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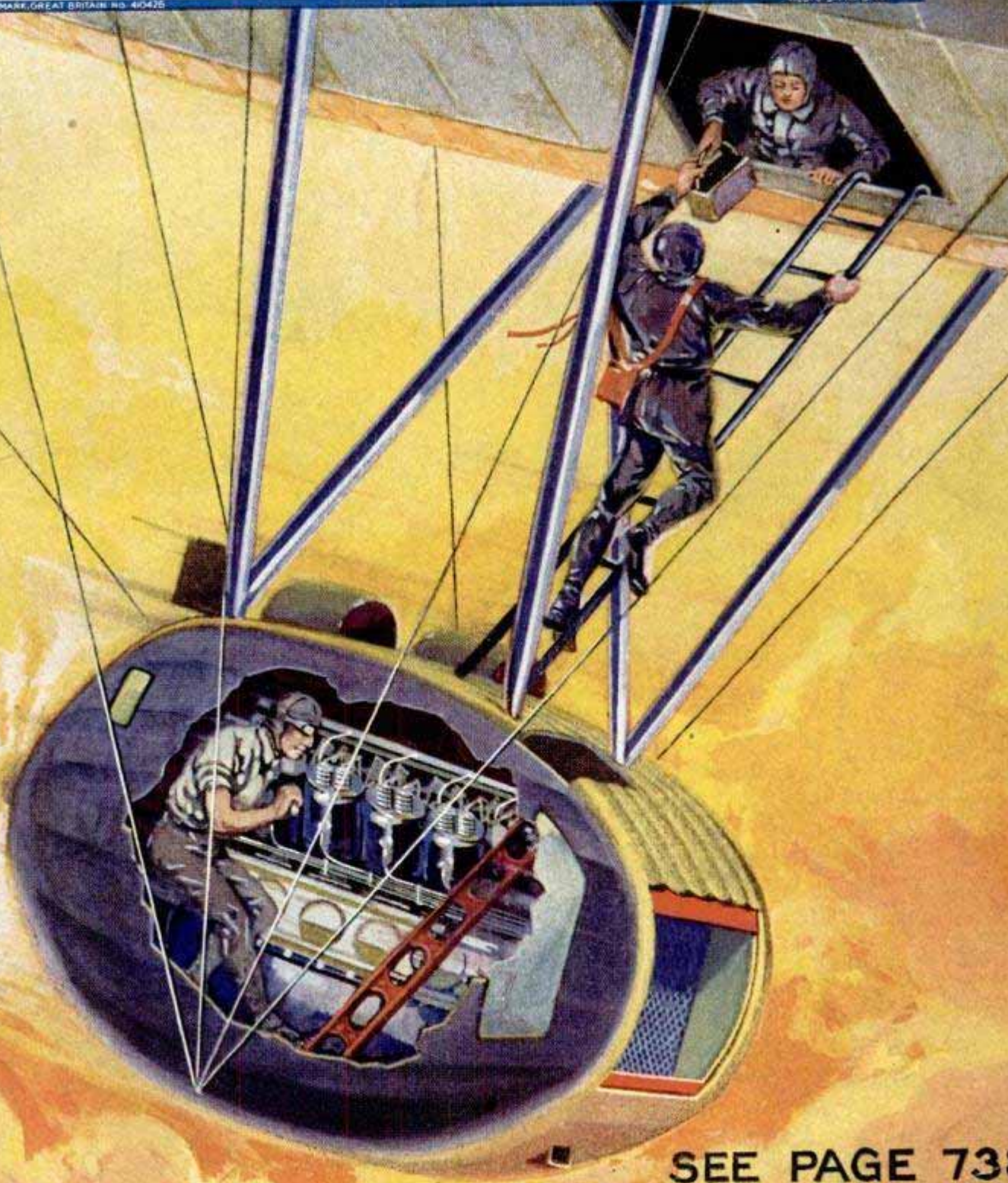
POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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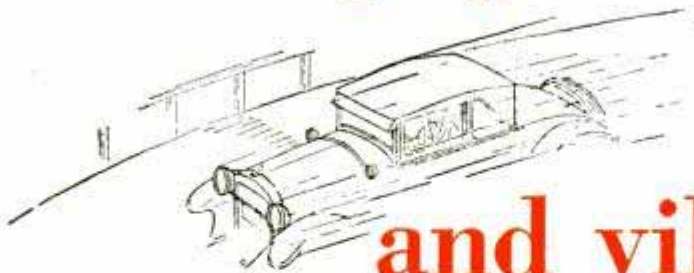
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WINDYACH

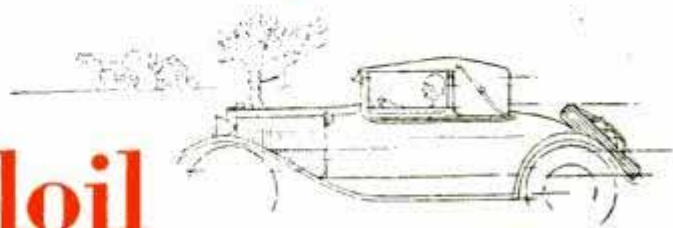
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all types of machinery

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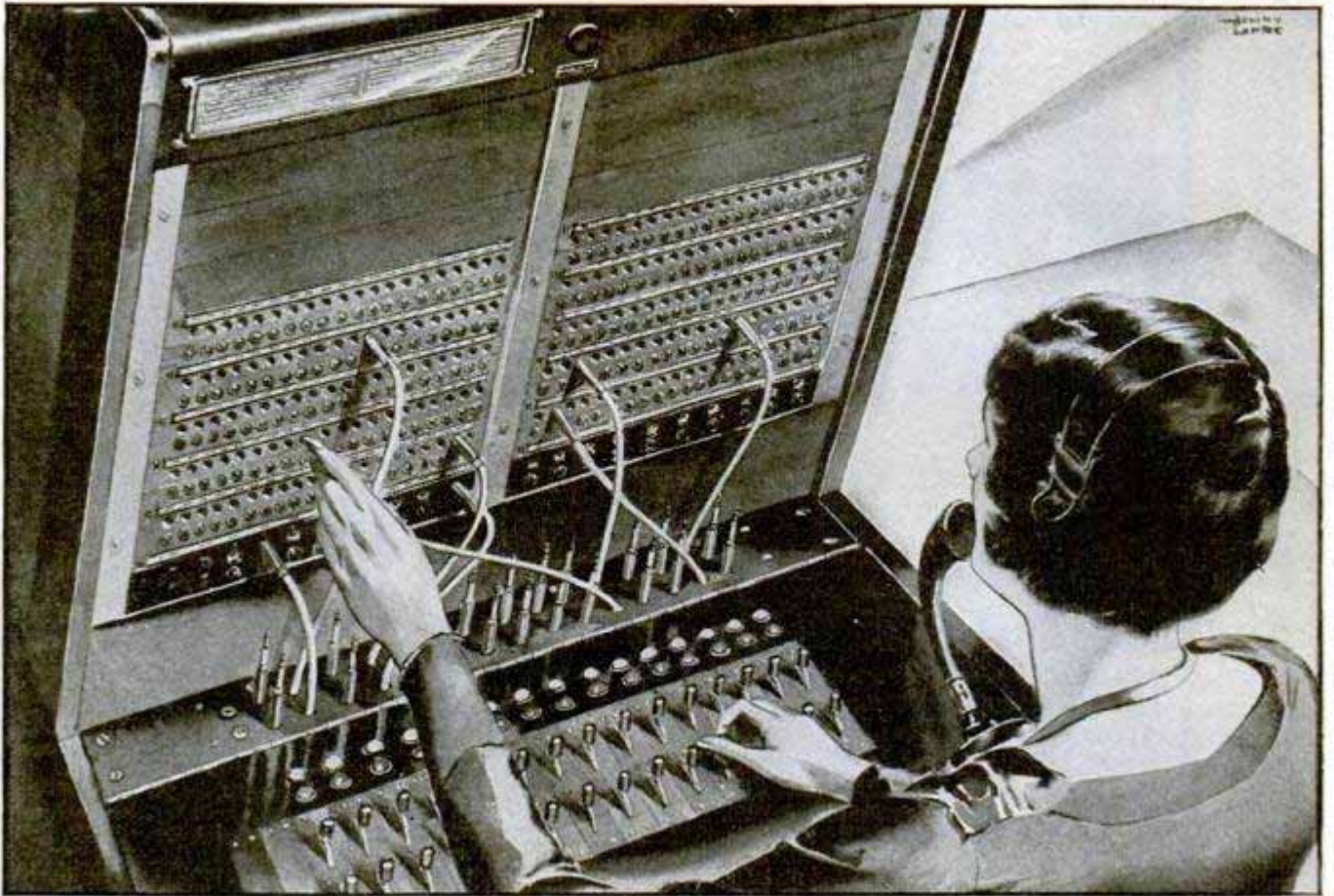
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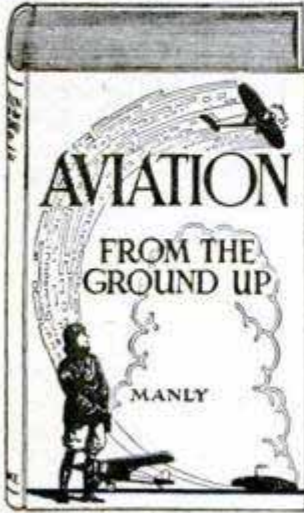
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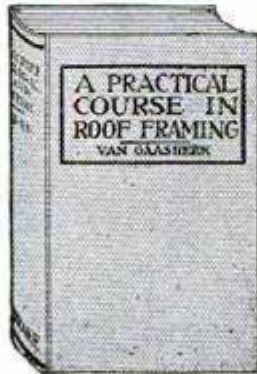
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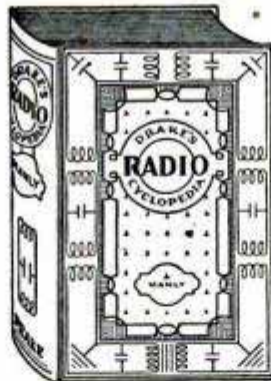
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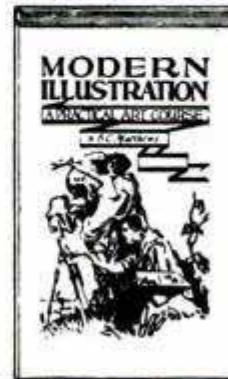
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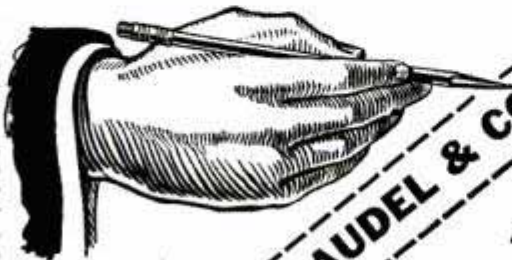


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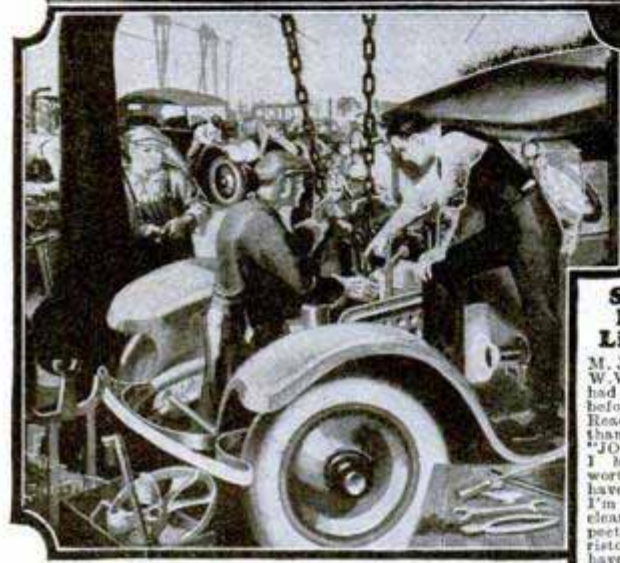
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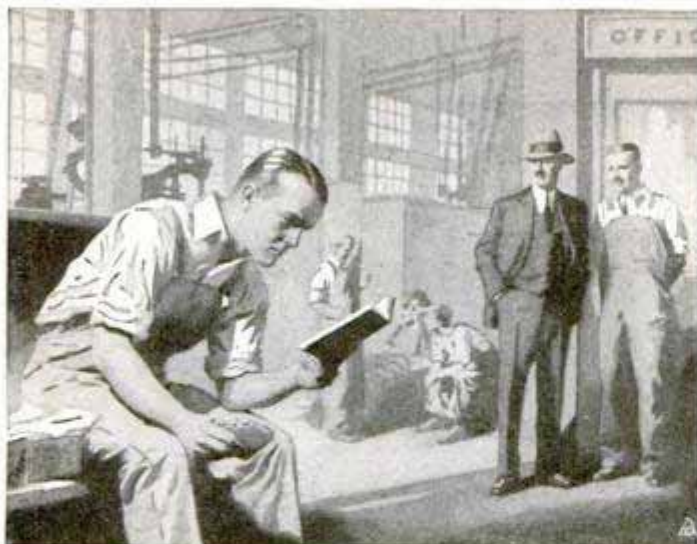


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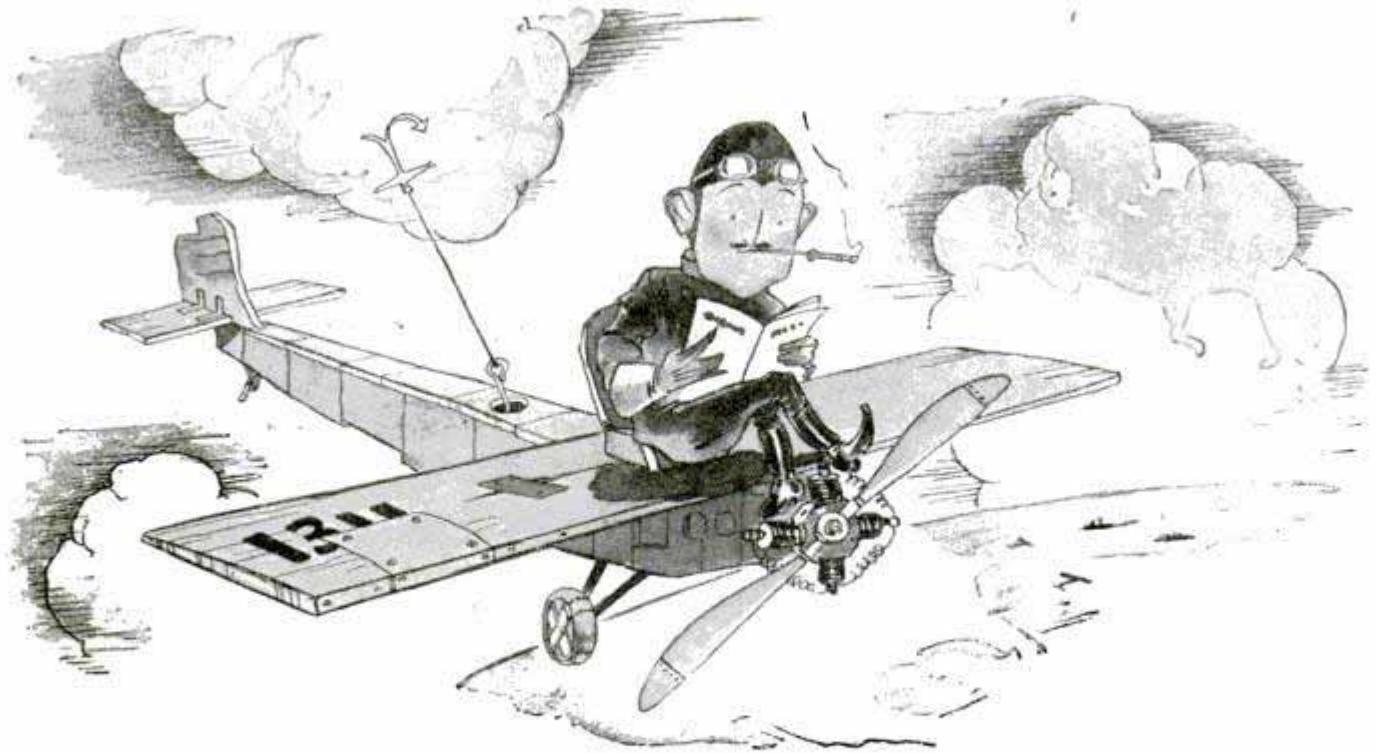
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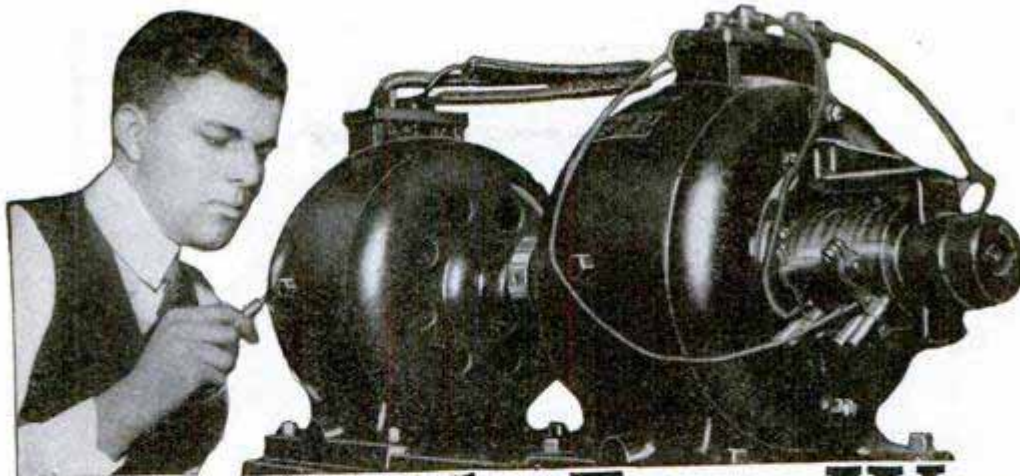
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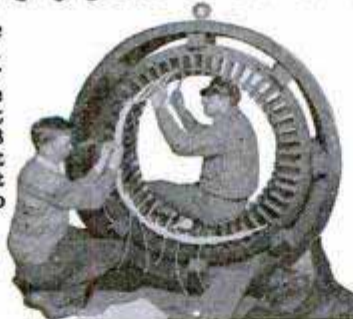
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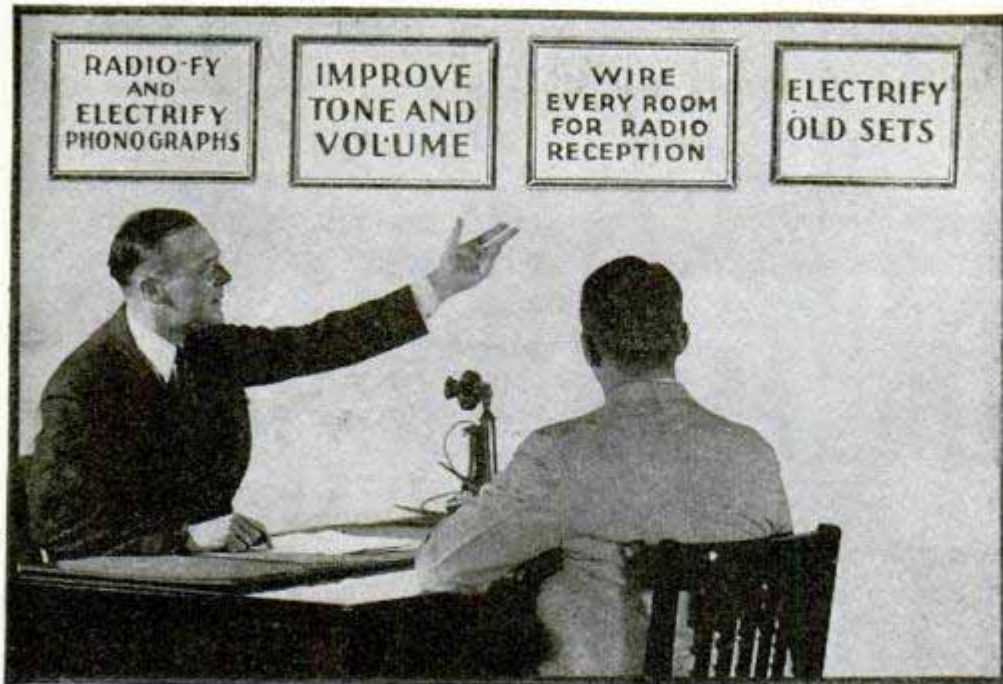
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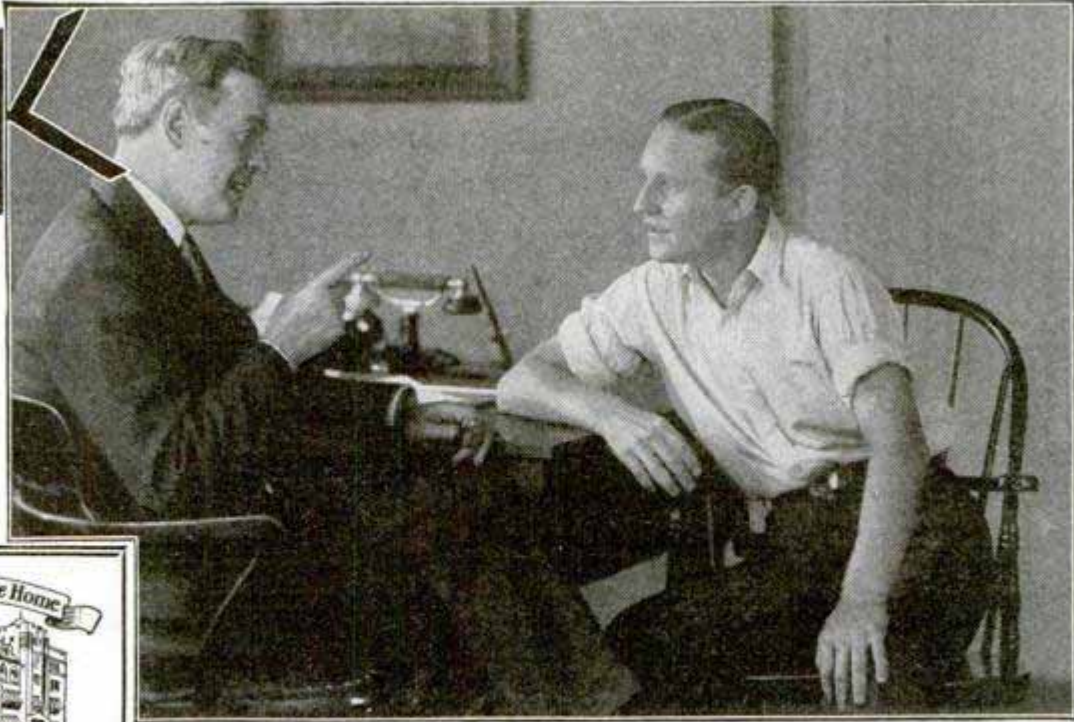
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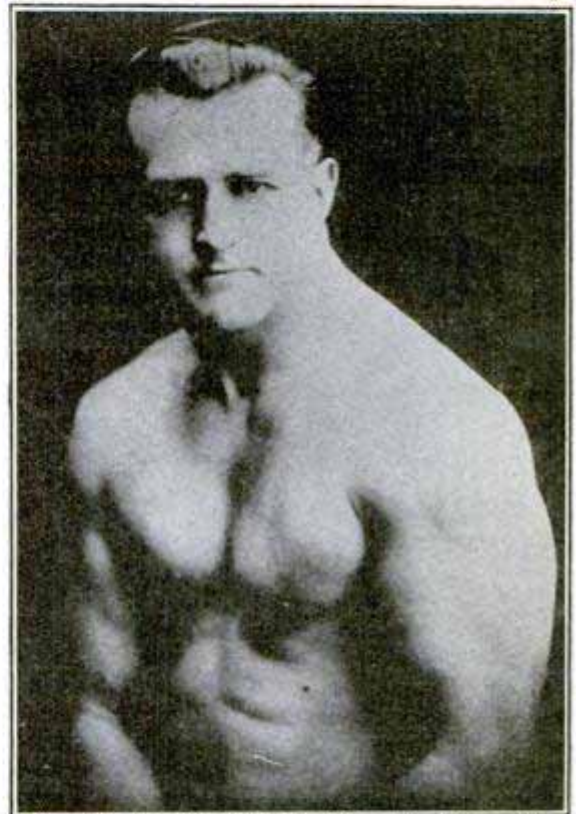
In the first 30 days I guarantee to add one whole inch of real, live muscle on each of your arms, and two whole inches of the same revitalizing strength across your chest. I'll take the kinks out of your back, strengthen and broaden your shoulders, give you a wrist of steel, and a fighting, peppy personality that just yells youth, vigor and vitality all over.

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You'll See It in Her Eyes

And will your friends notice the difference! Just watch that girl you love so dearly open her eyes, and *fight* to hold your attention! And the men in your crowd—they'll look up to you as a real leader. Instinctively they worship strength and leadership that must go with it. But let me tell you all about it. All you have to do is



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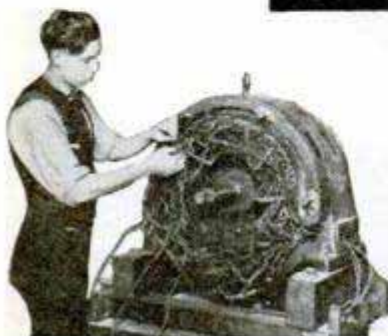
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A MARVELOUS little free book is bringing vital news to thousands of men today and making momentous changes in their lives. Just sixty-four pages—about seven ounces of paper and printers' ink; but there are thousands of men holding down big-pay jobs all over the United States and Canada with earnings running up to \$10,000 a year, and even bigger, who started by reading this great book.

Take, for instance, Frank J. Walsh of Ludlow, Massachusetts. Just a few years ago, Walsh was struggling along on \$1,000 a year. In just one evening, reading this little free volume, he made the change in his life that raised his pay over 600%.

About the same time that Walsh was getting his start two other men—C. V. Champion of Danville, Illinois, and R. B. Hansen of Akron, Ohio—were reading it too. Both were factory hands at the time—but today both of them are presidents of prosperous and growing companies with incomes over \$10,000 a year! Just lately a California cowboy named William Shore spent an evening reading this book, in a ranchhouse. It wasn't many months later that he told us of one week when he made \$525 clear, as a salesman.

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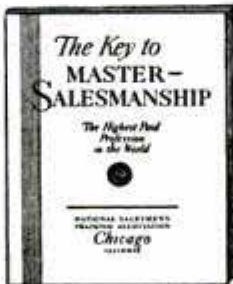
in your home, the secrets which great salesmen have spent years on the road to learn.

You can't keep a good man down—not if he really is a good man and will take advantage of his opportunities to rise in life. This book, "The Key to Master Salesmanship" brings ambitious men the chance they've all been looking for—the chance to get away from dull routine timeclock jobs at low pay. It shows them the way to a free employment service which gives N. S. T. A. members the pick of 50,000 high-pay jobs every year.

Right now this book, "The Key to Master Salesmanship," which showed these men how to get started on the road to success and independence, will be mailed as a gift to any ambitious man—absolutely free and without obligation. Why not see for yourself what amazing pay-raising secrets it contains? There is no better way to invest a two cent stamp! Simply fill out and mail the coupon to us today.

NATIONAL SALESMEN'S TRAINING ASSOCIATION

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—I asked Basil Glaze, of Germantown, Md. He answered "Yes!" and a few months later wrote me: "Though I started with no knowledge of music, your Course certainly taught me quickly. My playing has opened the doors to a new world of fun for me."

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More Invitations - Good Times?

DO YOU want more real pals to fill your spare hours with enjoyment? Do you? Then I'll show you how to make them—more than you've ever dreamed of having. How? Easy! By teaching you to play an instrument that everyone loves—the Hawaiian Guitar! Even if you think you have no "talent"—don't worry. You don't need any talent or previous experience whatsoever, to learn at home by this simple method!

—I asked Pauline Hamrick, of Matthews, N. C. She, too, answered "Yes!" and soon wrote: "The very day I received my Guitar and first Lessons I began to have fun. Now my lonesome days are over. I make new friends almost every day—everywhere I go, with my playing."

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—I asked Ralph Prutzman of Lehighton, Pa. He also said "YES"—and I showed him the quickest, easiest way to make it. Now he writes: "I'm getting along fine. The Lessons are easy and interesting. Made \$16 the very first night I played professionally and I'm not even through the Course yet! I see lots of good money-making opportunities ahead and I'm making more friends and having a better time than ever before."

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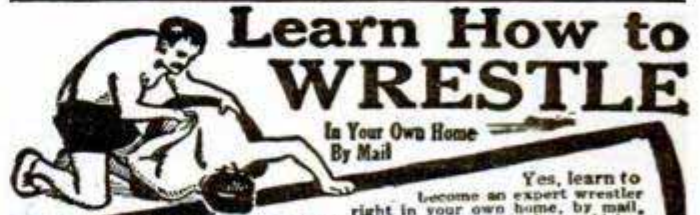
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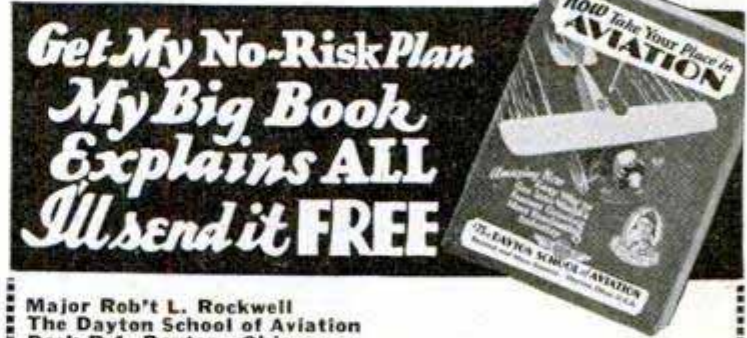
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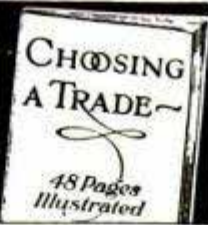
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"Show them you can do it! Show them you can dance as well as they!" my pride whispered. And I would!

But halfway across the hall my courage died. I was nearly paralyzed with fright. There she was, waiting expectantly—Marion Blake, an exquisite dancer—graceful, poised, at ease. Suppose she should refuse? Suppose she should leave me in the center of the floor? Oh, wouldn't the fellows chuckle then!

The Unexpected Happens

"I'm—I'm sorry"—I stammered. "I guess——"

"Why, of course, I'll be glad to dance!" she interrupted. And before I realized it we were swallowed up in the dancing throng.

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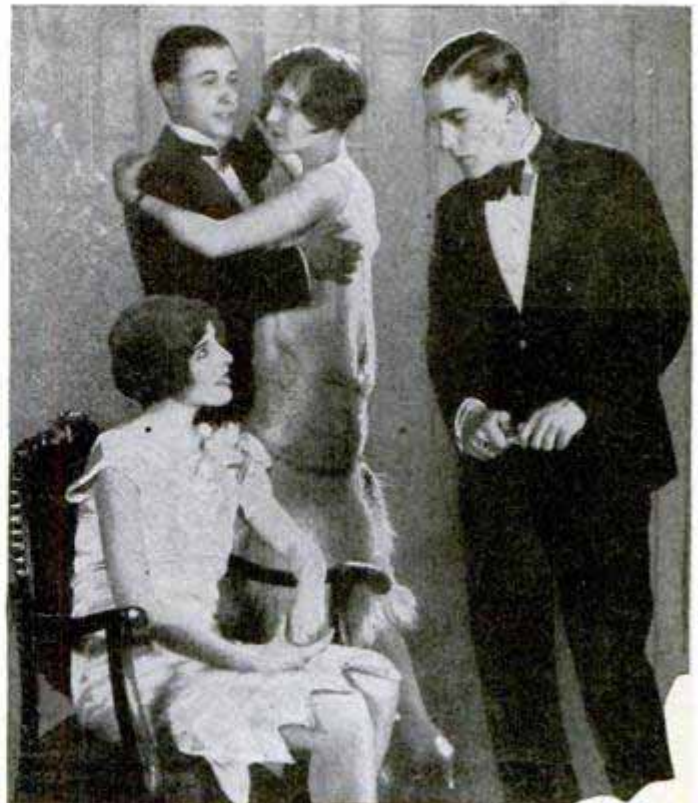
Suddenly she suggested that we sit out the rest of the number. I blushed furiously "Now, it's coming!" I thought. "Now, she is going to tell me what she thinks of my nerve!"

But I was in for the surprise of my life. "Jim," she began softly. "I'll be frank. You're not the best dancer in the world. But you're certainly not the worst. What you need is 'brushing up' on the latest steps. Why don't you get in touch with Arthur Murray?"

"Arthur Murray! Arthur Murray!" I repeated. "He teaches dancing by mail. You can't learn that way!"

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Naturally I was astounded, but the next evening I found one of Arthur Murray's ads and mailed the coupon. If Marion could become a wonderful dancer that way it was certainly worth investigation—especially since I didn't risk a penny.



I was nearly paralyzed with fright. Suppose she should refuse? Suppose she should leave me in the center of the floor?

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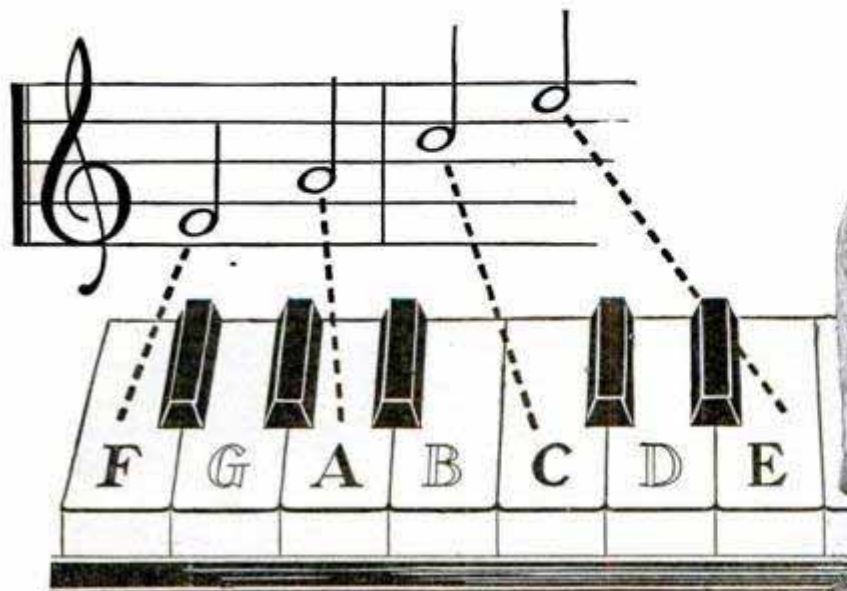
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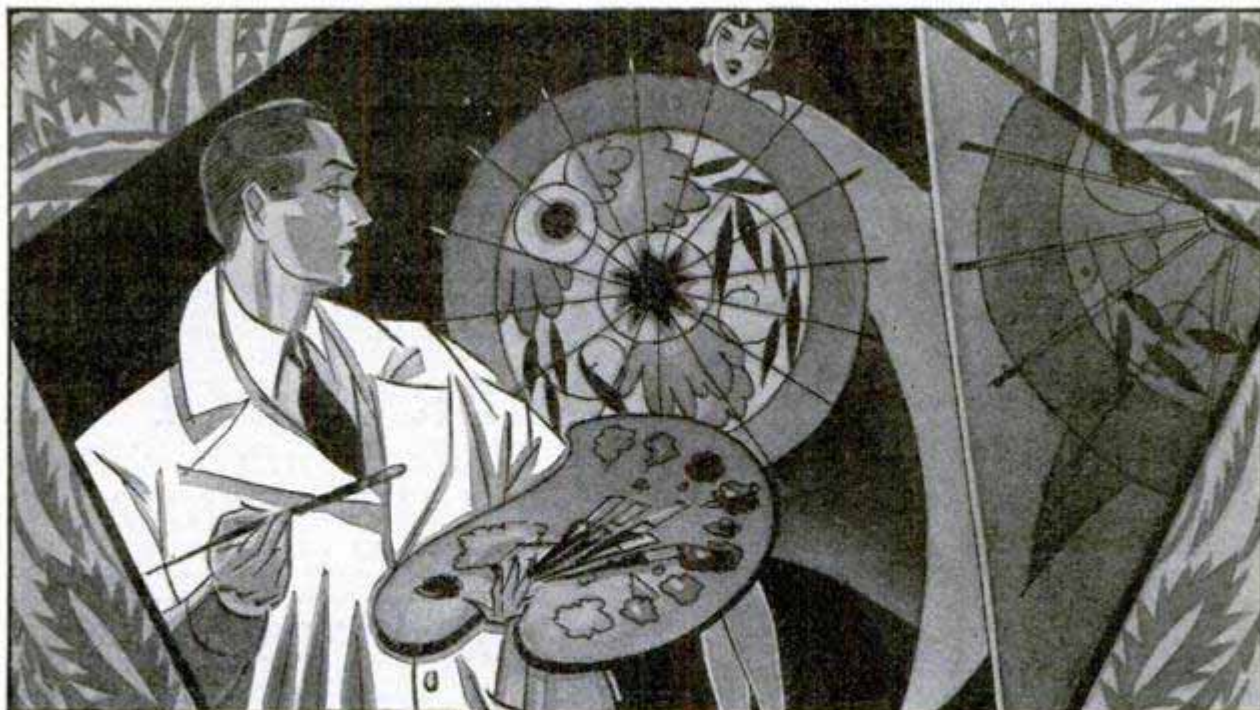
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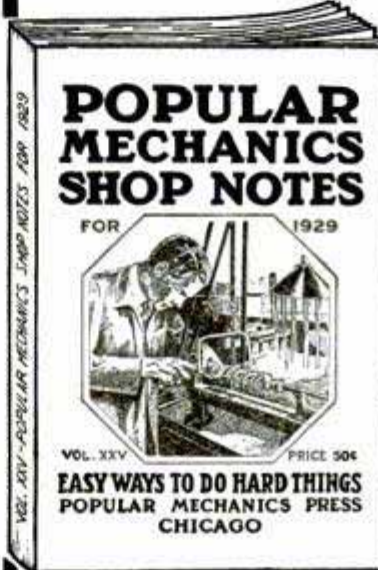
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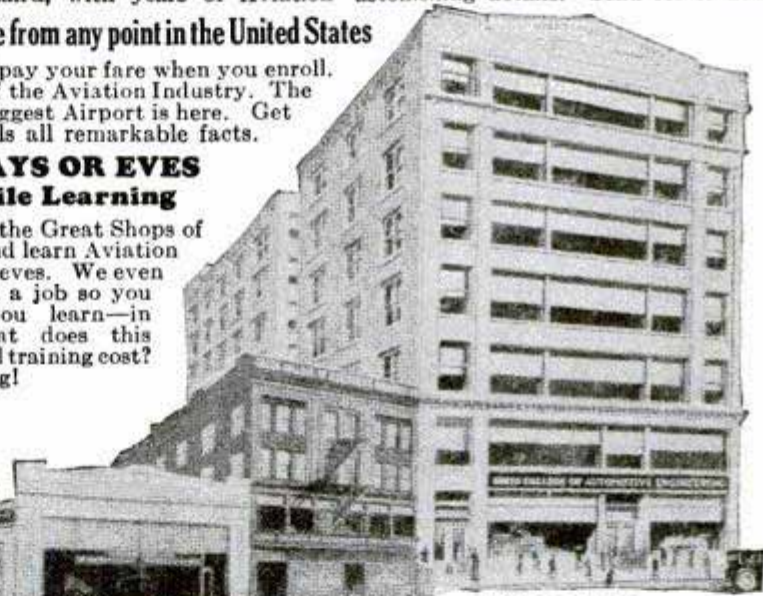
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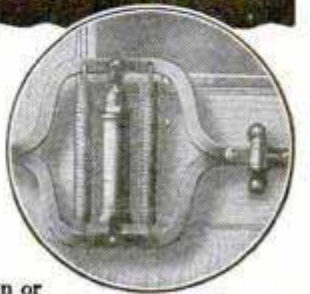
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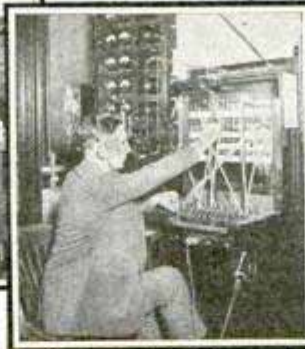
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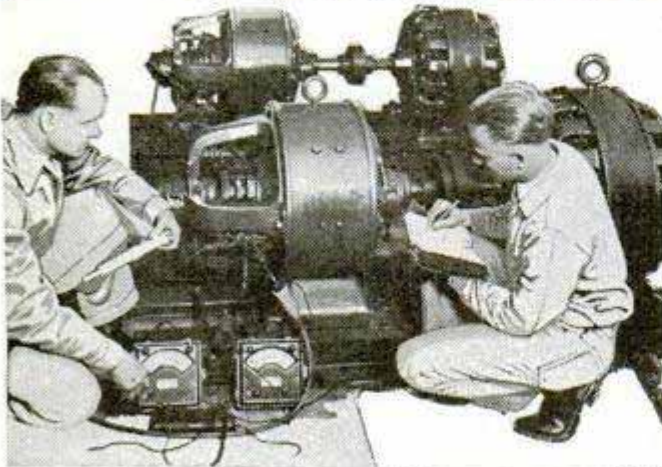
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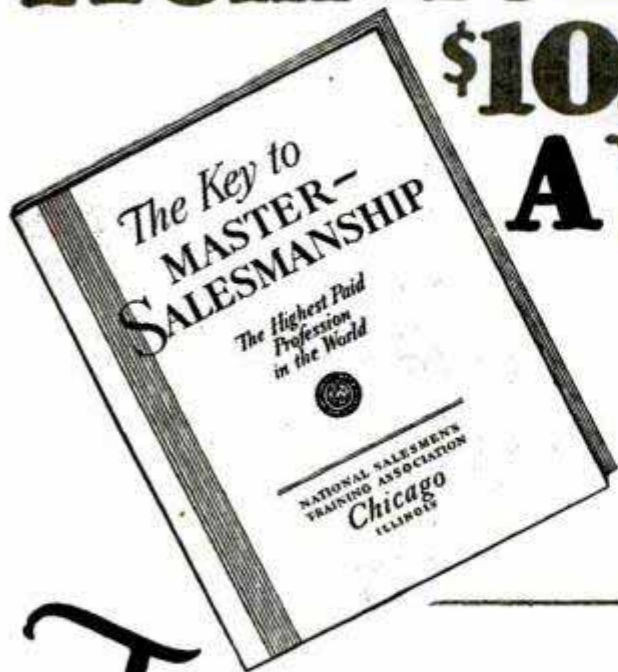
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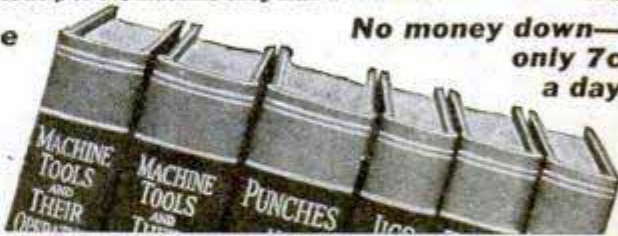
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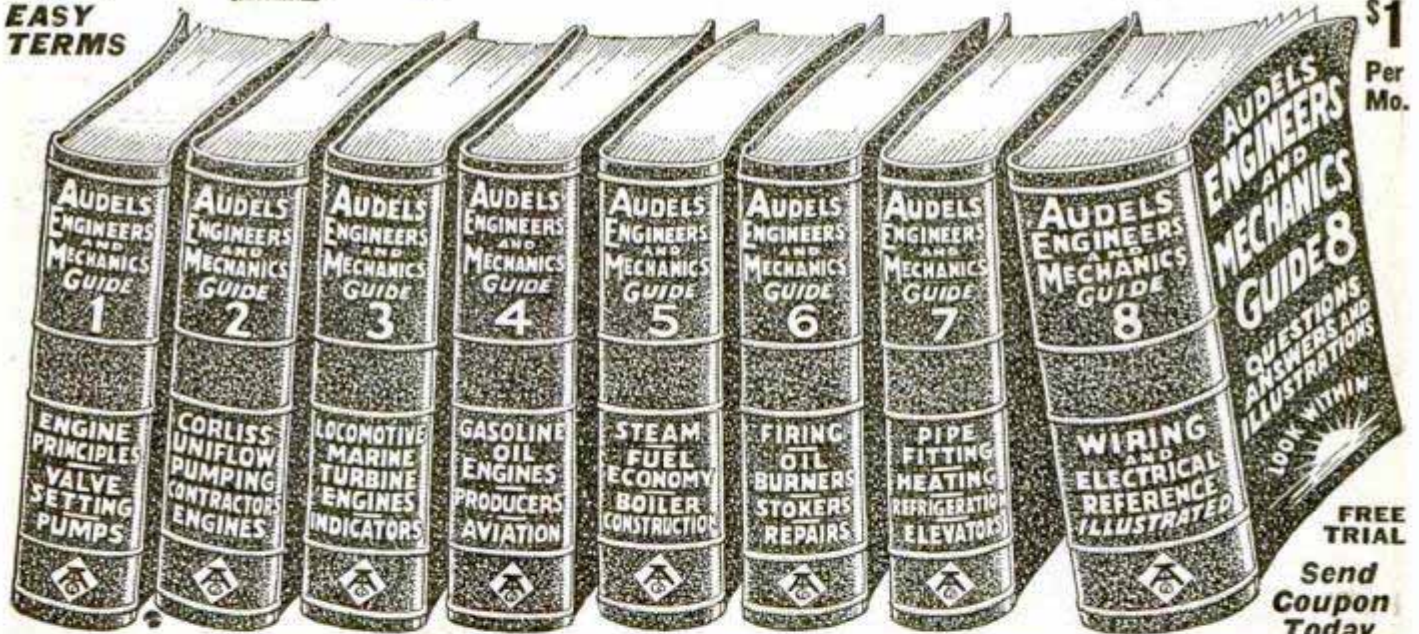


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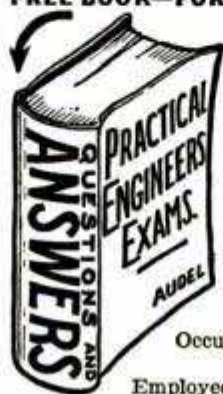
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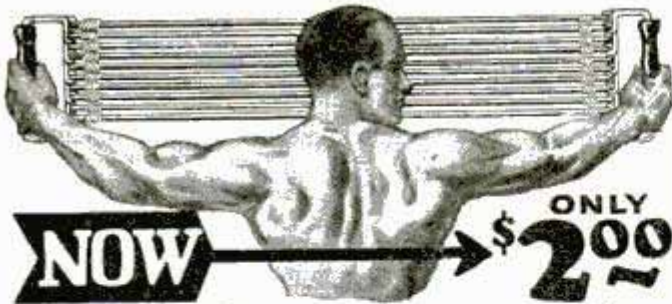
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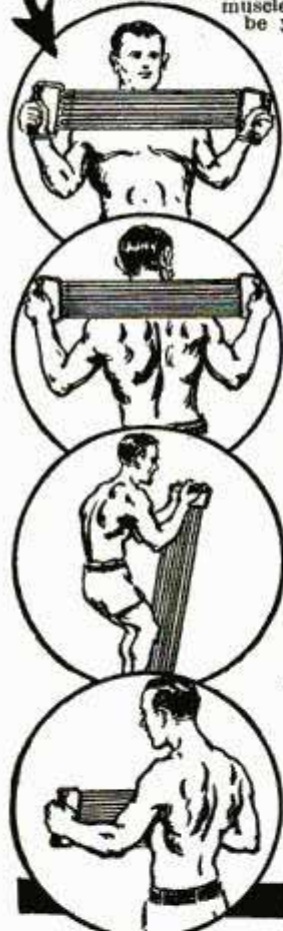
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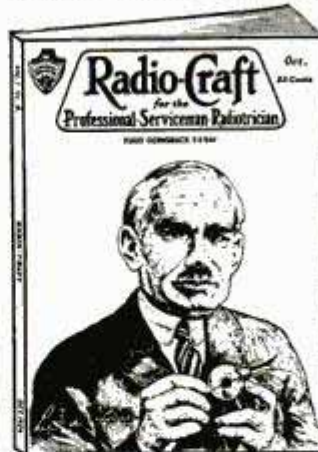
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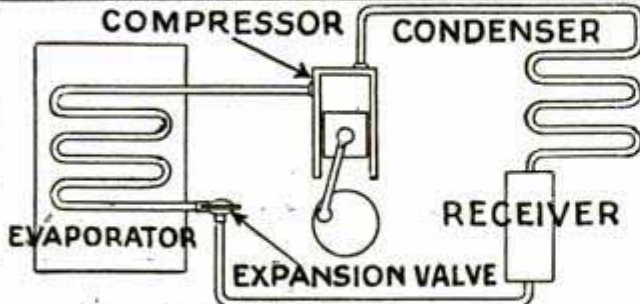
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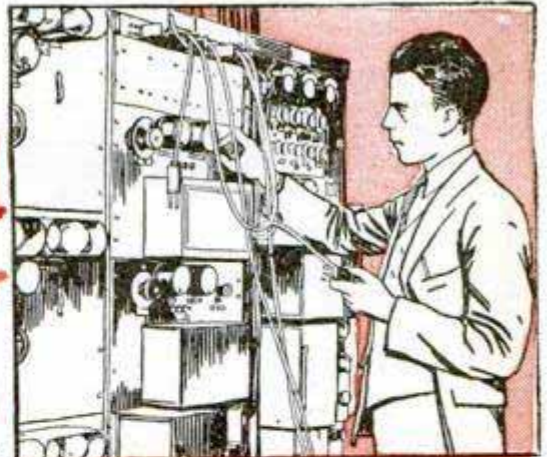
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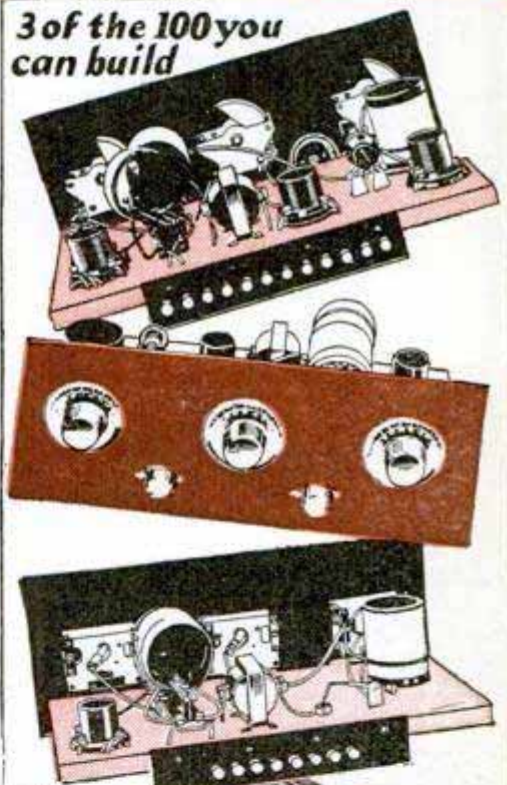
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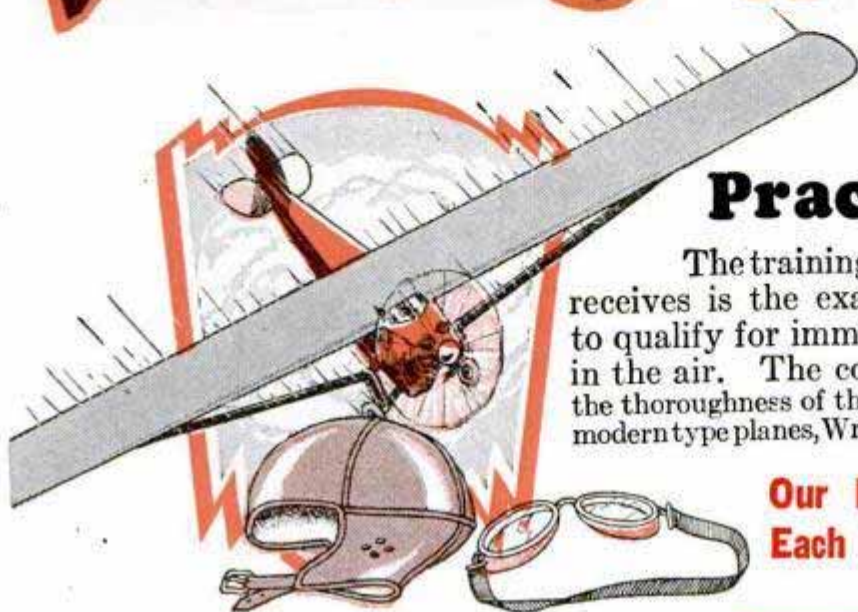
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PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. We expect Spring examinations.



CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get \$1700 the first year regular and automatically increase \$100 a year to \$2100 with further special increase to \$2300. They also have 15 days' vacation. Many February examinations will be held. City residence is unnecessary.

What Will You Earn 5 Years From Now?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. **DO YOU EARN \$1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET \$2700 OR MORE A YEAR, EVERY YEAR?**



FRANKLIN INSTITUTE
 Dept. C173
ROCHESTER, N. Y.

Rush to me entirely free of charge 32 page book with (1) a full description of the position checked below; (2) a list of U. S. Government jobs now obtainable; (3) tell me how to get the position checked.

- Railway Postal Clerk (\$1900-\$2700)
- Post Office Clerk (\$1700-\$2300)
- City Mail Carrier (\$1700-\$2100)
- Rural Mail Carrier (\$2100-\$3300)
- Clerk and File Clerks (\$1260-\$2500)
- Inspector of Customs (\$2100 up)

Get FREE List of Positions

Fill out the coupon. Tear it off and mail it today—now, at once. **DO IT NOW**—This investment of two cents for a postage stamp may result in you getting a U. S. Government Job.

Name.....

Address.....

Use This Coupon Before You Mislays It—Write or Print Plainly

MAIL COUPON TODAY

Swear Off Tobacco



Tobacco Tells on Nervous System



Tobacco Ruins Digestion



Tobacco Stunts Boy's Growth



Tobacco Robs Man of Vitality



Tobacco Steals from You the Pleasures, Comforts, Luxuries of Life

Tobacco Habit Banished Let Us Help You QUICK RESULTS

Trying to quit the tobacco habit unaided is often a losing fight against heavy odds, and may mean a distressing shock to the nervous system. So don't try it! Make the tobacco habit quit you. It does quit those who take **Tobacco Redeemer** according to directions.

It doesn't make a particle of difference whether tobacco has been used for a single month or fifty years, or how much, or in what form—whether it be cigars, cigarettes, pipe, plug, fine cut, or snuff. In most cases, **Tobacco Redeemer** removes all craving for tobacco in any form in a few days. Tobacco craving usually begins to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is safe, quick, pleasant, and thoroughly reliable.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment, there is usually no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves, and makes one feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of **Tobacco Redeemer** treatment for the habit.

Our Positive Guarantee

A single trial will convince the most skeptical. Our legal, binding, money back guarantee goes with each full treatment. If **Tobacco Redeemer** fails to banish the tobacco habit when taken according to the plain and easy directions, money will be cheerfully refunded upon request.

Let Us Send You Convincing Proof

If you are a slave of the tobacco habit and want to find a sure quick way of quitting "for keeps," you owe it to yourself and to your family to mail the coupon today or send your name and address on a postal, and receive our free booklet on the injurious effects of tobacco on the human system and positive proof that **Tobacco Redeemer** does quickly relieve the habit.

Newell Pharmacal Company
Dept. 300, Clayton Station, St. Louis, Mo.



Free Book Coupon

NEWELL PHARMACAL CO.
Dept. 300, Clayton Station St. Louis, Mo.

Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that **Tobacco Redeemer** does positively relieve the tobacco habit or money refunded.

Name.....

Street and No.....

Town..... State.....

FREE

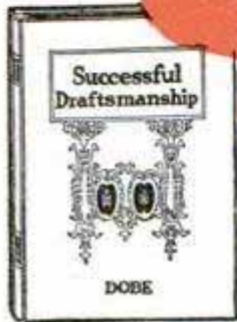
Get two wonderful books by mailing coupon below.

You get these Genuine High Quality, Imported Drawing Instruments, 14 Other Tools and a Drafting Table—all included in my Home Training Course.



These Two Books—
Mail Coupon!

Yes, Absolutely
FREE



2
Books
FREE



Just Send the Coupon Below!

Money-Back Agreement

I train you at home under a positive Money - Back Agreement. If my training does not satisfy you after you have finished, you get every penny back.

Age or Lack of Education, No Drawback

Previous experience is not necessary. You do not need to be a college man or high school graduate.

Help As Long As You Need It

As my student you can write to me any time you want to and as often as you like and I will give you help on any subject pertaining to draftsmanship. I will advise you about jobs, extra work, fees and how to make extra money.

Jobs for Draftsmen in Great Industries—Learn At Home

Automobiles—Electricity—Motor Busses—Aviation—Building Construction.

There are jobs for Draftsmen in all of these industries and in hundreds of others.

Aviation is expanding to enormous proportions. Electricity is getting bigger every day.

Motor Bus building is becoming a leading world industry.

Building of stores, homes, factories and office buildings is going on all the time.

No structure can be erected without plans drawn by a draftsman. No machinery can be built without plans drawn by a draftsman.

I train you at home, in Drafting. Keep the job you have now while learning drafting.

I will train you in drafting right where you are in your spare time. I have trained men

who are making from \$3,500.00 to \$9,000.00 a year. There is a big future for draftsmen because you plan and supervise the work of others, or you go into business for yourself. Get started now toward a better position, paying a good, straight salary, the year around. Comfortable surroundings. Inside work.

Earn As You Learn

I tell you how to start earning extra money a few weeks after beginning my training.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of Draftsmen come to me for men because they know that Dobe Trained Men make good as they have learned drafting by actually doing the work themselves, in a practical way. Employers know they are not taking chances on men trained by me.

If You Earn Less Than \$70.00 a Week Ask for My 2 FREE Books



Mail this coupon, at once. Get "My Pay Raising Plan" and "Successful Draftsmanship". Both of them point the way to Success. You owe it to yourself to find out what a big opportunity there is in practically all industries, for Draftsmen. These two books are Free. They come to you post paid. Mail the Coupon for them TODAY.

ENGINEER DOBE

1951 Lawrence Ave., Div. 93-58 Chicago

FREE BOOK COUPON

ENGINEER DOBE

1951 Lawrence Ave., Div. 93-58 Chicago

Send me free of all cost your book, "Successful Draftsmanship", also plan to earn money while learning and proof of big money paying positions. Also your new book "My Pay-Raising Plan."

Name.....Age.....

Address.....

Post Office.....State.....

NAME THIS

This Offer Open to Every Reader of This Announcement

Have you sent a name? If not do so at once. It makes no difference who you are or where you live we want you to send us a name for our toothpaste. Whoever sends the most suitable name will win \$1000—nothing else to do.

Nothing To Buy—Nothing To Sell

You can use a coined word or a word made by combining two or more words, such as "Snow-White," "Gum-Strength," etc., or any other name you think would fit the high quality of this dental cream. There is nothing to buy or sell—simply the person sending the best and neatest suggestion for a name will receive \$1000 cash prize, or, if prompt, \$1100 in all.

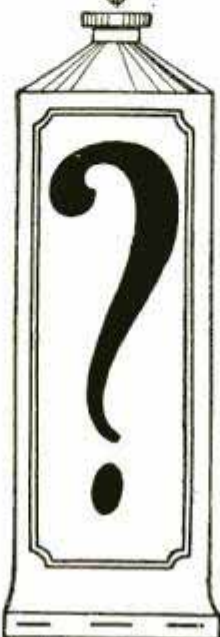
Any Name May Win

No matter how simple you think your suggestion is you cannot afford to neglect sending it at once. Any name may win.

Win this \$1000 cash prize by a few moments' thought. How can you earn this amount of money easier or more quickly? Remember, there is no obligation! The person submitting the winning name will have nothing else to do to win the \$1000 and the extra \$100, if prompt.

In choosing a name bear in mind this dental cream is marvelous for teeth and gums. It is designed to sweeten the breath, beautify the teeth, cleanse cavities and promote teeth and gum health. The only thing necessary to win is to send the name we choose as the neatest and best suited for this dental cream. Only one name will be accepted from each contestant.

This unusual offer is only one of a number of offers embraced in our novel distribution plan whereby those taking part may win any one of twenty-odd prizes, the highest of which is \$3500 cash. By participating in our distribution plan the winner of the \$1100 cash prize may win an additional \$3500, making a total of \$4600. Everyone sending a name, regardless of whether it wins or not, will be given the same opportunity to win the \$3500 or one of the other cash prizes. Get busy with your suggestion at once—do not delay! Neglect may cost you thousands of dollars.



WIN

\$1000⁰⁰

Cash

\$100 EXTRA for PROMPTNESS

To get quick action I am going to pay the winner an extra \$100 for promptness, or \$1100 in all, so send your suggestion **AT ONCE!**

Contest Rules

This contest is open to everyone except members of this firm, its employees and relatives.

Each contestant may send only one name. Sending two or more names will cause all names submitted by that person to be thrown out.

Contest closes November 30, 1929. Duplicate prizes will be given in case of ties.

To win the promptness prize of \$100 extra, the winning name suggested must be mailed within three days after our announcement is read.

MR. H. E. RAY, *Contest Manager*
813 McCune Bldg., Des Moines, Iowa

Enclosed with this coupon on separate sheet is my suggestion for a name.

Date this announcement was read.....

Date my suggestion is mailed.....

Name.....

Address.....

NOTE: Being prompt qualifies you for the extra \$100 as outlined in this announcement.



**Cuts
Shave
Costs
83%**

**365
Keen Shaves
A Year
From The
Same Blade**

**KRISS-KROSS
Fits All Makes
of Blades**

AGENTS!

Make excellent money with Kriss Kross. H. King made \$66 in one day. N. C. Paige made \$104 in 3 days! Spare-time workers, Office and Factory men make up to \$6 and \$12 extra in a day showing Kriss Kross to friends and fellow employees. Get details at once. Check bottom of coupon and mail it tonight!

No More Razor Blades to Buy!

THINK of it! 365 keen, cool shaves a year from the same blade! That's what the revolutionary invention of a St. Louis man is doing for American shavers everywhere!

Kriss Kross marks the beginning of a new era in shaving comfort and economy. Its performance is so sensational that it seems hardly fair to call it a stropper. Rather it is a super-stropper or blade-rejuvenator! Almost literally, it makes a new blade out of an old one every day. No longer do you find that your blades "die" after five or six shaves. Kriss Kross "brings 'em to life" a surprising way, week after week and month after month—and endows them with a keenness that they seldom possess when brand-new!

Magic Diagonal Stroke

Kriss Kross employs the famous diagonal stroke, same as a master barber uses. Never before has anyone captured the secret of reproducing it automatically. Eight "lucky leather grooves" do the trick in 11

seconds with a precision it takes a master barber years to attain.

But that's not all. Kriss Kross embodies still another feature that has hitherto baffled mechanical reproduction. It stropps from heavy to light. It's absolutely uncanny the way the strokes start with strong pressure and grow lighter and lighter until an adjustable, automatic jig flies up and notifies you that your blade is ready—ready with the keenest cutting edge that steel can take!

Fits All Blades

Kriss Kross produces unbelievable sharpness and prolongs the life of any razor blade for months and even years. Fits all brands and makes except Durham. Eliminates 83% of shaving costs and ends all bother about remembering to buy new blades! No more "raking" and seraping with dull ones, either! Kriss Kross solves your blade problem for all time and gives you keen, velvet-smooth shaves forever!

New-Type Razor Blade FREE!



To introduce Kriss Kross stropper, we are including this month free samples of a revolution in razor blade construction. Made to fit your present razor. Guaranteed to last longer and shave better than any other. Expect a new shaving sensation.—Kriss Kross blades are made of a unique steel, made a new and better way. Send coupon today.

Rhodes' KRISS KROSS

**KRISS KROSS CORPORATION, Dept. S-3714
1418 Pendleton Ave., ST. LOUIS, MISSOURI**

Canadian Address:

**CANADIAN KRISS KROSS CO., 39 Wellington Street East, Toronto 2, Canada
Largest Manufacturers of Mechanical Stoppers in the World**

**Kriss Kross Corporation,
Dept. S-3714, 1418 Pendleton Ave.,
St. Louis, Mo.**

Send me details of Kriss Kross Stropper. Also send free sample of your new type razor blade for.....Razor.
(Fill in your make of razor.)

Name.....

Address.....

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

() Check here for agents' money-making plan, full time or spare hours.

ANY BOY CAN WIN THESE PRIZES

Here are just a few of the attractive prizes selected from our Prize Book containing over 300 articles. You can easily have these and many more prizes . . . and besides earn your own spending money. Thousands of boys who are members of The Crowell Club of Junior Salesmen are doing this regularly. You are missing the time of your life if you don't get in with these fellows who spend part of their spare time delivering The American Magazine, Woman's Home Companion and Collier's The National Weekly to regular customers.



Here's smiling Bernard Korn, Ohio, with a few of the prizes he has won. How would you like to be as lucky as Bernard to have a good looking bicycle . . . a full chest of tools . . . a football . . . baseball glove . . . and a handsome set of silverware for Mother? Bernard will tell you that it's as easy as fun winning these prizes.

You Need No Experience to Start

If you want to win worth-while prizes, such as these shown, hurry and send your name and address on the coupon below. We will then start you as a Crowell Junior Salesman and tell you about the methods hundreds of boys are using to earn money and prizes.

