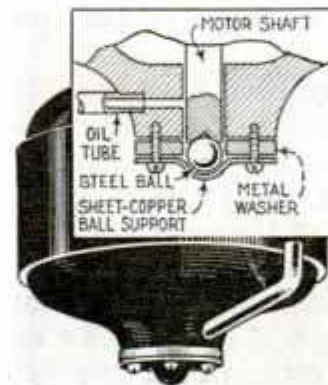
Grooved Disk Prevents Waste When Soldering Wire Connections

When soldering wire connections, hold a plaster disk under the work, and you can flow the solder evenly on the joint without waste. The disk is made of plaster of paris and is grooved at right angles, to take the wires while soldering the joint and to catch all excess solder that does not adhere to the work. A small round-nose chisel is handy for making the grooves.



Ordinary Electric Motor Operated in Vertical Position

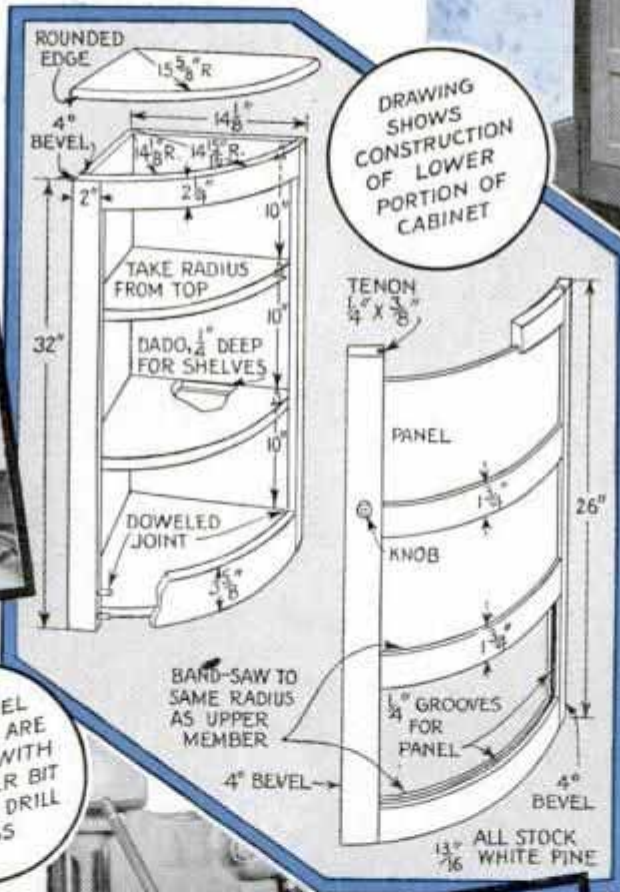
Motors designed for use in a horizontal position can be operated in a vertical position without excessive wear if a steel ball is used to take care of end thrust. The ball is held in place with a metal plate screwed to the end of the motor housing, a metal washer being used to space the plate from the housing. The ball rests in a depression formed in the center of the plate, and the end of the motor shaft is countersunk slightly to fit the ball. Lubrication is taken care of by enlarging the end of the oil hole and inserting a small copper tube, which is bent upward slightly to assure a gravity feed of the oil.



A Simple CORNER CUPBOARD

ADDDING a pleasing touch to a bare corner of a room, this useful cupboard can be made of white pine and painted or lacquered to suit, or it can be made of maple or other hardwood and finished to match other furniture. Its rounded front is simple in construction and can be handled easily with tools found in the average home workshop.

Start by squaring up stock for the lower portion of the cupboard. The side walls call for fairly wide stock, readily procurable in white pine, although a tight glue joint to make the desired width is equally as good as a solid board. One of the side boards butts against the other, the joint being made secure



DRAWING SHOWS CONSTRUCTION OF LOWER PORTION OF CABINET

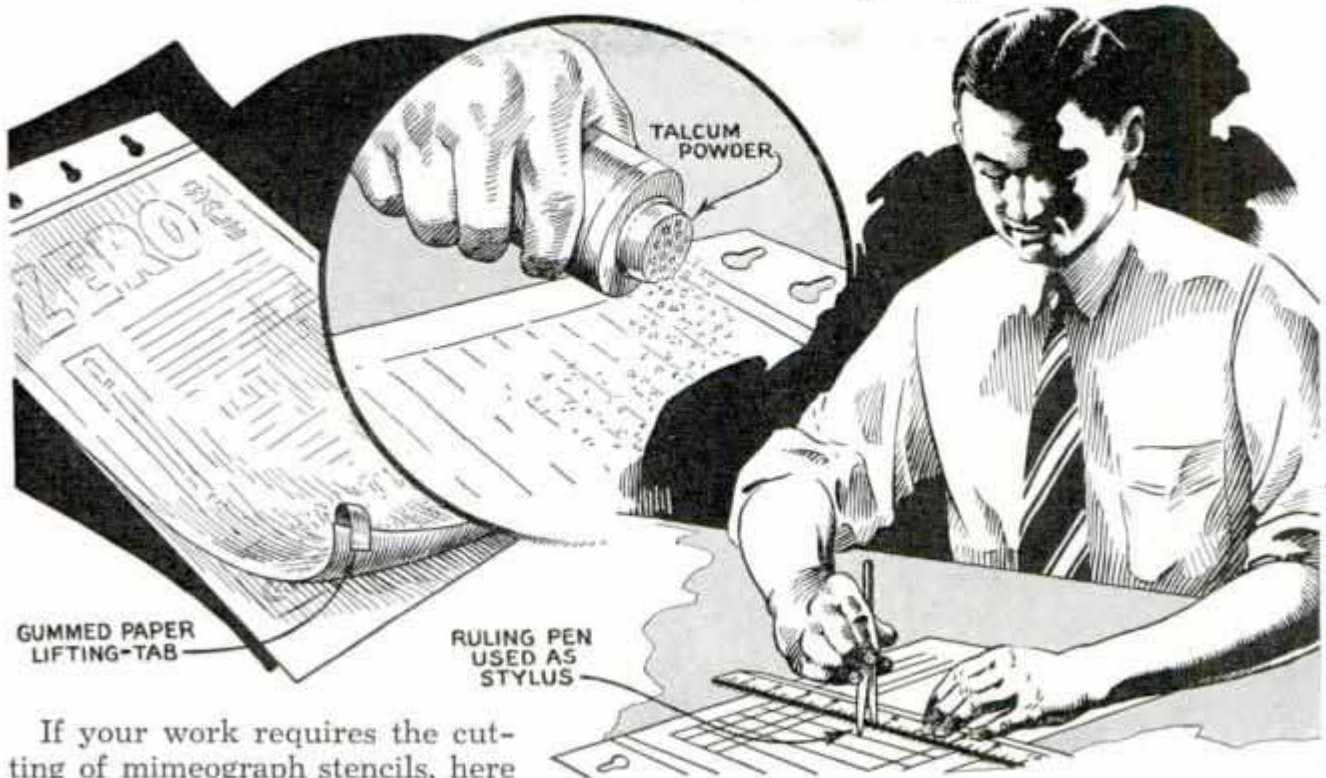
THE PANEL GROOVES ARE RUN IN WITH A ROUTER BIT ON THE DRILL PRESS



with dowels along its length. The curved face pieces are band-sawed to the specified radius, the stock being built up to the width that is required.

Curved pieces for the door are cut to the same radii as the facer strips of the cabinet proper. In cutting these curved pieces, it is necessary to mark the outer or larger radius only. After cutting this curve, the band-saw fence, or a suitable wood guide, can be set a distance of $1\frac{3}{16}$ in. from the blade, and the inner curve run in. A disk sander

Time-Savers for the Mimeograph Operator

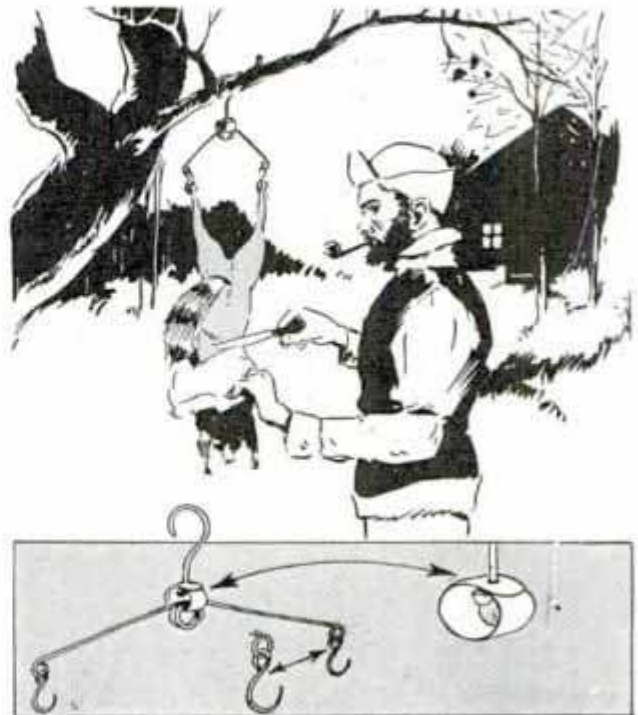


If your work requires the cutting of mimeograph stencils, here are three short cuts that will come in handy. The detail at the left shows a paper tab attached to one corner of the stencil for lifting it when it clings stubbornly to the backing sheet. When typing a fresh stencil, bits of the material will be picked up by the type, which often results in imperfectly formed letters. This may be avoided by dusting talcum powder

over the stencil before putting it in the typewriter, and then removing the surplus with a soft brush or cloth. When considerable ruling must be done on a stencil, use a draftsman's ruling pen. The points can be spaced quickly by setting them over a ruler, after which the pen is used as a stylus.

Spring Gambrel Suspends Small Animals to Skin Them

Here is a gambrel that is a help in skinning small fur-bearing animals. It is light enough to carry in the pocket and, when hooked over a limb of a tree, it holds the animal at a convenient height and keeps its legs spread apart. A 2-ft. length of very stiff wire is given two or three turns around a 1-in. pipe or rod to form a coil in the center to give the gambrel a spring effect, after which an eye is formed on each end. Hooks are fastened in these and are pointed at the ends to pierce the animal's feet. A strong, swiveled hook is fastened in the center of the gambrel by means of a strip of heavy sheet metal, the swiveling action being obtained by inserting the hook through holes in the end of the strip and then bending the end of the hook at a short right angle.—Martin G. Winterton, Ft. Lewis, Wash.



Vacuum Cups Hold Small Washboard in Sink or Tub

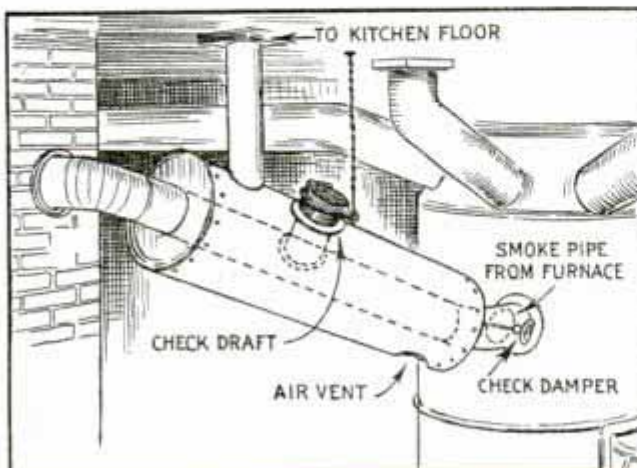


Large Vacuum Cups Attached to Legs of Washboard Keep It from Slipping in Tub

When small pieces are laundered on a washboard placed in the kitchen sink or bathtub, it is difficult to hold the board securely at the proper working angle. If a couple of vacuum cups are fastened to the ends of the washboard legs, this annoyance may be eliminated.

Utilizing Waste Heat from Furnace Smoke Pipe

In my home, which was heated with a hot-air furnace, the kitchen was not supplied with a hot-air pipe, and was quite chilly at times. To overcome this trouble and, at the same time utilize the heat radiated into the basement by the smoke pipe, I jacketed the latter with a length

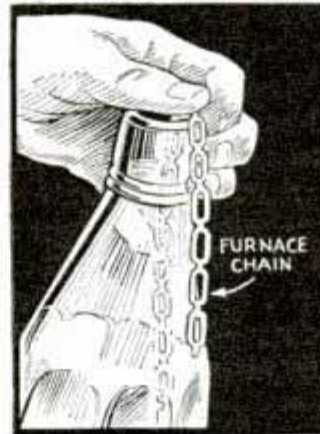


Sheet-Metal Jacket around Furnace Smoke Pipe Directs Waste Heat into Home

of 16-in. sheet-metal pipe and directed the waste heat into the kitchen through a hole in the floor. The jacket was closed at both ends with sheet-metal disks, the check draft in the smoke pipe being extended as shown. A vent in the bottom of the large pipe allowed air to enter the jacketed part of the smoke pipe, where it was heated and then passed through a 6-in. pipe into the kitchen. All joints in the smoke pipe should be cemented and then sealed with strips of asbestos paper. The jacket should also be covered with two or three layers of the paper to conserve the heat.—E. R. Newman, Lincoln, Nebr.

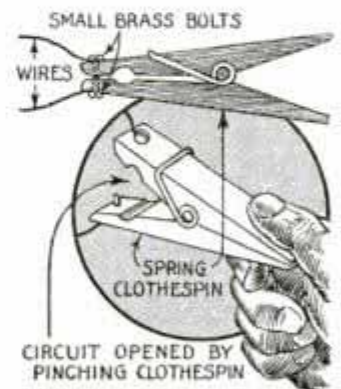
Chain Substituted for Shot When Washing Bottles

When washing bottles, drop a short length of furnace chain inside to aid in cleaning. The chain takes the place of shot, which is usually used for this purpose, it does just as thorough a job of removing foreign substances from the sides of the bottle, and is much easier to handle.



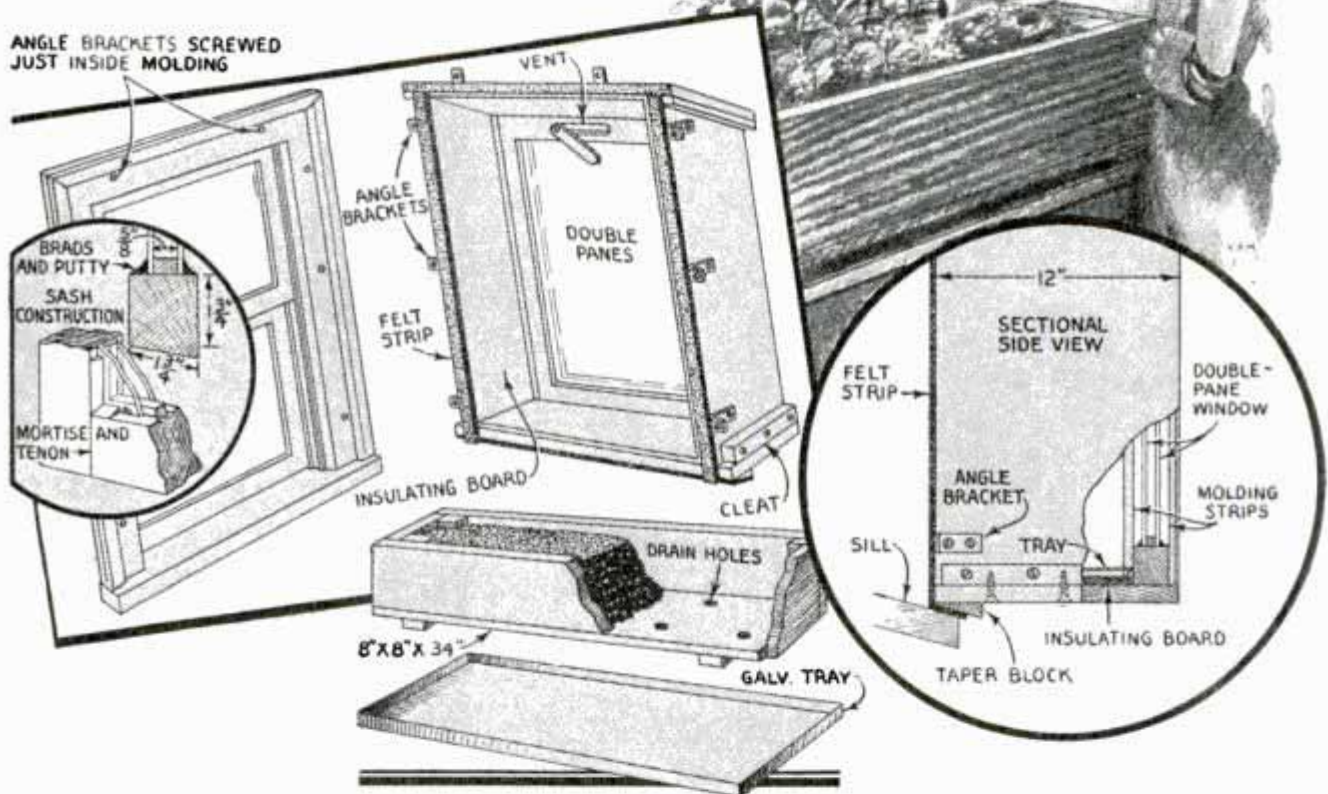
Spring Clothespin Converted to Simple Electrical Switch

In radio work or electrical experimenting where low voltages are handled, a switch that can be opened momentarily, but one that will keep the circuit closed under normal conditions, often comes in handy. Such a switch can be made from a spring-type clothespin. Simply drill the jaws near the end to take a couple of small, brass machine screws, which serve as contacts, and clamp the wires under the heads.



Winter Flower Garden Fits Your Window

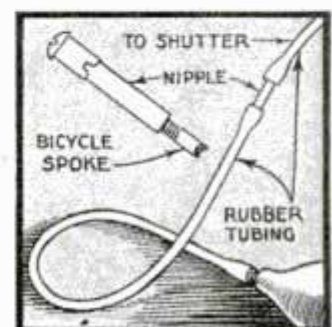
Well insulated and fitted with a double-pane sash, this small conservatory provides a place for a winter flower garden and also serves as a storm sash. It is fitted snugly against the outside of the window casing, preferably on a window having a southern exposure. Strips of thick felt along the edges make a tight joint between the casing and the conservatory, which is pulled up tightly with angle brackets, a tapered block, also covered with felt, being used at the bottom to get a snug joint at the sill. Any high-grade insulating board will do for the lining. If two storm sash are available they may be substituted for the double-pane sash, us-



ing thin strips of felt between the frames and screwing them together tightly to get a dead-air space between. Be sure the panes are well puttied. The sash are held in place with molding strips fitted carefully. The soil box, which is filled with rich soil consisting of leaf mold, loam and manure, is provided with drain holes and sets in a shallow, galvanized sheet-iron tray, two 1-in. blocks being nailed across the bottom of the box to serve as feet. The box should be painted a dark color to absorb as much warmth from the sun as possible, the conservatory being painted to match the window.

Repairing Tube on Camera Bulb

When the rubber tubing to the bulb of a camera shutter breaks or becomes worn, cut out the damaged portion and connect the severed ends with a bicycle-spoke nipple. When the head of the nipple is cut off, the remaining tube is just the right size to slip snugly into the rubber tubing.



What You Can Do *with*



By **FLOYD M. MIX**

FOR the craftsman, hardwood veneer backed with kraft paper has a variety of uses, especially because it will bend readily over relatively sharp corners. Besides being convenient to use for inlaying and overlaying work, it lends itself admirably for covering old tables and desks, making picture frames, serving trays, fancy wastebaskets and small boxes, lamp shades, etc., the scope of which depends mainly on your own ingenuity. Paper-backed veneer is available in a wide variety of light and dark wood so that you can obtain many pleasing combinations of color and grain, and its cost even permits its use for covering walls.

You can cut paper-backed veneer with a razor-blade knife, or sharp scissors. The bond between the paper and the wood and also a special adhesive, are waterproof. In applying the veneer, the wood side is sponged with cool water, and a thin coat



FANCY COVERINGS ON WASTE BASKETS

LACED OR TAPED TO FRAME

MAKING LAMP SHADES

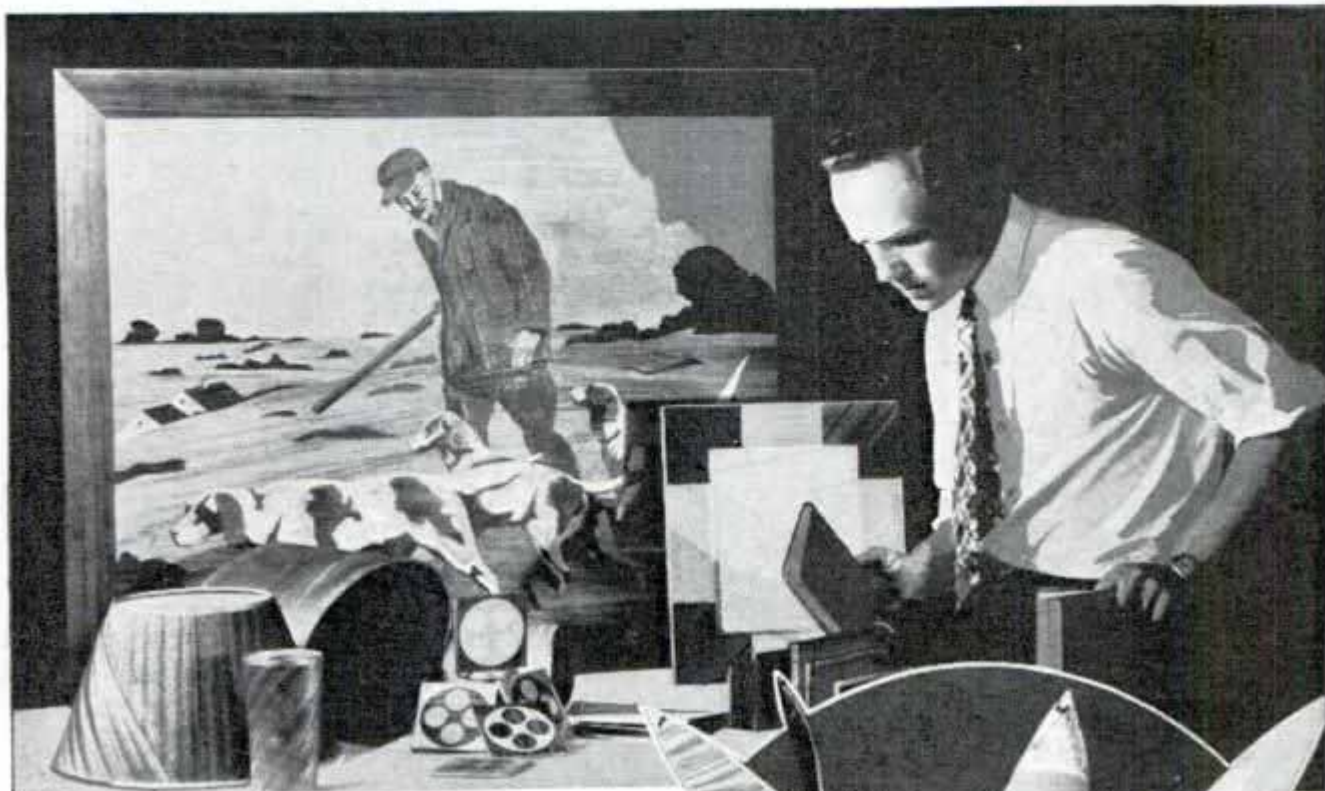
TITLE IN CONTRASTING WOOD

SCRAP BOOK, DIARY AND ALBUM COVERS

INLAYING SMALL BOXES

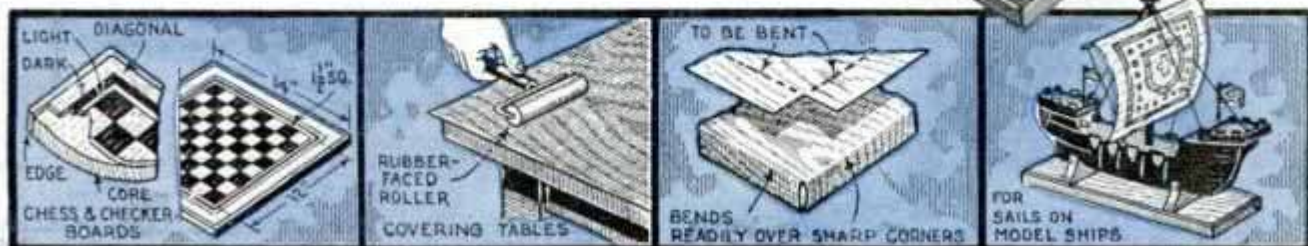
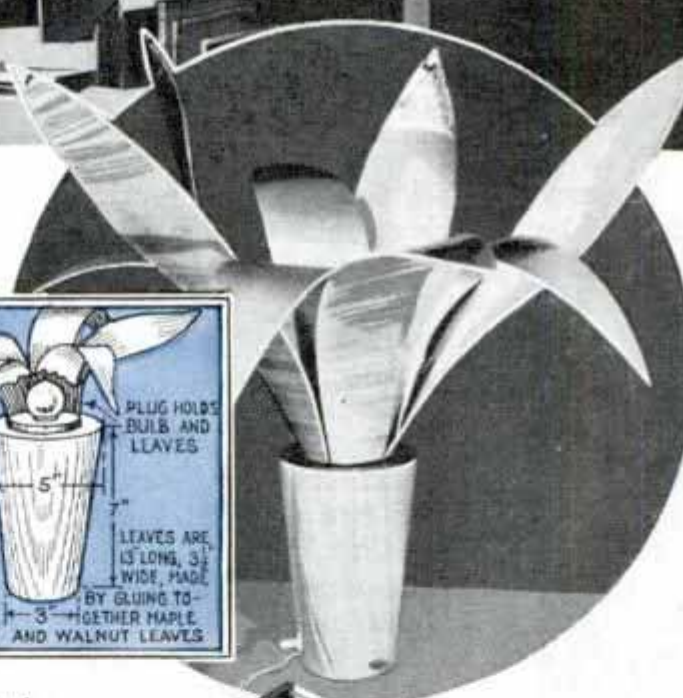
Supplied by Smith

PAPER-BACKED VENEER



of adhesive applied to the paper side. Adhesive is also applied to the surface to be covered. The glue is allowed to dry a few minutes until tacky, and then the veneer is pressed firmly into place. Excess glue should be worked out with a putty knife, or rubber-faced roller, beginning at one end and working downward with the grain. For most jobs no clamps are required. A thin coat of white shellac or wax will make a satisfactory finish.

An interesting item to make is a table or mantel lamp as shown in one of the photos. The base is a simple woodturning job and the leaves, which consist of walnut and maple veneer glued together, are bent to the proper shape when wet. A small lamp is mounted on a wood plug, as indicated.



**Accurate Fence for Circular Saw
Is Made of Flat Iron**



This Strong Saw Fence Is Easily Attached and Can Be Made in Any Size Desired

Unusually rigid, this saw fence is ideal for the homemade circular saw. It is made of flat iron, with the exception of the movable side member, which is a piece of angle iron bent to a U-shape at the ends to fit over the edges of the table. All joints are loosely riveted so that they will pivot. The four short arms must be the same length, and they must be drilled exactly alike, otherwise the movable member will not remain parallel with the side of the saw table when the fence is adjusted. A bolt through the stationary side member and the slotted center arm is loosened to adjust the fence. A scale inlaid near one edge will help in setting the fence.

Old Comb Converted into Skimmer



Fitted with a handle, an old comb makes a skimmer that will often be found more efficient than a spoon or paddle. The comb should be curved upward slightly at the

ends. If it is celluloid or hard rubber, it should be softened in hot water before bending. By riveting the handle of an old toothbrush to a comb, you will have a skimmer that can be used in acids.

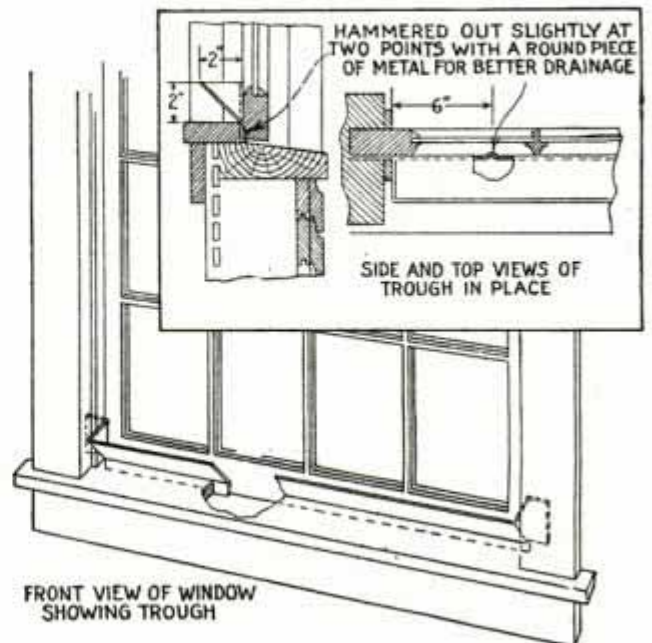
Mud Scraper Made from a Clock Spring

Made from a length of clock spring, this mud scraper will be found more efficient than the average paddle for cleaning shovels, spades, etc. A piece of spring about 1 ft. long is looped and the ends taped to provide a handle. A scraper of this kind is small enough to be carried conveniently in the pocket, and it will last a long time.



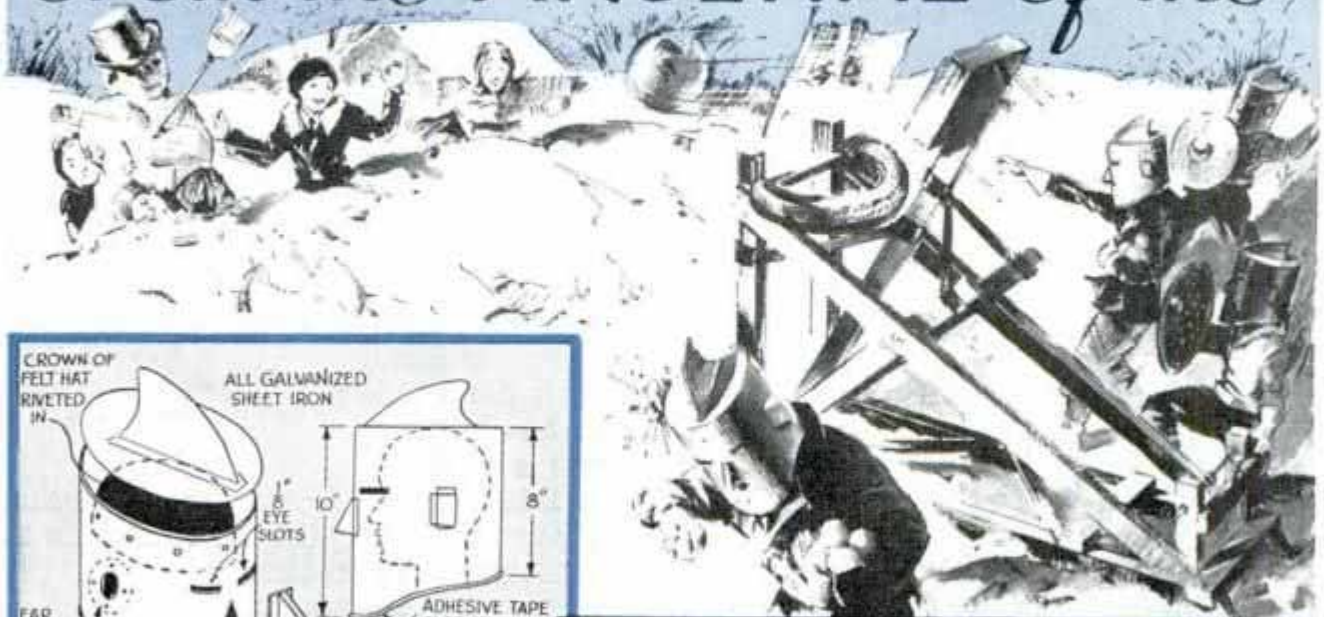
**Moisture on Window Drained Off
with Metal Trough**

Attached to a window as shown, a shallow brass or copper trough will direct condensed moisture outside instead of allowing it to run down on the sill, and possibly onto the wall underneath. The sash should be kept raised slightly so that the water can pass under it easily.

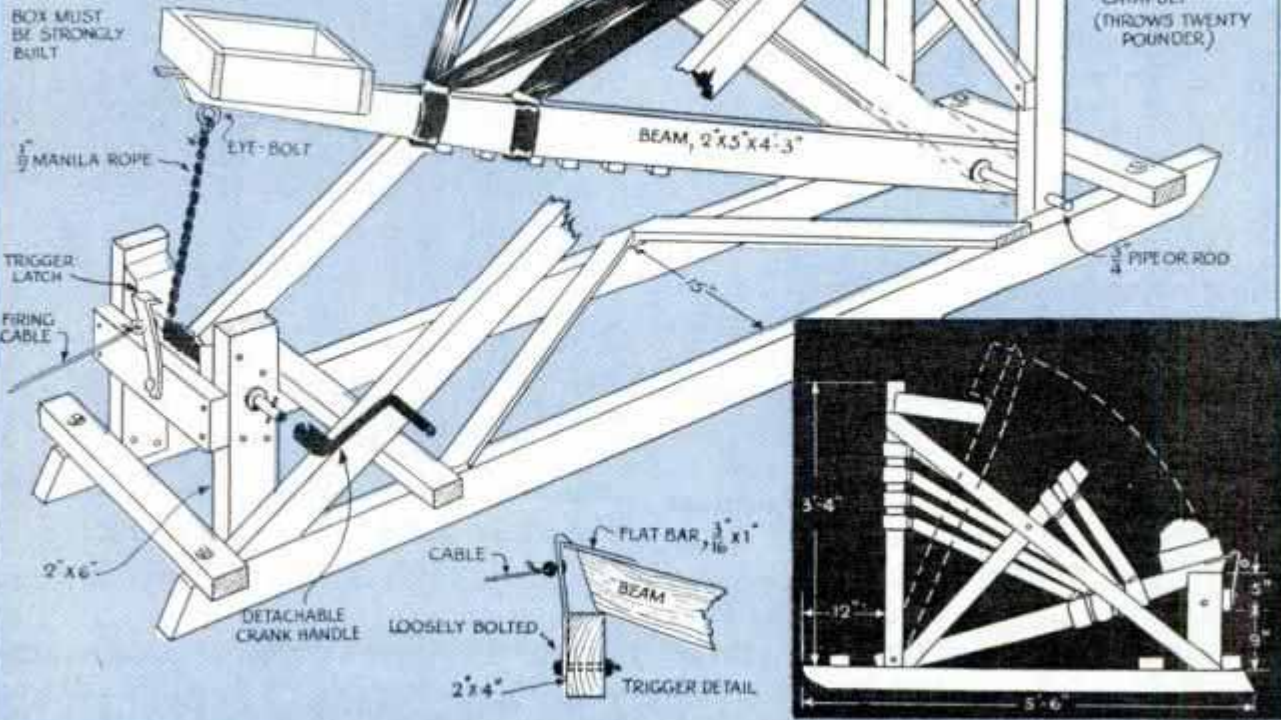
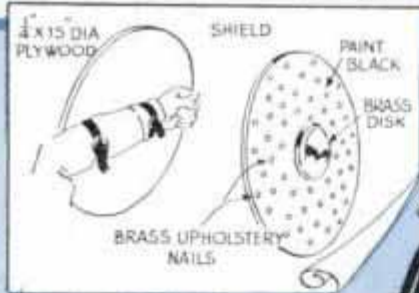
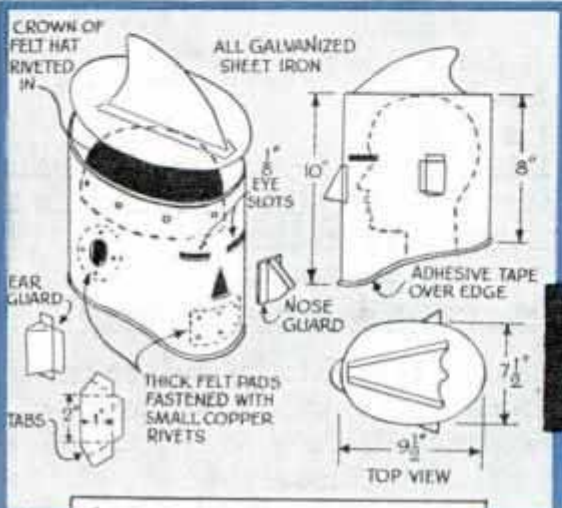


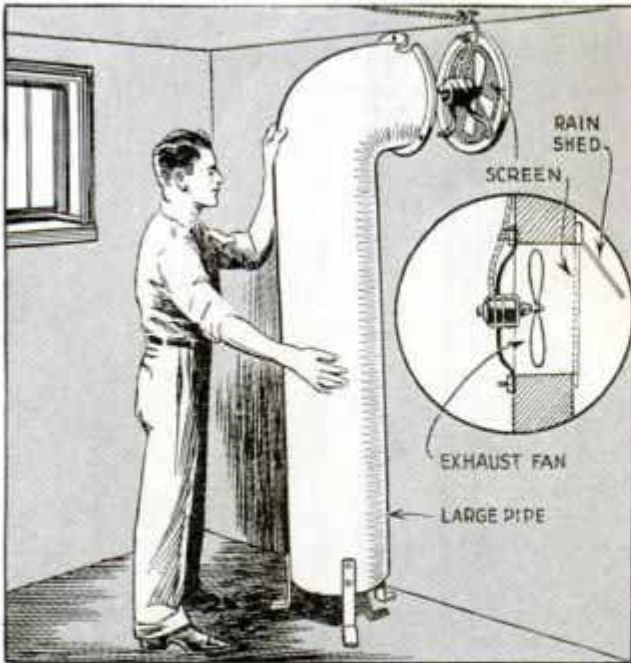
Sheet-Metal Troughs Prevent Condensed Moisture on Windows from Running Down on Sills

From the ARSENAL of the



Winter Warrior





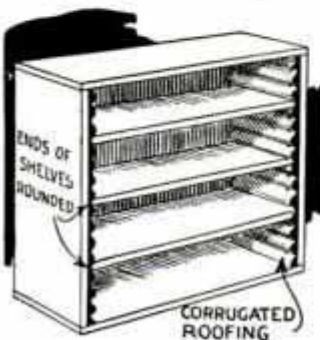
Electric Fan Installed in Wall Sucks Out Damp Air and Keeps Basement Dry

Damp Air Sucked Out of Basement Through Exhaust Pipe

Installed in a basement wall in connection with a large sheet-metal pipe, which extends down to within 6 in. of the floor, an electric exhaust fan will suck damp air out of the basement and keep it dry. The pipe, which is the type used for hot-air ducts on furnaces, is supported on flat-iron legs, and has an elbow at the upper end, the edge of which is flanged so that it can be bolted to a support around the fan opening in the wall. To keep out insects, the opening is covered with screen wire. Also, it is provided with a rain shed, which may be thin wood or sheet metal.