SEND THIS COUPON NOW!

Mr Jim Thayer, Dept. 126
THE CROWELL PUBLISHING CO.,
Springfield, Ohio

Dear Jim: I want to earn money and prizes. Please start me off as a salesman.

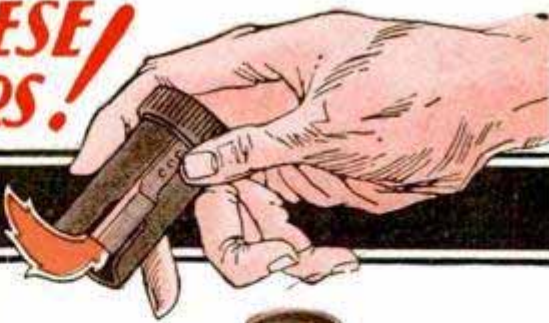
My Name _____

Address _____

Town _____ State _____

CASH IN NOW WITH THESE! 2 BRAND NEW MONEY MAKERS!

LIFT-A-LITE ASH RECEIVER



Here is the biggest hit brought out in recent years. A winning product—a sensational New Money Making Plan. On the right is pictured the new Lift-A-Lite Ash Receiver and Lighter Combination. No illustration can do justice to its real beauty and utility. It must be seen to be appreciated. It's a beauty to look at—the greatest convenience to use—takes but a snap to sell. The tray is deep and spacious, 6 inches long by 5 inches wide—the finest handiwork ever created. Made of durable Bakelite in lustrous colors and beautiful mottled effects in ONYX, RED, BLUEBLAZE, GREEN, MAHOGANY and WALNUT. The lighter works on an entirely new principle. Its exclusive patented features attract instant attention. By simply lifting the cap a light instantly appears. Replace the cap and enjoy your smoke with the tray handy to rest cigarette and hold ashes. The lighter has no springs or screws to adjust or any parts to get out of order. The working parts are fine gold finished. Every body is a prospect. Housewives, givers of gifts, club rooms, offices and business houses offer you tremendous sales and profits. Reap a harvest of the biggest profits you ever made in your life by getting behind this sensational big seller now. Our proven successful selling plans will show you how.

**JUST
LIFT CAP
FOR A
SURE LIGHT**

**\$5.00 VALUE
RETAILS FOR
\$3.45**

*Packed in
Gift Box*



Sensational Free Offer!

To get you started immediately we will send you a sample of the Lift-A-Lite Ash Receiver and De Luxe New Size Money Wallet and Lighter Set as illustrated here, both for the price of only one—\$3.45. With these samples in your hands we will prove to you that it is easy to earn \$2500.00 a month and more, or you may return the two samples and we will refund not \$3.45 but \$4.00 in cash. Mail coupon below!

**SAMPLES OF THESE \$3.45
2 BIG WINNERS for \$3.45
the price of only one**

Amazing New Advertising Imprint Plan Pays Tremendous Profits EVERY DEALER WORKS FOR YOU AS SUB-AGENT ONLY 25 ESTABLISHED DEALERS NET YOU \$2500 PER MONTH

We have originated an entirely new selling plan which will bring you big commissions in addition to the profits you make on the sale of this item to dealers. Lift-A-Lite Ash Tray makes a wonderful advertising gift and is designed to be imprinted with customer's ad. Twenty-five million dollars is spent annually in premium advertising. Every business and profession at one time or another—particularly during the holiday season—gives away advertising premiums to their customers or friends. You can cash in the profits on this business WITHOUT ACTUALLY DOING THE SELLING. The neighborhood dealer does that for you.

Here is How the Plan Works: We have designed a magnificent colorful display which automatically sells the consumer. At the same time a special message solicits orders from business men with their ads. The dealer is authorized to take orders at the list price furnished him and collect 25% deposit. This deposit the dealer retains as his profit and mails the order to us. We make shipment direct to the customer and collect the balance. Every order that the dealer sends in will show your name as our distributor. Out of this balance we pay you 25% commission. Advertising orders usually run in large quantities, ranging in lots of 100, 500 to several thousand. Estimating very conservatively, we will assume that a dealer will take orders for only 200 imprinted ash receivers per month amounting to \$500.00. On that basis he will collect 25% or \$125.00. Your commission is also 25% of the balance or \$100.00. If you have only twenty-five established dealers averaging 200 imprinted Lift-A-Lites per month, your commission will amount to \$2500.00. Before you appoint any dealer as your sub-agent for the imprinted lighters, it is necessary that he buy three or six assorted Lift-A-Lite Ash Receivers for resale and display over the counter. Your profit on the resale of Lift-A-Lites to 25 dealers will be \$108.00 in addition to the commission you will receive on all of their imprint orders. You can see at a glance what a money earner this proposition is. You simply can't miss a sale with this plan. Your earnings are only limited by the number of dealers you call on. BUT THIS IS NOT ALL.



NEW SIZE MONEY DE LUXE WALLET & LIGHTER SET

**\$5.00 VALUE
RETAILS FOR
\$3.45**

Here is our other winner, selling Big. The demand for the new size billfold is tremendous. This new combination of new money wallet and lighter to match is proving a whirlwind seller. Uncle Sam's recent change in the size of his paper currency means big money for you. Every man will want this De Luxe Set. The Wallet is smartly designed of genuine leather with handsomely embossed rose pattern. It is made to meet every requirement of the present day for a handy, convenient wallet to carry both the new size money and old large bills in separate compartments. There is a change and card purse and a compartment for identification and automobile license. The lighter is of the sure fire type with fine gold finished top and is covered with genuine leather embossed to match the wallet. Sells for only \$3.45. You make sales on sight every time you show it.

OUR SIX TESTED PROVEN SELLING PLANS LEAD YOU TO THE BIGGEST EARNINGS YOU EVER MADE

In addition to the advertising imprint plan briefly described above, we have five other plans that will prove big money makers for you. Briefly they are:—C. O. D. Plan. You take orders and collect your profit in advance. Initial and Emblem Plan, which brings instant sales and sells every prospect. Sales Board Plan—an extra profit maker. We show you how to build a steadily growing repeat business with dealers. Each and every one of these six plans will lead you to big earnings. Full details of all selling plans and selling aids will be sent with your samples.

Read This Extraordinary Guarantee

You take no risk. Send for these samples now and when they arrive if you are not satisfied it is the biggest opportunity ever offered for big sales and quick profits, return the samples and we will refund you not \$3.45 but \$4.00 in cash—50c extra for your trouble. YOU ABSOLUTELY TAKE NO RISK.

Rush Coupon Now for Special Offer

Fill out coupon below, enclose \$3.45 or \$1.00 deposit and we will ship C. O. D. for balance. You will receive one Lift-A-Lite Ash Receiver and one new size money De Luxe Wallet and Lighter Set—everything complete as illustrated here—with full details of all our amazing selling plans. There isn't another opportunity that compares with this. Exclusive territory to producers. Act now!

CLIP AND MAIL COUPON TODAY

GORDON MFG. CO. (Dept. CJ-19), 110 East 23rd St., New York, N. Y.

Your two big winners and selling plans interest me. I accept your special offer. Send me one Lift-A-Lite Ash Receiver and one De Luxe New Size Money Wallet Set.

Enclosed find () Full Remittance \$3.45

() \$1.00 deposit. (Will pay balance on delivery.)

It is understood you will refund \$4.00 if I return these samples.

Please include full details of all your selling plans.

Name.....

Address.....

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



OLD SIZE BILLS

NEW SIZE BILLS

CHANGE AND CARD PURSE

IDENTIFICATION AND AUTO LICENSE

GORDON MFG. CO., Dept. CJ-19, 110 E. 23rd St., New York, N. Y.

Who Else Wants a **BIG PAY JOB** in **ELECTRICITY?**

Thousands of Cooke Trained Electrical Men are making \$3,000 to \$5,000 a year — \$60 to \$100 a week — some even more. They prepared for their fine jobs in **spare time only**. Now look at them — Big Pay Men, successful, independent, on the road to fortune. Who else wants quick success — who else wants Big Money in Electricity — who else wants to quickly say goodbye forever to hard work and small pay? Do YOU? Then act at once — mail the coupon today sure!



Jumps from \$25 to \$100

"From \$25 a week grocery clerk to \$100 a week electrical contractor is my record since enrolling." J. C. Kotheimer, 1808 So. 7th, Louisville, Ky.



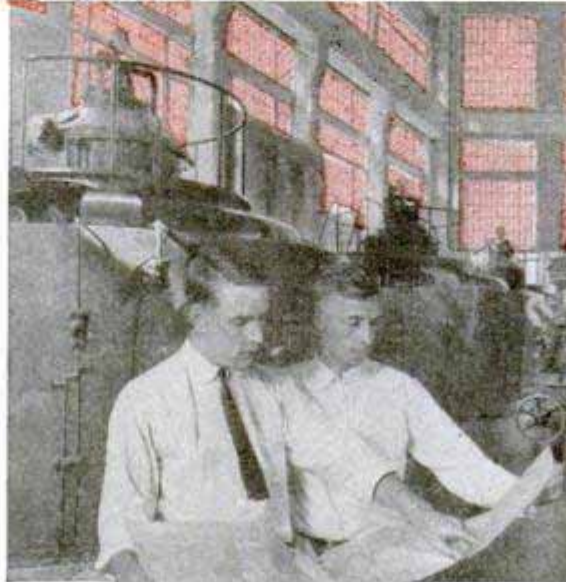
Hubert Gets \$100 a Week

"I was a \$30 a week truck driver when I enrolled with you. Now I average \$90 to \$100 a week easy." C. H. Hubert, 460 Cherry St., New York.



Now Makes \$12 a Day

"A short time ago when I enrolled. I was a laborer at small pay. Now I make \$12 a day." Robert Korns, 203 S. Maple, Newkirk, Oklahoma.



LEARN Electricity with the famous tried and proved "Work Sheet and Job Ticket" Method. It's just like actual shop experience. Yet it's all done right in your own home with a big complete outfit of apparatus given to you without extra cost. And it's done in your spare time — without quitting your present job or losing a single hour's pay.

You don't need previous experience or higher education. If you can read and write, that's enough. This famous training is as simple as A, B, C. Don't confuse it or compare it with any other Electrical course. There is nothing like "Cooke Training" anywhere. Big electrical men praise it — employers endorse it. That's why the "Cooke Trained Man is the Big Pay Man Everywhere and Always".

Electricity needs you, wants you, and will pay you well. Get ready now for a fine job in this Big Pay Field. Get started now under the famous Money Back Agreement with the same methods that have put thousands of men no smarter than you on Easy Street. Act today to get Big Pay. Mail coupon for my Big FREE BOOK "The Secrets of Success in Electricity", a brilliant story of Opportunity for you. Get it — mail the coupon NOW.

L. L. COOKE SCHOOL OF ELECTRICITY

The Cooke Trained Man is the Big Pay Man
Dept. 18, 2150 Lawrence Ave., Chicago, Ill.



Big Pay for Woelkers

"\$450 a month is what I now make with the help of L. L. Cooke's great electrical training." Leo Woelkers, 1332 Jefferson, Scranton, Pa.



Own Shop Pays Big Money

"You taught me all I know about Electricity. Last month I made \$675 in my new shop — I used to get \$15 a week." J. E. Ritch, Rt. No. 3, High Point, N. C.



\$80 a Month Increase

"In five months I boosted my earnings by over \$80 a month. I am \$1000 a year better off by taking your Course." Martin Herman, Box 598, Drumheller, Alta, Canada.



The MAN WITH 50,000 FRIENDS

This is L. L. Cooke, the man with 50,000 friends, because he has been so successful in training men for Big Pay Jobs in Electricity. In all the world there's no training like his. That's why his "boys" get the Big Jobs and Big Money. And now he wants to train YOU for a Big Pay Job too. Find out what he can do for you. Mail the coupon for his great book today.

L. L. COOKE, Chief Instruction Engineer,
Dept. 18, 2150 Lawrence Ave., Chicago, Illinois

You may send me, FREE and fully prepaid, your book "Secrets of Success in Electricity," with all particulars about your Home Study Course in Electricity.

Name _____

Address _____

City _____ State _____

Classified Advertisements

WORLD'S BEST WANT AD MEDIUM

Advertisements in this section, 30 cents per word, each insertion, minimum 10 words, payable in advance.

Rate starting January, 1930, issue 35 cents per word

To be inserted under proper classification in December issue, copy should be in our office October 18th

ADVERTISING AGENCIES

ADVERTISERS. Our 32 years mail order experience at your disposal. 68 page self-help guide, with United States map in colors, giving complete information best paying daily, weekly and monthly publications sent free. Frank W. Lenhoff Advertising Agency, 66 East Lake St., Chicago.

ADVERTISE In 24 big Sunday newspapers, 24 words \$15.00. Excellent for securing agents, salesmen and business opportunities. Catalog listing 1,000 leading dailies, weeklies, mail-order magazines, everything. Free. Wade Agency, Great Northern Bldg., Chicago.

GET Into Advertising. Learn quickly at home. Experience unnecessary. New easy plan. No text books used. Practical work. Old established school. Send name and address for interesting free booklet. Page-Davis School of Advertising, Dept. 3437, 3601 Michigan, Chicago.

ADVERTISERS. Publish your 24 word classified advertisement in 20 New York, Pennsylvania dailies, \$12.00. Campbell-McKay, Advertising, Box 123, Olean, N. Y.

ADVERTISE 50 Magazines 3c word; \$3.00 inch; 5,000 country weeklies 1c line per paper; lists free. Evans King Co., 672P, Wilmington, Del.

INCH Display Advertisement, 50 Magazines Year \$32. Wood's Services, Atlantic City, N. J.

ADVERTISING—Display or classified; placed anywhere; copy prepared; no additional charge. Newspaper, magazine, farm papers. List free. P. LeGrand Agency, 34 W. 33rd St., New York.

BEFORE Advertising get our catalog. No charge. 25 years in business. The largest classified agency in the world. Ankrum Advertising Agency, 100 No. LaSalle St., Chicago, Ill.

FREE—New 1929 Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISE in rural weeklies. Lists free. Meyer Agency, 4112 Hartford, St. Louis, Mo.

TIME Counts in applying for patents. See pages 140 and 141. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

FOR ADVERTISERS

ADVERTISE. 24 Words, 50 monthlies, 100 weeklies, \$4.50. List free. Allen, 234, Bound Brook, N. J.

"THE Master Letter Writer," including 500 successful letters, by Ad-Man Davison, world-famous letter expert; 704 pages, \$3. Circular sent. Opportunity Press, Westport, Conn.

ADVERTISE 300 Country newspapers, 28 words, \$10. Business getter. Lists free. Keator, Hartford Bldg., Chicago.

SALES PROMOTION

\$50 to \$50,000 Daily sales secured for our clients. This eastern client in fall 1927 had one product, but no distribution. Our counsel, plans, copy has now given him distribution in 26 states through 1200 outlets for 25 other products besides his original product. 85 years salesmanship-in-print experience back of our campaigns. Submit sales problems for free diagnosis. 10 years Sales Promotion, Manager Larkin Co. James C. Johnson, 118A Woodbridge Ave., Buffalo.

PRODUCTIVE Sales and advertising advice. Sales letters, slogans, advertisements, sales plans and copy prepared to fit your particular needs. P. A. Porter, Sales Counselor, 156 Fifth Ave., New York City.

LETTERS That talk—If you need sales letters that really sell. Mailing lists; form letters; any direct-mail advertising service. Write Omaha List & Letter Co., Box 1172, South Omaha, Nebr.

FORCEFUL advertising literature attractively prepared! Banning, Times Building, Watertown, N. Y.

AGENCIES WANTED

MANUFACTURERS Who have new patented specialties communicate with E. Temple, Box 737, Port Elizabeth. Mail canvassing organization whole South Africa. References furnished.

TYPING SERVICE

SEND Me your typing. Duplicate manuscripts 50c thousand words. 335 Rockwall, Tex.

MAILING LISTS

RURAL. City. Carefully selected. D. Taylor, 287 Grant St., Youngstown, Ohio.

BIG Free rate list describes 300,000 classified names. Many kinds; guaranteed correct; priced right. De Muth, 88-15 82nd Ave., Glendale, N. Y.

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MAKE Big profits with a fur farm in your backyard! Chinchilla rabbits, muskrat, mink. Write for facts. 252 Conrad's Ranch, Denver, Colo.

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"SCHEMER" Subscribers surely succeed. One reports \$50,000 from one tip; another \$25,000 from three Schemes; another \$10,000 from one formula. Try your luck! Year, \$1.00; three months, 30c. Patterson, Publisher, Alliance, Ohio.

FREE Book. Start your own little business anywhere, selling novelties by mail. My beginner's outfit contains everything required, novelties, circulars, instructions, etc. Descriptive book free. Hadwil, 3A-74 Cortlandt St., New York.

LEARN The collection business. Good income, quick results. Interesting booklet, "Skillful Collecting" free. National Collectors Assn., Long St., Newark, Ohio.

A BUSINESS Of your own making—Sparkling Glass Name and Number plates. Checkboards, signs. Big book and sample free. E. Palmer, 540, Wooster, Ohio.

CHARTERS; Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

COMPOSITION Floor making earns industrious men \$12 and more daily if used as trade. Or make business of it with profits up to \$10,000 yearly. Openings everywhere. Semi-Tile, Box 43, Hollis, N. Y.

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, Decatur, Ill.

AGENTS, Opportunity seekers. Make amazing profits. Write, Empire, Shawano, Wis.

AN Honest circular mailer looking for business. Make up a package, key them, inclose what you think a fair price and I guarantee to mail every piece to live prospects. No nude pictures or etc. Edward Armour, 136 East 28th St., New York.

MANUFACTURING Concrete building blocks is your home town opportunity. Particulars free. Concrete Machine Co., 5 Main, St. Louis, Mo.

I MADE \$30 a week home. French bread-making. 15 years' experience; free booklet tells. Ashbrook 67, Marengo, Ohio.

AMATEUR Cartoonists; Sell your cartoons. New plan. Smith's Service, PA-1194, Wenatchee, Wash.

TELEGRAPHY

LEARN Morse and wireless telegraphy. Big salaries. Tremendous demand. Expenses low, can earn part. Catalog free. Dodge's Institute, H St., Valparaiso, Ind.

CHEMISTRY

YOUR Chemical problems solved and formula or process furnished for \$5.00. Write me. W. Stedman Richard, Industrial Chemist, Box 2402, Boston, Mass.

BOOKLET Of experiments and chemical catalog 15c. General Chemical Company, Box 397, Reading, Penna.

CHEMICAL Analysis, processes, technical information. Robert Henderson, Laboratory, Madison, Me.

FORMULAS AND TRADE SECRETS

INDUSTRIAL Chemist furnishes formulas, processes; all lines. Moderate charges. Individual service. All inquiries answered personally. L. Clore, Industrial Chemist, Crawfordsville, Ind.

ANY Formula, 50c. Catalog free. Bernard Wells, Room 305, 852 George, Chicago.

ANY Formula, 50c. List free. 10 free with every 10 purchased. Weaver Mfg. Co., Altoona, Pa.

FREE Formula catalog. Agents Pitchen specialties. Western Chemical, Salem, Ore.

NEWEST Tested formulas. Particulars, catalog free. Grinstead Laboratories, Oswego, Kans.

DON'T Sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

RELIABLE Formulas for newest fast sellers. All lines. Sources for fine labels—containers. Start right. Free literature. Manufacturer's Bureau, R17, 3937 Tracy, Kansas City, Mo.

509 FORMULAS And big illustrated catalog 25c. Ideal Book Shop, Park Ridge, Ill.

MOST Sensational formula bargain ever offered. Latest, best sellers. List free. Specialty Mfg. Service, 801 So. Farragut, Bay City, Mich.

GUARANTEED Formulas, best science can produce for making popular, biggest-selling specialties all lines. Don't buy formulas till you've received valuable eye-opening literature. Miller, Chemist, 706-F Jetton, Tampa, Fla.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

FORMULAS; Guaranteed, catalog free. Bestoval Laboratories, 6720 Oconto Ave., Chicago.

SUCCEED With your own products. Make them yourself. Formulas, processes, trade-secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

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. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.50 and postal charges. Popular Mechanics Press, Room 808, 200 E. Ontario St., Chicago, Ill.

AGENTS WANTED

WANTED At once: More good men to introduce and retail Rawleigh's Good Health Products. Town and country. Wonderful opportunity. Get into business with backing of largest manufacturer its kind. Capital over 15 million dollars. Quick freight, express, parcels post service from 10 great factories and branches—one near you. Nothing new—no experimenting. No experience required. You simply follow the same old time-tested Rawleigh Methods which secure the most business everywhere and have given consumers best values and satisfaction for 40 years. 170 necessities frequently needed every home. Enormous demand. Annual sales now over 35 million products. Big free trial inducements. Quick easy sales. Repeat every 30-60 days. Enormous profits—\$200-\$400 month and more clear profits. Steady year around; no lay-off. No boss—you become sole owner and manager. Practically no capital required. We supply everything—stocks, outfit, sales and service methods. Big pay every day. Profits increase every month. "First come first served." For full particulars write W. T. Rawleigh Co., Dept. A-11PPM, Freeport, Ill.

AGENTS Wanted to sell greatest household invention of a century. A necessity in every kitchen. Housewives have been waiting years for it. One agent made 9 sales out of 10 calls. You demonstrate how it works. Then it sells itself. Both full time and spare time agents wanted. Write for descriptive circular and special big money making proposition. Jiffy Appliance Co., Sta. 1, 1020 Central National Bk. Bldg., St. Louis, Mo.

AGENTS Buy hosiery direct at lowest mill prices. Men's heavy silk and Rayon hose, doz. pairs, \$2.25-\$3.50; men's latest fancy hose, doz. \$1.45-\$2.10; ladies' Pointex silk hosiery, \$1.25-\$7.25-\$9.50. Satisfaction guaranteed. Act today. Superior Knitting Company, Dept. 31, New Haven, Conn.

AGENTS—Just out, extremely novel aluminum; elephant head keyholder (carried on belt). A speedy 35-cent seller. Fran Mfg. Co., Wilmerding, Penna.

MARVELOUS New invention. Hot and cold massager. Easy to sell. Profit 200%. Write today. Mystic Massager Co., Dept. K, Box 834, Toledo, Ohio.

SOMETHING Different! Fountain pen with check protecting device. Protects checks against check-raisers who steal thousands. Works like expensive checkwriters. Earn \$10 to \$20 daily. Free outfit offer. Securograph Pens, RC-55, Securograph Bldg., Oakland City, Ind.

AGENTS, \$240 Month. Dri-KleanIt removes dirt, grease, tar all one operation. Cleans car for 10c. No soap or water used. Car looks like new. Wonderful seller. Free sample. American Accessories Co., Desk 5831, Cincinnati, Ohio.

TWO Snappy 50c articles, sell year around, to everybody. Large profit. Circulars free. Benedict Mfg. Co., Dallas, Tex.

AGENTS, \$6 day made by our sales agents. Sell finest line guaranteed hosiery you ever saw. All styles, colors. Finest silks. Commission earned daily. Spare time satisfactory. Ford car given to producers when earned. Earn your own silk hose. Write for samples. Wilkoff Hosiery Co., Dept. 8031, Greenfield, Ohio.

MAKE Extra money quickly, easily and pleasantly by distributing our beautiful Scripture-Text Art Calendars for Christmas. Ever home is a real prospect. Liberal commissions. Send 25c for a sample copy and full details. Church Service Bureau, Collingswood, N. J.

CORNS, Callouses removed entirely without harmful results, money back guarantee. Price 35c. Agents wanted. Joyner's Special Laboratory, 625 N. 3rd St., Richmond, Va.

ARTICLES Of merit. Repeat sellers. Big profits. For information write Lightning Products Co., 616 W. Kinzie St., Chicago.

ARE You old at forty? See our advertisement on page 96 of this issue. The Electro Thermal Company, 2123 Morris Ave., Steubenville, Ohio.

\$2.45—RAINCOATS, All colors. Trenchcoats, tweeds, alligators, leatherettes. Sample coat and bonus to workers. Beautiful outfit free. Bradley, Dept. AB-11, 230 S. Wells, Chicago.

SELL Holiday Greeting Checks. Something different. 200% profit. Sample free. 3330 Telegraph, Oakland, Calif.

BIG Ohio corporation wants county manager. Opportunity \$50 to \$75 weekly. Earnings start immediately. Good for \$5,000 yearly. We furnish everything, deliver and collect. Capital or experience unnecessary. Fyr-Fyter Co., 1905-N Fyr-Fyter Bldg., Dayton, Ohio.

EMBOSSED Signs. Something new. Going big. Ten cents for two samples. Signs. 3328A Telegraph, Oakland, Calif.

MIRRORS Resilvered at home. Costs near 5 cents per square foot; you charge 75 cents. Immense profits plating auto parts, reflectors, tableware, stores, refinishing metalware, etc. Outfits furnished. Details free. Write, Sprinkle, Plater, 128, Marion, Ind.

AGENTS—Housewives want articles that save time, work and money. Our new line is chock full of such products. Help us introduce them in your territory. Quality goods, fully guaranteed. Highest commissions. Steady repeat sales. Write quick for particulars. American Products Co., 3945 Monmouth, Cincinnati, O.

RED Witch—Stain remover (ink, rust, iodine); grease remover (both wet and dry cleaning for entire garment). Truly complete cleaning plant in one bottle. Not just a spot remover. Why play around with slow seller. It's a whiz! Get our proof. G. & R. Household Chemical Co., Manning, Iowa.

AGENTS—New fast-selling golf specialty. "Scotch Caddie," the practice drive with self-returning ball, improves game 10 strokes and offers same enjoyment in back yard or basement as playing on golf course. Write for full information; send \$2.00 if you want sample. Arnold B. Enaley, 715 Stevens Bldg., Detroit, Mich.

AUTOMATIC Gas lighters sell on demonstration. Retail 25 cents; costs you \$8 gross. Gives \$28 profit. Rapid Manufacturing Company, 2772 Pitkin Ave., Brooklyn, N. Y.

BIG Line Xmas card assortments, boxes, packs. Our 17th season. Liberal profits. Samples three leading sellers \$1.00. Send quickly for free details, price list. Ufert, 100 West 21st, New York.

WOMEN Go wild over gorgeously beautiful Rayon silk bedspreads! Original! Different! New everywhere! Wildfire seller! Gorgeous full size swatches free! Baker Company, Salisbury, N. C.

SELL Nail polish; sample free. DeFrees, 1034 W. 90th St., Los Angeles, Calif.

NEW Item. Every home buys. 200% profit. International Ink Works, 3004 Eastwood Ave., Chicago.

AGENTS Wanted to sell billfolds designed to beat the pickpockets. Sells like wildfire. Write J. F. Oyer, 304 Adelaide Detroit, Mich.

AGENTS—Speed filter. Guaranteed filter beverages crystal clear, one gallon minute; new invention. Sparkler Mfg. Co., 448 West Grand, Chicago.

AGENTS, Housewives buy our dollar ironing-board cover and unburnable pad. Tremendous demand; high commissions assure unlimited earnings. Full—spare time. Mardo Co., 105 Wooster St., Dept. 1011, New York.

DON'T Sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 700% profit. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

STOP! 400 Fast selling specialties from many parts of world. Write for free wholesale catalog. Sports, Dept. PM, Leveur Center, Minn.

SELL Changeable signs to stores, 3 colors, 6 lines, size 14x24. Costs 40c, sells for \$1.50. National Sign System, 215 So. Broadway, St. Louis, Mo.

NEW "Hire-Fire" Two-in-One spark plug. Just out—reversible—one end cleans other—fires 11,000 volts—for cars, trucks, tractors. Free sample offer, write for open territory. Hire Mfg., Peoria, Ill.

STRANGE New electric iron cord! Prevents scorching. Saves electricity. Cannot kink or snarl. Used on telephones also. \$25 daily. Samples free. Neverknot, Dept. 11-A, 4303 Ravenswood, Chicago.

EARN Big Money with manufacturer of shoes and complete line of leather goods. No experience necessary. Big catalog and information sent free. Address Consolidated Shoe System, Dept. 20, Eau Claire, Wis.

MAKE \$8.5 Weekly. Amazing one-year guarantee sells Roseliff shirts fast. 24 hour shipments. No substitutions. Big advance commissions. Customer gets free initials. Earn your own shirts. Get free outfit including ties. Write today. Dept. P011, Roseliff Shirts, 1237 Broadway, New York.

SELL Beautiful "Style Tailored" shirts, lumberjacks and neckties direct to wearer at factory prices. Many beginners earn \$50 first week in spare time. \$100 weekly full time easy. Selling Outfit Free. Howard Shirts, 1213 Van Buren, Factory 251, Chicago.

MAKE Big money every day. Sell finest work pants and breeches. Every man buys 1 pair \$1.95, 3 pair for \$5.50, your commission \$1.00. Customer's satisfaction guaranteed. Largest, finest sales outfit free. Write today. Dept. LPM11, Longwear, 489 Broome St., New York.

BIGGEST Money maker tailoring line pays \$1.00 to \$7.00 order. Cash bonuses. Earn your own suits. Quality worsteds. All wool serges, cassimeres, top coats, heavy weight overcoats. Giant outfit. 1/4 yd. samples free. Dept. PM11, Olympic, 5th Ave., at 19th St., New York.

IMPORT Your own goods. German export magazine published in English, offers numerous bargains latest novelties; opportunity for obtaining profitable agencies. Copy 60c. Square Deal Supply, P-246 Fifth Ave., New York.

BIG Money weekly year round appointing agents. No canvassing, delivering or investment. Mother Hubbard Foods, 554U Congress, Chicago.

MAKE More Money; sell Public Service ties and shirts direct from mill; exceptional values; ironclad guarantee; liberal commissions. Selling outfit and sales helps free. Producers earn own shirts and ties. Write today. Public Service Mills, 4943CF Hudson Blvd., North Bergen, N. J.

SELL Biggest Xmas card value ever offered. Beautiful box 21 large cards and folders. All envelopes tissue lined. 3 gift cards free. \$2.75 value. Costs you 50c postpaid. Sample portfolio furnished. Lee Co., Canal Station, Chicago.

SELL Rhinestone Initial Belt Buckles, etc. Fastest Xmas sellers. Big commission daily. We deliver. Pocket outfit free. Chaton, 608 Blue Island, Chicago.

MAKE More money selling most complete line Raincoats, Sportcoats, Sheeplined coats. Leather Jackets and Tablecloths. Latest styles. Lowest prices. Biggest commissions. 7x5 swatch line free. Jeffrey, over St., Boston, Mass.

AGENTS Say Magic Metal Polishing Cloths sell like hot cakes. Send for sample free. Universal Laboratories, 193 Hanover St., Boston, Mass.

AGENTS Earn \$8 day. Bonus besides. Sell finest line guaranteed hosiery. All styles. Credit given. Spare time satisfactory. Auto furnished agents when earned. Write for sales plan. Reiterkmit Hosiery Co., Desk 5231, Columbus, Ohio.

\$3 TO \$10 Hourly demonstrating amazing door check. Finger-touch shuts all doors silently. No slamming. No broken glass. Keeps doors open when wanted open. Low priced. Big commission. No competition. Quick demonstration sells several to almost every home, office, factory, public institution. Write! Kant-Slam, Dept. SC-5, Bloomfield, Ind.

MEN Wanted—to demonstrate and take orders direct from motorists. Amazing magnetic trouble light. Sticks on metallic surfaces. Our men earn as high as \$75.00 weekly. Write for demonstrator. Magno, Beacon Bldg., Dept. 168, Boston, Mass.

MYSTERY Polishing cloth in tin cans sell like hot cakes. Write free sample. Mohler, Box 453JH, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS—Absolutely new! Our hand-colored popular-priced photo statuettes going big! Everyone wants them! Agents making \$10-\$25 daily! Samples furnished! Cruser Mfg. Co., LS2456 Jackson, Chicago.

SELLING Like blazes! Beautiful toilet goods assortment at \$1.50 with 24-inch pearl necklace free to your customers. 100% profit. E. M. Davis, 234 North Ave., Dept. 550, Chicago.

SURE! Big money for you. Amazing new window washer. Sells for only 75c. Over 100% profit for you. Beats every window washer on market. Every housewife, store, auto owner prospect. Send 50c for sample. Details free. Write Advance Metal Specialties Co., 184 W. Washington, Dept. S-10, Chicago.

A REAL Money-maker. Sells everywhere. Metal polish in tubes. Trial tube free. P. M. Reid, 1619 Clark, St. Louis, Mo.

BECOME Your home town leading business man. Sell full line of groceries, motor oils, paints. Everybody a customer. No capital or experience necessary. Selling outfit free. Write Loverin & Browne, 1602L So. State, Chicago.

GREATEST Opportunity; newest proposition. Build continually paying business in your own name. Household, industrial, brushes, brooms, mops, dusters, fully guaranteed. New catalog, all net prices, no discounts to bother with. Make as high as 300 per cent and over. Write today. Wire Grip Sanitary Brush Corp., 41 East 11th Street, New York.

SPLendid Money selling our boxed assortments of Christmas cards. Crackerjack proposition. Samples. Write quickly. Patterson Co., 4111 University, Des Moines, Iowa.

AGENTS, Distributors, make \$75.00 to \$100.00 weekly selling newly patented electric computing scale lighting device. Transforms old-type scales into electric. No competition, pays for itself, quickly applied, guaranteed. Massey Mfg. Co., 2481 Detroit Ave., Toledo, Oo.

AGENTS Wanted—Practical and most used necessity of the present day. Sold on a money back guarantee. The Es-Ton Company, La Salle, Ill.

WINDOW Shades are fastest sellers. Men wanted for profitable sales work. Very large commissions. Free demonstrating outfit furnished. Write for yours today. Kasan, 1481 Nostrand Avenue, Dept. A-14, Brooklyn, N. Y.

SELL Koehler's blue signs. Nothing like them for profit. Koehler, 717 N. Fourth, St. Louis, Mo.

400% PROFIT Selling imported and American novelties. A \$5.00 investment will earn \$180.00. Valuable and useful samples. Complete information 2c silver. Northwestern Co., 543-P North Ashland, Chicago.

SELL Everclean sparkplugs, sample 25c. Garage drop cord sets complete. Sample \$1.70. Guaranteed. American Equipment Company, 5558 Washington, Chicago.

100% CLEAR Profit! Men and women! Enormous profits can be made selling new \$2 patented pinless curtain stretcher. Miniature demonstrator furnished. Article sells itself. Exclusive territories available to first applicants. Western Newell Mfg. Co., Freeport, Ill.

\$10-\$25 DAILY Simply showing new Polly wrench. 10 wrenches in one. Guaranteed seller. Sample free. Gellman Mfg. Co., Dept. 6K, Rock Island, Ill.

EXPENSIVE Silk dresses; Slightly handled showroom samples sold cheap for cash. Peddlers, storekeepers, write Dress Jobbers, P-65 Times Square, New York.

DAMASK Tablecloths, no laundering. New futuristic design, cheapest price and largest commissions. Samples free. Gorden Mfg. Co., 6 N. Clark St., Chicago, Ill.

MEN! Get the new sensational Gitsknife counterdard. Good for \$20.00 daily. Free offer! Gits Co., E5419 Chicago Ave., Chicago.

AGENTS. Salesmen and exclusive distributors for auto accessory (to be nationally advertised immediately). Just opening state territories. Large profits to distributors. Pacific Coast Sales & Specialty Co., Dept. 1, 518 Hibernian Bldg., Los Angeles, Calif.

\$5.00 HOURLY. Mercerized damask scalloped table cloths, size 58x58", 75c! Tremendous demand. Other bargains. Big sample line free. American Braiding, Y-418 S. Wells, Chicago.

WELLS Cleared \$620.00 in one month with Business Guide and free legal service. Write for free outfit. Prof. Nichols, Dept. 62, Naperville, Ill.

MAKE \$20 Daily selling merchants changeable-letter show-window signs. Experience unnecessary. Send for free sample offer. Maze Company, 542 W. Washington, Chicago.

PATENTED Invention cuts gas bills 25%. Housewives delighted. My positive guarantee sells them. No competition. Starting stock free if you're a hustler. Box 18E, East San Diego, Calif.

GET Winter line now. Big season on. Sheep-lined coats, leather vests, flannel shirts, underwear, overcoats, sweaters, hosiery. Outfit free. Northern Sales, 101 So. Wells, Chicago.

JUST Out—New kind of electric lamp. 101 lamps in one. So beautiful women can't resist. So useful men buy instantly. Wonderful spare or full time proposition. Sell C.O.D. or deliver as you sell. Big profits daily. Write for money-making plan. Falcon Mfg. Co., Dept. P-251, 2550 Sullivan, St. Louis, Mo.

CHICAGO Expert valued \$3 stone at \$900. The diamond's only guaranteed rival! Greatest spare time side-line article ever known! Amazing profits. \$5 pocket sample case free. Write quick! Mexican Gem Company, Dept. PM, Monterey, Calif.

AGENTS—Men, you can earn \$12 daily wearing fine felt hats and show friends. Smartest styles. Latest shades. \$2 to \$5 saving on every hat. Samples free. Taylor Hat and Cap Mfrs., Dept. SC-135, Cincinnati, Ohio.

MAKE Steady money. Amazing one-year guarantee sells Rosecliff shirts fast. 24 hour shipments. No substitutions. Big advance commissions. Customer gets free initials. Earn your own shirts. Get free outfit including ties. Write today Dept. ME11, Rosecliff Shirts, 1237 Broadway, New York.

AGENTS Earn \$7 in one day. Sell new line guaranteed hosiery. Latest styles. Big sellers. Commission earned daily. Guarantee bond protects customers. Earn silk hose for your own use. Write quick. Silknet Hosiery Co., Dept. 1431, Dayton, Ohio.

AGENTS—Make a dollar an hour. Sell new kind of sharpeners. Sharpens all knives and tools quickly. Demonstrating sample 10c. Premier Mfg. Co., Dept. 97, Detroit, Mich.

BIG Money selling shirts and ties! Wonderful values. Finest line now ready. 54 latest New York styles. Big outfit and special samples. Everything free. Pioneer Mills, 1225 Broadway, Dept. D16, New York.

AGENTS: Free catalog 200 household specialties, toilet preparations, food products, portraits, frames, photo pillows, medallions, religious goods, pictures. Credit. James C. Bailey Co., Station C-11, Chicago.

AGENTS: Sell nursery stock. Free landscape service. Wonderful possibilities. Pay check weekly. Write for particulars. Perry Nurseries, R-11, Rochester, N. Y.

JUST Out—New patented apron. No strings or straps—\$20.00 a day every day; over 100% profit; commissions daily. Write for free outfit. Sta-Put Co., Dept. 211, St. Louis, Mo.

BIG Profits taking orders for ties and shirts. Latest styles. Made in our own big mills. Sell on sight at factory prices. Liberal commissions. Write for free selling outfit. Supra Value Shirt Co., 4927-M, Hudson Blvd., No. Bergen, N. J.

BIG Profits. Sell our holiday poultry banners to meat markets until Thanksgiving and then our Christmas window display cards, to every store, until Christmas. Both banners and cards are sold day or evening, alone or as a side line. Cash sales; no order taking. Great for crews of canvassers. Write today for free literature. Consolidated, 65-Q West Van Buren St., Chicago.

SALESMEN—Earn \$100 weekly taking orders for dazzler and rainbow glow electric signs. Big commission. Exclusive territory. High grade proposition. Write Chicago Sign Sales Co., Dept. 82, Charlotte, N. C.

NO Dull times selling food. People must eat. Federal distributors make big money; many over \$3,000 yearly. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with license, sample case and free samples for customers. Repeat orders sure; exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

GUARANTEED Household article selling under 50c, sold to homes and stores. 100% profit. Exclusive territory. DE-ZPM, 601 East 3rd St., Dayton, Ohio.

FREE Listing in Agent's Directory. H. Wolf, 6618 Quimby, Cleveland, Ohio.

GENUINE Alligator and coconut electric lamps. Joseph Fleischman, Tampa, Fla.

\$20 DAILY. Showing \$2.98 trench coats, also DuPont's launderless tablecloths; garment bags. Samples free. American, 726-LX Roosevelt, Chicago.

GET Next to 101 new, easy-selling items you can make yourself. Novelties, toys, foods, preparations. Profits aplenty. Manufacturer's Bureau, R18, 3937 Tracy, Kansas City, Mo.

MADE-TO-ORDER Greeting Cards. Sensational values. Half usual price for less attractive cards. No extra charge for name, monogram, or fancy lined envelopes. Commissions daily. No experience necessary. If already soliciting orders for cards, show our samples where you fail to sell your regular line. Sample book furnished without deposit. Write Orleans Card Company, Orleans, Vt.

AGENTS—Sterling's "Anti-Freeze" keeps frost off windshield. Sample 50c. Sterling Laboratories, Cedar Rapids, Iowa.

FAST Seller—Big profits. Every housewife, automobile owner, etc., will buy "Kwik Kleen" for windows, mirrors, furniture, store fixtures. Sample 35c. Sales plan free. Sterling Laboratories, Cedar Rapids, Iowa.

MAKE \$20 To \$35 a day selling Imprint Book Matches, spare or full time. Big repeat business—no investment—every merchant a prospect. Send 50c for selling outfit which includes complete samples. Imprint Book Match, Dept. 118, 877 Meigs St. Rochester, N. Y.

AGENTS—To sell electric water heater for \$2.75. New invention. Heats water almost instantly. Real moneymaker. Write Lux-Visel Company, Dept. N, Elkhart, Ind.

BIG Money monogramming automobiles. \$1.40 profit on \$1.50 sale. Particulars and samples free. Evans Products Company, Midian Ave., Windsor, Conn.

SANITARY Rubber goods—Agents and distributors wanted. Factory prices. Send for price list. Knickerbocker, 32 Union Square, New York.

NEW, Patented, most useful 50c necessity. Homes, stores, offices buy several on sight. Repeats. Sole Mfrs. Carney & Nestle, 852 Belmont Ave., Chicago.

WRITE Sponge Nozzle Auto Washer Co., 3780 Clairmont, Detroit, Mich.

SELL Foot specialties. Complete line. Big demand. Strictly legitimate. Dignified. Make good living. Have enviable business of your own. Men or women. Write at once. Health Opedic Company, 210 St. Clair Ave., N. W., Cleveland, Ohio.

AGENTS "Strike a gold mine" selling Nulustre cloths at 25c; cleans, polishes all metals; the duller the metal, brighter it shines. One agent sells 102 boxes in 116 calls. Write for free samples, particulars. Shef Mfg. Co., 20 Shef Bldg., Weehawken, N. J.

TIME Counts in applying for patents. See pages 140 and 141. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 14.

SNAPPY Shirt line ready! Season's best values. Agents cash in big. Nothing to invest. Get free outfit and handsome samples. Special features. Gracett, Dept. 711, 504 Sixth Ave., New York.

GOOD Men always wanted! I can use more men to distribute Hoyt groceries, toilet goods, extracts, home remedies. Only one to a town. Big pay for hard workers. Spare time or full time. Free auto for own use if you succeed. Handsome sample case furnished. Get my free proposition at once. Dan Hoyt, Hoyt Brothers, Inc., Dept. C-27, Newark, N. J.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

DON'T Sell for others—Employ agents yourself. Make your own products. Toilet articles household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

EARN 40 To 50% commission. Box assortments and personal cards. Write today. Full or part time. Artistic Card Co., Dept. 12, Elmira, N. Y.

ENGRAVED Name plates, signs, numbers, desk plates, store window signs, etc.; profits large. Brett Bros., Winthrop, Mass.

SELL Stores 5c candy specialties. 100% profit. Lorrac Products, Albany, N. Y.

NEW Style needle books pay \$22.00 daily profit. Free clever threader invention creates eager buyers. Sweeping country. One billion Paty needles sold. Proof free. Four different samples 25c. Paty Needle Co., West Somerville, Mass.

AGENTS—The Gyro-Whirl Brush washes an automobile in fifteen minutes without splash or spray! Every owner and garage-man a prospect; every user satisfied. Attaches to ordinary garden hose. Takes labor out of car washing. We help you sell and make money—\$15-\$30 daily. Write Gyro Brush Co., Dept. C, Ampere, N. J.

PORTRAIT Men: Why not Pasco portraits; we refund your money for all you cannot deliver. Frame catalog free. Portrait Agent's Supply Co., Dept. F, LaPorte, Ind.

WISE Agents. No canvassing. Pleasant work. No delivering. Big money. No investment. Appointing agents. Welcome Foods, Harvey, Ill.

BE independent; make, sell your own goods. Immense profits. Catalog dependable formulas, special selected agents' best sellers, free. R. Lustrò, 4211 Cottage Grove, Chicago.

WANT Distributing agent for Hanslick, powdered handsoap; removes anything from the hands without injury to skin; everybody a customer; great opportunity for hustler to get in business; sample free. Solar Products Co., J2144 So. Troy, Chicago.

FREE Booklet describes 67 plans for making \$20-\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., N. Y.

BIG Money daily, selling shirts of all kinds, lumberjackets, underwear, hosiery, sweaters, playsuits, overalls, pants, raincoats, leather coats! Outfit free! Experience unnecessary. Nimrod Co., Dept. 8, 4922-23 Lincoln Ave., Chicago.

BIG List of Christmas sellers! Greeting cards, combination toilet sets, perfumes. More than 400 items. Details free. Write! Togstad Co., 30 Pulton St., Kokomo, Ind.

SELL Complete line household brushes. Send for free catalog and sample case offer. National Brushes, St. Louis, Mo.

PHOTO Medallion men and women, the largest line of photo novelties in the world. Lowest prices, quickest service. Send for catalog showing over 200 money makers. Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-611 Gravesend Ave., Brooklyn, N. Y.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 442 Searle Bldg., Rochester, N. Y.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. \$1.45 profit every \$1.50 job. Free samples. "Ralco," X-1043 Washington, Boston, Mass.

SENSATIONAL Pencil, writes four different colors. Instantly interchangeable. Wonderful item for agents, distributors or side line. Splendid profit. American Sales, Tribune Annex, Minneapolis, Minn.

BIGGEST Surprise offer ever made. Be sure to answer this ad. My line of soaps, coffee, tea, spices, toilet articles, household specialties, pays you bigger profits. M. G. Roth, President, 2716 Dodder, St. Louis, Mo.

FREE Booklet describes 67 plans for making \$20-\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., N. Y.

TACKLE That concrete job. Don't be afraid of not getting good results. With the instructions found in Popular Mechanics Concrete Handbook you can easily make 173 articles of utility and beauty ranging from ordinary steps to garden furniture. This book will be sent for only 98c plus postage C. O. D. Send your order to Popular Mechanics Press, Room 808, 200 E. Ontario St., Chicago, Ill.

START An honest-to-goodness, successful-paying business that's yours. Making world's greatest sellers! Investment small. Profits great. Start anywhere. Get my valuable "eye-opening" literature about specialty manufacturing—How you can easily make guaranteed exclusive automobile specialties, including wonderful Loidlac, finest household cleaners, best soaps, high-grade toilet preparations, modern insecticides, delicious food and beverage lines fastest-selling carded specialties. 32 years unequalled reliable service. Miller, Chemist, 706-J Chemical Building, Tampa, Fla.

"HOW To Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

ADDING Pencil. Adds mechanically, almost human. Make big money daily. Get sample and territory now. Add-O-Graph Co., Dept. 25, Saltville, Miss.

DON'T Sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

SELL "Prevents Runs." Guaranteed to prevent runs in silk hosiery. Large profits. Particulars. Specialty Mfg., 307A West First, Los Angeles, Calif.

AGENTS—Make a dollar an hour. Sell Mendels, a patented patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

HOSIERY—Real money selling Montgomery hosiery. Great satisfaction in selling better quality for less. Catalog free. Montgomery Hosiery Co., Dept. 101, Trenton, N. J.

FAST-SELLING Specialties—Make them yourself! Appoint agents. List free. Girard Research Laboratories, Wheeling, W. Va.

THAXLY Formulas produce perfect products. All lines. Catalog free. B. Thaxly Co., Washington, D. C.

POLMET Polishing Cloth removes tarnish from metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retails 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

AGENTS—Here's a new one. "Bestever Powdered Hand Soap." Sells like wildfire. Marvelous discovery. Removes grease, paint, ink, oil, in fact anything from hands. Cannot harm skin. 150% profit. Great repeater. Agents simply coin money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 4315W Irving Park, Chicago.

SUCCEED With your own products. Make them yourself. Formulas, processes, trade-secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

SELL Men's neckwear—wonderful proposition. Astor-M. 39 East 28th, New York.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

MONOGRAM Automobiles, \$1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-T West Van Buren, Chicago.

GET Our free sample case—Toilet articles, flavoring and specialties. Wonderfully profitable. LaDerma Co., Dept. A, St. Louis, Mo.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS. Our cigar lighters, musical novelties and salesboards sell quick. Large wholesale catalog free. Joseph Sales Company, 223 Madison St., Chicago.

HOMEOPATHIC And Biochemie preparations sent postpaid to all parts of the world. Manual and booklet free. Halsey Bros. Co., 5547 Ravenswood Ave., Chicago, Ill. Established 1855. Agents wanted.

MEN, Women, make big money selling Amity greeting cards for Christmas and all occasions. Biggest deal on market. Write for catalogs 10 and 11 giving all particulars. Splendid opportunity for a business of your own. Amity Greeting Cards, 1104 So. Wabash, Chicago.

\$200 MONTHLY Selling amazing new automobile trouble light. Sticks anywhere on car. Electro magnetic. It's also an everlasting flashlight. Send for demonstrator and prices. National Electric Corporation, 222 High St., Newark, N. J.

MAKE \$100 Week placing electric advertising cigar lighters and fans on dealer's counter. Flashing colored advertisements. Write Drake Mfg. Company, Dept. M, Milwaukee, Wis.

32 SECONDS Complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days cleared \$100. Anderson, Mont., sold 1,400 in 14 weeks. Get details for good territory. Harvest time now. M. Morey Rim Tool, Buffalo, N. Y.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

NO Matter what you are selling postal addressed to Excello Sales Co., Shreveport, La., will bring best money making offer you ever received.

AGENTS—New shirt proposition. No capital or experience needed. Commissions in advance. Samples free. Madison Company, 566 Broadway, New York.

RIM Tool—Complete tire change 24 seconds. Exclusive territory. Victory Tire Rim Tool Co., Santa Monica, Calif. 1516 Pico Blvd.

\$12.00 DAILY Showing new table cloth. Looks like linen. Wash like oilcloth. No laundering. You just take orders. We deliver. Pay daily. Sample free. Bestever, 152 Irving Park Station, Chicago.

\$75 WEEKLY Up placing Aspirin, Notar-tar, Lighter Films, Silk-Tone and other self-selling counter display cards with merchants, soda fountains, cigar stores, etc. Over 100% profit. Steady repeats. Sterling Company, F. Baltimore, Md.

A BUSINESS of your own—Making sparkling glass name and number plates, check-boards signs. Big book and sample free. E. Palmer, 512, Wooster, Ohio.

AGENTS Wanted—On a fast selling 25c item for the kitchen, costs you 8 1/2c. Sample sent parcel post prepaid for 10 cents. P. Seed Filter Mfg. Co., Inc., 353 Broadway, New York.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tubunga, Calif.

FLAVORING Extracts—Bottle yourself! Concentrated! Free labels. 600% profit! Whirlwind moneymaking proposition! Write Thomas Manufacturing Company, Indianapolis, Ind.

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, Decatur, Ill.

REPLATE Brass worn-off automobile parts, reflectors, bath room fixtures, worn spoons, forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. \$1.00 half pints. Post paid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

TWO Money makers for agents. "Francis" Pocket Adding Machine retails \$4.85. To you \$1.00. "Excellograph" Rotary Stencil Duplicator \$37.50 retail. Write Typewriter Supply, 102 Hersch Bldg., Pittsburgh, Pa.

WE Start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 641, St. Louis, Mo.

ALL-ELECTRIC Radio Sets—First book on subject—just out. Kenneth A. Hathaway, well known radio adviser of the Chicago Daily News has written this clear, interesting and non-technical book. It covers dynamic speakers also. 120 pages. Illustrated. Pay postman only \$1.50 plus postage upon delivery. Popular Mechanics Press, Room 808, 200 E. Ontario St., Chicago.

CALIFORNIA Perfumed beads selling like hot cakes. Agents coin money. Big profits. Catalog free. Mission Factory 1, 2328 W. Pico, Los Angeles, Calif.

BIG Profits! Fast sales! \$9.75 automatic washing machine. Guaranteed. Write Storm Royalty Co., 3601 Enright, St. Louis, Mo.

\$60-200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

MEN With autos sell Koehler signs. 717 North Fourth, St. Louis, Mo.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

HIGH GRADE SALESMEN WANTED

A SPLENDID Side line—We sell pace books, check covers, coin bags, etc., mainly to banks. They are centrally located and do business quickly. Little time is lost. Our samples are light, compact, easily carried. Sales run into money, items repeat well, commission is liberal, and all paid immediately. We also have an excellent line of advertising novelties for merchants. Our quality is good, the variety extensive, the styles interesting. Line is big enough to devote your whole time if you wish. We are manufacturers, own our buildings, been in business fifteen years, make thirteen thousand sales a year, ship to every state. You could work wherever you happen to be. Correspondence invited. Continental Bank-Supply Co., Mexico, Mo.

BIG Free printing line brings easy quick profits. Union label. Bigger commissions—up to 55%! Experience unnecessary. Now write orders with America's most profitable printing stationery line. Thousands of free cuts. Over 150 standard items covering every business need: letterheads, noteheads, envelopes, billheads, business cards, statements, garage forms—shipping, battery, dry cleaning, tire, storage, parking and hat-cleaning tags; repair forms, blotters, gummed shipping, drug, advertising stickers, etc. Lowest prices. Steady repeat orders. Ship everywhere. New free outfit just off press. Write quick. Dept. 162, Box 498, Cincinnati, Ohio.

OUR Men actually earn \$300 to \$500 monthly selling our lines. Adelite, the newcomer in electric window salesmen, is making a big hit. More for the money than anybody gives. Business posters for every line. Changeable letter system, too. Permanent business for you working with us. Territory protected and repeats credited. Fat commissions. Full details will prove very interesting. Display Products, Ltd., 409-A East 31st St., Kansas City, Mo.

SALESMEN, Dealers, service men investigate this new radio device. First time advertised. Doubles volume and distance. Can demonstrate coast to coast in summer. Brings in stations never heard on set before. Territories to producers. Write W. H. Laferty, Sales Agr., 279 Richey Ave., Detroit, Mich.

SALESMEN—Easy to make \$50 weekly selling our attractive advertising novelties and premiums to dealer trade. United Specialties Co., Dept. PM, Fort Wayne, Ind.

WANTED Salesmen to sell the latest business stimulators and premiums to dealer trade. Farr Manufacturing Co., Dept. PM, Fort Wayne, Ind.

RIGHT Now! Wonderful chance to represent big shirt manufacturer. Best season coming. Easy work. Commission in advance. Outfit given free. Write Graecit Company, Dept. 711-A, 504 Sixth Ave., New York.

A SIDELINE That pays 40% advanced commissions. Biggest line illustrated printing for all businesses. No experience needed. Selling outfit free. Hillside, 1217 Van-Buren, Dept. 23, Chicago.

WANTED—Salesmen to sell merchants our latest fast selling line. \$60 weekly easy. Guy-Ray Products Co., Lafayette, Ind.

PUNCHBOARDS—Hottest, largest money-making line ever offered. Season starting. Best commissions. Nothing to carry. Catalog free. Act! M&L Sales, 301 W. Adams, Chicago.

POOL Shooter. New, fascinating vending machine. Merchants everywhere buy! Splendid side line—big profit maker! Free pocket outfit! Specialty Mfg. Co., W617 W. Division, Chicago.

SELL Christmas cards. Start now. Be the first in the field. Samples free. Windermere Press, 6702 Dorchester Ave., Chicago.

PAYING Position open. I'll put you in the shoe and hosiery business. Permanent income, protected territory, full commission on repeats. Experience not necessary. Handsome sample outfit, literature—everything you need to become a successful shoe merchant. Send for free booklet "Getting Ahead." Wm. J. Mishel, Tanners Shoe Mfg. Co., M. 20011 C St., Boston, Mass.

\$18 TO \$25 Daily; biggest selling line of 2-piece suits, \$9.95 and \$12.50; 3-piece wool suit, \$17.95 (regular \$28.00 value). All-wool overcoats \$18.50. Splendid raincoats, slickers and boys' suits. Biggest commission. Free outfits. "Jim" Foster, Inc., Dept. 211, 2250 S. Spaulding Ave., Chicago, Ill.

HOW About this winter? Does your present connection offer you the money you want to earn this winter? We can show you how to earn \$50 to \$100.00 weekly. Are you interested? Write Geographical Pub. Co., 621 Plymouth Court, Chicago.

SELL "Union Label" business stationery. Lowest prices. 72-hour delivery. Big commissions advanced. Amazing bonus. Cuts furnished for every business. Experience unnecessary. Outfit free. Northwestern, 2002 Division, Chicago.

WHILE Others talk, our salesmen actually clean up. \$8.50 commission on ten-minute sale at \$18.50. Original Electric Hot Dog Machine. Write for available territory. Leonard E. Dickerson, Manufacturer, Dept. E-18, Springfield, Mo.

SALESMEN To sell Sales Builders. A time-tested result producing flexible plan of direct advertising for retailers. Big earnings for high grade men. Write A. D. Bradley, 500 South 4th Street, Minneapolis, Minn.

EARN \$20 A Day. Establish income for life selling for \$1 a year, \$1,500 accident policy. Write W. C. Stone, 11 So. LaSalle, Chicago.

PUNCHBOARD Salesmen—Four average orders daily pay \$96.00 weekly. 90 complete deals. Slot machines of all kinds. The most gigantic line ever featured. Repeat commissions. Big beautiful 4-color catalog free. Lion Mfg. Co., Dept. 8, 308 W. Erie, Chicago.

SALESMEN. Wonderful side line. 40% commission paid daily. Sells all merchants. Pocket outfit free. David Lionel Press, 312 S. Hamilton, Dept. 104, Chicago.

BUSINESS Stationery—Largest line—highest quality—quickest delivery—biggest commissions—liberal bonuses—free copyrighted cuts every business. Experience unnecessary. Instructions and outfit free. Willens Co., Dept. 261, 2130 Gladys Ave., Chicago.

AUTOMOBILE Specialty tool salesmen—Wonderful new valve lifter for all latest motors. Quick sales, big commissions. Clark Feather Mfg. Co., Ft. Morgan, Colo.

MOST Unusual chemical development. New product for all autoists. Prevents steam, rain and snow from blurring windshield. Exceptional opportunity for distributors and salesmen. Exclusive territories open. Retail 50c. Send 25c for full size product, and details. Walter S. Doe Co., Manufacturing Chemists, Dept. 25, Kent, Ohio.

AMAZING Screwholding screw driver! Factories, garages, workers buy on sight! Profit 75c each. Exclusive territory. Free trial offer. Jiffy, 1233 Winthrop Bldg., Boston.

VEST Pocket basket ball. New! Legal! Thrilling! Also four other sure-fire winners! \$125-\$200 weekly. Pocket sample free. Katz Sales, J-4332 Harrison, Chicago.

COVERALL Salesmen—Make \$20 daily selling new \$3.50 improved coveralls also service coats with customers name embroidered on back. Unusual construction. Commission 75c! Wonderful advertising value. Lowest priced; highest commission. Free outfit. Am. B. Co., AD-418 S. Wells, Chicago.

RESURRECTION Plant—Unique novelty; miracle of nature. Money maker for salesmen. Cost low. Write C. E. Locke, 10 Rio St., Mesilla, New Mexico.

DON'T Sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

WONDERFUL Invention. Seals fifty envelopes minute. Sells on sight at \$2.25. Attractive trial offer. Square deal. Bank references. Kendal Sealer Co., 410 Sansome St., San Francisco, Dept. 14.

EXPERIENCED Salesman, as distributor for Whitlock Products direct to consumer. No competition, protected territory. Good reputation and ability to create opportunities essential. Opportunity for advancement. Replies confidential. Whitlock Products, 6895 S. Halsted, Chicago.

SALESMEN: To sell direct to consumers, factories, garages, schools, railroads, institutions, etc. High grade line of brooms, brushes and mops, for Chicago manufacturer. Sideline men considered. Write today. Frank Holub Mfrs., 1645 Blue Island Ave., Chicago, Ill.

\$250 TO \$400 Monthly for salesmen. Our goods sell quickly to factories, hotels, garages, public institutions, etc. Large profits. Year around repeat business. Exclusive territory. Free samples. Vasco Products, Elmira, N. Y.

\$50,000 PICTURE Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book "Profits in Portraits" explains. Sample free. Picture Man Friedman, Dept. 8, 109 West Austin, Chicago.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.34. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

BIG Money daily, selling shirts of all kinds, lumberjackets, underwear, hosiery, sweaters, playsuits, overalls, pants, raincoats, leather coats! Outfit free! Experience unnecessary. Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

AUTO Seat covers. Full or slip coverage all cars. Every autoist prospect. Selection and prices beat competition. \$3.00 commission advanced per set. Earn additional \$3.00 installation optional. Outfit free. Coverall, Inc., Lakewood, Ohio.

ELECTRICAL Tool line selling to garages, mechanics and auto owners, wonderful demonstrators, big commissions. Salesmen, write Barker Specialties, Girard, Penna.

PUNCHBOARD Salesmen, \$10,000 yearly. New line. All fast sellers. Lowest prices. Full commission on repeat business. Catalog free. Hurry! Puritan Novelty Co., 1409 Jackson, Chicago.

SELL Popcorn poppers. Low prices, big commissions. Northsides Co., 1306 5th, Des Moines, Iowa.

SALESMEN—America's leading collection service wants you to help doctors, merchants collect their bad accounts. You list them; we collect. Hustlers actually make \$75-\$100 weekly. Pleasant work, increasing profits. Get the facts. Arrow Service, 29 Jay St., Schenectady, N. Y.

SALESMEN—Become independent. Own your business; experience unnecessary. Selling our \$10,000 Accidental Death; \$50 Accident; \$25 Sick Weekly Benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department, Universal Policy Dept. A, 40 Clinton St., Newark, N. J.

SELL Goodyear raincoats; \$2.95 up. Goodyear Rainwear, 682 Sixth Ave., New York.

A MONEY Making sideline. A new quick seller to merchants and banks everywhere. Sales outfit free. Comm. paid daily. Carroll Co., Carroll & Albany Aves., Dept. 206, Chicago.

ADVERTISING Pencils cheaper than greeting cards. New Christmas designs appeal to all lines business. Fast sideline for hustlers. Cash in now. Northern Pencil Works, 126 S. Clinton, Chicago.

MAIN Or sideline. Sell auto tires and auto accessories to tire stores, garages, etc. Protected territory. Liberal commission. Economy Rubber Products Co., 604 Burkhardt Ave., Dayton, Ohio.

35% COMMISSION. Liberal repeats. New sales-producing service increases business 20% to 50%. Every retailer live prospect. Sales Stimulators, 339 W. Madison, Chicago.

SALESMEN! Sell Bostonian Shirts. Direct to wearer. Start in a money-making business of your own without a penny of capital. No experience necessary. Wonderful complete selling outfit free with everything you need to start collecting your profits at once. Write today, sure! Bostonian Mfg. Co., 106 Bleckford St., Boston, Mass. Est. 1863.

NEW Invention—Sell every business. Four \$15 sales daily pay \$288 weekly. Walker made \$145 first day. Exclusive territory. Adjustment Service, Dept. PM, Mobile, Ala.

WANTED District managers—Capable men to represent us in prosperous territories with direct home office contract. Our organization is the oldest of its kind in the health and accident business and offer exceptionally remunerative compensation. Write today for information. Dept. 18, Inter-State Business Men's Accident Association, Brown Bldg., Des Moines, Iowa.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-V West Van Buren, Chicago.

SUCCESS is no accident! You will fully understand this slogan when you examine our automatic credit and collection plan. Copyrighted, brand new, unusual. You make 250% on original sale. Half cash on repeats without call-backs. Commonwealth J. Publishing Company, 508 So. Dearborn St., Chicago, Ill.

SALESMEN—Four \$15.00 sales to merchants net you \$40.00 daily. Sayers Systems, 2813 Sheffield, Chicago, Ill.

TO Market 3A garage door holders, simple automatic action, quickly installed, instantly attracts garage owners, builders, dealers. Write for exclusive territory proposition. Knowlson-Stevenson Co., 1118 Packard, Ann Arbor, Mich.

PUNCHBOARD Salesmen make \$200.00 weekly selling punchboards and vending machines. Big repeat commissions. Beautiful 3-color catalog free. Best season now. Write today. Old reliable company, established 20 years. Lincoln Sales, 116 S. Wells, Chicago, Dept. D.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

\$60-\$200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 428-A North Clark, Chicago.

HELP WANTED

NO Dull times selling food. People must eat. Federal distributors make big money; many over \$3,000 yearly. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with license, sample case and free samples for customers. Repeat orders sure; exclusive territory. Ask now! Federal Pure Food Co., C2307 Archer, Chicago.

DO You need \$500? I'll show you a new, easy way to make it as my local representative. No experience or capital required. Immediate earnings. Albert Mills, 3946 Monmouth, Cincinnati, Ohio.

OBTAIN Employment desired, quickly, anywhere. Learn how. Write Box 39-202, Station K, New York.

ARE You old at forty? See our advertisement on page 96 of this issue. The Electro Thermal Company, 2123 Morris Ave., Steubenville, Ohio.