Corrugated Slides to Adjust Shelves

Shelves of workshop cabinets will be adjustable to various levels if they are supported with strips of corrugated roofing on the sides of the cabinets as shown in the drawing. For a neat job, the shelves should be thick enough to fit the sunken parts of the corrugations snugly, and for this reason, the ends should be rounded, which can be done with a wood rasp.



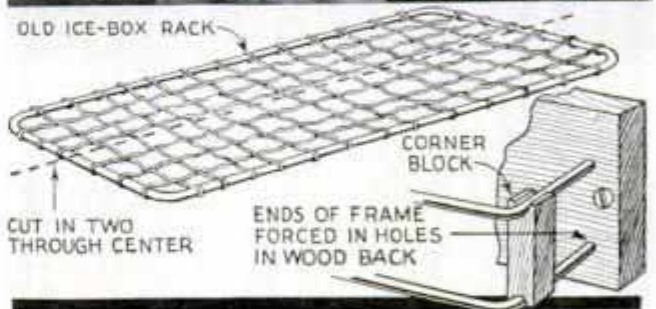
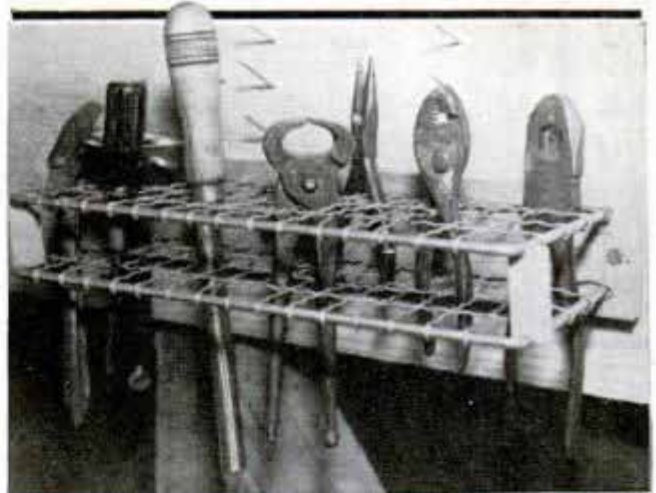
Cardboard Ruler Made on Typewriter Measures in Tenths of an Inch

If you have occasion to make divisional measurements in tenths of an inch, and such a ruler or scale is not at hand, one can be laid off on a typewriter. Most standard typewriters are spaced to write ten characters per inch. Using the apostrophe character, insert a card and type this character repeatedly, completing the ruler by typing the inch numbers in their respective positions.



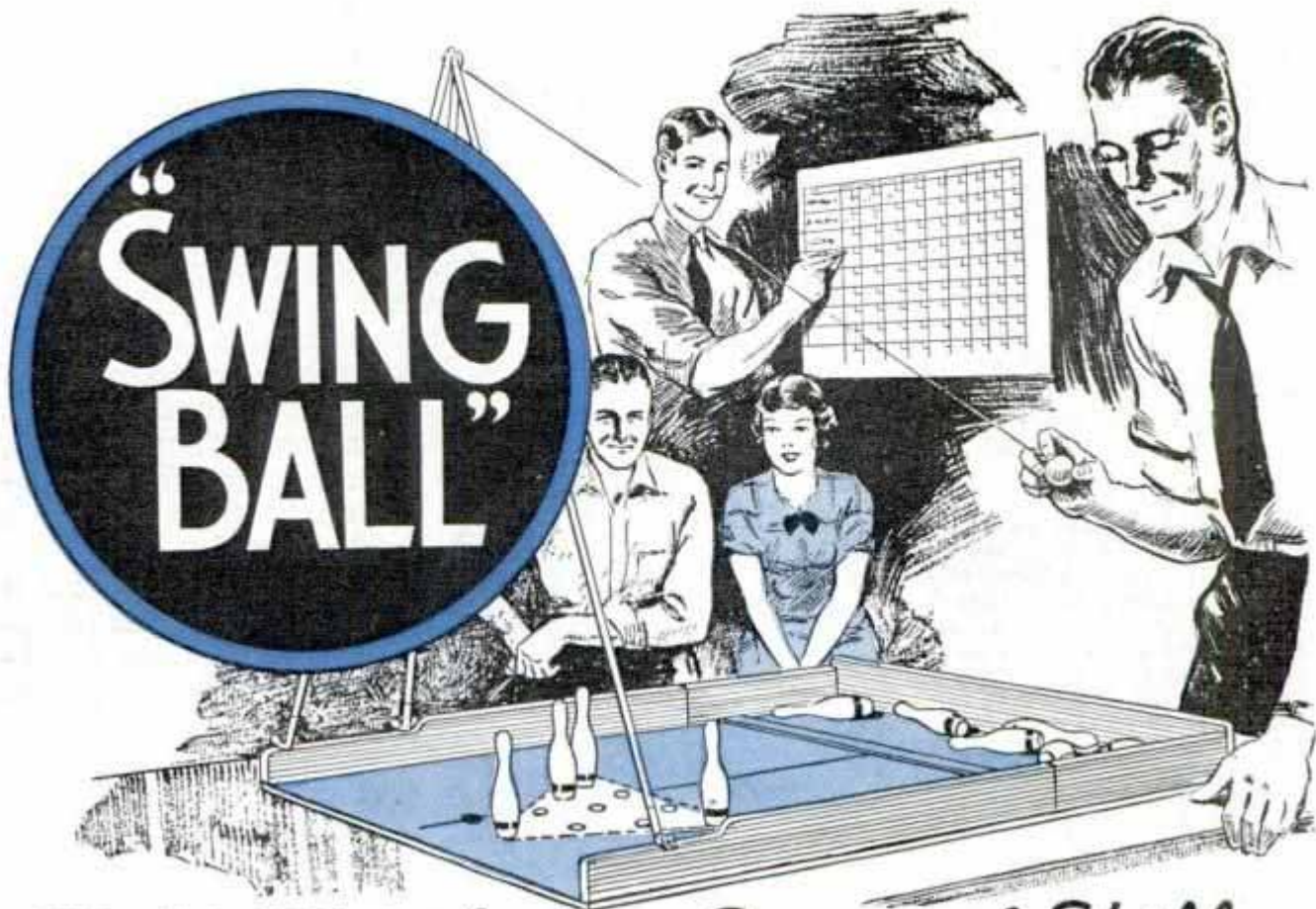
Tool Rack from Ice-Box Shelf

Jointed or forked tools, such as screwdrivers, chisels, etc., are held conveniently in this wire rack. It is made from an old ice-box shelf, which is cut in two and the



Rack Made from Old Ice-Box Shelves to Hold Forked or Jointed Tools

parts mounted horizontally on a wall as shown. Or, they may be mounted vertically in case you have small handles on the tools that will drop through the rack.



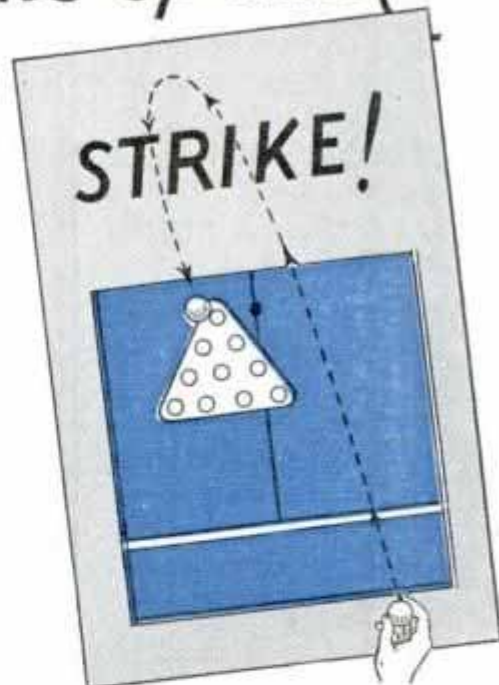
“SWING BALL”

Table-Top Action Game of Skill

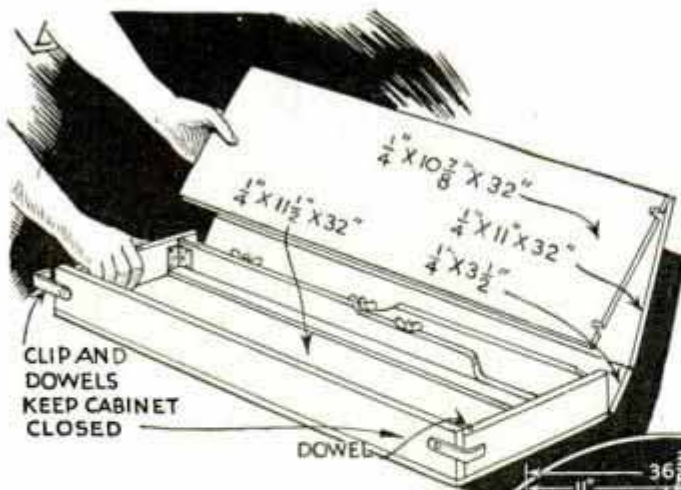
“BOWLING” on a table top requires skill, provides plenty of action and gives the entire family wholesome diversion on long, winter evenings. You count “strikes” and “spares” as in regular bowling, but you play with a suspended ball, manipulation of which requires some of the precision of billiards. The pins are turned on a lathe and the game board is arranged to fold compactly, forming a box in which all the loose parts can be stored. Or, if desired, a game board that is portable, but not folding, can be provided.

The ten pins and their arrangement is similar to the conventional bowling set-up, except that the triangular bank of pins points away from the player instead of toward him, and is located on one side of the center line. The suspended ball is weighted to four times the weight of a single pin and crashes through the bank of pins the same way as a bowling ball on an alley, after which it returns to the hand of the player. The ball must be swung in an elliptical path, hitting the pins on the return swing. It is this part of the game that gives rise to some interesting calculations. No matter from what point the ball begins its course, or how wide the ellipse traveled, the distances A and B, as shown in Fig. 7, are always the same.

In the game, you can follow rules of conventional



This table-bowling game in which a swinging ball is brought to bear upon a bank of ten pins, has many points in common with the usual bowling game. The scores are counted in the same way. Players must calculate the path of the ball, which travels in an elliptical path. Careful playing with application to make the “spares” count, will help you get a high scoring average. Two-pin shots, such as “splits” and “railroads,” require the greatest accuracy.



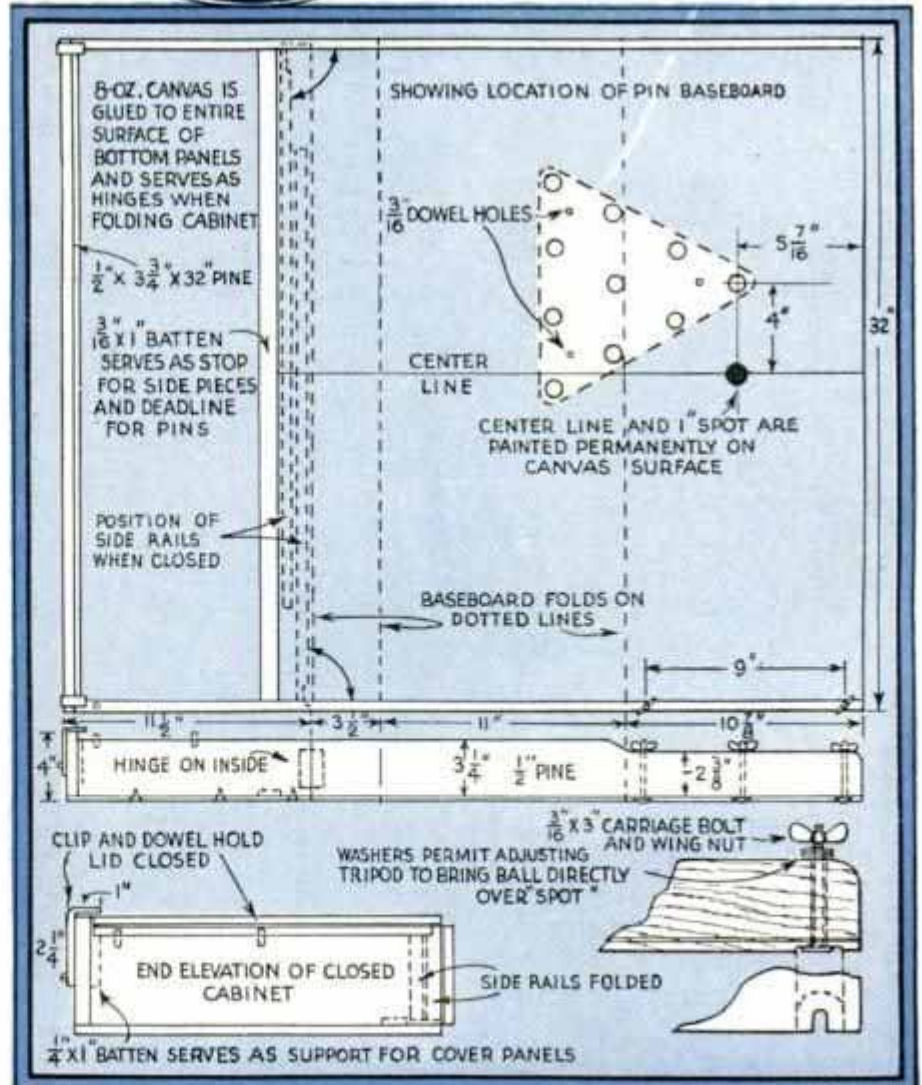
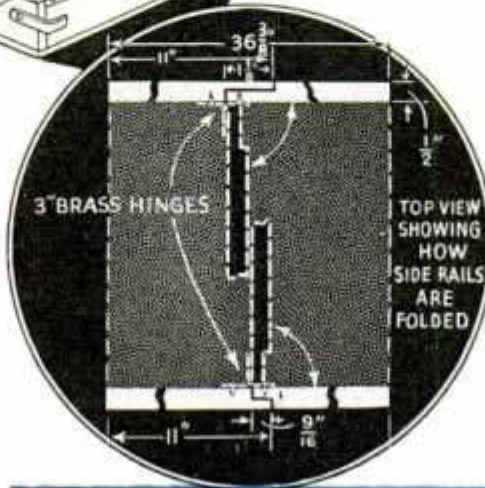
The game board can be folded compactly to form a box in which the pins, ball, tripod and other equipment are stored. The circular detail shows how two hinged rails, which form part of the sides of the game board, are folded together, collapsing it to form a box. Below, details of assembly, and arrangement showing the simplicity of construction. In playing, the pins knocked down by each swing are gathered into the space behind the slot which serves as a deadline

bowling. Players alternate, swinging the ball twice at each turn unless all pins are knocked down with the first swing, which is a "strike." Getting all the pins down in two swings gives you a "spare." When a player makes a strike he counts the score plus the ten of the strike plus the number of pins made in his next two swings. In case of a spare, he adds the ten of the spare to the score, plus the number of pins made on his next swing. Two swings—unless a strike is made—constitute a "frame" and ten frames make a "line" or game. If a pin is knocked over on the forward swing, if a player fails to catch the ball on its return swing, if the pins are missed entirely or if the ball strikes the leg of the tripod, it is

classed as a "gutter ball" and constitutes a scoreless play in which any pins that may have been knocked over do not count. These rudiments will give you some idea how the game is played, but if you are unacquainted with conventional bowling, it is a good idea to visit a local bowling alley or a friend who knows the game so that you can familiarize yourself with the details of scoring. Regular bowling score sheets

can be purchased at amusement supply stores, or one can be permanently painted on a blackboard.

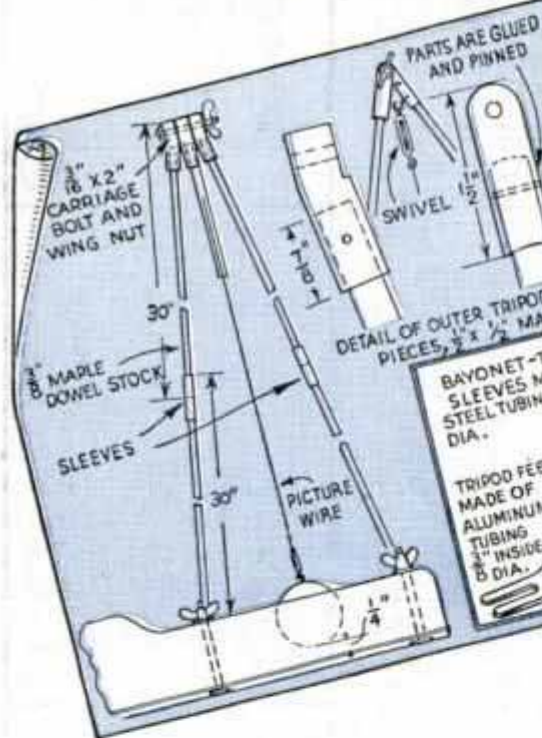
The game table is made up of four panels of 1/4-in. plywood or hard-pressed board, and these panels, laid out in their respective positions, are covered with a piece of 8-oz. canvas, glued on. After the glue has set, the



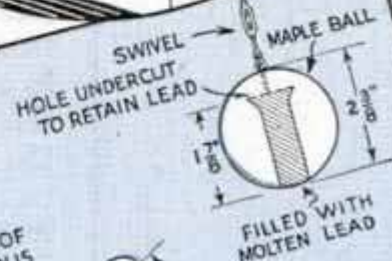
surplus cloth at the edges is trimmed away and the end piece and side pieces are mounted on the baseboard with wood screws, the side pieces forming the end of the box when the game board is closed. Hinged to these stationary side pieces, are two extensions that complete the sides of the game board when it is in use. These are held rigidly to the edge of the end panel that comes directly under the tripod, by means of bolts and wing nuts—two on one extension and one on the other. Notches in the edge of the end panels permit the bolts to be slipped in place readily. Besides serving the purpose of attaching the extensions rigidly, the bolts also hold the feet of the tripod. When the game board is to be folded, the bolts are loosened, the tripod is removed and the extensions are



$\frac{1}{4}$ " SQUARES



PIN BASE BOARD MADE OF $\frac{3}{16}$ " FIBER BOARD, MUSLIN IS GLUED TO TOP SURFACE



FILLED WITH MOLTEN LEAD

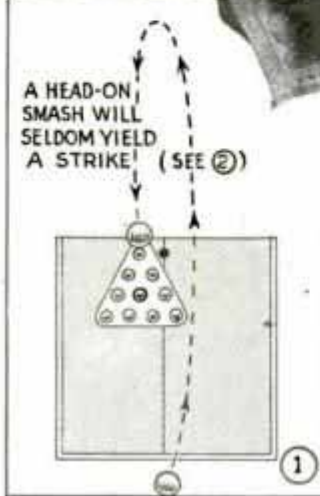
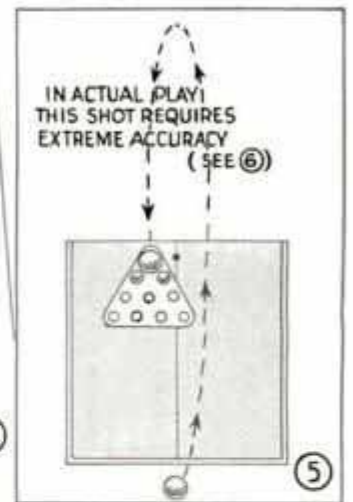
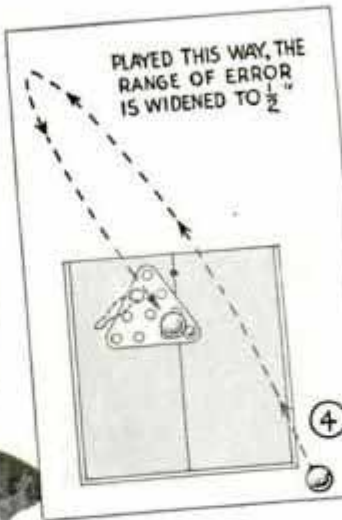
BOARD FOLDS ON DOTTED LINE



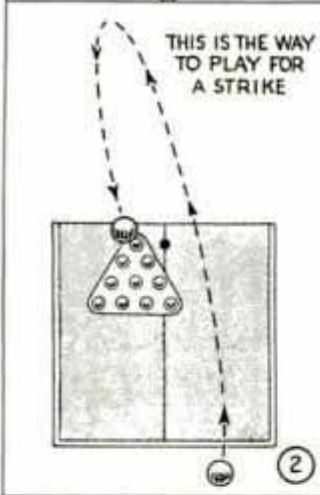
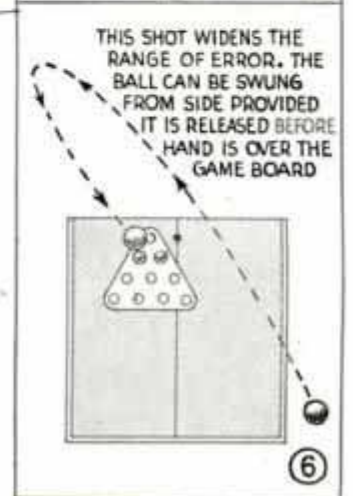
The tripod from which the ball swings has two-piece legs jointed together by means of bayonet-type sleeves. Wing nuts hold the tripod feet to the bolts on the ends of the hinged side extension pieces. The ball weighs four times as much as a pin

folded together so that they will be next to each other, against a cross batten which is screwed down permanently and bears the following instruction: "Gather All Toppled Pins Back on This Slat Before Making Second Swing." Other details on the construction and assembly of the game board, such as the clip-and-dowel arrangement for holding the box closed, can be obtained by going over the drawings. The center line and the ball-suspension spot are marked with black ink or paint.

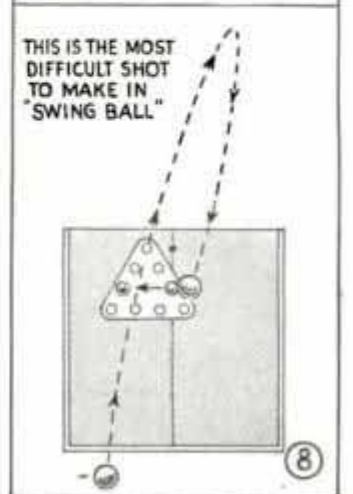
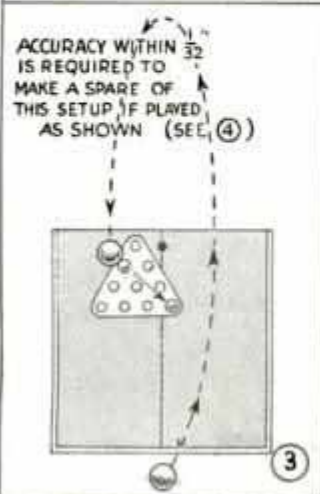
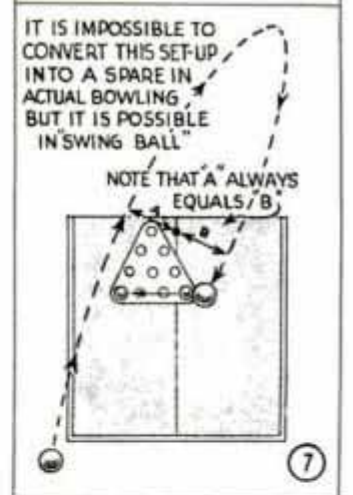
Now for the accessories to the game. The belly of the pins is $1\frac{1}{16}$ in. in diameter, so they can be turned readily from $1\frac{1}{2}$ by $1\frac{1}{2}$ -in. stock. Maple is particularly recommended, but beech, mahogany, or Australian gum can be used. The ball is turned from maple or lignum-vitæ, although a billiard ball also serves the purpose. When a maple ball is used, it is heavily weighted with lead, as shown in one of the details. The hole is enlarged at its base to retain the lead, which is poured



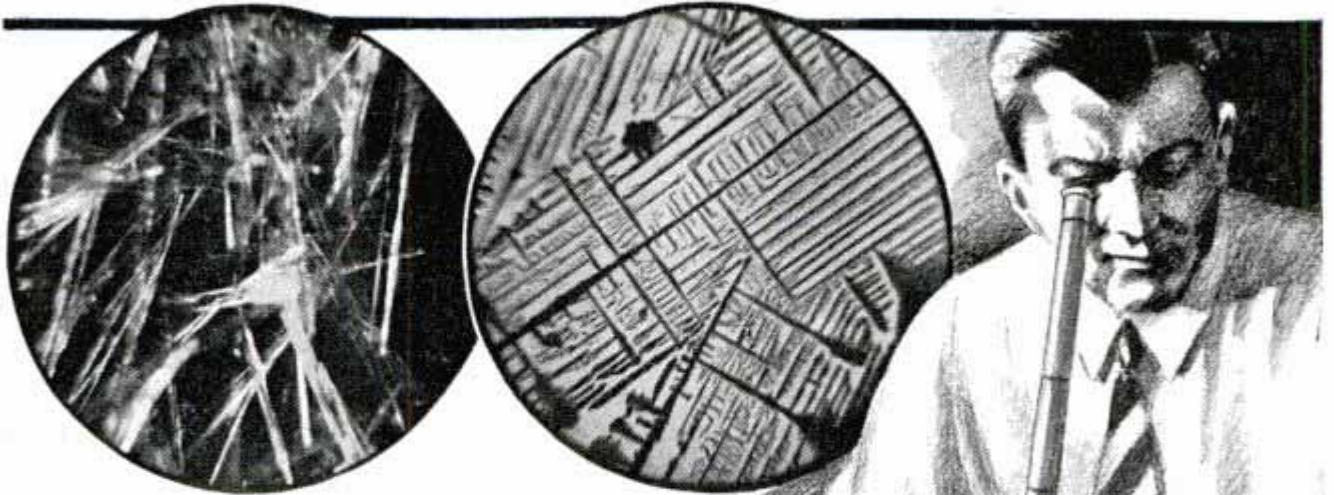
when it is barely above its melting point, in order to avoid scorching the wood. The construction of the tripod is clearly illustrated. Bayonet-type sleeves are necessary on the legs, as the oscillations of the ball put a strain on the legs which would work straight ferrules loose. A swivel at the top of the tripod holds a length of picture wire from which the ball is suspended, another swivel being provided at the ball end. The pin baseboard folds as indicated by the dotted lines in one of the details. It is fitted with three dowels which are glued in place and project on the underside so that they can be set into holes drilled in the surface of the game board. This assures getting the correct position of the pins at all times.



Now, let's play swing ball. First, the tripod legs must be adjusted to bring the ball directly over the suspension spot, and the wire adjusted to hold the ball 1/4 in. off the game board. Figs. 1 to 7 inclusive illustrate a few of the swings or "shots." Strangely, a strike will seldom result from a head-on hit of the king-pin. Fig. 2 shows the more scientific way to go after a strike. Two-pin shots will crop up constantly in the play, and the player most adept at making them, thereby recording a spare, is the fellow who will win the most games, other factors being equal. Careful playing, with application to the technique of making the spares count, will aid materially in getting a high scoring average.



Increasing the Strength of Small Microscopes



If you have a small microscope of 250 to 300 diameters, it can be converted to a higher powered instrument at no cost by simply using paper tubes to extend the length of the barrel. Make the tubes from heavy paper, or get some cardboard tubes of a size to fit snugly over the upper end of the microscope. Black paper or cardboard is preferable, although you can use any color and paint them black inside and out. Make up several tubes of varying lengths. In use, merely remove the eyepiece, slip one of the tubes over the end

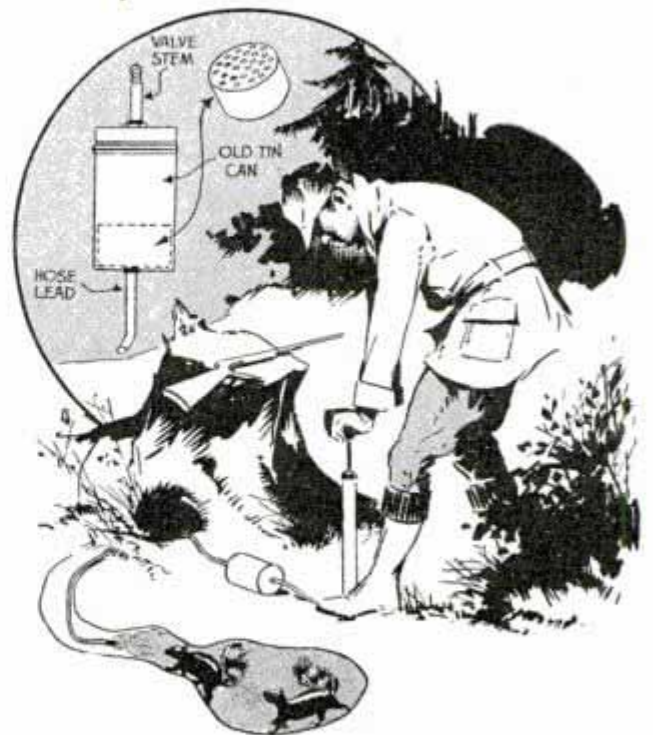


of the microscope and put the eyepiece in the upper end of the tube.—Brantlyn Woolsey, Ridgefield Park, N. J.

Inexpensive Den Smoker that Will Drive Out the Game

By merely working the handle of an auto-tire pump, you can force clouds of smoke into dens of small animals with this outfit. It costs nothing to build, and has a long hose that will direct the smoke into every pocket in the den. Get a large tin can having a tight-fitting cover. Solder a tire valve stem in the cover and a short tube in the bottom, the latter to take the long piece of hose. The smoke-producing material is held in a small can having the bottom perforated as shown. This material may be waste cloth sprinkled with smoke powder, which can be obtained from any firm that handles trapping supplies.—Martin G. Winterton, Lewis, Wash.

Woods that are quite absorbent require a priming coat that is rich in linseed oil, with a small amount of turpentine added; while the less absorbent woods need only a small amount of oil but more turpentine, to help the oil penetrate the wood.



With This Homemade Smoker, You Can Force Smoke into Every Pocket in Animal Dens

Old Razor Blade in Carving Tool Does Fine Detail Work



Carving Tool Uses Razor Blades, Which Are Shaped to Suit the Work at Hand

For carving in fine detail on small models and similar work, this tool has the advantage over others in that it employs an old safety-razor blade, which can be used whole or broken up into shapes to suit the work at hand. The tool holder is a piece of brass slotted at one end with a hack saw, and fitted with a machine screw to clamp the cutting blades in place.

Paintbrush Protected with Tin Sleeve

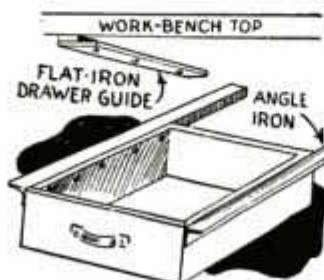


When a paintbrush is used frequently and is kept in a can of liquid to prevent paint from drying on the bristles, put a tin sleeve over the bristle end. Then, if the brush is left in the

can for several days, the bristles will not be bent out of shape by the weight of the brush. The sleeve should be a little wider than the length of the bristles.

Sagging of Workbench Drawers Stopped with Angle-Iron Slides

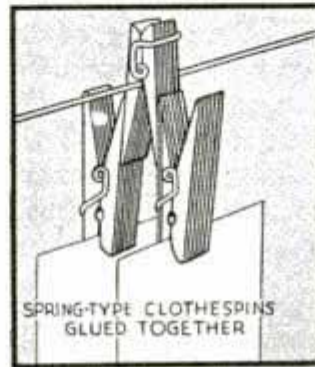
If the drawers in your workbench are loaded heavily and sag when pulled out, fit them with angle-iron slides to extend beyond the



rear end as shown. The guides for this installation are wide strips of flat iron screwed to the underside of the bench top, and spaced from the latter with pieces of wood or iron. If available, lengths of narrow channel iron may be used instead of the flat iron. These are drilled through both sides so that the upper side can be screwed to the bench.

Photo Negatives Held on Drying Line with Double Clothespin Clamp

Glued together as shown, three spring-type clothespins provide a double holder



for keeping photo negatives on a drying line. This is an improvement over the usual method of attaching a wire hook to a single pin in that the holder will not be dislodged by a slight movement

of the line. The holder is attached by straddling the line with the legs of the upper pin as shown, or by clipping the jaws of the upper pin to it.—Frank W. Bone, Adrian, Mich.

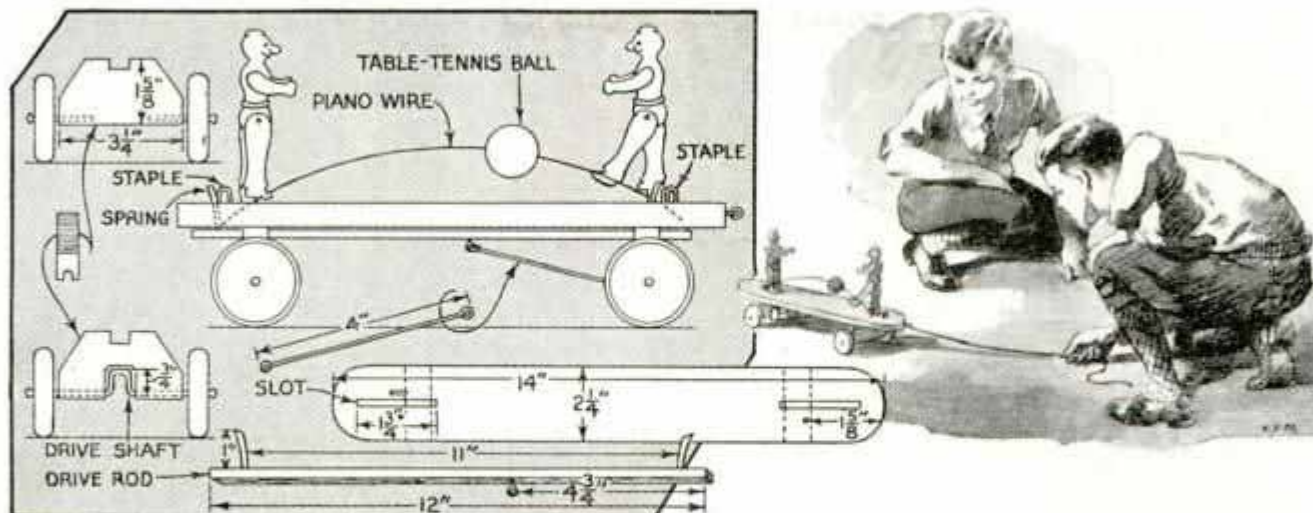
Screw Top on Sack Helps in Pouring

As an aid in pouring poultry and stock feed from a sack, cut out the screw top from an oil can and tie it in the sack top. Besides enabling you to pour the feed without spilling it, the screw top provides a means of quickly closing



the sack. If the tops are cleaned thoroughly before using, this idea is also handy in the kitchen where sugar, flour, salt, etc., are purchased in large sacks and removed when they are needed. A coat of enamel will help make the tops sanitary.

Lively Players Give Action to Football Toy



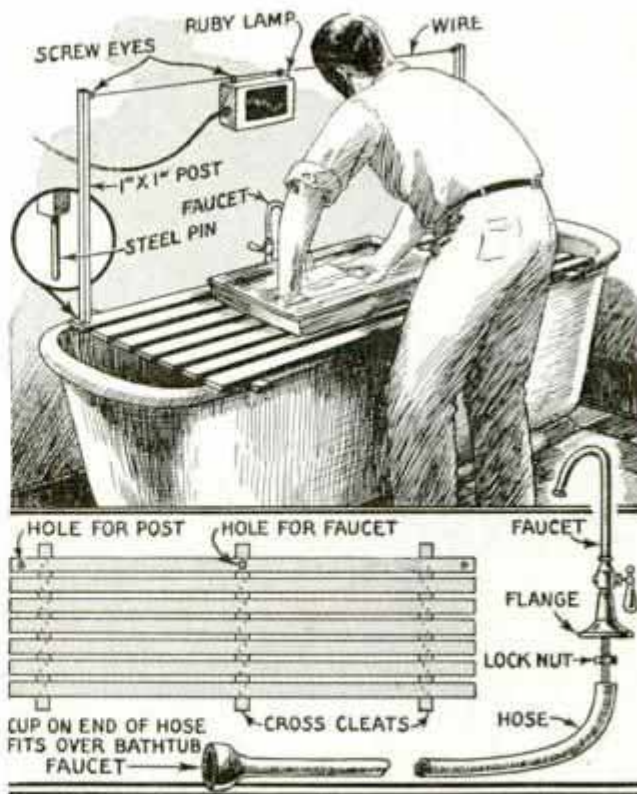
Snappy and amusing, this action toy causes two miniature football players to kick a ball back and forth between them when pulled over a floor. The wheels operate the pivoted kicking leg of each player by means of two lengths of clock spring, which project through slots in the base. These springs are fastened to a sliding drive rod, which is moved back and forth by the crank axle or drive shaft of

one pair of wheels. Wire staples, driven into the base to straddle the slots, act as triggers to snap the springs against the kicking foot of each player. The ball is a celluloid table-tennis ball drilled to slide easily along a curved length of piano wire, each end of which is anchored in a hole drilled obliquely into the base beside the players. These are scrollsawed from thin plywood or cigar-box wood.

Portable Photo Lab for Amateurs Slips over the Bathtub

Are you one of the many amateur photographers who are handicapped by lack of suitable space for a darkroom? If so, this portable equipment will enable you to do the work in your bathroom. A rack to hold the trays fits over the bathtub, stops being provided on the underside so that the rack cannot slip out of place. A handy faucet, fitted to the edge of the rack, can be connected to the bathtub faucet by means of a rubber hose. The ruby lamp can be moved to any convenient position on a taut wire suspended between two posts that are slipped into place at each end of the rack. With this arrangement, all spilled liquids will drain into the tub and it takes only a few minutes to clean up and store the equipment when the work is finished.

☞ An old card table with the top removed serves nicely as a frame on which to make a hooked rug; it is just the right height for working, and can be folded up and stored when not in use.



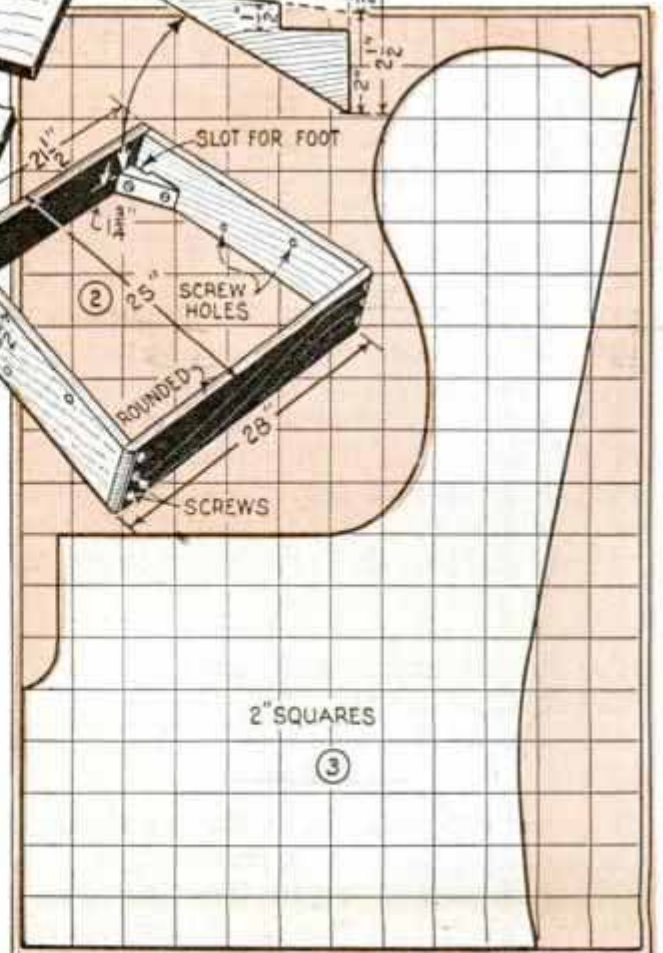
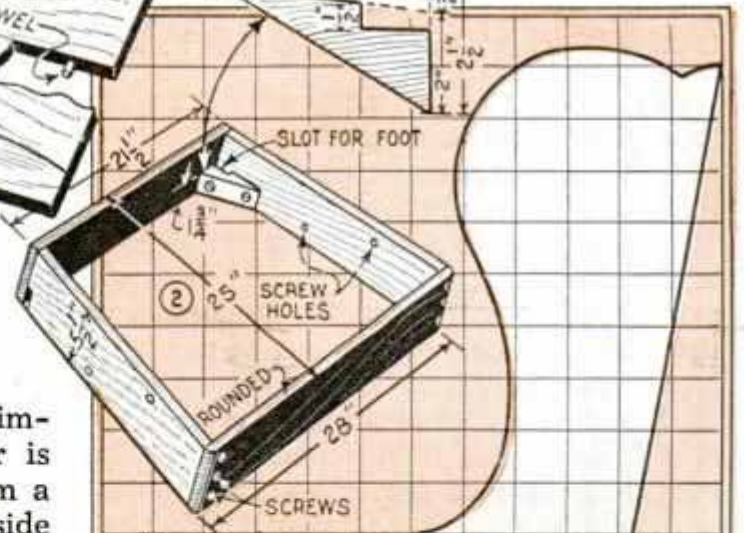
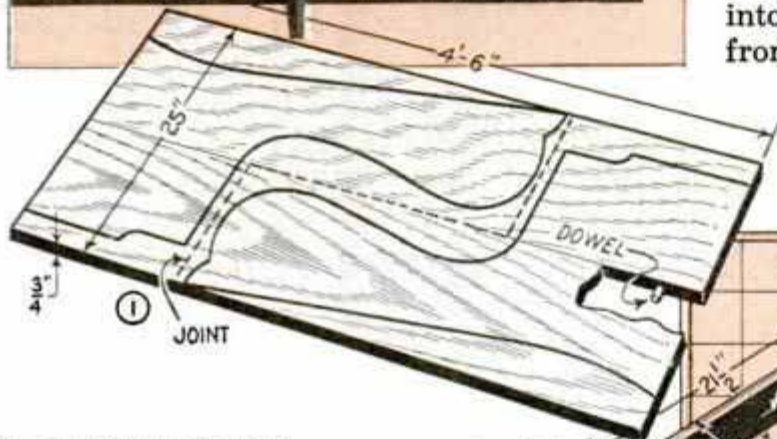
Set on Your Bathtub, This Rack, Which Holds Trays and Faucet, Quickly Converts the Bathroom into a Photographic Darkroom



Maple WING

design is again marked out on the panel and the sides band-sawed to shape. If the panel is too large or unwieldy to handle on a power saw, cut it apart along the dotted lines with a hand saw as in Fig. 1. The center cut should be made last, using a keyhole saw.

The frame, which carries the seat, is shown in Fig. 2. Any sound lumber is suitable, as it is covered by the sides and upholstery material. Screws, glue and corner blocks are used to get rigidity. Before attaching the side panels to the frame, holes for the feet should be made. The front feet are turned to the shape shown in Fig. 4, and are glued into holes drilled in the blocks at the front corners of the frame. The rear feet are band-sawed from hard maple to carry the curved line of



OUTSTANDING among colonial reproductions, this wing chair is upholstered neatly to provide real comfort, and its pleasing, quaint design adds coziness to any room.

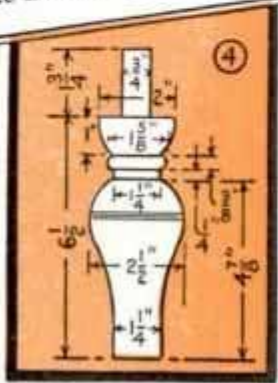
Construction of the chair frame is simple. Maple or knotty-pine lumber is matched for grain and jointed to form a panel large enough to make both side pieces, Fig. 1. Tight joints are essential, so be sure to make them slightly lower in the center than at the ends, as the shrinkage is greatest near the exposed end grain. It is advisable to dowel the joints at intervals to assure their holding under strain. To locate the dowel holes so that they will not be exposed in the sawing, a full-size pattern is made from the squared drawing shown in Fig. 3. This pattern is marked out on the pieces. After the glue is dry and the surfaces have been planed, the

no 00 p

CHAIR

of Colonial Days

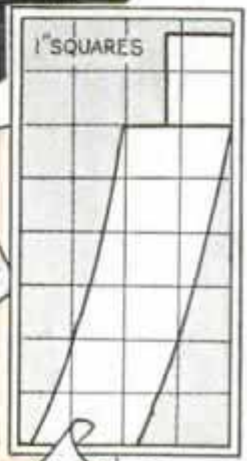
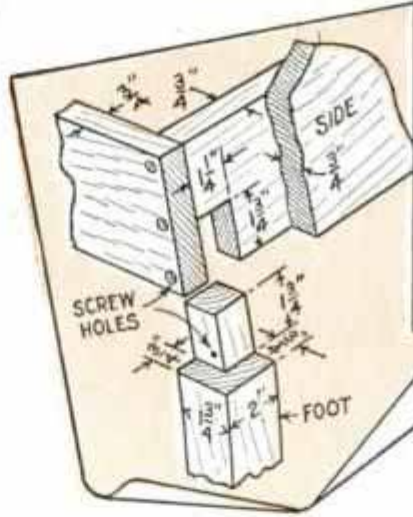
By R. O. BUCK
of the Lane Technical High School, Chicago



the back. A squared drawing of this form is given in Fig. 5. In order to have the back of the foot flush with the chair back, at the top, a shoulder is cut on the foot. Also, a similar shoulder is cut on the side, but here the foot is flush only at the extreme rear corner. To avoid having two thicknesses of the stock to span, thus leaving a weak tenon, the frame and corner blocks are notched out for the tenon, Fig. 5.

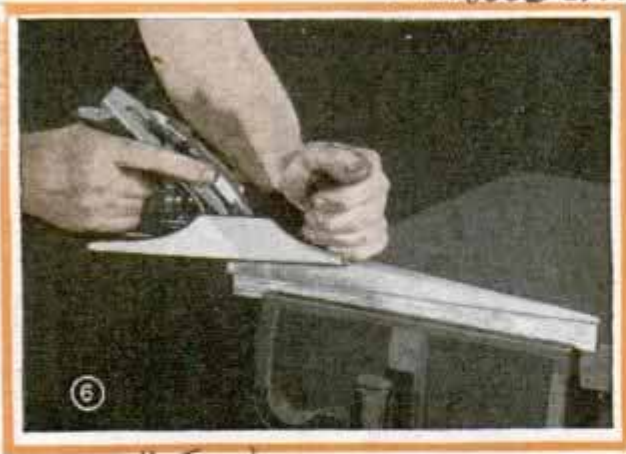
Having assembled the feet in the frame, the side panels may be glued and screwed into place, provided the formed top rail, side cleats and bottom rail have been made previously and fitted, as shown in the assembly drawing, Fig. 7. The exact length and bevel on the ends of these pieces can be determined best by trial. Short dowels and glue are used to fasten the horizontal members, light angle brackets being used to reinforce these joints.

The arm rolls, shown in the detail, are planed to shape by screwing them to a strip of waste stock so that they may be held in a vise as shown in Fig. 6. Dimensions and method for mounting these pieces are shown in the detail drawing. After the arm rolls are mounted, the top edge should be rounded carefully with a plane, or file and sandpaper, to conform



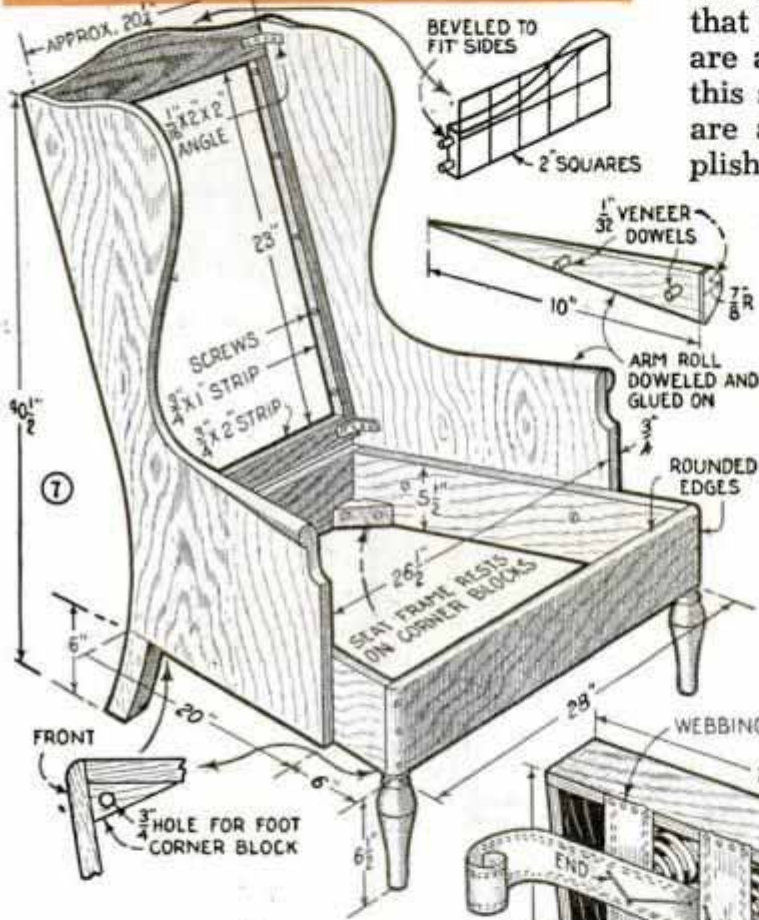
to the shape of the roll. When the frame has been sanded, it may be stained and finished.

Next comes the upholstering. If the directions are followed carefully, you will have no difficulty in getting a workman-like job. First, you will need a seat frame on which to stretch the foundation of webbing. This frame fits inside the main frame and rests on the corner blocks. The dimensions can be obtained from Fig. 8. Almost any lumber that is sound enough to hold tacks is suitable. Nails are used to fasten the corners. Webbing 3 1/2 in. wide should be spaced about equidistant on the frame so that there are three interwoven pieces running in each direction. Do not cut the webbing into lengths until



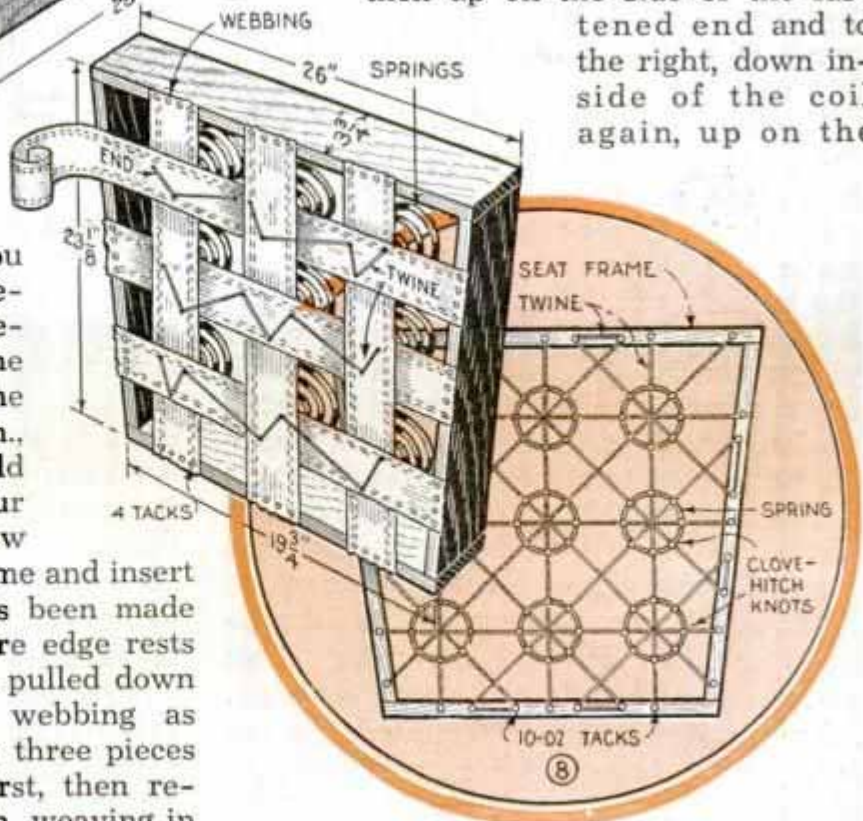
and out. Use seven tacks at each end, folding over as described.

Nine springs are used in the seat frame. These may be purchased for about 50 cents a set, or they may be taken from an old automobile or chair cushion. Each spring is fastened at the intersection of two pieces of webbing by means of strong twine, which is sewed through the webbing with a large needle. The usual practice is to make the thread continuous, tying it at each spring. After the springs are mounted, the frame is reversed so that they may be tied. The springs, which are about twice as high as the frame, at this stage, must be compressed until they are about level with it. This is accomplished by tying. Make a knot in one end of your twine, drive a 10-oz. tack through it, and fasten it into the edge of the frame on a line with the center of a spring. Stretch the twine across the springs to the opposite side of the frame and pull down until they are level with the top of the frame. Adjust them so that they stand vertical. Now grasp the twine and the spring nearest the fastened end with one hand, and, with the other hand, pass the free end of the twine down inside of the spring, then up on the side of the fastened end and to the right, down inside of the coil again, up on the



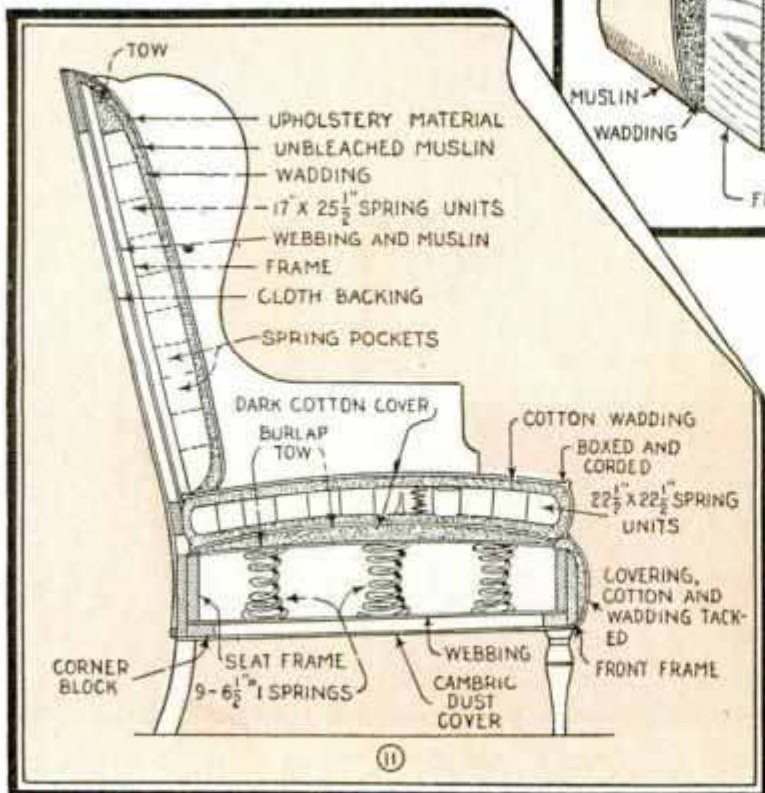
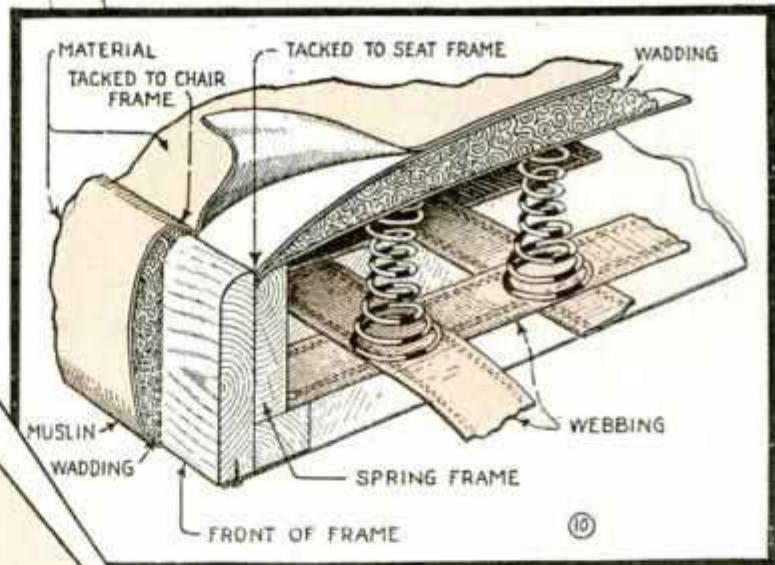
tended end and to the right, down inside of the coil again, up on the

it has been installed, as you will need the additional material for stretching. The procedure is as follows: With the webbing extended over the edge of the frame about 1 in., drive in three tacks. Then fold the end over and drive in four more to hold the first end. Now carry the piece across the frame and insert a stretcher block, which has been made previously, so that the square edge rests against the frame and, when pulled down horizontally, stretches the webbing as shown in Fig. 9. Stretch the three pieces running across the frame first, then repeat in the opposite direction, weaving in

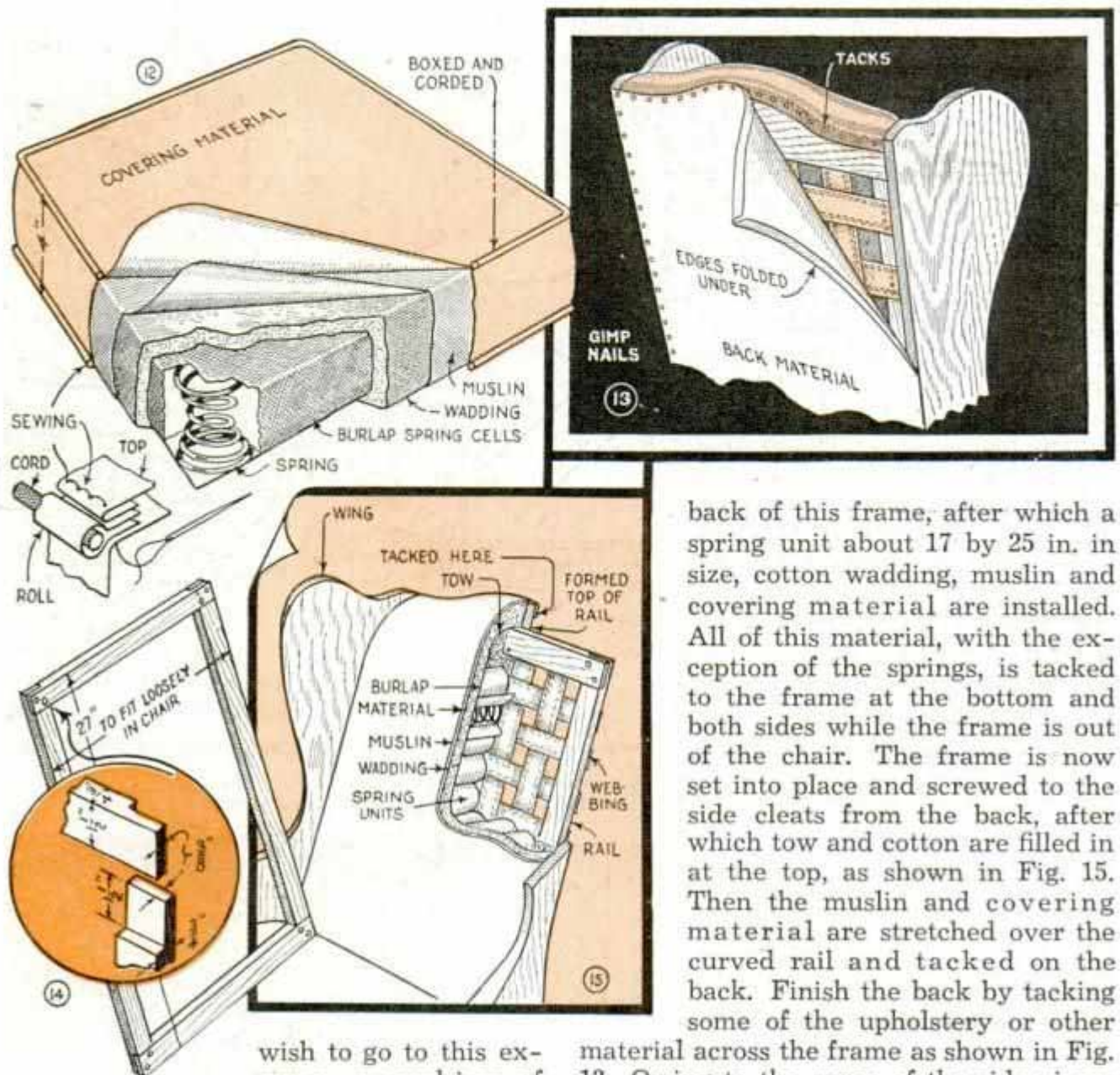


opposite side and to the left, and through the loop thus formed, pulling tight to form a clove-hitch knot. Pull the twine tight, and form a similar knot on the opposite side of the same spring, this time passing the twine down on the outside first, then up on the inside. Proceed with all of the ties in a similar manner, spacing the tops of the springs the same as they are on the bottom and fastening the twine to the edges of the frame with tacks. The springs are tied at eight points. The top of the spring assembly is covered over with burlap, securely tacked along the edges of the frame, and sewed to the springs. Over the burlap, a layer of cotton wadding is used to give a smooth surface. This, in turn, is covered with some dark cotton material, the edges of which are carried down and tacked to the outer faces of the frame.

The front rail of the chair frame is padded and covered with the upholstery material, as shown in Fig. 10. The material, without padding, is carried around the ends of the frame to meet the large side pieces, which carry the arms. After this operation is fin-



ished, the seat frame may be dropped into place and fastened to the corner blocks from below with long screws. The black cambric dust cover tacked across the bottom finishes the seat springing, as shown in the sectional drawing, Fig. 11. The loose seat cushion is the next job. As a foundation, a set of unit springs, which are simply coil springs sewed into burlap cells, are used. A 22 1/2 by 22 1/2-in. unit is about right. Units can be purchased ready made for a nominal sum or, if you do not



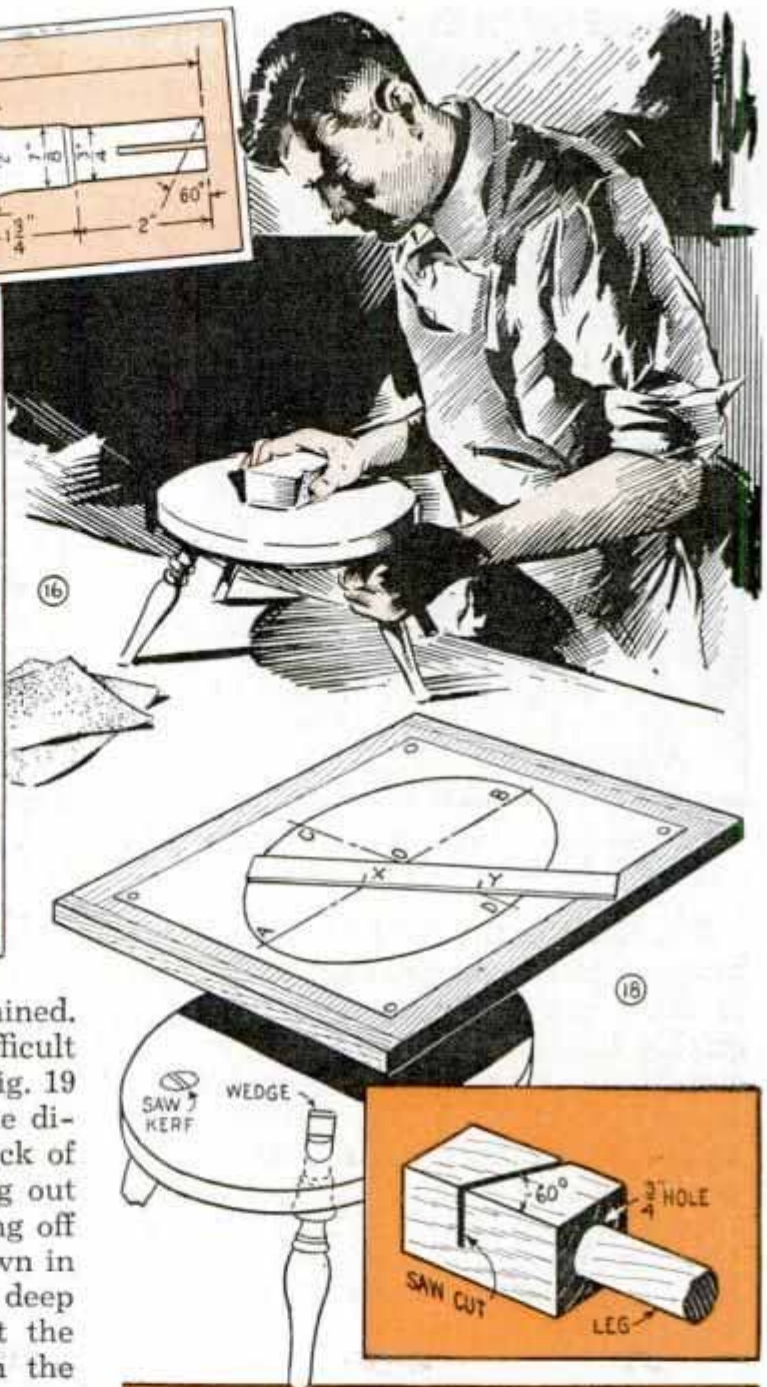
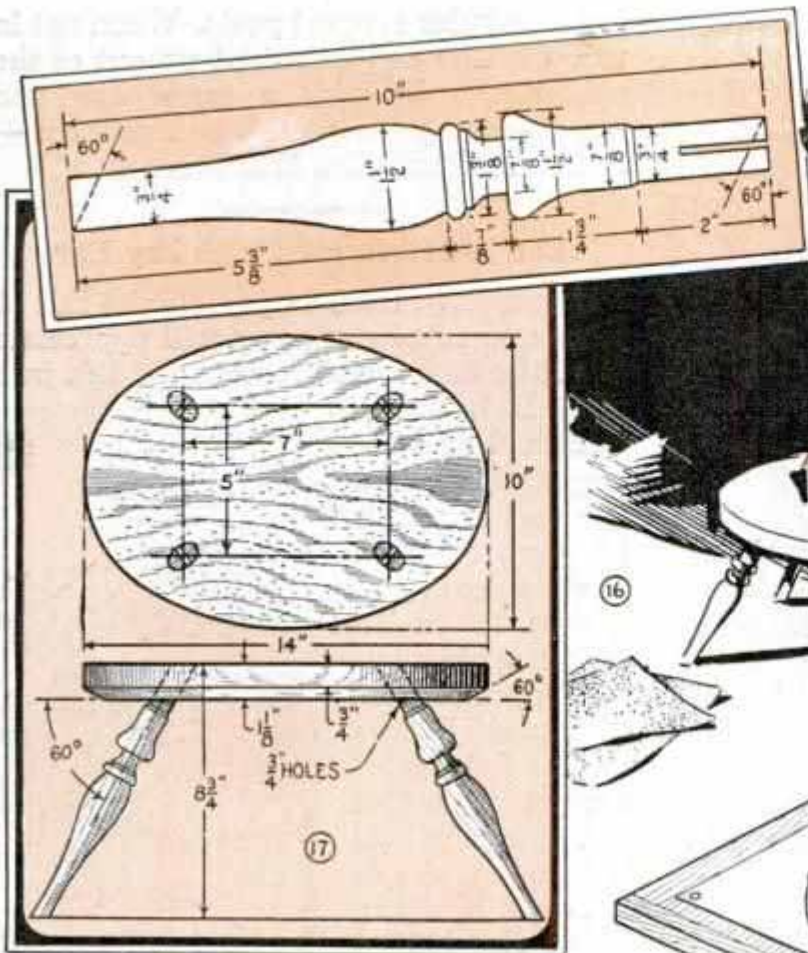
wish to go to this expense, a cushion of tow or cotton may be substituted, although this will sacrifice some of the comfort. The spring unit is covered with a casing of unbleached muslin of approximately the size and shape of the frame, and about 4 in. high. The edges of this casing should be boxed or squared, leaving a seam open at the back through which cotton wadding or tow is inserted around the unit and distributed to form a square-edged cushion. After sewing up the back seam, the cover of upholstery material is made and slipped over in a similar manner. The edges of this cover are boxed and corded as shown in Fig. 12.

The back cushion is formed in much the same way as the seat, except that it is mounted on a frame of the type shown in Fig. 14. Webbing strips, spaced about 1½ in. apart, are first stretched across the

back of this frame, after which a spring unit about 17 by 25 in. in size, cotton wadding, muslin and covering material are installed. All of this material, with the exception of the springs, is tacked to the frame at the bottom and both sides while the frame is out of the chair. The frame is now set into place and screwed to the side cleats from the back, after which tow and cotton are filled in at the top, as shown in Fig. 15. Then the muslin and covering material are stretched over the curved rail and tacked on the back. Finish the back by tacking some of the upholstery or other

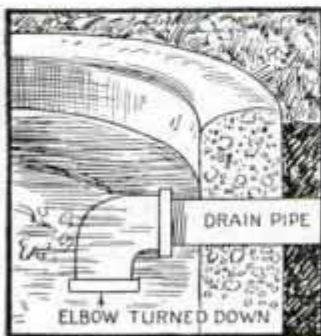
material across the frame as shown in Fig. 13. Owing to the curve of the side pieces it is necessary to tack a filler strip along the bottom edge to produce a straight line across the bottom.

A colonial chair would not be complete without one of the pleasing little crickets, which were so popular at that time. Fig. 17 gives the dimensions for a cricket, which should be made of the same material as the chair. The legs are turned to the pattern shown above Figs. 16 and 17, and are made long enough to extend entirely through the top, into which they are wedged as shown in Fig. 18. A convenient method for laying out the oval top is shown. Mark off on a piece of cardboard the distance X equal to C - O and the distance Y equal to A - O. Mark these points on both sides of the cardboard. By placing the cardboard so that these two points are always at the axes, a series of



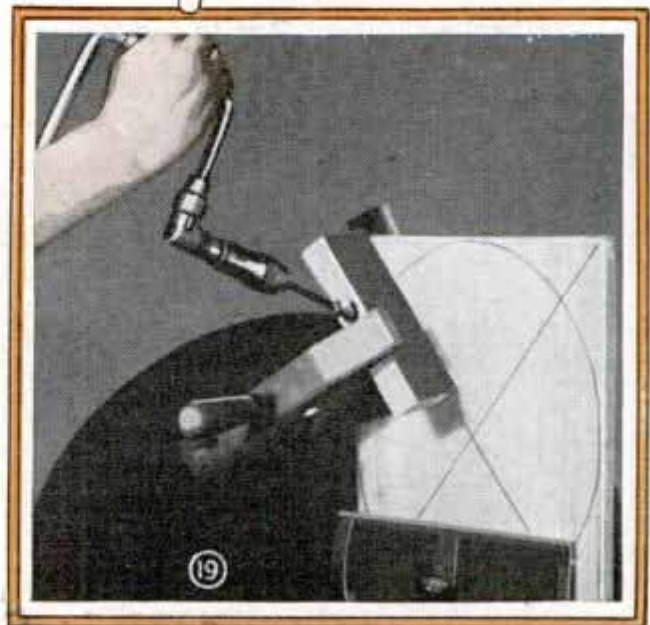
points on the ellipse can be obtained. Drilling the holes for the legs is difficult unless a jig like the one shown in Fig. 19 is used. The jig is clamped along the diagonal lines of the piece, using a block of scrap at the back to prevent splitting out the face. A convenient jig for cutting off the legs at the required angle is shown in Fig. 18. The hole is drilled just deep enough so that the saw will cut at the proper point. The block is held in the vise during the operation.

Elbow Prevents Clogging of Drain Pipes

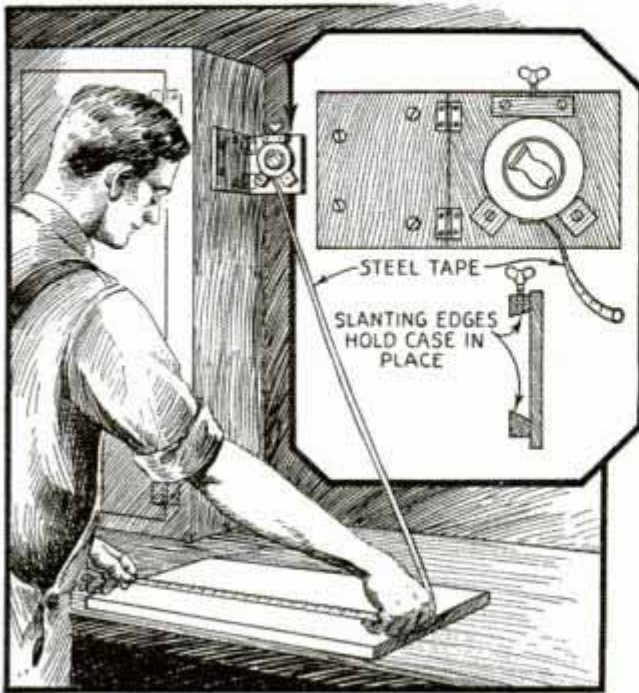


Instead of using a screen to prevent drain pipes that lead from fishponds, sumps, etc., from getting clogged by floating debris, add an elbow to the intake end of the pipe and turn it

down. The opening of the drain pipe is then always below the level of the water flowing out of the pipe.



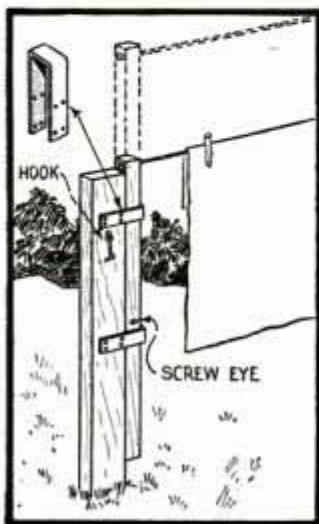
Hinged Holder Protects Steel Tape Used on Workbench



*Steel Tape Mounted on Wall to Prevent Breakage,
Is Handy around the Workbench*

Mounted on the wall above a workbench, a steel tape not only enables you to take accurate measurements more quickly than can be done with a scale or carpenter's square, but it is less likely to be broken. The tape is mounted on a hinged base so that it can be swung around to conveniently reach various positions on the bench. Wood blocks hold the tape case, which is removed by loosening a thumb-screw in one of the blocks.—W. C. Wilhite, Edelstein, Ill.

Clothesline Raised Out of the Way with Adjustable Post



As a clothesline must be fairly low to hang up clothes, it is often a source of much inconvenience when not in use. To make the line adjustable in height, it is fastened to two hardwood bars, which slide in U-shaped metal pieces screwed or bolted

to the regular support posts. When not in use, the line can be raised up out of the way and held with a screw eye and screen-door hook in each post and bar.—E. T. Gunderson, Jr., Humboldt, Ia.

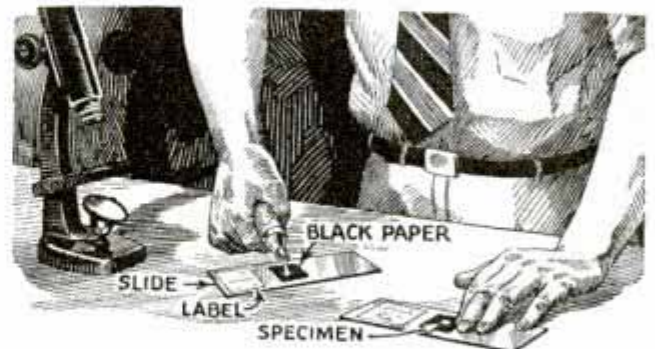
Can Lids Loosened with Pry Bar

If you have tried to pry off the lids of paint and sirup cans, you will appreciate this little tool, which loosens the lids in a jiffy. It is made from a 6 or 8-in. length of flat iron, one end of which is beveled and bent as shown. If a can is to be sealed again with the lid, it is best to gradually loosen the latter all around instead of trying to pry it off from one position, which is likely to bend the lid so that it will not fit tightly.