MAKE Big profits silvering mirrors. Easily learned patented process. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

BIG Wages in Canada, construction work, all trades! Write for list of positions, stamp appreciated. A. Allard, 4724 Des Erables, Montreal, Can.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 14.

"WHERE To buy thousands of articles wholesale." New directory. Agents wanted. Pruitt, Brookfield, Ill.

"IF You want to fly" let Alexander Klein, brilliant engineer, teach you. With great skill whole course of training has been simplified and made crystal clear. Remarkable book teaches in most practical and easily understood fashion. Recommended by skilled flyers. Sent C.O.D. anywhere in U. S. Simply pay postman \$2.50 and postage when delivered. Sent postpaid to any address upon receipt of \$2.50. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

STUDY Mechanical dentistry and earn up to \$125 per week. Learn at home in spare time to make crowns, inlays, etc. Write for information. Modern Dental Institute, 49 South Main St., Salt Lake City, Utah.

200 TRICKS You can do—Mystify your friends; have loads of fun. This collection of tricks has been selected by Thurston for the average person. Neither unusual skill nor elaborate apparatus are required. Send for this 200-page illustrated book. Pay postman \$1 plus postage when delivered. If outside U. S. remit when ordering. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

LEARN Aircraft welding, auto mechanics, electricity, Magnetos, radio. Big pay. Big demand. Low rates. Free catalog. Stevenson School, 2068A Main, Kansas City, Mo.

WANTED Immediately, men-women, 18-35, qualify for permanent government positions. \$105-\$250 month; no gov't experience required; paid vacations; common education; many needed soon. Write Ozment Inst., 101, St. Louis, Mo.

BECOME A landscape architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 29 Plymouth Bldg., Des Moines, Iowa.

U. S. GOVERNMENT Wants men, \$1,700-\$1,900 and up at start. Railway mail clerk examination coming. Let our expert (former government examiner) prepare you for this and also rural carrier, post office, customs, internal revenue, and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

BOATING—Send for free list of best books on all places of pleasure boating, building, handling, fitting out, navigation, seamanship, where to cruise, etc. Popular Mechanics Press, 200 E. Ontario St., Chicago.

AMATEUR Cartoonists: Sell your cartoons. New market. Smith's Service, PR-1194, Wenatchee, Wash.

LEARN Linotype—Pays good salary; home or college course; small cost; free catalog. Linotype School, Maumee, Ohio.

DOUBLE Entry bookkeeping 60 hours with 8 keys; guaranteed. (Diplomas.) International Bookkeeping Inst., 8 Springfield, Mo.

DON'T Prepare for any civil service examination without seeing our catalog. Free. Columbian Correspondence College, Washington, D. C.

BIG Demand for photoplay talking picture and magazine stories. We revise, develop and copyright. Sell on commission. Established 1917. Booklet free. Universal Scenario Company, 406 Western and Santa Monica Bldg., Hollywood, Calif.

AIR Navigation and meteorology—New, simple, non-technical book needed by every flyer. Nothing else on the subject like it. Written by Captain Duncan who has over 3,000 hours of flying to his credit. 225 pages. Flexibly bound. 80 pictures, maps, etc. Pay postman \$3.00 when he delivers book. Popular Mechanics Press, Room 808, 200 E. Ontario St., Chicago, Ill.

STENOGRAPHY, 25c. Self-instructive books, 100 subjects, trades, etc. Will Marr, B605, Nashville, Tenn.

DISSATISFIED Working for somebody else? Want your own business? Want to be your own boss? Start a distributing bureau. Easy. Profitable. No selling. No experience. Start immediately. Opportunities everywhere. Complete instructions one dollar. Particulars free. Wagner, Box 457, Palo Alto, Calif.

PRIVATE School for boys and girls. Wilson Schools, Dayton, Ohio.

MEN, Women, 18 up, want a government job? \$105.00 to \$280.00 month. Steady work. Short hours. Paid summer vacation. Common education usually sufficient. Experience usually unnecessary. We coach you without leaving home. 32-page book with full particulars and sample coaching free. Write immediately. Franklin Institute, Dept. C3, Rochester, N. Y.

WRITERS, Authors: Criticism is essential; learn by exchanging Ms. with other writers. Get analytical test questionnaire. Send copy (not original) of story with \$1 to M. L. Smith, 87 Coleman St., Dorchester, Mass.

FIREMEN, Brakemen, baggagemen (white or colored), sleeping car, train porters (colored), \$150-\$250 monthly. Experience unnecessary. 810 Railway Bureau, East St. Louis, Ill.

MAIL Carriers, post office clerks, \$1700-\$2300 year. Steady work. Men 18-45. Frequent examinations. Common education. Particulars free. Write immediately. Franklin Institute, Dept. C14, Rochester, N. Y.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solutions, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send No Money. Just write a postal for "Hensley's 20th Century Book of Formulas." Pay postman postage and \$4. Popular Mechanics Press, 200 E. Ontario St., Room 808, Chicago, Ill.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS—Factory rebuilt Royals, Remingtons, Underwoods, New Royal, Remington and Corona portables. New "Excellograph" Rotary Stencil Duplicator \$37.50. Catalog free. Pittsburgh Typewriter Supply, Dept. 945, Pittsburgh, Penna.

TYPEWRITERS, All standard makes, \$10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

TYPEWRITERS—All makes, \$6 to \$32. Fully guaranteed. Dee Typewriter Exchange, Ada, Okla.

ADDING MACHINES

NEW \$3.50 Automatic adding machine. Adds, subtracts, multiplies, absolutely accurate. Capacity \$999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Saves time. Postpaid \$3.50. Bassett Co., 1458-D, Hollywood Ave., Chicago.

"MARVELOUS" 999,999,999. Calculator. Eliminates mistakes automatically. Postpaid \$2.75. Calculator Company, 721-G Magoffin St., Lexington, Ky.

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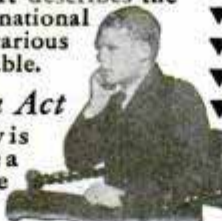
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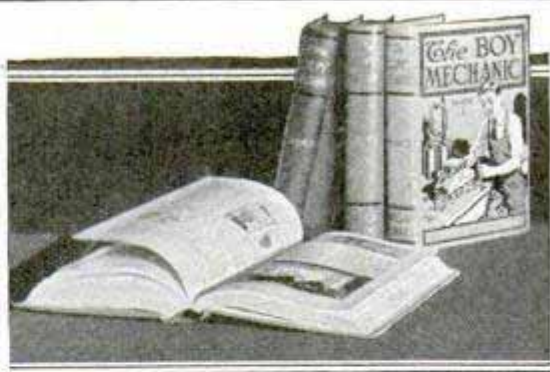
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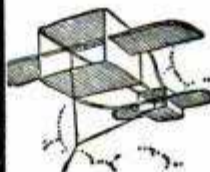


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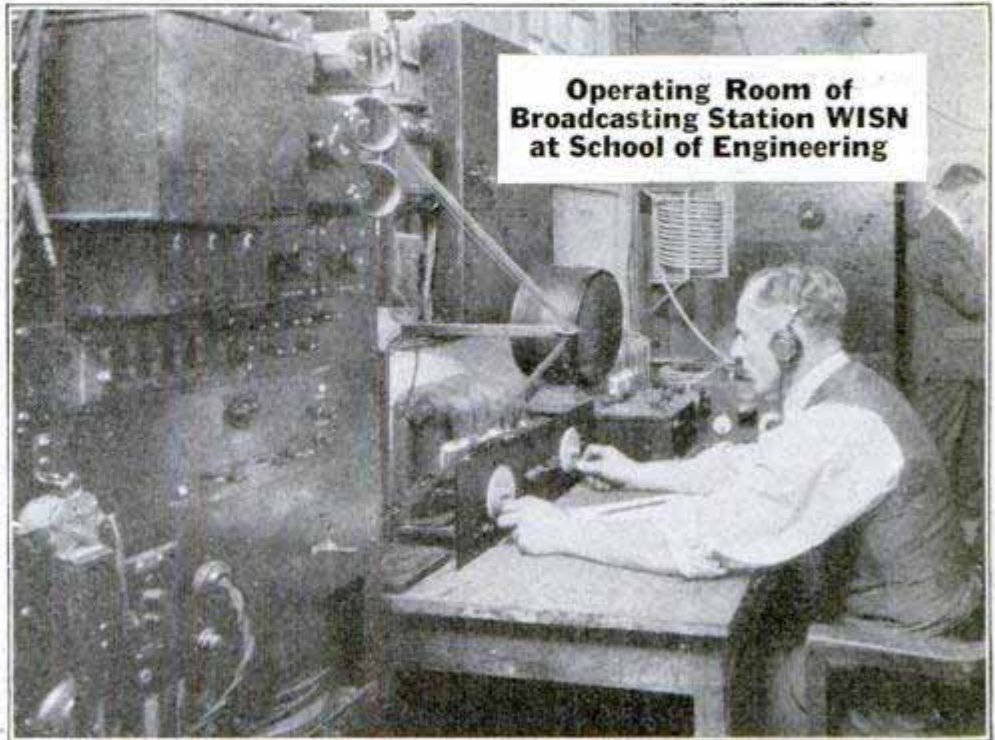


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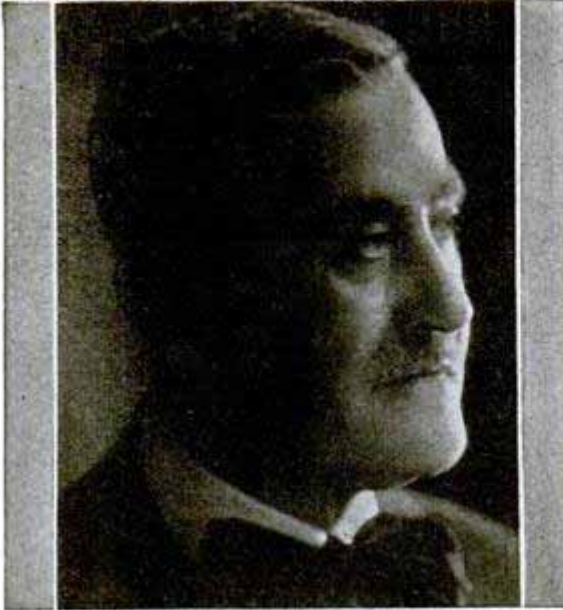
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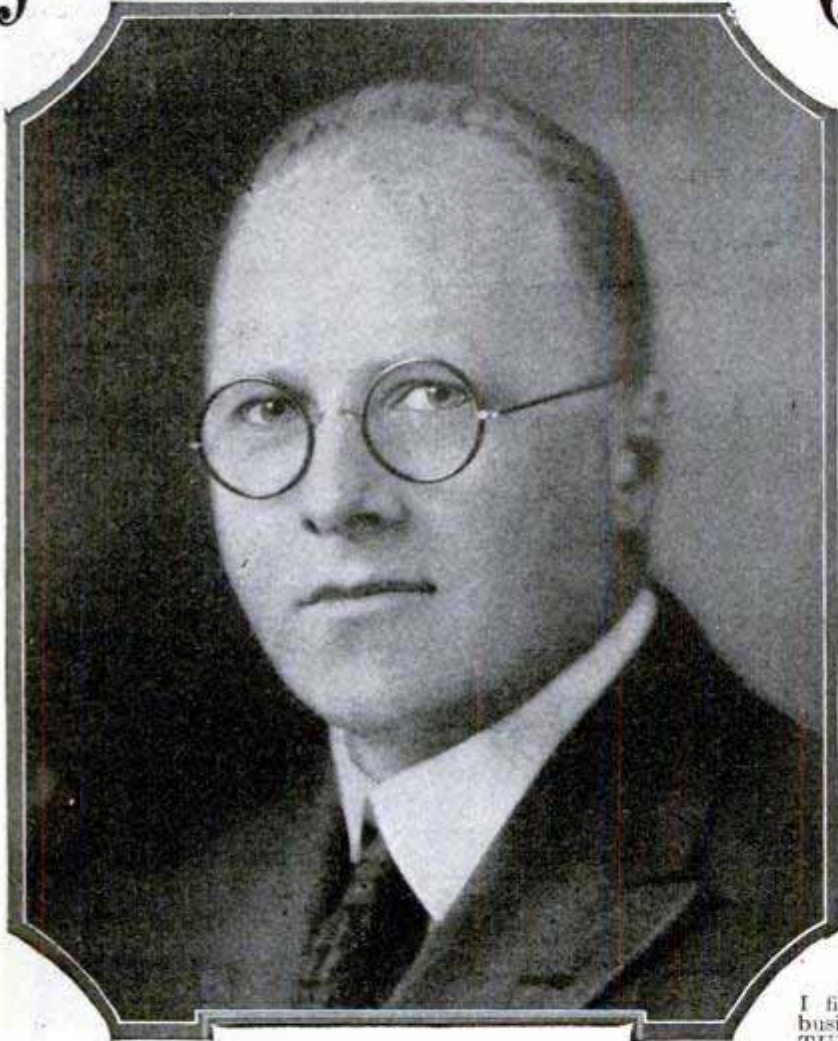
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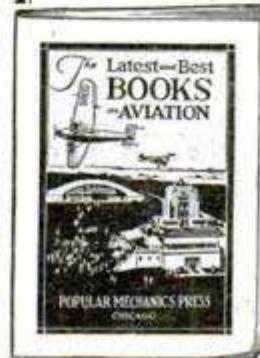
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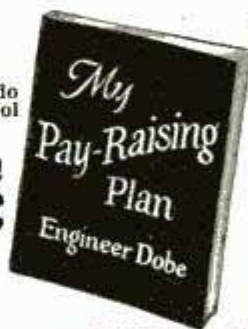


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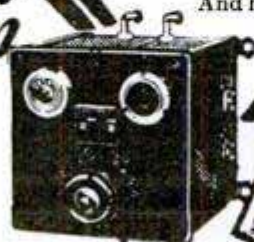
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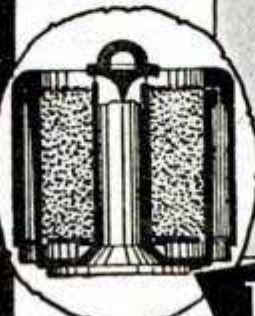
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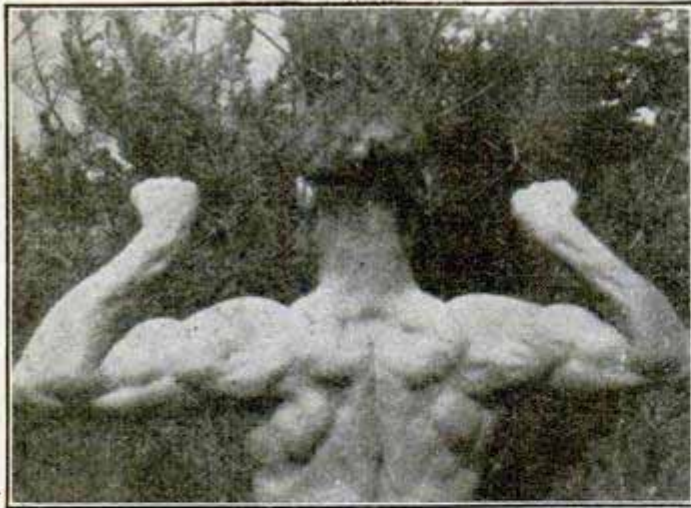
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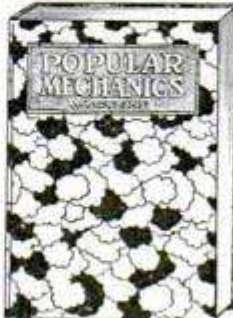
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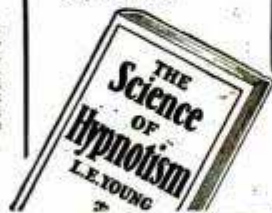
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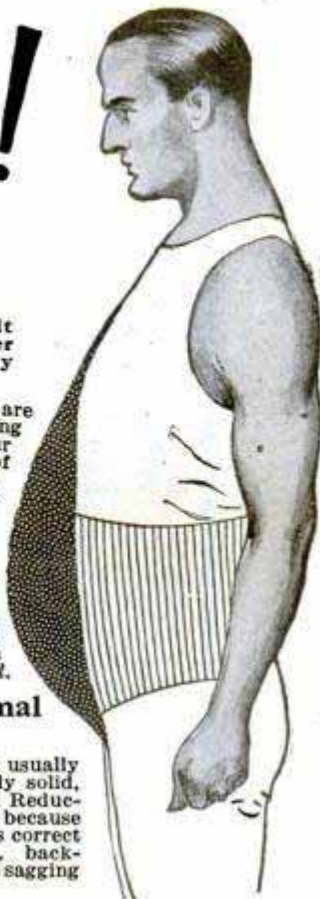
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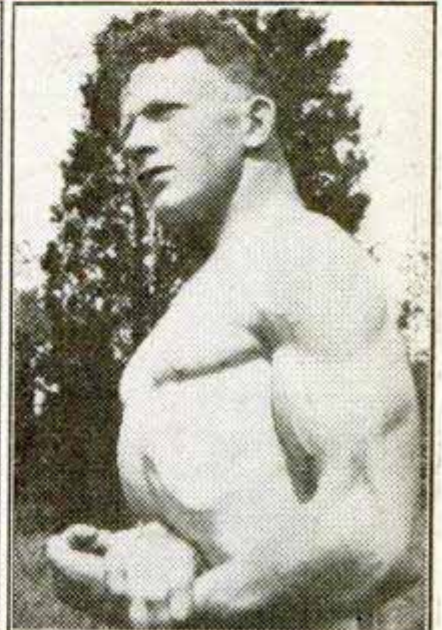
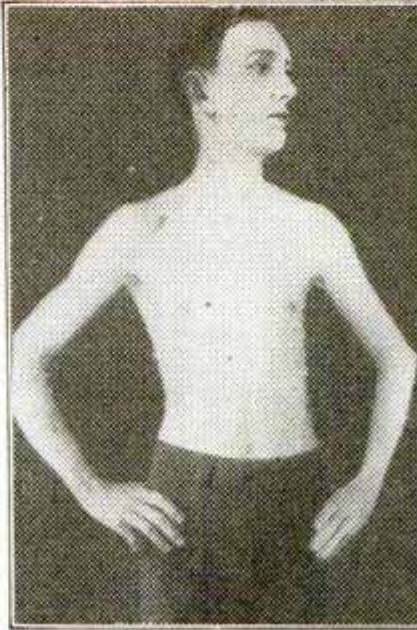
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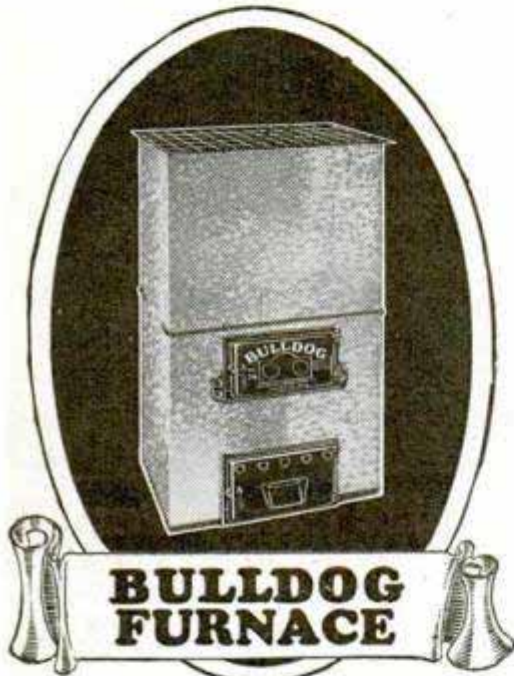
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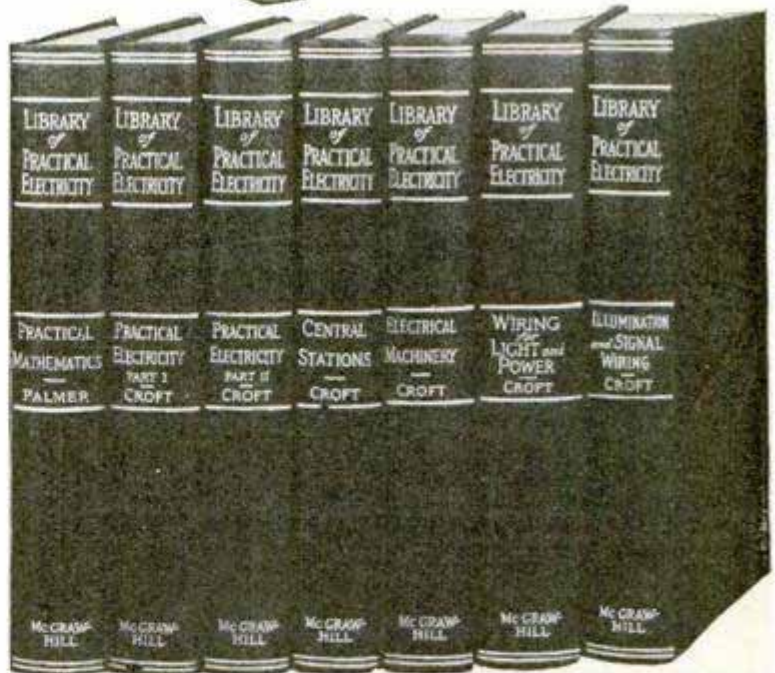
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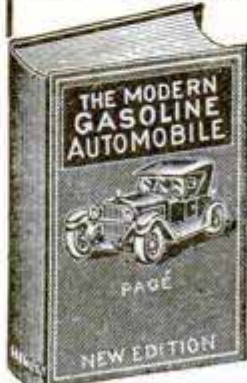
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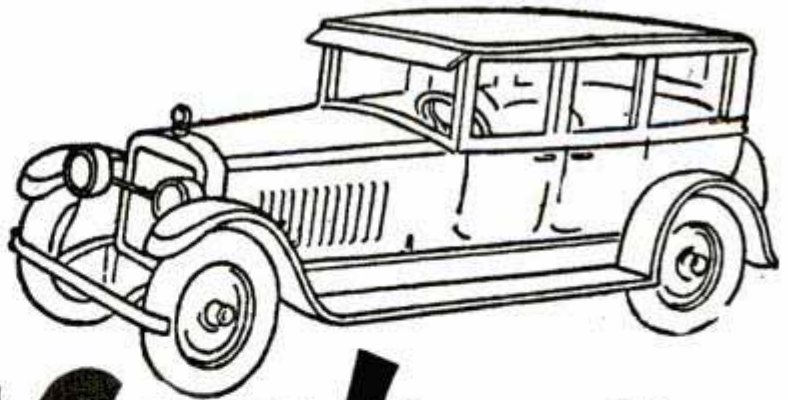
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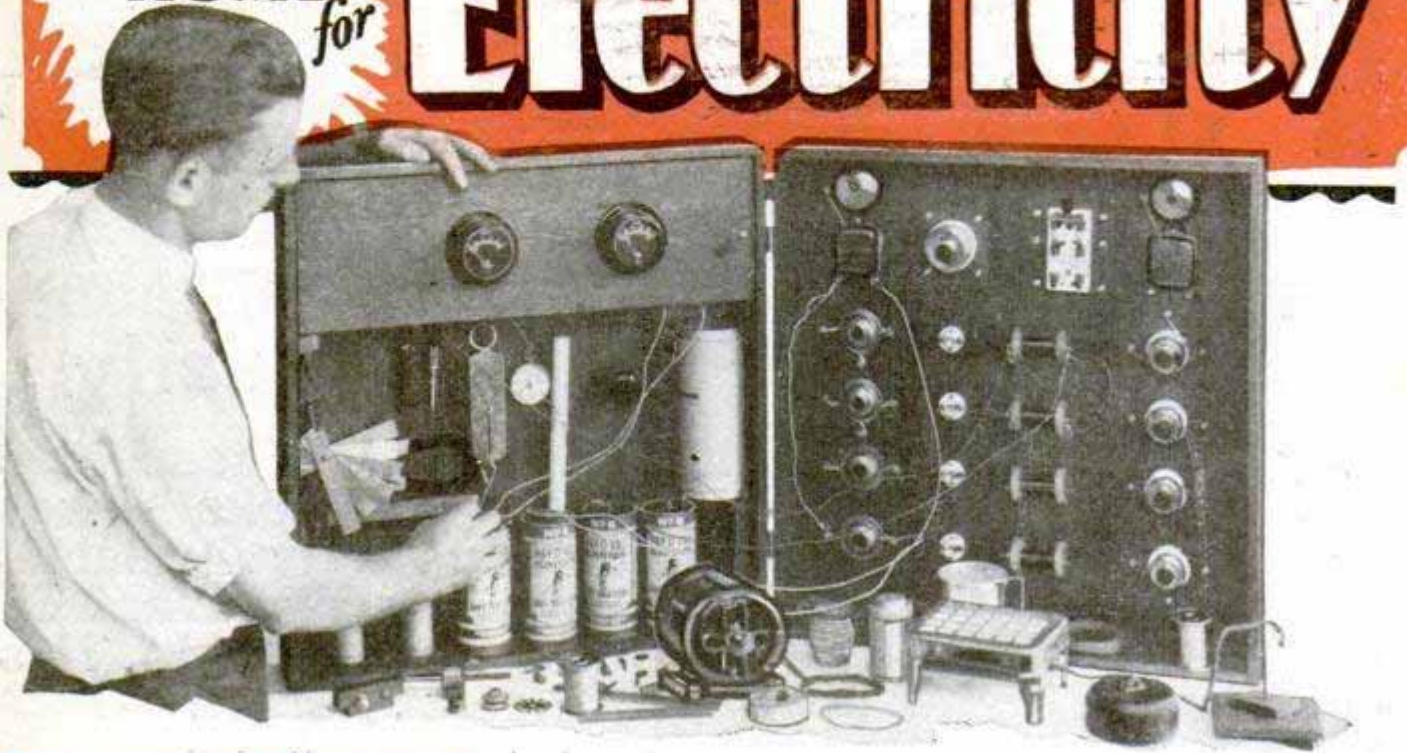
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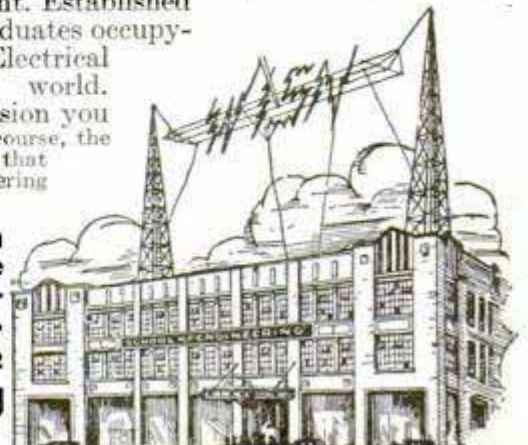
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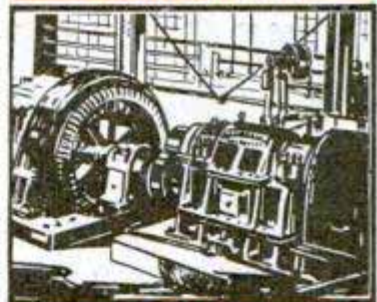
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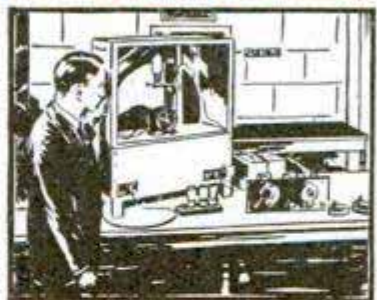
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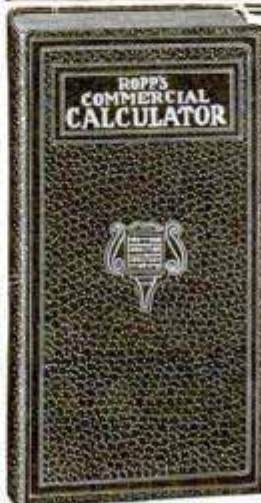


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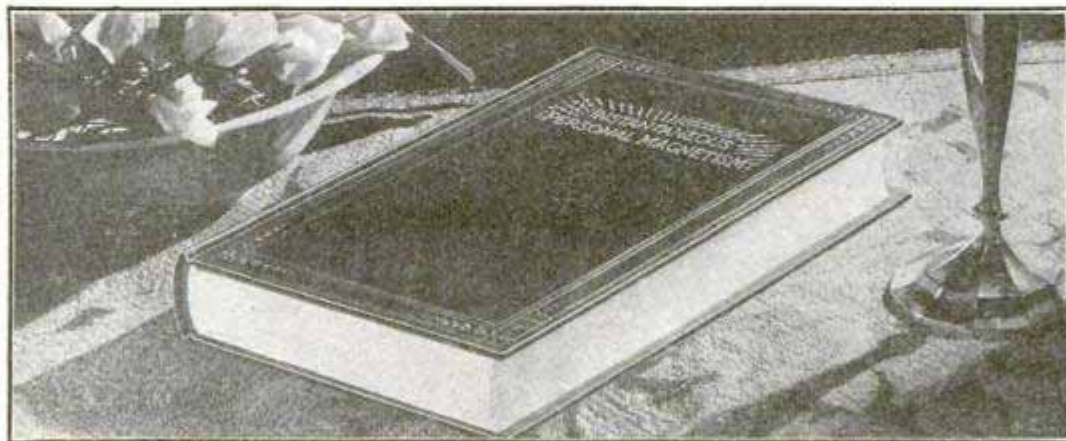
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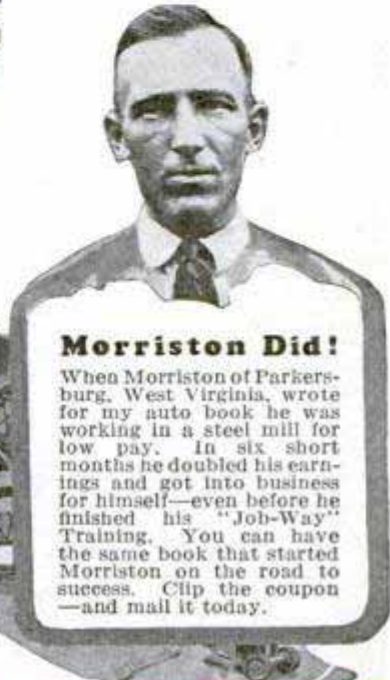
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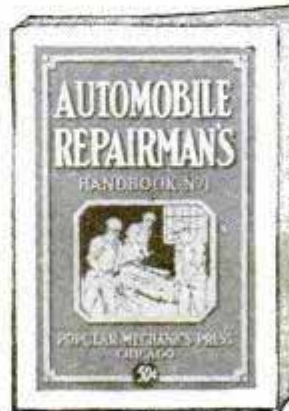
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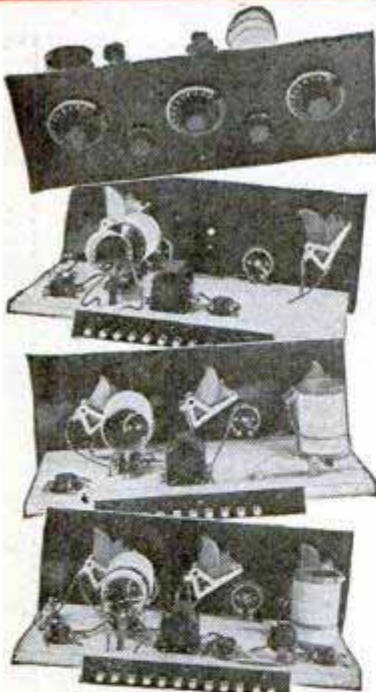
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Over 300,000 jobs have already been made by Radio's amazing growth. It continues to grow and expand fast. This big growth can put you ahead fast. I have doubled and tripled salaries. I have shown hundreds how to make much more money in Radio than they were making in other fields. Let me show you what I can do for you.

Many Make \$5 to \$25 Extra A Week Almost at Once

The day you start I will show you how to do 10 Radio jobs most common in every neighborhood so you can begin making extra money. Frank Golden, 329 Walnut St., Newark, N. J., says, "I made over \$900 in my spare time in about 10 months." This is the world-famous course that pays for itself.

I Will Train You at Home In Your Spare Time

Hold your job. My 50-50 method of training—one-half from lesson books and one-half from practical experiments using Six Big Outfits of Parts given without extra charge, makes learning at home easy, fascinating. It is unequalled. It gives you practical Radio

experience while learning. You don't have to be a high school or college graduate. Many of my most successful graduates didn't finish the grades.

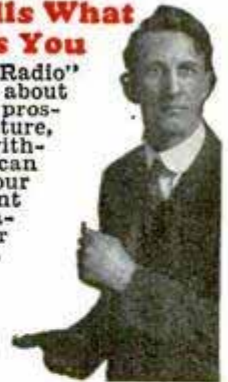
Your Money Back if Not Satisfied

My training is right up-to-the-minute with Radio's latest developments. Television, Talking Movies, Radio in Aviation, Screen Grid Tubes, A.C. Sets are included. It fits you for Radio factories, broadcasting stations, a spare-time or full-time business of your own, operating on board ship which gives you world-wide travel without expense, commercial land stations, research laboratories and many more branches. Every penny will be returned if after completion you are not satisfied with the lessons and instruction service.

FREE Book Tells What Radio Offers You

"Rich Rewards in Radio" gives you the facts about Radio, what your prospects are for the future, how you can get in without delay, what you can make. It explains our lifetime Employment Service after graduation and many other fine features. Get a copy AT ONCE.

J. E. SMITH, Pres.,
Dept. 9YPP
National Radio Institute
Washington, D.C.



J. E. SMITH

Jumps From \$35 to \$100 a Week



"It is certainly great sport to do Radio work and a profitable one too. I had the pleasure of earning \$110 last week servicing and selling sets. I have made as high as \$241 in two weeks. Before I entered Radio I was making \$35 a week. You started me off on the right foot by giving me the knowledge every man should have to succeed in Radio."

J. A. VAUGHN,
4202 Arsenal St., St. Louis, Mo.

Mail this Coupon at Once

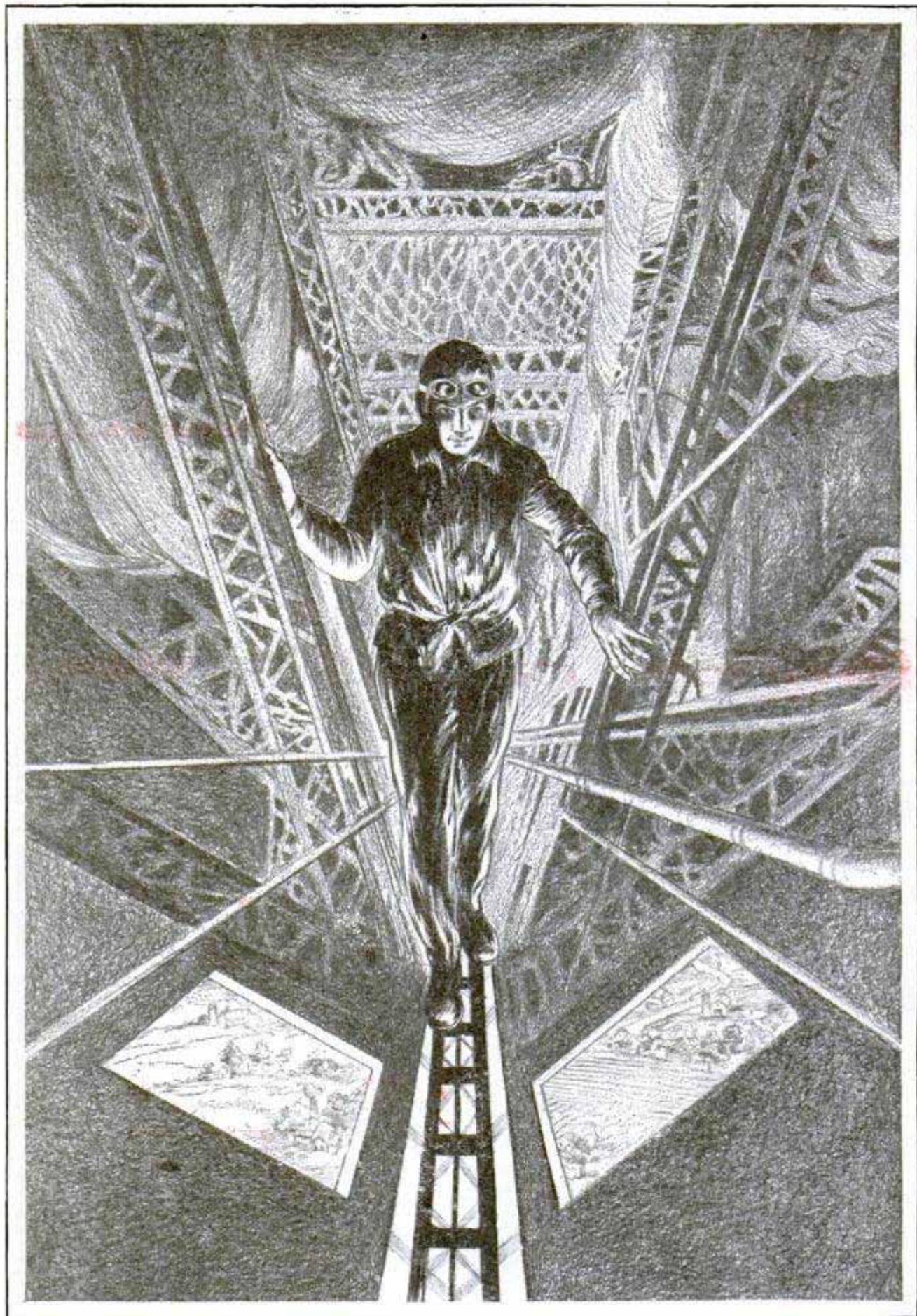
J. E. Smith, President,
National Radio Institute,
Dept. 9YPP
Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," your book on Radio's opportunities for big success.

Name _____
Address _____ Age _____
City _____ State _____



3373



A Drawing Depicting a Member of the Crew of the Zeppelin on the Catwalk Leading through the Inside of the Dirigible to the Various Quarters and Compartments—See Page 738

Henry Miller News Picture Service
519-13 1/2 St. N.W.
Washington D.C.

Popular Mechanics Magazine

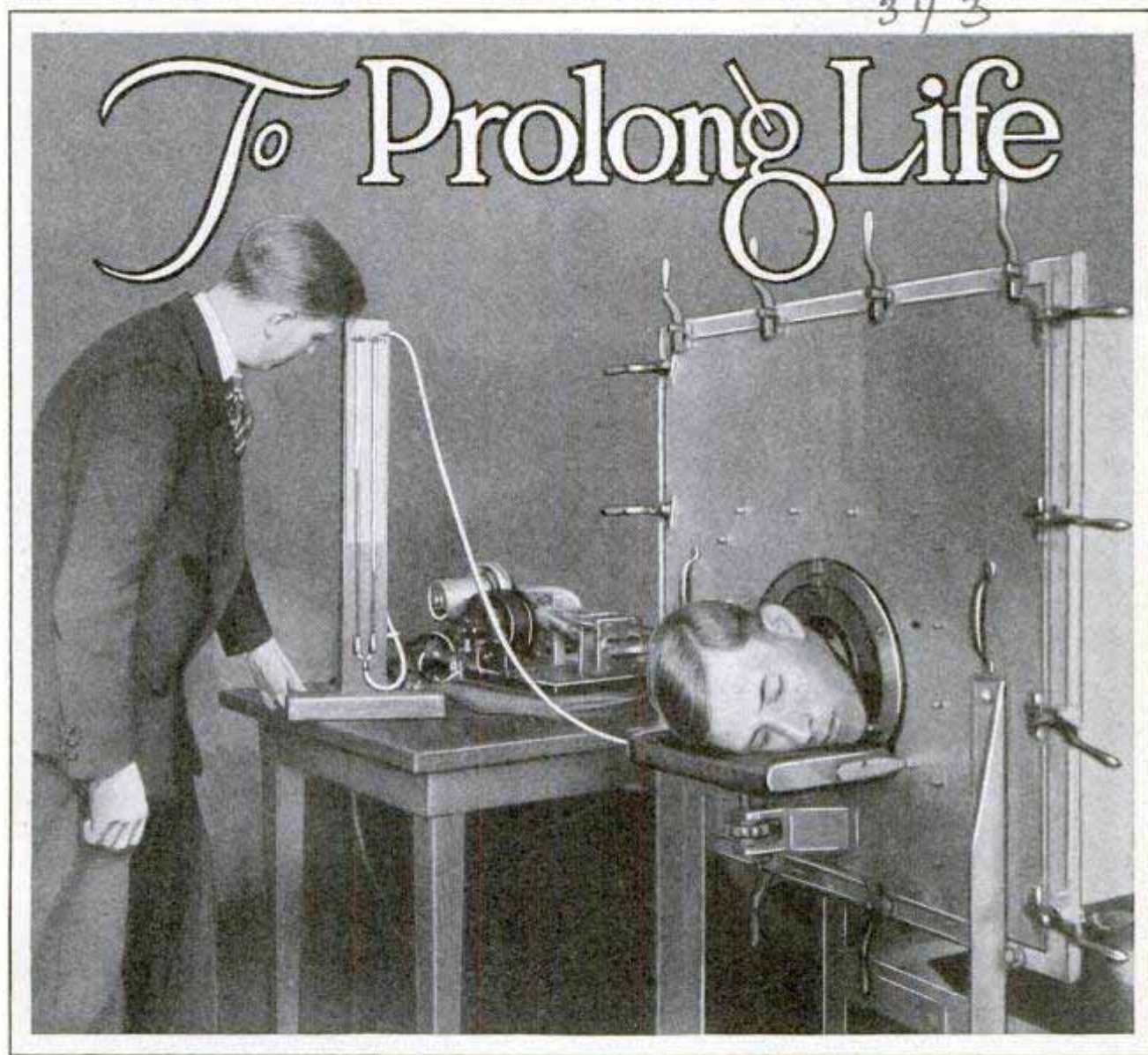
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 52

NOVEMBER, 1929

No. 5



A Mechanical Breather, in Which the Patient Is Sealed and by Means of Positive and Negative Pressure Is Forced to Breathe, Even Though Asleep; the Tube Connects to a Blood-Pressure Gauge

By ANTHONY WAYNE

MEDICAL science is finding in mechanical contrivances a close and useful ally in the saving of life. When, through accident and disease, it is impossible to breathe properly, to sleep or eat, the mechanically inclined physicians have stepped forward with new inventions that will save many lives and make for health.

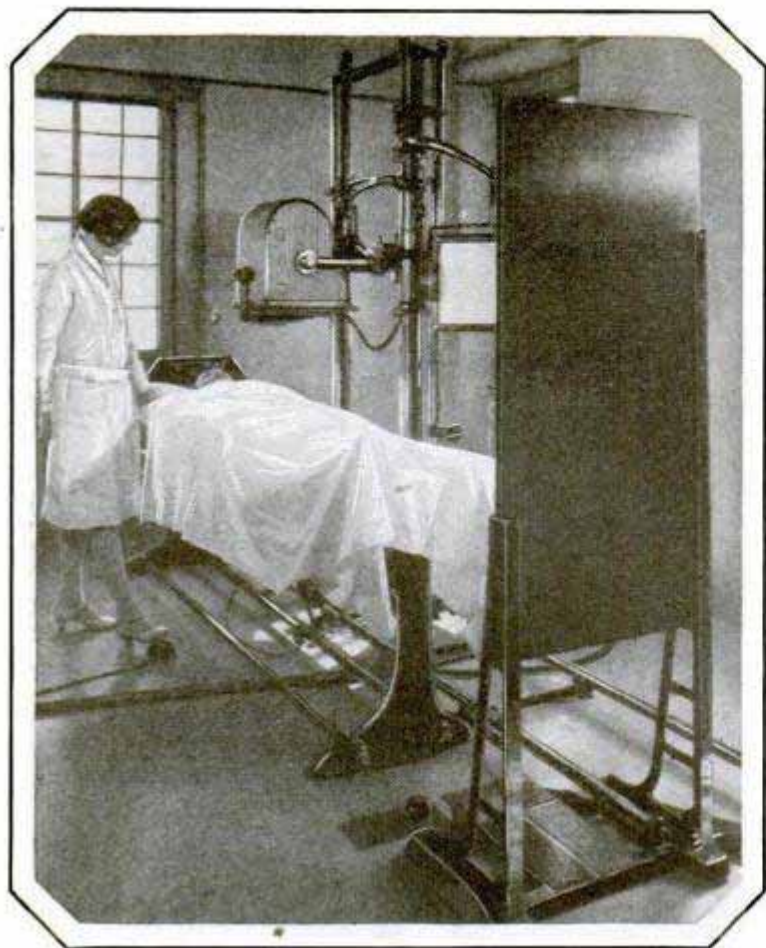
The new science of mechanical aids for man is based on the theory that the body is made up of many parts even as the automobile is put together by the use

of bolts, rings, valves and other devices. Suppose the heart fails. If injections are given to prevent blood coagulation, adrenalin, a powerful stimulant, will force the heart to function again. Without such injections, the individual must certainly be considered dead, and not many years ago would have been gone past recovery. Now he may live again.

The new science says that even if a man stops breathing in a normal way, he may be aided to keep on living. The

W. H. Vincent Wilcox
International Bldg
705

343
706



An Oil-Immersed X-Ray Apparatus Gives Protection from Shock and Its Capacity of Helping People Is Increased

principle is the same as with the loss of a spark plug in a machine or the short-circuiting of the ignition system. The whole automobile is not discarded nor is it necessarily worn out.

Not long ago Dr. O. S. Gibbs, of Dalhousie University, was able to keep cats alive over long periods with a rubber pump substituted for a heart. If the lack of a true heart can be considered as death, then certainly these cats were dead although they were capable of movement. Their artificial hearts worked as well as the hearts which nature gave them.

In Bellevue hospital, New York, there has recently been installed a machine that supplies the necessary stimulus to the individual who needs help in breathing. The manual system of producing artificial respiration has done wonders, but the latest apparatus for this purpose will do much more and revive many who might certainly have been considered dead according to past experience. The method is specially applicable in cases of electric shock, concussion, gas poisoning, smoke or drowning and industrial accidents.

In this, the newest of the artificial aids developed for man, the patient is placed in a hermetically sealed tube, his head protruding through an air-tight rubber collar. Respiration is brought about by rhythmically increasing and decreasing the pressure in the chamber. The degree of pressure can be closely watched and the change and the temperature in the cabinet may be controlled from the outside. A blood-pressure gauge also is used. If oxygen is to be given, a hood is placed over the individual's head. By such purely mechanical means is restoration to normal conditions possible.

Recently, Dr. S. S. Brunkhanenko was able to revive a detached dog's head by supplying it with an artificial heart, with a blood substitute composed of salts of blood and adrenalin. "The severed head opened its eyes, rejected acids with the tongue and swallowed a piece of cheese laid on the tongue. For more than

three hours every test showed that the dog's head was alive," the doctor stated. This is along the same line as the method used to make a frog's leg muscles move by means of the application of a high-voltage electric current. The nerves are still capable of reacting to the stimulus, even though the animal ceases to function as a whole.

The mechanical respirator, which was perfected by Philip Drinker and Louis A. Shaw, of Harvard University, is so designed that the patient lies on a mattress placed on a trunk which is attached to the lid of the tank. The head and neck extend through a rubber collar. The lid and trunk of the tank can be quickly pulled in and out with ease to permit occasional examination.

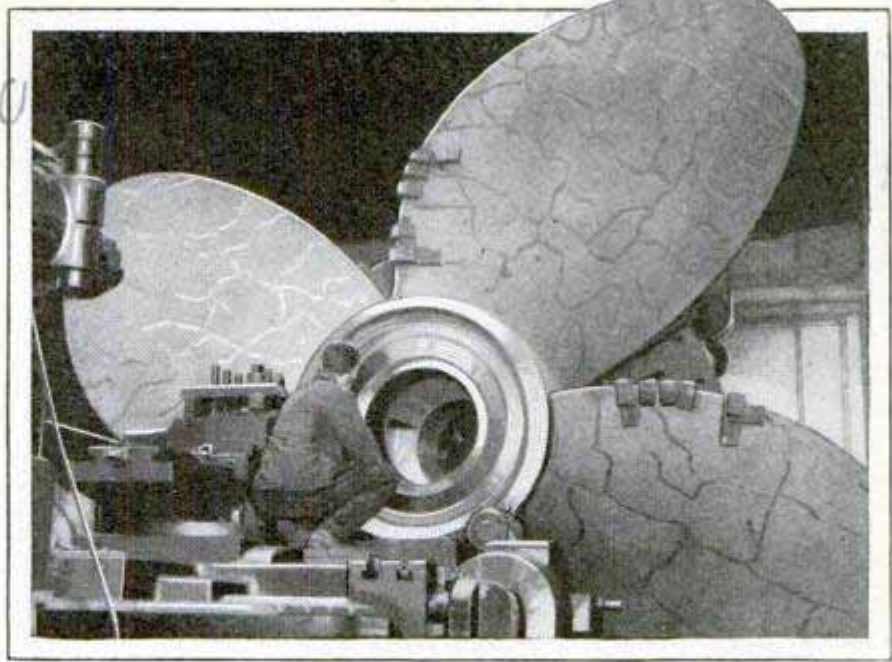
By means of electrically driven blowers, alternate positive and negative pressures are applied. A little girl was placed in the mechanical breather because certain of her muscles were paralyzed, and her life was preserved although ordinarily she could have lived but a few hours. In this strange machine she lived and even slept.

Continued (in Sept. 1929)

SEISMOGRAPHS TO HELP BETTER HIGHWAYS

3440

To study the effects of passing vehicles on roads of various kinds, a western company has installed a number of seismographs, ordinarily employed to register earthquakes along the highways. The instruments are said to record simultaneously the extent of the vertical and horizontal earth movements, thus furnishing important data to help in determining the best sort of road surface for long wear under operating conditions. Seismographs were used during the war to determine the range of enemy batteries.



Twenty-Ton Bronze Propeller for the "Empress of Japan"; Figure of Man Emphasizes Its Enormous Size

BIG SHIP'S BRONZE PROPELLER WEIGHS TWENTY TONS

What is said to be the largest bronze propeller in the world has been made for the new Canadian Pacific liner "Empress of Japan." It weighs twenty tons and required a cast weighing fifteen tons more during its construction.

MINIATURE PLANES ON WHEELS FOR CHILDREN'S CONTEST

3446

Children of France are becoming air-minded, and engaging in airplane races on the beach at La Baule is their latest sport. Miniature planes mounted on three wheels, two forward and one at the tail, provide the craft for the contestants and pedals furnish the power.



French Children Race in These "Airplanes" Equipped with Three Wheels, While Pedals Furnish the Motive Power

SPRAYER DRIES FOOD EXTRACTS

3456

Drying fruit juices, milk and milk products, chocolate, margarine, beverage extracts and rubber latex is accomplished with an atomizer made by a Danish concern. The atomizer is adjustable for thin or thick liquids and is capable of producing uniform particles of large or small size. Evaporation from such particles is extremely rapid, which means that the moist product is subjected to heat for a shorter period, giving quick desiccation at a low temperature, so that none of the products to be dried is damaged. The process retains the vitamine content.

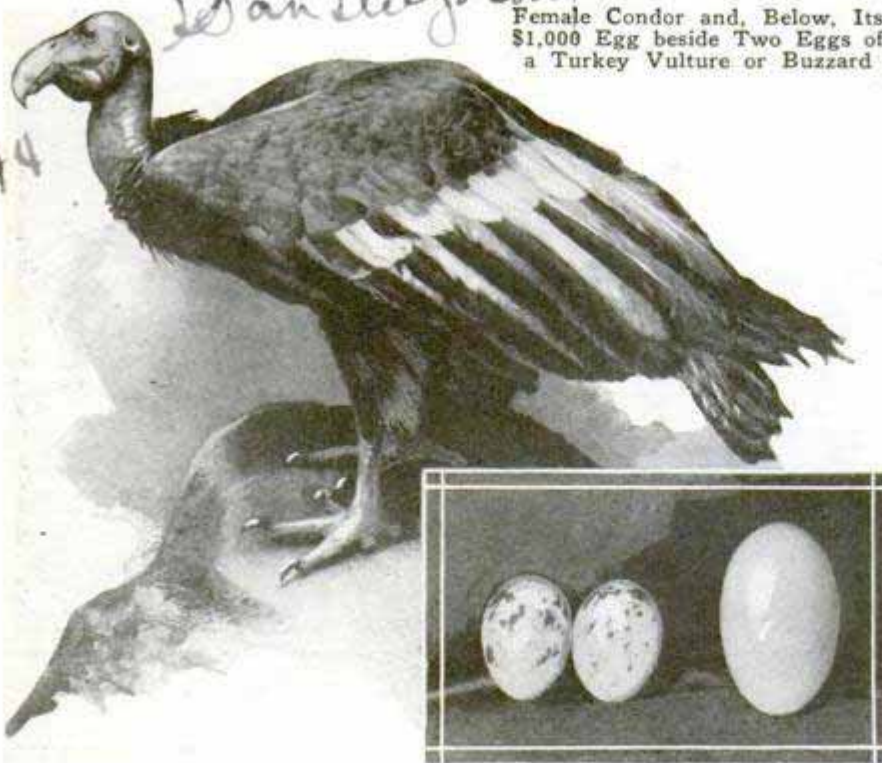
W. S. Lyngbyvej, Hurs, Sted, 11

Denmark

California Condor
San Diego Calif

Volado
Ohio

3444



Female Condor and, Below, Its \$1,000 Egg beside Two Eggs of a Turkey Vulture or Buzzard

year, occasionally only one egg every two years, and the young birds remain for two or three years with their parents. The nest is a mere hollow, scooped in the sand and dust of the floor of some inaccessible cave in the face of a cliff far back in the mountains. Distance and time are of no importance to birds of such power and speed of flight, so that the nest is often fifty to one hundred miles from the feeding grounds. The condor egg is approximately four and one-half inches long by two and one-half inches in diameter at the widest part,

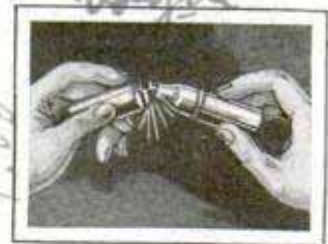
YOUTH FIGHTS CONDOR TO WIN THOUSAND-DOLLAR EGG

An egg of the almost extinct California condor has been found in a cave some fifty miles back of Ensenada, Lower California, by Carlos R. Lume, a young hunter and trapper. This egg, valued at \$1,000 in cash, or \$2,000 in exchange for other zoological specimens, is the fifteenth known to be in museums and private collections, and the first to be collected since 1915. Lume battled more than an hour with the two parent condors before he was able to escape with the egg. The California condor is the largest of the vultures, and also the largest bird that flies, individuals having been taken which exceeded in size the condor of the Andes, supposed to have been the original of the fabled Roc. The wingspread of the California condor is eight and one-half to nine and one-half feet, and the weight from forty-five to sixty pounds. In spite of its great size, the speed of the condor is estimated at sixty miles an hour, and the soaring range at 3,000 to 4,000 feet, whence, naturalists believe, the great vulture discovers its food by sight rather than by smell. Ornithologists assert that California condors do not mate until they are four years old and remain mated for life. Each pair produces but one egg a

equal-ended and olive-drab in color, paling in some instances almost to white.

LIGHTER STRIKES LIKE A MATCH SAVING WEAR ON THUMB

Springs, wheels and other units are not necessary on a cigar lighter operated like a match. A scratcher pin near the wick is drawn across a flint just as a match is ignited on a box. The lighter is then used, put back in the holder and is ready for another operation. A light, quick stroke ignites the wick, and there is nothing to get out of order.



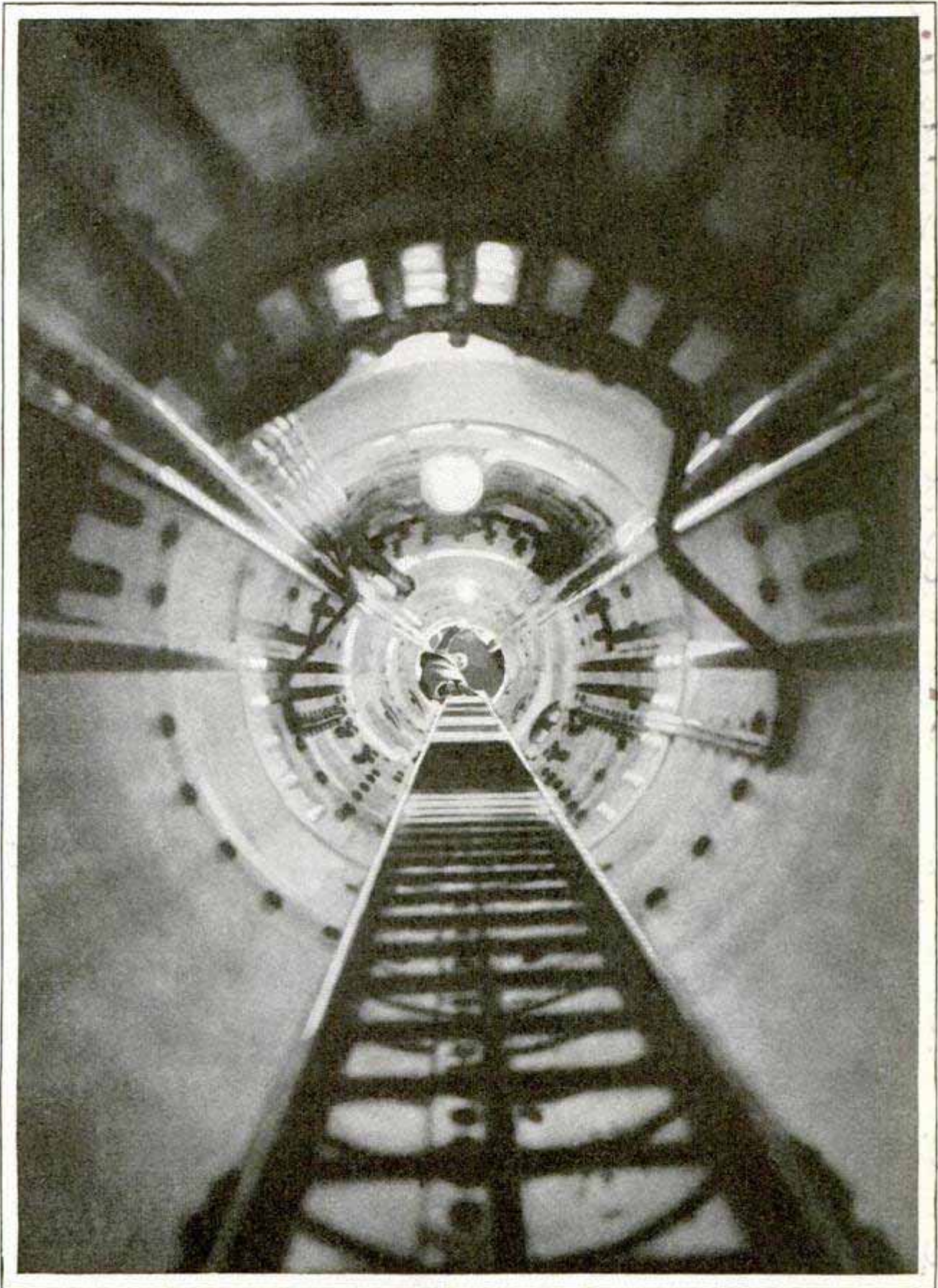
ACIDS MADE FROM SAWDUST

Acetic acid, the active principle in vinegar, and lactic acid, the substance that makes milk sour, have been prepared from sawdust and the process promises commercial returns, chemists at the recent meeting of the American Chemical society were told. The sawdust is first turned into sugar, then treated with a substance contained in malt sprouts and the acid is obtained by adding a micro-organism that ferments the sugars.

Prof. W. H. Peterson
R. J. Algerier
all

3443
Blade for spray
445
never used

University of Wisconsin

P. 241 8/10/29
"LOOKING-UPWARD" VIEW AT LINER'S CROW'S NEST

Looking Upward inside the Hollow Mast of the German Liner, "Bremen," Which Set a Transatlantic Speed Record; At the Top Is the Crow's Nest Reached by the Ladder inside the Mast; the Hollow Mast Enables the Lookout to Reach the Crow's Nest without Being Exposed to the Elements, and in Some Ships They Also Are Employed as Ventilating Shafts or to House Engine-Room Exhaust Vents

Boeing Engine

*any R. Cousins
A.M.T.C.E.
M.T.A.E.*



One Engine and Part of the Cabin of an Eighteen-Passenger Plane to Be Used on the Chicago-San Francisco Route

EIGHTEEN-PASSENGER PLANE WEIGHS OVER EIGHT TONS

One of the largest commercial airplanes ever produced in the United States is the Boeing tri-motored eighteen-passenger transport, which will follow a twenty-hour schedule from the Golden Gate to Chicago. Twelve similar ships are being built to be placed in this service. They have a wing span of eighty feet, weigh eight and one-half tons when fully loaded, are more than fifteen feet high and can carry a ton and a half of fuel.

CURRENT CONTROL ON BULBS TO CUT LIGHT BILLS

Electricity is "rationed" to the light bulbs in sufficient amount to keep them running at full efficiency while preventing waste of current, by means of an auto-

matic temperature control being tested in England. These are the claims for the unit, and reports of an actual test in London stated that the control apparatus effected a saving of more than twenty-eight per cent in current without any decrease in light, over bulbs not so equipped. Just as an electric range is not run for long at full heat, the current being turned down when the oven has been warmed sufficiently, so the new bulb device cuts down the supply, allowing just enough to keep the lights burning with full strength. It is a well-known fact that only a fraction of the current passing the meter is converted into light.

LION'S HEAD IS PICTURED IN STAMPS

Using only postage stamps for his materials, a French painter has made a life-size picture of a lion's head. Stamps of many different countries were used and 3,000 hours were required to complete the picture, which contains 50,000 stamps.



The Picture of the Lion's Head Was Made from 50,000 Postage Stamps of Different Countries

*Boeing Airplane Co. Boeing
Georgebeton Station, Wash. D.C.
Cant A.C. Packard
Vaneuil Square
Trancions, London W.1
449
Peldorine
Isolder Larry Road
11/21/23*

N. F. Fieret

McPherson

DIAMONDS MADE FROM CARBON AND METAL

Greater success in the production of synthetic diamonds is reported from McPherson College, where Prof. J. Willard Hershey, applying methods that were originated about thirty years ago and developing new ones, has made what he believes are the largest synthetic diamonds on record. He melts pure carbon with the filings of various metals in an electric furnace, then plunges the white-hot mass into an ice-cold saturated salt solution. The cooled material is treated further with chemicals and tested for diamond particles. Doctor Hershey believes that "the difficulties preventing preparation of large and beautiful stones are only technical."

ARMY SHOES AS FLOWERPOTS FEATURE NOVEL GARDEN

An English gardener has added a novel touch to his landscaping by reproducing



Gardener Tending His Old-Shoe Plantings; the Shoes Make Good Substitutes for Ordinary Flowerpots

scenes from the surrounding country in miniature. He also makes use of old army shoes to grow some kinds of flowers. The discarded shoes are partly filled with earth and employed as pots. They have the advantage of being unbreakable and the leather retains moisture for a long time.

H. Hatfield near Steyning



Servicing Tri-Motor Plane from the Special Truck Equipped with Electric Pump and Air Compressor for Inflating Tires

PLANE-SERVICE TRUCK FILLS TANKS BY MOTOR PUMP

Electricity replaces hand power in a service station on wheels to refuel airplanes. At a touch of a button on the dash control, gasoline is pumped into the airplane's tank at the rate of thirty gallons a minute. The truck holds 1,150 gallons of fuel and the pump is operated from storage batteries charged by a generator, run from a power take-off from the drive shaft. The outfit was developed especially for aviation purposes, and one of its earliest applications was in filling the plane that tended the "Question Mark" during its historic endurance flight.

FLAME FROM ALUMINUM DUST HOTTER THAN GAS

By employing powdered aluminum instead of hydrogen or acetylene gas, Dr. Frank M. Strong, of Syracuse University has produced a flame so hot that it will melt its way through any known solid when used in a blowpipe. The dust is fed from the bottom of a hopper by means of a screw conveyor. At the end of a brass pipe, it is met by a swift cross stream of oxygen. After being ignited, the two produce an intensely hot flame because free oxygen is yielded rapidly and the heat is concentrated on a small area.

☐ Slightly underripe fruits make the best pickles, Cornell experts advise.