Microscope Mounts Save Time and Storage Space

A quick and inexpensive method of making microscope mounts for viewing minerals is to use glass slides. A small square of black cover paper, obtainable from any printer, is mounted in the center of the slide with transparent household



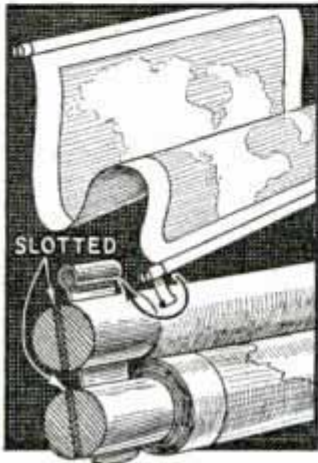
*Microscope Mounts Made from Glass Slides for
Viewing Specimens of Minerals*

cement, after which the specimen, about one-half the size of a pea, is attached in the center of the paper with a drop of the same material. A label, containing the name and variety of the specimen, may

then be cemented to the slide. Such mounts should be viewed under the lowest powers of your microscope by direct illumination.—Hence J. Griffith, Dallas, Tex.

Roll Maps Locked with Tin Clips

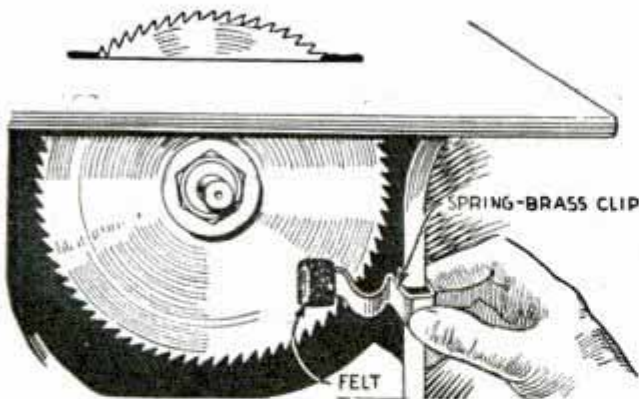
Instead of using rubber bands to keep large maps from unrolling, rig up a couple of tin clips as shown. The projecting ends of the map sticks are slotted with a saw and the clips are inserted into the slots of the lower stick, being fastened in place



with a single brad which acts as a pivot or hinge. When the map is rolled, the projecting end of each clip is swung to engage the open slots of the upper stick, locking the two so that the map will remain rolled.

"Singing" of Circular Saw Stopped with Felt-Pad Sound Absorber

"Singing" of a metal-cutting saw may be silenced by a small felt pad, which is held lightly against the side of the saw by means of a spring-brass clip attached to

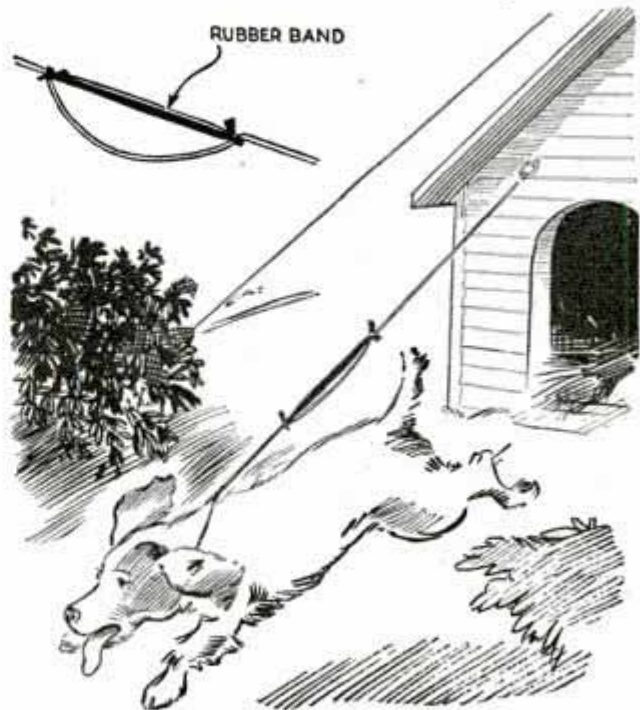


Felt Pad on Spring-Brass Clip Silences "Singing" of Metal-Cutting Saw

the saw frame. The pad dampens vibration of the saw, which causes the singing noise.—Kenneth Murray, Sturgis, Mich.

☐ When glass push pins are used to hang pictures, dip them in enamel to harmonize with the color scheme of the room.

"Shock Absorber" for Dog's Leash Made of Inner-Tube Strip



Spring or Rubber Band in Dog's Leash Absorbs Shocks on Its Neck When It Is Tied

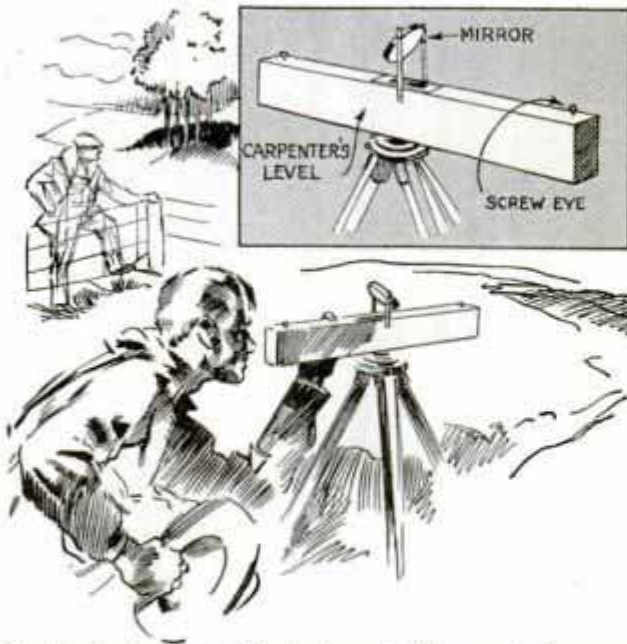
If you keep your dog tied with a leash, insert a short length of heavy inner tube or a spring to cushion shocks when the animal, in running to the end of the leash, suddenly takes up the slack. The band or spring may be tied in the leash, as shown, leaving 3 or 4 in. of slack in the latter, or it may be tied to the end. Still another way is to cut the leash in the center and tie the band to the severed ends.—Leonard Mitchell, San Francisco, Calif.

Even Margins Trimmed on Photos by Following Shadow of Knife

An effective method of obtaining even margins on photo prints is to place a large lamp above the trimmer so that the knife casts a shadow on the photo at the exact spot where it will fall. This method



is especially handy when trimming prints on double-weight paper, which is too opaque to transmit a shadow from a lamp placed underneath the trimmer.—Neil W. Northey, Loma Linda, Calif.



Simple Instrument, Made from Mirror and Carpenter's Level, Which Was Found Useful in Surveying Farm Bottom Lands

Surveying Instrument Improvised from Carpenter's Level

In surveying the bottom lands of his farm, a man improvised a practical instrument from a carpenter's level, pocket mirror and a couple of screw eyes. The mirror is soldered to a U-shaped wire, the legs of which are inserted in holes on each side of the spirit glass, the screw eyes being driven into the level in the positions shown. By adjusting the mirror to a 45° angle, it is possible for the operator to level the stick on a camera tripod as he sights through the screw eyes toward an objective point established ahead.

Aluminum foil in which camera film is wrapped can be cemented to wood model parts to give them the appearance of metal.

A Masterpiece in Ship Models



Hundreds of plans for many other projects are listed in our 80-pp. booklet "What to Make" which will be sent for 12c postpaid. Also contains information on workbench construction, tools you need, how to file saws, make wood joints, spin metal, get correct measurements, etc.

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Viking Ship Model—888: Used by Norsemen in early explorations. 14-in. hull—25c.

"Santa Maria"—759: Simplified design of Columbus' flagship. About 18 in. long—25c.

"U.S.S. Pensacola"—863 and 864: Midget design of 10,000-ton treaty cruiser—50c.

Prairie Schooner—728: Model is quaint reminder of covered-wagon days. Wagon without top, 8¾ in. long—25c.

Model Colonial Cannon—835: Perfect 10-in. miniature of guns used during days of 1776. Turned brass and wood—25c.

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago

SHOP NOTES

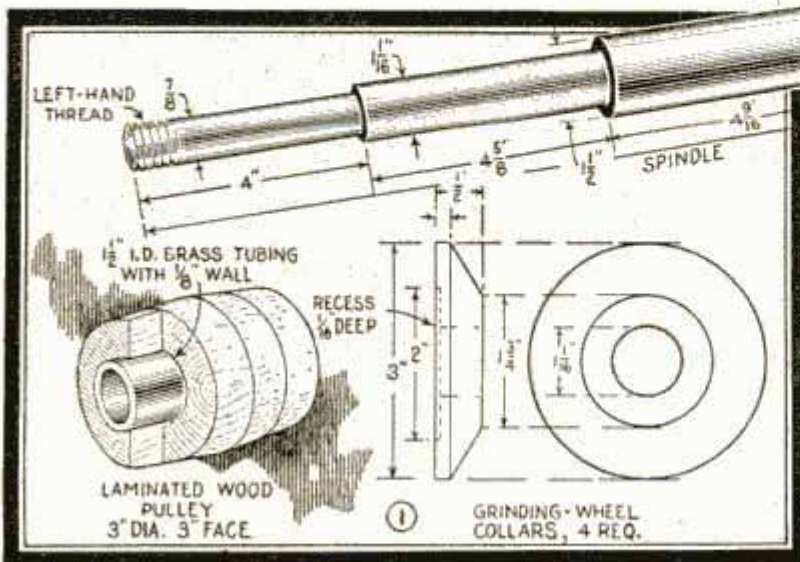
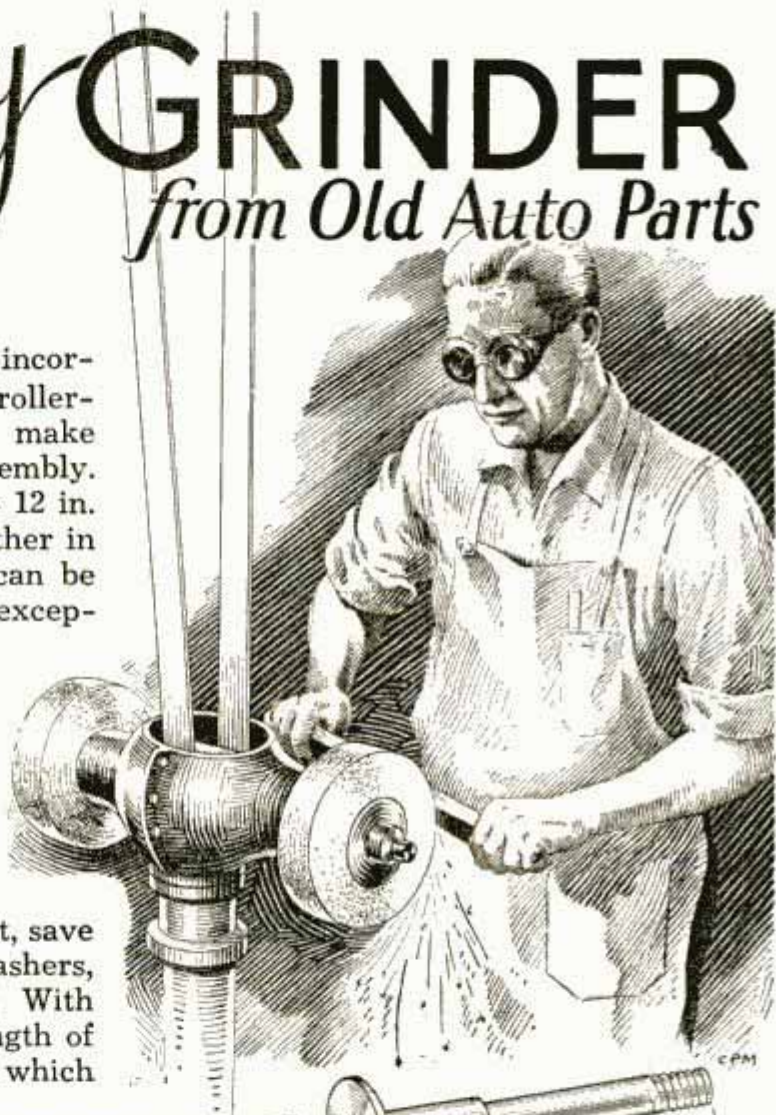


Heavy-Duty GRINDER from Old Auto Parts

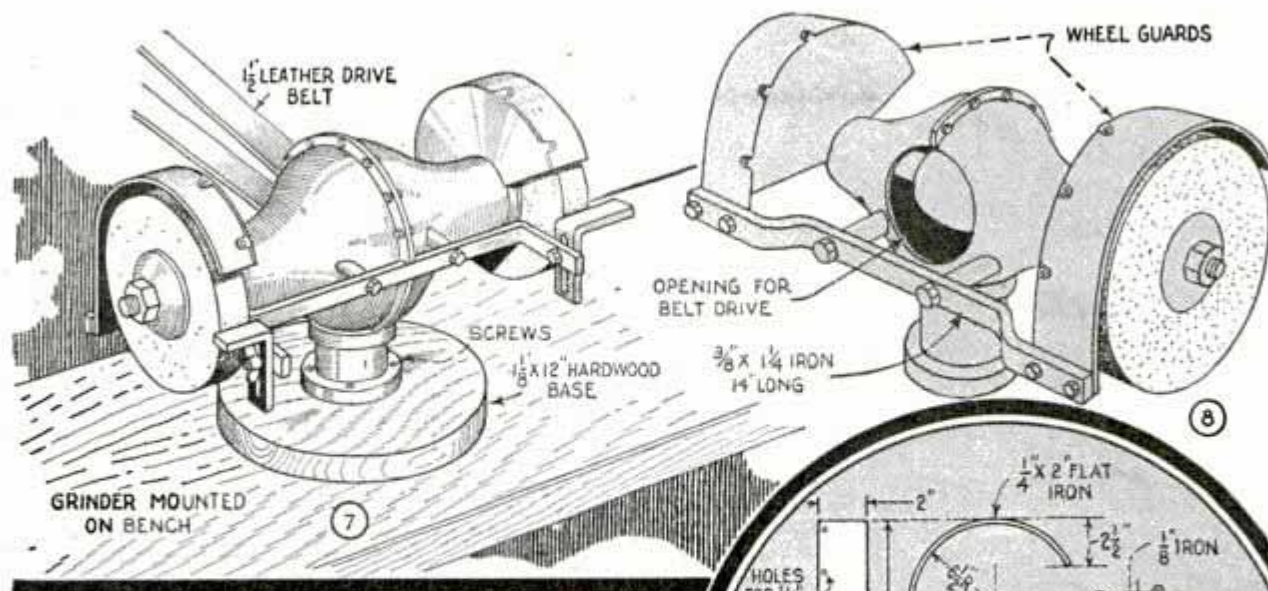
by ROYCE M. ROATH

STURDINESS and accuracy are incorporated in this inexpensive, roller-bearing grinder, which you can make from an old auto-differential assembly. The grinder will take wheels up to 12 in. in diameter, and it can be made either in a floor or bench type. The work can be done with ordinary tools with the exception of a turned wheel shaft, which is substituted for the axles, the latter and the gears being discarded. The original grinder was made from a model-T Ford differential, although you also can use the housing from a model-A Ford or a Chevrolet.

When you take the assembly apart, save the bearings and the thrust washers, which are used on the new shaft. With these parts at hand, get a 24-in. length of cold-rolled steel, 1½ in. in diameter, which

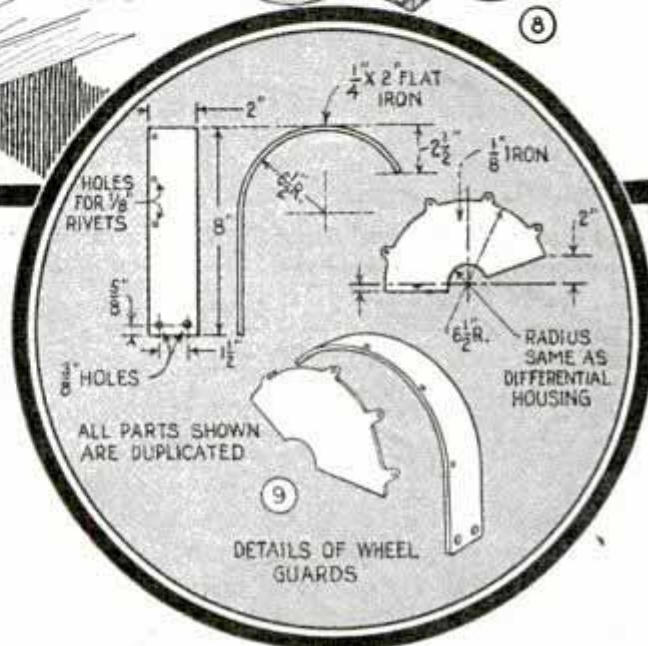


is used for the shaft. Rough, cast-iron disks, commonly known as building washers, are cheapest for the four wheel collars needed. To make the drive pulley, shown in Fig. 1, four hardwood disks are bored to a drive fit over a bushing made from a 3-in. length of brass tubing having an inside diameter of 1½ in. and a 1/8-in. wall. Use glue between the



tail gives an over-all finished length of $13\frac{3}{4}$ in., but it is better to make this roughly 14 in. to allow for irregularities in sawing off the ends. Note the collar inside the housing. This is the retaining collar for the outer end of the roller bearing and is already brazed in place. Also, note that the housing projects slightly beyond the collar, which allows room for a felt grease-retaining washer. The opening for the drive belt can be cut at a point opposite the propeller shaft sleeve, or you can arrange it so that the machine can be driven from the back. Before assembly, drill and tap holes into the housings directly above the bearings to take standard pressure grease fittings as in Fig. 3.

To assemble, place two of the original steel washers taken from the differential assembly on the spindle, one on each end, and slide them up against the inner shoulder. Place the bearings in position with one end against the washer. Then slip on the two halves of the housing and bolt them together. Drill four holes through the housing to take $\frac{3}{8}$ -in. iron rods, Figs. 4 and 6, which support the guards on one side and the tool rest on the other. As these holes pass through the housing at an angle, it is best to drill them with a $\frac{5}{16}$ -in. bit, and then enlarge them with a reamer. In order to tighten the bolts effectively, sleeves are cut from $\frac{1}{2}$ -in. pipe and placed over the threaded ends of the rods between the flat-iron supporting bars and the housing as in Figs. 4 and 6. One end of each sleeve is beveled so that it fits snugly against the housing. The assembly of the wheel guards is shown in Figs. 8



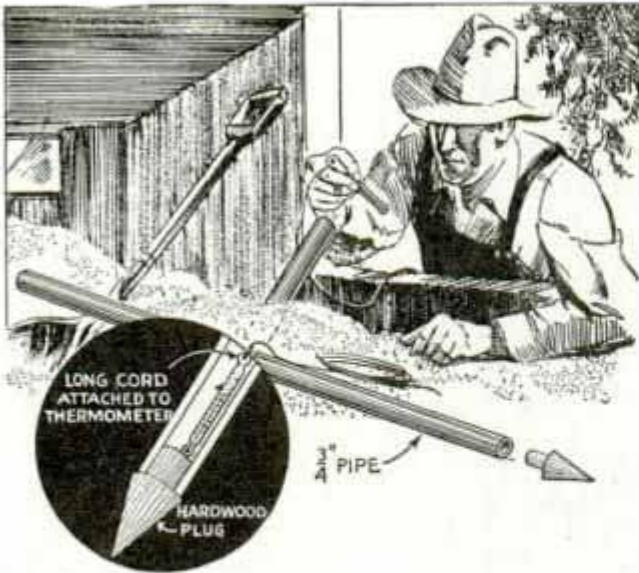
and 9, the latter giving the essential dimensions. The wheel guard is bolted to the supporting bar at the back. It is not fastened to the housing. The balance of the assembly for the floor-type grinder with overhead belt drive is clearly shown in Fig. 5, while the bench type is shown in Fig. 7.

Safety requires that the speed of 12-in. grinding wheels should not exceed 2,000 r.p.m.; 1,800 r.p.m. is better for a wheel of this diameter. Smaller wheels can be driven at proportionately higher speeds.

Lantern Attached to Brakeman's Arm



To keep both hands free for his work, a brakeman fastens the electric lantern to his arm. The handle of the lantern is slipped over his arm, and the bottom is fastened to his wrist with a heavy rubber band.

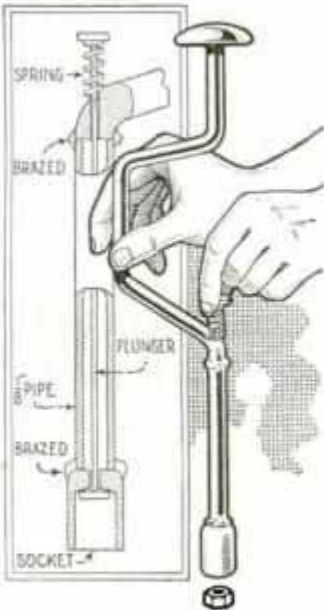


Pipe Pushed into Stored Grain Carries Thermometer to Check Temperature and Warn of Heating

Checking Temperature of Stored Grain to Prevent Heating

A farmer who sometimes experienced losses by having his grain heat and spoil in the bin, rigged up this tool to check its temperature. A length of $\frac{3}{4}$ -in. pipe with a pointed wood plug in one end was pushed into the grain so that a thermometer could be lowered inside with a string. The thermometer was left in the pipe for several hours, or overnight, before taking a reading.

Plunger on Speed Wrench to Expel Nuts



Greasy nuts and cap screws that ordinarily stick in the socket of a speed wrench are expelled with this plunger attachment. Saw off the shank of the wrench and, in its place, braze a piece of $\frac{1}{8}$ -in. pipe. To the end of this, braze a wrench socket of the size desired. Then run a length of stiff wire or

small rod through the pipe and socket and out through a hole drilled in the end of the wrench as shown. This serves as the

plunger and is fitted at the upper end with a knob, under which is a small compression spring.—G. E. Stillwell, Atlanta, Ga.

Split Spout on Oil Can Prevents the End from Clogging

When oiling out-of-the-way bearings on a piece of machinery, the spout of the oil can is sometimes accidentally jabbed into grease or dirt, which clogs the spout. To prevent this, split the end of



the spout and bend the two pieces to a wedge shape as shown, leaving the spout openings at the sides.

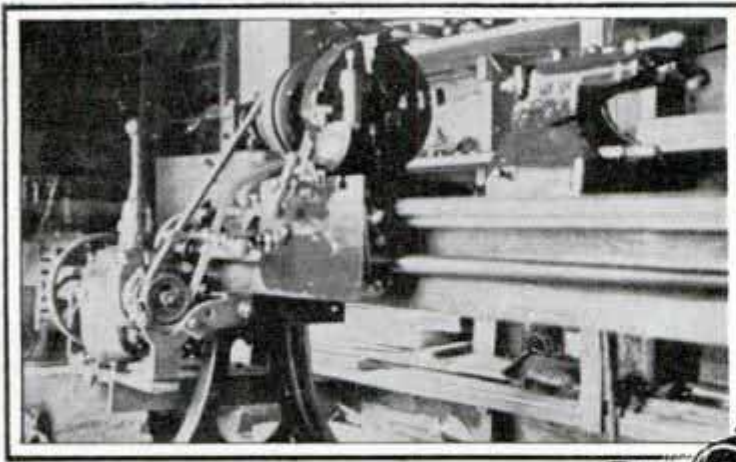
Waste Box for a Paper Cutter

A workbench on which a paper trimmer is used will be kept tidy if the latter is mounted on a wooden box to catch the waste. The box should be several inches longer than the trimmer, which is fastened to it with triangular pieces of sheet metal. The box shown in the photo is fitted with a sliding lid, which is kept closed when the trimmer is not in use to prevent the waste from being scattered.—Guy A. Rafuse, Bridgewater, N. S., Canada.

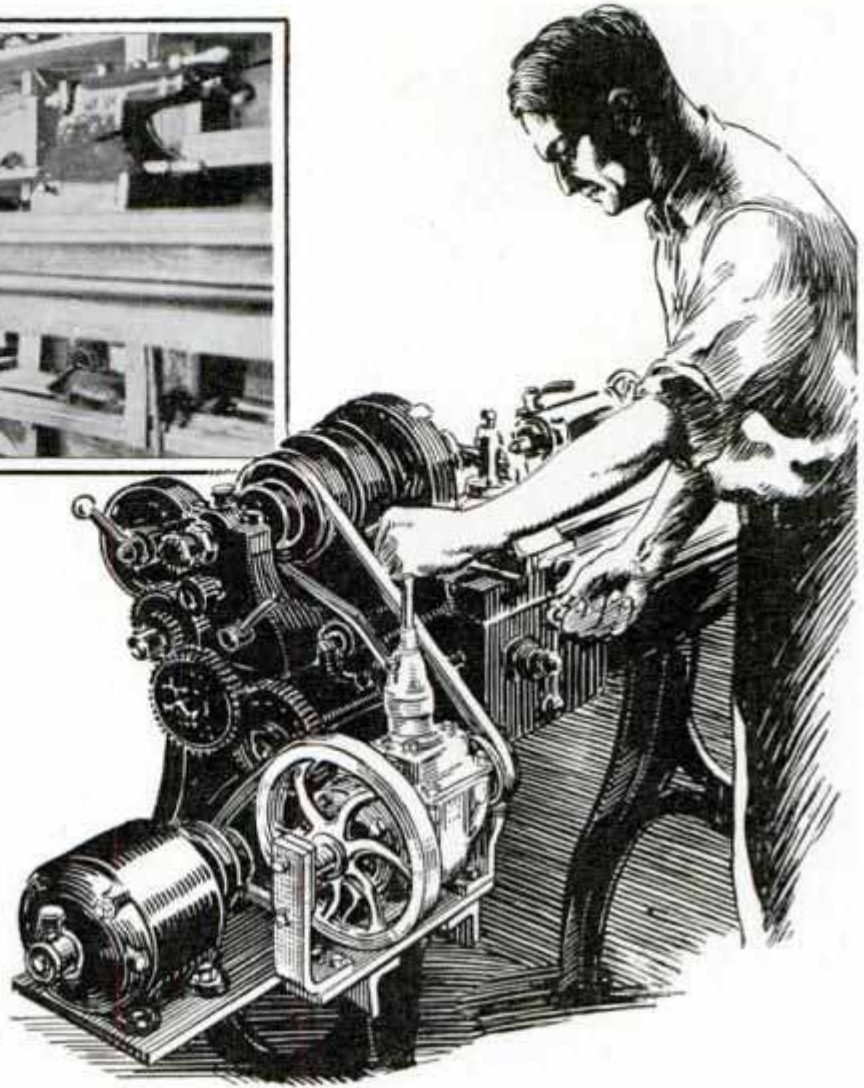


Paper Trimmer Mounted on Box, Which Catches Refuse and Keeps Workbench Clean

Old Lathe Improved with Auto Transmission



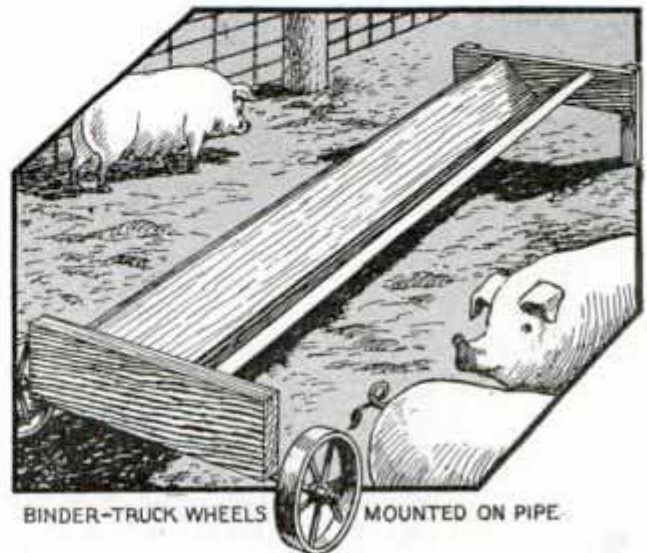
Lathes with cumbersome countershafts may be converted inexpensively into compact units by using an old auto transmission. This enables you to reverse your lathe, or to drive it forward at any one of three speeds by merely stopping the motor and shifting a lever. Get a transmission that is in good condition. Wash out the old grease with gasoline and refill it with fresh lubricant. The method of mounting the assembly depends on your lathe. Usually this can be done in a manner similar to that shown. Sizes of pulleys will be governed by the speeds at which you wish to drive the lathe. The drive pulley is



mounted on the front end of the transmission shaft, while the pulley for driving the lathe is keyed to the rear end in the position occupied by the universal joint.

Wheeled Feeding Trough Is Easily Moved in Hog Pens

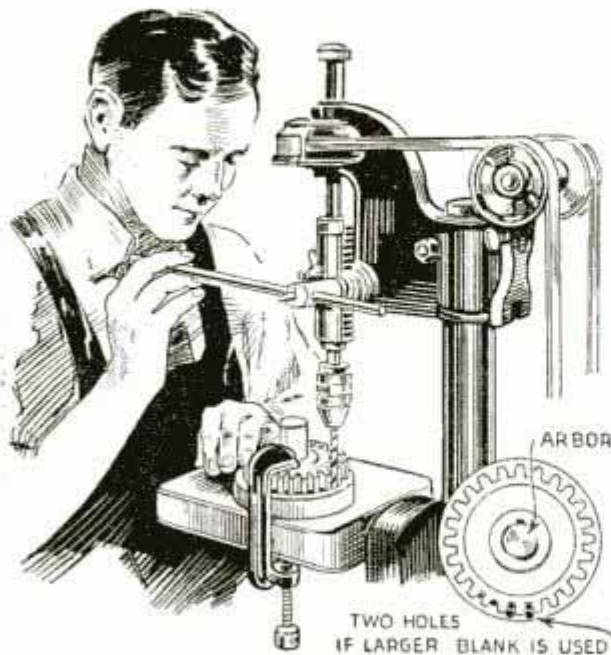
As an aid in moving hog-feeding troughs, which must be done at intervals to prevent mud puddles from forming around them, they can be fitted with a pair of wheels, such as those taken from the trucks of an old binder. The wheels are mounted on a pipe, which serves as an axle, and is attached to one end of the trough. This arrangement will permit the trough to be wheeled about when the opposite end is lifted from the ground. Legs should be attached to raise this end of the trough to a level position.



BINDER-TRUCK WHEELS MOUNTED ON PIPE.

☐ A piece of rosin stirred into melted bab-bitt will make it flow better.

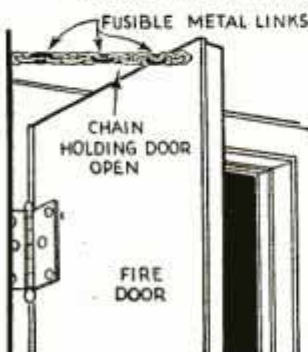
Using Your Drill Press to Cut Teeth on a Blank Gear



In the Absence of a Milling Machine, You Can Cut Teeth on a Blank Gear with a Drill Press

For experimental work, or in an emergency, a gear can be made on a drill press. The old gear, which is used as a pattern, and the gear blank are fastened together with a tight-fitting arbor. This is important, as the pattern must not shift or turn on the blank once the work is started. Select a drill bit that will fit loosely between the teeth of the gear to be copied, and drill the blank. One hole between each pair of teeth is sufficient if the new gear is to be the same size as the pattern. In some cases, if accuracy is not critical, or if the new gear is for temporary use, it may be made slightly larger than the pattern, and two holes drilled between each pair of teeth as shown. The teeth are then filed smooth to the correct bevels and the new gear is hardened.—Walter Evans, Buffalo, N. Y.

Fire Doors Closed Automatically

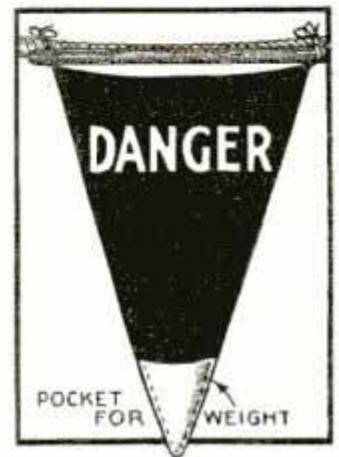


Fire doors, which have been propped open for ventilating purposes, become a hazard when left in this position unless some provision is made to assure their

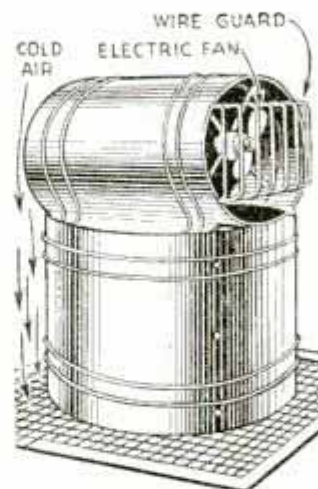
prompt closing the instant fire breaks out. If the door is held open by a chain containing one or more fusible links, which melt at a temperature of 170° Fahr., the door will close automatically when this temperature is reached. The alloy for the links is made by melting together cadmium, 1 part, lead, 1 part, and tin, two parts. The mixture is cast in thin rods, which are bent to form the links.

Keeping Horizontal Flags Unfurled

On certain construction jobs it is sometimes necessary to mount a flag horizontally, suspending it from a cable or brace rod. In this position, the wind often wraps the flag around the cable so that it cannot be seen. To avoid such trouble, stitch a small pocket at the tip end of the flag. It takes but a moment to drop some sand, pebbles or other weight into the pocket to hold the flag unfurled.

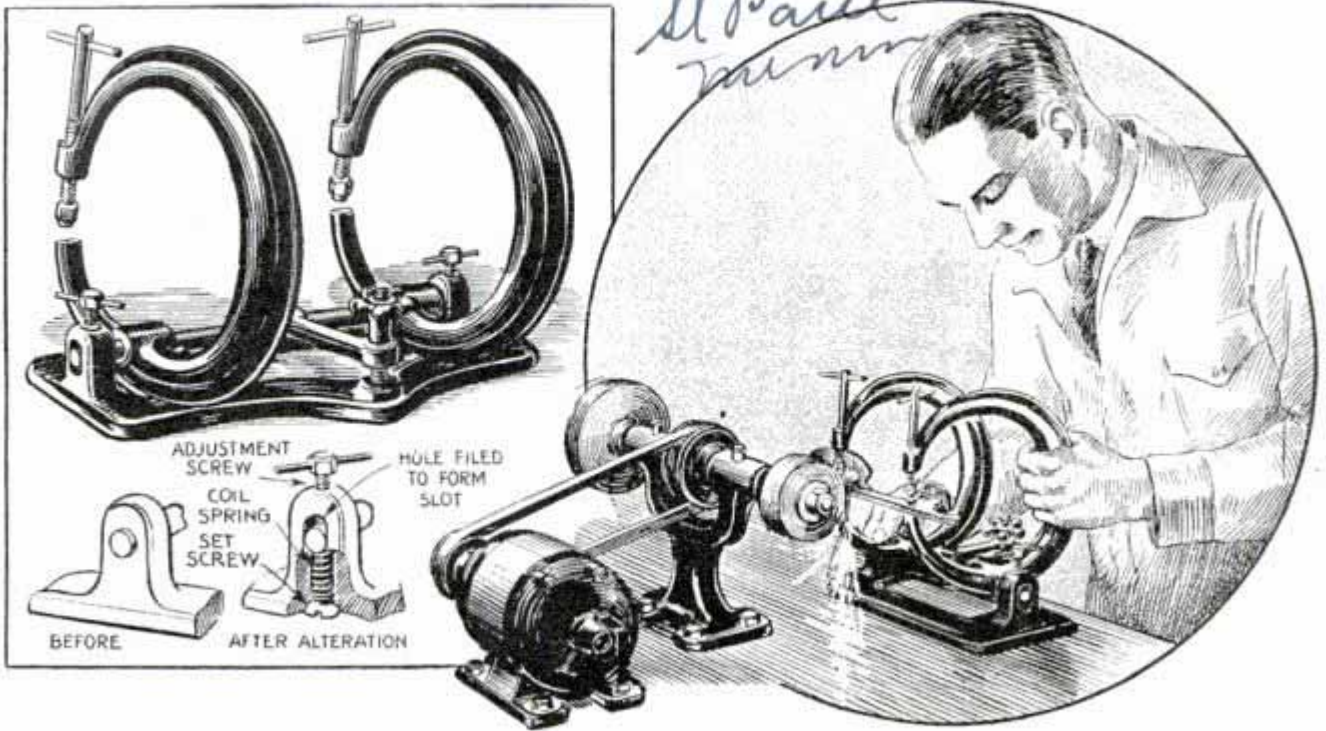


To Distribute Heat in Shop or Garage



Quick and uniform distribution of heat in a shop, garage or store, which is heated by a pipeless hot-air furnace, can be had by arranging two oil drums and an electric fan as shown. The heads and bottoms of the drums are removed, and one side of the horizontal drum is cut out to fit snugly over the top of the vertical drum. When the assembly is set over the hot-air outlet, a fan in one or both ends of the horizontal drum distributes the heated air.—Elmer A. Vandrey, Truman, Minn.

214 W. Archana Ave
Improved Blade Holder for Grinding Skates



Recommended by a man with 15 years experience in grinding skates for professional skaters, this method of altering a skate holder so that it can be adjusted vertically comes in handy when grinding skates that have curved edges or tapered blades. To make the alteration, drill vertically through the lugs which support the rod carrying the clamps. Then, with a round file, elongate the rod holes in the lugs to allow the rod to move $\frac{1}{2}$ in. ver-

tically. A strong compression spring, held by a set screw in the lower end of the lug, bears against the rod and a wing screw, tapped into the upper end of the lug, compresses the spring. Movement of the screw gives a positive vertical adjustment for centering against the grinding wheel. For grinding figure skates, two stones are used, each 1 in. wide and $2\frac{1}{2}$ in. in diameter, one, a 100-grit stone of medium hardness and the other an India oilstone.

Tool Drawer with Folding Handle Is Carried to the Job

In a large shop or garage where tools are kept in cabinet or workbench drawers, mechanics will save time if the drawers are provided with carrying handles. Then, instead of looking through a drawer for a few tools needed to make a certain repair, they can carry the drawer to the job, thus saving extra trips to the bench for tools that were forgotten. The handles may be lengths of iron rod of suitable diameter, bent to the shape shown in the drawing. The end of the rod projecting from the front may be bent into a ring to form a drawer pull.



☐ A concentrated solution of tartaric acid and water is efficient for removing most shop stains from the finger nails.

WELDING and CUTTING

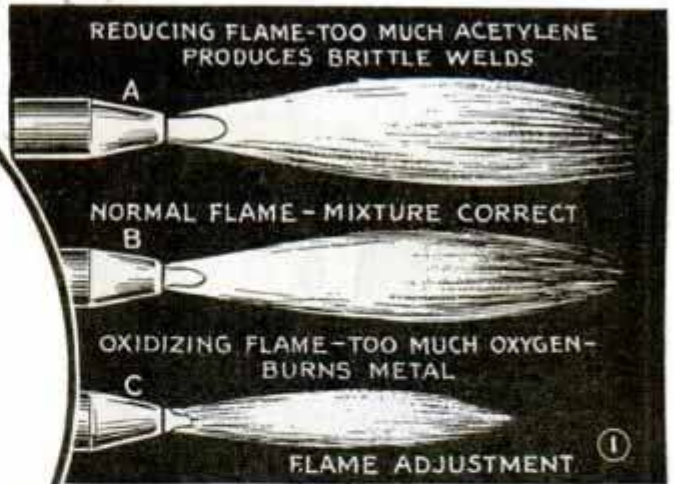
with

Oxyacetylene

By C. A. CROWLEY



Complete Welding Outfit Which Includes Gauges, Torch and Hose, and Is Capable of Handling All Ordinary Repair Jobs, Costs about Fifty Dollars



methods of using it are simple and skill can be acquired quickly by anyone who will observe the simple rules and methods explained in this article.

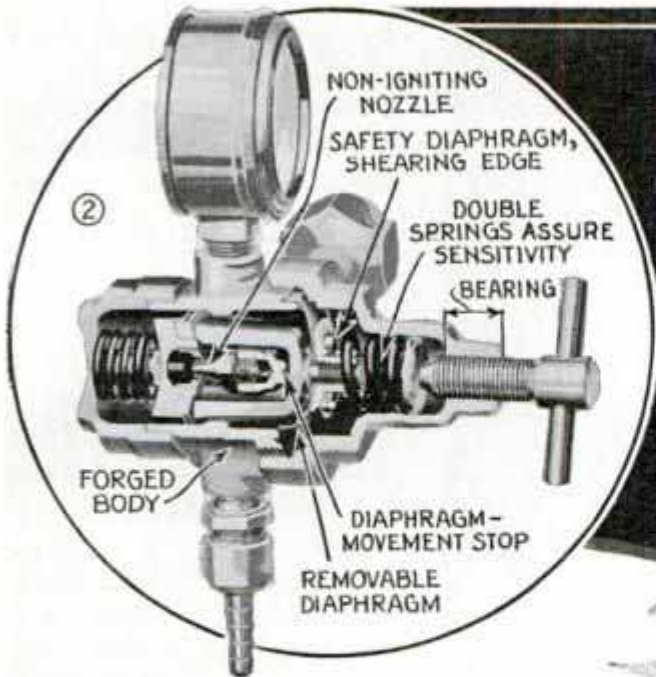
For general welding purposes the standard oxyacetylene welder of the type shown here may be relied upon to give satisfaction. To put the welder into operation, the tank valves are opened while the hand screws in the regulators are loose. The hand screws on the gauges are then adjusted by screwing in until the pressure required for the job is indicated by the working gauges. The other gauges indicate the high pressure in the cylinders. The working pressure required for any particular job depends upon the size of the tip used. One of the tables indicates the pressures that have been found suitable for a variety of tip sizes. This table also indicates the proper tip to select for jobs of different thicknesses. With the pressure adjusted, the acetylene valve on the torch is opened and the gas ignited with a sparker. Matches should not be used. Next, the oxygen valve on the torch is slowly opened until the flame acquires the appearance shown in Fig. 1, detail B.

Adjusting the Flame

The knack of adjusting the gases to produce a good welding flame should be acquired by practice. Detail A, Fig. 1, shows a reducing flame produced when an excess of acetylene is being used. It can be recognized by the feathery edge of the

GAS PRESSURES FOR WELDING STEEL			
Thickness of Metal	Tip Size	Approximate Gauge Pressures	
		Oxygen Pressure	Acetylene Pressure
1/32"	68	1 lb.	1 lb.
1/16"	56	2 lb.	2 lb.
3/32"	54	2 lb.	2 lb.
1/8"	52	3 lb.	3 lb.
3/16"	50	4 lb.	4 lb.
1/4"	45	3 lb.	3 lb.
5/16"	45	4 lb.	4 lb.
3/8 to 5/8"	35	4 lb.	4 lb.

IF YOU have worked with metal, you have undoubtedly had some jobs in which the short cuts of welding would have been a great advantage. A complete oxyacetylene welding outfit, including gauges, torch, etc., capable of handling all ordinary repair and shop construction jobs can be purchased for less than \$50. The



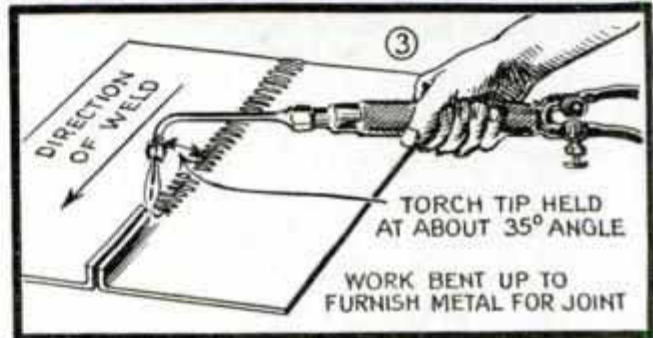
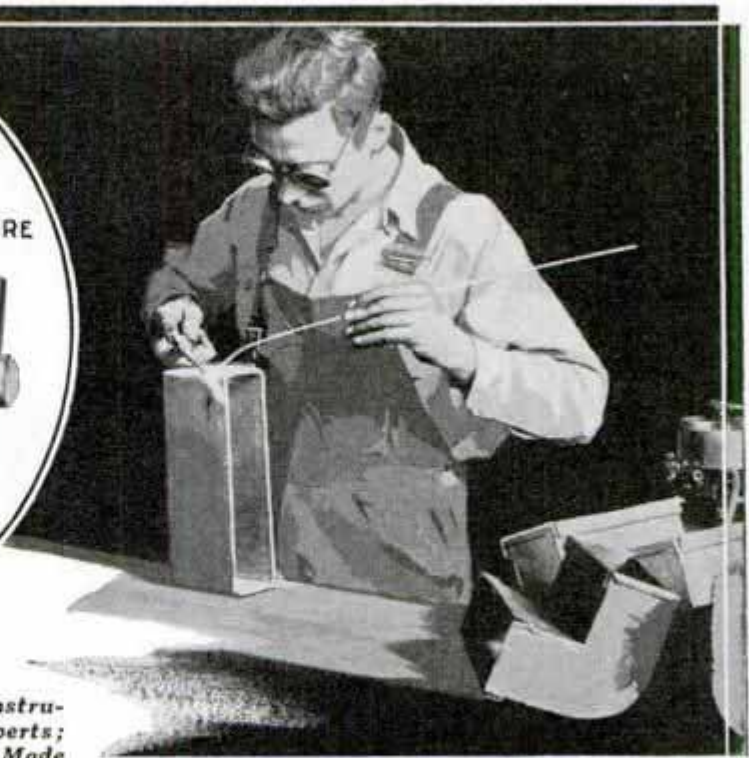
Regulating Gauges Are Delicate Precision Instruments and Should Be Repaired Only by Experts; Right, Strong Points in Sheet-Metal Work Made Cheaply and Rapidly with an Oxyacetylene Torch

white luminous cone. This flame tends to introduce carbon into the weld and produce hard spots. It is undesirable, except in certain cases, which will be pointed out in connection with nickel-alloy welding. Detail C shows the appearance of a flame produced when too much oxygen is used. This flame has a short pointed, white cone. Welding with an oxidizing flame burns the metal and renders the weld weak and useless. Detail B shows the appearance of one neutral or normal welding flame. It is produced when just enough oxygen is flowing to burn all of the acetylene. When it is used, welds will be thoroughly fused and free from burned and hard spots.

During the progress of making a weld, the flame must be observed closely and adjustments made if the characteristic of the flame changes. To turn out the torch, the torch valves are closed to extinguish the flame and the tank valves are then shut. Next, the torch valves are opened to relieve the pressure in the gauges and finally the gauge screws are loosened so that they will be ready for safely opening the tank valves when the outfit is used the next time.

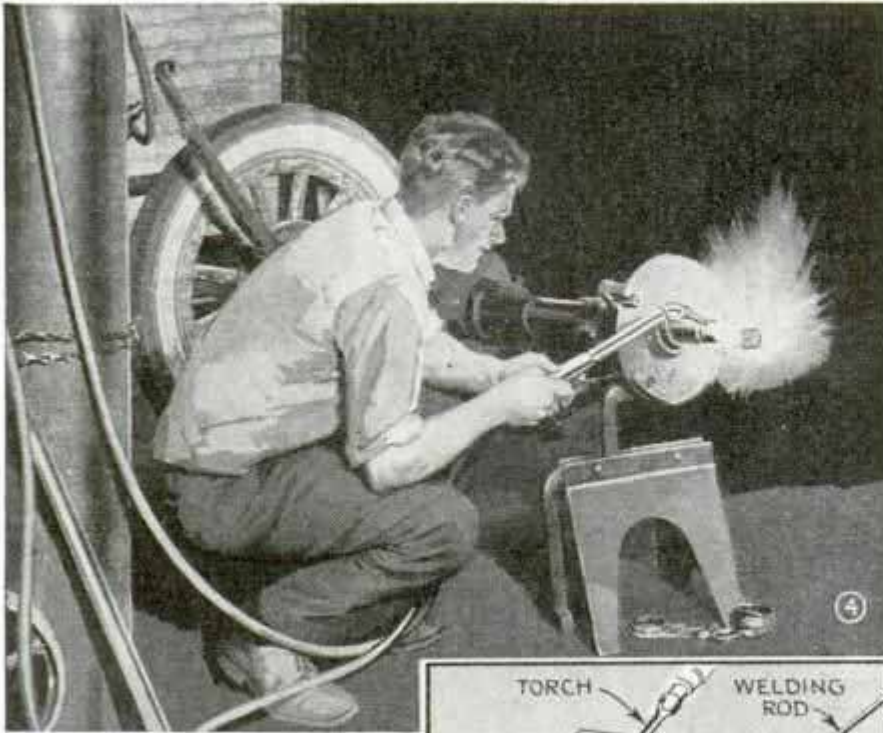
Welding Sheet Metal

During all welding or cutting work the operator should wear goggles of a type made specifically for this work. Goggles not only protect the eyes, but also enable



the welder to see all of the details of the weld as it progresses.

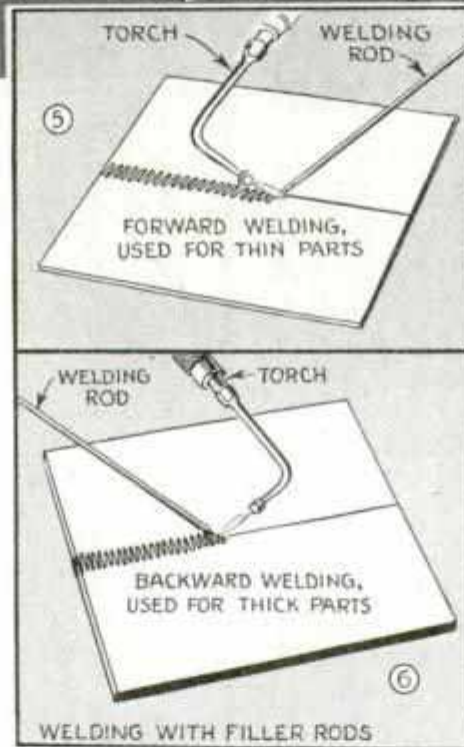
To weld sheet metal, the edges of the metal which are to be seamed are bent up as shown in Fig. 3. This applies to metal $\frac{1}{8}$ in. thick or less. The metal is bent up at an approximate right angle and the height of the bent-up stock should be made as little as is convenient to bend. The pieces are then butted together. To prevent warping, the ends at which the weld is started should touch and the other ends should be separated a fraction. The torch equipped with the proper tip is now adjusted to a neutral flame. It is then applied to the starting edge of the seam. The luminous cone of the flame should just barely touch the work. The flame is played steadily back and forth across the seam in a path similar to that shown by the lines back of the torch in Fig. 3. The flame is advanced steadily and as rapidly as the metal melts and flows together. After a little practice sheet-metal seams can be made rapidly and neatly.



Above, Heating Bent Car Axle Previous to Straightening It; Center, the Wavy Lines Show the Back-and-Forth Movement of the Torch in Welding Pieces of Sheet Metal Together

Welding Thick Sections

When making a plain butt weld with filler rod, the rod used should be about of the same composition as the work. This type of weld can be made either forward or backward as shown. Thin work is usually better handled by the forward method, Fig. 5, while backward welding, Fig. 6, will be found easier when the material is quite thick. The lines show the path of the torch. The rod is slowly fed into the flame. With thick material the forward progress is slower and as the filler rod or welding rod melts, the pool must be heated until it flows freely and amalgamates with the base metal on the two sides of the seam. When the backward method is used on thick welds, the torch is given only a slight transverse movement and the welding rod must follow the flame movements with a slightly greater transverse or circular motion; thus the rod manipulation is used to assist in puddling the hot metal into a homogeneous weld. Thick sections should



be beveled slightly, as shown in Fig. 9, to assure even penetration of the molten metal. This illustration also shows methods of preparing other thick sections.

Special Jobs

To illustrate the versatility of arc-welding, Fig. 7 shows a mechanic making a repair to a wire wheel, while Fig. 12 shows a cracked oil pan being repaired. The torch flame is directed so that the hot part, just beyond the luminous cone, plays on the parts to be repaired; fluxed welding rod is applied with the other hand. Fig. 8 shows how welding rod may be fused to a gear to replace a broken tooth. The metal is built up larger than the gear and the job is finished by dressing off the excess metal to leave a new tooth. This type of



Emergency Repairs on Wire Wheels Quickly Made with a Welding Torch and Filler Rod

repair frequently saves long delays in procuring hard-to-get parts for old cars and machinery. The oxyacetylene torch is used in the sheet-metal shop to displace riveting when strong joints, unaffected by heat, must be produced cheaply and rapidly. Figs. 4 and 11 show how the torch may be used to heat parts previous to straightening them.

Using the Cutting Torch

Ordinary torches are not suitable for cutting purposes; however, combination outfits are available. Fig. 10 shows one of

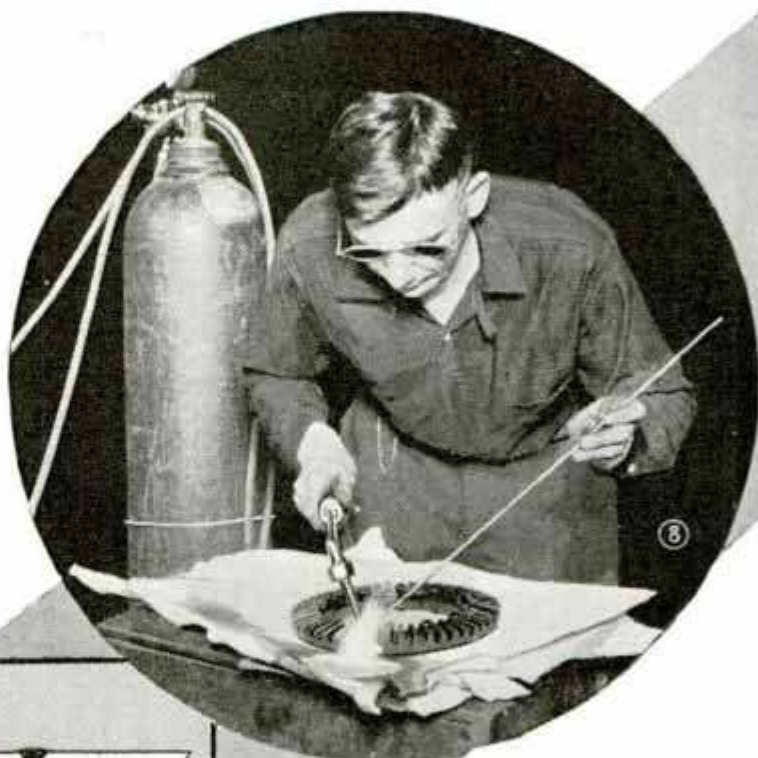
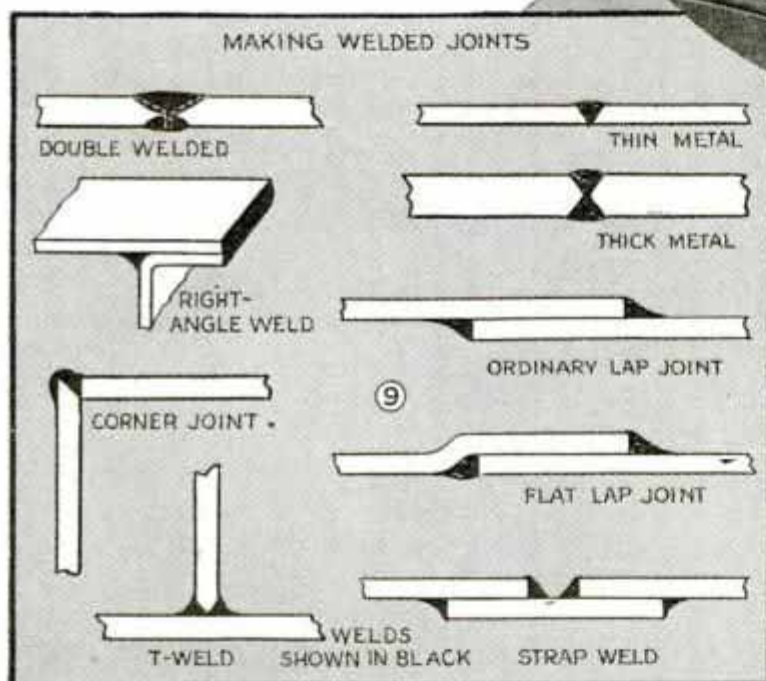


Photo Shows How Welding Rod May Be Fused on Gear to Build Up Broken Teeth; Left, Methods of Welding Various Types of Work



valve on the grip of the torch when the work has become hot enough to cut. Once the work is hot in one spot the torch may be moved continuously with the cutting blast of oxygen on, thus cutting continuously and with great rapidity. The path of the cut to be made is laid out with a soapstone crayon because this kind of a mark is not destroyed by the

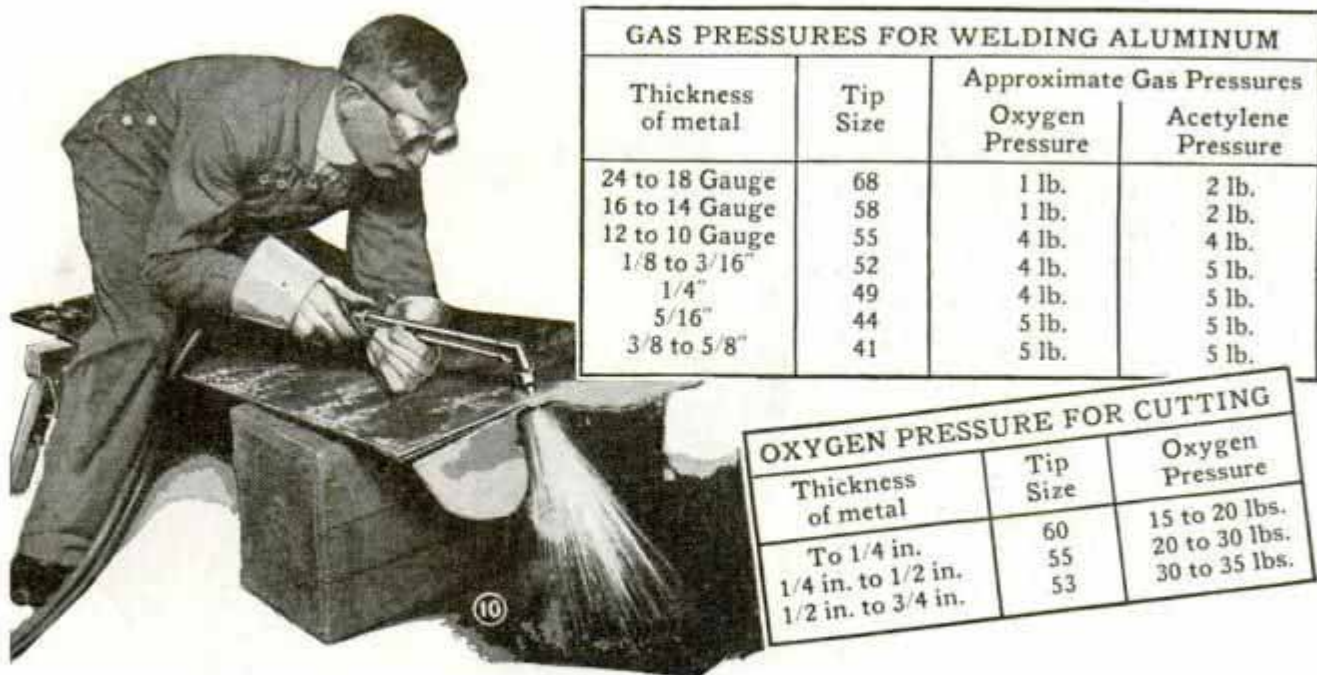
these outfits being used to square off an irregular piece of steel plate. The cutting torch produces an intense hot flame which heats the metal to a white heat. When the metal is white hot the torch is pulled back from the work about $\frac{1}{8}$ in. and the oxygen valve depressed. Under the oxygen blast the hot iron burns like paper, enabling the operator to make a cut rapidly through even extremely thick steel sections.

The tips of cutting torches have several holes, the large center one being for pure oxygen, controlled by a hand-lever valve, while the tiny surrounding holes pass an oxyacetylene mixture each of which burns like the flame from a welding torch. These small flames do the heating and the oxygen is admitted by depressing the cutting

heat. One of the tables gives the oxygen pressure required for cutting operations on a number of thicknesses of steel.

Welding Aluminum

Aluminum and aluminum alloys may be welded readily with the oxyacetylene torch. Tip sizes and gas pressures which are suitable for various thicknesses of these metals are given in a table. For welding aluminum and its alloys, a neutral flame is used. The metal must be thoroughly cleaned and a special aluminum flux employed. These fluxes are mixed to a paste with water immediately before use and applied with a brush or swab. The welding rod used when filler is necessary should be selected with great



GAS PRESSURES FOR WELDING ALUMINUM			
Thickness of metal	Tip Size	Approximate Gas Pressures	
		Oxygen Pressure	Acetylene Pressure
24 to 18 Gauge	68	1 lb.	2 lb.
16 to 14 Gauge	58	1 lb.	2 lb.
12 to 10 Gauge	55	4 lb.	4 lb.
1/8 to 3/16"	52	4 lb.	5 lb.
1/4"	49	4 lb.	5 lb.
5/16"	44	5 lb.	5 lb.
3/8 to 5/8"	41	5 lb.	5 lb.

OXYGEN PRESSURE FOR CUTTING		
Thickness of metal	Tip Size	Oxygen Pressure
To 1/4 in.	60	15 to 20 lbs.
1/4 in. to 1/2 in.	55	20 to 30 lbs.
1/2 in. to 3/4 in.	53	30 to 35 lbs.

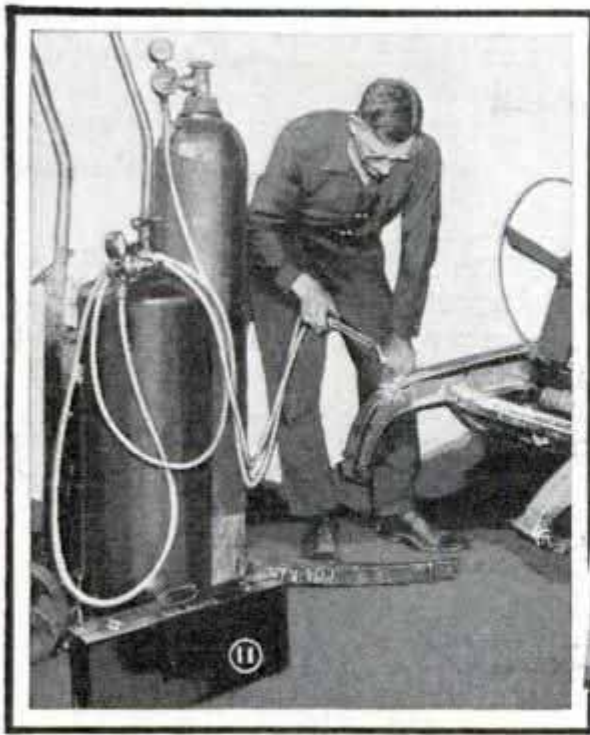
The Cutting Torch Produces an Intense Flame Which Brings the Metal to a White Heat, Then a Jet of Oxygen Burns the Hot Metal Like Paper; Photo Shows How a Cutting Torch Is Used to Square Off a Piece of Heavy Steel Plate

care. Commercial aluminum 2S and 3S should be welded with pure aluminum wire. The strong alloys 17S, 25S and 51S can be welded with a rod of the same composition as the alloy if the parts are not clamped together too rigidly. For welding these hard alloys where the parts must be clamped rigidly, a rod of the following composition should be used: Silicon 5% and aluminum 95%. This type of rod may be used for welding any of the aluminum alloys. Rods of this composition are available. Large pieces of aluminum or aluminum alloy including castings should be preheated to slightly under 800° F. before welding is attempted. It is important that this temperature is not exceeded. The following practical methods are available for determining when the temperature is reached. (1) Blue chalk marks will turn white at the proper temperature for applying the torch. (2) A pine stick will just leave a char mark on the casting when the proper temperature is reached. (3) Aluminum loses its metallic ring when struck at the welding temperature. The work should be well supported during welding and the torch must be applied with care as these alloys melt rapidly. Carelessness will result in holes being burned in the work. For welding sheets or when preheating is not used, buckling may be minimized by covering the metal on each side of the seam with

asbestos paper soaked in cold water. This takes up heat and prevents excessive expansion.

Welding Monel Metal and Nickel Alloys

Oxyacetylene welding of the two commonly used nickel alloys, monel metal and chrome nickel, as well as pure nickel is much the same as steel, except for minor changes. The tip used should be of the same size as for steel, of equal thickness or one size larger. The welding rod should be of the same general composition as the alloy being welded, otherwise the weld will be weakened rapidly by corrosion. Special composition rods are available for all of the common nickel alloys. The torch flame should be reducing, with only a slight feather, no longer than 1/8 in., showing beyond the tip of the luminous cone. During welding the end of the rod should be kept well within the flame, to prevent its becoming oxidized. Special fluxes should always be used on monel metal, chrome nickel and pure nickel. These are available for all of these metals. They should be used as thin pastes made by mixing the dry powdered flux with alcohol or by dissolving it slowly in boiling water. The paste flux is painted onto the seam and welding rod with a small brush. For best results on these alloys, there should be little puddling; the molten pool should be kept quiet, with the tip of the



The Torch Has Many Uses in the Average Garage; Broken Parts That Are Difficult to Get for Old Cars, May Be Welded Together in a Short Time

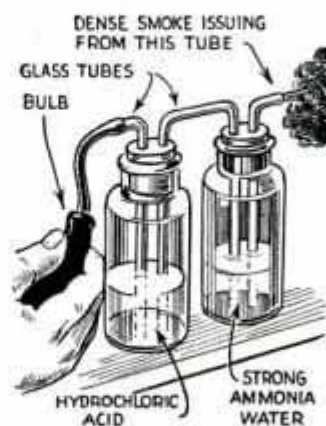
luminous flame just touching its surface. Excessive puddling and boiling of the metal take the life out of it and produce a brittle weld. The welding of thin gauge nickel and alloy metal is accomplished by flanging the edges slightly less than 90 degrees, the turned-up edges being made as short and as nearly equal in height as possible. The bottom and top of the seam are painted with flux paste before fastening the parts in position. No rod is needed as the edges are merely melted together with the flame. The crevice left on the underside may then be filled with soft solder, silver solder or spelter.

Care of Welding Equipment

The most important rule for handling oxygen cylinders is to use absolutely no oil. Oil and grease must be kept off the cylinder valves and regulators. If this rule is followed and the cylinder valve is kept closed when not in use, there is no danger in handling oxygen. Gas cylinders should not be stored in the hot sunshine or in overheated locations because heat expands gases and causes the pressure to become abnormally high. Acetylene cylinders should be used in an upright position, because they contain a liquid, acetone, which will be ejected through the torch if the cylinder is tipped over. Acetylene can be generated from calcium car-

bide and water; however, if this is done only a tested and approved type of generator manufactured by a reputable concern should be used. The use of the homemade acetylene generators is at best hazardous. Unless large quantities are used, it is more economical and many times safer to use cylinder gas. As the regulating gauges are delicate precision instruments as shown in Fig. 2, their repair should not be attempted by anyone not experienced in their internal workings.

Chemical Smoke Generator Is Safe in Locating Air Currents



Producing a dense smoke without any fire hazard, this generator, which uses hydrochloric acid and strong ammonia, is helpful in determining the direction of air currents when installing ventilating systems. The

smoke produced by the generator is better for this purpose than that produced by a fire, as it is heavier and will not rise above the scene of action.

Stops on Ladder Hold Load While Workman Rests



Cleats Nailed to Sides of Ladder Serve as Stops on Which to Rest the Load as You Climb

After seeing a workman injured, when he lost his balance while carrying a bunch of shingles up a ladder, a carpenter nailed triangular cleats to the sides of the ladder as shown. The cleats serve as stops on which the workman can rest his load at intervals as he climbs.

Evaporation of Water Keeps Wood Barrels from Drying Out



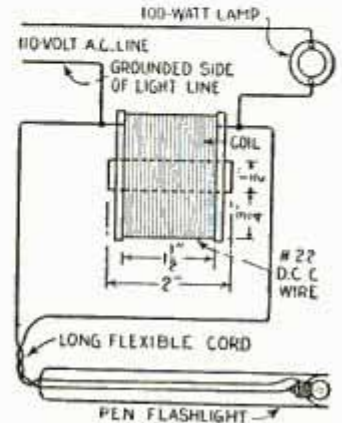
which gives considerable evaporation surface. The moist air inside the barrels

Instead of filling their empty barrels with water to keep them from drying out, a western olive-packing company turns them upside down over gallon cans filled with water, in which pieces of clean burlap are inserted. Enough burlap is used in each can so that a large part projects,

keeps them from drying out, and they do not become soured. Thus, labor and expense are saved in cleaning them, as the barrels are ready for use after a rinsing with clean water and a few hours' airing.

Flashlight Operates on 110 Volts

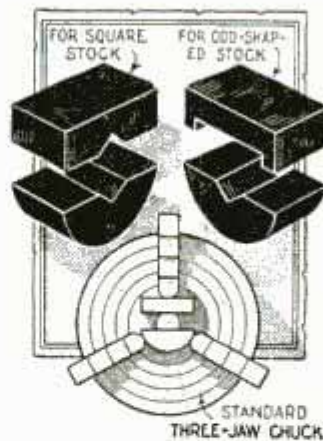
For inspecting mechanisms in close places where a large lamp cannot be used, such as brushes on motors of fans, vacuum cleaners, etc., a small battery-less light can be had by connecting an ordinary pen-type flashlight to a 110-volt line through a coil and a 100-watt lamp as shown. The coil is wound on a 1/2-in.



iron-rod core to a depth of about 3/4 in. Brilliancy of the lamp is increased by using a little more wire on the core, the correct amount to use being best determined by experimenting.

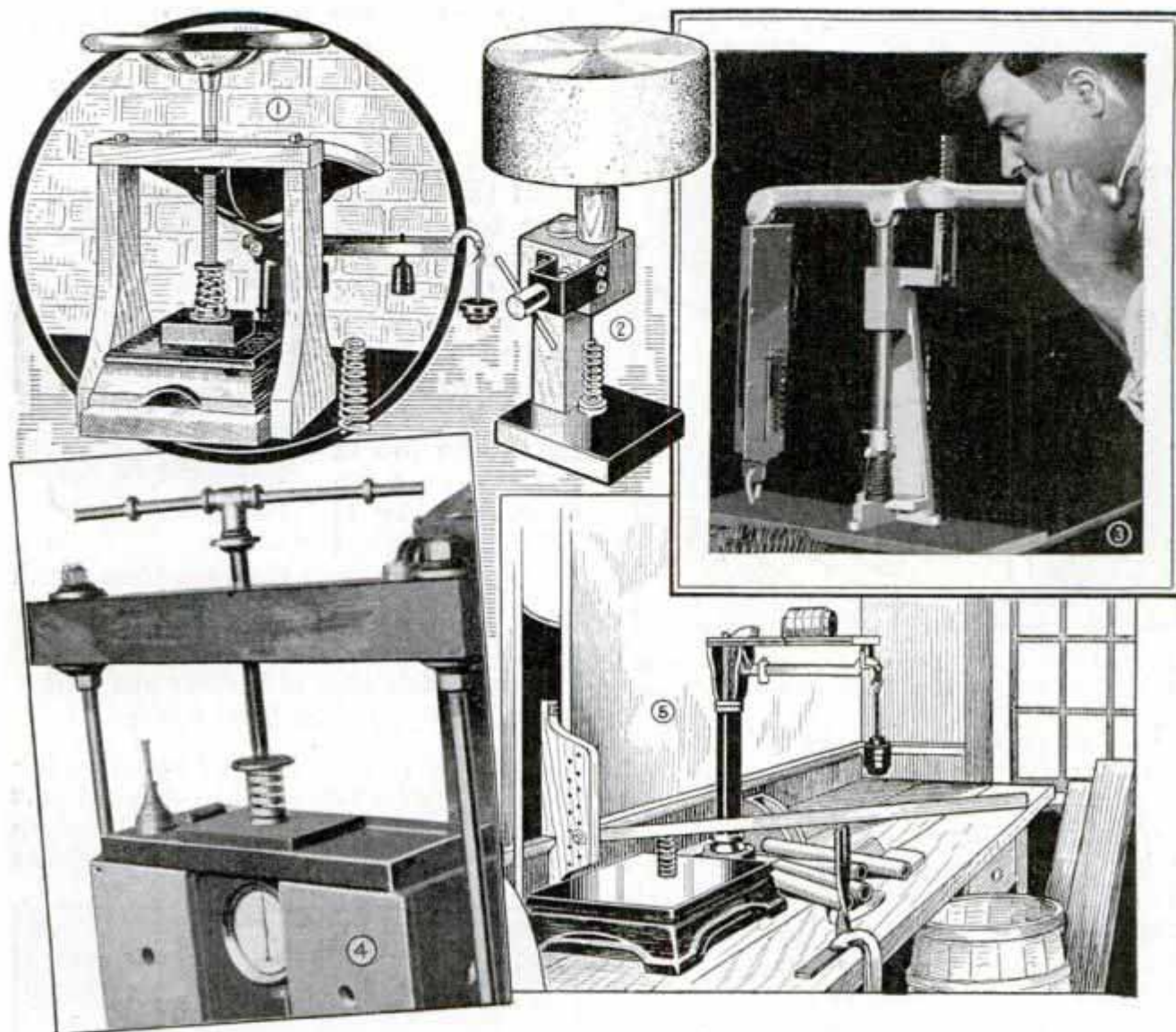
Increasing Range of Three-Jaw Chuck

Auxiliary jaws of the shapes shown will enable you to use a three-jaw chuck for many jobs that would ordinarily require a four-jaw chuck. Work of almost any shape may be held for turning or for drilling. If the upper jaws are made up in varying thicknesses, it is possible to hold work in any position that may be required for turning it off center.



Small veining tools that will give satisfactory service may be made from old umbrella ribs or steel writing pens, flattened and sharpened to suit the work at hand; after cutting the tools to the required length, they are inserted into wooden handles.

Pressure of Coil Springs Tested with Scales



When you wish to know exactly how many pounds pressure it takes to depress a coil spring a given distance, any one of the methods shown will tell you at a glance. In Fig. 1, a platform scale of the counter type is set in a press frame made of wood and provided with a clamp screw. The scale beam gives you the pressure in pounds, and the amount of compression is gauged by a pin set into the base on which the spring rests, the clamp screw being run down until the collar on its lower end touches the top of the pin. Figs. 3 to 5 show varied applications of the same principle. The device shown in Fig. 2, is especially adapted to quick work where it is necessary to check possible variations in a large number of springs of the same size. Weights of a known denomination are placed on the platform to give the pressure in pounds, and the distance of com-

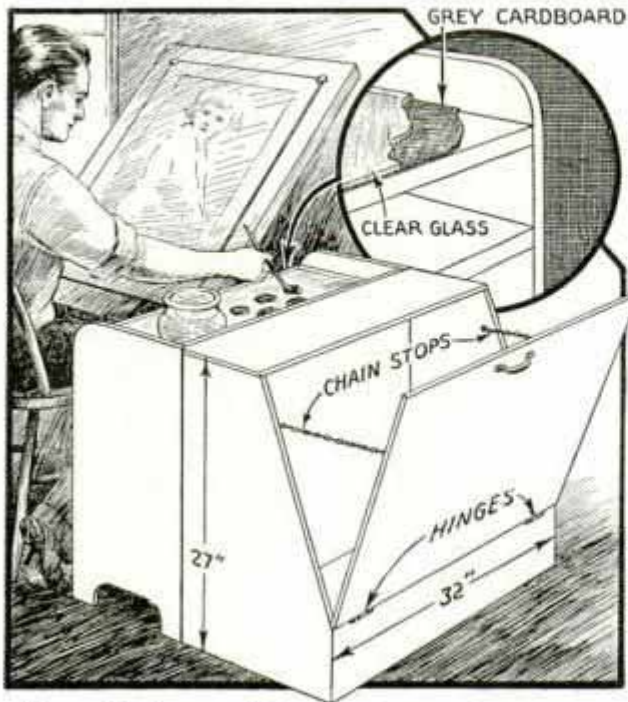
pression is regulated by the length of the gauge pin over which the spring is placed.—A. E. Granville, Knox, Ind.

Garden Hose Makes Long-Life Casing for Worn Lighting Cable

When lighting cable, such as used by photographers and stage electricians, begins to show signs of wear, its life can be lengthened considerably by encasing each section in an equal length of small-diameter garden hose. Where the hose terminates at the plug ends, tape, stout cord or rawhide may be used to bind it tightly in place. Any good cable paint will permanently seal the joint.