Cleveland, Ohio

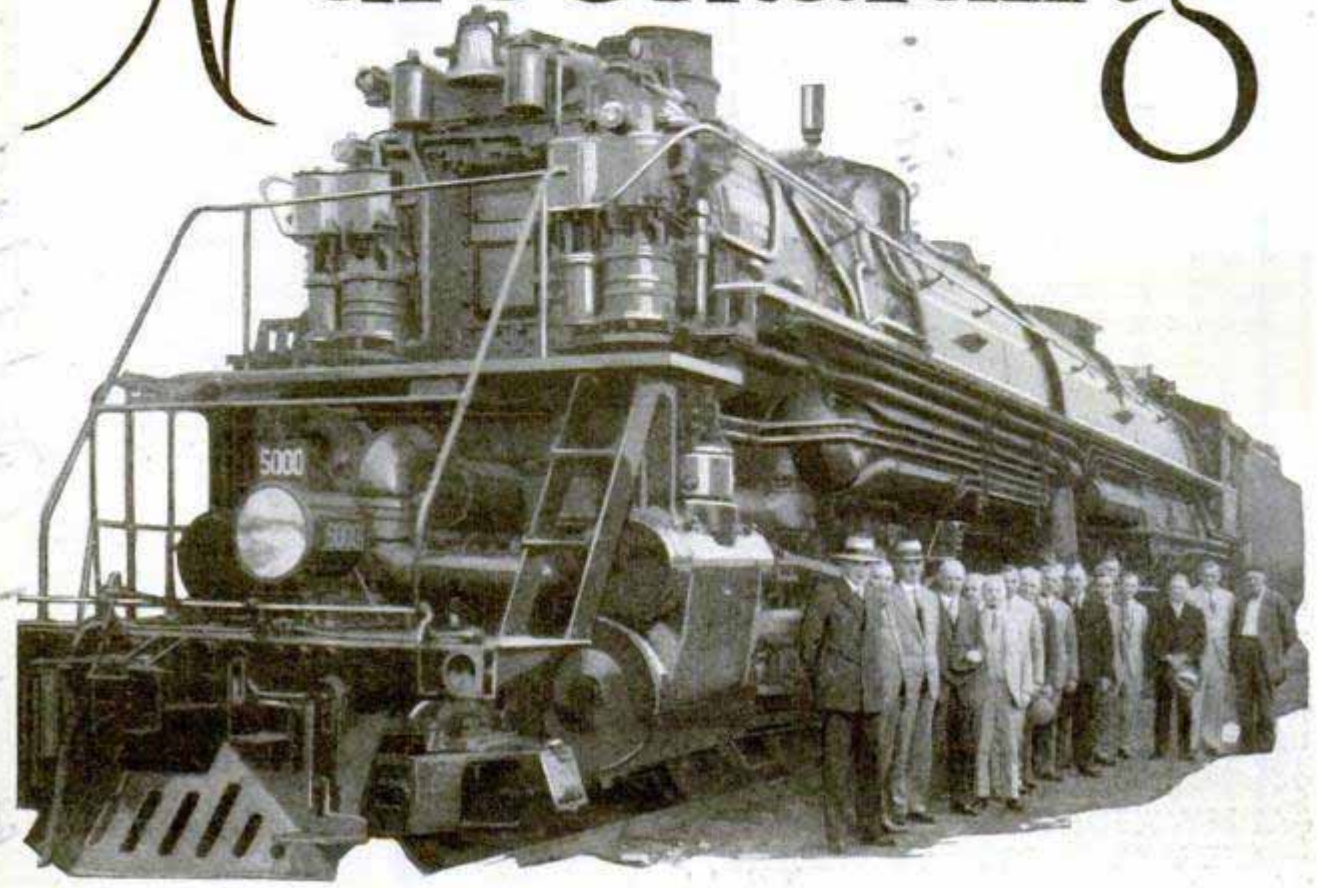
Ward by Richfield Bldg Los Angeles

Electric Service

Ohio

3250

Nursemaiding



Officials of the Northern Pacific Railway and Associates with No. 5000, Gigantic Steam Locomotive Which Is 125 Feet Long and Operates between Glendive, Mont., and Mandan, N. D.

By EARL CHAPIN MAY *Sharon, Conn*

A GROUP of firemen and engineers were swapping stories of trouble met while on the line.

"I was running a fast eastbound passenger," one volunteered, "and was just coming into Westboro, Mass. The station platform was filled with people and my engine was shooting past when my right side rod broke. Before I could slap on the air, the left rod buckled and snapped off the main pin. Both sides of that engine were sure torn up."

"What happened then?" inquired a bystander.

"Oh, nothing much," the big fellow replied. "I just stayed with the engine on the track until an engine from a local freight dragged me onto a siding and then took my train into Boston. After that the wrecking crew turned up."

"About the only trouble I have these days," chimed in another locomotive cap-

tain, "is when my driving wheels slip going up a grade. These darned new engines are so heavy they spin on wet rails in spite of sand, until I cut in my booster engine."

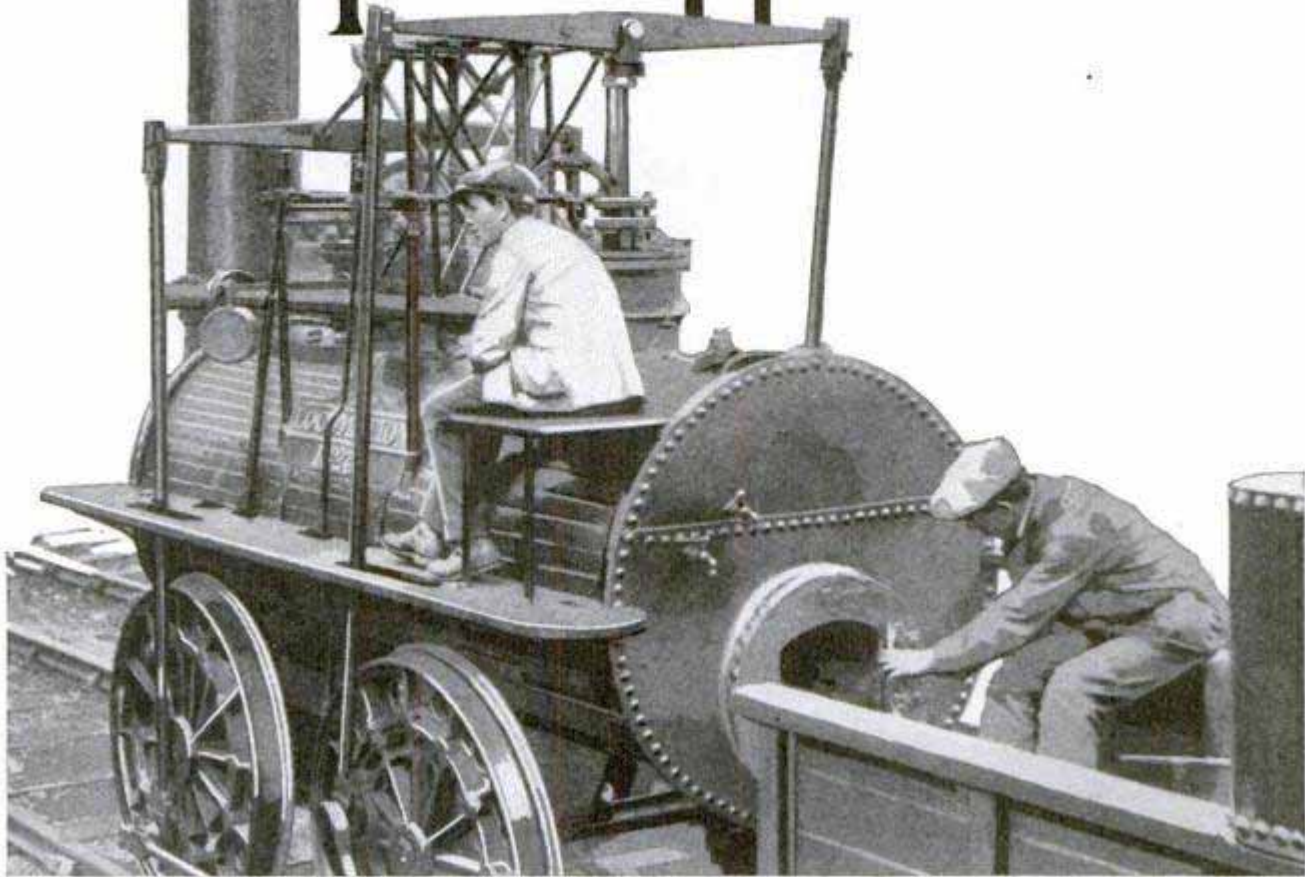
"Why don't you send for a wrecker, Joe?" a veteran demanded. "About all you youngsters seem to know is to holler for help from the wrecking crew. When I began handling an engine throttle I was taught to take care of it myself. I carried the tools to do it, too. About all you fellows take out with you is a monkey wrench and a pick."

"That's about right," the first speaker admitted, "but we can't be experts on all the jewelry on the latest model locomotive—and carry a machine shop with us, too."

"Superintendents of motive power, master mechanics and their men are just naturally nursemaiding our iron horses,"

*used on first engine
Darlington. Stockton 1825*

the Iron Horses



Historically Important in British Railroading, the Locomotive No. 1, Built by George Stephenson in 1825; the Engineer Had an Outdoor Seat on the Left Side, While the Fireman Rode in the Tender

added another denim-clad engineman. "That's why they get so much service out of engines—through modern methods of handling them."

The last speaker voiced a principle of the policy prevailing on all Class-1 railroads. This policy is in sharp contrast to that pursued years ago. Then engine crews wrestled with breakdowns while passengers paced around the stalled train impatiently. Enginemen in charge of railroad motive power now are expected to "take it out and bring it in again." Because of the increasing intricacy of steam engines, their crews have much more responsibility than did the enginemen of twenty or forty years ago, but they operate on a much larger margin of safety. For most of the trouble shooting is done by shopmen before the engines leave the terminal.

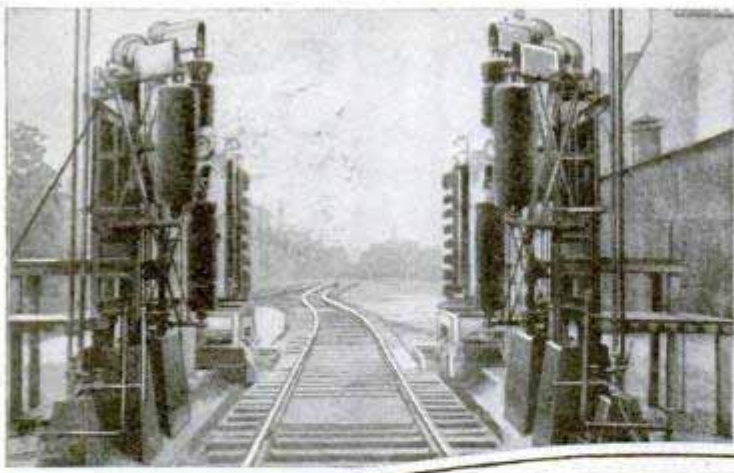
Twenty years ago a first-class passenger engine weighed in the neighborhood of

190,000 pounds and cost approximately \$30,000, while the best freight engines of that period cost a little more and weighed about 215,000 pounds. Today the famous Hudson type of motive-power unit weighs 351,000 pounds, and a Mohawk or Berkshire type of freight engine weighs 15,000 pounds more. Each costs about \$90,000. These weights are exclusive of the tender.

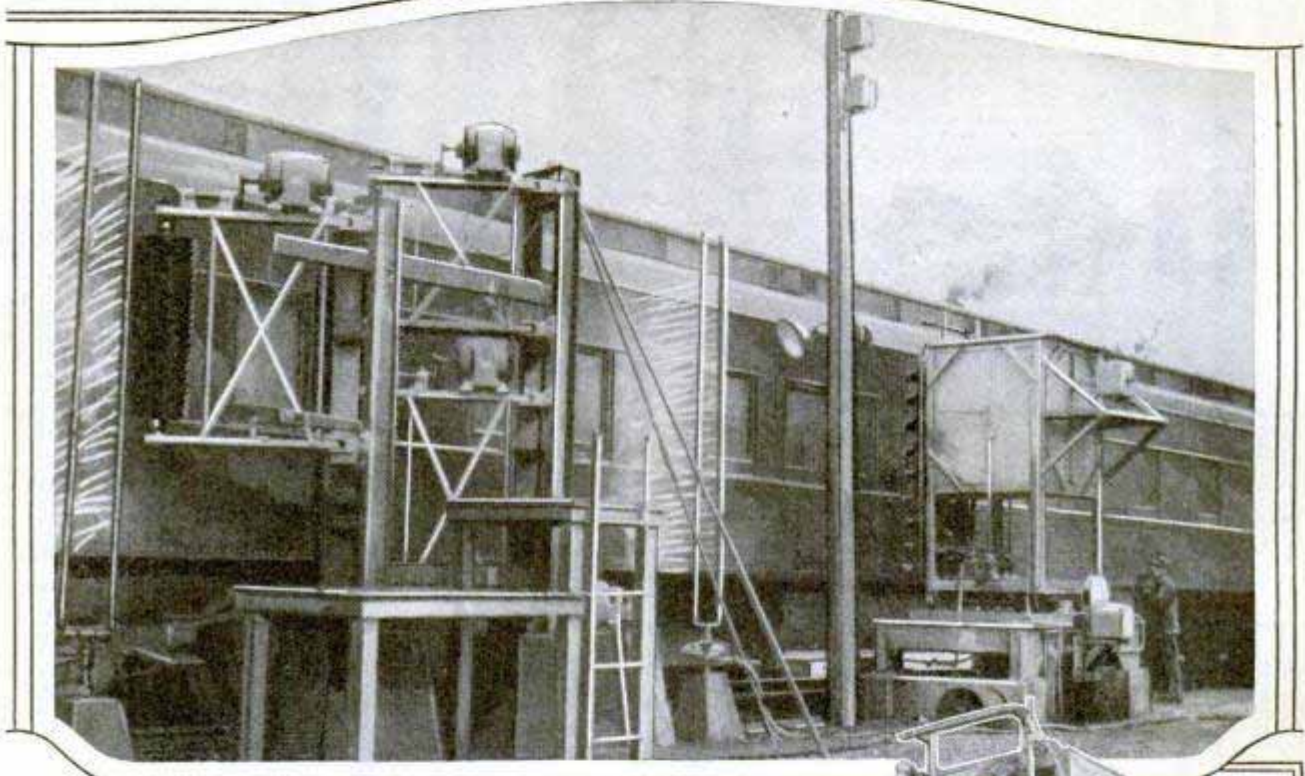
Once these great iron horses have been completed, and accepted after road tests by traveling or foreman engineers, they go into service. But after fifteen days of hauling freight or passenger trains on schedule, they go back into the shops for a "washout." A washout on the line is an accident which may result in a disaster. Invariably it is expensive. A washout in the shops is plain insurance, through maintenance of maximum pulling power.

There are seven distinct operations in an engine terminal washout. Not only is the boiler cleared of sediment by running

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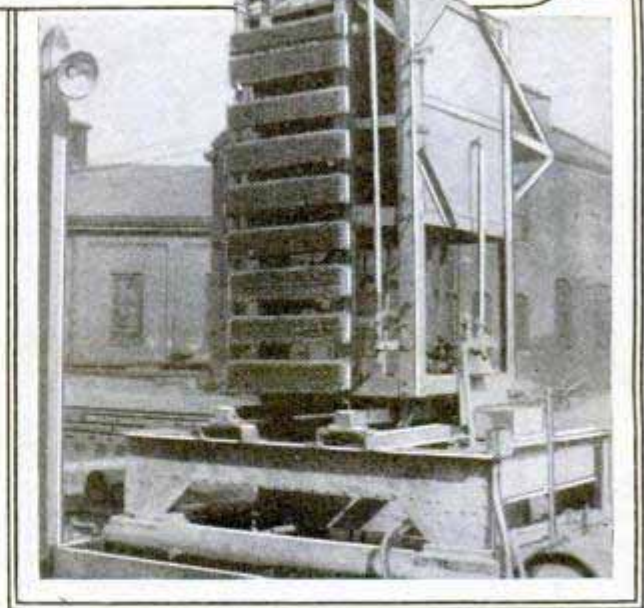


dered coal through the mechanical stoker are held by hook bolts. If the bolts are loose they must be tightened, if the jets are worn they must be renewed. At the same time the stoker's distributing plate is examined and must be replaced if it has been burned. The front end of each main rod, running from the pistons to the driving wheels, must be taken down and the rod examined with a magnifying mirror for checks,



warm water from the top of the boiler out through the mud ring at the bottom, thus avoiding inside "blistering," but strainers, feed-water lines, tank valves and tank are cleaned. The cold-water sprinkler inside the tank and tender, and all pipe connections with that tank, are tested and examined carefully. The exhaust nozzle on the little booster engine, which acts as an accelerator when an engine starts or has trouble with a heavy load going over a hilltop, is cleared of accumulated dust or grease. The exhaust-nozzle bridge, which splits the forced draft in the smoke box and thus increases temperature, is renewed, if necessary, that is, if it is worn and hence does not function properly.

The air jets which distribute the pow-

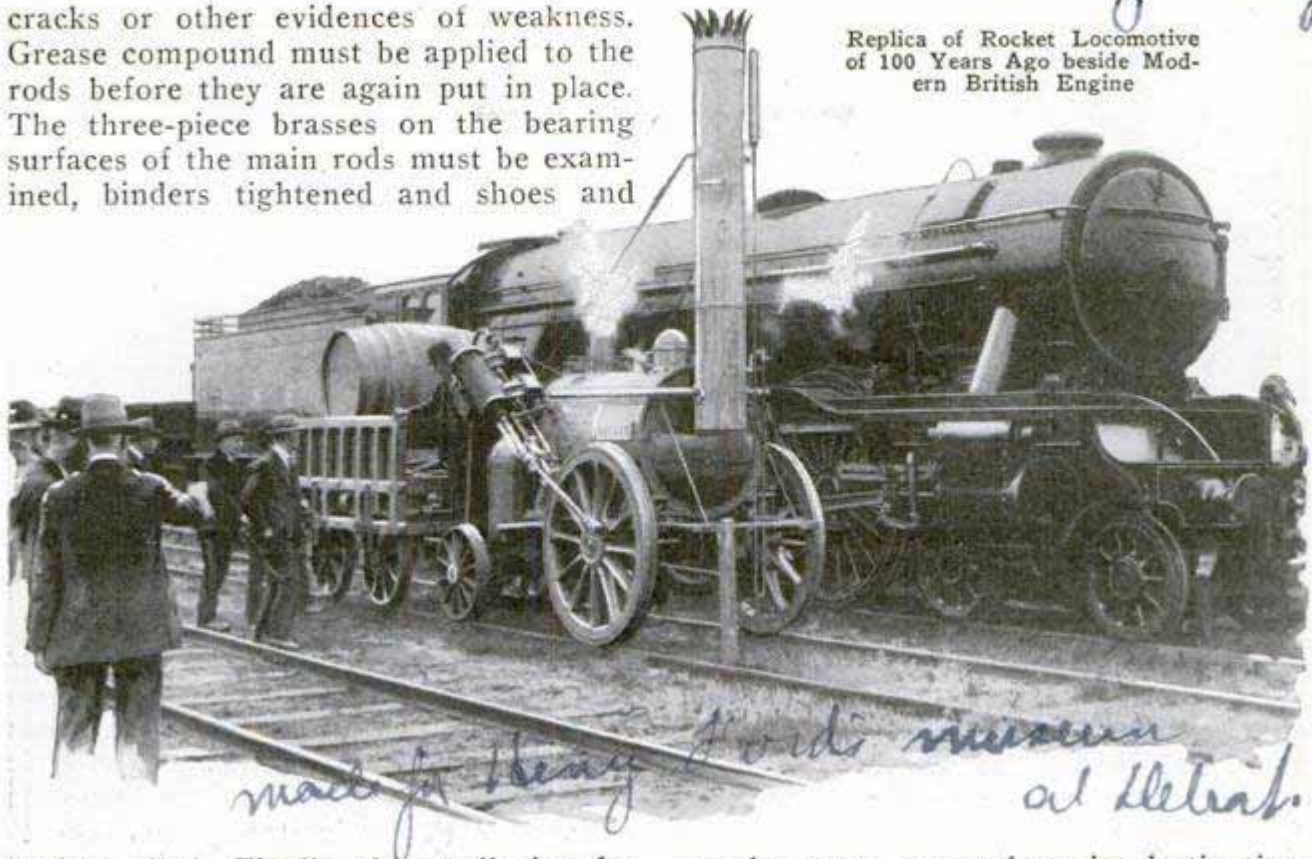


Views of a Modern Car-Scrubbing Installation, Showing, from Top to Bottom, the Brushes, Water Jets and Oxalic-Acid Pipes

Developed by Baltimore and Ohio

cracks or other evidences of weakness. Grease compound must be applied to the rods before they are again put in place. The three-piece brasses on the bearing surfaces of the main rods must be examined, binders tightened and shoes and

Replica of Rocket Locomotive of 100 Years Ago beside Modern British Engine



wedges oiled. Finally, the small pipe descending from the boiler top to within three inches of the crown sheet of the fire-box must be cleaned, because, when water gets low enough in the boiler to expose the bottom of that pipe, steam rushes up it and blows a whistle. This low-water alarm tells the engineer to start his pumps before the crown sheet is uncovered—unless he wants the boiler to explode.

In the old days, when 160 pounds of pressure was high, boiler explosions were not infrequent, though the engineer could determine the height of water by testing with hand gauges or by watching the water glass. Now, with 250 pounds of pressure, he may ignore the boiler's gauges and the special alarm whistle will give him timely warning.

In the more picturesque but less practical days of years ago, the same engine crew took out the same engine and no other crew ever sat in its cab. Now, engines are turned out in types and are distinguished by numbers, and each is handled by many crews, a kind of mass production in motive power. These engines are on duty all the time they are not under shop inspection. On long, high-speed runs of crack passenger locomotives, a crew will leave the engine at each 150 or 200 miles, but the iron steed, guided by

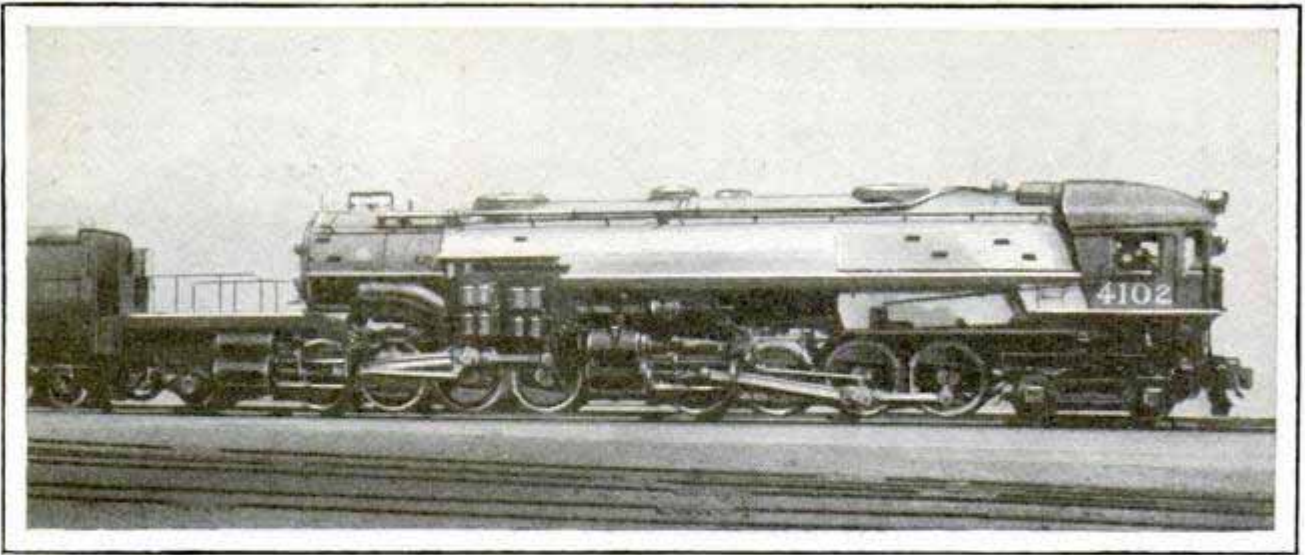
another crew, proceeds to its destination. It is a poor iron horse in this day and age which cannot cover 10,000 miles a month in passenger service or 5,000 miles a month while hauling freight.

Major troubles are rather rare. Although big engines on our roads carry 250 pounds of steam, a locomotive boiler seldom "lets go." Boiler explosions are almost unheard of in modern engines, because the builders know how to insure strength and stability, mechanical superintendents know how to keep the boilers in form, and the most careless of engineers cannot ignore the low-water alarm steam whistle.

The breaking of a side rod or a main rod is exceptional, because long testing has shown that the maximum of strength for weight is attained by fluting a main rod and that side rods should be plain or rectangular. Moreover, pounding or vibration is reduced by use of a three-piece floating bushing for the driving rods instead of the old-style stiff split brass held in place by adjusting keys. The new-style bushing is better lubricated and does not bind if it becomes warm enough to expand; hence it does not overheat the main pin, for example, and leave the engine helpless on the rails.

To the efficiency of the airbrake has

3250
716



Burning Oil and Weighing, with Its Tender, over 900,000 Pounds, This Cab-in-Front Locomotive Is One of a Fleet of Ten Delivered for Mountain Service over the Southern Pacific Lines

been added the automatic train stop which, if the engineer runs past a stop or caution signal, applies the air automatically, so the train is under control, no matter what happens to the enginemen. In the larger latest engines, the mechanical stoker has relieved the fireman of handling 5,000 pounds of coal per hour. Now the coal travels from the tender to the firebox along a revolving horizontal spiral, which has a series of three crushers, and is sprayed onto the fire.

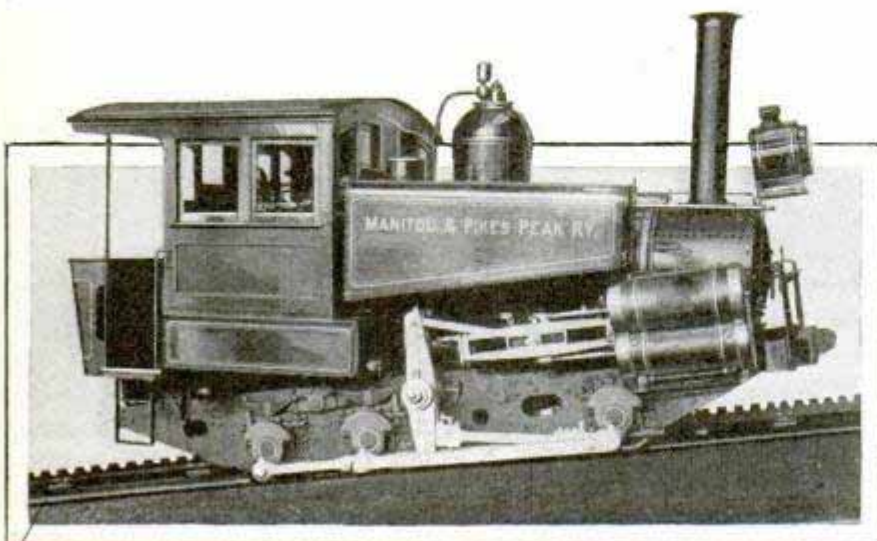
The lame-backed fireman of pre-stoker days would have welcomed the modern feed-water heater which heats the water from the tender before it enters the boiler, by subjecting it to exhaust steam. He would also have welcomed the modern superheater which increases the expansive power of the boiler steam, and the

devices which ring the engine bell by air and sand the rails almost automatically.

Instead of a dim kerosene lamp in front of the smokestack, a brilliant electric light, with its own power plant, supplies energy for the train stop. The old heroic days are past when a traditional Casey Jones, in order to avoid a head-on collision, flexed his biceps and pulled back on his reverse lever. There were giants in those days but they could not turn a trick of that character today. The locomotive's machinery is too heavy for mere man power. The engineer of this year's iron horse reverses it by spinning a small metal wheel actuated by steam or air pressure. This process is slower than the old lever, but is less laborious.

Engineers and firemen have it soft as far as using muscle is concerned, but life for two men in each cab is so complicated by mechanical appliances that they might be frequently in trouble if the mechanical executives and their assistants were not functioning so skillfully.

The difference between yesterday and today in American railroading is a difference in favor of modern methods and records, due to respect for rules laid down by federal and state commissions, enforced by railroad executives.



Tiny but Powerful; Special Locomotive Built for the Cog Line of the Manitou and Pikes Peak Railway

*Baldwin Locomotive Works
123 S. Broad St. Phila*

cannot locate maker 3426

GAS REFRIGERATOR FOR ICE-CREAM TRUCK

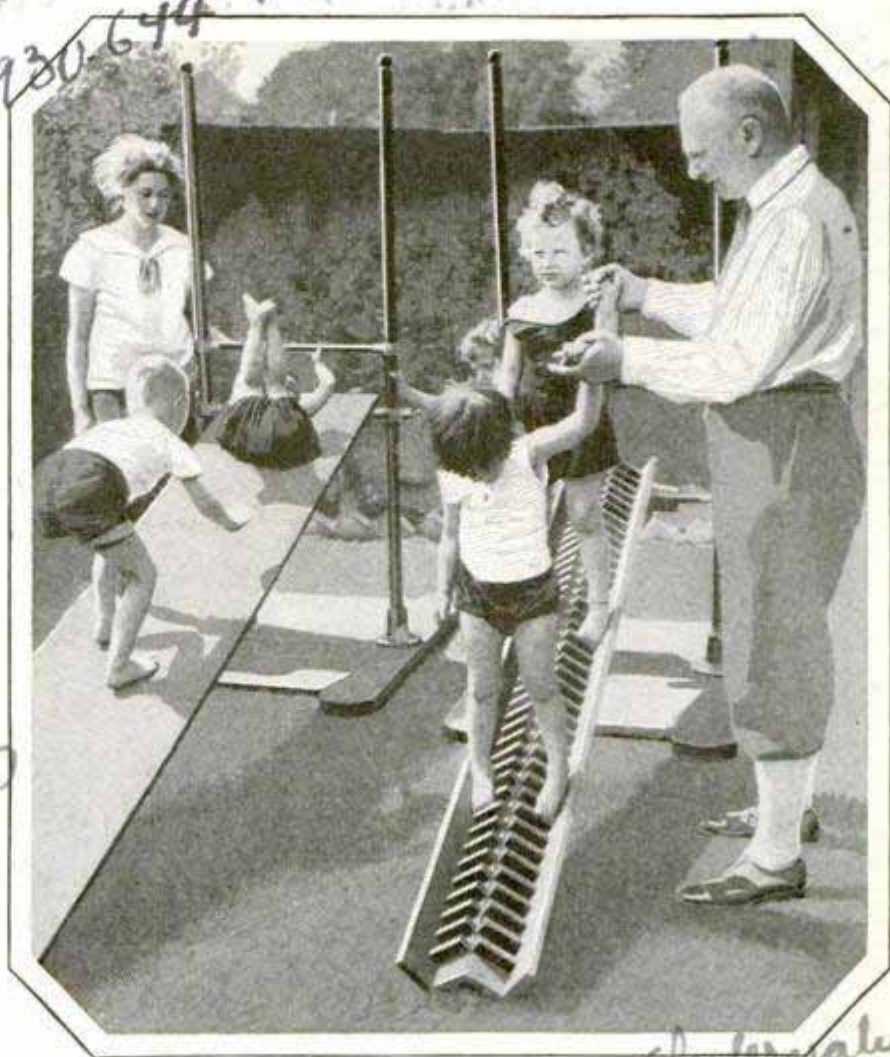
Ice-cream and milk-delivery trucks are being equipped with gas-burning refrigerating apparatus as a substitute for salt and ice. The plan is more effective and cleaner and is also said to be cheaper, particularly because the maintenance and service costs are greatly reduced. Successful operation of these refrigeration plants promises more extensive shipment of perishable goods by auto truck, owners point out.

see April 1930-6-44

"MYSTERY" PLANE'S SECRET IS THE COOLING SYSTEM

One of the principal secrets of the "mystery" plane which the navy is testing is the novel cooling system of the engine. It is modified to permit the use of "prestone," the high-efficiency cooling liquid. As a result small radiators can be used, and these are mounted on each side of the fuselage, thus reducing the air resistance.

3470

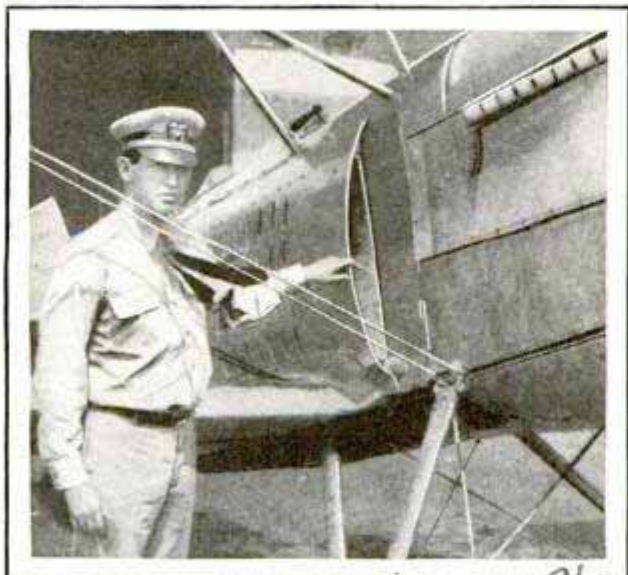


Youngsters Exercising in a Berlin Outdoor Gymnasium; the Foot Ladder Is of Special Benefit in Cases Needing Corrective Aid

International

CHILDREN'S FOOT GYMNASIUM CORRECTS DEFECTS

Extensive gymnastic training for young and old is being encouraged in Germany, and, at some of the schools and recreation grounds, special attention is paid to the children. In Berlin, for instance, one outdoor gymnasium has an inclined walk on which wooden blocks are set at angles. As the child steps over them in bare feet, the muscles of legs and arms are strengthened and minor foot defects are remedied.



Copyright, Underwood and Underwood
This Small Radiator on the Navy's "Mystery" Plane Uses a High-Efficiency Cooling Liquid

PIT TO STOP SMUGGLERS 3438

At the American approach to the Ambassador bridge, between Detroit and Windsor, to be opened next year, an inspection pit for automobiles, similar to service-station pits, has been constructed. Automobiles suspected of smuggling liquor will be required to run onto the pit, where custom officers will make a quick search for compartments under the floor.

*Lieut. J. Clark
Naval Air Station*

34/4
718

(No reply & letter)
7/10/30 July, 1930.
20



Motorboating and Flying Are Combined in This Racing Craft Equipped with an Outboard Motor Which at Times Causes the Craft to Leap into the Air and Fly Short Distances

OUTBOARD-MOTOR BOAT "FLIES" FOR SHORT DISTANCES

Motorboating and flying are combined in an outboard racing boat which at times actually leaps into the air and flies for

short distances. The boat is owned by Harrison Fraser, former holder of the outboard speed record, and he made the "fuselage" of his modern Pegasus of a racer to which he attached a twin-cylinder sixteen-horsepower outboard motor.

April 1931-588 probably. Austral
Ste. Ame. des Cycles Austral.
1 de la Republique 1923
France

HUNDRED-DOLLAR "BABY" AUTO DEVELOPS HIGH SPEED

Not much larger than a toy, a small automobile, said to be well fitted for



For a Limited Purse and Service in Heavy Traffic; the Hundred-Dollar "Baby" Auto

serviceable duty especially in the cities, has appeared in Paris. It costs but \$100,

is powered with a two and one-half horsepower motor and yet develops a speed of over twenty miles an hour. It was exhibited at a recent auto show.

STALKING BIG GAME BY PLANE

Twentieth-century marksmen are taking to airplanes to stalk big game in Africa. Guns, ammunition, portable film cameras, etc., constitute the outfit employed by the flying hunters and three or four hundred miles is an average trip, because the flyers do not care to run the risk of a forced landing in the jungle. Antelopes and other boldly colored creatures may be easily located from the sky, but the natural camouflage that characterizes the giraffe, leopard and other timid animals makes shooting them from above difficult. Only when large herds of animals move together across the prairies is there any certainty of shooting them from the air.

at auto show

Erig. Orenting
Johannesburg

payee note
San Francisco Chronicle

and
M. C. Elrick

AVIATION INDUSTRY'S GROWTH CALLS FOR MANY MEN

Nearly 25,000 persons are directly employed in the manufacture of airplanes and airplane motors in the United States, according to the department of labor. The industry has demanded special materials, metals, wood, cloth and rubber with a consequent increase in the number of workers; schools teaching aviation need instructors, hundreds of mechanics are employed, and the necessary distribution of gasoline to supply the airplanes has required more men. The department considers the development of any new industry, such as aviation, of special importance at the present time for the reason that it offers employment for many workers who have been forced out of older activities due to the adoption of machinery in those lines.

drawn age 9/15/19



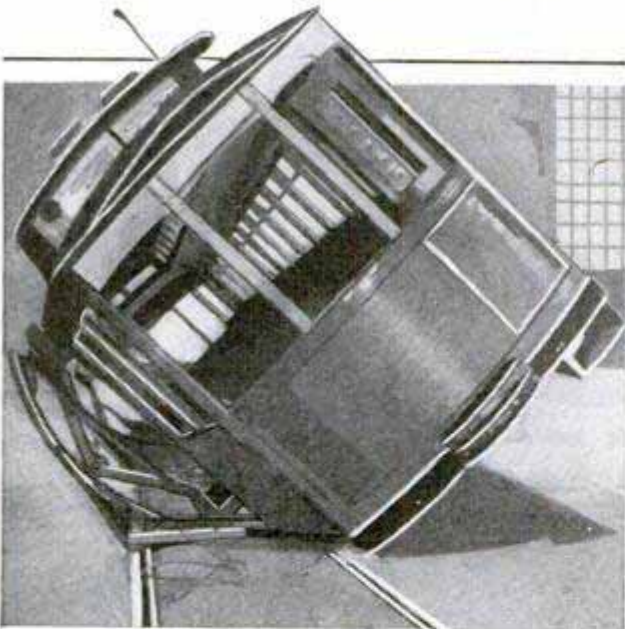
The Instrument Indicated Is an "Hourometer," Which Shows a Plane's Actual Time in the Air

PLANE'S ACTUAL TIME ALOFT SHOWN BY "HOUROMETER"

Indicating the actual time of an airplane in the air in hours and minutes is the purpose of an instrument designed by two Oakland inventors and called an "hourometer." A device near the landing gear electrically connects or disconnects as the plane rises or lands. It is expected to prove helpful in assisting pilots to keep accurate logs in endurance flights, etc.

TROLLEY CAR TILTED ON SIDE SO REPAIRMEN MAY WORK

Picking up a street car and turning it over on its side to give repairmen easy access to the bottom or top from the floor level of the shop, then tilting it back in an upright position, is accomplished by a



A Truck Which Tilts Trolley Cars into Convenient Positions for Repairmen

truck used by the Cincinnati street railway. The truck operates on the railway tracks on small wheels and has levers and cranks which hold the body of the car.

PHOTOGRAPH NOISES ON SHIPS TO END ANNOYING SOUNDS

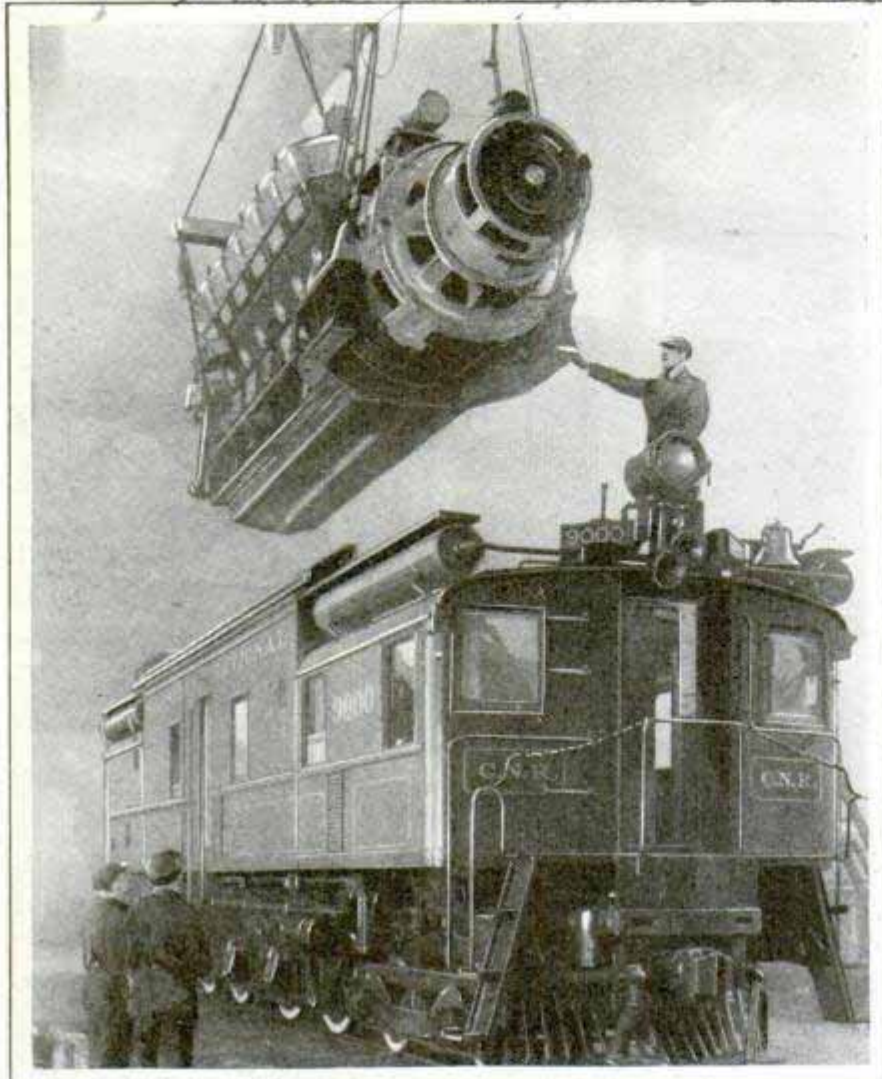
Annoying sounds on ships are being eliminated by a process of sound photography. Prof. A. M. Low, British scientist, is conducting the campaign by stopping or rendering the noise harmless to comfort. Phonographs are used to record many of the noises, and in other cases an audiometer. This is an instrument by means of which sound waves are collected by a trumpet, projected onto a diaphragm, thinner than a soap bubble and carrying a mirror on which the collected waves are projected as a beam of light. The oscillations of this beam are recorded on a film which forms the noise picture. The means to stop the sound is judged by its intensity on the photograph. After locating the noise, sound absorbers are placed about the source.

Winton's shop

Winton's shop 7129

341 720

*Designed by William Beardmore
Glasgow Scotland*



Huge Cables Were Used to Lower This 50,000-Pound Diesel Engine into Position to Operate Oil-Electric Locomotive

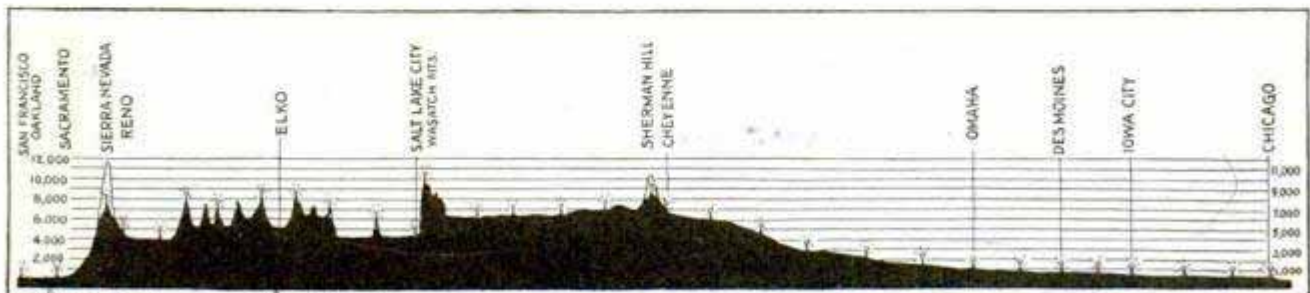
is a Diesel engine of mammoth size driving an electric generator, to supply current for the actual driving motors. Built in two units, the 9,000-class weighs 650,000 pounds, of which 480,000 pounds are carried on the sixteen drivewheels. Each unit consists of an oil-engine generator set mounted on the locomotive frame, boiler equipment to provide steam heat for standard passenger coaches and Pullmans, four traction motors, air brakes and other auxiliary equipment. Although electricity would be available for heating the coaches, steam was necessary as all existing coaches have been built for that type of heating.

3405
LONGEST LIGHTED AIRWAY CHICAGO TO PACIFIC

OIL-ELECTRIC GIANT OF RAILS BRINGS NEW ERA

Heralded as the most unusual departure yet made in the application of motive power, locomotive No. 9,000 has been given its inaugural run by the Canadian National railways. The new locomotive is unlike anything ever seen on a railroad, for it combines the electric drive with the heavy-oil Diesel engines which are rapidly driving steam off the seas. The result

Oakland-San Francisco air-mail, express and passenger route bears the distinction of being the longest lighted airway in the world. It extends over 2,000 miles with emergency landing fields every twenty miles for night flying, a revolving beacon every ten miles to keep planes on their course, and a flashing blinker every three miles. The route also contains the highest beacon in the world, that just west of Cheyenne, Wyo., which is 10,000 feet above sea level.



The Drawing Shows the Longest Lighted Airway Which at Night Guides Airplanes from Chicago to San Francisco; the Route Contains the Highest Beacon, 10,000 Feet Above Sea Level

Boeing systems

+40 76 8/21/29

2575

3435 San Diego St

San Diego Calif

FACES VS. INTELLIGENCE ARE STUDIED BY PSYCHOLOGIST

The photographer's stock warning, "Look pleasant, please," is sound advice, especially if the photograph is to be used in applying for a position or in any sort of competition, for a pleasant, alert expression improves your chances of appearing intelligent. This, at least, is the inference to be drawn from an experiment in which 600 men and women judged the intelligence of twelve photographed faces. Reporting the experiment before the International Congress of Psychology, Dr. R. S. Uhrbrock, of Cornell University, said that six of the twelve faces in the photograph represented men of high intelligence. The other six were men of lower mentality. Eight of the twelve faces were classified correctly by the judges, on the whole. But there were pictures of two men, both of whom had exactly the same high intelligence ratings. One face showed a drooping mouth, a snarl and averted eyes. More than three-fourths of the estimates said this man was a dullard. The other man looked the camera in the eye, with a pleased, agreeable expression. Three-fourths of the judges called this man bright. The investigation raises questions worthy of being pursued further, Doctor Uhrbrock said. It may be that certain facial characteristics are constantly associated with high or low intelligence in most people's minds. If these facial characteristics can be controlled, an individual may have himself photographed so as to put his best features foremost, or he may be able to select the one in a set of his own photographs that most accurately represents his intellectual level.



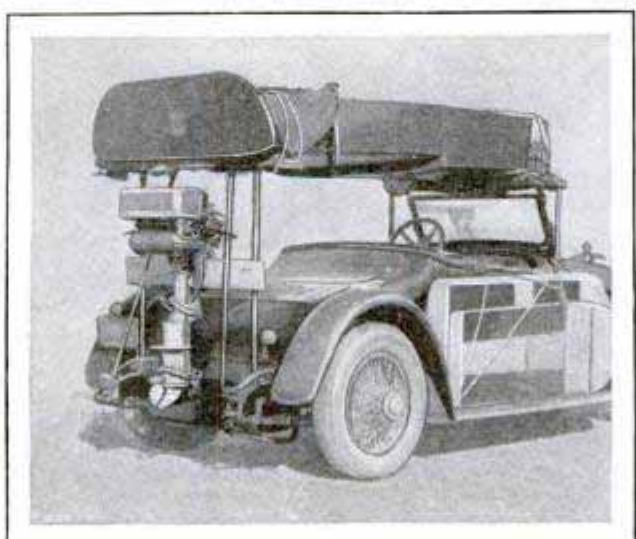
Small Pool Where Tiny Boats Sail in Calm and Windy Weather as Well; They Are Moved by a Concealed Wheel

SMALL SHIPS SAIL ROUND POOL REGARDLESS OF WIND

Small sailing ships in a San Diego pool sail around constantly regardless of wind direction to the mystification of visitors. Their motion is controlled from a lighthouse in the center of the pool which conceals an axle with a hub to which is attached a spoke for each vessel. The outer end of each spoke is bent upward and fastened under the ship. From whichever direction the wind blows there is always a filled sail to move one boat into the wind, keeping all in motion.

DETACHABLE RACK HOLDS BOAT FOR HAULING ON AUTO

For carrying a small power boat on an automobile, a detachable rack has been made which consists of two sections, the front one being a crosspiece of wood supported by two iron pipes bolted to the running boards. The rear-section supports are bolted to the frame of the car, being reinforced by rods leading to the ends of the springs to take up the shocks and eliminate topheaviness. The outboard motor may be clamped to a cross-piece at the rear.

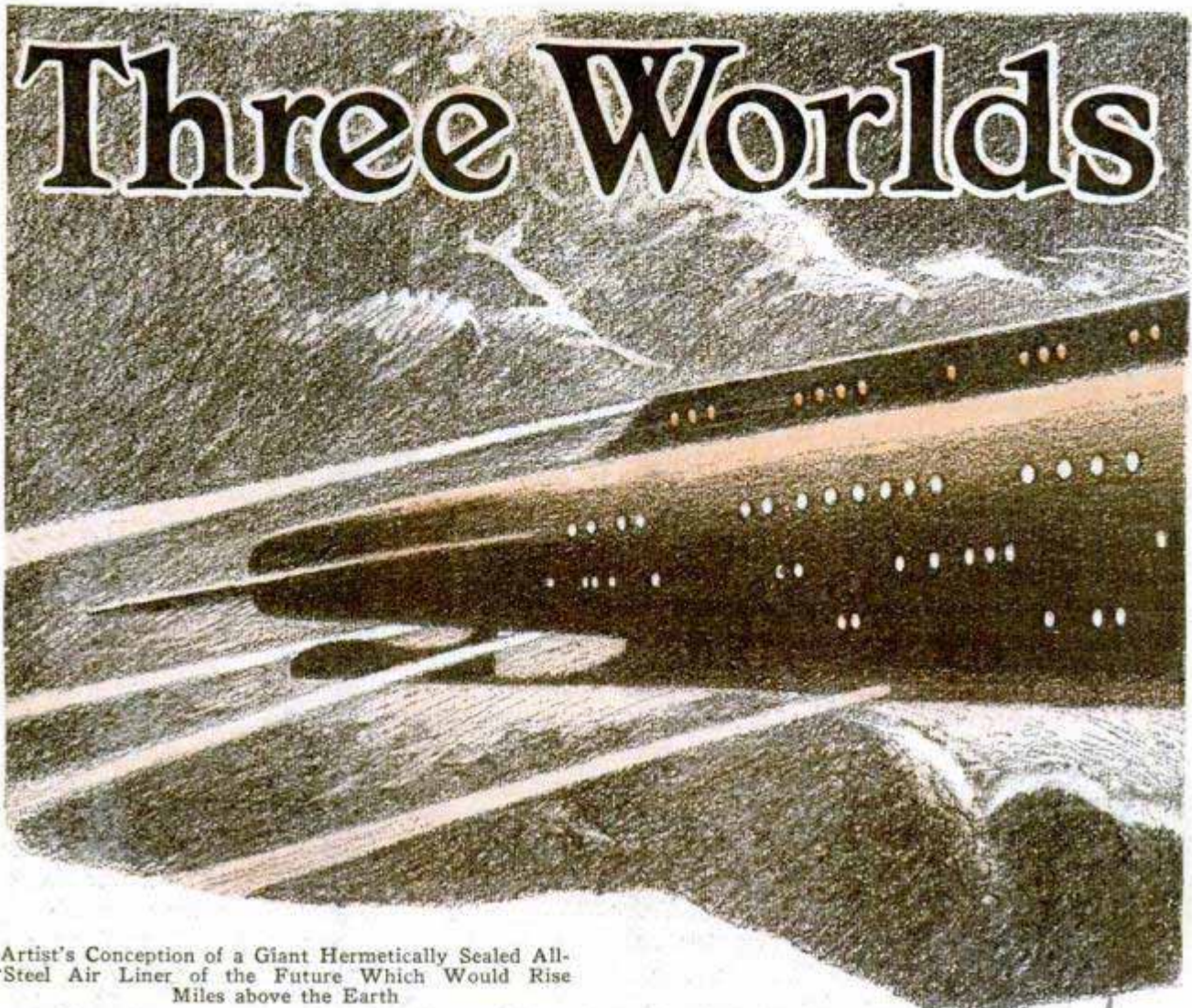


Detachable Rack for Hauling Boat and Outboard Motor by Auto; It Is Quickly Adjusted

3210
Ureigner. Lawrence J. Cornstock.
Ocean Park, Calif.

3000

Three Worlds



Artist's Conception of a Giant Hermetically Sealed All-Steel Air Liner of the Future Which Would Rise Miles above the Earth

By DON GLASSMAN

545 W. 111 St. New York

THE EARTH flings man a challenge. It offers three new worlds.

Lying outside the boundaries of latitude and longitude, these mysterious realms harbor strange creatures. The worlds of rock, water and gas need exploration.

The rock world invites men to search its porous crust for life that extends indefinitely toward the center.

The water world covers three-fourths of the globe's area, conceals vanished continents and supports a vast pageant of life.

The gas world is the sky sea. By volume stupendous, its life is both visible and invisible. Higher than we have ever believed, thrives a dominion of microscopic animals sustained by the sparsest air and enjoying frigid climate.

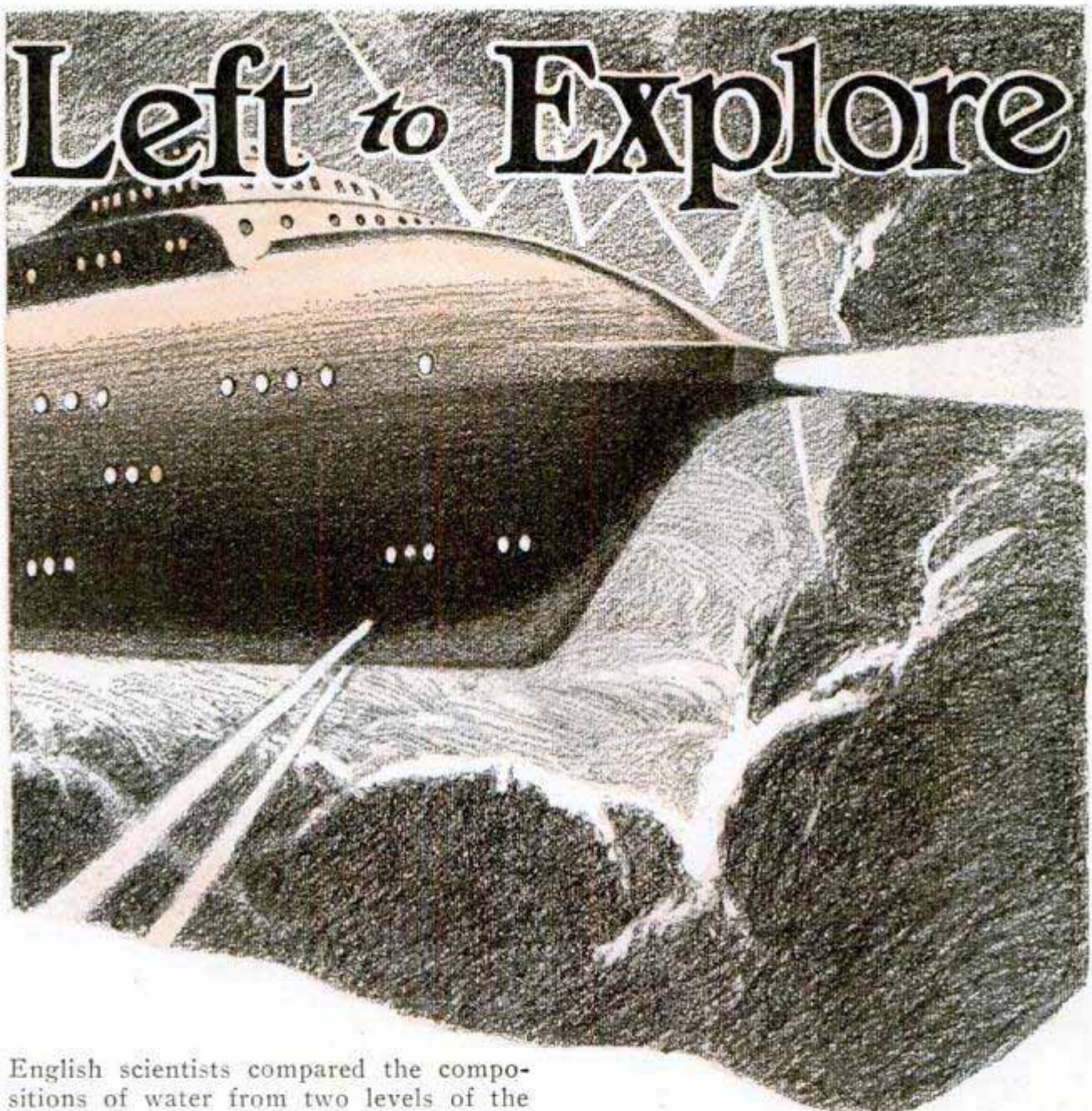
The most remote fastnesses on this earth have been reached by men independent of modern inventions. Columbus found a continent, Peary and Amundsen discovered the poles using simply sailing vessels

and dog teams. But the new age of discovery will be exalted by invention of a high order. In fact, inventors will share equal honors with explorers; for whithersoever a quest leads, the investigators will need tools, conveyances, instruments and machines.

Pressure and gravity are the forces the new explorer must overcome. He needs assistance, and the inventor fortifies him with the armor of his genius. So it is, the challenge flung to explorers concerns inventors also.

Just two years ago, when Dr. E. S. Bastin, of the University of Chicago, discovered a new subterranean realm, prevailing notions that life fifty feet beneath the surface of the earth was impossible were shattered, even though bacteria had already been found living in solid ice and boiling water.

How was subterranean life found? The story has its beginning in 1895, when two



English scientists compared the compositions of water from two levels of the ocean, one from the blue muds at a depth of 17,400 feet, the other from a shallow shelf, and found that shallow water is rich in sulphate and poor in lime, while water drained from the deep blue muds is rich in lime and poor in sulphate.

Then came a Russian scientist, Issatchenko. He dredged the Black sea bottom and raised mud samples from a depth of 6,300 feet and identified living bacteria. He found a whole tribe of "sulphate eaters."

"These bacteria eat sulphates in the deep sea bottoms," he said, "and that explains why shallow ocean water is rich in sulphates."

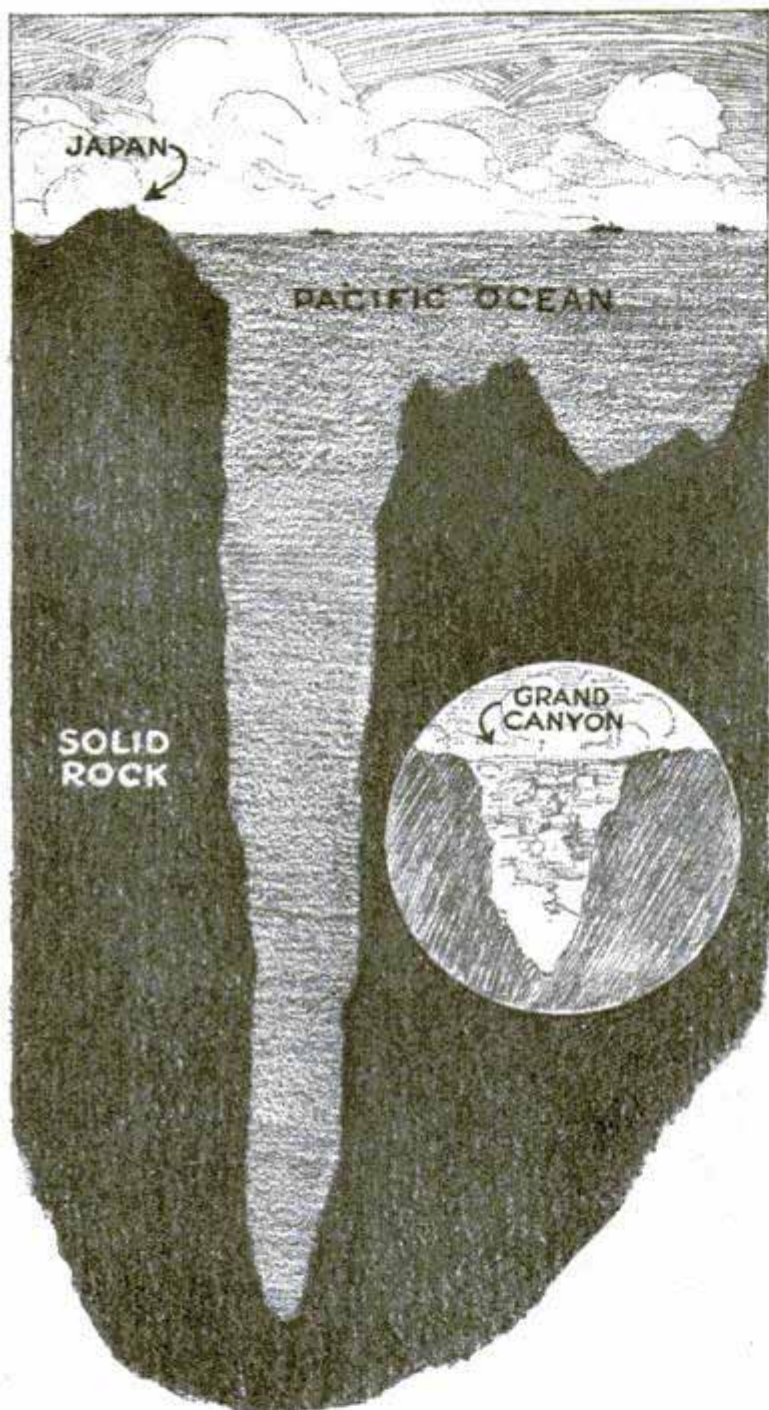
Like many others, Doctor Bastin pondered over the mysterious role of sulphate eaters. Now, in his work as a geologist

he had often wondered about the disappearance of sulphur-bearing minerals. "Were sulphate eaters responsible here?" he asked himself, repeating the old question, "Does life extend far below the surface?"

When a geologist thinks of mud he recalls oil, too. For oil is fatefully linked with mud, being secreted on the sea bottom by marine animals and sealed in a natural reservoir by mud. That is the fuel we tap today.

Where but to an oil well would one go for evidence of life, for oil is rich in sulphate? If sulphate eaters could withstand a pressure of 3,000 pounds a square inch at the bottom of the Black sea, why couldn't they withstand twice as much,

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Drawing Showing Comparison between Grand Canyon and a Gulch in the Pacific Floor Five Times Deeper

certain ore deposits; and the laws of a universal cosmos of life govern this globe.

The Submarine World

Actually, we have seen very little of what composes the ocean bottoms. No man has stood on the brink of the canyon described by George W. Littlehales, of the U. S. Navy.

"A stupendous trough fronts the eastern borders of Japan," he said. "Five times deeper than the Grand Canyon of the Colorado! Twelve hundred miles long and its sides unbelievably steep. This submarine gash is 100 miles wide. No natural or artificial feature on the surface of the earth compares with its overpowering grandeur."

At the bottom of Submarina, there is frigid darkness. The water is colder than ice. Never a ray of light leaks through. Who prowls here? Shark-nosed demons, fantastic and ghostly, attacking with saw teeth and tentacles. Their shapes and variety are infinite. They swim on a forage, driven by ravenous hunger.

Dr. Austin H. Clark, of the Smithsonian Institution, a veteran of many deep-sea expeditions, contends that our present knowledge does not permit us to explore the ocean bottoms. "A diver's descent of 360 feet is nothing," says Doctor Clark, "when you consider that the

such as obtains under one mile of rock?

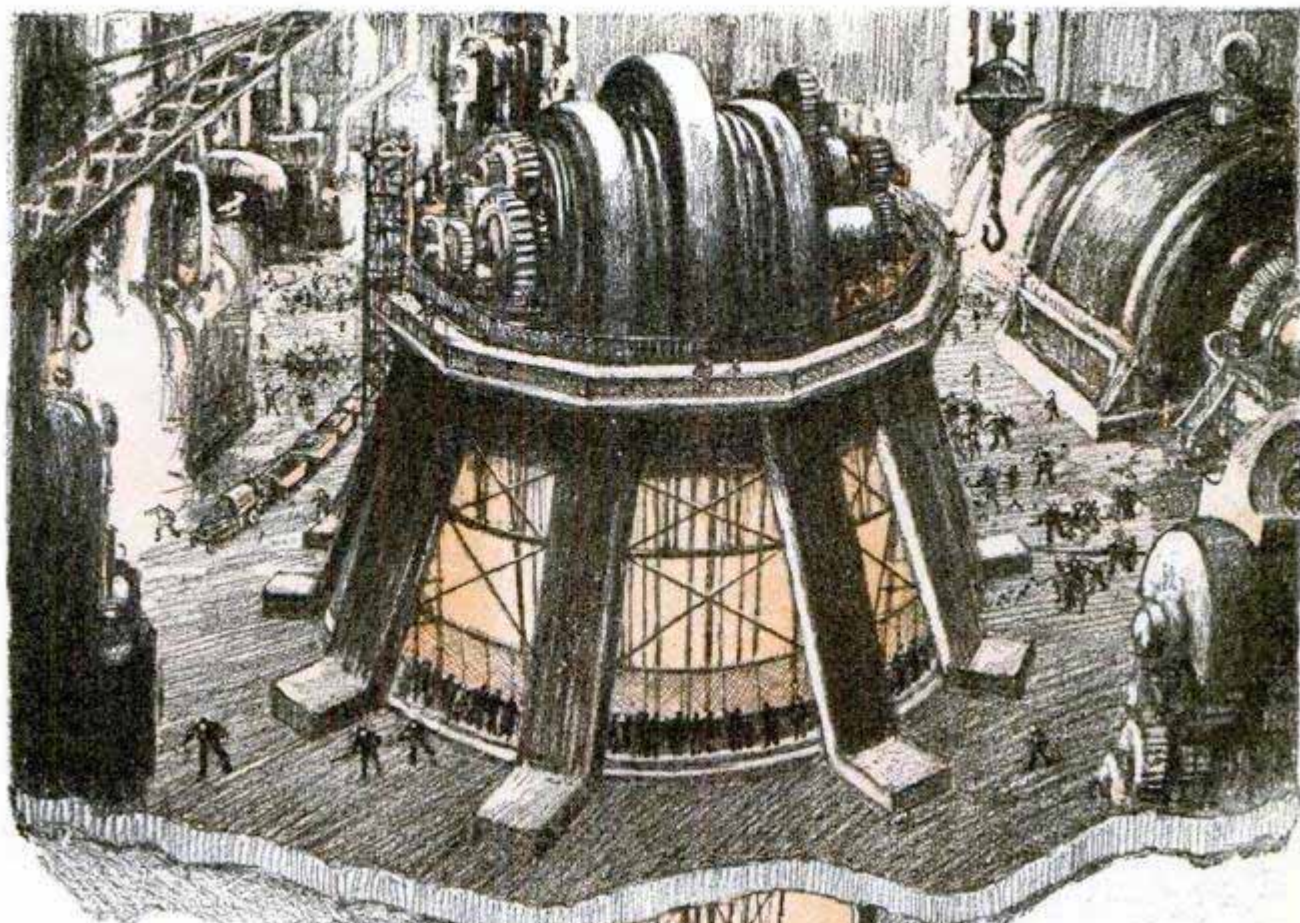
Doctor Bastin obtained samples of brine waters that flowed from oil wells bored to 3,000 feet, and was amazed to see bacterial cultures grow overnight. Subterranean life was abundant at almost a mile below the surface, reaching down indefinitely.