☞ Castings will part from plaster molds easily if the inside surfaces of the latter have been smoked over burning rosin.

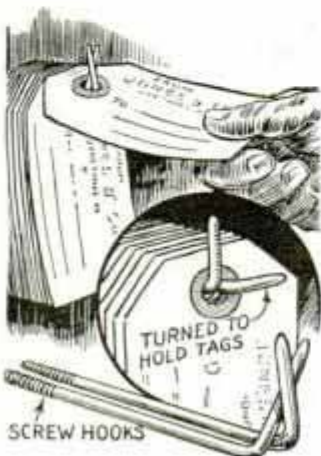
Color-Mixing Slab and Supply Cabinet Added to Artist's Taboret



Neutral Palette and Large Storage Compartment Added to Taboret Make It More Useful to Artists

If a taboret is altered to include the following features, its utility to an artist will be greatly increased: The circular detail shows how a piece of clear glass, laid over a sheet of medium grey cardboard, transforms the taboret top into a neutral palette on which paints can be mixed and readily washed off. For storing canvases and illustration boards, so that they may be kept free from mars and dust, a compartment is attached to the back of the taboret as shown in the lower detail. Due to a large hinged door and the width of the tapering back of the compartment, its contents are conveniently accessible to the artist from his seat.

Screw Hooks Guard Tags from Wind

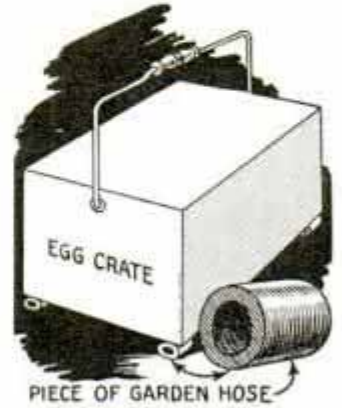


To keep a supply of shipping tags at hand on a loading platform, so that they will not be mislaid or blown about, drive a couple of screw hooks side by side in a near-by wall. Then you can slip the tags over them and turn one of

the hooks down so that its head will be at right angles to the other one. To remove tags, twist the hooks together.

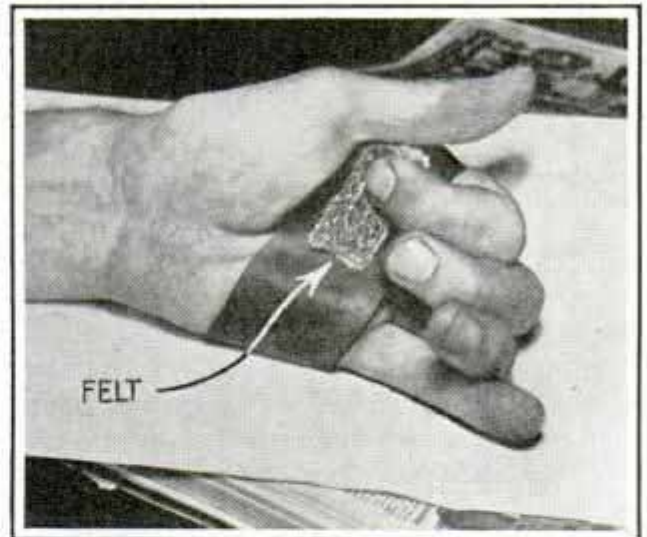
Eggs Protected by Cushioning Crate with Pieces of Hose

Farmers who haul their eggs over rough roads can reduce breakage by cushioning the crates with pieces of hose, which are toenailed to the corners. The job of nailing can be done easily if holes are punched through the walls of the hose pieces with an ice pick or other sharp instrument.



Finger Moistener of Rubber and Felt Helps in Handling Paper

As an aid in counting and assorting paper stock, or for turning the pages of books and catalogues, a worker in a western book bindery uses the finger moistener



Felt Pad Held in Palm with Rubber Band Moistens Fingers When Handling Paper

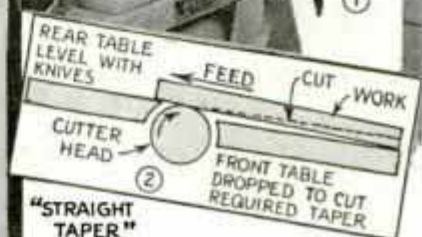
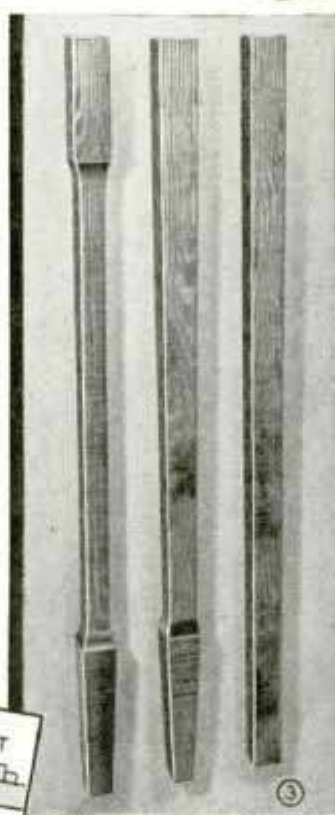
shown. It consists of a rubber band, cut from an inner tube, to which a small piece of felt is sewed. This is kept saturated with water and moistens the finger tips when they are pressed against it.

❑ Frozen potatoes should be placed in a dark place until thawed.

FURNITURE LEGS

Made on the Jointer

SQUARE legs made on a jointer can be used for a wide range of projects, and offer a distinct advantage in uniform results and high-speed production. Typical examples of this work are shown in Fig. 3. The simplest type is the straight taper. The rear table is level with the knives, while the front one is dropped an amount equal to the taper desired. See Fig. 2. The rear end of the work must rest on the table. Long stock is handled conveniently by using an extension rest as in Fig. 1. Short tapers are made as shown in Figs. 4 to 7. A small block is pushed under the stock as in Fig. 6 to get a three-point contact on the table and knives and block, and the work is pulled over the knives, Fig. 5. Sharp brads projecting through the block help to hold it in place. A variation of this method is shown in Fig. 7. The block is clamped to the table and does not move with the work, the result being a slightly curved surface. To make the "stop chamfer,"

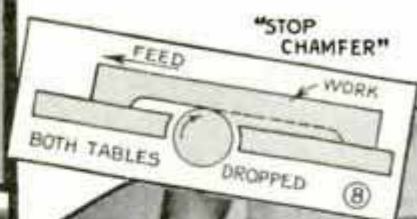
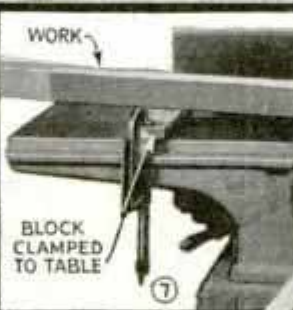


"STRAIGHT TAPER"

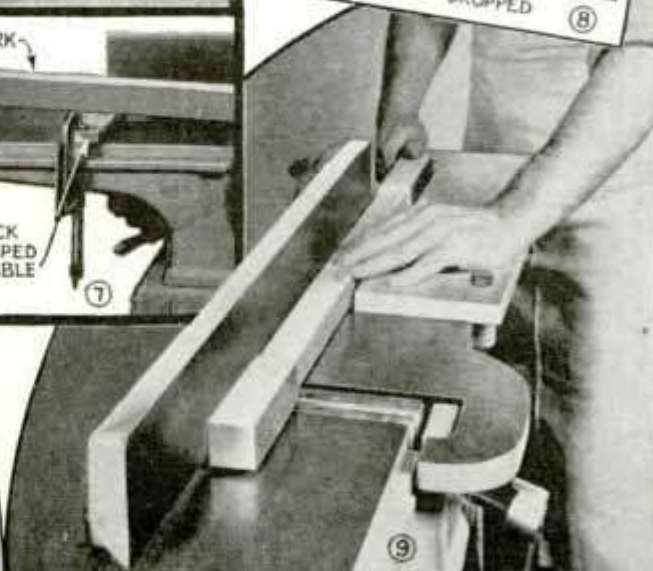
Figs. 8 and 9, both tables are dropped the required depth, after which the work is gradually lowered onto the revolving knives. A starting block is necessary. A second block can be used to mark the end of the cut.



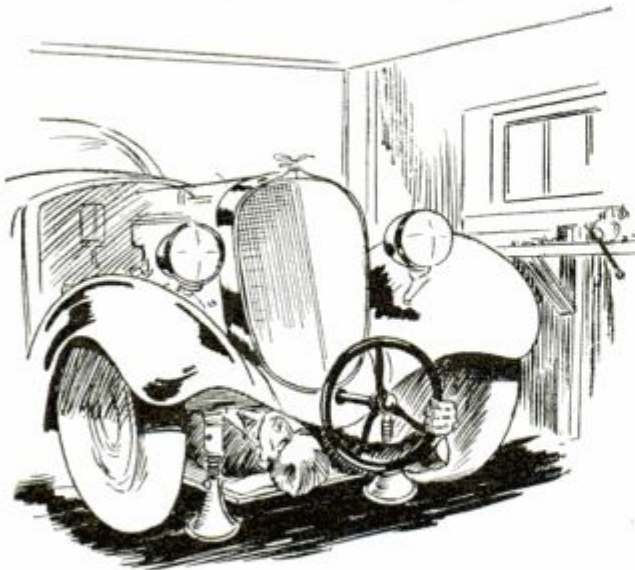
"SHORT TAPER"



"STOP CHAMFER"



Steering Wheel Cranks Motor When Adjusting Bearings

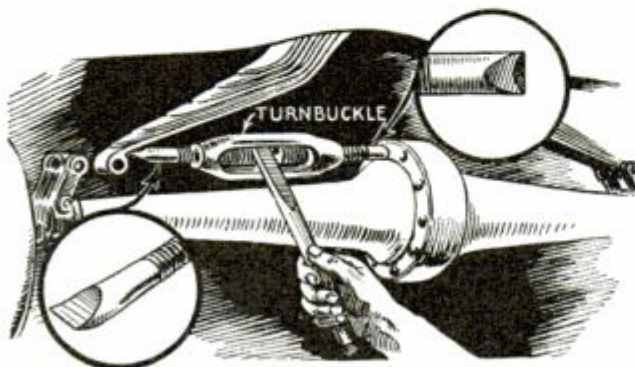


Old Steering Wheel Slipped over Crank to Turn Motor When Adjusting Bearings

By slipping a steering wheel over the crank, you can turn the motor when tightening the bearings without crawling out from under the car. If the hub of the wheel is reamed, it will fit most cranks. It can be clamped in place with a set screw.—Vernon Tracy, Centerville, N. B., Canada.

Forcing Ford Spring into Position with Turnbuckle

Installing the rear spring on a Ford is done easily with a large turnbuckle. One end of the buckle is ground to a chisel edge to fit under the eye of the spring, and the other is cupped to fit over a bolt head in the differential housing. After attaching one side of the spring to its hanger, it is quickly expanded with the turnbuckle to get the other end in place. If the screws already in the turnbuckle

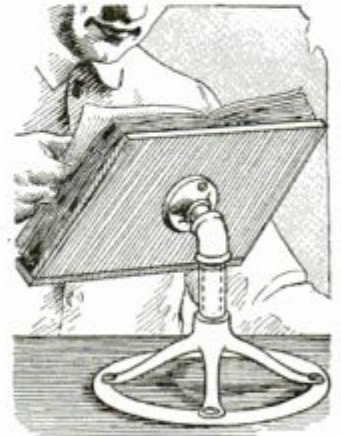


Large Turnbuckle with Altered Ends Expands Ford Spring for Attaching It to Hangers

are not suitable, threaded rods of the right length can be substituted. One has a right, while the other has a left thread.

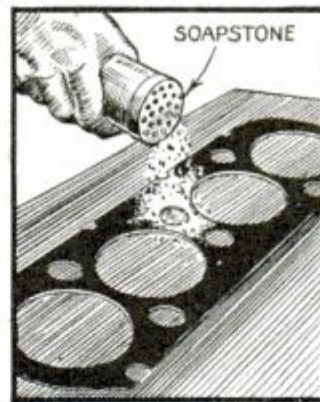
Revolving Stand to Hold Catalogues in a Garage

In the parts department of a garage, where large catalogues are handled, revolving stands of the type shown will support them neatly on the counter. The assembly of pipe fittings, upon which the catalogue rest



is mounted, is supported on the stub shaft of an inverted steering wheel and turns for use at either side of the counter.

Soapstone Solves the Problem of Sticking Gaskets



If you coat a cylinder-head gasket with soapstone before putting it on, it is not likely to stick the next time the head is removed. The powdered soapstone is applied by rubbing it over the gasket with a small piece of felt.

This will not hinder the sealing qualities of the gasket in any way.—Ray J. Marran, Kansas City, Mo.

To Loosen Frozen Lock in Car Door

This trick enables you to open your car door quickly if water has entered the lock and frozen. Just insert the key as far as possible and hold the flame of a match or ci-



gar lighter directly under it. This will melt the ice and get you started without delay or the expense of a service call.—C. E. Packer, Chicago.

Removable Door Handle to Foil Theft from Delivery Car

To prevent petty thieving from a closed car used for delivery purposes, an eastern merchant removed the door handle and substituted a specially constructed portable handle, which fits into a slot on the outside of the door. In this way, valuable articles may be safely left in the car without taking the trouble to lock it every time a stop is made.—S. Stowell, Fox Chase, Pa.



Clothespin Used to Deflate Tire

Whittled to a point as shown, a common clothespin not only makes a handy tool for quickly deflating a punctured inner tube, but also serves to mark the location of the hole when the tube is laid aside while preparing the patch. If notches are made on the "legs" of the pin, it is less likely to slip out of place.



How to Locate Shorted Cell in Auto Battery

Failure of the starter to crank a motor may be due to a discharged battery or a shorted cell. To determine which condition is causing the trouble, remove the filler caps from all of the cells, then operate the starter switch. At the same time, watch the cells closely. If the liquid in one of them boils violently, it is shorted. On the other hand, if no boiling occurs, the battery is discharged.

Cutting Blank Gaskets with a Large Ball Bearing

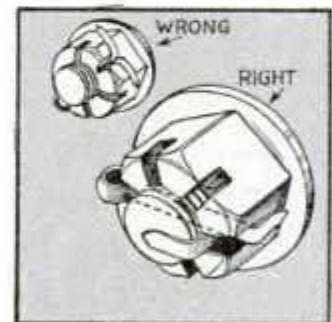


Large Ball Bearing Welded to End of Steel Rod Makes Efficient Tool to Cut Gaskets

Welded to the ends of steel rods, large ball bearings of various sizes make punches for cutting holes neatly in gaskets. The blank gasket is laid over the face of the motor block, after which the punch is held over the hole where the opening is to be made and given a sharp blow with a hammer.

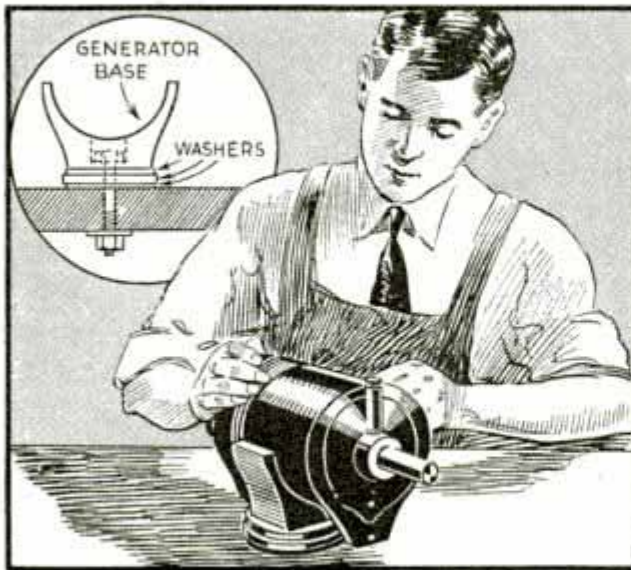
Right Way to Install Cotter Key

Did you know that so simple a job as installing a cotter key to lock a castellated nut could be done in the wrong way? Always use a key that fits snugly in the hole, and insert it so that the side of the head lines up with the slot in the nut. Drive the head in firmly, bend one leg of the key over the end of the bolt or shaft, and the other one back over the side of the nut.



☞ To clean the porcelain of a spark plug, first scrape off the carbon and then polish it with fine valve-grinding compound.

Pivoted Cradle Holds Generator for Repairing



A Generator, Starter or Motor Held in This Cradle Is Turned to Any Convenient Working Angle

Pivoted to the bench top with a bolt, the half-round base from an old-style generator, or a base made from heavy sheet metal, serves as a turntable in which to

hold starters, generators or electric motors when working on them. Two or three large washers should be used between the cradle and the bench for a bearing surface. Thrust washers from an old model-T Ford differential serve nicely for this purpose.—Jack Beater, Fort Myers, Fla.

Finding Slow Leaks in Inner Tube

Inner tubes are often discarded because of the apparent impossibility to locate a slow leak. However, if the tube is partly inflated and then held under a slow stream of water from a faucet or hydrant, the leak may be made to show bubbles by taking each area of several square inches and stretching the rubber with the hands. A very small puncture will, in this way, be made to expand sufficiently for air to escape, and the constant flow of water over that part of the tube provides a film that will produce the bubbles. When the leak is found, a match inserted into the puncture marks its location.

The Next Issue

SHORTCUTS FOR THE MODEL RAILWAY BUILDER

The first installment of a series which will be of lasting value to every model-railway fan. Shows how you can make the parts from stock material, without the need of castings, and how model-railway building can be simplified to eliminate many machine operations. Also gives you easy methods and time-saving jigs to solve problems of construction and assembly.

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Check your age group.

WHAT THE MILDNESS MEANS TO

Lieutenant Commander Frank Hawks, U.S.N.R. (*right*), holder of 214 speed records and the Harmon Trophy, says: "I've been flying for 19 years and smoking Camels almost as long. Making speed records tests the pilot as well as his plane. As the athletes say, Camels are so mild they don't get the wind. And they never upset my nerves. Camel must use choicer tobaccos."

*"Camels don't get your
Wind" Athletes say*



© 1935, R. J. Reynolds Tob. Co.



"I smoke Camels all I want," says Colonel Roscoe Turner (*left*), who set the transcontinental speed records both ways. "I enjoy Camels more. And because of their mildness they never tire my taste. A speed flyer uses up energy just as his motor uses 'gas.' After smoking a Camel, I get a 'refill' in energy—a new feeling of vim and well-being."

"Get a Lift with a Camel"

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"I appreciate the mellow flavor of Camels," says Sir Charles Kingsford-Smith, the trans-pacific flyer (*below*). "They refresh me when fatigued, and Camels are so mild that I can smoke any number without throwing my nerves off key."

*"They Never Tire
Your Taste"*

"I must take every precaution against jangled nerves," says Mrs. Theodore W. Kenyon, sportswoman pilot (*below*), "so I smoke Camels. They are the mildest cigarette I know. I can smoke Camels steadily and they never upset my nerves."

*"They Never Get
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What's It a Sign of?

(Continued from page 890)

the normal panorama of shifting-weather systems that we find depicted in a series of weather maps.

Let us consider a few well-founded weather proverbs and what is back of them.

"When the dew is on the grass
Rain will never come to pass."

Dew gathers on grass and other exposed objects when they grow cool enough to condense water out of the air. This happens on still, clear nights, the kind we have during fine weather.

"In the morning mountains,
In the evening fountains."

When "woolpack" clouds pile up to mountainous heights in the forenoon, we know the active vertical ascent of moist air, the principal cause of rainfall, has set in early in the day. With this good start it is likely to rain before night.

"If the sun set in gray
The next will be a rainy day."

A gray sky is usually one overcast with a high thin cloud, or just the kind of cloud that runs well ahead of a general rain-storm.

"A rainbow in the morning
Is the shepherd's warning;
A rainbow at night
Is the shepherd's delight."

The word "night" means late afternoon; otherwise it could refer only to the rare lunar rainbow. If the air is so charged with moisture that rain begins early in the day, it may continue the whole day. If the air is relatively dry, so the shower takes a long time to get started, it will probably be of short duration.

Most proverbs connecting the moon with the weather are without any rational foundation. One of the most foolish notions is that the position of the lunar crescent in the evening sky indicates whether rain is at hand. According to one version, if the crescent will "hold water," the following weather will be dry, while if its angle is such that water will run out, the weather will be wet. A second version asserts exactly the reverse.

The position of the crescent moon depends upon the angle the moon's path makes with the horizon, and on any given date it is always the same at all places in

the same latitude. Hence, if either of these beliefs were true, we should expect the same kind of weather, wet or dry, to prevail on a given date throughout a belt of latitude extending around the globe.

The appearance of the "old moon in the arms of the new" is likewise given two opposite interpretations, neither with any foundation in fact. The saying that "moonlight nights have the hardest frosts" means merely that very clear nights, which favor the rapid cooling of the earth by radiation, are also nights of bright moonlight, if the moon is above the horizon. As to the idea that the moon and the weather usually "change together," the weather is always changing while the moon changes from one phase to another on four days in every lunar month, so there are plenty of coincidences to keep alive this notion.

Many plants undergo certain changes with an increase in the humidity of the air or some other change in atmospheric conditions, but unfortunately for the prophet the atmospheric changes do not always point clearly to future weather. The air can grow very humid, for example, without producing rain, the occurrence of which depends as much upon air movements as upon air moisture. The pimpernel is known as the "poor man's weather-glass," but the belief that it always closes its blossoms before a shower is not borne out by observation.

Animals are often restless and birds are often noisy before a storm, but the conditions that thus affect their behavior may occur without a storm following. Thus, the saying that "a bee is never caught in a shower" contains only the grain of truth that when the sky grows dark, as it usually does before rain but also at other times, bees cease to leave the hive on honey-gathering trips. Bees are, moreover, often drenched in sudden showers.

Thousands of weather proverbs and sayings are recorded in literature. Most of them are on a par with the belief that if you break a mirror or meet a black cat you will be overtaken by some misfortune.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Here's a Picture you can make

Tonight!



LONG fall evenings bring gay times at home. It's a side of life that your camera shouldn't miss. Make pictures tonight. Or tomorrow night. And certainly Thanksgiving time when the family foregathers.

It's easy to take indoor pictures. Any camera that can be set for "time" will do.

Get Mazda Photoflash or Photoflood bulbs from your dealer—load your camera with Kodak "SS" Film, particularly adapted to night picture taking, or use Kodak Verichrome Film which will also give very good results. Follow the diagram and information given here to make a picture like the one shown, with Photoflash.

If you have a camera with a fast Lens . . . *f*.6.3 or faster—you can make snapshots—indoors, at night, with two or three Mazda Photoflood bulbs and Kodak "SS" Film. Open the lens to *f*.6.3—set for 1/25 second. And snap the picture as you would outdoors.

Night Pictures with Any Camera . . . With any camera that may be set for "time," you can make quick time exposures at night with Mazda Photoflood bulbs, or make Photoflash shots as here indicated. Photoflood bulbs cost 25¢, last for many pictures. Load with Kodak "SS" or Verichrome Film. See your dealer or write for folder.

Here's how you do it



Load with Kodak "SS" or Verichrome Film. Place your camera on firm table, eight feet from subject as shown in diagram. Hold Photoflash bulb, in reflector, above and to the side of camera. Set camera for "time." Open shutter—flash bulb—close shutter. That's all there is to it.

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How to Play Table Tennis

(Continued from page 836)

the bounce of the ball will indicate the degree. The shifting of the weight and the turn of the body are virtually the same as the movement of the golfer as he swings. At the finish of the swing the back of the hand should be upward. Lift and follow through are the elements of perfect stroking. Lift causes the ball to drop quickly after passing the net. Follow through supplies speed, accuracy and direction.

A flawless backhand also is important. Here the back of the hand leads and faces the net in executing the swing, and the stroke generally starts on the left side of the body. What has been said of the forehand also is true of the backhand, except that at the completion of the stroke the palm of the hand is facing upward and the ball is struck on the opposite side of the bat. The player's right shoulder should lean toward the net, the weight shifting from the left or rear foot to the right foot at the finish. If the forefinger, outstretched along the side of the blade, interferes with the shot, move it closer to the handle.

The quick, staccato backhand jab, known as the flick shot, is a lightning fast stroke performed with a quick movement of the forearm and with virtually no follow through. Its suddenness recommends it as an offensive weapon.

The underspin stroke corresponds to the court game's chop. It is attained by striking down on the ball and is best played on the forehand. To make this shot, tilt the upper edge of the racket as far back as necessary to get the desired results. The movement starts at the side of the body and as the arm goes forward, keep the upper edge of the bat laid back until after the stroke is finished. When executing underspin shots, the wrist should not be turned over when the ball is hit, as this produces topspin. The ball should be hit, not pushed, and the player's actions are comparable to the wood chopper's.

The backhand chop is made like the forehand except the ball is struck on the opposite side of the bat. The shifting of the weight and the position of the feet are the same as in the topspin strokes.

Two other strokes are the block shot and smash. The block shot is a first cousin to the tennis half volley and is used prin-

cipally on the defense, as when a ball is driven directly at you and you haven't time to step aside to stroke it. Hold the bat with a firm wrist, with the blade almost in a vertical position, and adjust the thumb and fingers as illustrated. By turning the wrist one way or the other you can control the direction of the ball, and its height is governed by the angle of the racket. In most cases, the block shot is made on the backhand. There is little or no stroking, but speed can be attained by pushing the forearm forward as you come into the ball. Keep the wrist locked and let the stroke be short and jerky.

The smash is a kill shot used on a ball that bounces unusually high. With the exception of a rigid wrist that scarcely moves when the ball is struck, the stroking is similar to the topspin drive. Best results are obtained by hitting the ball with the blade perpendicular to the desired flight of the ball. Make the stroke long and sweeping.

In table tennis, the server can write his own ticket, so there are about as many varieties of delivery as there are players. The commonest serves are the regular topspin and underspin strokes. As one of the best serves is a fast shot which just clears the net and terminates deep in your opponent's court, make sure the point where your racket first hits the ball is low and the spot where the ball strikes the receiver's side is close to his end of the table.

The secret of successful serving lies in converting it into a point getter. If you can't win a point outright, try to place the pellet so the return will be so weak you stand a chance of putting it away.

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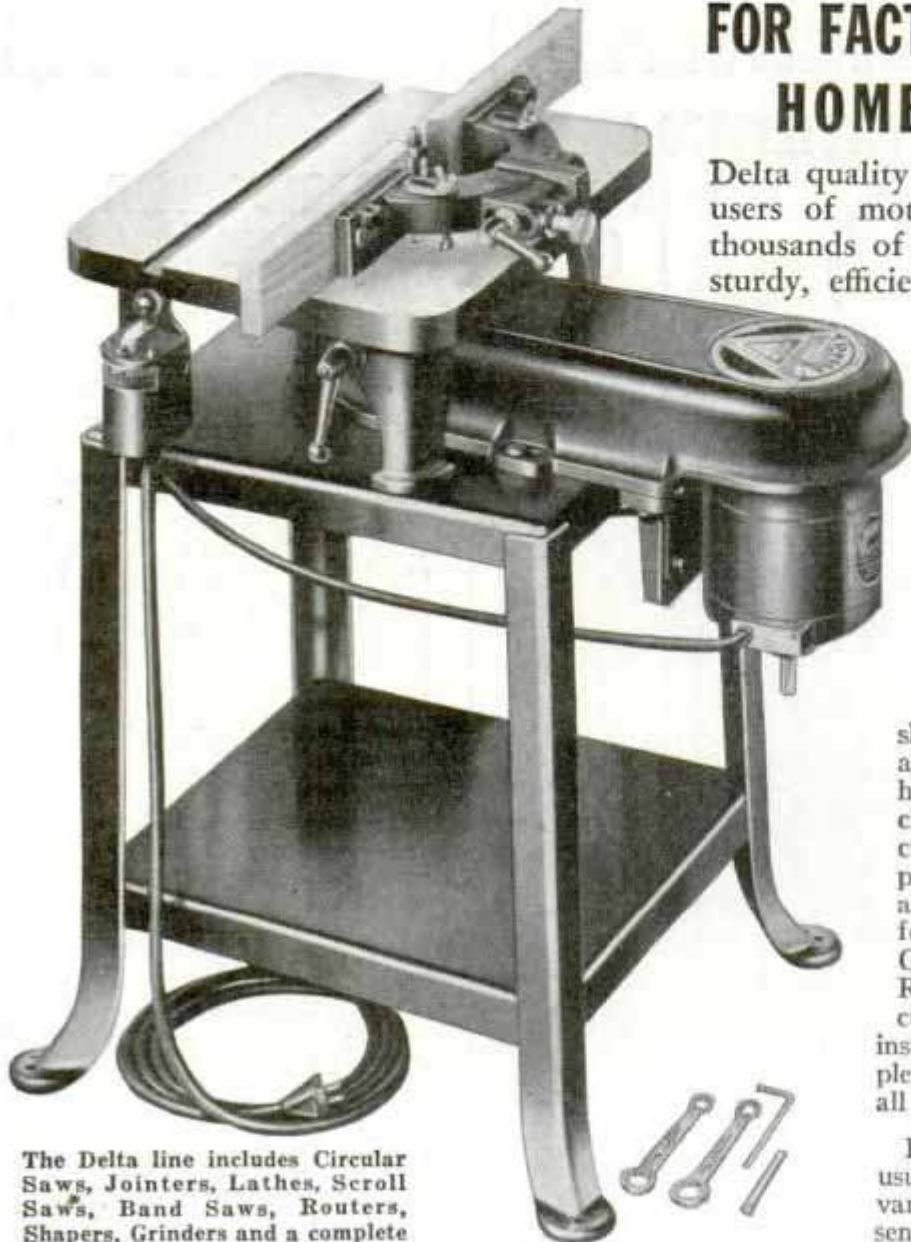
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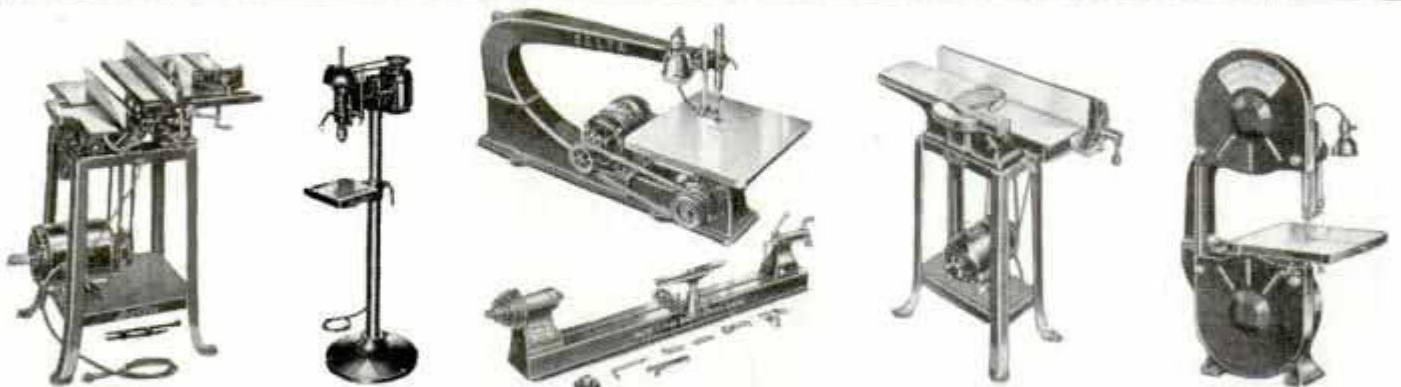
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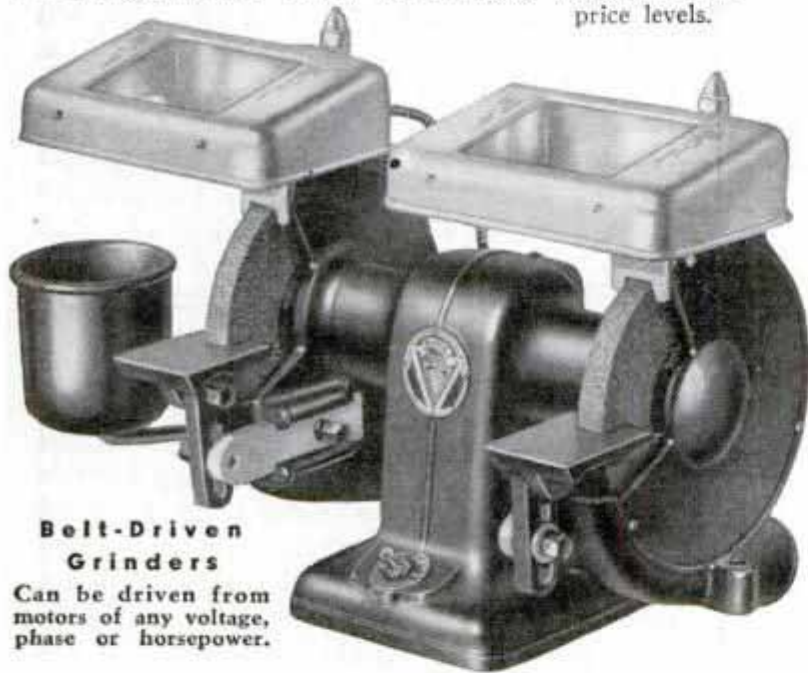
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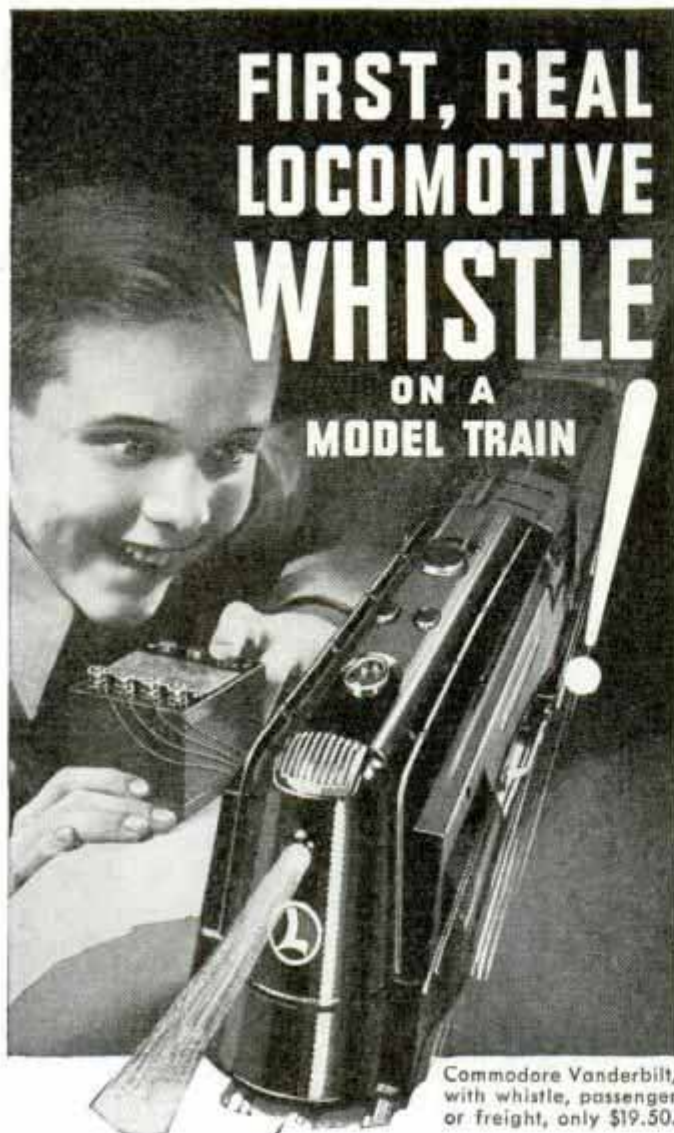
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HERE comes Lionel with a real locomotive whistle! Press a button and the locomotive pipes short or long blasts — anytime, as the train is roaring down the track, backing or standing still. It's amazing — but there's not space here to give you all the thrilling details — so send this coupon at once for the new Lionel catalog — 44 pages packed with excitement. New streamlined models! A gate-man who pops out of his shanty and flags the limited — automatically. It's all in this new railroad book — so get it now.

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Please rush me your new 1935 Catalog. I enclose 10c in stamps to cover postage and handling.

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CITY _____ STATE _____

THE ROMANCE OF WHISTLES

(Continued from page 857)

The first words every locomotive learns to say are the familiar warning, "Whoo-o-o, Whoo-o-o, Who—Who!" shrilled out at the whistling post a quarter mile before a highway crossing. But the whistle has many other messages to tell. Railroaders who know locomotive talk sometimes spend restless nights back in the sleepers, conscious of every signal blast. A succession of short, sharp toots tells them there's some obstacle on the track just ahead. A single short whistle precedes application of brakes, and two medium blasts mean brakes are being released. A medium and three short notes send the flagman back to protect the rear of a stalled train. To call him back, the engineer sounds four medium whistles if the train is eastbound and five if it is westbound. One long whistle salutes a station ahead, and two medium and a short blast signal the approach to a railway crossing. One short and one medium whistle direct the crew to inspect a leaking train line, and three medium blasts should worry any wakeful railroaders aboard; it is the signal that a car has broken loose from the train.

Railway whistles at first were just tin post horns borrowed from stage-coach days. The engineer blew his own horn. But in 1832 a farmer driving his egg cart across the Leicester-Swannington railroad tracks in England ignored the engineer's frantic toots and, although he escaped alive, his eggs were scrambled. So the railroad hitched the post horn to steam and created the steam trumpet. Then, in 1835, it adopted the steam whistle. Since then, endless research has adapted whistles to the peculiar conditions of the railroad. Fast and slow trains, prairies, hill country and switchyards require particular types of signals. Three-toned whistles proved to have better carrying power for fast passenger trains, and at first three separate whistles were installed and blown simultaneously. Now the same effect is achieved by building three chambers within a single whistle column. The Chicago and North Western railway makes its own five-chamber whistles, and recently equipped its speedy "400" with a resonant air horn. Electric and Diesel locomotives, lacking steam, require air horns and in

(Continued to page 124A)



At last!

A THRILLING NEW CONSTRUCTION TOY FOR THE YOUNGER BOY



The New
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DESIGNER SIZE

Contains a generous supply of parts packed in two metal drawers, and a tray in red covered case. (Beautifully illustrated book of models included.) Price complete \$4. Sent prepaid upon receipt of money if not at your dealer's.

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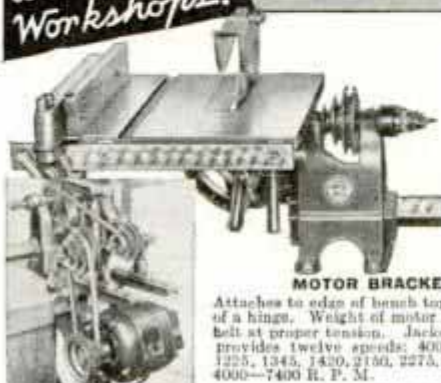
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A thoroughly practical workshop . . . performs a multitude of different operations . . . requires only a small amount of space . . . owning it involves no heavy investment. Once the basic Add-A-Tool comprising lathe, bench saw and motor has been acquired, accessories may be added as the need arises. Write for descriptive folder.

PRICE
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MOTOR BRACKET
Attaches to edge of bench top by means of a hinge. Weight of motor keeps lathe belt at proper tension. Jackshaft set up provides twelve speeds: 400, 734, 795, 1225, 1345, 1420, 2150, 2275, 3440, 3900, 4000—7400 R. P. M.

SPECIFICATIONS — LATHE: Distance between centers 30". Swing 7 1/4". Compound tool rest for metal turning and all other accessories available extra cost. **BENCH SAW:** Table 14"x12". Removable throat for dadoing. Wood-faced ripping fence. Table lifts 45°. Uses 7" blades, cuts full 2".

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Please send me your folder on 1936 Driver Tools.

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*For snapshots
at night*



*a picture like
this may win
\$350* for you*

* A \$250 Grand Prize will be awarded to one of the six winners of the \$100 prizes, hence the grand prize winner receives \$250 for a single picture.

89 CASH PRIZES EACH IN NOVEMBER AND DECEMBER

STILL A CHANCE FOR THESE PRIZES:

2 prizes of \$100 each	10 prizes of \$10 each
3 prizes of \$50 each	20 prizes of \$5 each
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\$250 Grand Prize

Any amateur picture-taker is eligible. Human interest . . . heart throbs or humor . . . counts more than photographic skill.

You'll find scores of likely subjects around your home . . . the baby, the children at play, Thanksgiving, birthday parties, pictures that tell a story.

HOW TO TAKE THEM. Simply screw two or three G-E MAZDA Photoflood lamps in bridge, floor or table lamps, load your camera with supersensitive film and shoot away . . . taking **SNAPSHOTS**, if your camera has a fast 1/6.3 lens, or **QUICK TIME EXPOSURES**, if you use a box or slow lens folding camera. These lamps are good for dozens of pictures and cost only 25 cents list.

For shots of babies, pets and action, use G-E MAZDA Photoflash lamps (15 cents list). Each lamp gets only one picture but you get it in 1/50 of a second . . . fast enough to record normal action. And you can use these lamps on flashlight batteries or house current.

Ask your dealer for a folder "Snapshots at Night Contest" on this \$2500 contest or write Dept. "D", General Electric Co., Nela Park, Cleveland, Ohio.

RULES

1. Any amateur photographer (except employees of the General Electric Company and those engaged in the manufacture or sale of photo supplies) may enter any number of pictures made on or after October 1, 1935 and not later than January 1, 1936, in one or more of the October, November, December contests.
2. Prizes will be awarded **ONLY** for pictures taken by artificial light, indoors or outdoors.
3. Winning pictures will be chosen solely on subject interest or appeal, not on technical excellence. The decision of the judges shall be final.
4. Each prize winning picture with negative and sole rights for advertising, publication and exhibition in any manner shall become the property of the General Electric Company.
5. Each print must bear the owner's name and address on the back. No prints will be returned.
6. All entries for the October contest must be postmarked not later than midnight, November 2; for the November contest, not later than midnight, December 2; and for the December contest, not later than midnight, January 3, 1936. Get entry blanks from your druggist or camera dealer and mail with prints only (be sure to keep the negatives) to:

Prize Contest Office, General Electric Company,
Nela Park, Cleveland, Ohio

GENERAL ELECTRIC
MAZDA PHOTO LAMPS

THE ROMANCE OF WHISTLES

(Continued from page 122A)

many cases these have become the vocal "trade-mark" of the high-speed train. These horns are operated by compressed air from the brake system.

Faster trains need more piercing whistles, but the railroads could not let the noise become a nuisance to passengers or to communities along the line. In building whistles for the Burlington "Zephyr," foghorn designers for the lighthouse service were consulted. Three horns were installed, one on the roof and two inside the air intake grating, sounding simultaneously. Its raucous shriek had to be toned down later. The Milwaukee railroad equipped its "Hiawatha" with a musical air horn but added a regular steam whistle for emergency use. A train crew on the Milwaukee road once was arrested for sounding the whistle within the city of Waukesha, Wis., contrary to a municipal ordinance. A number of cities prohibit locomotive whistles "except to prevent accident." If the whistle is provided with lever control the engineer can soften its blast somewhat, but if operated by an air valve the whistle automatically opens full blast. The deep-throated whistles of the North Western, the Wabash and the Milwaukee roads are of the "steamboat" type. In early railroading days, when engineers were permitted to furnish their own whistles, they sometimes borrowed real steamship whistles. Then they took the whistle home as a memento when they retired.

In favorable conditions of humidity, temperature and wind a whistle may be heard fifteen miles.

Latest time-saver for the busy engineer is a push-button whistle used on certain Milwaukee railroad trains. At the whistling post the engineer needs only press a button and the whistle automatically shrills the traditional two long, two short warning notes for the grade crossing.

There's more to locomotive talk than the signal book shows. Old-time engineers develop a "touch" on the whistle cord their friends can recognize, and "talk" to them with a peculiar tattoo. And if you hear an odd quaver in the voice of the 5:32 as it rumbles into town some afternoon, you'll know Engineer Sam Jones is telling his wife in engine language: "Put on the kettle, I'll be home for dinner!"

Complete POWER WOODWORKING SHOP

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WOOD LATHE
DRILL PRESS
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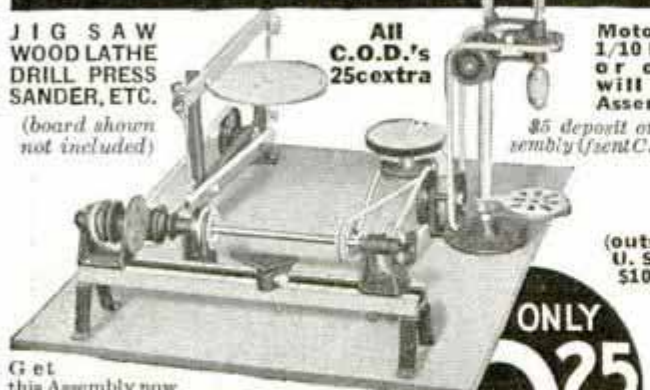
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25c extra

Motor of
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Get this Assembly now and this winter make a few of the many things you have planned, i.e., book shelves, foot stools, sewing cabinets, book ends, wall brackets, corner cupboards, end tables, magazine racks, etc. Easily and speedily done with power tools. Assembly consists of the following tools, which may be purchased separately: Jig Saw equipped with adapters, 1 doz. assorted blades and booklet, "Make Your Own Jig Saw Puzzles" (\$1.50); 2-speed Wood Lathe, 9 1/2 in. Bed (\$2.00); Drill Press complete with chuck (\$2.50); Disc Sander with 6 sandpaper discs (\$1.00); Set Hangers and Linshaft (\$1.00); 5 Line Shaft Pulleys (\$1.25).

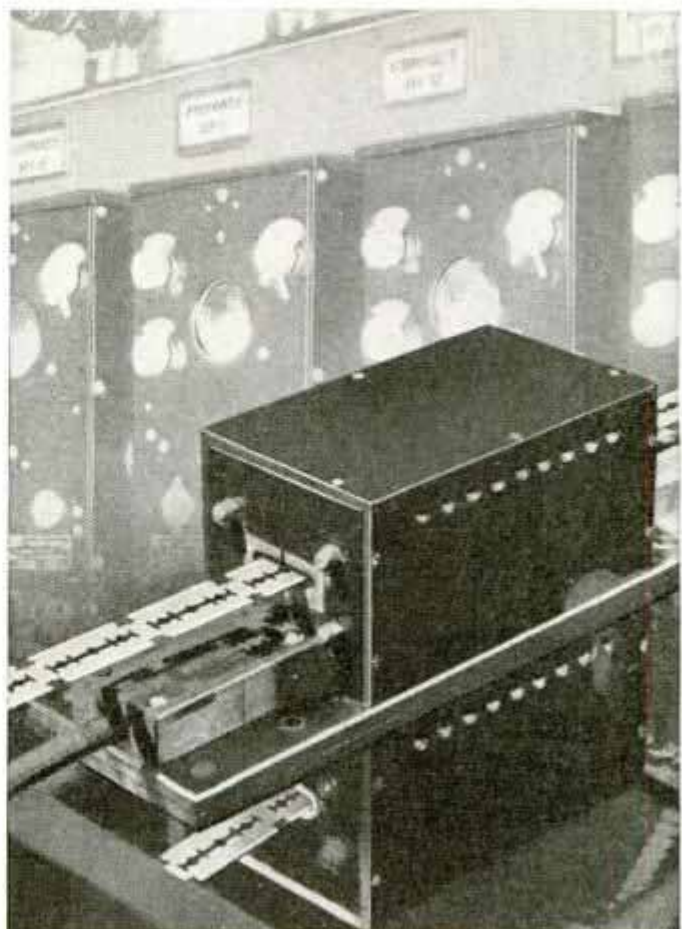
FREE Six 2 1/2 Ft. Endless Rubber Belts (value \$1.50) given with each Complete Assembly. Assembly may be purchased with \$5 Lathe having 2 1/2 in. bed. Simply add \$1 to your order. AN IDEAL XMAS GIFT FOR MAN OR BOY. BUY EARLY.

Send 5c stamp for 24 page catalog fully describing all our low priced tools.

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WHAT IS THIS DEVICE THAT MAKES STEEL "Talk"

- Messages relayed from this magic black box to a battery of automatic switches, control the hardening of Gillette steel as it passes through electric furnaces.
- In effect, this amazing device makes steel "talk"—orders more or less heat in the furnaces as the condition of the steel demands. This results in constant uniformity of hardness in the steel—contributes in a big way to the shaving comfort you enjoy with the Gillette "Blue Blade".
- Before the development of this equipment, hardness could not be uniform, for variations exist in even the finest steel. Now a master strip of steel—of exactly correct hardness—controls the temperature of the furnaces—the only furnaces in the world that can produce steel of uniform, predetermined hardness.
- With this blade you get more shaves—better shaves—because Gillette steel takes and holds the sharpest edges ever put on metal. Try the Gillette "Blue Blade".

Reputable merchants give you what you ask for. In stores where substitution is practised—INSIST ON

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AMAZING NEW AUTO INVENTION

Scientific Laboratories, P-960, Wheaton, Illinois, have perfected an accessory device needed on every auto. There is nothing else like it on the market. Fits all autos. Easily attached. County and State Distributors wanted everywhere. 100% to 300% profits. One-free offer to introduce quickly. Send address and car name today.

COMPLETE ELECTRIC PLANTS



ONAN A.C. PLANTS furnish the same current as city service. Operate Radio, Water System, Refrigerator, all Appliances.

SIZES 350 WATTS UP

Have A.C. Current anywhere. Models \$110 and up. Easy to install. Available from stock. Ideal for farms, camps, lake homes, commercial purposes—anywhere electricity is needed.

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Send—free—Gilbert Thrills Magazine and combined Opto Kit Catalog.

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WINGS OVER FOUR CONTINENTS

(Continued from page 868)

to control, so all supplies for the airport had to be hauled in by airplane.

Today the service between Europe and South America functions with a regularity between ninety-seven and ninety-nine per cent perfect. French pilots and mechanics have been held up and captured by bandits and in the pioneering period, sixty-eight pilots, engineers and navigators paid with their lives in the effort to get the air line running smoothly. But they made it possible for letters to go from Paris to Buenos Aires in three and one-half days.

Air France's Far Eastern line dates to 1927 when the first hydroplanes flew between France and Syria. In 1933, the company made connection on a regular schedule between France and Indo-China. Despite the great climatic changes and the inhospitable terrain planes maintain their schedule more than ninety-eight per cent of the time.

Air France's supreme effort in construction is embodied in the thirty-seventon flying boat, "Lieutenant de Vaisseau-Paris." She is destined either for the south Atlantic or the Mediterranean line. Her six Hispano-Suiza motors give her more than 5,340 horsepower to carry her at a speed of more than 160 miles per hour at an altitude of 6,000 feet; her cruising speed is more than 140 miles per hour.

With eight in her crew and seventy-two passengers, the "Lieutenant de Vaisseau-Paris" has a cruising range of 750 miles. The captain rides in the ship's nose; behind him are the pilots, then the three mechanics, then the passenger cabin. Passenger accommodations include a salon with twenty comfortable chairs and dining tables; six cabins de luxe with beds and wash bowls; a kitchen, bar and comfort station. This is the arrangement if the ship operates in the Mediterranean zone. If she operates in the south Atlantic service, the number of passengers is decreased to thirty, while the cruising range is increased to 3,000 miles. Then there will be twelve cabins, each fitted for two people, in addition to public rooms.

According to her designers, the "Lieutenant" can fly the south Atlantic in a single hop of fifteen hours. And she could fly the north Atlantic in twenty-nine hours flat, making one refueling stop.



NICHOLSON The sign of an expert

Home tool users quickly learn that there is a difference in files. And as a man becomes expert in his own shop Nicholson Files become his choice.

These chaps who make unbelievably intricate trains and steam engines, who cut decorative chandeliers and andirons from old scrap metal, whose wood working is a marvel of accuracy and beauty, almost invariably use Nicholson Files.

Use Nicholson Files in your shop. They are sharp, durable and economical. They are first quality tools—they are the first choice of the expert home tool user. At your hardware store. Nicholson File Company, Providence, R. I., U. S. A.

Genuine

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

JIGSAW AND MOTOR

Cuts 900 strokes per minute



The sensation of the year! A full-sized Jigsaw with motor attached and two saw blades—for only \$3.45. Stands 15½" high, 15¼" long. Made of sturdy, channelled steel. Has 12" throat. Work table is 6¼" round. Motor operates on AC current only. 105 to 110 volts, 50 or 60 cycles. Direct cam drive gives maximum power. No belts to break or slip. Handles wood up to ¾" thick. Cuts 900 strokes per minute. Comes complete with cord, ready to plug in light socket.

Ideal for making Jigsaw puzzles, statuettes, toys, fretwork, etc. Jigsaw guaranteed for one year. Never before such an amazing bargain.

Send only \$1.00 with order. Pay balance upon delivery. Satisfaction guaranteed or money refunded. Order now!

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\$3.45
COMPLETE

HANDICRAFT COMPANY 110 West Chicago Avenue
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DO YOUR
Christmas "Shopping"
WITH



**GENUINE
Masonite
TEMPERED
PRESWOOD**

THIS YEAR, why not build your own gifts in your own home? They carry much more sentiment. And if built with Genuine Masonite Tempered PRESWOOD, they last longer . . . save your money.

Hundreds of items can be made of this remarkable material . . . easily . . . quickly . . . inexpensively. It is grainless and uniform in quality. Easy to work with. Can be cut or sawed to any size or shape with ordinary tools.

Genuine Masonite Tempered PRESWOOD is moisture-resisting. Will not warp, chip, split or crack. Surfaces remain smooth, rigid and strong for all time. Its natural warm-brown finish produces beautiful results without further treatment. Or it can be varnished, painted or enameled.

Genuine Masonite Tempered PRESWOOD is also ideal for home-building or remodeling. Easy to finance under F.H.A. Ask your Masonite dealer.

Mail in the coupon below for a free sample of Genuine Masonite Tempered PRESWOOD.

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Please send me a free sample of Genuine Masonite Tempered PRESWOOD and more information about this wonder material.

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When writing please mention Popular Mechanics

Fish Worth Their Weight in Gold

(Continued from page 874)

any other fish that approaches the nest. The male dwarf gourami builds a "bubble nest" atop the water and lures the female in to lay her eggs.

There are plenty of tricks to this hobby, but they are not difficult to learn. Nature does not encourage mating of unrelated species, and you will wonder whether you can cross breeds successfully. Ask Alfons Heintze, who makes it a full-time job.

"You can fool the fish," says Mr. Heintze. "When they are very young they do not recognize family differences. Mate them then, place the pair together before they are two months old, and you may have success."

Recently it was discovered that a canned food made especially for fox and other fur animals is also a perfect food for fish. It is a jellied substance made of meat, dry skim milk, wheat, tomatoes, edible bone meal and salt. Dried shrimps are another good food. But when Mr. Heintze wants to fatten his fish and bring them to maturity quickly he feeds them little white worms and daphnia, or water fleas. Fish thrive on live food in any quantity.

This is another profitable sideline. Water fleas, found in any stagnant pool or inlet of a river, can be sold at five gallons for a dollar in centers where there is a demand. One Chicago man, a cripple without other means of support, built a shack beside a sluggish river and supplied fish dealers with buckets of daphnia every day, earning \$40 to \$50 a week.

Baby fish of different families can be started together in large tanks, but if you mean to breed true types you must separate them in about two months. Keep plenty of plant life in the tank or bowl. Although it is not always essential, aeration will give the fish more "pep"; you can buy a tiny air pump for a small sum. Use a voile net for lifting the fish, and handle them as little as possible. Dip your hands in water before touching them; dry hands tear the scales. When it is necessary to add water, use rainwater or let the tap water settle for five days or more before using it. Purifying chemicals in city water systems and sudden temperature changes may kill the fish.

Fish are subject to diseases. Skin ail-

ments caused by plant and animal parasites can be treated. Sometimes silver nitrate is used, sometimes a salt solution is a tonic for fresh-water fish, sometimes a change of environment is as good for fish as a vacation for the working man. Mr. Heintze once lost several tanks of fish due to a skin disease he could not control. Let a fish come down with some internal sickness and the doctor is beaten right at the start. You can't tell whether it has stomach ache or rheumatism. Surgery is virtually impossible—although there have been Cæsarian operations on guppies, which are live-bearers.

An easy way to keep your aquarium clean is to employ a Japanese "dojo," a "corydora" or a bevy of snails as maids. Snails keep the bowl clean and supply infusoria, good food for baby fish. Scavenger fish feed on the bottom, scooping up mouthfuls of sand, filtering out the food particles and letting the sand pass on through the gills. Thus they keep food from decaying on the tank bottom. Some egg-laying fish use this scooping method to dig their nests.

Bettas, or Siamese "fighting fish," produce a marvelous variety of color in their young, which become a deep blue-green as they mature. A pair costs about \$3 to \$5, and about one-tenth of the brood will be beautiful enough to bring you good returns. Angel fish, those broad-sided black and white beauties with long barbels hanging from their "chins," are inexpensive when young but you may sell a grown pair for \$10. One dealer recently sold a well-developed female for \$60. Angel fish live about six years and begin breeding after two years. Some fish never breed in captivity, and this naturally increases their value. The "mytinnis Rooseveltii," a flashy, gilded fish first brought back from South America by Theodore Roosevelt, will not breed away from its native waters. A pair costs \$25 to \$40.

There are many varieties of brilliant fish available to make your bowl a fascinating pageant of color. Watching this kaleidoscope of life in your own home is intensely interesting, and with proper care and study you may develop new types and add new colors to the undersea rainbow.



**THEY SAY I'M
TWICE
AS HANDSOME
SINCE I GAINED
10 POUNDS**



*Posed by
professional
models*

**It's a crime
to be
SKINNY**

**When This Special, Quick Way
Puts on 10 to 15 Pounds Fast**

EVEN if you never could gain before, remember, thousands have gained solid, naturally attractive flesh this new, easy way — *in just a few weeks!*

Doctors now say the real reason why great numbers of people can't seem to gain an ounce is they fail to get enough health-building Vitamin B and iron in their daily food. But now with this new discovery which combines these two vital elements in little concentrated tablets, hosts of men have put on pounds of firm flesh — *in a very short time.*

Not only that, but thousands have also gained a naturally clear complexion, freedom from unhealthy indigestion and constipation, glorious new pep.

7 times more powerful

This amazing new product, Ironized Yeast, is made from special *cultured ale yeast* imported from Europe, the richest known source of Vitamin B. By a new process this ale yeast is concentrated 7 times—*made 7 times more powerful.* Then it is *ironized* with 3 kinds

of strengthening, blood-building, energy-giving iron.

If you, too, are one of the many skinny people who simply need Vitamin B and iron to build them up, get these new Ironized Yeast tablets from your druggist at once. Day after day, as you take them, watch skinny limbs and flat chest round out to normal attractiveness. Skin clears to natural beauty, new health comes — you're an entirely new person.

Results guaranteed

No matter how skinny and run-down you may be, try this new "7-power" Ironized Yeast for just a few short weeks. If not delighted with the results of the very first package, money back instantly.

Special FREE offer!

To start you building up your health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results guaranteed with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 5312, Atlanta, Ga.



MAKE PERMANENT FURNITURE REPAIRS WITH PLASTIC WOOD

Anyone can do a ship-shape job of repairing quickly—loose drawer pulls, broken chairs, loose casters, holes in wood, nicks, cracks, screw holes, etc.—with this wonderful new discovery called Plastic Wood. It is wood in a can that handles as easily as putty—yet when dry it is as lasting as real wood.

INSIST ON THE GENUINE

For permanent, expert-looking repairs use genuine Plastic Wood—which has all the properties of wood except grain—adheres to wood, metal, stone, glass, plaster or porcelain—will hold nails and screws and can be sawed, carved, sanded, turned on a lathe without splitting, cracking or crumbling—can be painted, varnished or lacquered perfectly—is *water-proof*, weatherproof.

Plastic Wood is ideal for filling cracks along baseboard, drainboard, in floors; filling old nail and screw holes; repairing damaged toilet seats; filling holes around pipes or wiring; 1001 other uses.

Plastic Wood comes in 25c tubes, 35c cans—in 9 colors—at paint, hardware and variety stores.



PLASTIC WOOD

121 PUZZLES in One Package
 ALL PARTS OF WOOD — NO FOREIGN ORDERS ACCEPTED — SEND 15¢ TO THE CARROM COMPANY Dept. P.M.1—LUDINGTON, MICH.

NEW BENJAMIN AIR PISTOLS \$7.50

Powerful—Accurate—Economic—Practical—Adjustable Shooting Force—Amazing Maximum Velocity—the Only Genuine Compressed Air Pistol on the market—cal. 177 or 22 and BB Single Shot—with Bolt Action—Hammer Fire—Hair Trigger—Safety \$7.50—for Target and Small Game. Also 177 and 22 Single Shot Air Rifles \$7.50—Single Shot BB Air Rifles \$6.00—25 Shot BB Repeater Air Rifles \$7.50. At Dealer or Direct. FULL DETAILS—TARGETS—FREE—WRITE TODAY. Benjamin Air Rifle Co., 691 N. Broadway. St. Louis, Mo.

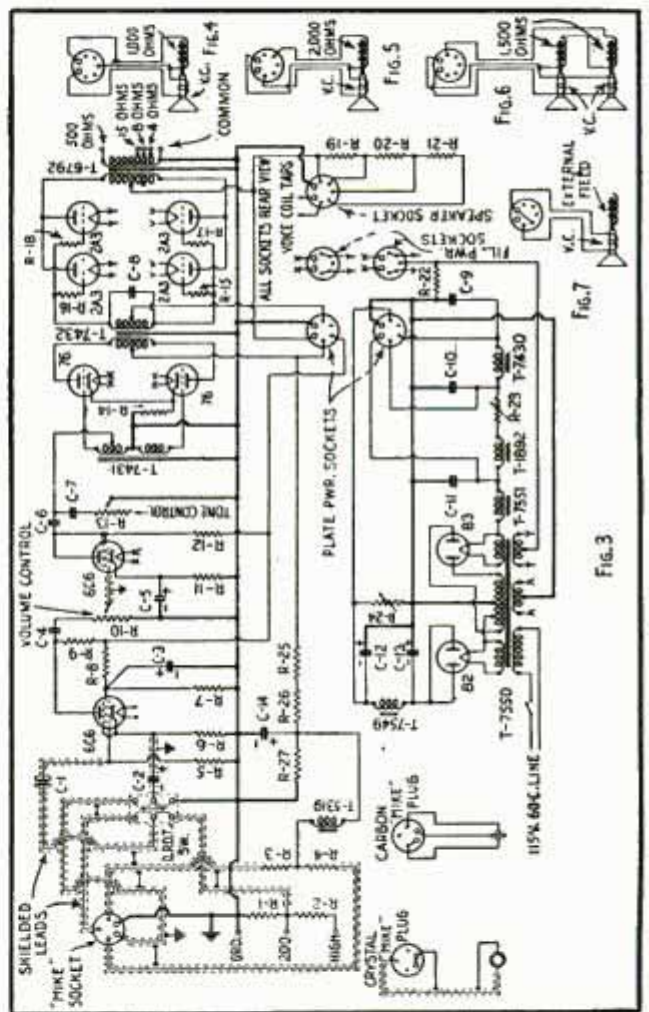
BUILDING A 30-WATT AMPLIFIER

(Continued from page 903)

sockets installed, together with the resistor and terminal mounting strips, are available from radio parts dealers, in the form of a foundation kit which lists for \$8; all other items may be purchased individually. A complete material list can be obtained upon application without charge.

Figs. 1 and 2 show the amplifier and power-unit layouts with the various transformers and chokes in their relative positions. The schematic circuit diagram is given in Fig. 3 and possible speaker combinations are indicated in Figs. 4, 5, 6 and 7.

A microphone input socket provides



connection for either a crystal microphone or a double-button carbon variety. An input terminal strip, indicated at the left in Fig. 1, has a 200-ohm and a high-impedance connection. The 200-ohm connection will accommodate a phonograph pick-up, the output from a ribbon microphone or the output from a pre-amplifier or other source. The high-impedance tap is for a pick-up or other similar source of

(Continued to page 132A)

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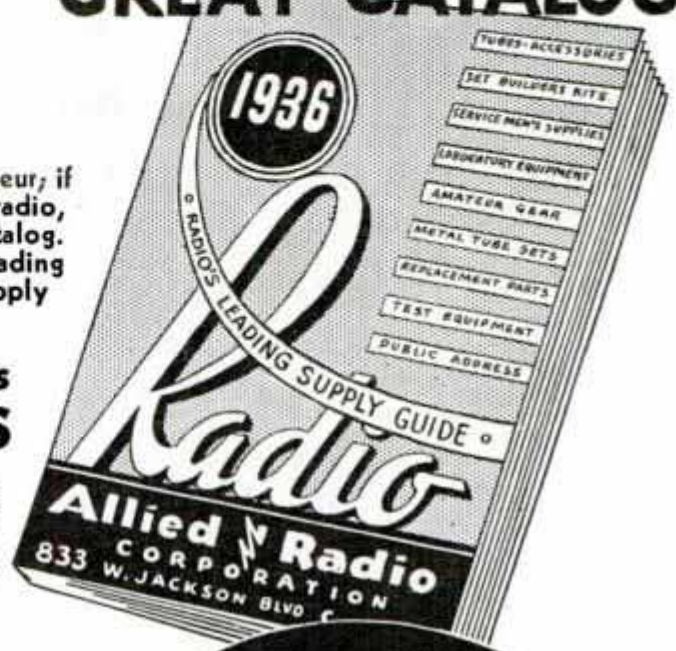
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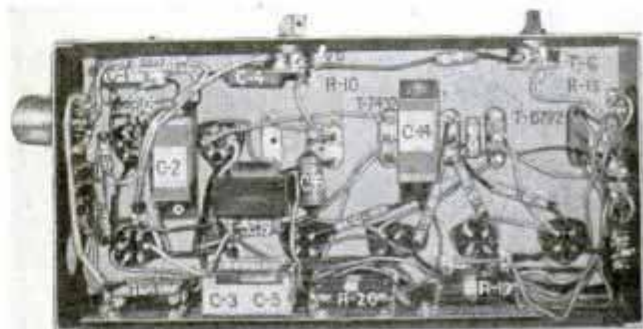
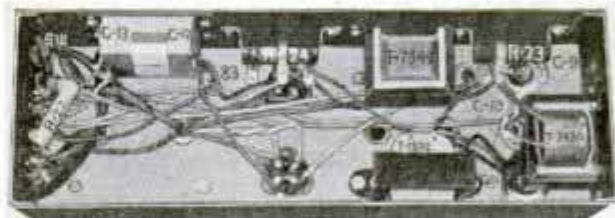


BUILDING A 30-WATT AMPLIFIER

(Continued from page 130A)

approximately 10,000 ohms impedance. A switch on the front panel permits changing from microphone operation to phonograph pick-up as desired.

Color-coded leads of the power transformer, indicated in Fig. 2, have the fol-



View Showing the Underside of Power Supply and Amplifier Units

lowing values: blue, primary; small black, 6.3 volts; black and yellow, filament center tap for 6.3 volts; heavy black, 2½ volts, 10 amp., and the green and yellow lead is the center tap for this winding. The yellow leads are for the 5-volt filament supply to the type-83 rectifier tube. Green leads supply 2½ volts for the filament of the type-82 rectifier. Brown indicates the high-voltage leads, with black and brown for the center tap; this high-voltage secondary winding delivers 435 volts a.c. each side of center. The red lead is the a.c. tap for the bias supply. An enlarged blueprint of all diagrams is available from Popular Mechanics radio department, those who wish it should specify blueprint R-217.

Provision is made for speaker voice-coil connections at the output terminal strip in Fig. 1 where taps 4, 8, 15 and 500-ohms are available and also at the speaker socket where any two of the taps may be wired. Thirty watts of field supply are made available at the speaker socket for fields or field combinations of 1,000 to 3,000 ohms. If two or three different speakers or speaker combinations are desired, it is not necessary to change any of the wiring.

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Foundation Unit Includes

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Paint Magic and What It Means to You

(Continued from page 842)

contains small percentages of sulphur, continually settles on these paints. Rain falling on this dust produces weak solutions of sulphuric acid which attack the surface.

In solving such problems many new materials have been found. One of the most valuable synthetic resins used in the paint and varnish industry has been evolved from coal tar. Hydrogen and oxygen in combination with the carbon in coal is made into synthetic alcohol. From this formaldehyde is made, and this is the raw material for phenolic resins. In many respects these new resins have decided advantages over the natural varnish gums, and their production is increasing by leaps and bounds. So it is that coal tar, once a useless by-product of the coke industry, is now of value to paint engineers.

We also have manufactured varnish gums whose physical characteristics can be controlled. We can make them hard or soft, tough and elastic or brittle, depending upon the use for which we intend them. The natural resins formerly used had to be taken just as they came from the ground and their uses were restricted to the range of their characteristic properties. With the aid of these new synthetic resins paint engineers can evolve materials which modern rapid-production schedules demand. For instance, the automotive industry demands quick finishing and tough, wear-resisting coatings, so paint engineers produced the synthetic finishes used on the new cars.

The general use of motor cars painted in light colors would greatly reduce the number of traffic accidents, according to W. A. Lindberg, color engineer for a motor-car company. He made a check on motor-car collisions and found that in a large percentage of cases, either one or both of the cars involved were painted black or a very dark color. This is particularly true at night when the superior visibility of the lighter cars is more pronounced than in the daytime. In addition to the value of the lighter colors in preventing accidents at night, they serve to accentuate the appearance of motion. A light-colored car appears to be moving while a dark one seems static.

The production of furniture at prices

within reach of buyers would be impossible if it were not for the use of modern-production schedule coatings. The type of finishes used at the turn of the century would entail so much labor that pieces of modern furniture might cost from fifty to 100 per cent more. These new finishes also have other advantages. Some of them are alcohol-proof and others have been developed to withstand cigarette burns.

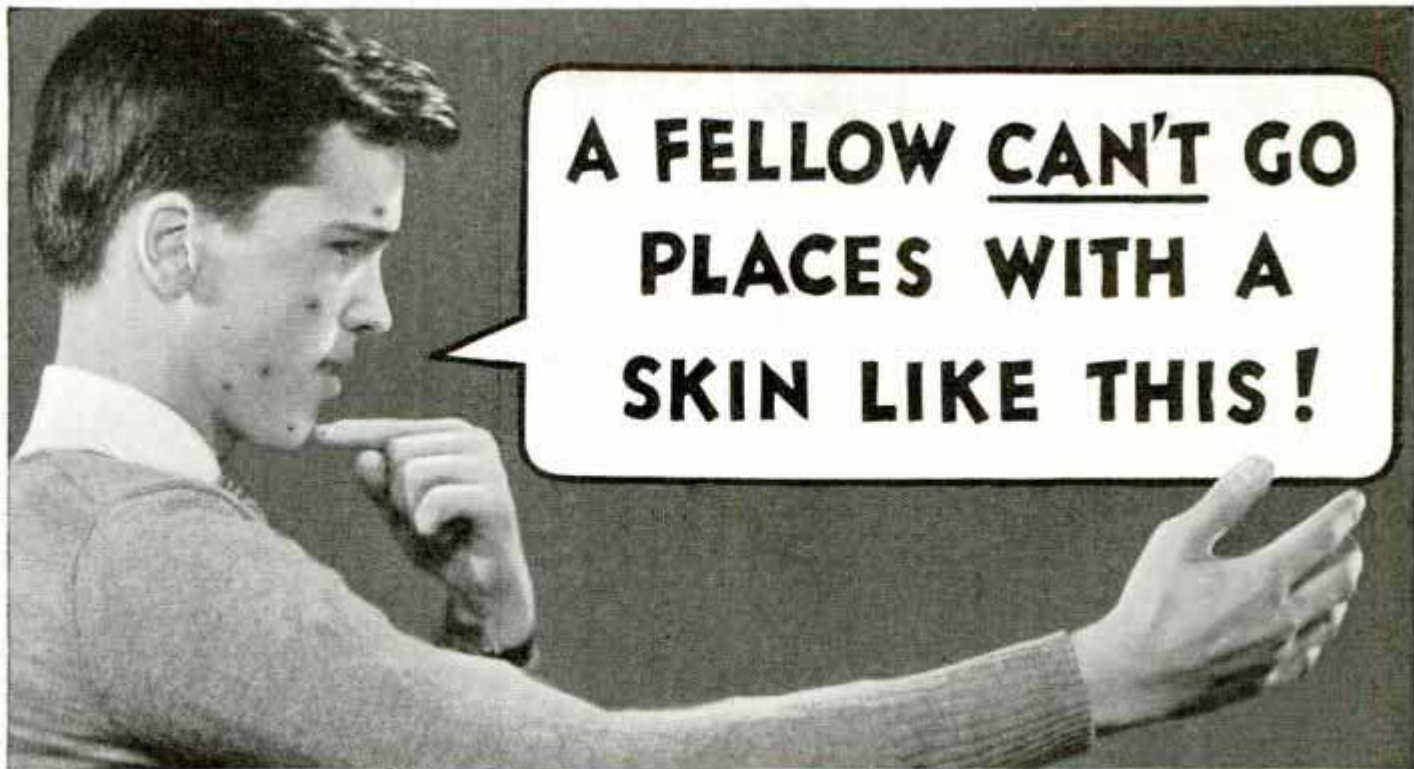
There are also new finishes for the home. Some are so formulated that ink, grease and even iodine stains can be washed from their surface without showing any ill effects. Ease of application and greater hiding power enhance the value of present-day decorative coatings. One or two coats of these modern enamels now regularly achieve results that required numerous coats of old-time paints and varnishes.

There are many things which are still in the laboratory form of paint engineering. Among these are the so-called rubber paints and the use of water in nitrocellulose lacquers. Rubber as a base for paints is most valuable because of its high resistance to acids, alkalis and moisture, and not, as might be supposed, because of its elastic qualities. It is believed that rubber base paints will be made in the near future which can be used successfully on a wide variety of surfaces.

Recent experiments on aqueous dispersions show a possibility of making nitrocellulose lacquers of higher solid content. Through a process of emulsification the resulting lacquers would contain a large percentage of water vehicle. Such a lacquer would greatly reduce fire hazard of these materials. It is also claimed these lacquers would have better spraying and brushing qualities.

In 1933 over a million gallons of soybean oil were consumed by the paint industry. Its contribution to paint-making has been valuable, but it does not have the drying qualities of linseed oil. It is used with, rather than in place of, the latter.

The world of paint, varnish, and lacquer is changing today more rapidly and radically than ever before. Paint engineers are showing us new magic with colors and greater utility of paints and new and better ways of making them.



But Pete is soon pimple-free and "out stepping"



Don't let adolescent pimples make a hermit out of YOU!

Between the ages 13 and 25, important glands develop. This causes disturbances throughout the body. And waste poisons in the blood irritate the skin, causing pimples. Clear these skin irritants out of your blood, with Fleischmann's Yeast. Then the pimples disappear. Eat 3 cakes a day, before meals, until skin clears.



—clears the skin
by clearing skin irritants out of the blood

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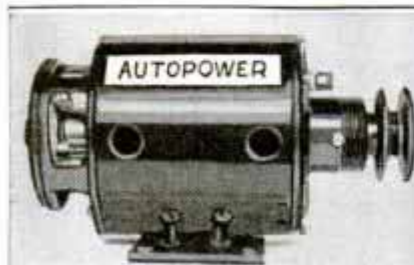
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THE ALADDIN OF THE MOVIES

(Continued from page 853)

across the floor to a bowl of milk. Sindler has had to tape shut the mouths of alligators to make them harmless, play nursemaid to a 300-pound turtle, and take care of a group of fighting bulls as part of his duties.

Each studio has a property department in which it stores a miscellaneous collection of nearly everything under the sun. In the United Artists collection there are 3,000 heavy pieces ranging from suits of armor to rugs and period bedsteads. Aside from these the studio has 7,500 "hand props" like jewelry and dishes. One room is piled high with furniture, another with different kinds of saddles, a third with paintings. Stands hold various types of umbrellas and walking canes. Wrist watches, necklaces, and silverware are laid in cases. On the lot you will see different kinds of automobile bodies, replicas of ancient carts, and even a collection of small boats.

If a studio needs something that it doesn't own, the chances are the item can be rented from one of the property houses, huge warehouses stacked with equipment. Like the property men themselves, the free lance property houses are inveterate collectors. Auction sales, secondhand stores, and pawn shops are combed for anything the movies might need. Antique dealers who have made the rounds of the property houses have been rewarded by uncovering valuable period pieces.