To explore the land of sulphate eaters, expeditions of diggers, borers and dynamiters are needed. For long, man has wanted to drive a shaft into the heart of the planet. Possibly he will find that life had much to do with the enrichment of

ocean basins are almost as deep as Mt. Everest is high.

"At a depth of one mile, our protective armor would have to be much thicker than at shallower levels. Under huge pressure water can penetrate microscopic crevices. For instance, in dredging operations, I attach glass balls to my nets. When these hollow spheres come up they are more or less filled with water. Yet near the surface, these balls are perfectly impervious and never leak.

"The maximum descent of submarines is less than 1,000 feet. The zone of ef-



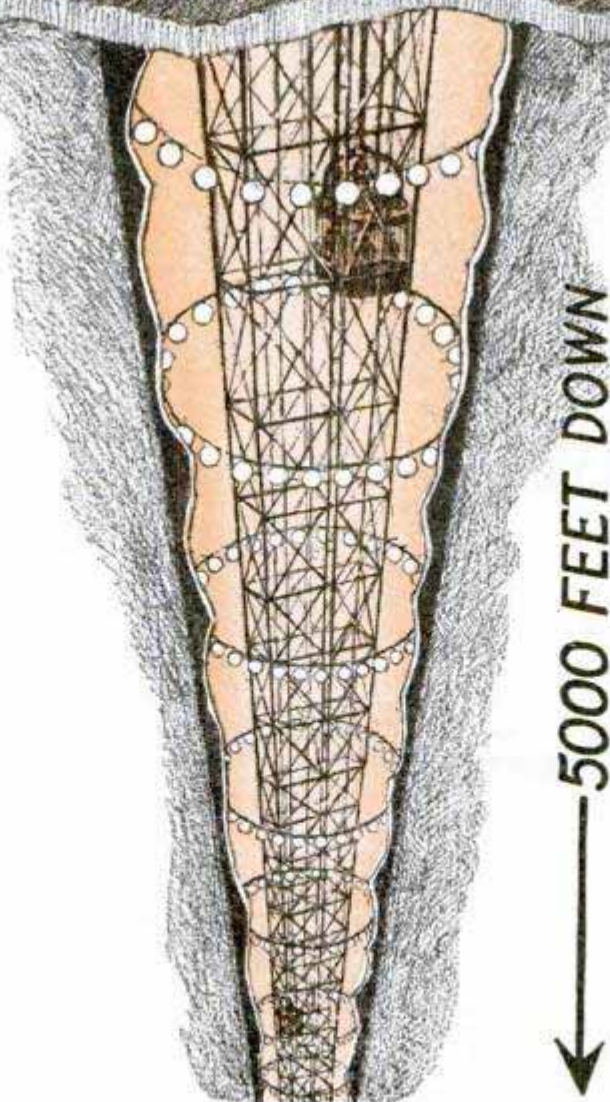
An Artist's Idea of the Machine That Would Bore a Shaft 5,000 Feet Deep to Explore Rock Formations

fective illumination is but 600 feet. Man has not even reached the preliminary abyss. Below 600 feet, the 'twilight zone' is similar to pale moonlight."

The Atmospheric World

The gaseous realm excites the imagination. It was the first of the three to intrigue man.

In 1927, Capt. Hawthorne C. Gray, army air corps, ascended 42,470 feet in a balloon. He sailed uncharted sky seas where the temperature is frigid, yet constant. That was the limit of human endurance.



Commercial-aviation operators say they cannot compete with cheaper surface conveyances unless their aircraft attain a minimum speed of 200 miles per hour. Will air lines be driven to higher altitudes where resistance is lessened? If so, they need new equipment and knowledge.

Then there are clues to a realm of the earth higher than aircraft can travel. In the last five years we have learned startling facts about the tenacity of life. Maj. R. W. G. Hingston, naturalist of the Mt. Everest expedi-

3000

tion of 1924, exclaims, "How relentless is the force of nature to spread into every corner of the earth!

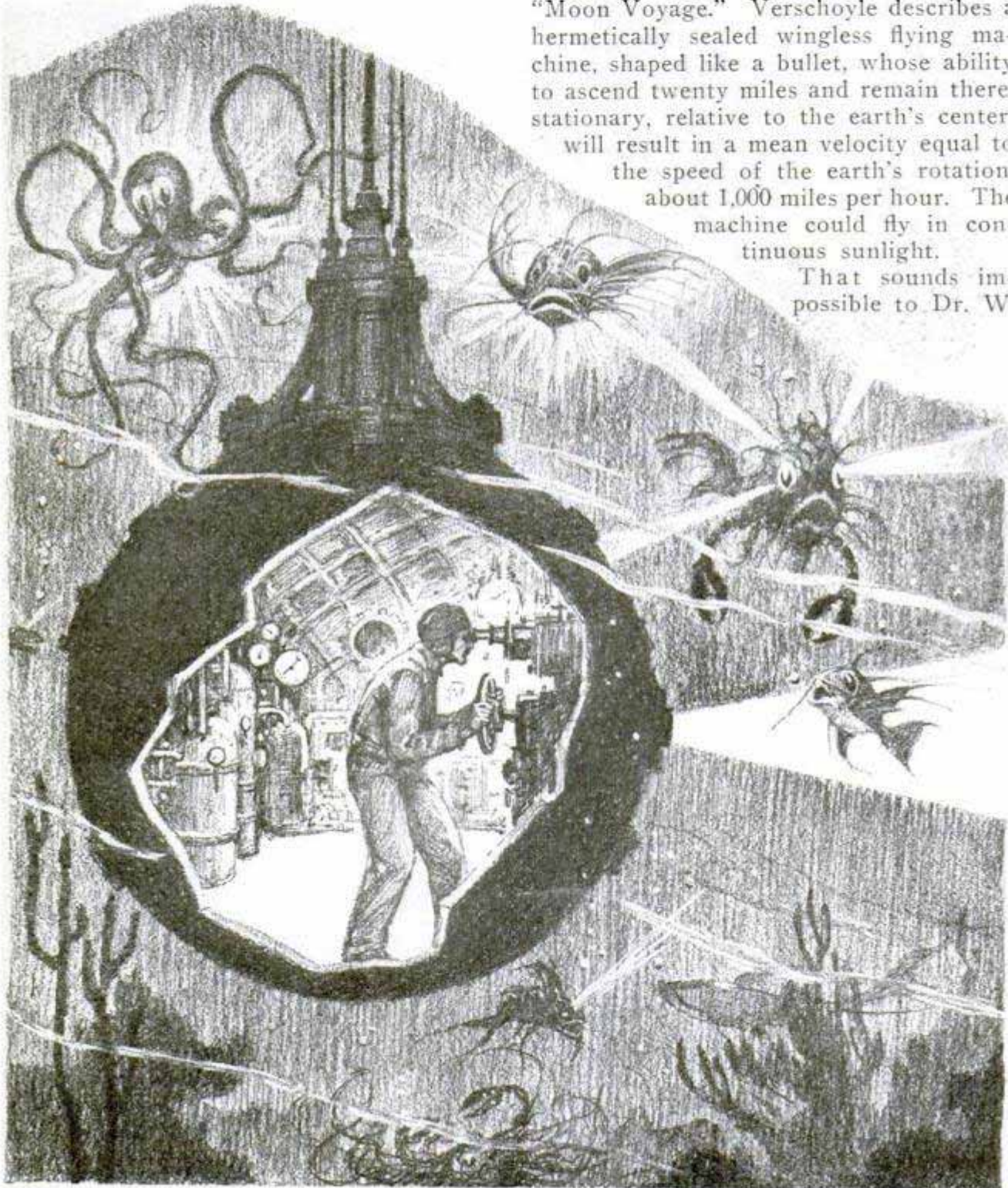
"On the Tibetan plateau I saw wild sheep and mountain hares struggle up barren slopes at 17,000 feet, bees, moths and butterflies at 21,000 feet and choughs at 27,000 feet. I saw life thriving in ice pools, glacial crevasses and rockbound mountain passes."

That arouses speculation on how high life can exist. Organisms can withstand intense heat, cold and pressure. They can eat mineral foods. What is the ceiling of existence? Sparse air extends out about 300 miles.

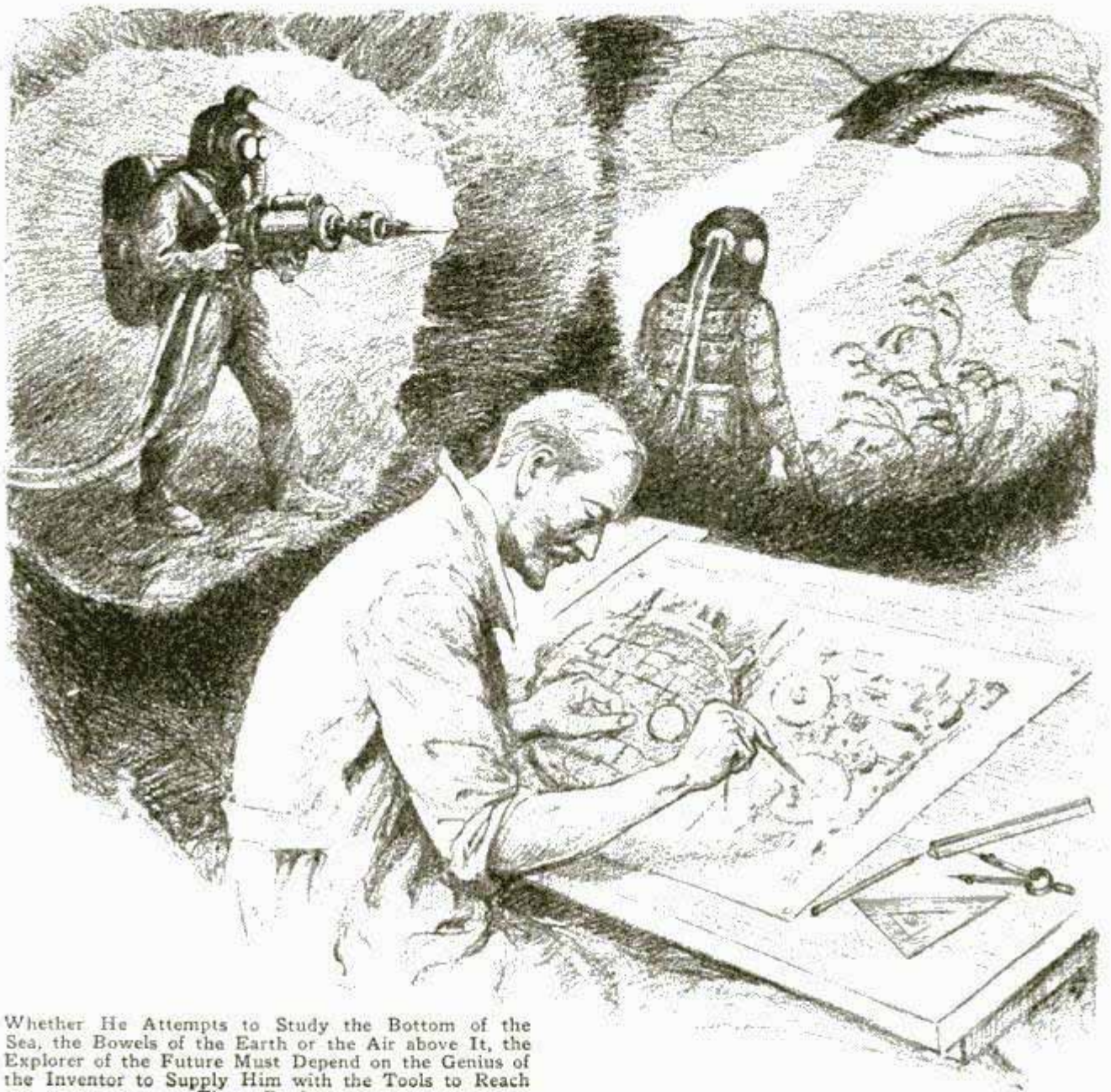
W. D. Verschoyle, an English scientist, predicts aerial navigation at an altitude of 100,000 feet within the next century. Jules Verne intimated such travel in the "Moon Voyage." Verschoyle describes a hermetically sealed wingless flying machine, shaped like a bullet, whose ability to ascend twenty miles and remain there, stationary, relative to the earth's center,

will result in a mean velocity equal to the speed of the earth's rotation, about 1,000 miles per hour. The machine could fly in continuous sunlight.

That sounds impossible to Dr. W.



Drawing Depicting the Hollow Metal Sphere from the Inside of Which Explorers Equipped with Telescopes and Powerful Searchlights Might View Deep-Sea Life at Lower Depths Than Ever Before Attempted



Whether He Attempts to Study the Bottom of the Sea, the Bowels of the Earth or the Air above It, the Explorer of the Future Must Depend on the Genius of the Inventor to Supply Him with the Tools to Reach These Regions

J. Humphreys, of the U. S. weather bureau. He says:

"At an altitude of 50,000 feet the air is extremely thin and propellers would gasp for something to pull against.

"By sending up balloons to about 100,000 feet, roughly twenty miles, we have recently learned that the mercury stops falling at about 35,000 feet as one ascends. Above that level is the constant temperature zone, whose temperature is about minus 60 degrees Fahrenheit."

So we see the opening scenes of an operatic mystery, replete with heroism and adventure, poignancy and thrill. It reveals how living substance crawled, swam and flew to new realms. The careers of a million nameless species that sprang up

and spawned their kind. Finally, the grand wonder of birth and the grim tragedy of death.

3115

WOOD TREATED TO RESIST FIRE

Tests at the University of Wisconsin have demonstrated that wood used for trim may be made fire-resisting, while fire-proof wood is a possibility. The research workers said the tests consisted largely in treating wood with a diammonium-phosphate solution, with similar results obtained by the use of zinc chloride. By charring the specimens so treated, it was definitely determined that the wood had exceptional fire-resisting qualities, although not entirely fireproof.

Mr. J. W. Truax,
Forest Products Laboratory

at meeting of American Society for Testing Materials

338 3

maker not known



This Auto Trailer for Campers Unfolds into Kitchen and Dinette, but Packs into Small Space for Transportation

AUTOMOBILE CAMPING TRAILER UNFOLDS INTO A KITCHEN

English campers are using a compact auto trailer instead of a tent to provide "home comforts" during a tour. The trailer unfolds by sections to provide plenty of room for cooking and eating, but when not in use the sections can be packed so compactly that they take up but small space for hauling.

CHRISTMAS TREE FARMS GROW MOST OF HOLIDAY SUPPLY

Most of the holiday supply of spruce and evergreen is grown on Christmas tree farms, an industry concerning which little is heard. One Ohio nursery has over 400,000 trees growing on seventy-five acres of land, ranging in size from tiny year-old Norway spruce seedlings to trees thirty feet tall. All of the trees come from seeds, and when the seedlings are two or three inches high, they are planted in beds, being arranged two inches apart in rows one foot from each other. There they remain for two or

Bushier's Independence 3 This nurseries, Independence 3

three years, when they are transplanted to fields where they have more room to develop. An average tree requires five years to reach a height of from four to six feet. Instead of cutting the trees, thousands of trees now are being dug up, and the roots wrapped in burlap with moist sod for shipment. After the tree has served its Christmas purpose, it may be transplanted into the yard where it usually lives and flourishes as a lawn evergreen, and may even be dug up and brought into the house the following year. Most

people want "fat" trees for Christmas, believing they are better-looking, but growers claim a slim tree can be more tastefully decorated and does not look overburdened when full of toys.

CRANKS REPLACE OARS TO DRIVE A SMALL BOAT

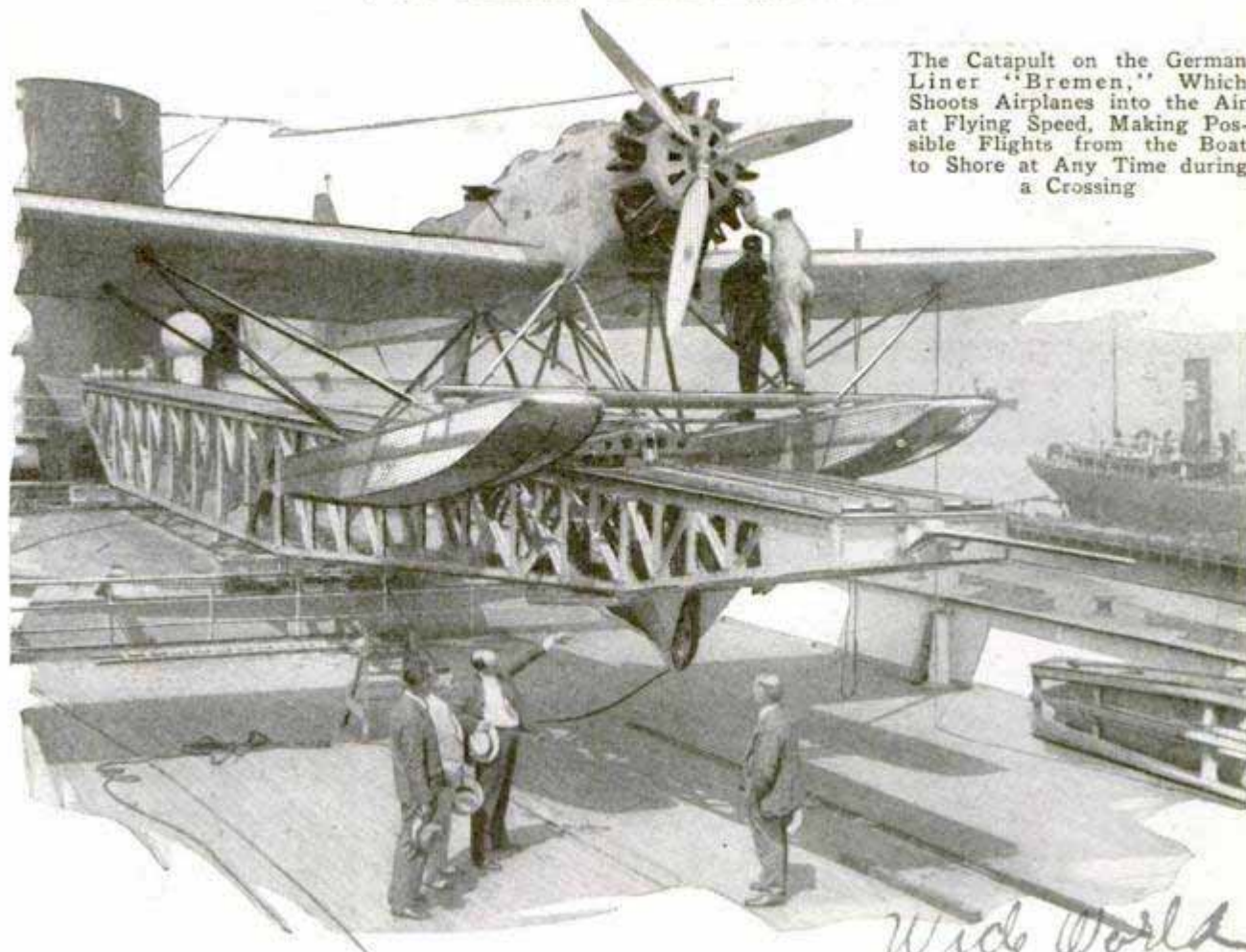
Operating a rowboat by hand without the necessity of rowing has been accomplished by an English army officer who made such a craft for his wife's use. Two cranks are attached to the gunwales of the boat in front of the passenger and by turning the handles two propellers in the rear are revolved thus furnishing the motive power.

now market



A Rowboat without Oars, Run by Turning the Cranks in Front of the Passenger, Thus Revolving Two Propellers in the Rear

official at Aldershot



The Catapult on the German Liner "Bremen," Which Shoots Airplanes into the Air at Flying Speed, Making Possible Flights from the Boat to Shore at Any Time during a Crossing

Wide World

NEW CATAPULT DRIVES PLANE FROM DECK OF LINER

Shooting an airplane into the air from the deck of the German liner "Bremen," which recently established transatlantic speed records, is made possible by a catapult designed to launch the plane at flying speed. The catapult makes possible a flight from the ship to land with mail, express or passengers at any time during a crossing.

HOW TO TEST ANTIQUE GLASS

Collectors of antique glass are advised by an English glass expert to shine the article before completing the purchase because it should be clear and colorless as water unless sold as colored or tinted. The faintest trace of color indicates that lead, iron or magnesium is present, all these metals being injurious to its lasting qualities. Minute air bubbles appearing in glass when it is held to the light are an indication that it was not sufficiently worked in its melted state and has a tendency to become opaque or to crack when

exposed to sunlight. Glass which is slightly turbid suffers from "mattress," a defect which causes it to devitrify, losing its luster.

FOG WHICH SOLIDIFIES INTO ICE IS PERIL TO AVIATORS

Three meteorological conditions cause the peril of ice forming on aircraft, says Dr. Alexander McAdie of Harvard University. These are sleet, glaze and subcooled fog, the latter being most dangerous. Subcooling means that the tiny vapor particles are actually slightly colder than the freezing point, although still water, the condition occurring when the air is clear of dust upon which the droplets might solidify. Immediately upon contact with aircraft these particles of fog become a layer of ice. The best way to escape it is to watch thermometers closely and seek levels where the temperature is higher. Glaze occurs when raindrops fall upon a surface which is much colder and freeze to it, while real sleet is due to raindrops falling through a layer of air below freezing and solidifying as they fall.

Serge H. Holden.

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*Bureau of Meteorological
Aviation*

8396



These Young Men Show What to Do When a Boat Capsizes: Straddle It, Use the Oars as Floats or Hang to Bottom of Boat

WHAT TO DO IF BOAT TIPS OVER AND YOU CANNOT SWIM

Keeping afloat when the canoe or row-boat upsets, even though unable to swim, is not difficult if the victim does not become panic-stricken when plunged into the water. In case of a rowboat capsizing, the two oars, or even one oar, placed under the arms will keep an inexpert swimmer afloat until he can paddle toward shore or summon aid. When one member of a

canoe party cannot swim, he may keep afloat by straddling the craft while the swimmers shove it ashore, or if all are unable to swim, each may hang onto the bottom of the overturned canoe with one hand, using the free hand to paddle.

WORLD'S LARGEST AIR CAMERA

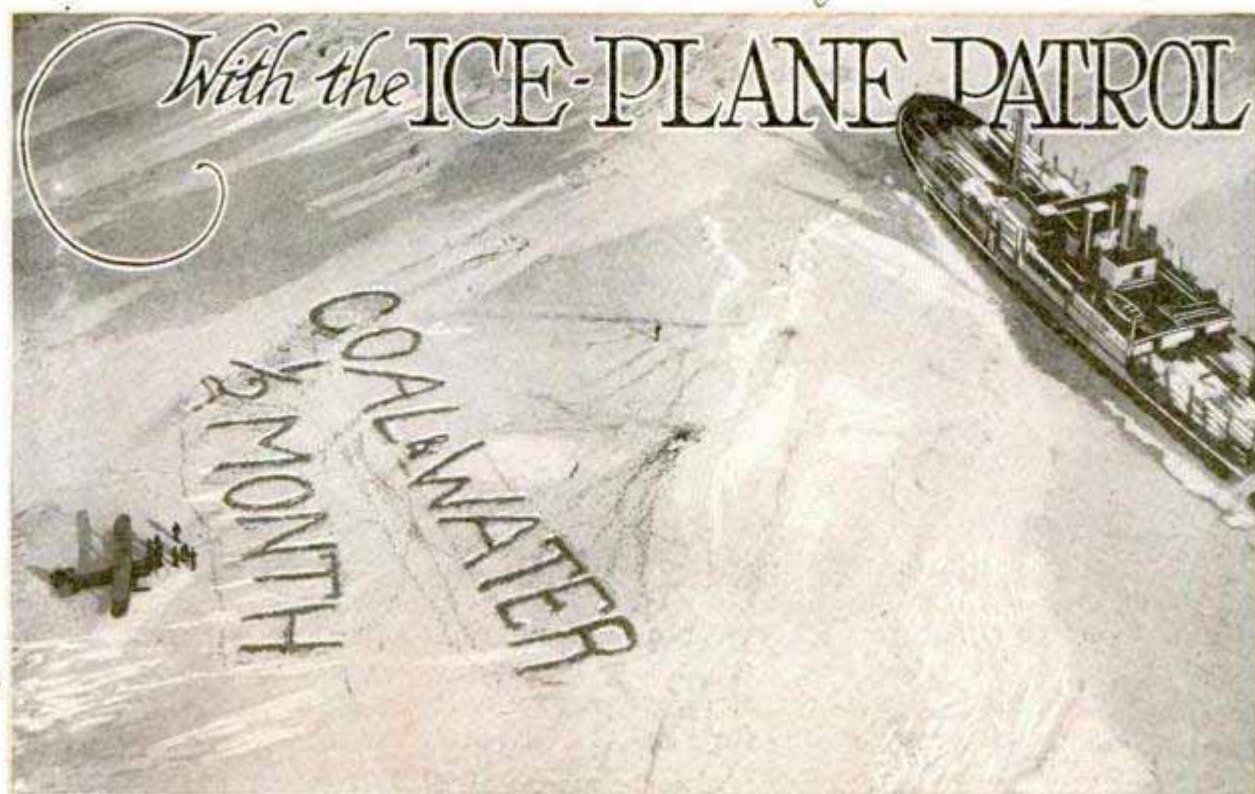
3429 TESTED

The world's largest aerial camera, weighing 130 pounds and measuring about half the height of an average man, has just been tested successfully by the army air corps. The camera was developed to take widespread ground areas from high altitudes, and is the result of five years of experimentation. The pictures taken are nine by eighteen inches and the roll of film carried is 150 feet long. The camera's most important feature is that its operation is fully automatic, possessing a registering device whereby the elevation of the plane, the time, date, and the number of the negative are noted on one corner of the film. The device is electrically heated so that it will function at

the very low temperatures found at altitudes exceeding 40,000 feet. Ordinarily the camera is suspended through a hole in a section of the ship's bottom. While the picture is being taken, the plane moves at a speed of about eighty-five miles an hour. The completion of an exposure, including the automatic setting and winding of the shutter, the rolling of the film and the shooting of the picture, takes only fifteen seconds. During these operations the photographer has little to do.

Army Air Corps
Wright Field

3285
Com. H. O. W. ...
Columberie, 29 Beau Aog
Berley Heath, nr London,
Eng



The Crew of This English Steamer, Frozen In in the Baltic Sea, Have Written in Coal Dust on the Ice That They Need Coal and Water, and the Airplane Has Arrived with Supplies

IN PORTS all round the Baltic sea, the German radio last winter was crackling an SOS telling of suffering and danger hundreds of miles distant, where many steamers of all nations were caught fast in the ice, their crews starving, their bunker coal running low, while drifting fog and lee-shore icefloes made it practically impossible for the most powerful of ice breakers to reach them.

Two of the most up-to-date of Germany's cruisers, the "Elsass" and the "Schleswig-Holstein," were converted into ice breakers and sent post-haste from Kiel harbor to the rescue of the nearest of the imprisoned steamers, whose radio announced that she was ice-bound off the island of Fehmern, some seventy miles east. A grey fog came over the sea and almost blotted out the surroundings by the time the navigators calculated they were about the position whose latitude and longitude had been radioed in the SOS. The cruiser sounded her siren and sent out radios, but there was no response.

Then came a wireless from Kiel, ordering the ship to return to port at once, and co-operate with spotting airplanes of the Luft Hansa, one of Germany's biggest air lines.

Back at Kiel, the ice breaker prepared for a new life-saving hunt in the cold and fog, while her consort, the "Schleswig-Holstein," steamed out of harbor under the convoy of an airplane in a search for two marooned steamers. After a brief flight, the plane reported spotting the two ice-locked ships which were invisible to the keen-sighted observer scanning the sea from the cruiser's fighting top. Later the plane reported several other steamers fast in the ice. Some of them were displaying flag signals. One read: "I am in great danger. I want coal." Another signaled: "I must have food! Down to our last biscuit, after days in the ice. Hurry, please!" A third ship had written in coal dust on the ice the one word: "Water!"

The plane had not found the ships on the first flight! At the outset, the position of the SOS steamers was a matter of mere guesswork. Systematic flights had to be made before each ship could be located. Each bay and arm of the sea was thoroughly scanned, and in weather in which the visibility was bad, the planes zigzagged in the air in order to hit on clear spaces of sufficient width. The job of the cruisers was to rescue the crews

of the ships; the problem of the spotting planes was to find and feed their crews.

This problem was made none the easier, owing to the fact that the seadromes were all frozen up, and a service of land planes had to be hastily improvised. From all ports of the German shores of the Baltic sea, from Kiel in the west to Lubeck, Stettin and far-away Danzig, the East Prussian timber port, fleets of fast planes took short flights to get a rapid bird's-eye view of the ice conditions in the waters below. The east-bound planes radioed back that the steamship lanes in their waters were pretty clear of ice; but the west-bound planes reported to the airport bases that a knife-edged east wind could be seen drifting the floes and the locked-in steamers farther away. From the shores of Denmark, the airplane observers made out fresh drifting floes threatening the imprisoned steamers with further perils of crushed hulls and broken screws.

When the planes spotted the frozen

steamships, it was impossible to land on the floes without running great risks. Under pressure, big chunks break off the floes, and fissures or open leads of thawed water endanger landing and take-off. By ingenious methods, the ice-locked crews were victualed with bread, peas, meat, potatoes and bacon, while drinking water, in the form of ice blocks, was dropped on the floes along with chocolate, cigarets and newspapers. Sacks of coal were actually sent down by the airplanes hovering over sailing ships with fireless galleys.

Parachutes to float down the food and necessaries could not be used, owing to the raging wind, which would have blown them far out of the reach of the starving crews. So the food and fuel was strongly packed in small sacks, incased in wood fiber, and dropped from the airplane, flying at a height of from 150 to 190 feet. Later, it was found that hardly one sack of peas and coal had burst open on contact with the floe's surface.

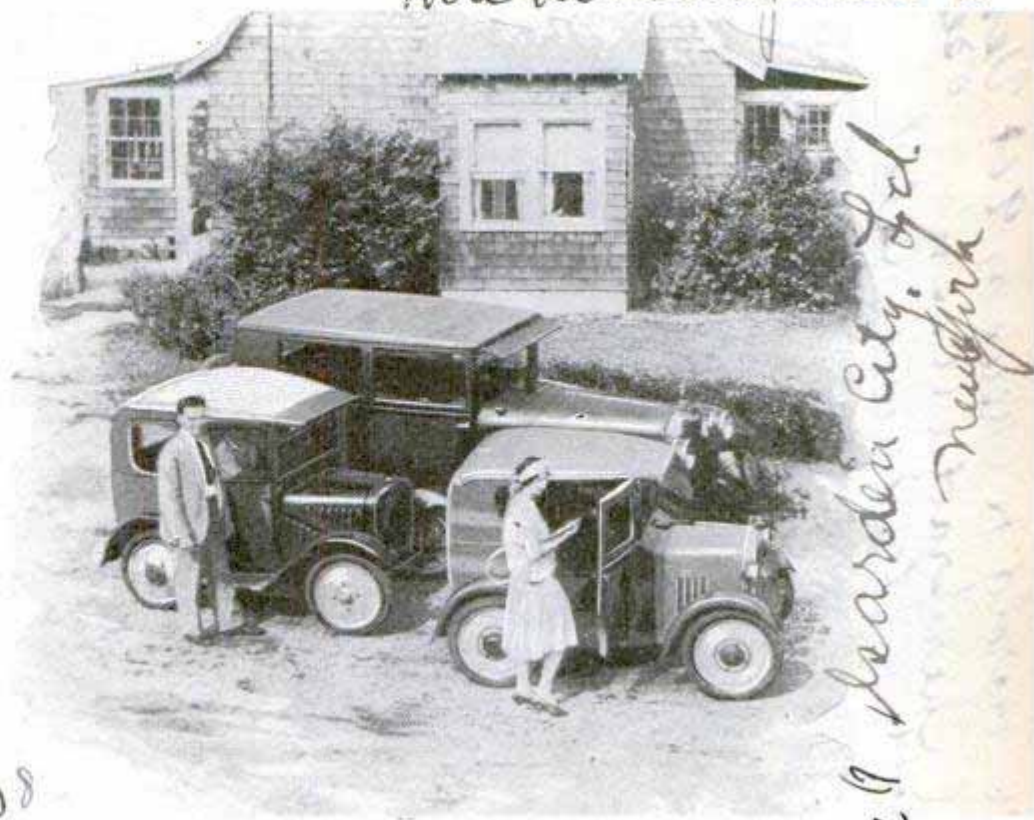


Photos Courtesy Deutsche Luft Hansa

This Picture, Taken from an Ice-Plane Patrol, Shows a German Ice Breaker Standing by a Frozen-In Cargo Steamer, While an Airplane Has Dropped Packages of Coal on the Ice

*James Martin
Martin Aeroklane Co*

Gliding quite closely above the nearest steamship, the airplane threw down the 112-pound food and coal containers, and flew on to the next ship to unload another cargo. The airmen could see the crews leaping from the decks onto the ice and dragging the provisions aboard. Where the ships had no radio, a code of flags was arranged between planes and vessels. One captain hit on the method of writing his wants in coal dust on the new-fallen snow.



Four Wheels and a Body Containing an Engine Constitute These Baby Autos, Which Have Neither Chassis Nor Chassis Frame

WHAT MAKES A GOOD PILOT? 3308

What is the most desired characteristic in the student pilot? A. F. Arcier, vice president of the General Airplanes corporation, says an infinite capacity for detail plus unlimited patience are the most essential needs. Natural flying instinct is merely the unification of the several characteristics. The student who knows no limit in the study of every detail of aeronautical science, offers in his vigilance and attention to duties the best formula for flying safety, and is to be preferred to the man who learns to fly more quickly, but with a careless disregard of the fundamentals of operation. Impatience, carelessness and lack of knowledge of the fundamentals of flying were blamed for the majority of air accidents due to man failure rather than machine failure.

3148

READY-SLICED LOAF OF BREAD

Ready-sliced loaves of bread, coming to the housewife evenly cut and packed in a pasteboard tray wrapped in waxed paper, are now on the market. The bread is sliced automatically as it comes from the oven, the operation enabling it still to retain its flavor and moisture. The sliced bread saves time, particularly in making toast and sandwiches.

*Schulze Baking Co
408 Eschfeld Blvd*

BABY AUTO WITH NO CHASSIS HAS PACKING-BOX GARAGE

Weighing only 600 pounds, and with a sixty-inch wheelbase, a baby automobile, constructed by a New York man, is to be placed on the market at a price around \$200 and probably will be distributed through a mail-order house. The tiny car is unique in construction, consisting essentially of a body with an engine in it and four wheels. There is no chassis or chassis frame, each wheel being independently mounted on the body. In place of springs, rubber "aviation cord," such as is used in the landing gear of airplanes, is used. There is little rebound from bumps despite the lightness, because each wheel acts independently. The car is fitted with a four-cylinder engine and has an electric starter and other necessary instruments. It comfortably seats two persons, and the maker claims it will travel fifty miles on a gallon of gasoline. It is planned to ship it in a weatherproof packing case with hinged door which will also serve as a garage. A man of ordinary strength can lift one corner of the car and shove it in or out of the box.

*Warden City, Ind.
New York
not being marketed*

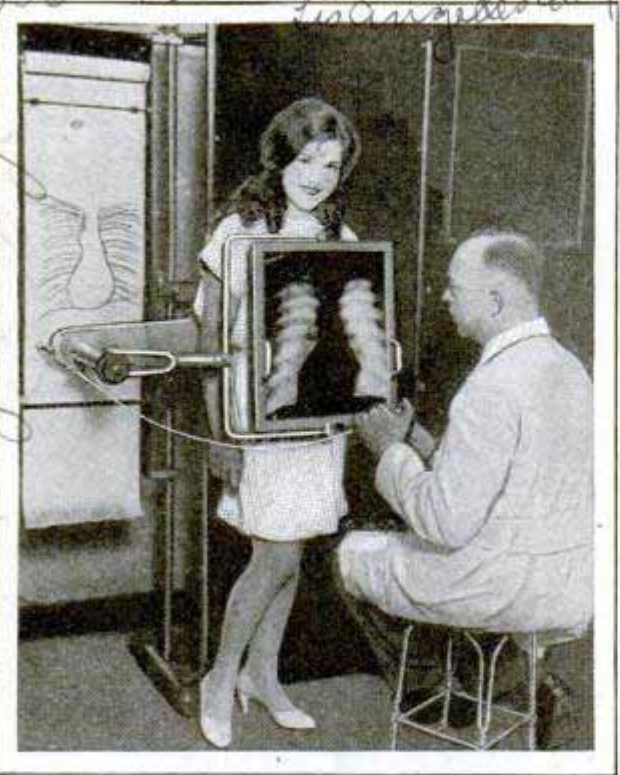
4/21/36

Reuss, 918

Temie Blvd. Calif

of Automobile Engineering

Cleveland Ohio



Combining the X-Ray and Pantograph, as Shown, Eliminates the Negative in X-Ray Photography

X-RAY TRACING BY PANTOGRAPH ELIMINATES NEGATIVES

Combining an X-ray machine with pantographic principles, a scientist has obtained tracings of organs or bones without using a negative, sensitive plate or film of any kind. The operation is known as an orthodiagraphic examination, and the appliance that makes the tracing is termed an orthodiagraph. The patient stands in front of the X-ray which brings out bone and tissue on a visible plate. The operator traces the outlines thus revealed on a near-by sheet of paper by the pantographic method.

VARIABLE PROPELLERS SEEN AS AIRCRAFT NEED

Airplane propellers that can be adjusted as to pitch while the plane is flying, are being developed and their successful adaptation will greatly increase the efficiency of sky craft, in the opinion of engineers. They point out that the propeller acts in the air as a screw does in wood. Its pitch is comparable to the pitch of a screw, that is, it is the distance the screw will advance when turned once. In a propeller, the practical pitch is somewhat less than it would be theoretically,

since the air is a less substantial medium than wood and a pitch that will produce the greatest efficiency at top-speed level flying, for instance, is not the best for climbing, starting or other maneuvers. If the pitch of the blades can be changed at will, the pilot will be able to achieve for his plane somewhat the same flexibility as the motorist accomplishes with his car by means of the gear shift. Various methods have been tried for controlling the blades. What some engineers regard as the most promising is a small electric motor, operated by a storage battery, geared to the propeller and enabling the pilot to change the pitch of the blades. One of the drawbacks to the control systems already introduced is that the apparatus adds too much to the weight of the ship. It is believed, however, that the electric-motor plan can be developed without great increase in weight, and what added burden there is will be more than offset by the great advantage of the adjustable blades. On heavy transport planes, the gearing of propellers to decrease the speed of the engine as applied to the propeller, is expected to come into extensive use where more than one motor is employed.

OUTBOARD MOTOR IS COOLED BY AUXILIARY PUMP

For use on a lightweight high-speed outboard motor recently placed on the market, there is provided an auxiliary plunger pump which can be quickly attached and provides a steady stream of water for cooling the cylinders at slowest



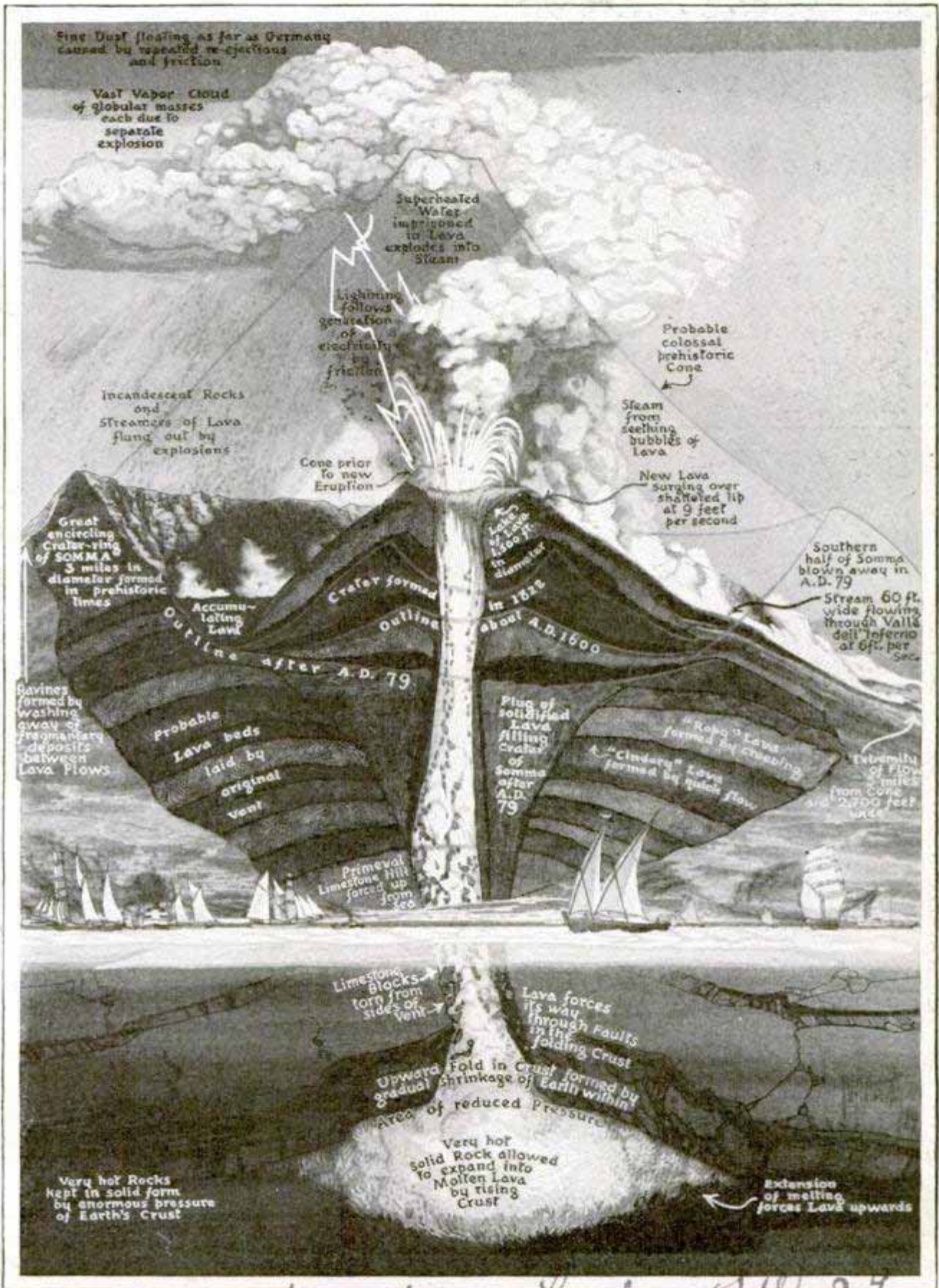
trolling speeds. A bronze cam is attached to the propeller shaft in place of the customary acorn nut and the auxiliary pump fastens on the pressure-flow scoop with a pin and has a gland fitting into an ordinary water gland. With only a scoop to provide circulation of water through action of the propeller, sufficient water to keep the motor cool was supplied only at fast speeds, it was found.

Tryed out by Dr. Harold H. Reuss, 918 Temie Blvd. Temie, Calif. National Chiropractic Assoc. Convention in Los Angeles Calif. J.P. Wright and W.A. Turnbull } Engineers. Curtis Aeroplane Motor Co. 572

Frank W. Caldwell, Chief Engineer

Coile Motor Co., 6240- 2nd Blvd.

LIFE HISTORY OF WORLD'S MOST NOTED VOLCANO



© S. W. Clatworthy, 916 Tulse Hill, London, N.W. 2, Eng.
 Diagram Illustrating the Life History of Vesuvius, Which Owe Its Splendid Shape Largely to the Fact That the Great Vent Has Remained Practically Unmoved Throughout the Ages

3356

3401

see April 1929. 6/16.
Dunlop
Siro & Rubber Co
West Road, Buffalo, N.Y.



Practicing Service Shots with the Aid of "Machine Gun" That Fires Tennis Balls at Player at Twelve Different Speeds

MACHINE GUN SERVES TENNIS BALLS TO PLAYERS

To aid tennis players in strengthening their returns on services, a machine gun to serve the balls has been developed. The gun holds a load of thirty-six balls and can be adjusted to fire them at the player at twelve different speeds.

PHONE LANGUAGE IS SOUGHT FOR INTERNATIONAL USE

What is the best language to use for international communication by telephone? Interesting facts have been revealed as the result of experiments with the various tongues. Italian is the most easily understood with German, English and French next in the order named. On the other hand, it is important to have a language in which the most can be said in the shortest time. From this standpoint, French ranked first, then came English, German and Italian. In general, the longer words are better understood, while short words have the advantage of speed.

3418
Edwin E. Slosson
in Colliers.

tered, 4,232 are licensed and 2,885 bear identification numbers. Computed on the basis of 1928 population estimates, California is the most "air-minded," with one plane for every 8,778 persons, while the District of Columbia ranks second with one for 9,200 persons. The market for open land biplanes is the largest in numbers with 2,991 such craft licensed, and cabin land monoplanes are next in favor with 1,093 licensed. Three states have less than five planes licensed or identified. Nevada has two, New Mexico, three, and Maine, four. Nineteen of the states have more than fifty each.

PISTOL SHOTS POISON SPRAY AT FLIES AND MOSQUITOES

Artillery, in the form of a toy pistol which fires a charge of poison at insects, is the latest weapon against flies, mosquitoes, spiders and other pests. The gun fires the concentrated poison spray on the insect, which expires in a few seconds. It is cocked by pressing the handle and fired by a trigger.



Spray Gun That Fires a Stream of Poison to Kill Insects. It Is Cocked by Pressing the Handle

Edw. Walter B. Kirten
549 E 80th Seattle Wash

8/26/29

3419

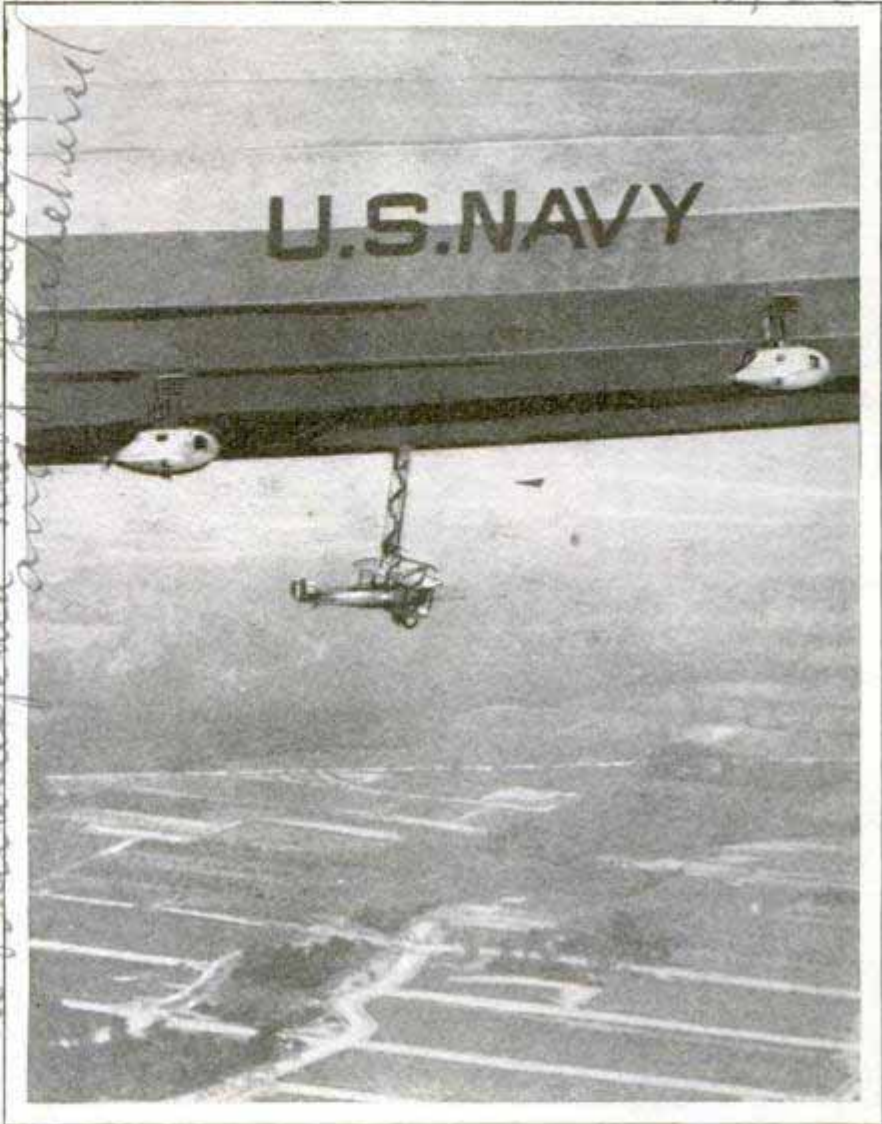
3400

NAVY'S LUNG SAVES TWENTY - SIX FROM SEA

Using the artificial "lung" recently developed for rescue work when men are trapped in submarines, twenty-six officers and bluejackets of the navy safely ascended from the after hatch of the reconstructed submarine "S-4" far below the surface during a successful test a few weeks ago. In some respects the lung resembles a gas mask. It consists of an oxygen bag with a container of soda lime in one corner. A tube leads from the oxygen compartment and from the lime canister to a mouthpiece, and the entire lung is strapped loosely about the neck and body. A nose clamp is provided to keep from drawing in salt water through the nostrils. The feature of the mouthpiece is the rubber flange which fits inside the lips and against the teeth and gums to form a firm and water-tight grip. In conducting the rescue tests with the device, use was made of a newly developed telephone set by which persons on the pier could talk clearly to the men in the submerged submarine.

Co-1st Lieut. C. B. Morris

Philadelphia Navy Yard



Plane Safely Hooked to the "Los Angeles"; Engineers Predict This System Will Be Used to Transfer Passengers

PLANE IS TOWED BY DIRIGIBLE AFTER CONTACT IN AIR

That passengers may be transferred between dirigibles and airplanes while both craft are in motion was demonstrated successfully at the air races in Cleveland when a plane made contact with the "Los Angeles"; a man climbed down into the cockpit from the big bag and was soon flying away in the plane. The dirigible is fitted with a ladder arrangement that is lowered from about the middle of the underside of the ship to provide a grip for

the airplane's hook. This latter unit is so arranged that it does not interfere with the usual operations of the plane and is raised in contact position simply by pulling a cord near the pilot's seat. Great skill is needed on the part of the plane's pilot and the operators of the dirigible in making a contact of this kind and the weather conditions must be suitable.

ARTIFICIAL SUNLIGHT IN MINE

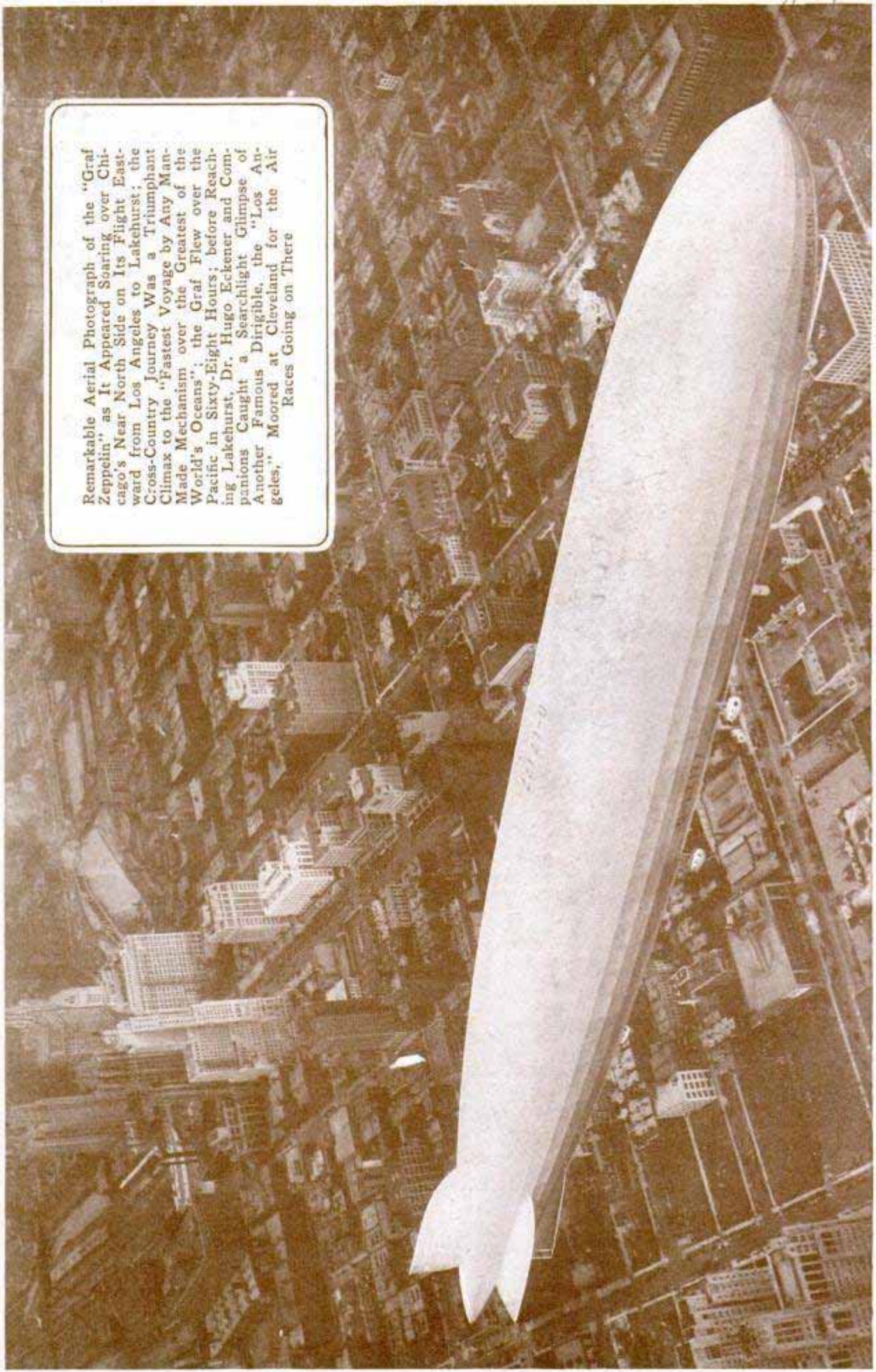
Workers in a large western mine, deprived of sunlight because they labor far below the ground, are henceforth to be provided with artificial sunshine. An ultraviolet-ray solarium, capable of treating 150 persons an hour, is to be installed in the "dry" room of the plant. It is expected to aid greatly in keeping the workmen in good health.

Walloo, ddah

San Francisco California
Mining & Concentration

3373 Henry Miller News Picture,
Service, Inc. 519-13th St NW, Washington, DC

Remarkable Aerial Photograph of the "Graf Zeppelin," as it Appeared Soaring over Chicago's Near North Side on Its Flight Eastward from Los Angeles to Lakehurst; the Cross-Country Journey Was a Triumphant Climax to the "Fastest Voyage by Any Man-Made Mechanism over the Greatest of the World's Oceans"; the Graf Flew over the Pacific in Sixty-Eight Hours; before Reaching Lakehurst, Dr. Hugo Eckener and Companions Caught a Searchlight Glimpse of Another Famous Dirigible, the "Los Angeles," Moored at Cleveland for the Air Races Going on There

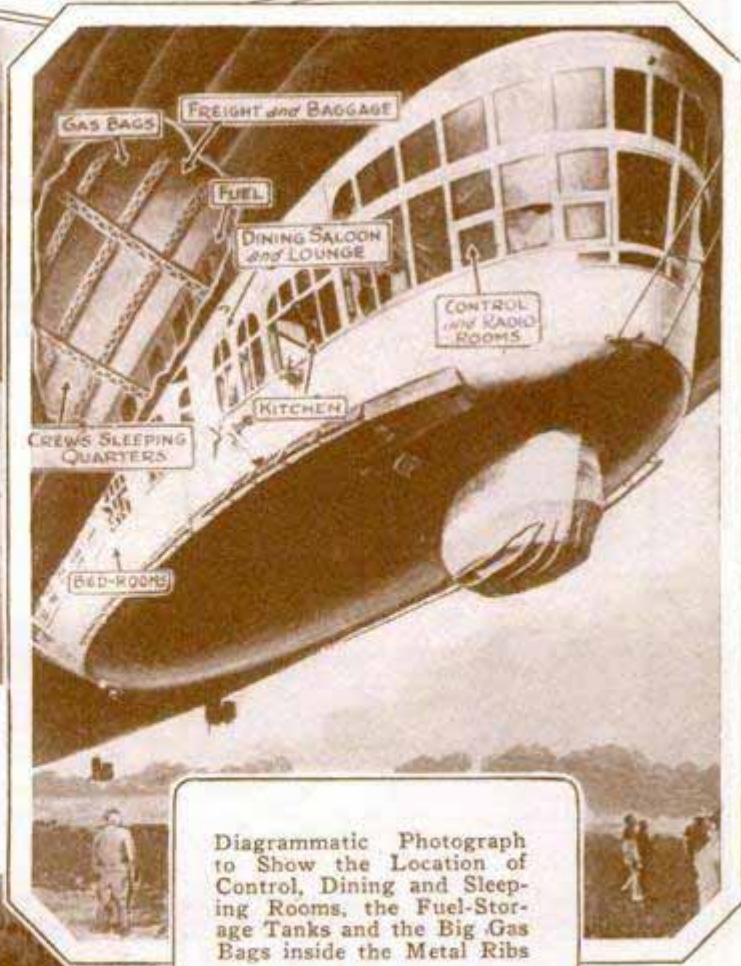


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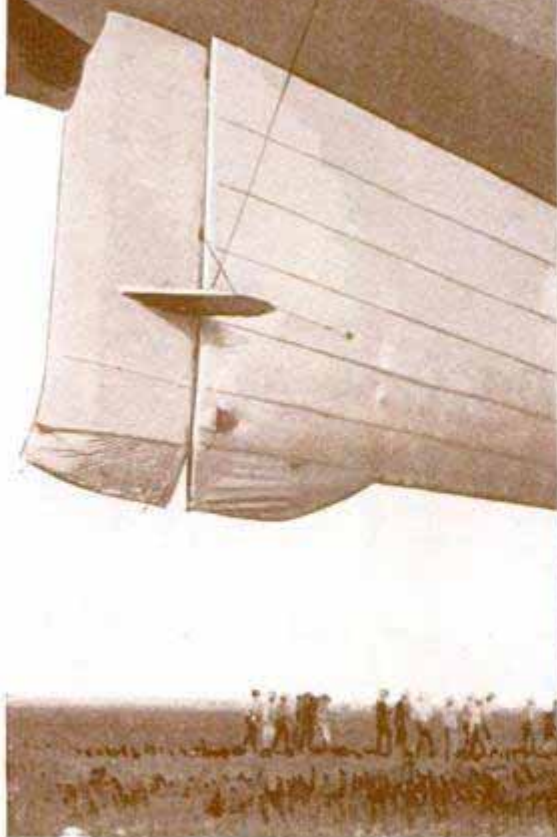
332 Michigan

With the Graf Zeppelin

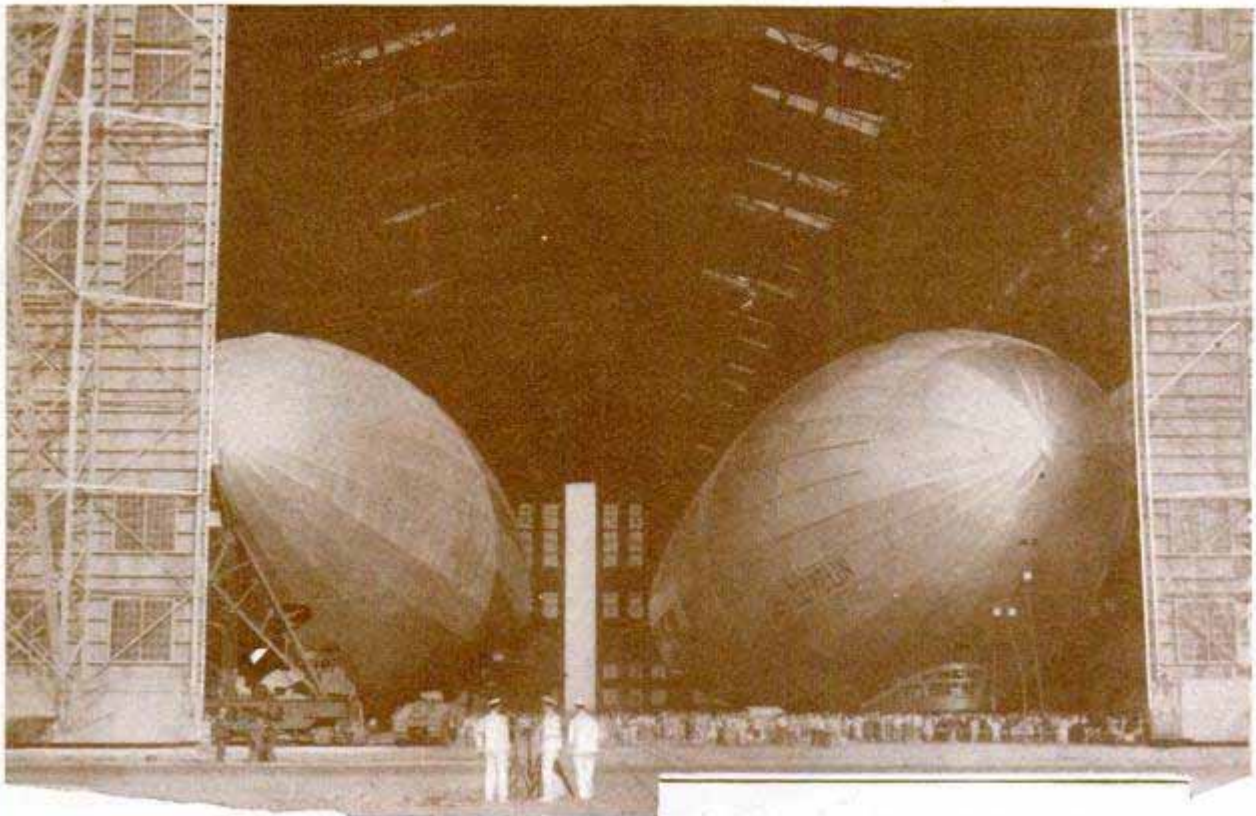
Looking Up at One of the Streamlined Motor "Eggs," and Below, Evidence of a Near Tragedy; the Damage Was Done When the Graf Scraped High-Tension Wires at Los Angeles during Difficulty in Ascent



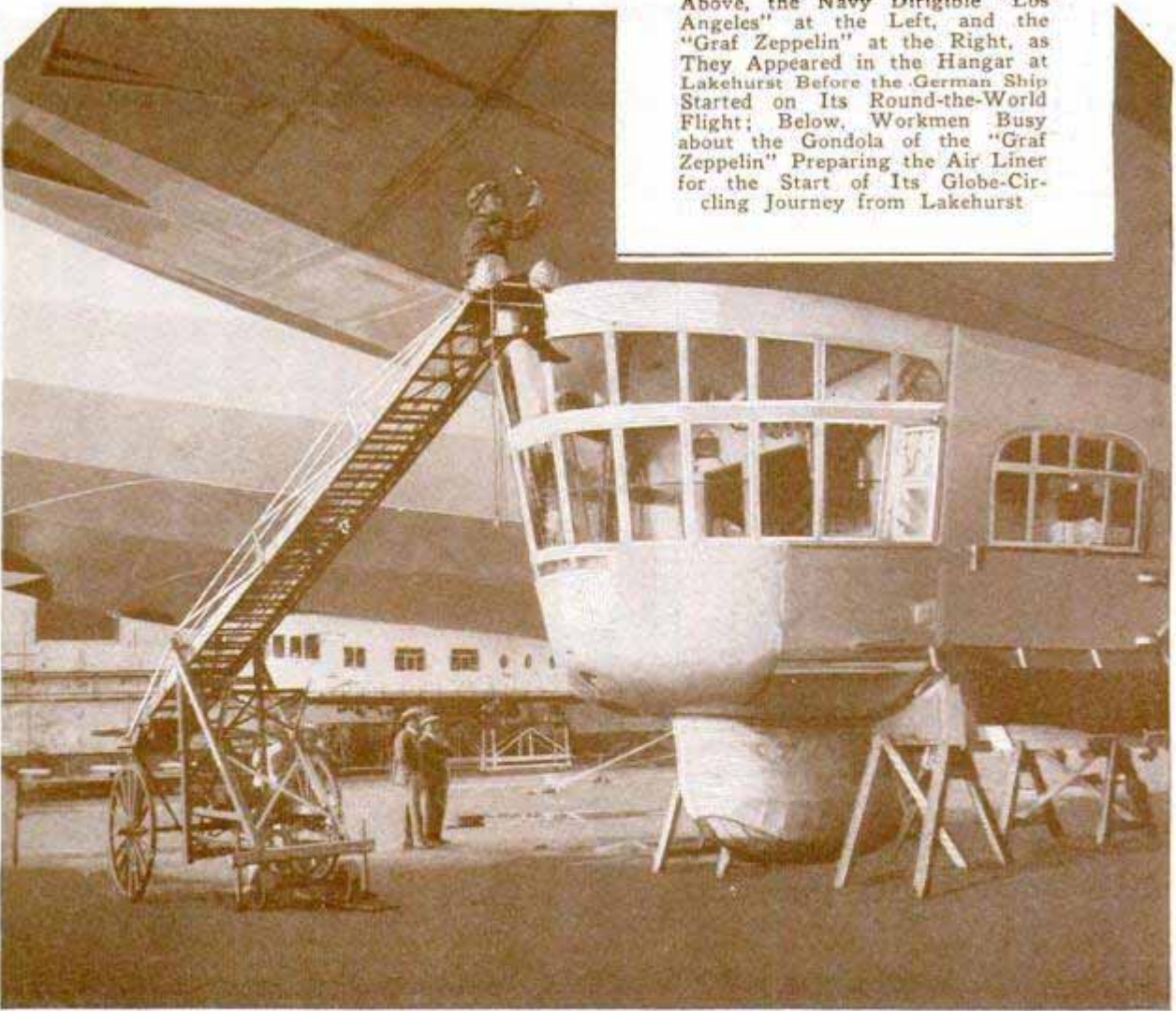
Diagrammatic Photograph to Show the Location of Control, Dining and Sleeping Rooms, the Fuel-Storage Tanks and the Big Gas Bags inside the Metal Ribs

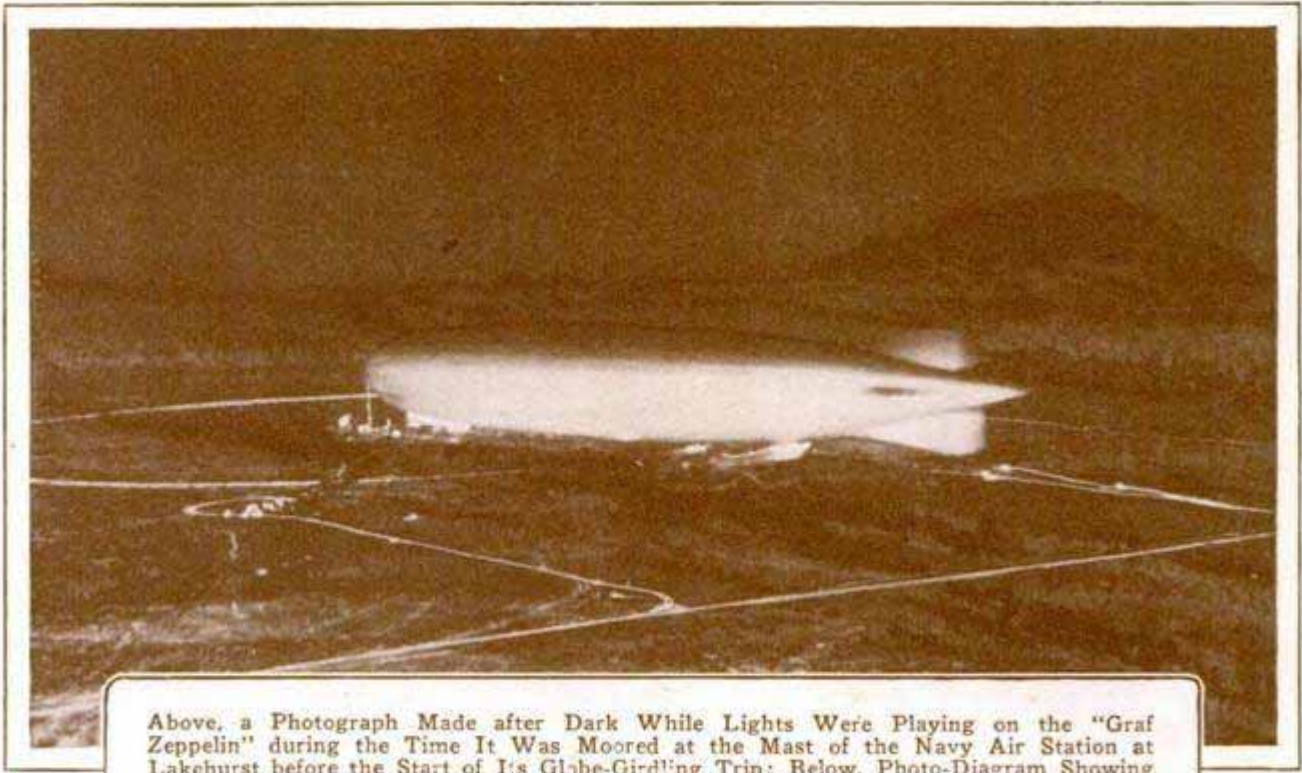


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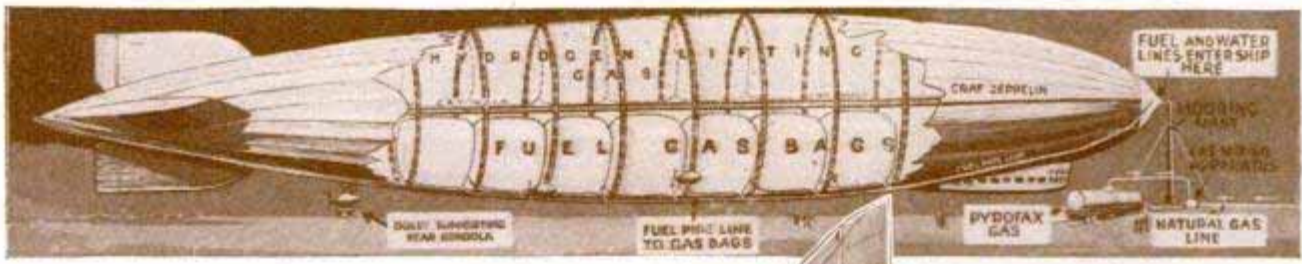


Above, the Navy Dirigible "Los Angeles" at the Left, and the "Graf Zeppelin" at the Right, as They Appeared in the Hangar at Lakehurst Before the German Ship Started on Its Round-the-World Flight; Below, Workmen Busy about the Gondola of the "Graf Zeppelin" Preparing the Air Liner for the Start of Its Globe-Circling Journey from Lakehurst.

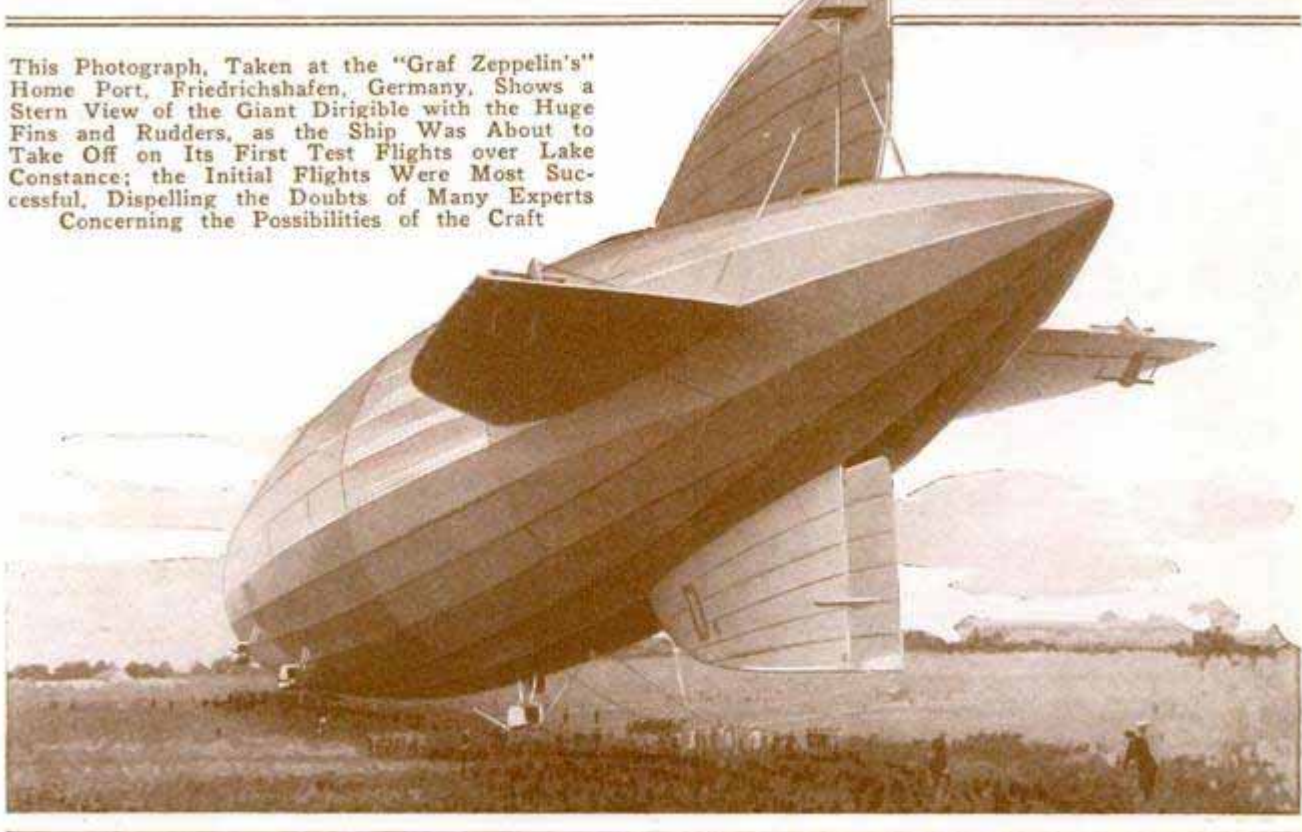


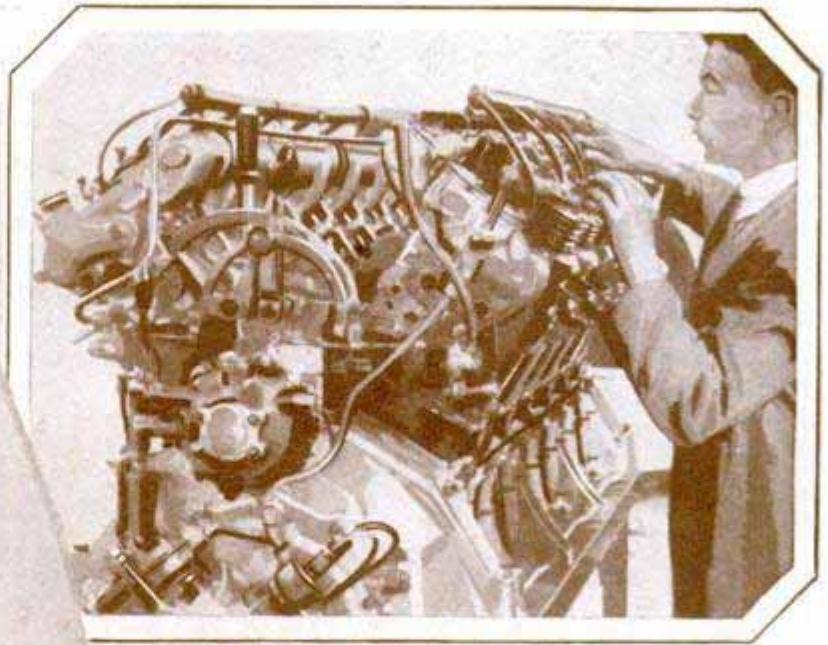


Above, a Photograph Made after Dark While Lights Were Playing on the "Graf Zeppelin" during the Time It Was Moored at the Mast of the Navy Air Station at Lakehurst before the Start of Its Globe-Girdling Trip; Below, Photo-Diagram Showing How the "Zeppelin" Was Refueled at Los Angeles and Other Stops

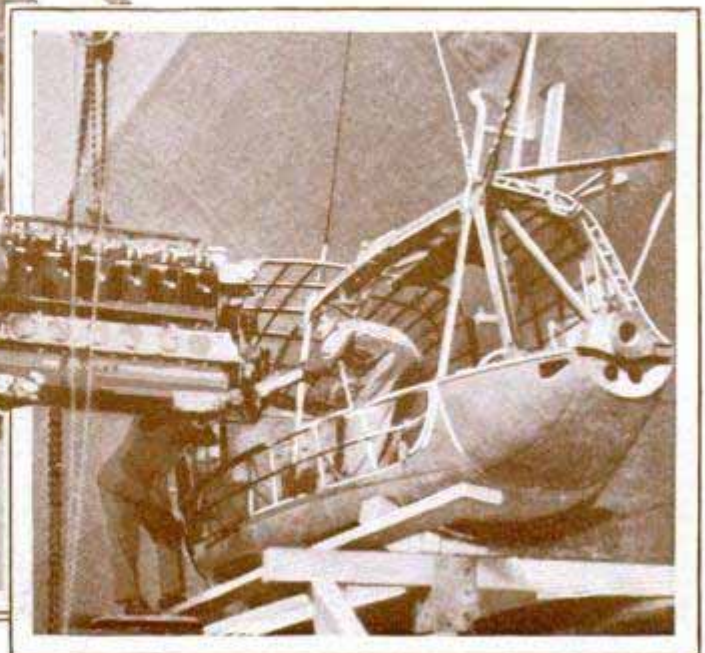


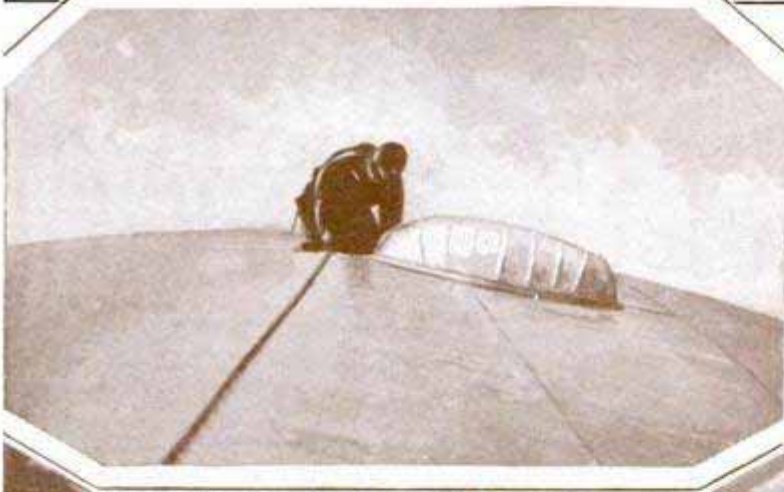
This Photograph, Taken at the "Graf Zeppelin's" Home Port, Friedrichshafen, Germany, Shows a Stern View of the Giant Dirigible with the Huge Fins and Rudders, as the Ship Was About to Take Off on Its First Test Flights over Lake Constance; the Initial Flights Were Most Successful, Dispelling the Doubts of Many Experts Concerning the Possibilities of the Craft





Above, Inspecting One of the Five 520-Horsepower Rohrbach Engines Which Carried the "Graf Zeppelin" around the World; Left, Lady Drummond Hay, English Noblewoman and Newspaper Writer, Who Was the Only Woman Passenger on the Round-the-World Trip, and, Below, One of the Powerful Engines Being Hoisted into Its Gondola as the Dirigible Was Nearing Completion; the Airship Has a Capacity of 3,750,000 Cubic Feet and Uses for Fuel a Gas Having Approximately the Same Specific Gravity as Air; It Has Accommodations for Fifteen Passengers with a Lounge, Dining Room and Ten Double Bedrooms for Their Comfort, and Easily Carries a Load of Fifteen Tons; a Kitchen with the Latest Electrical Equipment Provides the Meals, and the Dining Rooms Seat Forty Persons While a Crew of Two Score or More Operates the Great Ship



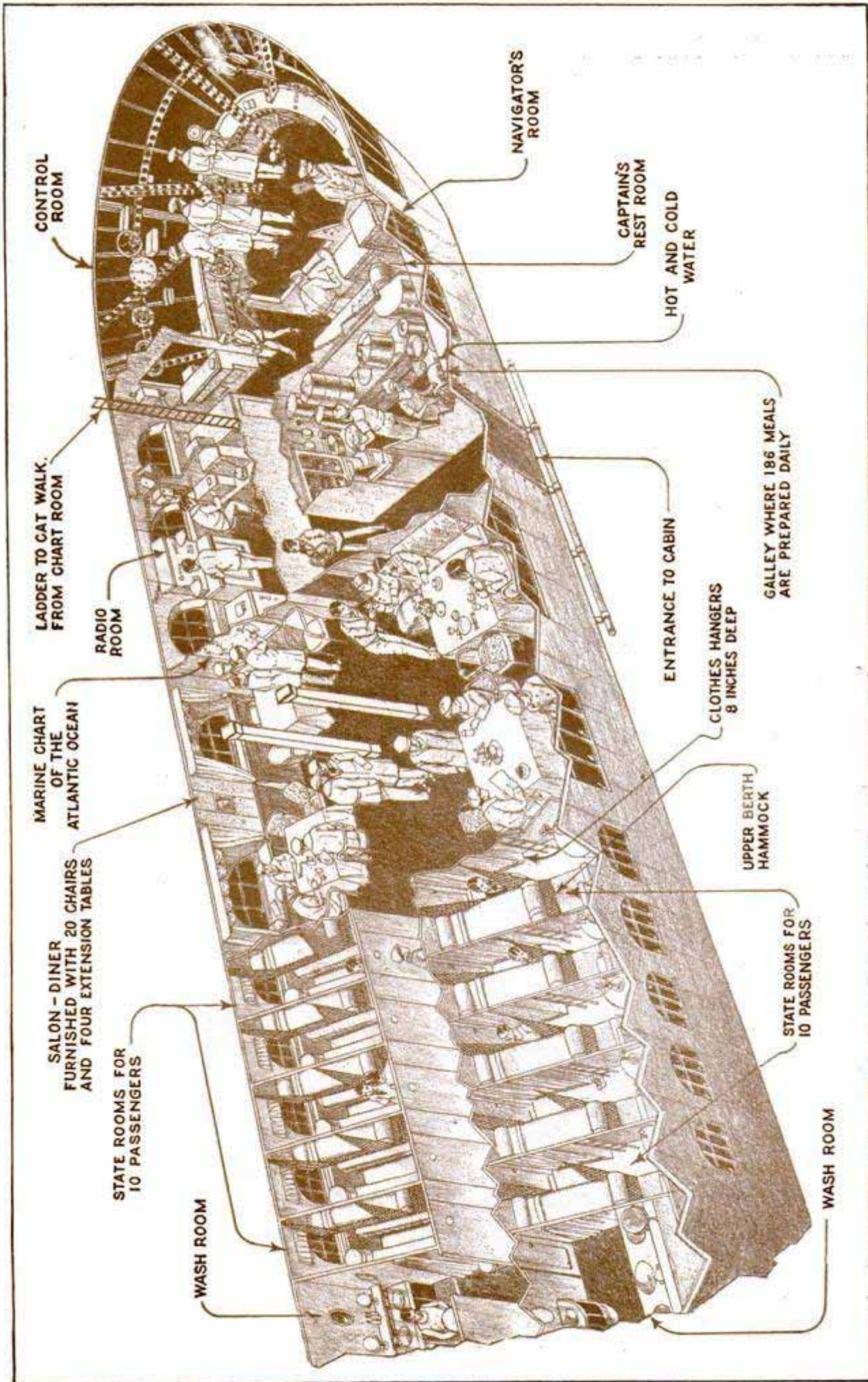


Above, Three of the "Zeppelin" Crew Who Previously Brought the "ZR-3," Now the "Los Angeles," to the United States; Left to Right, Anton Wittmann, Navigator; Capt. E. A. Lehman, First Officer, and H. Von Schiller, Navigator; at Left, a Member of the Crew Climbing Up through a Hatchway to Make an Inspection of the Dirigible's Fabric; This Picture Was Taken from Another Hatchway



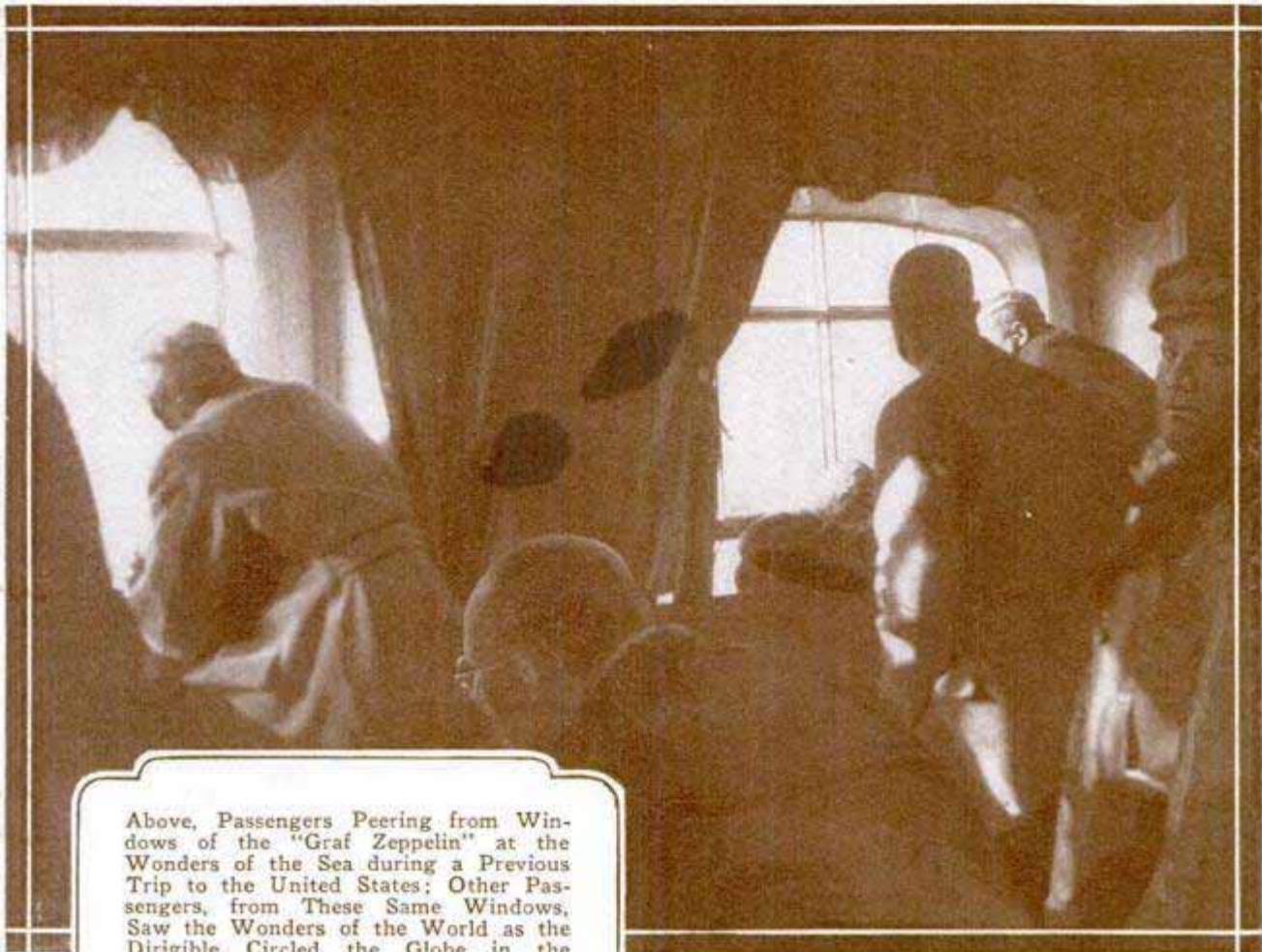
Mount Fuji, Seventy Miles from Tokyo, and a Sacred Beauty Spot of Japan, Is Pictured Above; over This and Other Such Scenes the Zeppelin Passed on Its Tour around the World

3393

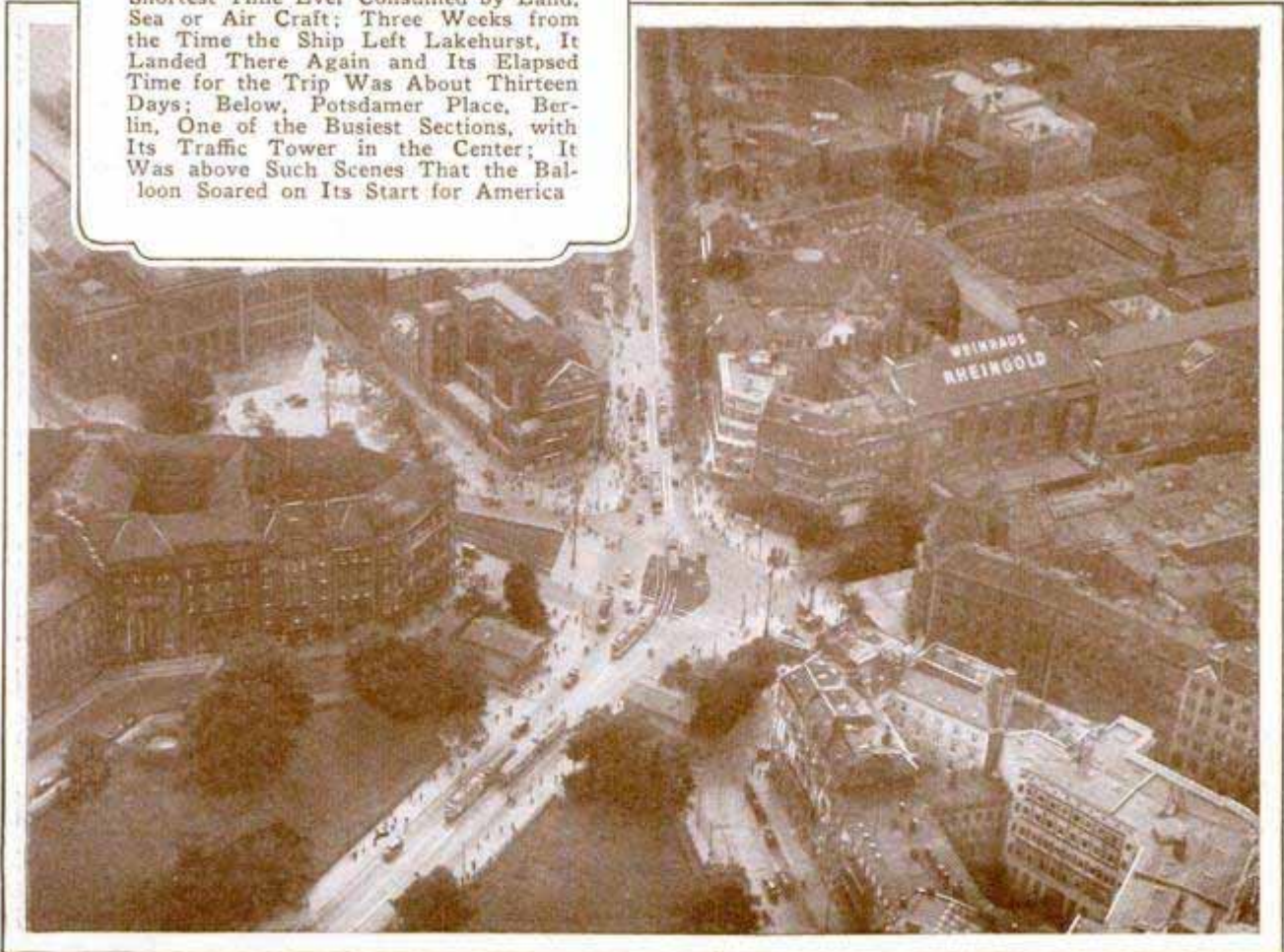


Above Is an Artist's Drawing of the Interior of the Zeppelin's Luxurious Gondola, Showing the Arrangement of State Rooms for Passengers, the Dining Salon, Chart Room, Radio Room, the Captain's Quarters, the Control Room and the Navigator's Quarters.

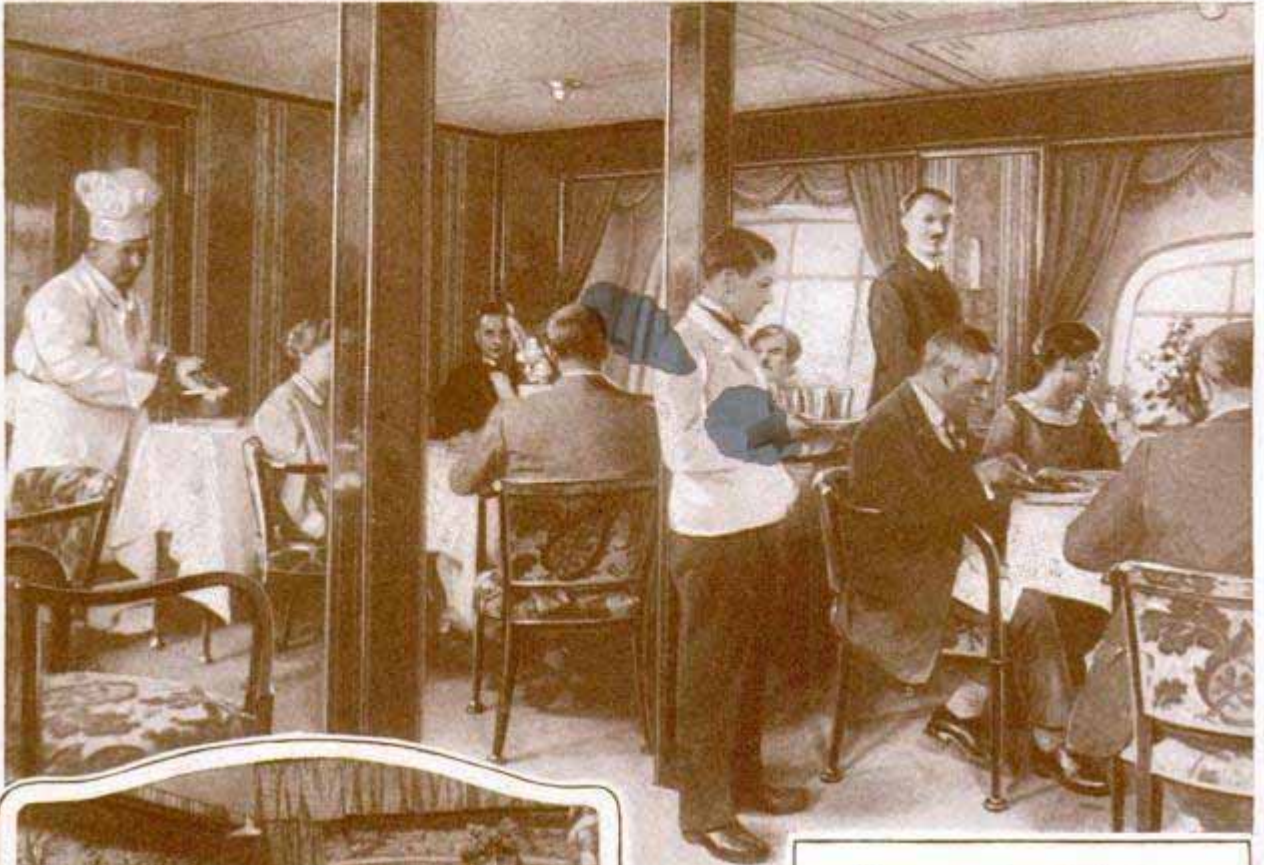
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Above, Passengers Peering from Windows of the "Graf Zeppelin" at the Wonders of the Sea during a Previous Trip to the United States; Other Passengers, from These Same Windows, Saw the Wonders of the World as the Dirigible Circled the Globe in the Shortest Time Ever Consumed by Land, Sea or Air Craft; Three Weeks from the Time the Ship Left Lakehurst, It Landed There Again and Its Elapsed Time for the Trip Was About Thirteen Days; Below, Potsdamer Place, Berlin, One of the Busiest Sections, with Its Traffic Tower in the Center; It Was above Such Scenes That the Balloon Soared on Its Start for America

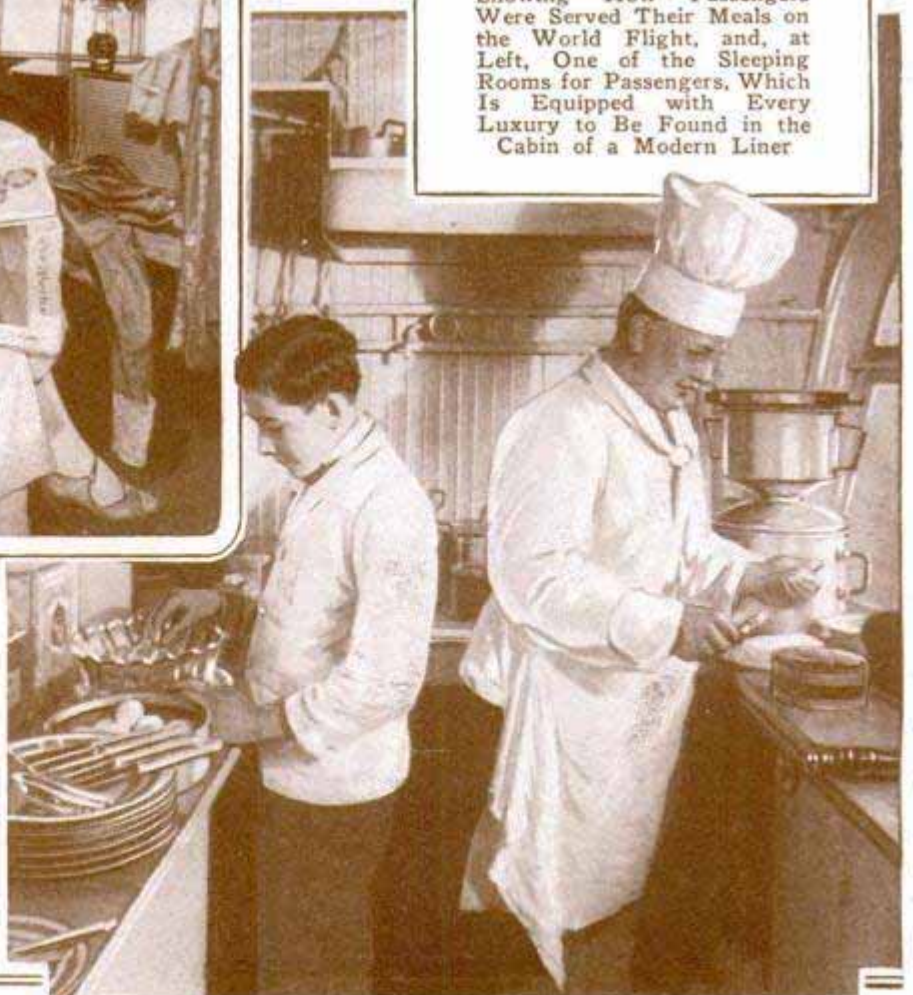


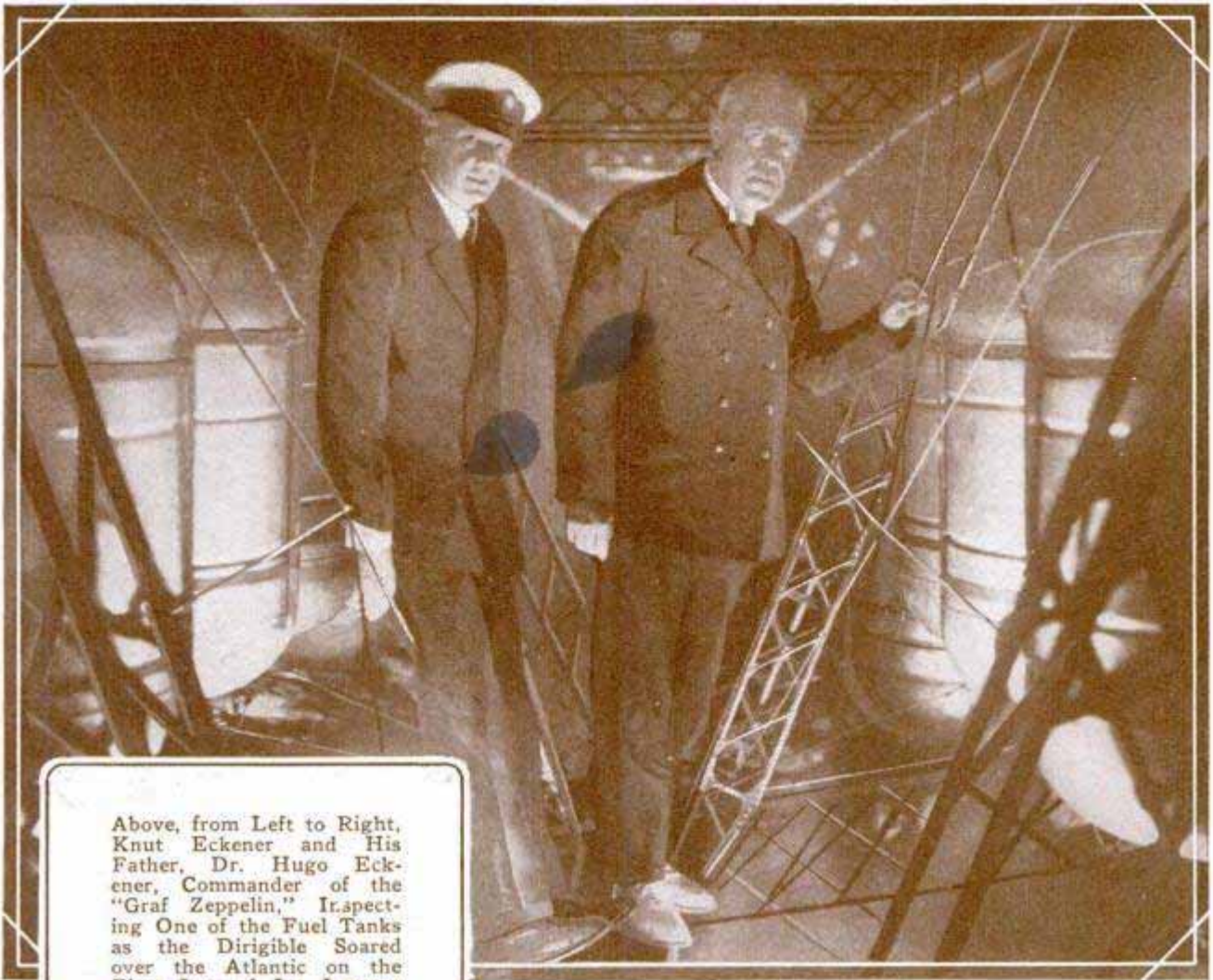
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Above, a View of the Luxurious Zeppelin Dining Room, Showing How Passengers Were Served Their Meals on the World Flight, and, at Left, One of the Sleeping Rooms for Passengers, Which Is Equipped with Every Luxury to Be Found in the Cabin of a Modern Liner

At the Right Is Shown an Interesting View of the Tiny Kitchen in Which Was Prepared All the Food Served to the Passengers and Crew of Sixty Persons during the World Tour; the Kitchen Is a Model of Efficiency and Is Equipped with Every Kind of Electrical Device Which Would Save Time and Space in Preparing the Meals

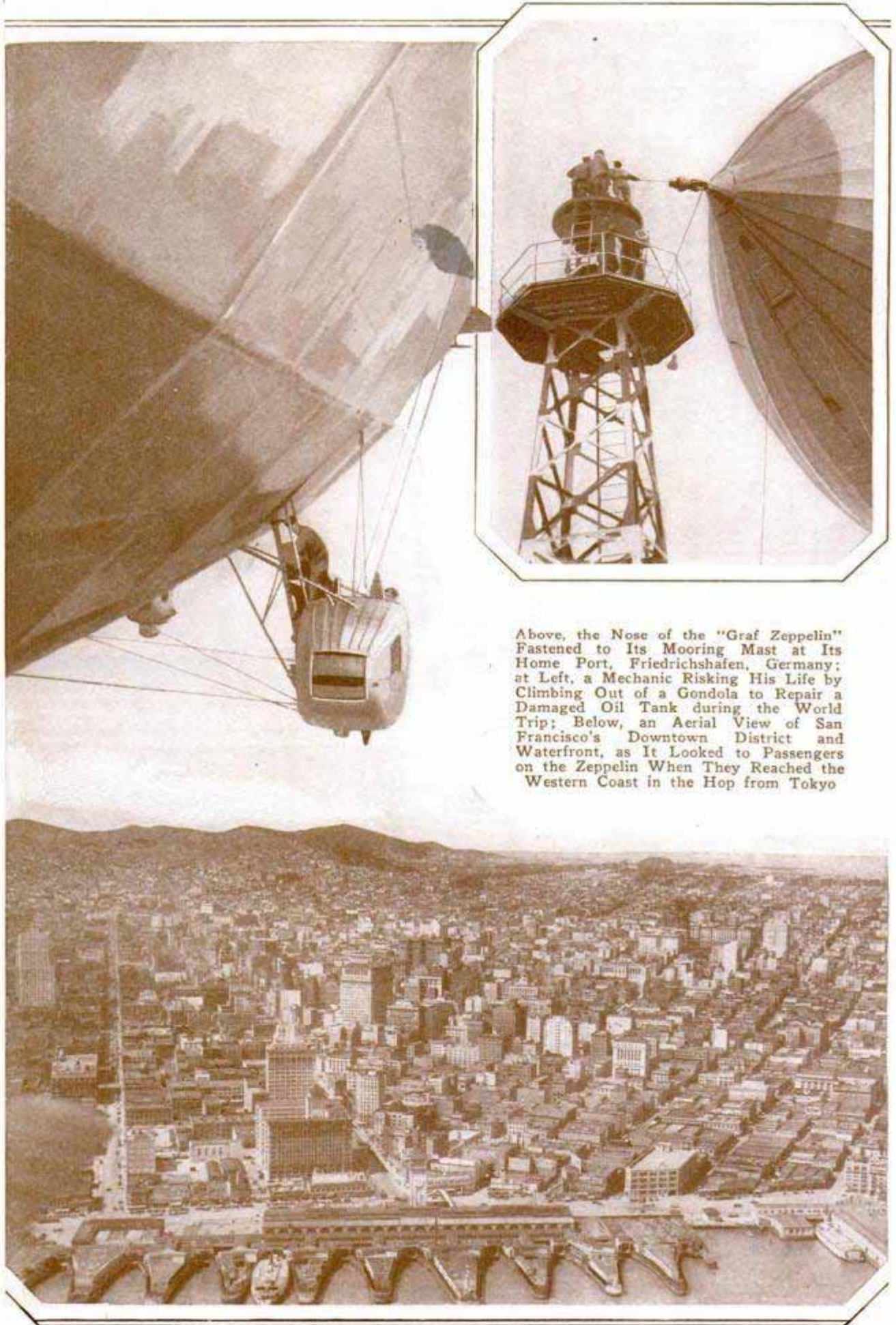




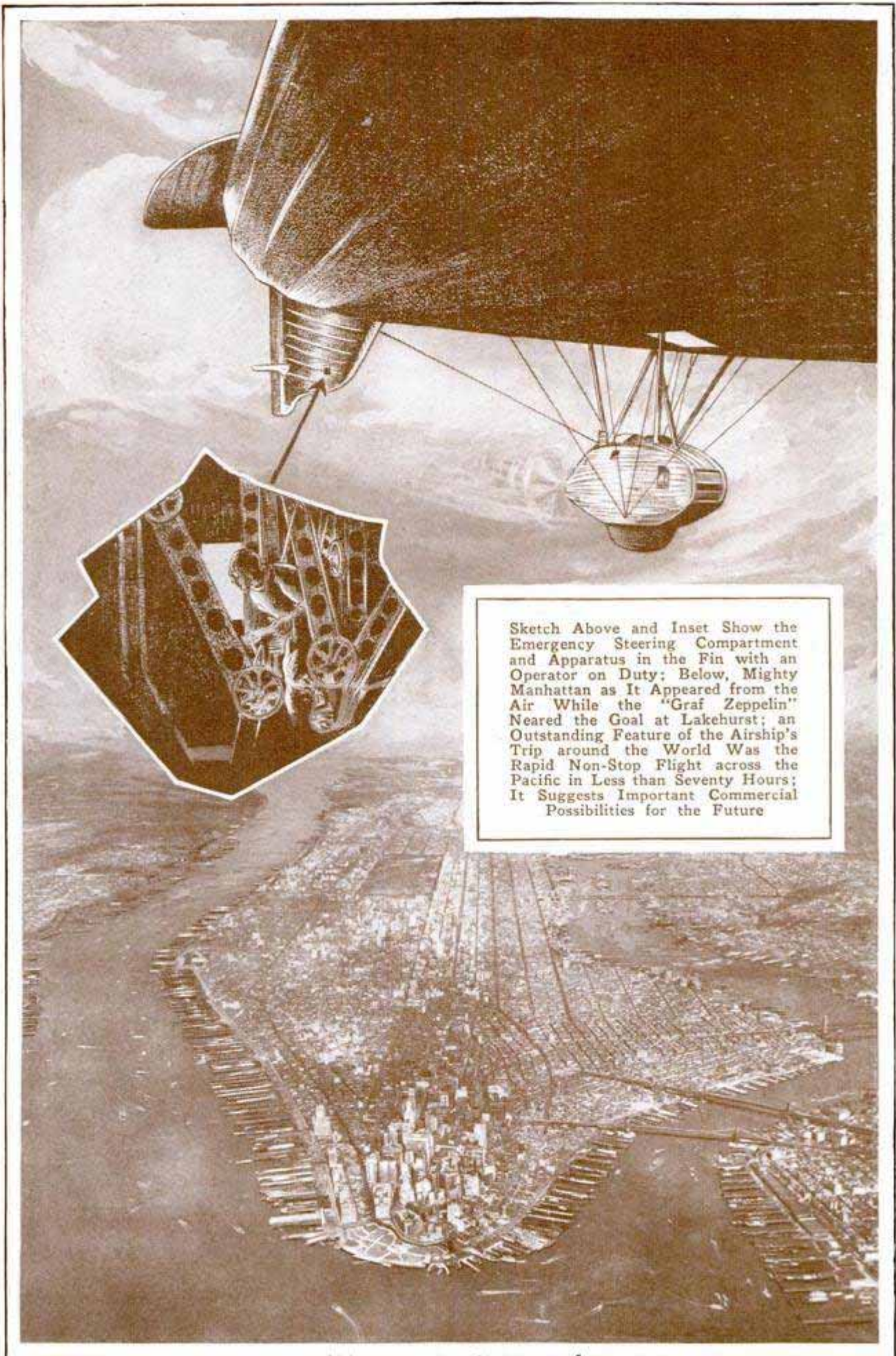
Above, from Left to Right, Knut Eckener and His Father, Dr. Hugo Eckener, Commander of the "Graf Zeppelin." Inspecting One of the Fuel Tanks as the Dirigible Soared over the Atlantic on the First Leg of Its Journey around the World; It Was the Son Who Risked His Life to Repair Damage to the Ship during Its First Trip to America in 1928; Below, Lady Drummond Hay and Other Passengers Getting Their First View of the United States



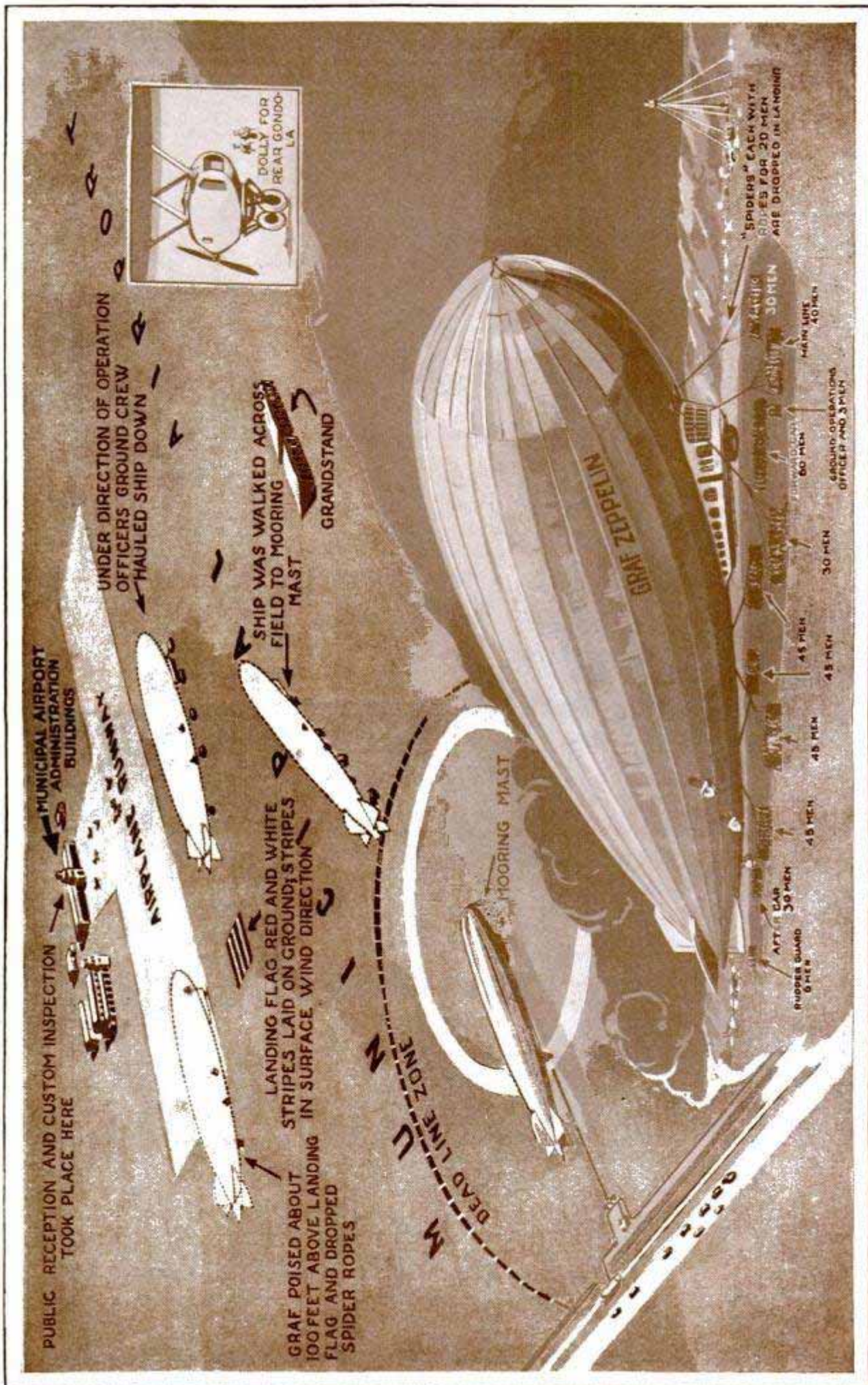
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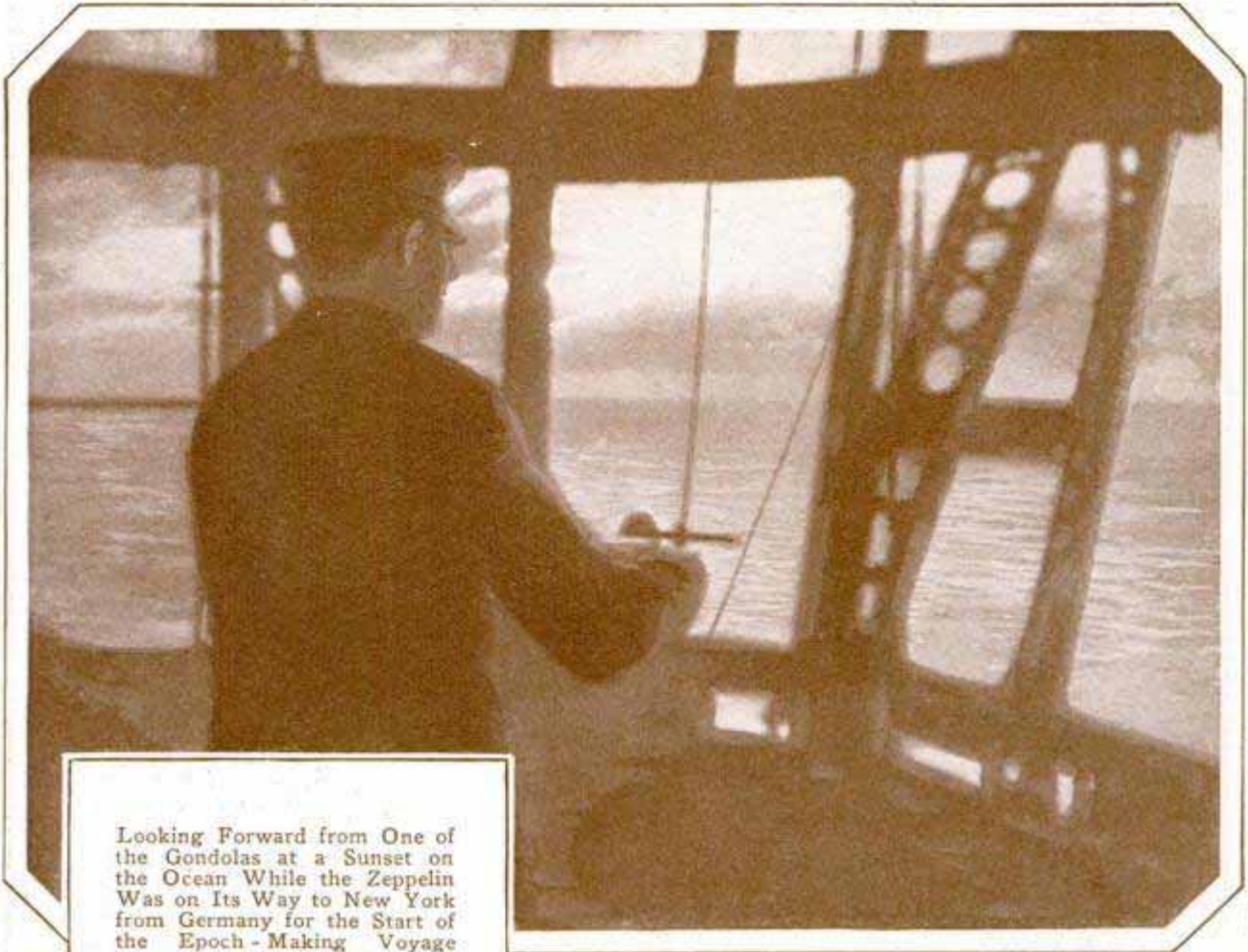
Above, the Nose of the "Graf Zeppelin" Fastened to Its Mooring Mast at Its Home Port, Friedrichshafen, Germany; at Left, a Mechanic Risking His Life by Climbing Out of a Gondola to Repair a Damaged Oil Tank during the World Trip; Below, an Aerial View of San Francisco's Downtown District and Waterfront, as It Looked to Passengers on the Zeppelin When They Reached the Western Coast in the Hop from Tokyo



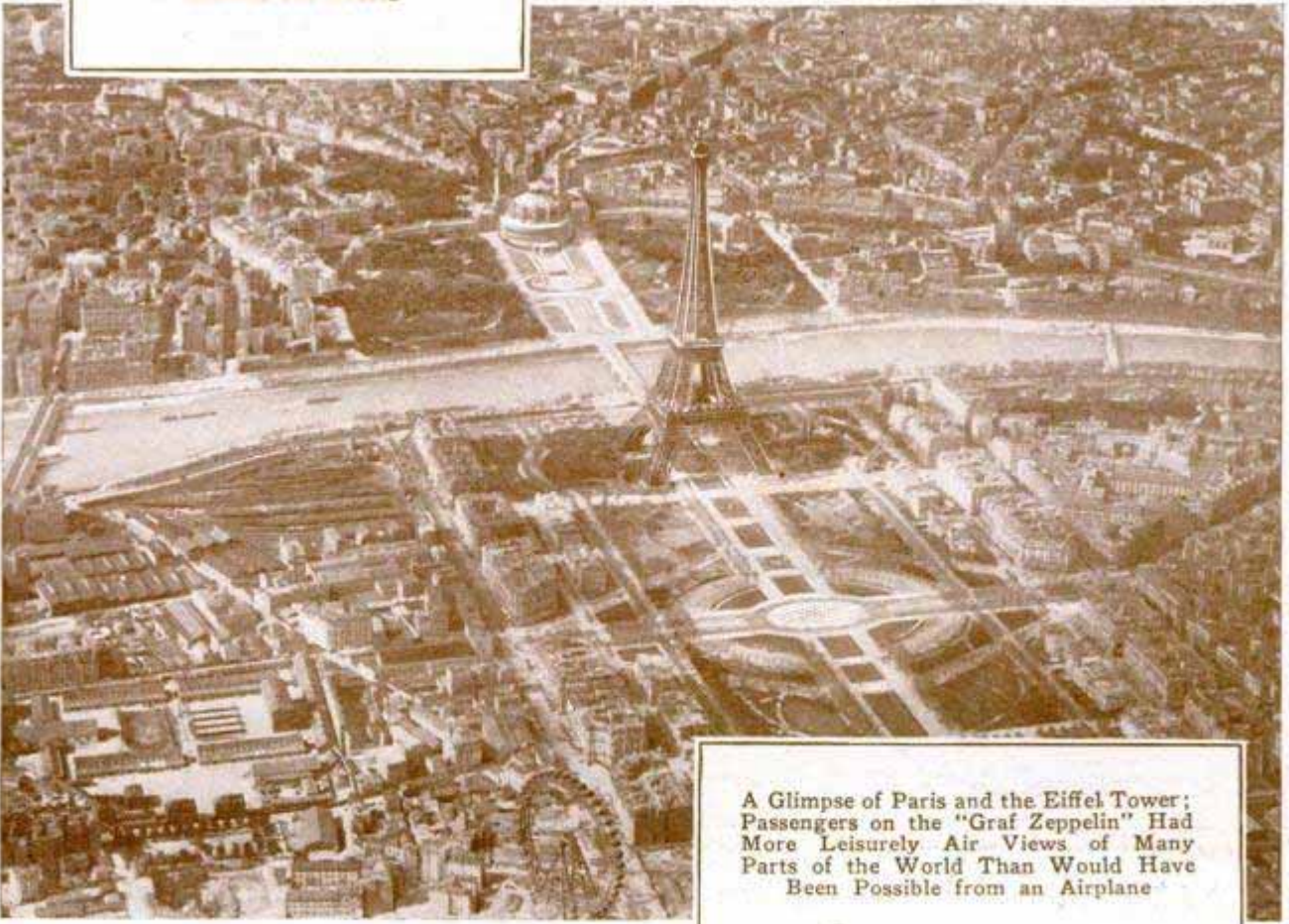
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How the Graf Was Moored at Mines Field, Los Angeles, After It Had Been Halted a Moment before the Administration Building on the Airport: Note the Number and Position of the Squads of Men Needed to Handle the Big Craft and Walk It Safely to the Mast

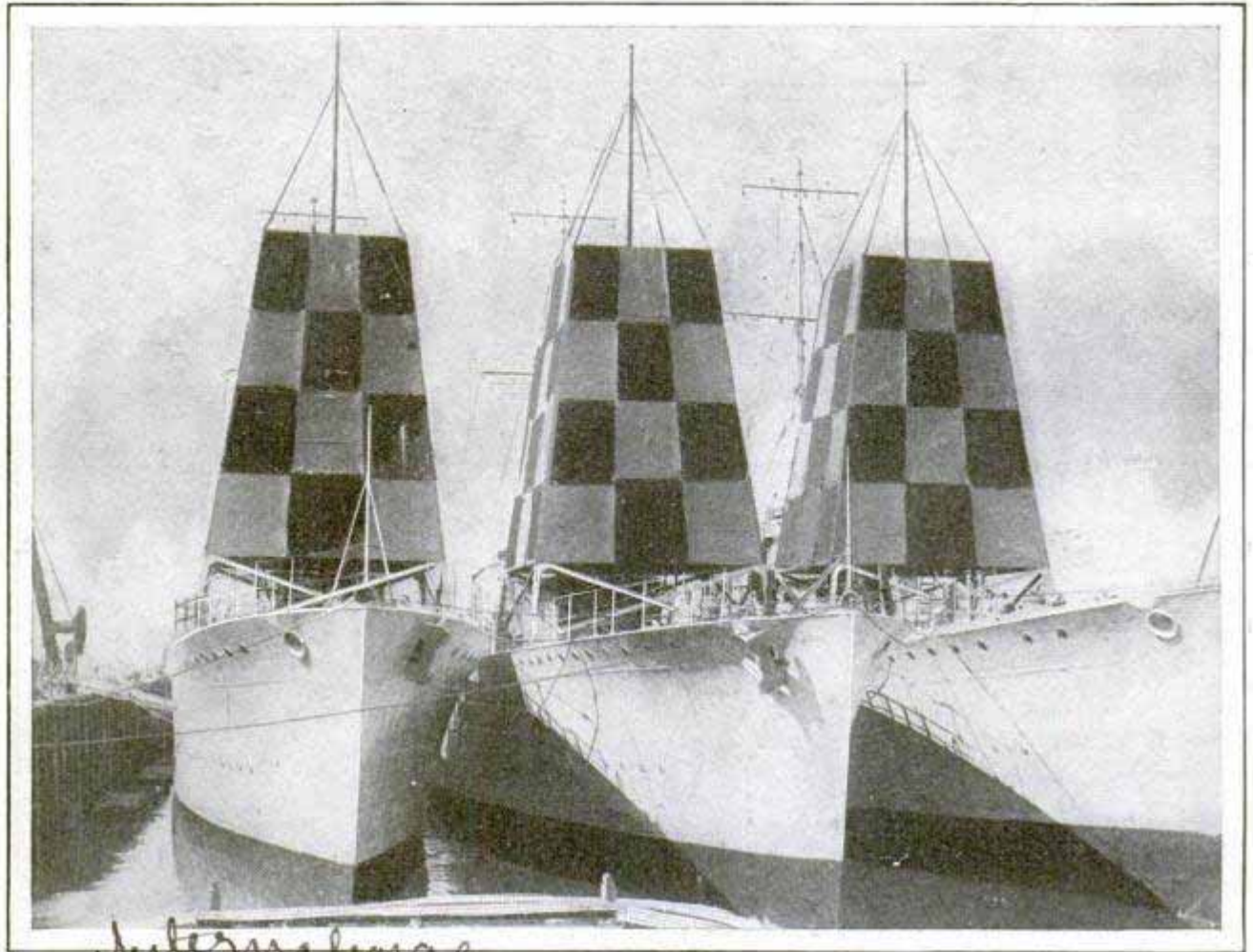


Looking Forward from One of the Gondolas at a Sunset on the Ocean While the Zeppelin Was on Its Way to New York from Germany for the Start of the Epoch - Making Voyage around the World



A Glimpse of Paris and the Eiffel Tower; Passengers on the "Graf Zeppelin" Had More Leisurely Air Views of Many Parts of the World Than Would Have Been Possible from an Airplane

3404



Destroyers Fitted to Serve as Markers in the Schneider Cup Races; the Distinctive Pattern and Colors of the Pylons Make Them Visible for a Considerable Distance

PYLONS BORNE ON DESTROYERS ARE AIR-RACE MARKERS

Three British destroyers were outfitted with pyramid-shaped pylons mounted on their forward decks, to serve as markers in the Schneider cup races. The pylons carried on the ships marked the turning points for the competing planes.

PENCIL WRITES THREE COLORS WITH INTERCHANGING LEADS

Capable of writing in any one of three colors by simply pressing a button, a handy pencil which saves the time of artists, designers and draftsmen is now on the market. The pencil carries black, blue



Sectional View of the "Magazine" Pencil That Holds Leads of Different Colors

and red leads, any one of which may be drawn out of position and another in-

serted by pressure of the finger. The pencil also may be fitted with yellow, green or indelible leads, and comes in a variety of exterior colors.

CATTLE THRIVE ON IRON RUST MIXED IN FEED

By the addition of common iron rust to the diet of cattle tested at Iowa State college, beneficial results have been obtained in recent experiments. For eight months several groups of cattle were fed different rations, and at the end of the period, it was found that those which had the rust added to their rations had gained almost one-third more in weight than those which had been given the normal plain feed. An ounce of rust was given daily to each of the animals.

Ten per cent of the areas of the national parks will be open to travel when the present ten-year road-building program is completed.

Empire. Archer, Gray

Internationale

Ames Iowa

Chicago J. H. Steady 46/88 46/61

Tri-Kolor

nardi Mfg Co U.S. Canada

3421

3402

\$2.00 - \$3.50

Research Assn. for Woolen and
Worsted Industries

3362

TESTER FOR FABRIC SHOWS DEFECTS IN WEAVING

Knitted fabrics of various kinds are automatically tested with an interesting apparatus developed by a British inventor. It reveals irregularities in the finished textiles and also enables the inspectors to trace and correct the cause of defects, such as result from improper variation in the tension on the threads during the knitting operation.

FLEXIBLE SHAFT IS COUPLING FOR SHOP TOOLS

Increasing the usefulness of the average workshop, a flexible-shaft assembly is on the market that can be fastened to the shaft of an electric motor while the other end is equipped with attachments for various kinds of work. The assembly consists of an outer flexible steel casing, inside of which a shaft made of layers of piano wire rotates. Threaded ends permit fastening of a drive coupling to one end, and to the other adapters for a drill chuck, polishing and grinding wheels, small saws, groovers, routing cutters, wire scratch wheels and a carbon-removing brush.