Rare and strange properties are sometimes easier to find than more prosaic pieces. Sindler can tell you where to lay your hands on a sheik's headdress or a polar dog sled, but he had a hard time finding some mechanical horses popular as exercisers a few years ago. Eventually he found a salesman with a list of people who had bought the exercisers. From them he was able to rent those he needed.

So far, Sindler has never been stumped, but he doesn't boast because he never knows what a director will want next.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.



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WITH ONIONS AND STEAKS AND CHEESES;
HER STOMACH FEELS GRAND
SINCE SHE KEEPS TUMS ON HAND . . .
SHE EATS WHAT SHE DARN WELL PLEASES!

NO ALKALIES FOR ACID INDIGESTION!

MILLIONS have found they do not need to drench their stomachs with strong, caustic alkalies. Physicians have said this habit often brings further acid indigestion. So much more safe and sensible to simply carry a roll of Tums in your pocket. Munch 3 or 4 after meals—or whenever troubled by heartburn, gas, sour stomach. Try them when you feel the effects of last night's party, or when you smoke too much. Tums contain a wonderful antacid which neutralizes acid in the stomach, but never over-alkalizes stomach or blood. Pleasant to eat as candy. Only 10c at any drug store.



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DON'TS FOR HUNTERS

(Continued from page 896)

The waterfowl hunter who uses a boat may get into the headlines if he puts a loaded shotgun on the seat next to him. There are several types of casualties due to this kind of carelessness. First, there are those occurring when a duck hunter tries to pull a loaded gun toward him. To reach out on the seat of a duck boat, and attempt to haul a loaded shotgun, muzzle first, toward you is a sure way to prove that a shotgun charge at close range never did anybody any good.

A hunter with a loaded gun in a boat also has a chance to show his skill as a swimmer by discharging the gun and blowing a hole in the bottom of the boat. The safest don't for the duck hunter is this: Don't paddle around in a boat with a shooting partner and a couple of loaded guns. Better to lose a duck than to take a life. If you are paddling a duck boat alone, rest the shotgun so the muzzle points away from you but so you will be able to lift it and shoot quickly. In fact, "jump shooting" for mallards calls for just such quick work. But a mixed crowd of hunters and loaded guns in one boat is not a restful or safe outfit.

Carrying a loaded gun in an automobile is another trick of the careless hunters which calls for a "don't." Some states make this dangerous practice a violation of the game code. Carrying a loaded gun in an automobile is not only dangerous to the shooter, but also a menace to wild game. The "meat hunter" who wants meat instead of sport drives along a road slowly, looking for a game bird in the field, then reaches for a loaded gun to get a pot shot at the bird on the ground. But few can average 100 per cent in the trick of reaching for a gun in a hurry, swinging it around, and shoving it through a window.

The large number of deaths and serious injuries recorded every year among deer hunters is giving the conservation departments considerable worry. The majority of these involve the accidental killing or wounding of a hunter by a shooter who "thought it was a deer." Don't shoot until you know what you are shooting at. Often there are stretches of woods where hunters are more numerous than the deer. The nervous, inexperienced, or careless

(Continued to page 140A)

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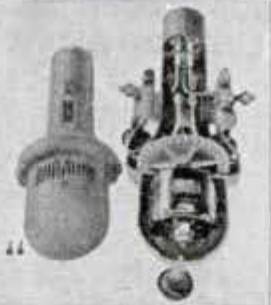
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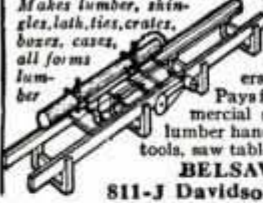
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Leaky Pail



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Oil Leaks

Possibilities like these are ever present to the householder, but invite no delays, repair bills or expensive new purchases if you have a copy of the Smooth-On Home Repair Book, and a can of Smooth-On No. 1 on the shelf and like to prove yourself equal to the emergency.

Hundreds of repairs similar to the above are made quickly, easily and cheaply with Smooth-On No. 1, which stops leaks of steam, water, gas, oil, gasoline, smoke, etc., anchors loose screws, bolts, nuts, handles, machinery, etc., and holds equally well in metal, masonry, bath room tile, and wood.



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Smooth-On No. 1 expands in hardening and when metallized holds as tightly as the metal to which it is attached. Power plant engineers, shop foremen and professional repair men prefer Smooth-On repairs because the simple cold application avoids fire risk and extra labor and a dependable finished job is ready in a hurry.



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CRAFTSMAN'S MODEL CO., Dept. P-24, 2030 N. 41st St., MILWAUKEE, WIS.

2963 **DONT'S FOR HUNTERS**
(Continued from page 138A)

shooter sees a slight movement in the brush. Instead of waiting until he can make out the outline of a deer head and catch a glimpse of antlers, he shoots. Too many times the bullet speeds toward a crouching hunter instead of a buck deer. Death or serious injury to a hunter results. The practice of "shooting before you are sure" is one of the most serious of all forms of carelessness.

One of the basic, unwritten laws among hunters is that each man should check and double-check the gun before it is taken into the house, to be sure it is unloaded. When this precautionary measure is ignored, there may be an accident, thus proving that sometimes a fellow is not safe even when he has come out of hunting fields!

"I didn't know it was loaded" is an old and sometimes sad comment after a gun goes off. So every shooter should learn to keep in mind at all times one of the cardinal safety first rules of the game: "Don't guess, make sure the gun isn't loaded."

1095 **DIAMONDS HELP MAKE YOUR CAR AND FIRE YOUR FURNACE**

More industrial than gem diamonds are produced each year—2,500,000 carats of industrial against 1,500,000 carats of gems—but the gem diamonds, containing fewer flaws, have an import price of about \$47 a carat compared with five dollars a carat for industrials. The greatest single use of industrial diamonds is in truing abrasive wheels and, since the emery wheel is a vital key to the mass production of automobiles, the auto industry is the biggest industrial diamond customer. About eight cents' worth of diamonds is used in making an average car. One-fifth of all industrial diamonds is used in diamond core drills. Another fifth is used in diamond dies for drawing wires. Through a single die 300 tons of copper wire, about 8,000 miles, can be drawn without any variation in gauge. Another fifth of the industrials is used for turning and polishing billiard balls, telephone mouthpieces and fountain pens or machining gears and crankcases. In some high-pressure oil furnaces a pierced diamond feeds a jet of oil to a flame in a precise and constant stream.

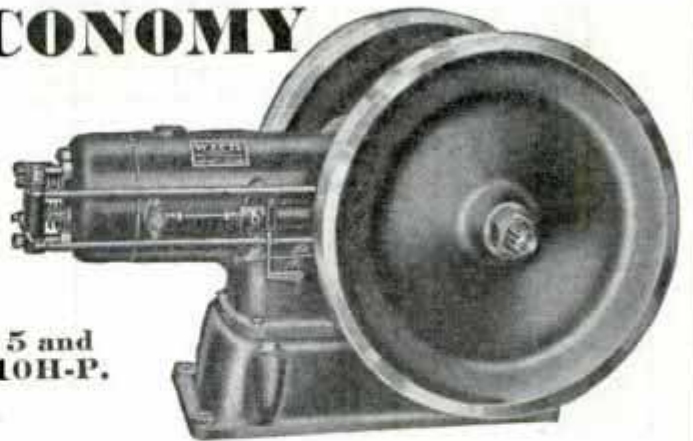
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Whyt-Rox Chem. Co. writes: "We replaced a 5 H. P. electric motor with a WITTE Diesel Engine and are saving \$65.00 per month."—All WITTE Diesel users report big savings and almost unbelievable economy. Price \$300.00 and up. Cash or terms. Immediate Delivery.

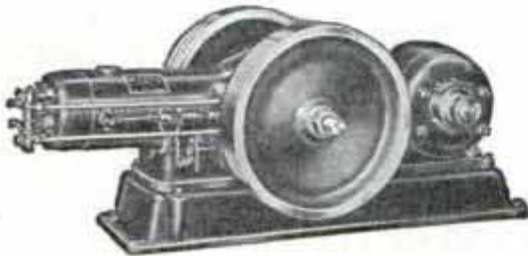
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2 to 7 K.W. A.C. or D.C.
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Diesel-Lite Plants are powered with the economical WITTE Diesel Engine, close coupled by multiple vee belt drive to A. C. or D. C. generators, forming a complete self-contained unit that will furnish electric power for less than one cent per kilowatt. These units have remarkable flexibility and may be used for engine power, electric power or a combination of both. Simple to operate and care for.



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New DRIVER TOOLS ARE READY

The new "Series 700" Drill Press is built with mechanical precision never before associated with tools of its price class. Its splined spindle, four SKF Ball Bearings and Jacob's Key Chuck are factors that any engineer or mechanic can appreciate.
Besides drilling, the "700" model will do mortising, shaping, carving, routing, dovetailing and tapping.
The splined spindle—a new DRIVER development—deserves special note. After exhaustive tests to reduce vibration this type of spindle was adopted. Of all types, it proved the best. In design it is similar to the ends of automobile propeller shafts. In action it gives that extra element of balance so essential in minimizing vibration at high speeds.



FEATURES
Jacob's Key Chuck regular equipment.
Chuck capacity 1/16" to 1/2" drills.
Maximum distance chuck to table 11 1/4".
Maximum distance chuck to base 17".
Distance center of chuck to column 6 1/2".
Table 9' x 8", base 9' x 8".
Diameter of steel column 2".
Spindle travel 3 1/2".
Spindle 3/8" diameter, tapered at end for Jacob's Chuck.
Height over all 38".

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8/11/49



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You can do this job yourself. Sani-Flush makes it easy and inexpensive. Just pour *ten cents'* worth into the radiator. (Directions are on the can.) Run the engine, drain, flush, and refill with anti-freeze solution. Sani-Flush is thorough. It is safe. Cannot harm radiator, rubber fittings or aluminum cylinder head. Sani-Flush is used in most bathrooms to keep toilets sparkling. You can buy it at any grocery, drug, or hardware store—10 and 25 cent sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush KEEPS RADIATORS CLEAN—NON-CAUSTIC



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MINIATURE
Not toys but fine tools with a hundred clamping and holding uses. Made to industrial standards; Malleable; Accurately aligned steel screws with free-acting swivels; ground seats; correct designs (maximum strength) and accurate machining.

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Free!
Clamp Catalog
46 pages of
clamps for wood
and metal.

FUEL SAVERS PAY THEIR WAY

(Continued from page 823)

since it results in quicker heat and prevents escape of too much warmth before the radiators are reached. However, the saving would be only nominal for heat which escapes into the basement is not lost entirely. Some of it rises into the house.

Engineers disagree on whether a humidifier, which introduces moisture into the air, will reduce fuel bills. They agree that the humidifier will make the home more comfortable, but Prof. Kratz, with other authorities on the subject, rejects the theory of saving. He has found in tests that the heat required to warm water in the humidifier to vaporization point is equal to the saving that could be accomplished by reducing the house temperature to the somewhat lower temperature that the higher humidity would permit and still maintain the same comfort. But Prof. Kratz recommends the humidifier, whatever its type, as a means of being comfortable and healthy. The average home with steam or hot-water system has a winter humidity of eighteen to twenty per cent, whereas it should be not less than thirty per cent at seventy degrees for comfort. If forty per cent relative humidity is used, condensation appears on single-pane windows when the outdoor temperature drops to thirty-five degrees. Storm windows must be used to prevent this inside frosting. "Weep holes," small openings in the bottom or top of the storm window or door, are for the purpose of preventing excessive condensation, as well as for admitting fresh air.

One inexpensive humidifier is available for installation in the chimney. The exhaust or waste heat warms the water to vaporization and a small fan expels the moist air into the house. Another type consists of a small cabinet that is placed on the hot-water or steam radiator. Heat from the radiator warms the water in the humidifier, whirling brushes help to vaporize the water and a tiny fan blows the moist air into the room.

For satisfactory service out of any of the fuel savers, Prof. Kratz and Crane engineers recommend that installation be turned over to a reliable plumber. Amateur attempts may result in trouble, and possibly in higher, instead of lower bills.

Rochester Mfg. Co., Rochester, N.Y.



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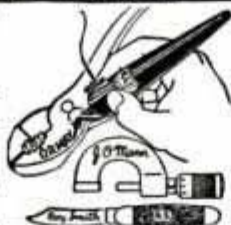
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**OLD MONEY
and stamps
WANTED**



POST YOURSELF! It pays! I paid J. D. Martin, Virginia, \$200 for a single copper cent. Mr. Manning, New York, \$2,500 for one silver dollar. Mrs. G. F. Adams \$740 for a few old coins. I want all kinds of old coins, medals, bills and stamps. I pay big cash premiums.

I WILL PAY \$100 for A DIME

1894 S. Mint; \$50 for 1913 Liberty Head Nickel (not buffalo) and hundreds of other amazing prices for coins. Get in touch with me. Send 4c for my Large Illustrated Coin Folder and further particulars. It may mean much profit to you. Write today to

B. MAX MEHL, 324 Mehl Bldg. Fort Worth, Tex.
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"DIRECTED HEAT"

as much or as little as you want
AT ANY ANGLE YOU CHOOSE



WHEN you heat with a Superfex Heat-Director, you have clean, convenient oil heating without a furnace. This flexible heat can be increased or decreased at will, by a slight turn of the control dial. Heat rays may be *directed* to warm floor or other surface by opening at any desired angle the patented adjustable shutters on one, two or three sides of the Heat-Director. With shutters all closed, you have a circulating heater.

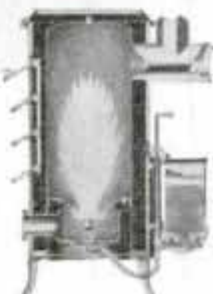


Diagram shows burner, patented shutters and removable fuel tank

Heat-Director's vaporizing burner uses inexpensive No. 1 fuel oil, distillate or kerosene. The removable fuel tank holds a supply for as many as 42 hours.

Heat-Director is set up like a stove and connected with a flue. Draft regulation is automatic.

Heat-Directors are finished in porcelain enamel in burlled walnut design. There are three sizes, also radiating models. See them at your dealer's today.

For one-room chilly spots, see the smart modern designs in portable Perfection Room Heaters.

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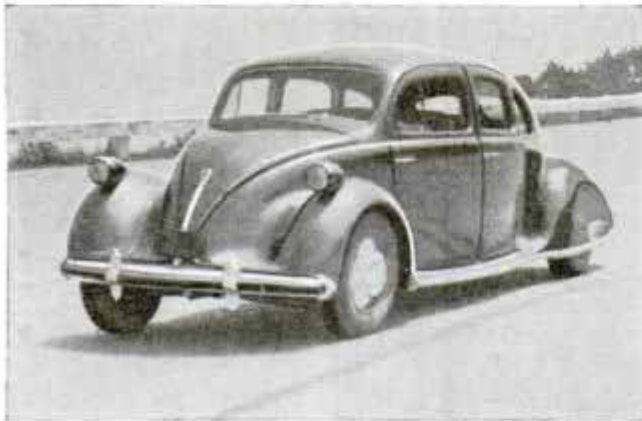
When writing please mention Popular Mechanics

The 1936 Cars

(Continued from page 805)

engines with more horsepower, more economy and more lasting qualities is very promising. In the offing is the rotary-valve engine, capable of turning over at a much faster rate than the poppet-valve motor now in use. One rotary-valve engine now is undergoing severe tests, preliminary to introduction as standard equipment.

A peek at the car of the future is afforded the public in the experimental automo-



Briggs Experimental Car Taking the Curve on One of Its Test Runs

bile constructed under the direction of John Tjaarda at the Briggs Manufacturing company. Its pleasing streamline body already has been on exhibition and approved generally by observers. Now its rear engine, an eighty-four horsepower V-8 with a speed of better than 100 miles per hour, its independent suspension of all four wheels, its unit motor-and-transmission that can be removed quickly for repairs and numerous other features are being tested. That the rear engine is probably the next step in motor-car development is conceded by many engineers.

Lubrication of the internal engine is coming in for more attention. Some models have oil temperature regulators, such as the Buick, with its water channels running through the valve-in-head rocker arm shaft to cool or warm oil intended to lubricate valve mechanism.

Frame design for 1936 is substantially the same. Chevrolet, on the standard model, presents a box-girder construction that has only three supporting cross members. It is said to be exceptionally strong and to resist twist.

"Knee action" seems to have held its

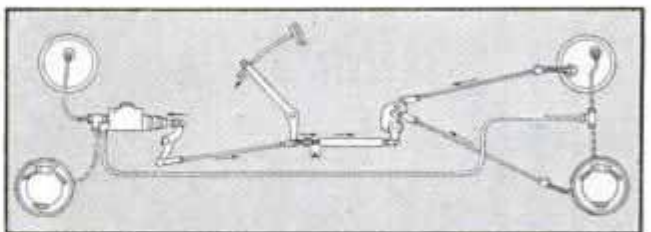
own this year. Cord has front-wheel suspension with transverse springing, while the Hudson is using a novel arrangement that appears to be a combination of the knee action principle and the conventional leaf springing.

There is a trend to bigger batteries, one car in the higher-price range boasting a twenty-one plate battery that requires attention only three times a year. The small cars are equipped in many cases with fifteen-plate batteries with high amperage in order to meet the increased need for electricity imposed by hot-water heaters, radios and similar equipment.

Tires are headed apparently for the "doughnut" state of development. Sections are getting wider, pressures lower and circumference smaller in many instances. Cars which used a 6.50 tire last year have adopted the 7.00 for 1936 and the 7.50 is used on at least one model. A 9.00 tire is recommended as the best size in the "doughnut" class.

Automatic controls are increasing in number, with spark, choke, starting, battery charging and other operations controlled without attention from the driver.

This idea of relieving the driver of all care is growing rapidly and the car of the future may boast such features as lifetime lubrication of springs, wheel and steering bearings and chassis; battery needing attention once a year; high-compression en-



Sketch Showing Hookup between Hydraulic and Mechanical Brakes on the Hudson

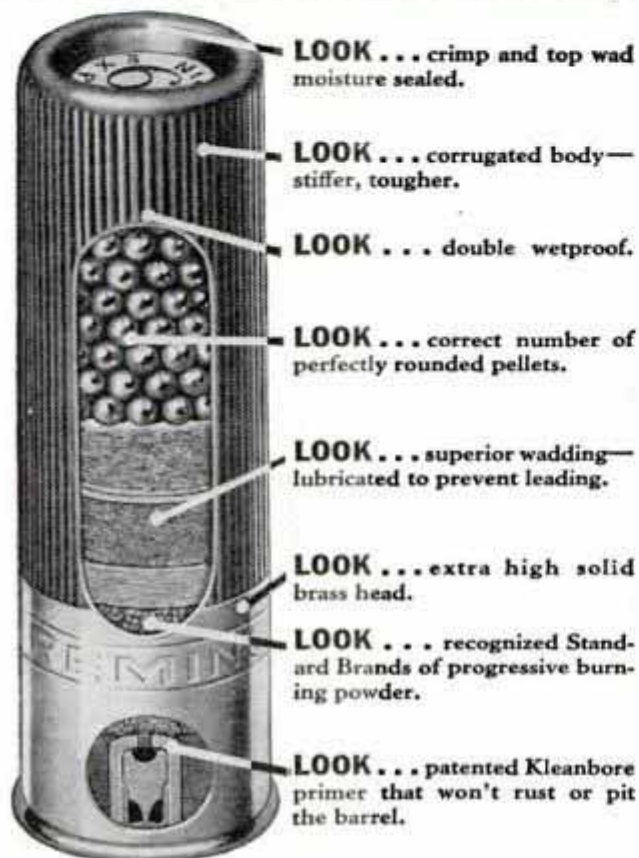
gine requiring oil twice a year and a carbon-removing job every 50,000 miles; a finish that resists all chemicals, rust and dirt and can be cleaned with only a dry cloth; puncture-proof tires carrying only eight to ten pounds of air pressure and good for 50,000 miles—

A car like this may not be introduced immediately, but the industry is moving in that direction.

No further data. 8/11/36

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IT'S no accident that Nitro Express Shot Shells bag more game. They're built to give a *balanced pattern*—a uniform spread that holds true for 40, 50, 60 yards or more.

Equally important to water-fowl shooters is the downright reliability of Nitro Express Shells under all shooting conditions. In tests they've been soaked in tubs of water, frozen and kept in ice for days—yet they came through with their full long-range smash when the firing pin hit their non-corrosive Kleanbore primers.

SHOOT NITRO EXPRESS SHELLS this season. See if they don't pattern better than anything you've ever fed your gun. *Remington Ammunition Division, Remington Arms Company, Inc., 1777 Seaview Avenue, Bridgeport, Connecticut.*

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Snapshot of Vernon Palmer, Caribou, Maine

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I don't have to worry, because I always change to Quaker State Winter Oil before the first cold snap. Even though the car has been out-of-doors all night, and I find it in the morning covered with snow—it starts without any trouble. I give the credit to Quaker State. Here's why:

I've put 52,298 miles on this car, using Quaker State, and I've never paid out one penny for motor repairs. Can I ask for any better performance? I should say not!

Very truly yours,

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OSCILLIGHT TELEVISION RECEIVER

(Continued from page 901)

ceivers." All special parts will be available to experimenters in the near future at reasonable prices. The Farnsworth oscillight television receiver, shown in the photos, employs a cathode-ray tube with a screen 9 in. in diameter giving a black-and-white image 5 by 6 in. Six additional standard tubes are used in this scanning unit. The tubes, from left to right, operate as follows: the first three scan the picture vertically; the fourth is a synchronizer; the fifth a picture-frequency amplifier and the sixth tube, beyond the base of the cathode-ray tube, controls horizontal scanning.

A sectional view of the "oscillight" tube is given in Fig. 1; the electron gun sends a beam of high-velocity electrons down the axis of the tube and this beam is focused by means of a magnetic field on a fluorescent screen, where it produces a bright spot of light. A special electrode connected with the input signals controls the intensity of the beam and the brightness of the spot on the screen. The magnetic deflection coils give the beam a horizontal and vertical motion which "paints" the image on the screen. The tuning shaft of the picture signal receiver is coupled directly to that of the sound receiver as shown in Fig. 2; final assembly may be made in a console cabinet.

A.C.-D.C. CODE-PRACTICE SET

(Continued from page 905)

not work reverse one of the connections on the audio transformer, change either the primary or the secondary but not both. Use a pair of high-impedance headphones; the pitch of the signal will depend on the transformer used and the adjustment of the variable resistor.

A copy of the continental code is given; further code characters and abbreviations will be found in any radio textbook. When learning code, think of the letters in the terms of sound rather than dots and dashes. For example, instead of thinking of the letter A as "dot-dash," memorize the sound as "dit-dah" and so on. Two persons learning the code can take turns sending and receiving. It is a good idea to have an experienced operator demonstrate the sound of well-sent characters.

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No. 1 Style for 1933 Fords. No. 2 for all other cars. For comfortable driving in rain or cold. \$2.00 per set. Easily installed. Cash or C. O. D.

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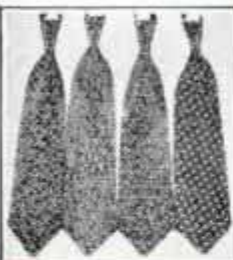
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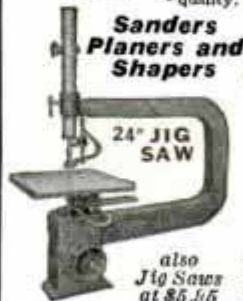
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WONDERS OF HIGH FREQUENCY

(Continued from page 863)

and the energy that comes through the air to your radio receiver.

Man started his study of electromagnetic energy by developing direct current and since then he has created many uses for isolated portions of the energy spectrum. Alternating current gave us heat, light, power, and communication conducted along wires. Different frequencies can be sent along the same wire at the same time, the result being multichannel telephone circuits and even low-power telephone communication over high-tension power lines that carry 220,000 volts at the same time. The next highest frequency energy waves provided the radio telegraph and with still higher frequency it became possible to speak through the air. Bands of even shorter waves brought television, the beam radio, and electrotherapy.

At the California Institute of Technology, Prof. G. W. Potapenko is coming close to closing the gap between radio waves and heat waves. A few years ago twenty-meter waves were considered extremely short and now Prof. Potapenko has created an oscillator that generates waves of from two meters to as little as three centimeters in length. Not even Potapenko will predict what uses may be found for these ultra-high frequencies. His oscillator consists of two oscillatory circuits tuned so that the radiated output is a harmonic of the wave length of each circuit. If energy of ten centimeters in length is desired, one circuit is tuned to 100 centimeters and the other to ninety centimeters, the difference of ten centimeters being the length of the waves created.

With these "micro" waves Potapenko is studying the properties of different kinds of matter and is seeking new uses for iron, nickel and cobalt in the electrical industry. He is also investigating the selective absorption of ultra-short waves in various materials.

Somewhere in this ultra-short band is thought to be the mystery ray by means of which the army is able to locate ships maneuvering along the coast after dark and in fog. Most radio detection devices operate on the principle of receiving back waves that are reflected from the surface of the target, and this may lead to inves-

(Continued to page 150A)



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WONDERS OF HIGH FREQUENCY

(Continued from page 149A)

Calculations as to whether or not a ship could conceal its presence by applying an absorptive paint to absorb the ultra-short waves instead of reflecting them back. Black paint, for example, absorbs a great deal of heat and light waves, while white paint is a good reflector of both, and the ultra-short radio waves have many of the characteristics of heat and light rays.

The medium-short radio waves permit nearly perfect transmission at only fractions of the amounts of power now used by broadcasting stations, and in addition give static-free reception. Amateur radio experimenters who used to jam five kilowatts of power into the air at 200 meters to "work" a station a few hundred miles away are now talking casually across the country on twenty-meter wave lengths on much smaller amounts of power, and voices from across the ocean sound as if they were in the next room.

Being of such short wave length that they have some of the properties of light, ultra-high frequency radio waves can be focused like searchlight beams to travel in only one direction and may be reflected from smooth surfaces just like light. A parabola-shaped reflector behind the transmitting aerial, or a series of phased half-wave antennas, gather the waves and throw them in a straight beam toward the receiving set where they are gathered from the air by a similar reflector. For this point-to-point communication the receiving station cannot be hidden by mountains or be below the horizon.

One radiotelephone circuit between France and England operates on an eighteen-centimeter wave length and consumes only one one-hundredth of the power used by an ordinary light globe, as compared to powerful stations in the broadcast band that use from five to fifty million times that power. The surprising economy is due partly to the fact that the short waves are more efficient and partly because nearly all the radiated energy can be thrown in one direction, eliminating losses into empty space. One possibility of the efficiency of the higher frequencies is the "stepping up" of the frequency of domestic current for lighting purposes, using neon-type globes to provide satis-

(Continued to page 152A)



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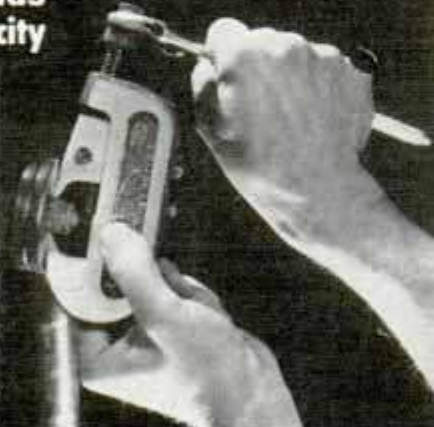
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WONDERS OF HIGH FREQUENCY

(Continued from page 150A)

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By means of high-frequency radio, aviation is solving the problem of blind landings. Ships have been able to guide themselves into fog-shrouded harbors. Collisions at sea may be reduced by means of short-radius short-wave transmitters on ships that broadcast in all directions through the fog. One possibility that is already practical is that of providing short-wave transmitters for automobiles so motorists can call the nearest telephone exchange and be connected over ordinary telephone wires with home or office. Amateurs have already done this as a stunt.

The high-frequency waves, vibrating at millions of times per second, raise body temperatures and stimulate circulation. Heat has always been a valuable aid to medicine and in adapting high-frequency radio to their needs physicians found that with the "fever machines" they could obtain deeper, more uniform heats than before, as well as a specific electrical effect that seems to be lacking in applications of external heat. The "radio knife," an offshoot of electrotherapy, enables surgeons to make deep cuts that heal rapidly.

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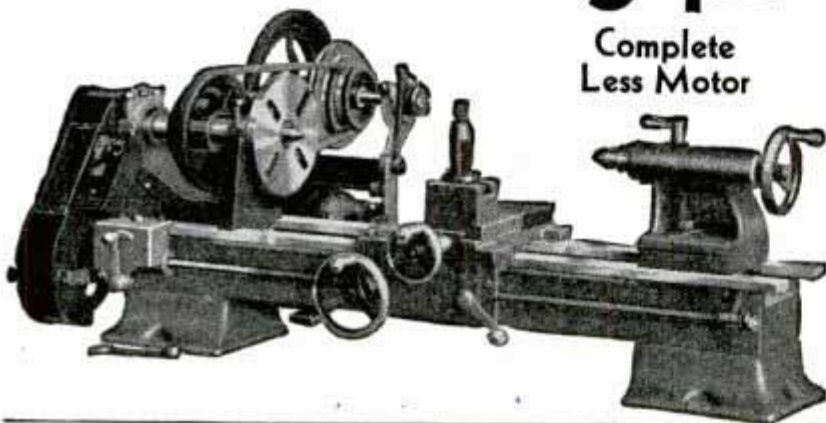
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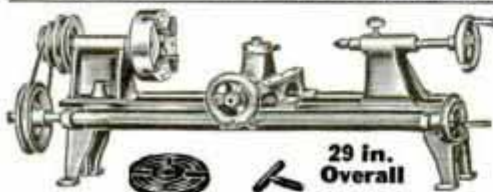
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THE SECRETS OF A SMOOTH RIDE

(Continued from page 879)

even new ones. Engineer Phillips says many cases of high-speed shimmy, really a dangerous condition, are caused by warped rims or bulging tires, while a crooked wheel sometimes causes shimmy, hard steering or spotty tire wear. On knee-action cars shimmy appears more often when tires are inflated to too high a pressure because harder tires increase the tendency of the wheel to hop. But on axle cars, shimmy is more likely to occur when tires are soft.

This is one condition the driver can remedy. Keeping tires properly inflated is important because it decreases tire wear, makes steering easier and gives a smoother ride under average conditions.

Important as is inflation, some motorists overdo it on a long trip. You may have noticed the car began to ride roughly after a couple of hundred miles, usually on a hot day. When the passengers complained, you found the tire pressure had gone up, so you let out some air. Engineers warn against this practice of "bleeding" the tire. They are thinking of the life of the tire and the safety of the passengers, rather than the smoothness of the ride. Here is the explanation:

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When the driver lets air out of his tires to get more comfort, he increases the amount of heat generated in the tire and before long the pressure may climb again to the uncomfortable zone. So long as the driver does not permit his tires to drop below the proper pressure, he need have no worry about inflation.

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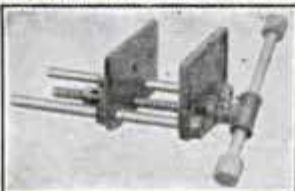
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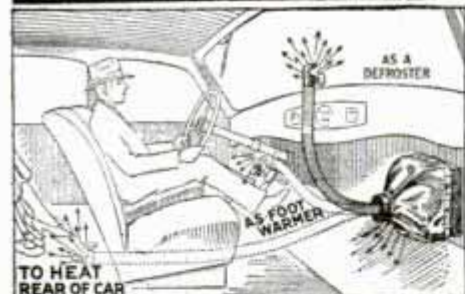
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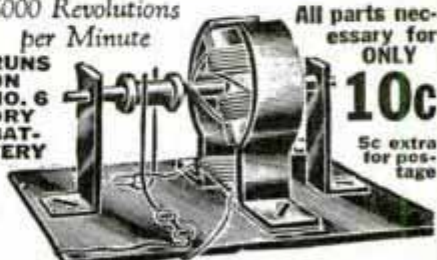
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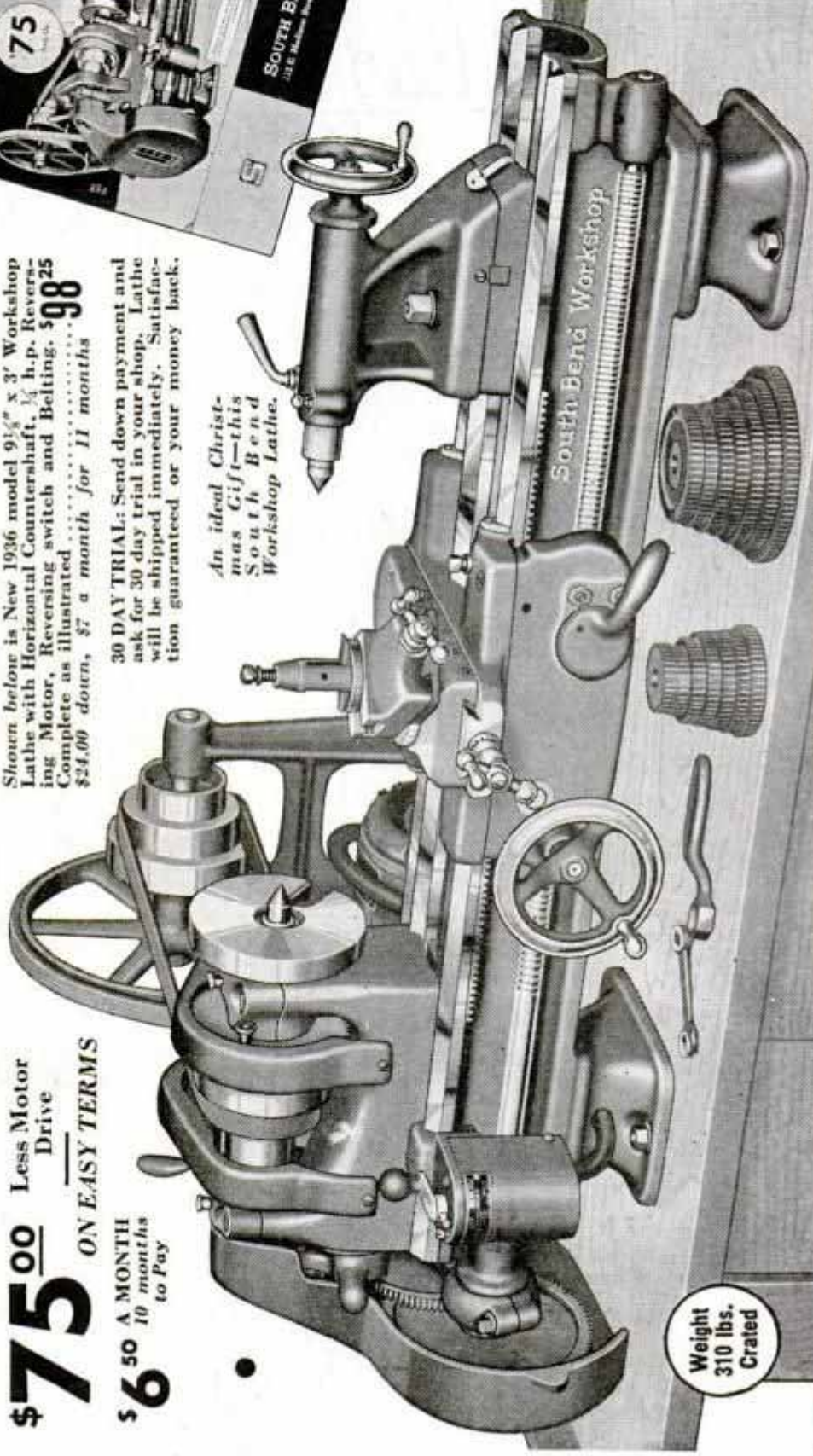
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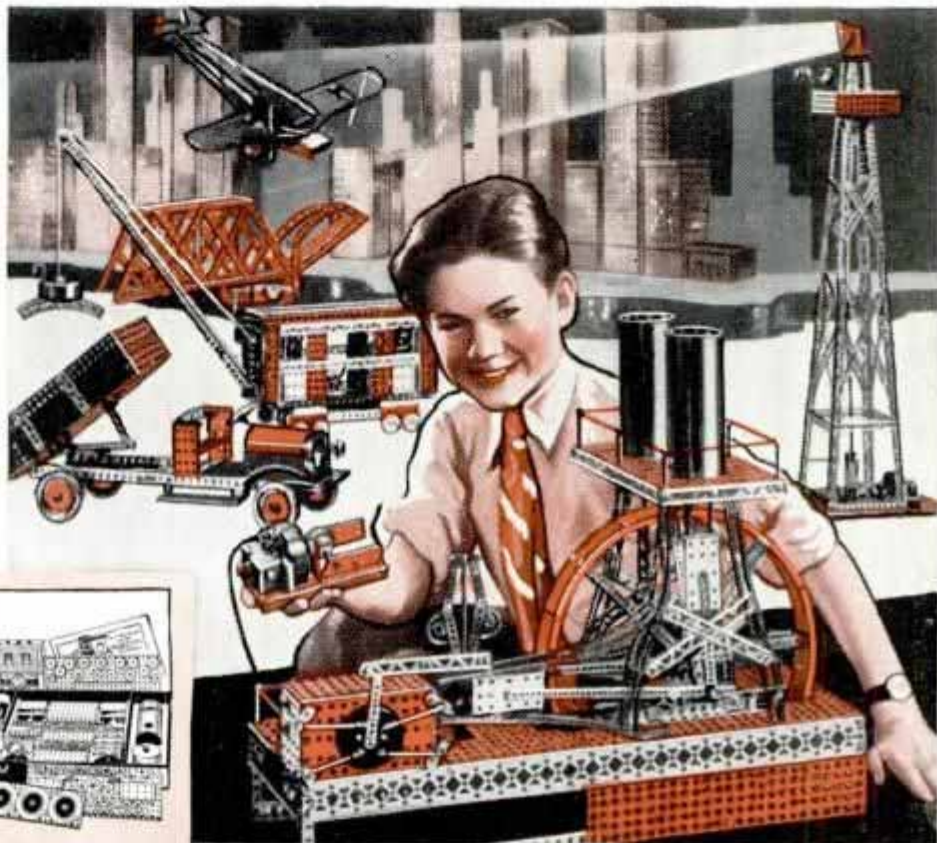
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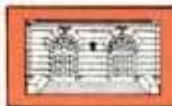
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