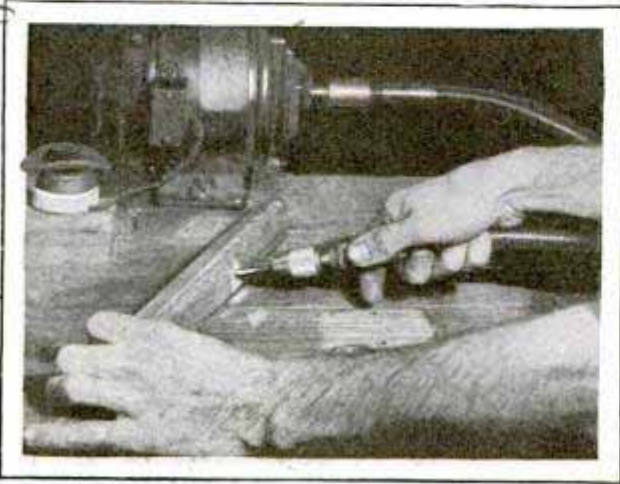


A Canoe Made into a Sailboat by Adding Outrigger Beams and Stabilizers; an Engine Also May Be Attached

OUTRIGGER CANOE A SAFE BOAT FOR SAIL OR MOTOR

Canoeing has not only been made safe, but the thrills of sailing and motor-boating have been added to it, with the provision of outrigger beams to which stabilizers are attached. Two flexible spruce outrigger beams are used, metal air-tight stabilizers being attached to each end, making capsizing virtually impossible. With this arrangement, the canoe also may be equipped either with sails or with an outboard motor. In the latter case, a full canopy over the boat is provided. The equipment may be attached to any canoe in a few minutes without marring the craft, and one of its principal advantages is that it has a draft of only a few inches, and thus the boat may be used in very shallow water.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.



Flexible Shaft Which Provides a Coupling between a Portable Motor and Workshop Tools

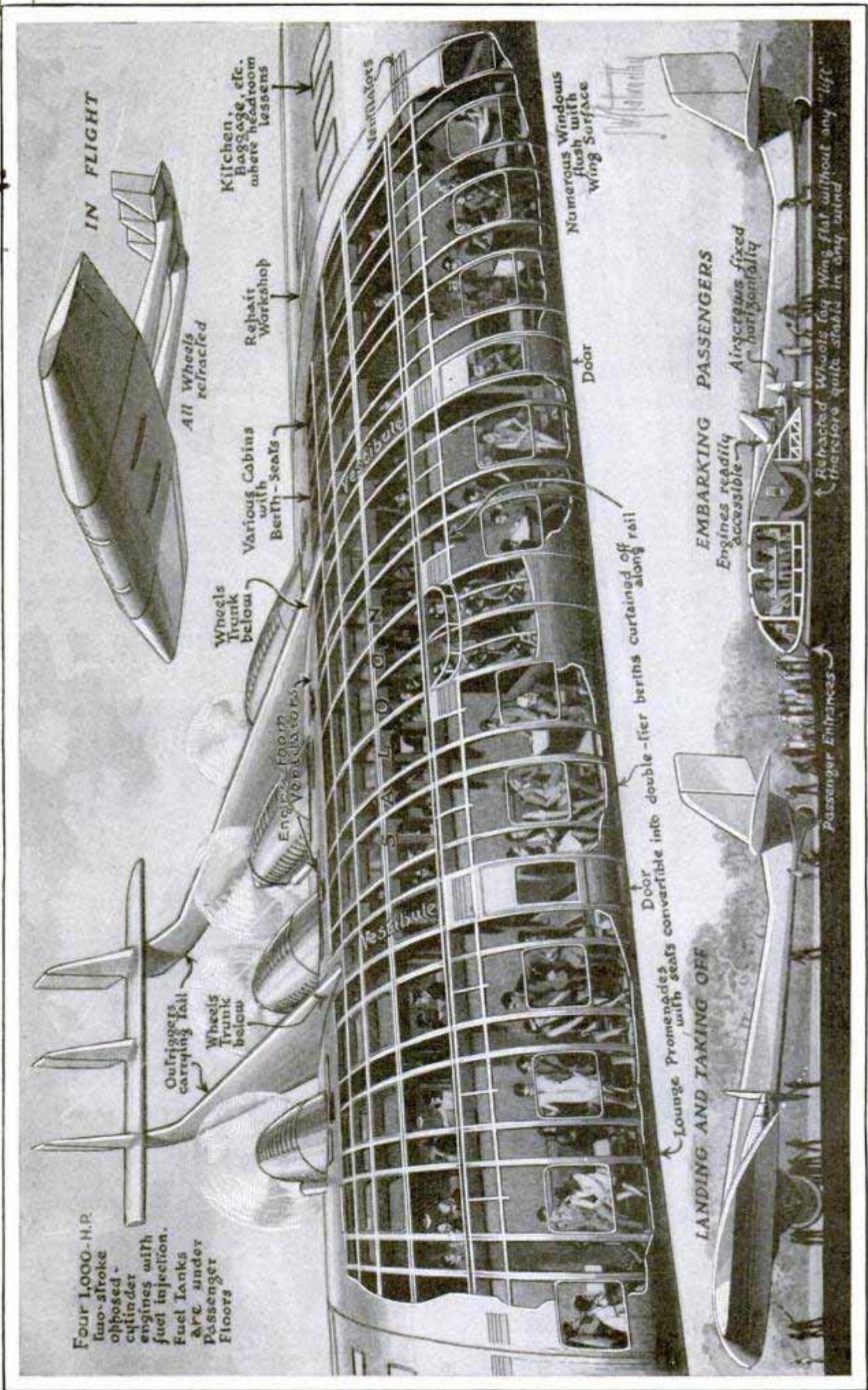
Marketed through S.S. Kresge Co.

Torrington
Headingley
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3145



Four 1,000-H.P. two-stroke opposed-cylinder engines with fuel injection. Fuel tanks are under passenger floors

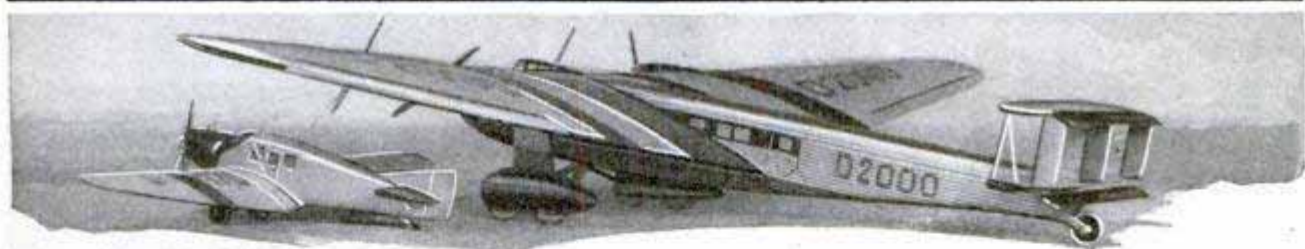
Drawing of the Junkers Ship Which, It Is Planned, Will Be Driven by Four 1,000-Horsepower Engines and Will Carry 100 Passengers in Huge Wings, Nine Feet Thick and with a 240-Foot Span; There Is No Fuselage, Everybody and Everything Being Contained in the Wings

A. ...
R. W. Schroeder

3143

The Future of Air Travel

RECENT altitude flights, the development of the variable-pitch propeller, better fuels and more efficient planes have awakened new interest in the practical side of high flying. Engineers assert that aviators will be reaching 75,000 feet in the near future. At 30,000 to 45,000 feet, where the stratosphere begins, with its favorable constant winds, a ship, it is believed, might skim from Los Angeles to New York in eight hours. Several thousand feet higher, even greater speeds could be made. Such heights will not be attained with present equipment, but

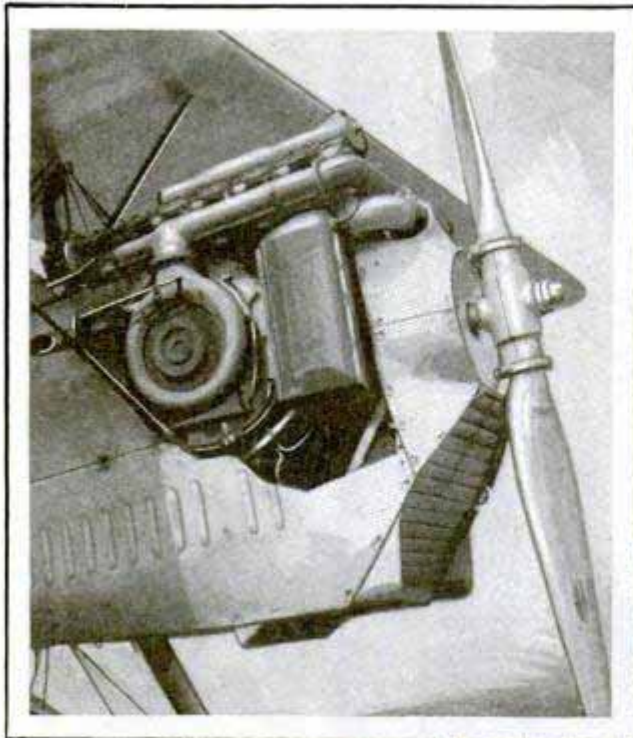


Above, Fur-Lined Suit, and Oxygen Mask and Tank for Flying in Rarefied Air; Below, Model of Forty-Passenger, Twenty-Ton Junkers Ship, Compared with an Ordinary Four-Passenger Plane

authorities declare that the utilization of the upper altitudes, the speedways of the skies, is the next step in flying, and they confidently predict that what is considered a daring altitude "stunt" today, will be an everyday occurrence tomorrow.

High flights are constantly revealing secrets of the skies. Several important developments in flying progress are directly due to the "Columbuses of the upper air," who have been confident that, high over our heads, lie faster and therefore shorter routes to distant lands. It is a fact not generally known that some of the improved gasolines widely enjoyed in motoring and in aviation today, are the outcome of a better fuel prepared especially

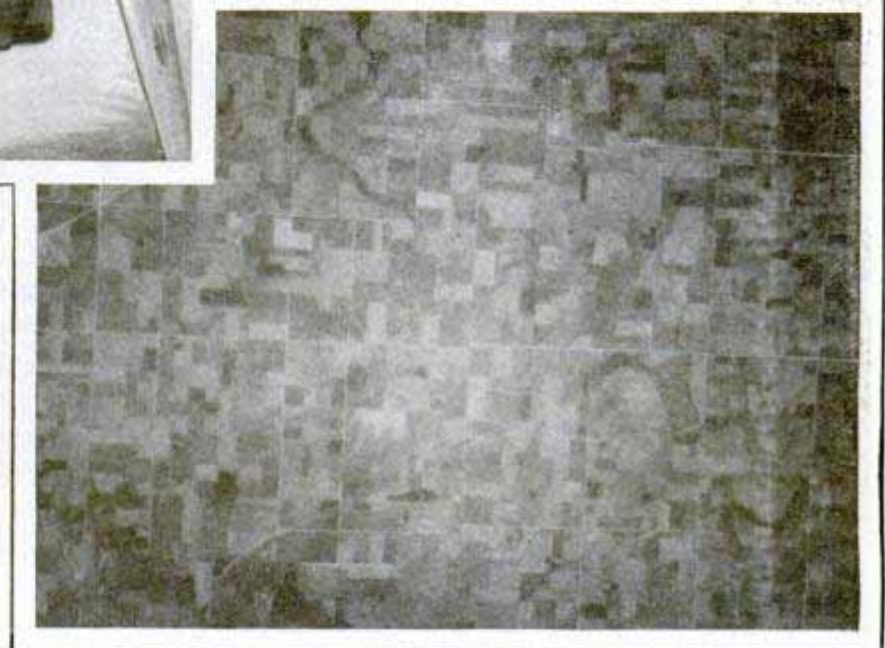
for Maj. R. W. Schroeder, pioneer altitude flyer, for his record-breaking flights of ten years ago. The flow meter, a valuable instrument to tell how much gasoline per hour the engine consumes in flying, was originated by Major Schroeder and developed by engineers under his direction. Altitude flying has given impetus to the development of the variable-pitch propeller, promised for practical use almost any day. With this device, on which the blades can be changed in pitch to give the ship greater efficiency on take-offs and at cruising speeds, airplanes will be given something of the flexibility and added power attained by the gear-ratio arrangement in an automobile.



tion. Compressed by the supercharger and by the pistons of the motor, it would burn and supply power for flight. "If a plane were powerful enough to reach such a height, it could remain there for an indefinite length of time and could cover any distance at a speed of 3,000 miles an hour, using the atmosphere as a fuel," declares B. V. Korvin-Kroukovsky, aeronautical engineer, in a recent article in *Aviation*. "To be able to do so, however, it must possess about forty times the minimum power it requires for horizontal flight at sea level."

High flights have led to many improvements in aerial photography and in flying instruments. To keep clockwork mechanisms on barographs and other instruments from stopping, due to thickening of oil at high altitudes, engineers have learned to substitute a few grains of graphite for ordinary lubricants. Heated flying suits and cameras, their shutters

kept warm so that they will not become brittle and fly to pieces in the cold air, improved goggles and better breathing apparatus are a few other developments contributed by altitude flying. However, much of this pioneer equipment will not be needed in the future, for aviators will ride the high levels in air-tight cabin planes. They will breathe air at sea-level pressure all the way, through the operation of a supercharger similar to that used to supply the engine. Since Major Schroeder made the first flights at high altitudes with a supercharger, this instrument has been greatly improved, until now one is visioned, capable of supplying a plane at an altitude of 200,000 feet. At such a height, the mixture of hydrogen and oxygen in the air is right for combus-



Above, Plane Equipped with Supercharger for Attaining Great Altitudes; Below, a Photograph of Indiana Landscape from 39,250 Feet

Such extreme altitudes probably will not be attained in the immediate future, but man will soon be sailing along the lower stratosphere where there are no clouds, no fogs, no disturbing air currents, only constant conditions favorable to progress.

According to Major Schroeder, whose official altitude record of 33,113 feet stood for several years, man will sail the upper air for the chief reason that there lies the greatest speed, and speed is the supreme aim in aviation.

"Picture an automobile road eight miles from your city, a road that is traveling 100 miles an hour in the direction you want to go," he said in talking over some phases of altitude flying. "Suppose your automobile makes 100 miles an hour. In



Here Is an Airplane Constructed Especially for Attaining High Altitudes; Experiments with Such Ships Are Considered Important Because Great Sky Liners of the Future Expect to Utilize the Upper Air Strata

order to enjoy extra-rapid progress toward your destination, you naturally would drive upon this traveling road. Now, tip this magic highway eight miles up in the sky and you have a fair idea of the great speedway that is up there waiting for us. We probably know more about the bottom of the ocean than we do of the extreme upper air, so that this region is one of mystery, but we do know that it is suited to flying in spite of its extreme cold and the rare atmosphere. In some ways, it is an ideal region, for conditions are constant. There are no storms or fogs. The air is so dry that when frost forms on the plane, it quickly drifts or is blown off.

"Present improvements in superchargers, propellers, engines and planes, all point to the practicability of further exploration and use of the higher altitudes. An air-tight cabin plane will have to be built. Before leaving the army, I had started construction on such a cabin. Occupants of the plane will be comfortably

supplied with air at sea-level pressure from a supercharger. A man needs only 300 cubic feet of fresh air per hour while a 425-horsepower engine requires more than 42,000 cubic feet of air an hour, so it ought not to be difficult to keep passengers and crew breathing under sea-level conditions.

"Planes for these high altitudes will be specially constructed. With the present type of ship and propellers, it takes too long to reach high altitudes. The fast express air liner of the upper lanes will have broad wings for steep climbing, a variable-pitch propeller and a reliable supercharger. The supercharger is intended to keep the carburetor supplied with air at sea-level pressure, no matter how rare the surrounding atmosphere may be. This is extremely important, for, at little more than 20,000 feet, the air is only half as dense as it is at sea level and, at about 80,000 feet, its density is reduced twenty-five times. Without a supercharger, a motor loses more than half of its original

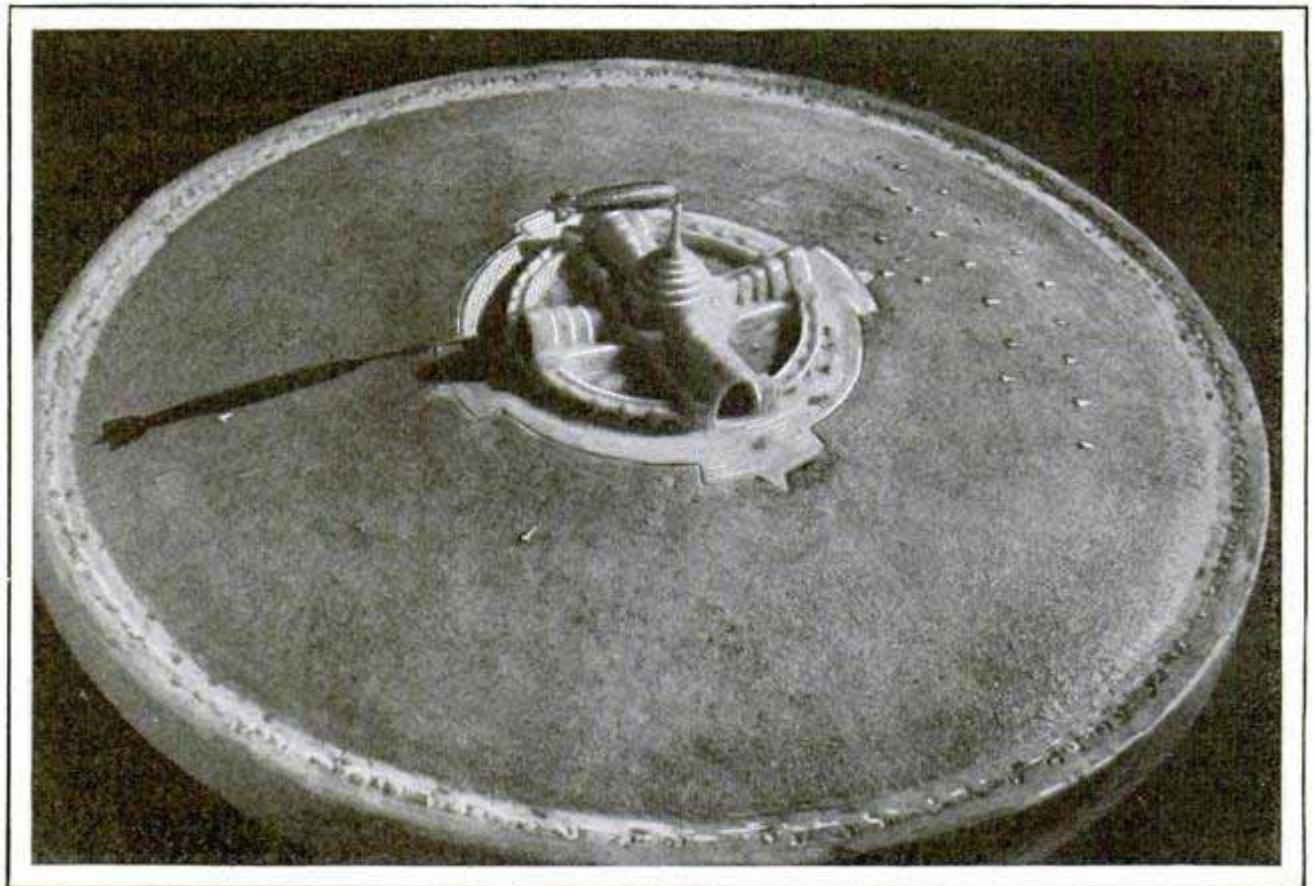
horsepower at an altitude of 20,000 feet, while, at 45,000 feet, only about ten per cent of the original power is available.

"We do not know much about the winds in the stratosphere, but what little we have discovered shows that they probably will be of great aid. There are dependable currents from the west at 30,000 feet and higher. Speeds of 300 miles an hour from Los Angeles or San Francisco to New York will be common because of these winds at high altitudes, so that I regard non-stop flights of eight hours between the coasts, from west to east, as a practical certainty just as soon as the proper planes are constructed."

One of the chief instruments the high flyer of the future will use, says Major Schroeder, is the ordinary thermometer. When it ceases to register any lower temperatures, the aviator will know that he has reached the stratosphere and can level off with the constant anti-trade winds in his favor. This low temperature probably prevails for a considerable altitude above the troposphere, or lower level of the atmosphere, at a comparatively constant point around seventy degrees

below zero. From observations taken by means of weather balloons, at a station near the equator, at an altitude of 15,000 to 45,000 feet, southwest counter trade winds are found. From 45,000 feet to 60,000 feet is a level of upper easterly winds which change to westerly at levels between 60,000 feet and 75,000 feet, while the section between 75,000 and 90,000 feet is swept by easterly winds. Aviators therefore would be able to take advantage of the various wind directions at different elevations when extreme altitudes are accessible.

One of the interesting developments in high flying is the relative ease with which a high altitude is attained now as compared with the time when Major Schroeder battled his way to a height where his eyeballs froze and he was compelled to descend when exhaust fumes from the motor poured into the cockpit with blinding and suffocating results. His barograph later showed that when he lost consciousness, he fell from the peak of his flight, 38,180 feet, to about 1,500 feet in two minutes and eleven seconds. Not long ago, Lieut. Apollo Soucek, of the navy, climbed



A Model, Done in Soap, of a "Beehive" Airport, Including, in the Center, an 850-Foot Hotel with a Dirigible Mooring Mast, and, Below the Surface, Tunnels for Autos, Subways and Railroads

to 39,140 feet with nothing more unpleasant than a feeling of weakness and dizziness and eyes that pained him in the extreme cold. A few days later, he made a world's record in the same plane, fitted with pontoons.

Capt. St. Clair Streett and A. W. Stevens, of the army, reached a height of 40,220 feet, by their altimeter, after a grind of an hour and twenty minutes. They had six quarts of liquid oxygen and suffered relatively little discomfort, although the throttle was frozen and they had to descend carefully to 34,000 feet where the throttle thawed out. The plane's gasoline was exhausted and they landed. In the early days of flying, heights of a few hundred feet were considered remarkable, and experts predicted that planes would meet their chief drawbacks in the form of land obstacles. Having learned to fly in the roughest and stormiest air, man is now directing his attention to the quiet altitudes nearer the stars.



This House, Constructed to Look Like a Pensive White Puppy, Serves to Advertise a Roadside Hot-Dog Stand in California

**HOUSE LOOKING LIKE PUP
ADVERTISES HOT DOGS**

Constructed to resemble a pensive white puppy, a house in California serves to advertise the hot-dog stand of the owner. The dog house is located near Los Angeles and attracts much attention from passing tourists.

**ALARM CLOCK STARTS MUSIC
TO AWAKEN SLEEPER**

Music replaces the shrill ringing of a bell to awaken the sleeper in a combined alarm clock and phonograph now on the market. The clock is set for the rising time when it starts the record playing.



Alarm Clock Attached to a Phonograph Awakens You with Your Favorite Record

BABY TROUT EAT HORSE MEAT

Ground horse meat is the diet on which baby trout thrive at a fish farm in Beaver Crossing, Nebr. Elimination of freshwater algæ, well aerated water, clean pools and the horse meat were found to be the principal requirements of a successful fish hatchery. The small fry are hatched on the premises in wooden troughs filled with water from artesian wells which flows over aerators. When the fish are four inches long, they are moved to concrete pools which are painted with lime to keep down the growth of algæ. The fish grow to a length of eight or nine inches in less than a year, at which time they are worth about a quarter each and weigh three to the pound.

Goldfish sometimes live for thirty years.

J. Elmer Young, 25-A, Great New Street, London, E.C.4, Eng.

Letter returned.
2/20/31

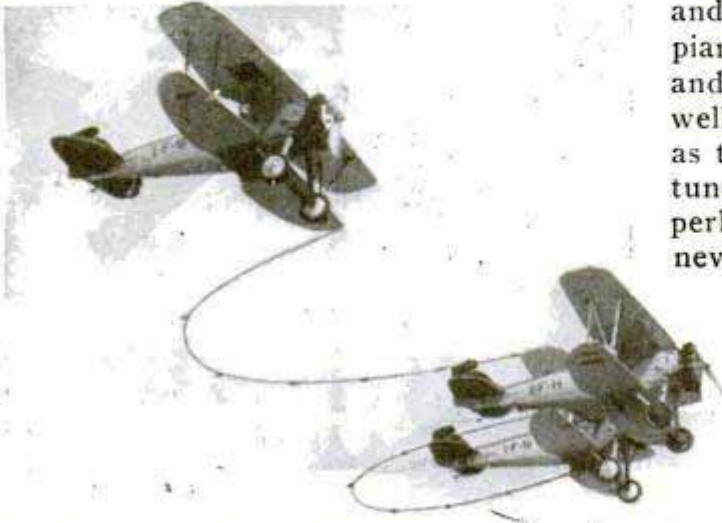
*and many more
leading London.*

3363

613 Spreckels Theatre Bldg
San Diego Calif

THREE PLANES TIED TOGETHER LOOP THE LOOP AT ONCE

Such great flying skill has been developed by fighting squadron No. 1 of the



Navy Planes, Bound to Each Other with Ropes in Groups of Three Are Looping the Loop Together

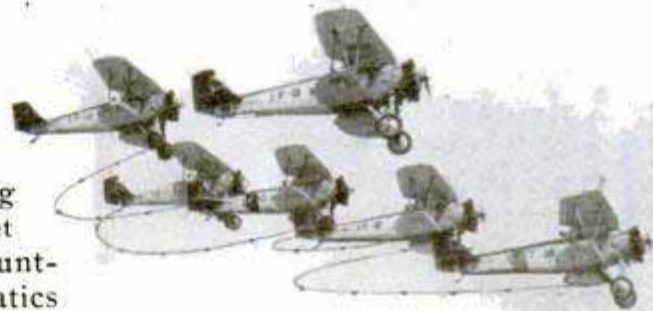
U. S. S. "Saratoga" that the nine-plane formation loop the loop together, each group of three ships being tied to each other by ropes forty feet long. The navy does not permit stunting, so the flyers call the feat "aerobatics leading to flight proficiency." In flying these dangerous formations, the wing tips of the various groups are only fifteen feet apart. The planes take off in three sections known as the "Vee of Vee's," move into a nine-plane "V," shift into what is known as an echelon of echelons, then loop the loop in three-plane formations without breaking the lines.

3379

JARS OF WATER INSIDE PIANO REDUCE HEAT DAMAGE

To counteract the effects of hot, dry air upon his piano during the winter, E. J. Disler, expert tuner of Tiffin, Ohio, has had success in placing six fruit jars, filled with water, inside the cabinet of the upright. He is careful to keep the containers filled and to adjust them so that they will not touch strings or sounding board. The jars are removed in the spring. "An ideal temperature for a piano would be about sixty-five degrees Fahrenheit the year around," Mr. Disler declared. "Such conditions cannot be secured in the

average home, hence every effort should be made to prevent the piano from being damaged by hot air that has too little moisture. The heart of the piano is the sounding board. Since this is made of wood, it naturally is affected by moisture and temperature. Remember, when a piano gets out of tune, that its volume and tone quality are greatly impaired as well as its pitch. There is no general rule as to how often an instrument should be tuned in a year, two times at a minimum, perhaps. The old idea that a piano should never be placed against an outside wall has gone by the boards with the advent of modern heating. In winter when the house is likely to be overheated,



an outside wall is often the best place for the piano. Put the instrument in the coolest place in the house in winter; any spot where the piano is not directly exposed to a draft from between two windows." One of the chief reasons why pianos get out of tune, Mr. Disler explained, is that the hot, dry air causes the sounding board to shrink, resulting in a change in the tension of the strings.

336

WHALES TO BE ELECTROCUTED WITH CHARGED HARPOONS

Whales in future will be electrocuted, if an invention which has been tested is taken up by whaling companies. Norwegian engineers have devised a method of killing them instantly with electric currents in the harpoons. Three whales were killed in this manner in tests off the Faroe islands. The invention is considered of great value, because the number of whaling vessels could be reduced.

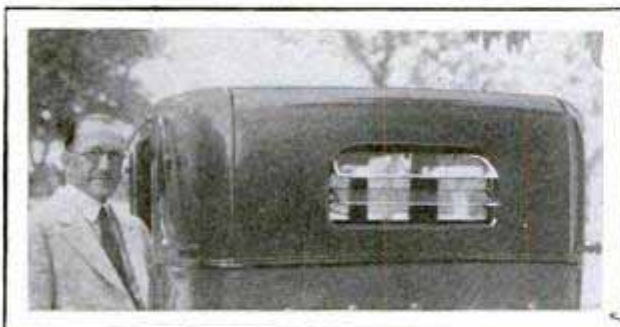
Weekly Express
8/10/29

CANCER CURE FOR RATS FOUND BUT UNTRIED BY HUMANS

Discovery of a compound that dissolved and apparently cured cancer in 1,000 rats and mice in a few days has been announced to the International Physiological congress, although the treatment has not been tried on human beings as yet. It is injected hypodermically into the cancer and its effect literally is to cause the malignant cells to breathe themselves to death. The process is termed oxidation, and means the abnormal cells get more oxygen than would filter through to them from breathing. Instead of trying to poison the cancer, the treatment consists of speeding up the natural activities of the body cells, thus working it to death. A young Russian who evolved the process said his attention was arrested by the fact that in humans suffering from cancer the cortex of the suprarenal glands showed effects apparently traceable to the cancer. An extract of these glands in their healthy state is the basis of his compound. To this extract, called corferrol, is added iron and pyrrol blue, a coal-tar product.

VENTILATOR IN REAR WINDOW OF AUTOMOBILE

Ventilation of closed automobiles without creating heavy draft is made possible by the use of a rear-window ventilator that takes the place of the usual stationary back window. It consists of two glass plates, each in a metal frame attached to a rod, by means of which the ventilator may be tilted inward or outward. The operation is similar to the



Rear-Window Ventilator for the Auto, Operated Like the Transom over an Ordinary Door

transom above doors and the ventilator is used particularly in cold weather when opening windows would cause a draft.

Dr. David H. Taylor
 1211 Medical Arts Bldg



These Accomplished Stilt Walkers Are Employed in Training Vines in an English Hop Garden

WORKERS ARE PUT ON STILTS TO TRAIN HOPS

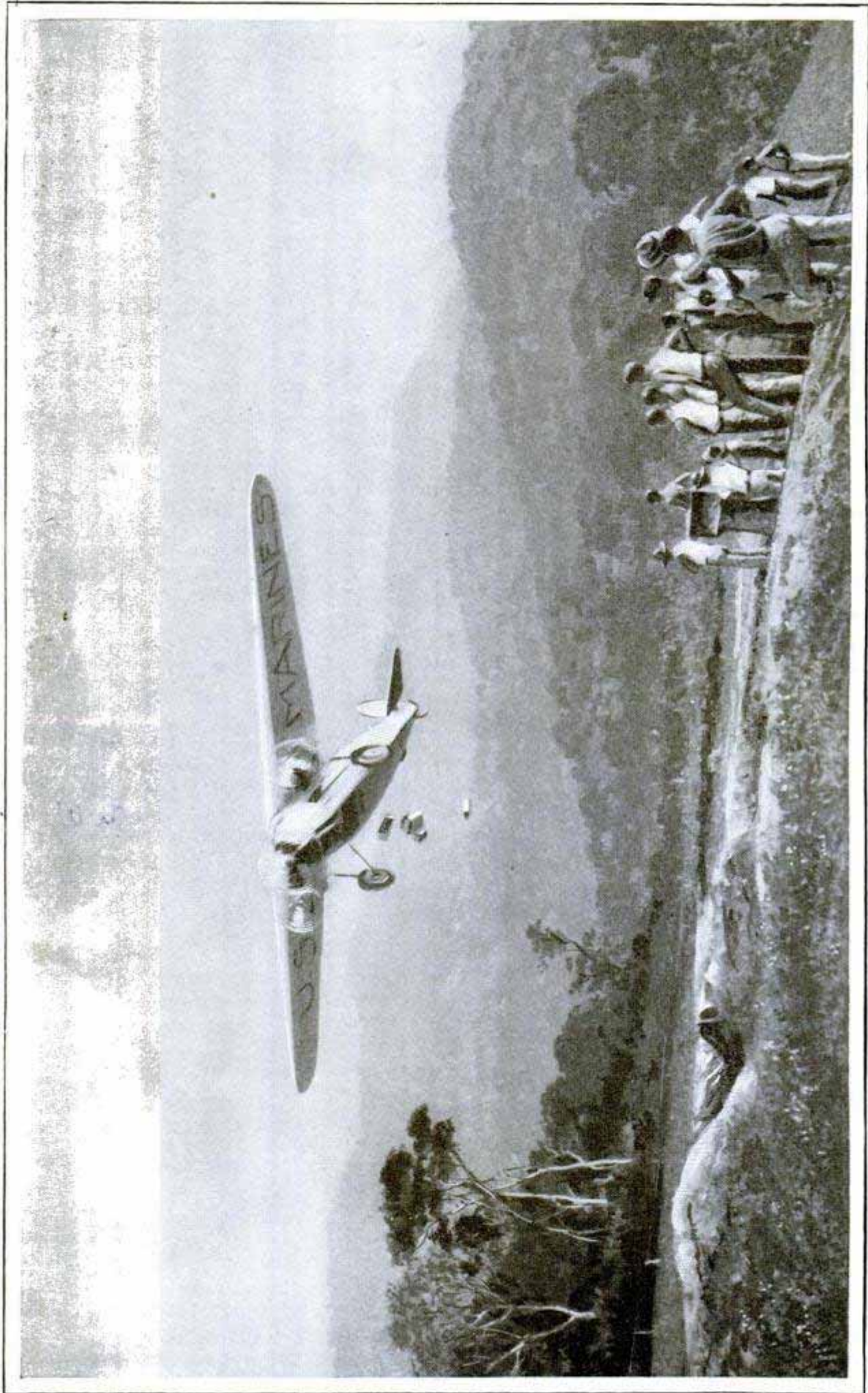
Employees in the hop gardens of Kent, England, are accomplished stilt walkers. The workmen are equipped with long stilts which serve instead of ladders when they train the young hops over the tops of poles and give other care to the vines.

TIRE DUST CAUSE OF SKIDDING

Rubber dust is blamed for skidding in dry weather by an official of a British automobile club who has conducted tests in an effort to determine the cause. Dust from the constant wear of thousands of rubber tires, when mixed with ordinary dust and water, he said, forms a particularly virulent form of grease. This, he believes, accounts for slippery roads after a long period of dry weather.

British Ministry of Transport
 advised in

Wick World
 335
 Natural Physical Laboratory



Swooping Close to the Ground in a Tri-Motor Plane, Marine Corps Flyers Toss Out Supplies to a Detachment in Nicaragua

Help *from the* Skies



Rushing Serums and Other Disease Preventives to Stricken Areas Is an Important Part of the Pilots' Business in Times of Flood and Other Serious Disasters

By K. M. PAINTER

MANNA from the clouds seems almost fantastic to the logical-minded twentieth century, yet the inhabitants of southeastern Alabama and western Florida were fed in this manner when the spring floods cut them off from civilization. Science has furnished the angel of mercy with wings, and hope is written in the skies.

In the early stages of the recent disaster, aircraft afforded the only means of reaching the flooded regions, and 3,000 loaves of bread, sixty cases of canned goods, twenty bushels of potatoes, twenty-five bundles of children's clothes, 100 blankets, and 1,500 newspapers were among the supplies distributed in this novel manner. Navy planes from the air station at Pensacola, Fla., were recruited, and made 113 flights totaling 15,000 miles. Registered mail valued at \$1,000,000 was dropped from the planes, and 5,000 pounds of ordinary mail winged its way to the refugees.

Although the flood was not as widespread as the Mississippi disaster of 1927,

nor as sudden as the New England flood of the same year, it will be remembered as the first disaster in which the air-ground message code, recently perfected by the Red Cross in co-operation with the army air corps, was used effectively over a large area. What to deliver and how much, so as to avoid waste and secure the proper distribution of supplies to the points where they were most needed, was ascertained by the flyers by means of the newly developed code. There was, however, an original difficulty which presented itself. How were the marooned flood victims, anxious to signal for those supplies which would stave off starvation, exposure, and disease, to do so. They did not know the code. The difficulty was overcome when special editions of a newspaper, carrying the entire code, were taken by the airplanes and dropped to the stranded people.

During the six days when the flood was at its highest, planes from Maxwell field, Ala., made 296 flights, an average of almost fifty each day, to deliver supplies and

ascertain the wants of the population, which was completely cut off from the outside world by means other than the air-ground code. In addition to food and medical stores, an outboard motor was dropped by parachute to a relief party along the bank of the river at Elba, Ala., in order to expedite the removal of inhabitants from roofs and tops of buildings. That rescue workers as well as flood victims may need help against the elements, was the discovery of Lieut. W. H. Higgins and Corporal Woodward of Langley field, who had been ordered to the flood area for duty. While they were patrolling a part of the inundated district, the motor of the airplane developed trouble and they were forced to land in the flood waters.

"I was scouting at about 100 feet, and we had just passed over several marooned people," recounted Lieutenant Higgins. "We still had our full load of 400 pounds of relief supplies, when suddenly the motor started violent vibration and the power dwindled to nothing. My first inclination was to jump, but knowing we were too low for that, I tried to make the open water in the stream of the Conecuh river. We lacked altitude for this, so I headed for an open space in the backwater. On account of the load, I was able to slow the machine down before striking the water. This was fortunate as I had no time to perform all the stabilizer-rolling busi-

ness necessary for normal landings with an 'O-11.'

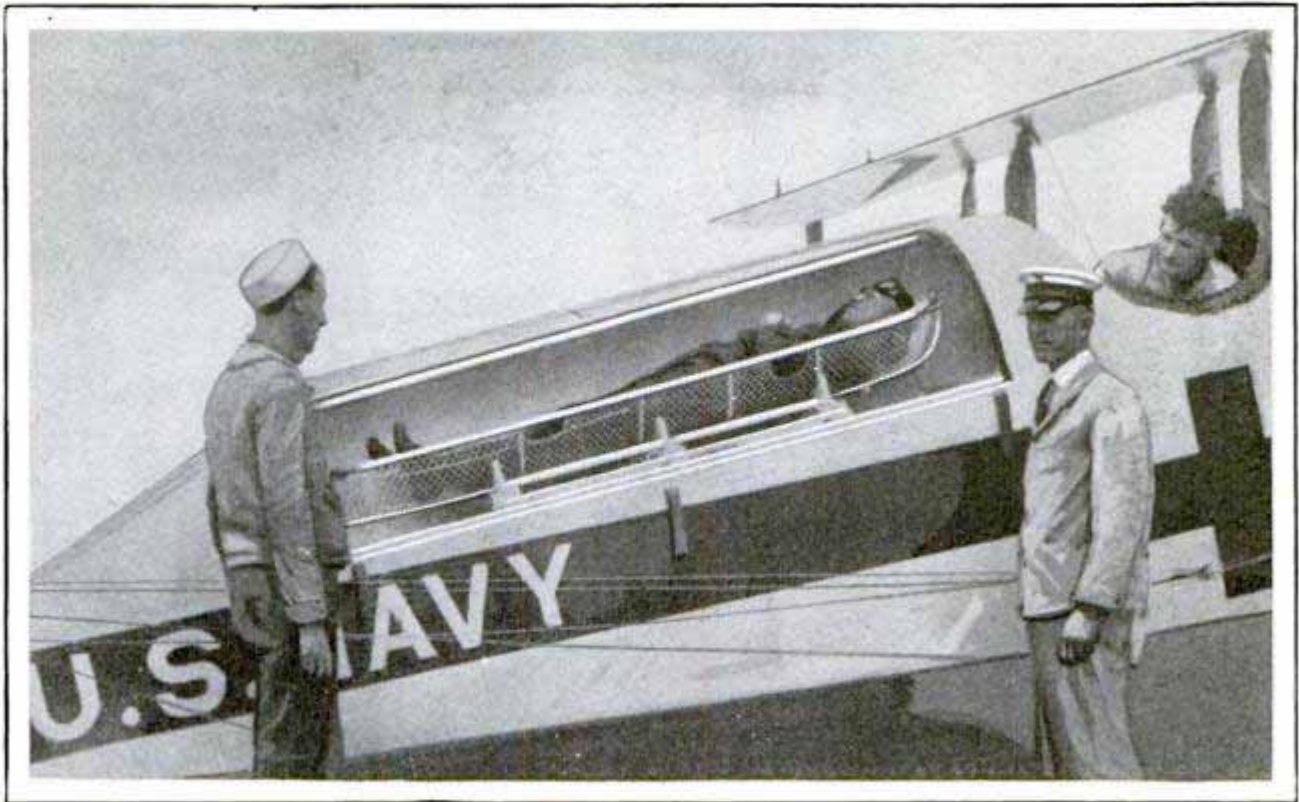
"We hit the water at only about sixty miles an hour, I heard something break about the time we hit, and no sooner had we touched than the plane whipped over on its back. This threw Corporal Woodward out and clear of the ship, but I was trapped in the cockpit with my parachute. I didn't know I could work as fast as I did, but somehow I got my safety belt unclasped and my parachute partly unfastened and got from under the machine. The parachute floated me to the top.

"Corporal Woodward had floated to a log jammed against some pine trees by the time I got up. I floated to him with my parachute. Then we ripped the pads from the parachutes to use as floats. That is what pads are for, but I had never used one before. When we got fixed up with 'life preservers,' we started out through the water for the river. I told Corporal Woodward to stay as close to the shore as possible. The current, however, bore him out into midstream and he soon outdistanced me. After swimming and floating downstream for about half a mile, I saw an old house sticking out of the water. I maneuvered to it, caught a part of the roof, and climbed inside. I found myself in the attic, surrounded by quilts and old clothes. This was quite agreeable, for I was cold and shivering, and decided that a change into dry clothes was in order.

"Some men in a boat came along, and I joined them. Together we went in search of Corporal Woodward, and found him in the top of a pine tree. He had managed to get out of the main current and was swept, by a cross current, among the trees. The corporal was much disturbed as he had to fight with a polecat over his perch. Good, comfortable tree tops were scarce in that vicinity, and the polecat would not release its squatter rights without a struggle."



Submerged Sawmill and Town of Brewton, Ala.; the Mill Was Used as a Landmark by Rescue Pilots



An Ambulance of the Clouds; the U. S. Navy's New Hospital Plane, Which Affords Patients More Comfort and Much Greater Speed Than Would Be Possible in a Vehicle

But experiences like Lieutenant Higgins' are, fortunately, not everyday occurrences, else 90,000 miles could not have been covered by airplanes when they were recruited to combat the onslaught of water that flooded 20,000 square miles of the Mississippi valley two years ago. On hundreds of little spots of high ground, behind the broken levees, the half million refugees huddled in search of safety. To assemble a fleet of boats sufficiently large to comb this area would have required weeks, but the planes met the crisis. It was not uncommon for an aviator to rush into the relief headquarters with a story of 500 or 1,000 refugees stranded on a levee with the water rising rapidly about them. A radio would begin sputtering directions to a rescue ship, and a few hours later, the half-clothed, starving, weary refugees would sight the ship battling the currents to get them.

While transportation by boat was necessary in rescue work, it was slow and tedious. In emergencies, airplanes were called into service, carrying medical supplies and doctors to outposts of the relief headquarters. From Arkansas City, Ark., came a radiogram to the Memphis headquarters: "Serious epidemic of dysentery. No medicine. Rush supplies." Immedi-

ately a plane was dispatched, and an hour and a half later delivered her precious cargo—thirty-five hours under boat time.

After the Florida hurricane disaster, when 6,281 injured persons were in danger of typhoid fever, Lieutenant Bissel flew from Langley field, Va., to Miami, Fla., carrying typhoid antitoxin. When death rode the mighty torrent that swept down on Winooski valley, Vt., airplanes provided advantageous lookout towers, but because seaplanes were not obtainable, it was impossible for the pilots to land in the devastated area. As a result of the New England experiences, the first airplane-relief signal code was devised by the army air corps detachment. Afterward it was enlarged and adopted by the Red Cross, and first put into service in the recent Florida-Alabama flood disaster. The code employs the simplest form of visual signals, somewhat like those for use between ground troops and co-operating aircraft in war, in which those on the ground signal the plane with strips of white cloth laid flat upon the ground, and the plane signals with engine blasts caused by opening the throttle.

The use of the air ambulance by the French forces in Morocco, as well as elsewhere, has been common and has resulted



Aviators Are Doing Much to Curb Fires in Our National Forests; Flying at High Altitudes, They Have Wide Vision and Can Quickly Summon Aid

in the saving of life and elimination of much suffering, especially during the severe fighting on the Wargla front in Morocco, when the smaller monoplane machines went to the actual front line and brought back wounded to a relay post twenty to thirty kilometers behind the battle line, from which they were taken in larger Breguet planes to surgical hospitals more than 100 kilometers away.

A recent report from Vice Consul Ellis A. Johnson tells of effective transportation service furnished by airplanes during the extremely severe ice-bound and snow-bound conditions in Denmark. All other methods of transportation had failed, and every available plane in the country—of army, navy, and private flying companies—was pressed into service. Emergency calls for additional planes brought Dutch, German and Swedish airplanes to Denmark. Ice-bound ships, islands, and forts were supplied with food and medicines dropped from sixty airplanes which were operated daily during the entire period without a single accident.

But the airplane's rescue activities are not confined to the spectacular. Nearly every day brings with it disaster that calls for emergency relief. Not long ago, during a rebel uprising, women were rescued by airplane from a besieged legation on the Indian frontier; to the vigilant eye of the airplane, the Bering sea yielded up an ice-bound vessel given up for lost. The eyes and wings of mercy have, since their

debut in the new role, effected varied rescues. Quite recently an isolated lightship keeper off one of the Virginia capes had good reason to be thankful when he was stricken with acute appendicitis. By radio he requested assistance and a patrol boat was rushed from the naval air station at Hampton Roads, Va. Less than half an hour later he was in a Norfolk hospital.

Such rescues, bordering on the miraculous, are making more and more air converts of skeptics; little wonder that air-mindedness is on the upward trend.

3066
**ADJUSTABLE LIGHT FOR PLANES
MAKES LANDING SAFER**

To promote safety in landing and taking off, an adjustable searchlight for airplanes is mounted in a streamlined body in gimbals like a compass, so that it has



an adjustability range of thirty degrees in all directions. It is operated from the pilot's seat by pull wires and counteracting springs.

For small planes the lights are under each wing tip, but for larger craft, fixed lights are at each wing tip and the adjustable light in the center. The lamps provide from 35,000 to 70,000 candlepower and give strong illumination even at a height of 1,000 feet.

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*Carl Fein Fein
Germany
485 5th Ave. New York*

daily mail 07/1/27

AIR POLICE USE SMOKE BOMBS TO SIGNAL ARRESTS 3361

France has established an air-police patrol to operate over that country to control the movement of the large number of planes, particularly touring ships, that pass above French territory daily. Pilots failing to observe international air regulations face heavy fines. Police airplanes warn erring pilots by firing smoke bombs, all aircraft addressed in this manner being required to follow the police ship to the ground and land alongside it.

George A. Rosner, Los Angeles, Calif.

AIR IS NOT SO LIGHT 3346

Similes such as "light as air" and "thin as air" are incorrect, as it would require an exceptionally strong person to carry a roomful of air any considerable distance if it were compressed into a suit case. One thousand cubic feet of air weighs seventy-five pounds and a room twenty feet long, ten feet wide and twelve feet high contains 180 pounds of air, a weight the carrying of which would prove a burden.

Perhaps a revolution, Waterbury, Mass.

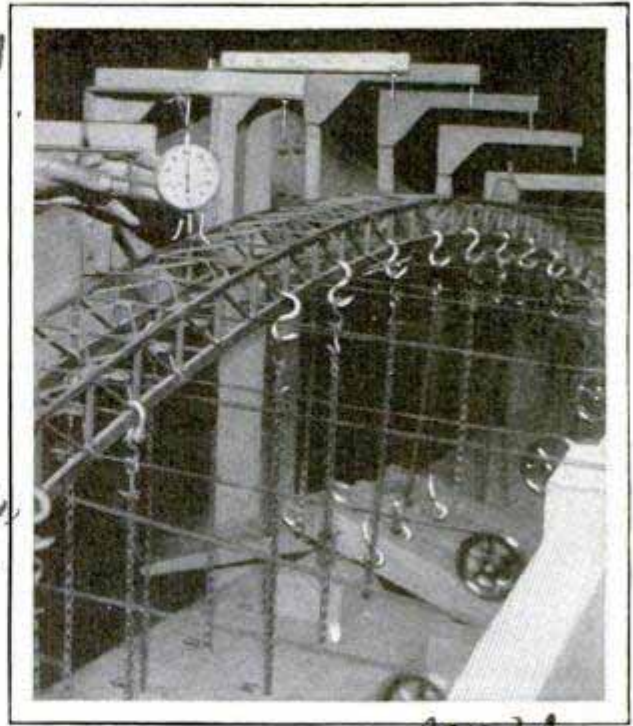
THERMOMETER FOR THE BLIND HAS RAISED FIGURES 3333



Blind workers at a St. Joseph, Mo., craft shop are enabled to take temperature readings with an indicator which has the degrees marked in raised figures and also employs the Braille system of lettering. A blind person may make a reading by touching the metal hand and following it to the gauge where his fingers reveal the temperature.

HOW GREATEST BRIDGE SPAN IS MADE SAFE 3365

Measuring the exact capacity of the load that can be borne with safety by the longest bridge span in the world before it is constructed, has been made possible by erecting an exact miniature model of the steel arch that will be a part of the



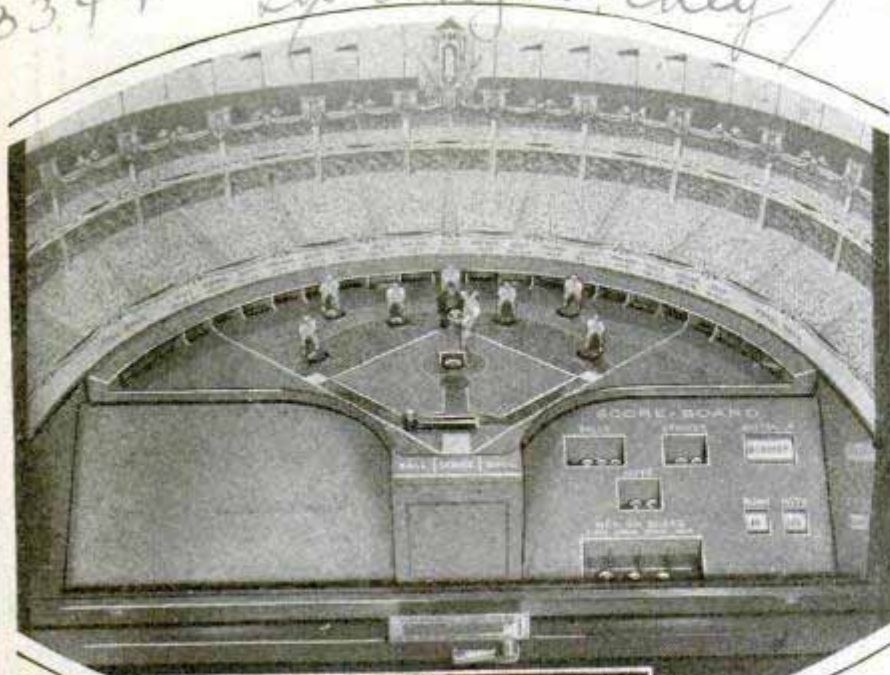
Model of Longest Bridge Span Tested with Weights, to Determine Capacity of the Real Arch

Kill van Kull bridge which is to connect Staten island with the mainland of New York by way of New Jersey. The bridge and approaches will have a total length of 8,075 feet and will cost \$18,000,000. The span of the great arch will be 1,675 feet, and the structure, exclusive of approaches, is to contain 34,500,000 pounds of steel. It will have a clearance for vessels of 150 feet and the rise of the arch will be about 275 feet, the depth of the crown fifty-seven and one-half feet, and the two arch trusses will be seventy-five feet apart. The span is designed to carry four lanes of traffic, two rapid-transit tracks and two sidewalks, all on one deck. The dead load of the main arch is 28,000 pounds per linear foot and the weight of the traffic is estimated at 6,000 pounds per linear foot of the whole bridge. Gauges placed on the model registered the bending of the structure even to thousandths of an inch when weights were applied. When the maximum load was applied at one end, the opposite end was raised as was the case with Brooklyn bridge a few years ago when the cables at one end snapped.

Accidents cost the United States a minimum of \$960,000,000 last year, of which automobile accidents accounted for about \$275,000,000.

Amusement Machine Co. 421 E. Washington St. Los Angeles, Calif.

Q 15 3-36



Two Views of a Coin-in-the-Slot Baseball Game, Which Is Operated by Two Players

COIN-IN-SLOT BASEBALL GAME TESTS PLAYERS' SKILL

One of the latest coin-in-the-slot amusement devices is an automatic baseball game, a complete inning of which is played for five cents, enabling two persons to represent rival teams and affording many of the thrills of a real game. The diamond and players, with a realistic background representing a crowded grandstand, are inclosed in an attractive cabinet, and upon the insertion of a coin in the slot, the game begins, electricity and gravity being the principal factors in the mechanical operation. A small steel ball pops up from the umpire, falls into

a socket in the tiny pitcher's hand and speeds forward as the pitcher is snapped toward the bat. This is operated by the human player, who swings it simply by pressing a small lever near the coin slot. The pitcher's position changes slightly, giving a variety of deliveries. Balls, strikes, outs, the position of the men on bases, in fact, a complete record of the game, play by play, are automatically registered by balls and moving signs on the scoring board at the right. Considerable skill is required to bring

in a big score, as much depends upon striking the ball at exactly the right moment. Since the game continues on paying only one nickel until there are three men out, a skillful player can prolong his amusement. Ten runs in a single inning is considered a good score. There are but few electrical parts to the cabinet, insuring little likelihood of breakdowns. Much of the automatic operation of the device is accomplished by the weight of the balls falling into the proper compartments.

Illustration Technique #13 & Aug 8/1929

ELECTRIC DESK LAMP AND FAN COMBINED IN ONE

Electric lamp and fan are combined in one article of desk furniture produced in Germany. The fan differs from the common type in that its blades, rotating on a vertical shaft, are arranged to form a conical surface parallel to the underside of the lamp shade.

This directs the air stream upward so that papers on the desk are left undisturbed and the air does not strike the head of the person using the desk, while cigar smoke is dispersed and ventilation accomplished.



insect life

STRANGE HABITS OF INSECTS REVEALED BY SCIENTIST

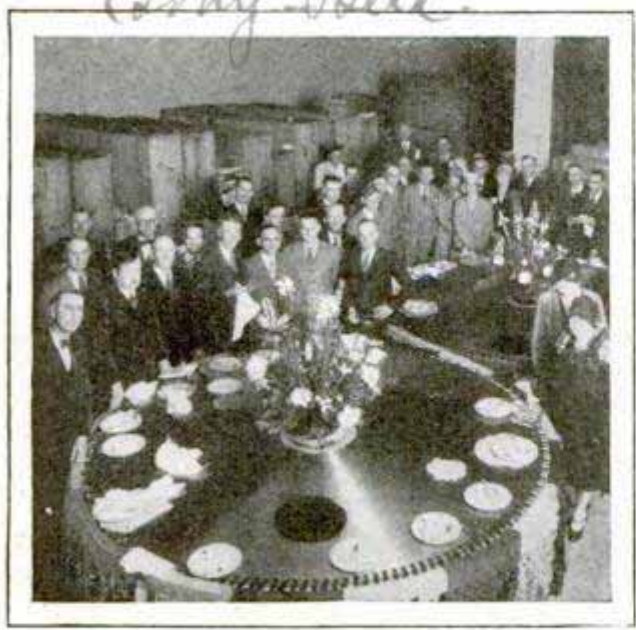
While many kinds of flies, including the mosquito which is a member of the fly family, prey on man or animals or crops useful to man, it is unfair to conclude that they are utterly useless, says C. H. Curran, of the American Museum of Natural History. This group of insects also preys on major insect pests. For the most part parasitic flies attack caterpillars, beetles and beetle larvæ. Their methods are often most ingenious. In some cases the flies deposit thousands of eggs on low plants and grasses, depending on a caterpillar to come along and eat the leaf, swallowing the eggs along with it. When the egg hatches the maggot feeds on the cutworm which swallowed it. Mosquitoes are partly controlled by nature itself.

3331

CIRCULAR SAW IS LUNCH TABLE FOR EIGHTEEN PERSONS

Eighteen persons were comfortably seated recently around luncheon tables, the tops of which were circular saws, 108 inches in diameter and weighing 795 pounds each, made by a saw-manufacturing company for a lumbermill at Longview, Wash. The saws are used in cutting giant logs, each having more than 150 removable teeth. They were utilized as tables at the opening of a branch factory at Portland, Oreg.

Long View



Circular Saws, Intended for Cutting Giant Logs, Here Are Employed as Luncheon Tables

Beaver Lumber Co. & Sons, Tacoma, Wash.



One Hand Only Is Required to Operate This Aerial Camera with Its Pistol Grip and Trigger

AIR CAMERA WITH PISTOL GRIP WORKED WITH ONE HAND

Fitted with a pistol grip, an aircraft camera intended particularly for the owner-pilot, may be operated with one hand. The exposures are made by pressing a trigger similar to that of a revolver. The camera weighs a little over three pounds and takes pictures three and one-quarter by two and one-quarter inches, a standard size for films, thus making the cost of plates and other equipment low. The body is of aluminum and the shutter has instantaneous speeds up to one-hundredth of a second. The camera will not take roll films, but plate holders, film-pack adapter or focusing screen may be used.

HEAT-PROOFED RAIL COACHES SUCCESSFUL IN TESTS

3369

Summer passengers on trains of a western road may travel in greater comfort if recent tests in treating the coaches with heat-resisting materials are as successful as indicated. Aluminum paint and actinic glass are used. The paint for heat absorption has been known previously, but it had not been used on railroad equipment. The special window glass, heretofore used in India and Africa, cuts off about eighty per cent of the heat, while admitting about sixty-five per cent of the light. It is green in color and soothing to the eyes. The paint keeps out about twenty-five per cent of the heat radiated from the sun.

Ⓞ A large redwood tree may contain enough lumber to build twenty average-size houses.

Gettman, America

3133

The Farmer Turns



Electricity Adds Beauty to Model Farm; Shearing Sheep the Modern Way

By H. H. SLAWSON

Dearborn, Chicago

LIFE on the farm is not what it used to be. The farmer has found a new hired man, through whose help drudgery has been banished, with much weary, back-breaking toil.

In the change, the farmer's wife has also benefited, and so have his children, to say nothing of the cows, the poultry, the pigs and other inhabitants of the barnyard.

The explanation is easy. Electricity is this new chore boy which is changing the age-long habits of earth's oldest industry. Farmers are enjoying the advantages of the electric fan in the cow barn, electric

lights in the haymow, electric radiant heat in the pigpen, and electrically driven implements from grindstones to threshing machines. And they even make hay now while it rains—with the help of electricity.

An authoritative count reveals 227 profitable uses for electricity on the farm. These range from A-battery eliminators, animal groomers and six other uses under "A," to bull tamers and twenty-one others under "B," down through twenty letters of the alphabet, to wood sawing at the bottom of the list. Electricity pumps the water, shreds the fodder, husks the corn, separates the milk, grinds bones, feed, fertilizer and sausage, cleans, bags and hoists grain into the bins, dries, bales and elevates hay, heats water, hotbeds and incubators, helps ventilation in the house and the stock barns, and also traps insects in the orchard and garden or thieves in the henhouse.

It cools or warms, sterilizes or pasteurizes, and bottles the milk. It hulls oats or sprouts them. It stimulates plant growth and furnishes refrigeration. It shears sheep and sprays whitewash and insecticides. In the farmhouse it does everything that electricity can do in the city home, including operation of the player piano.

In 1924, there were, in the state of

Washington

motor General Electric

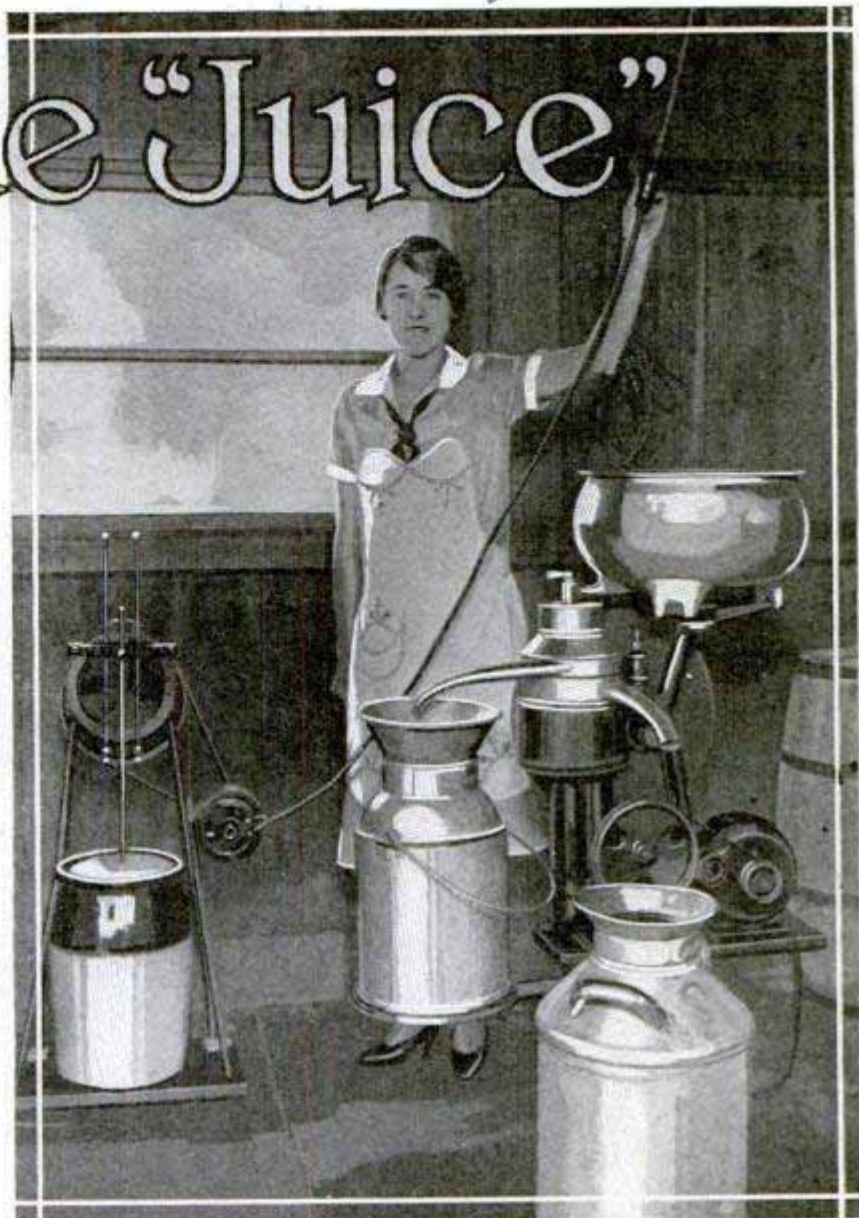
On the "Juice"

Illinois, all told, only 2,201 farms provided with central-station service. But on Jan. 1, 1929, there were 13,284 electrified Illinois farms. Indiana has 15,163 farms getting such service.

California farmers claim to be the heaviest users of electric energy, as there are 55,000 electrified farms in that state. Altogether more than 500,000 farms in the United States are served by electric-light and power companies.

But there is a tremendous problem to be solved before rural America can be completely electrified. In Indiana, according to the 1925 federal farm census, there are 195,000 farms, the value of which is almost one and three-quarters billion dollars. On the basis of three to the mile, a rough estimate would call for 65,000 miles of power lines to serve these farms, and on the basis of construction costs of \$1,000 per mile, this would mean an expenditure of \$65,000,000 for lines alone. A like sum would be required to wire and equip the farm buildings, making the total installation cost almost ten per cent of the value of the industry in Indiana.

Electricity, to make its way on the farm, thus has to justify itself from an economic standpoint. In this regard, one of the state committees on the relation of electricity to agriculture submits the following. Ten cents spent for electricity will perform one of the following tasks: Cook for two persons for one day; do the family washing for one week; run the vacuum cleaner ten hours; operate the milking machine one hour and twenty minutes; separate 1,500 pounds of milk; heat a 150-



With Cream Separator and Churn Operated by Electricity, Much of the Drudgery of the Farm Dairy Is Eliminated

egg incubator for two days; saw one and two-thirds cords of wood; pump 500 gallons of water; run a fanning mill three hours, or cool a refrigerator for twelve hours.

Electricity is used on one model farm to light the barn, cow yard, washroom and milk-storage room. It does the milking, pumps ice water through the milk coolers and refrigerates the storage tank. It elevates grain to overhead bins, grinds feed, clips and grooms the cows. In the retail dairy, it turns the separator, drives the bottling equipment and operates the bottle-washing brushes. Some dairymen also pasteurize milk by running a current of electricity through it. One farmer in Wisconsin has rigged an endless-chain device with wooden crossbars, driven by

*Edison Electric Appliance Co. 771
5600 W. Taylor, Chicago*

3/33 772

Master Electric Co

POPULAR MECHANICS

Dayton, Ohio



but the electricians have fixed all that. When the lunch hour is ended, out go the lights, all but one faint pilot lamp away up in a distant corner, operated by a dimmer device which simulates sunset.

Electricity also is used to provide heat for sprouting oats, whose green tips supply the necessary vitamins for the health of the baby chick. Ultraviolet treatments have also been found of advantage as a

means of promoting healthy growth and lowering mortality. Electric heat is provided for the brooders and electric incubators are operated with greatly reduced costs and increase in results.

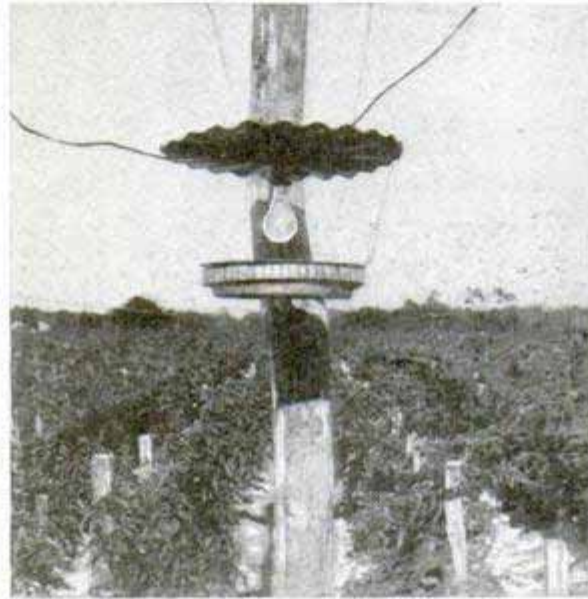
Many unusual adaptations of electricity to agriculture have been devised. At the New York college of ag-

electricity, for cleaning the gutters behind the cows in his barn.

The electromagnetic milking machine is the newest of many devices available to the dairy farmer. And the next adaptation of electricity to dairying is a device which takes the milk from the cow, through a pasteurizer and a refrigerator into a container, without exposing it to the air.

"It is probable," says one authority, "that the milk so produced could be kept sweet a month. Its bacterial count would be low."

The poultry house has also benefited by electricity. Almost everybody has heard how "biddy" can be fooled into believing day has dawned long before its actual advent. An alarm clock, attached to an electric switch, automatically turns the lights on, early in the morning, so biddy can hop down from her roost and begin scratching around. Many poultrymen set the alarm clock so she wakes up for a midnight lunch, which means more strength to the layers and more profits to the owner. You might think that after waking the chickens at midnight they wouldn't be inclined to go back to roost,



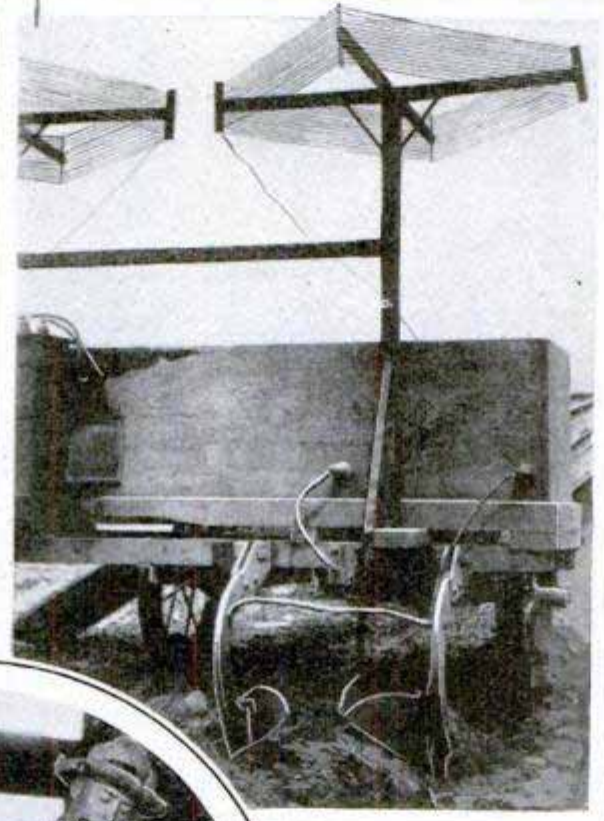
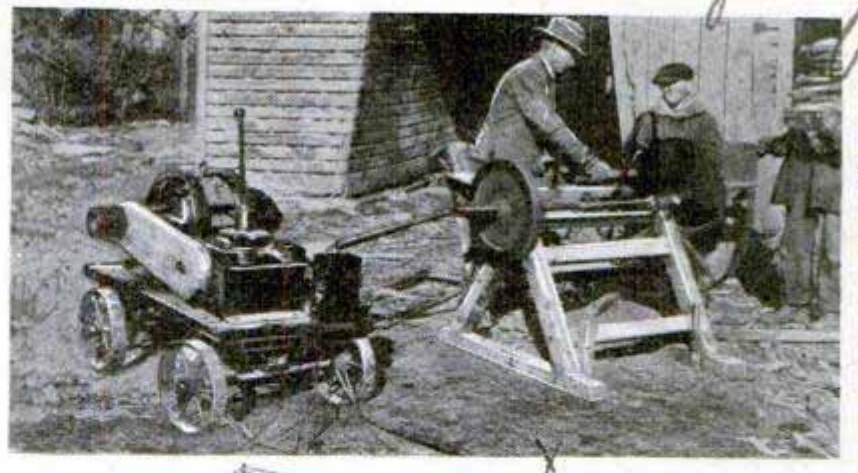
Motorized Grindstones, Light-Bulb Insect Traps, and Electric Cow Cleaners Mark the Modern Farm

American Radiator & Supply Co
820 S Michigan
Chicago

riculture, an electric screen door was constructed to electrocute flies around the dairy barn. As many as 2,500 flies, with other insects, were killed daily when they came in contact with the fine charged screen.

An electrical animal groomer is a convenience much favored by many farmers, especially for the dairy barn. It thoroughly removes dirt and hair without permitting it to escape into the stable air.

Electric lights are used by truck gardeners for insect control. Flying to the bright light, the moth or beetle drops into a pan of kerosene fastened below the globe. An Alabama farmer



who used lights to trap insects over a tomato patch, reports that his losses from bugs were negligible, while on an unlighted plot the loss ran from thirty-five to fifty per cent of the crop.

At Cornell University, a study has been made of the problem of using electricity to dry damp hay. The hay is stacked over a shallow trench into which the mouth of a blower pipe is inserted. This is operated by a motor which drives

hot, dry air into the trench and allows it to percolate upward through the loosely stacked hay.

With such a device, the farmer no longer is obliged to make hay while the sun shines. He can cut it in a downpour of rain, if he wishes, stack it up, turn on the switch that puts the blower to work and electricity does the rest. The same principle has also been used to hasten the curing of tobacco.

An electrically driven vegetable-tying machine is among the novelties recently appearing on the market. Truck gardeners find it of use in tying onions, radishes, celery, etc. It will handle as many as 150 dozen bunches of celery in an hour.

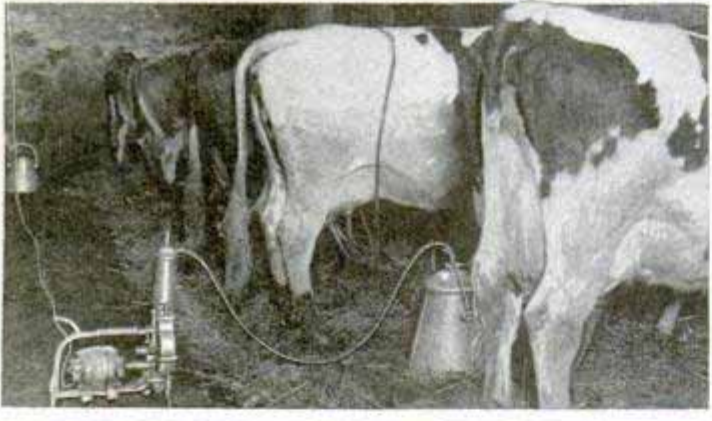
Electro-culture, even in its present im-



Sawing Wood in the Up-To-Date Way; a Plow That Electrifies the Soil, and Electric Fanning Mill

cannot locate - Felius Tying Machine 1194-14th St
 elec. vegetable washer Milwaukee food power machine.

Porto. Portable Power Tool Co
 Chicago



Electric Beauty Aid of "Dobbin"; Drying Wet Hay with Motor Blower, and Portable Electric Milking Outfit

maturity, has fascinating possibilities. At Purdue University an investigation has been under way for three years into an apparatus that consists of a wooden pole with projecting prongs, through which, it is claimed, electricity is sprayed into the air over the field with beneficial results. No scientific conclusions have yet been announced as to the standing of this device.

At the National Rural Electric Project laboratory at College Park, Md., George W. Kable, the director, has been carrying on a study of the results claimed for a high-voltage high-frequency electric plow devised by Hamilton L. Roe, of Leroy, N. Y. The inventor claims that the elec-

tric charge, passing through the soil, makes the plant food in it more readily available and eliminates the need for fertilizer. It also kills weeds and pests and makes plants less susceptible to drouths.

In test plots, quack grass was killed outright, which is considered remarkable as the roots of this plant are very hard to kill. Buckwheat and potatoes, on soil treated with the Roe plow, were freer from weeds than were check plots. The potatoes were also free from potato bugs and blight without spraying, which was not true of other parts of the field.

"I am not sure," said Mr. Kable to me recently, "that the time will never come when the farmer can dispense with plowing. Since the dawn of history, when a crooked stick was first used to turn the soil, farmers have clung to the plow as the indispensable foundation of husbandry. I do not know just what method may be devised to get away from this age-old practice. I do know that some crops can be grown without the traditional preliminary use of a plow. To me it seems that the possibilities in this direction are unlimited."

"In the medical profession," said Mr. Kable, "much knowledge is being developed regarding the use of the X-ray and the ultra-

violet ray on human beings. To some extent this knowledge is being applied to agricultural problems. The field has, however, barely been scratched.

"Electrical research work in one direction has resulted in such mechanical marvels as the radio and television. There is no reason why, if directed intensively to agriculture, research should not also prove correspondingly fruitful of achievements in this field."

That is the vision which rises before the farmer when he presses the button that turns on the "juice."

☐ American cities have 4,778 structures ten or more stories in height.

Milner - 26 Laval Separator Co, 165 Broadway, New York

3/3

PALATABLE GLUE FOR STAMPS FROM SWEET POTATOES

3366

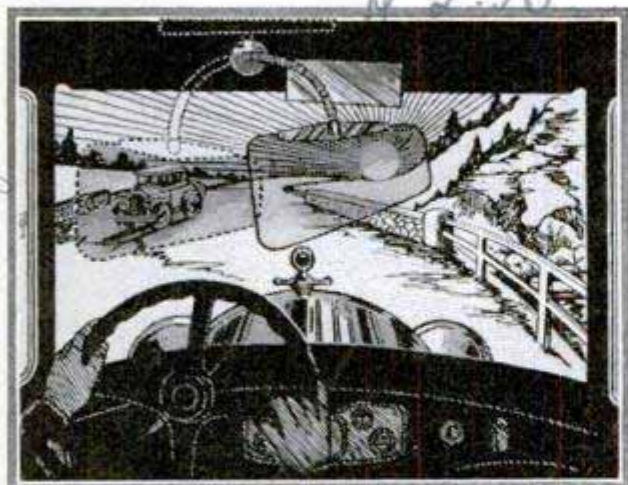
Stamps with glue to suit the individual taste may be on the market soon as a result of researches by the bureau of chemistry and soils which has found a high quality of starch is obtainable from sweet potatoes. From the starch, dextrin of pleasant taste has been produced and this is being tested to determine its suitability as glue for stamps and stationery. A method of economical commercial production is being attempted with the fall crop of sweet potatoes. Tapioca is the present source of most stamp and stationery glue, but if manufacturers can use cull sweet potatoes for the purpose, a market will have been found for part of the 80,000,000 bushels of culls produced each year, which in the past have been fed to cattle. Six pounds of the sweet potatoes make one pound of starch.

ADJUSTABLE GLARE PROTECTOR SAVES MOTORISTS' EYES

3282

Fitting above the windshield, inside the automobile, an adjustable shield is intended to protect the eyes of the motorist against sun glare and the lights of approaching cars. The shield is of a material that diffuses the sun's rays, and is mounted on a flexible arm adjustable to any position. It is held from five to seven inches from the windshield when in use, and when not in use, may be raised to the

8 2.50



An Adjustable Glare Protector on a Flexible Shaft Which Shields the Eyes of Motorists

top of the car, leaving an unobstructed view ahead.

*Aaron's Mfg. Co.
Tulsa, Okla.*



Web World

French Convicts Wear These Masks to Prevent Them from Becoming Acquainted and from Plotting

MASKS FOR FRENCH CONVICTS TO PREVENT PLOTTING

Prisoners in the model French-prison at Fresnes, near Paris, are garbed in masks covering head and shoulders on their rare emergence from solitary confinement, to make it impossible for the convicts to recognize other inmates and plot with them. The wearer can breathe freely through the loose mesh of the mask and is able to see everything except the face of another prisoner dressed the same way.

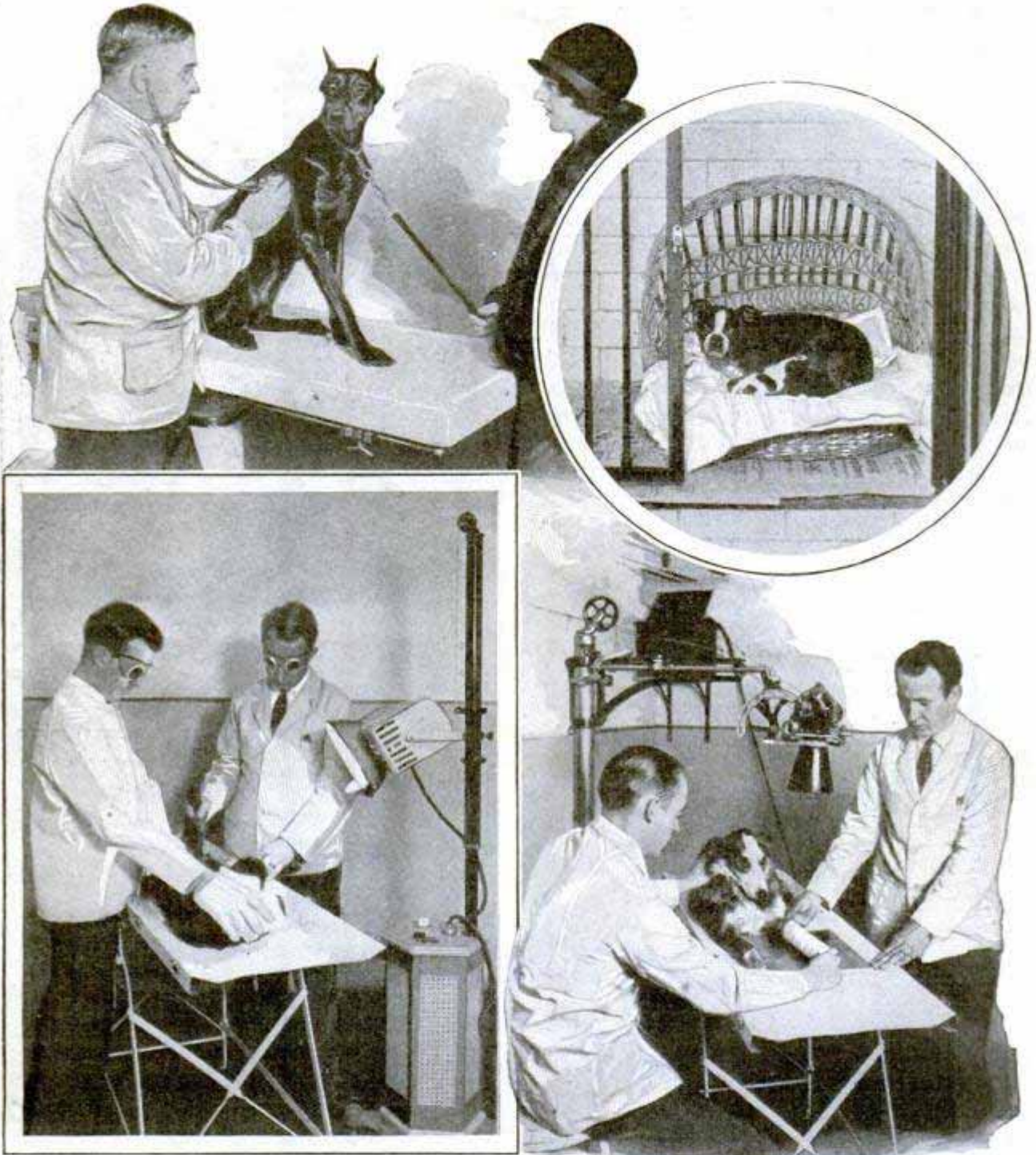
VOLCANOES PUT SALT IN SEA

8233

What makes the sea salt? Dr. Thomas A. Jaggar, director of the Hawaiian volcano observatory, believes the salt is deposited in the sea by the 485 known volcanoes of the world which annually discharge more than 100,000,000 tons of hydrochloric acid, thus supplying the chlorine that keeps the ocean salty. Even though the amount of hydrochloric acid gas in steam from volcanoes is almost negligible, the ceaseless emission of the steam puts the gas in the air, and thence into the rain, he believes.

*Science Service
Bulletin 434*

MODERN MEDICAL SCIENCE SAVES LIVES OF PETS



Where Dogs and Other Pets Receive Scientific Care; Glimpses inside the North Shore Animal Hospital, Showing How Dumb Patients Are Treated with the Aid of X-rays, Ultraviolet Light and Other Modern Means

Dogs and other domestic pets receive medical treatment embodying some of the latest scientific discoveries at the North Shore Animal hospital in Evanston, Ill. X-rays, ultraviolet light, special wards for animals suffering from communicable diseases and elaborately equipped operating rooms, are among the institution's unusual features. A motor ambulance calls for patients, food is prepared

under highly exacting conditions, constant record is kept of each patient's progress; in fact, the general procedure, from the time the animal is admitted, receives its physical examination and is assigned to its proper department, until it is released, is much the same as in a hospital for human beings. Dr. J. V. Lacroix, head of the hospital, talks about dogs and their care, as a family doctor would talk

Dr. J. V. Lacroix

to a mother about her children. "The lifetime of a dog is about one-seventh that of a man," he said. "Discipline is as necessary with these pets as it is in a human family, and this is especially true in regard to the diet. Largely because of his long association with men, a dog has learned to eat practically anything that a man will eat. Meat is the basis of its diet, but meat alone is not advisable. Some fibrous food is necessary. This is furnished by bran, steamed carrots and other vegetables that contain much cellulose. White bread, rice or potatoes contain the necessary starch. Raw meat once a week is desirable. Raw liver is a good laxative. The meat need not be cut fine. Milk is an important article of the diet, but it does not agree with all dogs. The animals should not have highly seasoned foods, and should not be given large quantities of candy, ice cream or cake any more than children should. Living in a small apartment is unnatural for a large dog and much care is needed in its feeding and exercising. A kitchenette apartment is no more a place for it than for a concert grand piano." Visitors are admitted to the hospital daily between the hours of two and four o'clock in the afternoon. The dogs, especially, seem to appreciate the careful treatment they are accorded, and in one or two instances, after being patients there, dogs have voluntarily reappeared to be treated for an injury.

PANORAMIC MIRROR FOR AUTO SHOWS WHOLE ROAD

Giving the motorist a full view of the road behind, a panoramic rear-view mirror has been placed on the market. Looking in it gives the driver the same effect as looking out of all the windows at once and shows the cars approaching from



Panoramic Rear-View Mirror for Auto Giving a Complete View of Whole Road Behind

each side and from the rear. The glass diffuses light in all directions, obviating the glare of headlights from the rear.

PLATFORM ON TOP OF LADDER SERVES AS SCAFFOLD



This Platform, Attached to an Ordinary Ladder, Serves as a Scaffold for One-Man Jobs

Eliminating necessity for a scaffold for one-man work, a ladder platform is on the market which may be attached to the top of any ladder. On long ladders, two such platforms, one above the other, may be used, providing space for two men to work. The platform is nearly a yard wide and the end resting against the building is provided with rubber bumpers to prevent its sliding sideways. Safety clamps also are used.

AIR REPLACES OIL IN SWITCH

Switches for high-tension electric-power plants in which compressed air takes the place of the usual oil filling, have been invented and are now being placed on the market in Germany. Advantages claimed for the switches include economy in size, safety of operation and a large range of capacities.

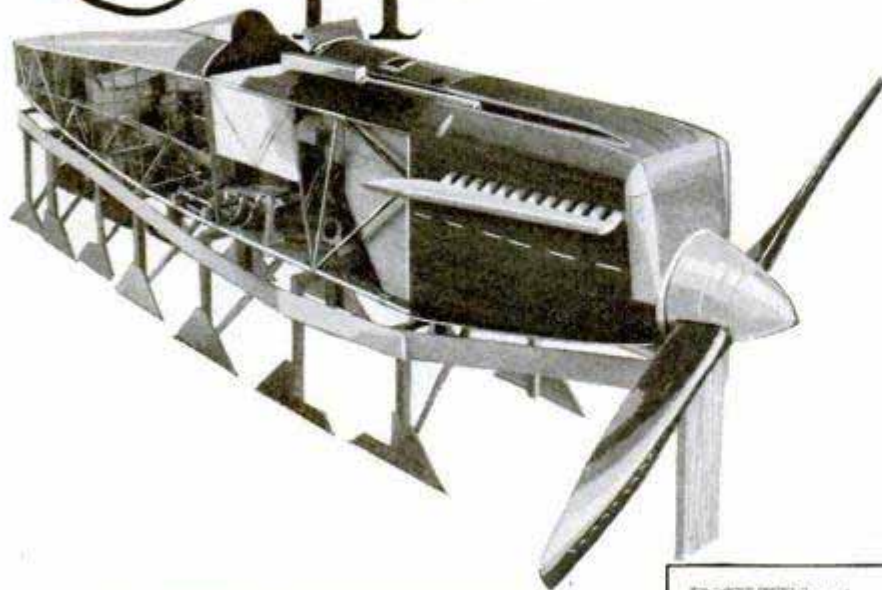
Chicago 2054 Parkway

826 W. Ave. 61
Cedar Rapids, Iowa

3337
3360
Frankfurt a. M.
Allgemeine Elektrizitäts
Gesellschaft
W. H. ...
1966 8 66th
M. ...

3080

How *the* Ship



failures in flight have become very rare, but new designs are occasionally found to be unsatisfactory due to such weaknesses as lack of necessary performance or stability; and as such mistakes are likely to be very costly to the manufacturer of the plane, they must be very carefully guarded against.

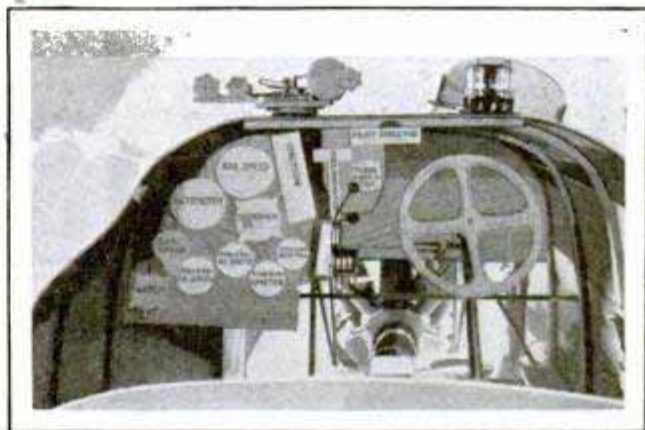
By **EDWARD CAMPBELL**

Projection Engineer Boeing Airplane Co.

SUCCESSFUL airplane design consists mainly of profiting by the knowledge now available as a result of the thousands of planes that have been built and tested to date, and of incorporating this knowledge into a practical airplane, through the application of sound engineering principles.

Our successful airplanes of today are the result of a process of evolution, beginning with man's first attempt at flight, and in which the well-known trial-and-error system has necessarily played an important though sometimes expensive part. Painstaking theoretical and wind-tunnel research have gone hand in hand with actual flight testing, but the latter is always the final criterion. Each new design must be an improvement over what has gone before in order to be a success, so original ideas are constantly being developed. However, if precedent is completely ignored, the designer may as well be back in the pioneering days of aviation.

Accordingly, when the design of a new airplane is to be undertaken, the designer's first step must be thoroughly to familiarize himself with what has already been done with that particular class of plane, in order to avoid mistakes already made. Such serious consequences as structural

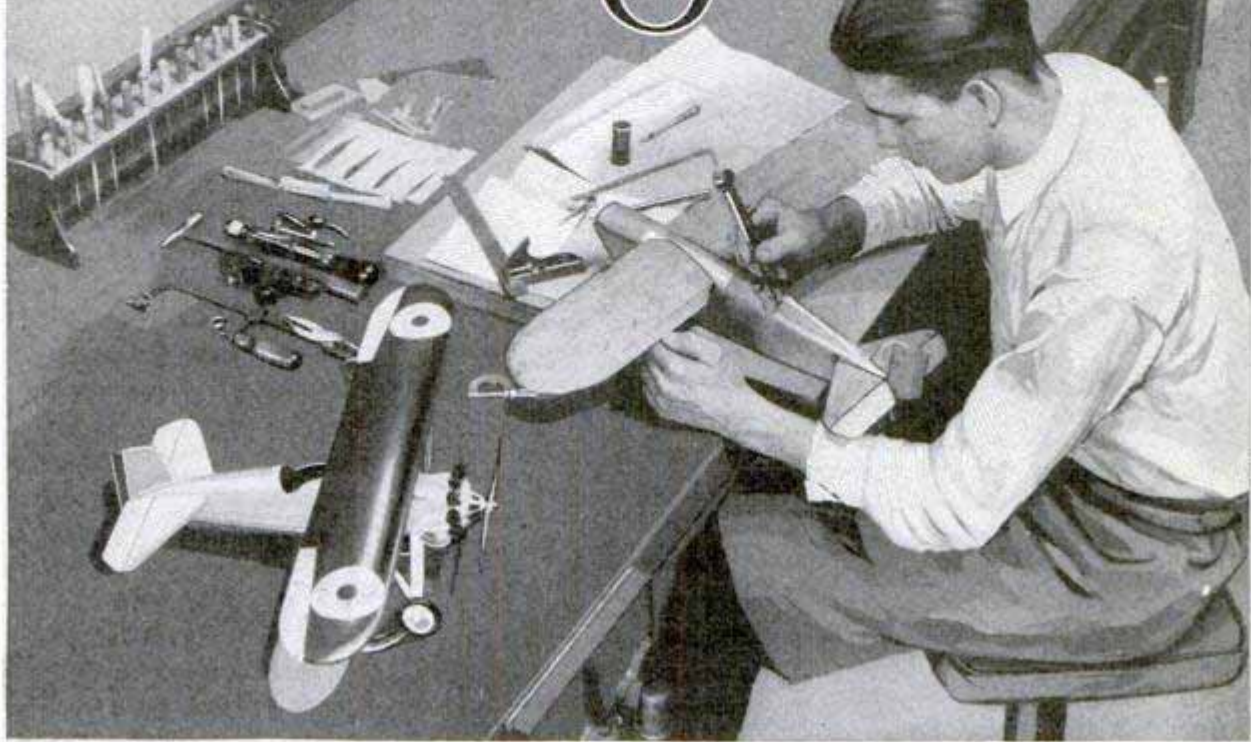


The "Mock-Up" or Full-Size Wooden Model of Part of a Plane, and Cockpit of Model

The design of an airplane necessarily starts with the formulation of the specification. This includes such characteristics as the type, that is whether it is to be a monoplane or biplane, single or multi-motored; useful load, or amount of cargo, fuel and oil to be carried; performance to be attained, which includes speed, climb and ceiling; type of engine to be used; the wing section; pounds per square foot of wing load; structural strength; degree of stability and maneuverability; and such considerations as type of construction, first cost and ease of maintenance.

Often the designer has little given him in the way of a specification other than the purpose for which the plane is to be used. With that as a basis, he must determine the above characteristics and should adhere to them as closely as pos-

is Designed



Photos Courtesy Boeing

Through His Skill in Making Models during a National Contest, Othello Dickert Landed a Job in the Boeing Factories; Some of His Models Are Valued at \$1,000 Each

sible throughout the design of the plane.

The next step is the preliminary weight estimate. One of the secrets of successful airplane design is the ability to make a reasonable weight estimate to begin with, and to hold the weight of the finished plane down to that figure. This takes a great deal of experience and very careful supervision of detail design and construction, as a plane will inevitably tend to gain steadily in weight up to the time of its completion. Overweight with resulting decreased performance has been the cause of failure of many otherwise promising designs.

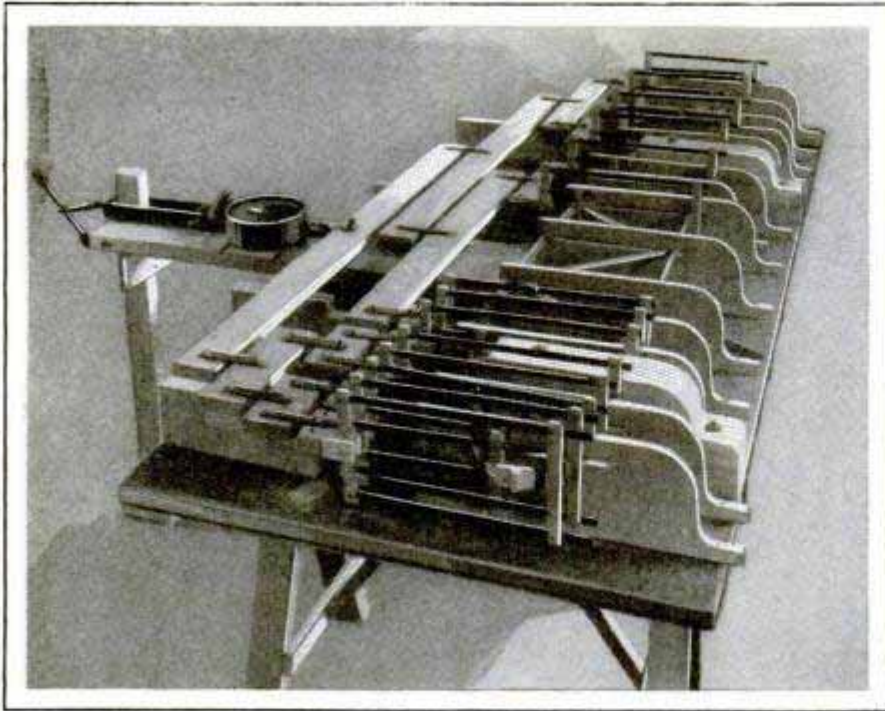
For the preliminary weight estimate it is customary to divide the plane into a number of parts, such as wing group, tail group, body group, power plant, and useful load; and these are then further subdivided, as found convenient.

The weights of certain parts, such as engine, instruments, and useful load may be definitely known, while the weight of such

items as the wings, fuselage and tail surfaces must be estimated on the basis of experience with similar types of construction in planes already built. As the design progresses, the detail weights can be computed quite accurately. However, the scales are the final criterion, and the saying "it always weighs more" is too often found to be true.

It is important that the preliminary estimate be as close to the final weights as possible, as it is upon the former that the wing area and general proportions of the ship must be based. After a preliminary design of the wings has been made, the detail design of the ship begins with a scale drawing showing the side view of the fuselage. For this, it is best to locate first the most important items, such as engine, fuel and crew, in their desired relative positions. The less important items are then located, and the outline of the fuselage determined.

By locating the center of gravity of the



Testing the Wing Ribs of a New Design, to Be Sure They Have Sufficient Strength in Service

various parts and using their estimated weights, the center of gravity of the whole fuselage is next calculated, and this determines the location of the wings and landing gear. The location of the center of gravity of the complete plane with relation to the wings is so important that, if it should come out only a few inches forward or aft of the designed location, it might easily result in the ship's being totally unmanageable. The wheels must be located far enough ahead of the center of gravity to prevent the plane from nosing over in bad fields, but not far enough to put too much weight on the tail. Insuring the proper final location of the center of gravity of the complete airplane is one of the designer's greatest problems, and it can only be accomplished by careful preliminary design and constant checking of weights as the construction of the ship progresses.

With the side view completed, front and plan-view drawings are made, and the performance and stability characteristics are then calculated. By means of theoretical computations based on data obtained from flight tests of existing planes of similar type, an experienced designer can determine these characteristics quite accurately before the plane has passed the paper stage. If the design in question is at all radical, or if the more accurate determination of per-

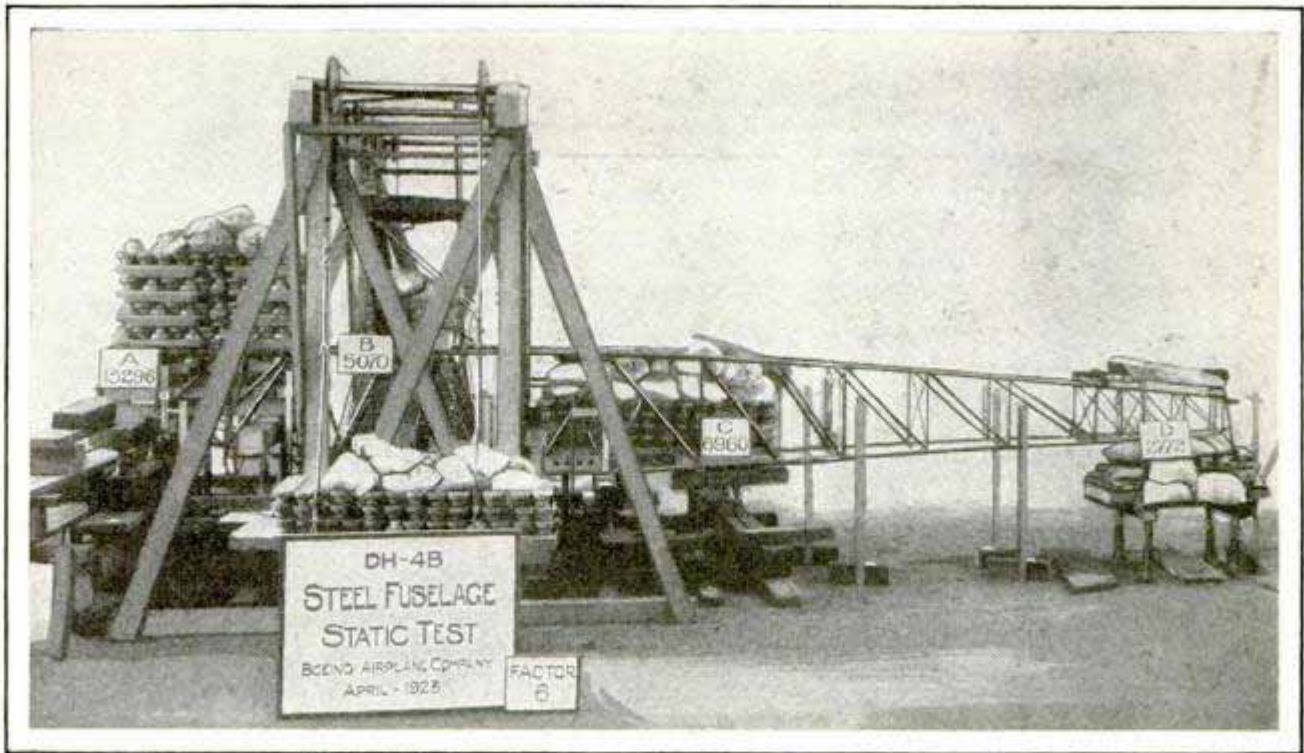
formance and stability is considered advisable, a small but very accurate model is made and tested in a wind tunnel. These models are very expensive to build, but the information obtainable from such tests will often show up weak points in a design which would have proved very costly if not discovered until the flight tests were made. While performance calculations and wind-tunnel tests may not give strictly accurate results as compared with the final flight tests, they are particularly valuable for comparing the relative merits of two or

more designs under consideration.

If satisfactory performance is indicated for the general design, a full-size "mock-up" is usually built before the detailed design progresses too far for changes in arrangement to be readily made. A mock-up is a full-size reproduction of a portion of a finished plane. It is usually built of wood, and includes enough of the plane so that such considerations as the degree of visibility and comfort that the pilot and passengers will have can be determined.

The actual engine is often installed in its relative location and portions of the wings are reproduced in order to determine to what extent they will interfere with the vision of the pilot and passengers. The pilot's cockpit is usually finished in considerable detail with instruments and controls installed in place. Thus the need for important changes in design can often be discovered at a time when they can be made without much trouble. Visibility and comfort are characteristics which are difficult to determine from drawings, and when the plane is completed, it is usually too late to make the desired changes.

At this point, it is usually advisable to make a large-scale layout or profile, as it is called, of the fuselage in side elevation. This is usually made one-quarter size and shows all items to be installed, such



Testing the Complete Fuselage or Frame of an Airplane; the Loads, Carefully Measured, Are Applied in Such a Way as to Approximate Flight and Landing Conditions

as instruments, piping and controls. Its chief purpose is to prevent the possibility of unforeseen interferences, and it usually looks like a Chinese puzzle by the time it is finished, due to the complex installations necessary in a modern airplane. When time for such a drawing is not taken, it has been known to happen at the time of final assembly of the airplane, that the designer finds, to his dismay, that he is faced with the necessity of passing a structural member of the fuselage through the carburetor, or of running a rudder-control wire through the fire extinguisher.

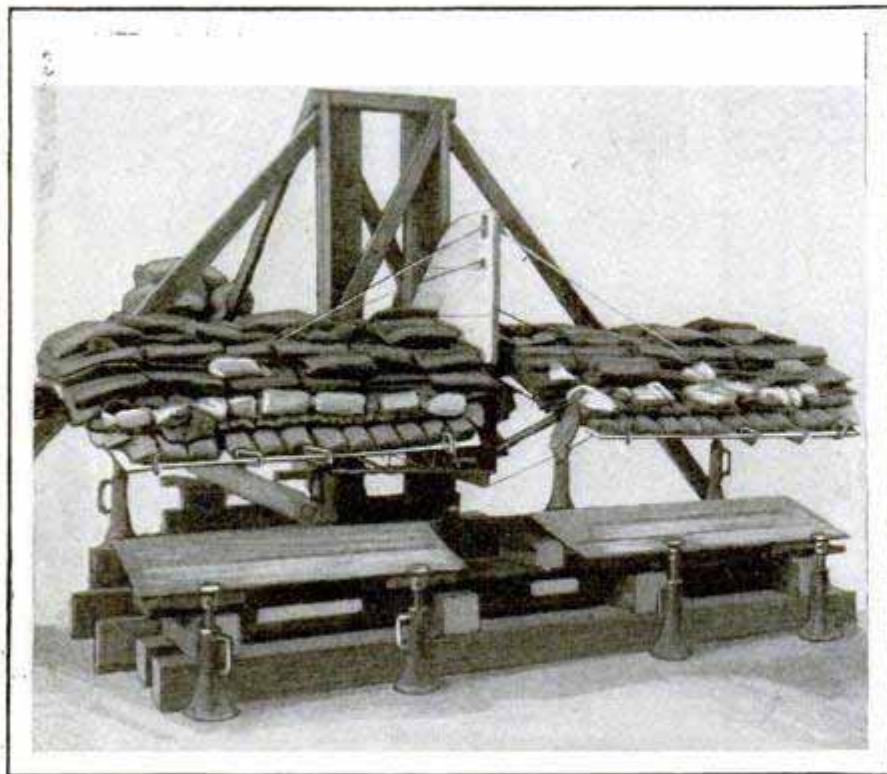
By this time, the principal dimensions of the ship are definitely determined and the stress analysis can be carried out. This is a lengthy process, since the structure of an airplane is called upon to carry many types of loading in the course of normal operations. The stress in a given strut or wire may vary between wide limits, depending, for instance, upon whether the plane is flying at high speed, pulling out of a dive, or landing. An airplane structure must be analyzed for some six or seven distinct types of loading, approximating as many actual conditions encountered in service operation. This work is usually divided between three or four men, and requires considerable time.

With the stress analysis completed, the

greatest load which each strut and wire will be called upon to carry is known, and the detail design of the hundreds of different parts which go to make up the airplane can then be carried out. As each part must be designed to carry the required loads and must be drawn up in detail, several hundred drawings are required. This work is generally divided among a number of men whose work must be co-ordinated by the engineer in charge of the project.

When a part is difficult to analyze for strength, or when there is any question about its being capable of carrying the required loads, a sample is made and tested to destruction. Wing ribs are tested by applying loads to them through systems of lever arms which duplicate actual flight conditions as nearly as possible. Complete wing structures, tail assemblies and fuselages are frequently set up and tested by means of properly distributed sand loads, while small fittings are commonly tested in standard testing machines.

The process of designing and building an airplane is usually accompanied from the very beginning by a seemingly endless series of changes. These cause many complications and much extra work, but are inevitable since all progress and im-



Bags of Lead Shot Are Piled on the Tail Assembly of a New Design, to Determine Its Strength

provement is necessarily based on change.

When the plane is finally completed and ready for flight, the highly interesting moment for the designer arrives when the final weight and center-of-gravity location are to be determined, and it is a case where the fate of the airplane really hangs in the balance. The total weight is usually pretty well known at this time, but if the center of gravity is found to be too far forward or too far back, the plane will not be safe to fly. This occasionally happens as a result of unforeseen changes in weight or location of certain parts of the plane, and some means must be found to shift the center of gravity to its designed location. If it is too far forward, a little added weight in the tail may bring about the desired result, as it is located a considerable distance from the center of gravity. If it is located too far back, however, nothing less than a change in the engine mount, so as to move the engine forward, will usually suffice, and this will require corresponding changes in the engine control and cowling.

After the balance is checked and found correct, the engine is usually run on the ground for several hours to test the engine installation, and if this is found to be satisfactory, the ship is ready for its

first flight. The moment when the first plane of a new design takes off on its trial flight is always an interesting one for everyone concerned, particularly the designer and test pilot. In the pioneering days of aviation, the information that was sought at the trial flight related to whether the plane would fly at all and, if so, whether it could be controlled and would hold together when landed. Now, however, airplane design has reached the point where there is little cause to question the airworthiness of a new plane before its first flight, unless it happens to be a very radical de-

sign. The first flight and the following routine test flights of a modern plane are made primarily for the purpose of determining whether it has the necessary performance, ease of control and stability required to suit it to the purpose for which it was designed. In the flight tests, such characteristics as speed, rate of climb, ceiling, fuel consumption, and degree of stability are determined; and it is often found desirable to try out several types of tail surfaces, propellers, and even engines.

When these tests are satisfactorily completed, the final step is to redesign the plane to the extent of incorporating in it the many changes which are inevitably found to be desirable during the designing and building of an airplane. Then the process of replacing preliminary drawings and sketches with complete and final drawings begins, and when this is finished, the design is at last complete and is ready to go into production.

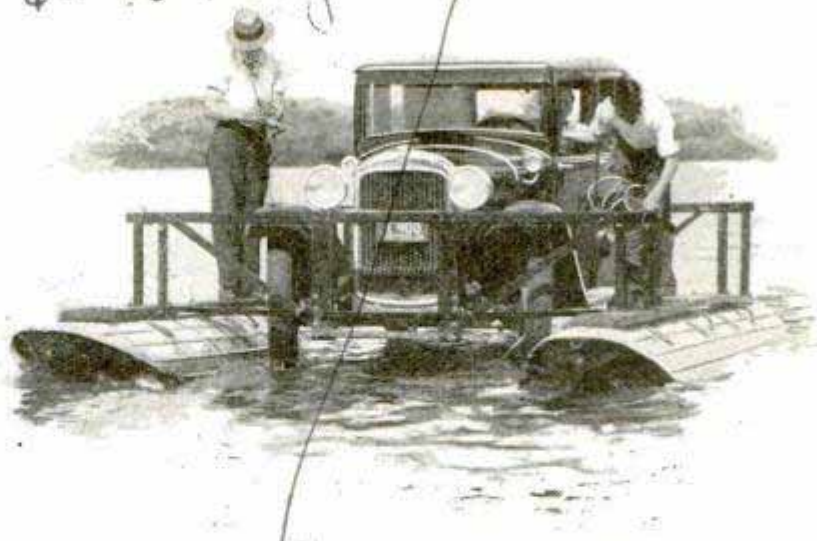
☞ Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

4-564 Egin Ave.

VITAMINES TO BE SUPPLIED BY THE SEA

Wash News 8/22/29

Science is looking to the sea to supply needed vitamins and food resources of the future, particularly if a time of overpopulation should arrive. Experiments of the bureau of fisheries show the value of foods of marine animal origin, indirectly or immediately, for human consumption. These tests indicate that the benefits will be as great whether man eats marine life or animals that are fed fish products. Cows' milk, deficient under ordinary conditions in vitamins C, D and E, iron and iodine, was found to increase in vitamine content as well as iron and iodine when fish meal or other marine food was included in the diet.



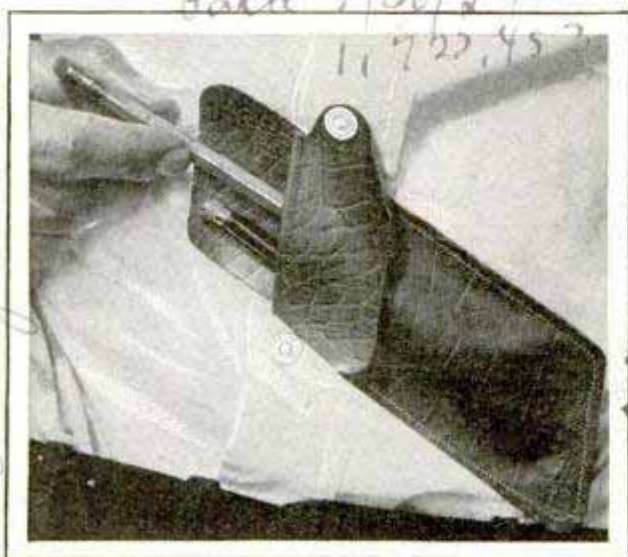
This Automobile, Equipped with Seaplane Pontoons and a Marine Propeller Shaft, Travels by Water as Well as by Land

AUTO ON SEAPLANE PONTOONS TRAVELS BY WATER

Using a pair of seaplane pontoons, a Manitoba, Canada, Winnipeg man makes trips by water in his automobile, and recently completed a 120-mile voyage without mishap. The propeller shaft of the car is disconnected at the universal joint, and a marine propeller shaft, rigged on the framework between the two floats, is connected. Thus equipped, the car cruises at a speed of about fifteen miles an hour.

LEATHER HOLDER FOR PENCILS BUTTONS ON SHIRT

Persons who have no place to carry pencils when they lay aside vests, now may use a leather pencil scabbard which buttons onto the shirt. The holder is essentially a sheath which fastens to the shirt at an angle and has room for half a dozen pencils in a position where they are always handy for use.



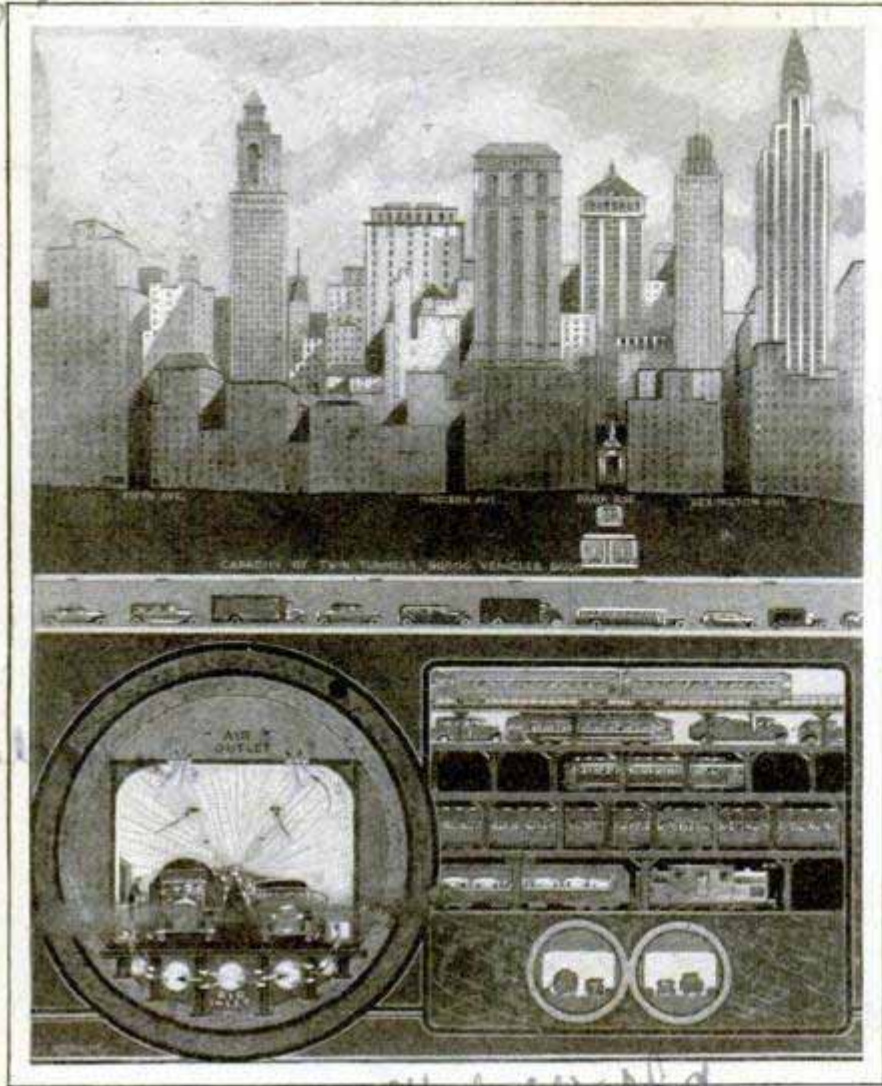
A Leather Scabbard for Carrying Pencils Which Buttons onto the Front of the Shirt

STEAM PIPES TO MELT SNOW FROM MOUNTAIN PASS

Steam pipes are being employed to conquer the snowdrifts that pile up each winter in the Berthoud pass over the Continental divide. This pass, 11,300 feet above sea level, often is blocked by snow from late October to May or June. Shoveling out the snow is an almost impossible task for about a mile and a half and it is in this section that steam pipes are to be used. Buried a few inches underground, no great heat is required as it will be necessary to keep the ground only a few degrees above freezing so the snow will melt and the water will drain off. During severe cold in the middle of winter or during light snowfall in early autumn or late spring the steam will not be used, but it is expected that it will keep the pass open several months longer than is possible at present.

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3249



Above, Location of Contemplated Manhattan Tunnel, and, Below, Cross Sections Showing the Bore and Six Tiers of Traffic

MANHATTAN TUNNEL PROVIDES SIXTH TIER OF TRAFFIC

Six tiers of traffic, piled one on top of the other, part underground, some at the surface, and others above the surface, will be provided for certain sections of New York with completion of a proposed tunnel under Manhattan island and the East river to the boroughs of Brooklyn and Queens. Above the projected double-decked tubes with two roadways, each accommodating two lines of traffic, would be the Pennsylvania and New York Central railroads, Interborough Rapid Transit, the subway, the under-surface street-car lines in Madison avenue, the street level and the elevated railroad. Total length of the tri-borough tunnel is estimated at 22,600 feet. Under the river, two tubes are to be driven and the ultimate cost of the bore is estimated at about \$103,000,000.

W. J. ...

FLYING NO CURE FOR DEAFNESS

Stories of deaf persons having their hearing restored by taking airplane rides are ridiculed by Dr. L. H. Bauer, of the department of commerce. Instead, flying is likely to make deafness even worse by contracting the eardrums. In very rare cases, said Doctor Bauer, there are instances of hysterical deafness caused by some great emotional strain, and in such a case, a breathtaking dive in an airplane, or some other equal thrill, might restore lost hearing.

Portland Ore

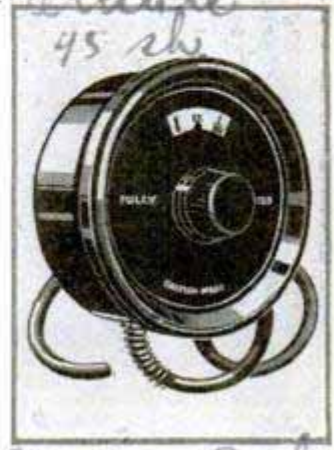
MOUNTAIN RANGE REPRODUCED IN SAWDUST

Sculptured into a resemblance of parts of the Cascade range, the world's largest sawdust pile offers interest to tourists and residents of Portland, Ore. The pile is estimated at 240,000,000 sacks, and the sawdust is used to provide electric power to a city of 350,000 people. Its size, coupled with the exactness of the reproduction, lends an air of reality to its appearance.

Portland Ore

TIME SWITCH FOR AUTOMOBILE TURNS ON PARKING LIGHTS

Motorists who must turn on parking lamps when leaving their cars before dark, or return to switch them on later, have this worry eliminated by a time switch which may be set to light parking lamps at any designated



Stabilite 45 rh

Electric Co. Ltd. Sphinx House

Am. J. Francis, 40 Canadian, Rue de Valenciennes, Paris, France

M. U. 2 ch...

Pocket Corp...

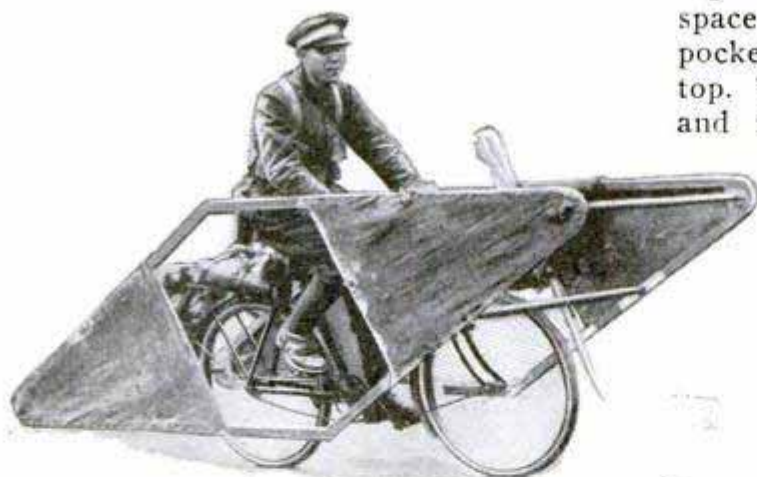
20 22 nd St New York

time. The switch may be fitted to any car and is regulated by turning a knob to the time lights are to be switched on when the car is parked. The instrument consumes no current.

PIANO WITH THREE KEYBOARDS PLAYS QUARTER TONES

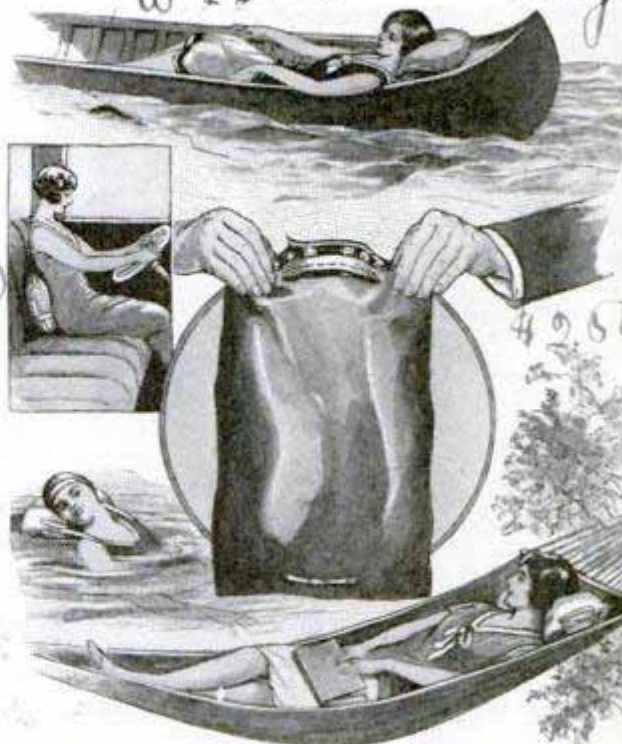
Distinguished musicians gathered in a small room in Paris recently to hear a triple-keyboard piano that plays quarter-tone notes. The instrument is the invention of a young Russian and is of German manufacture. It produces twenty-four separate pitches and was devised especially for the rendition of chamber music, and a symphony composed by the inventor. The pieces have quarter-sharps, quarter-flats, three-quarter sharps and three-quarter flats that cannot be played on an ordinary piano. Modern composers have said that the quarter-tone piano and similar instruments that give a division of tones may restore to music its "fluid quality," which has been lost somewhat in the present notation system.

PAPER "TANKS" ON BICYCLES USED IN MANEUVERS



"Tanks" Used in British Army Maneuvers Were Made of Cardboard Frames like the Above, and Mounted on Bicycles

Cardboard frames, made to resemble lumbering tanks and mounted on bicycles, were used as one-man war machines in recent maneuvers conducted by the English army near Aldershot. Thousands of troops participated in the various battle formations in which the cardboard tanks played an important part.



An Air Pillow Which Inflates Itself Adds Comfort to Swimming, Boating and Motoring

SELF-INFLATING AIR PILLOW ADDS COMFORT TO SPORTS

Affording comfort at the beach, while motoring, or engaged in other sport, a self-inflating air pillow may be transformed from a pillow to a bag for carrying wet bathing suits, or compressed into space permitting it to be carried in the pocket merely by opening a clasp at the top. The bag is twelve by seventeen inches and made of khaki cloth and rubber.

The clasp has rubber-lined edges, making the bag air and water-tight when the clasp is locked. Aside from its uses as a pillow and bag, the convenience also may take the place of water wings for swimming or of a canoe cushion, and has been used in emergency as a hot-water or ice bag. The outside of the pillow is decorated in a variety of contrasting colors to suit individual tastes.

The U. S. navy leads the world in airplane catapults, with two each fitted or building for eighteen battleships, and two each on ten cruisers built and eight others being built, a total of seventy-two, while Japan has but one, and England and France a couple each.

3147

Fighting the



By G. H. DACY

Montgomery Ave. Bethesda Md 4639
FISHING fables such as might be conjured out of the realm of fancy are enacted in real life in the waters of the Gulf Stream near the Florida keys.

These fishing grounds annually attract anglers from everywhere. Some 600 varieties of game and food fish live in these waters and, no matter how inexperienced the fisherman may be, he never returns with an empty creel.

The Gulf Stream, which tempers the climate of both Atlantic shores, is 1,000 miles wide at some points, but narrows to fifty miles off the Florida keys. This results in the relative congestion of warm-water fish in that stretch of salt water. Small wonder, under such conditions, that the largest pleasure-fishing fleet in the world, valued at more than \$12,000,000, centers at Miami ready for angling expeditions after silver tarpon, sailfish, marlin swordfish, sunfish, trunk-back turtles, whiplays, jewfish, whales, sharks and other denizens of the deep blue sea.



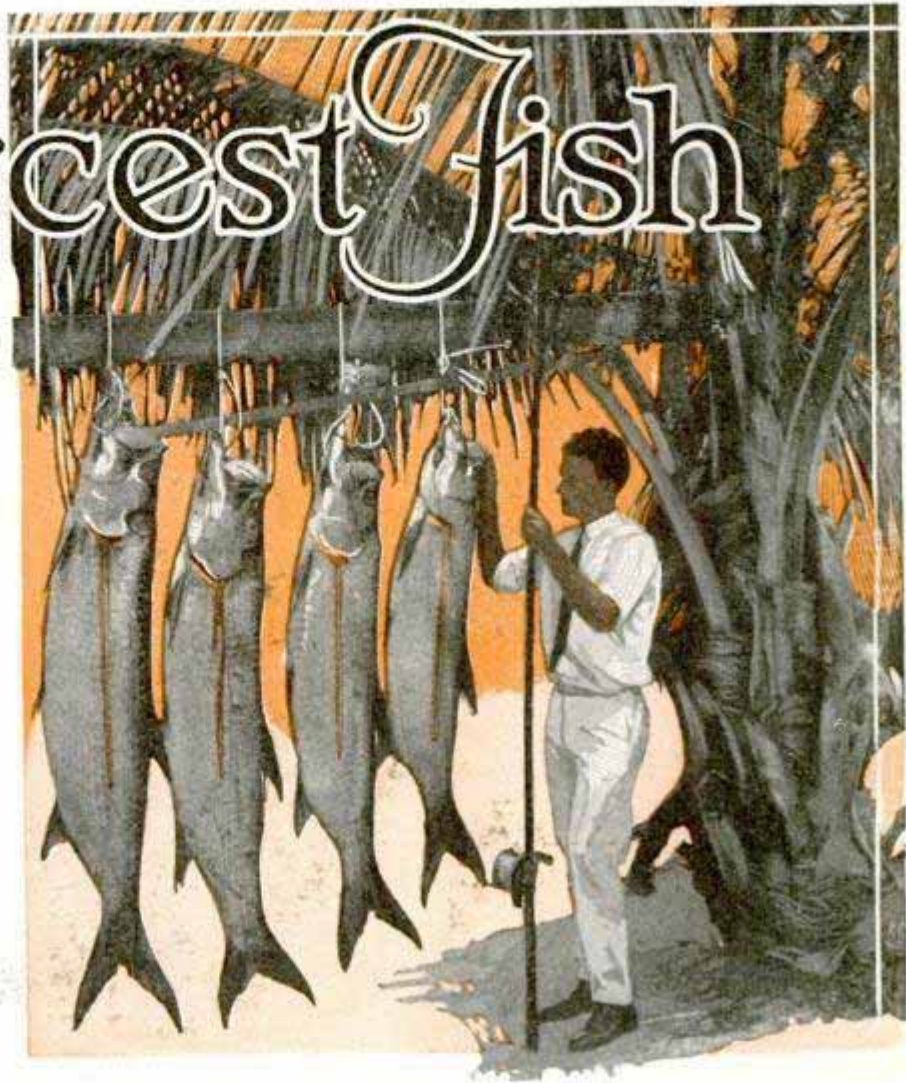
Below, Hammerhead Shark, Sighted from an Airplane and Later Harpooned from a Fishing Boat

Fiercest Fish

Capt. Charlie Thompson, dean of big-game fishing in south Florida waters, easily wins world honors as narrator of the champion fishing story. And just to prove that his experience was founded on fact instead of fiction, Captain Thompson towed ashore the giant of the ocean which gave him the fiercest fight of his life. Thompson won the battle, which lasted forty hours, but he lost exactly sixteen pounds in weight during the contest.

"Two fishermen had chartered my boat for a week's cruise," Captain Thompson said. "When the lookout sighted the monster, I ordered our thirty-one-foot motor tender lowered. The boat was outfitted with fish-fighting equipment. One seaman accompanied me. As soon as our boat was in range, I began firing at the mammoth with a high-powered rifle. Most of the bullets found the target but, apparently, made little impression.

"Finally, we approached close enough for me to throw a harpoon into the floundering giant. Quickly, I fastened the line to the prow of the boat. Enraged, the mammoth began a blind flight, towing our boat as though it were nothing at all. From then on, for the next two days and a night, it was a mad, exciting battle. Our fishing yacht followed us as the monster towed the small boat several hundred miles. The big boat could not get close enough to offer much assistance, and our supplies of food and water were soon ex-



Silver Tarpon Caught in South Florida Waters; They Sometimes Leap Eight Feet High in an Effort to Free Themselves from the Hook

hausted. Our condition was becoming desperate, while the monster, as it became more infuriated, seemed to gain strength.

"Finally, when our ammunition was exhausted and all of the harpoons were seated in the mammoth, we signaled to the pursuing yacht. In desperation, the fishermen launched a rowboat and tried to bring us food and more fighting supplies. The monster, sensing the presence of the boat, made a wild charge and smashed the frail craft. Just when my companion and I had about resigned ourselves to a terrible death, the frantic efforts of the monster to break free from the five harpoons became feebler. And, almost before we comprehended what had happened, it was floating like a derelict on the ocean. The mammoth was forty-five feet long, weighed 30,000 pounds, and its body circumference was twenty-three feet."

Down in the latitude where Captain

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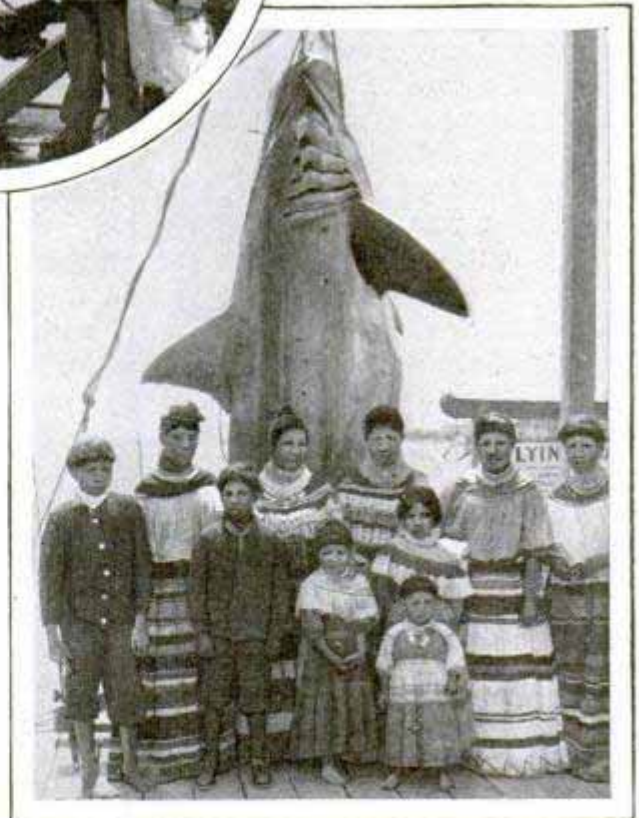
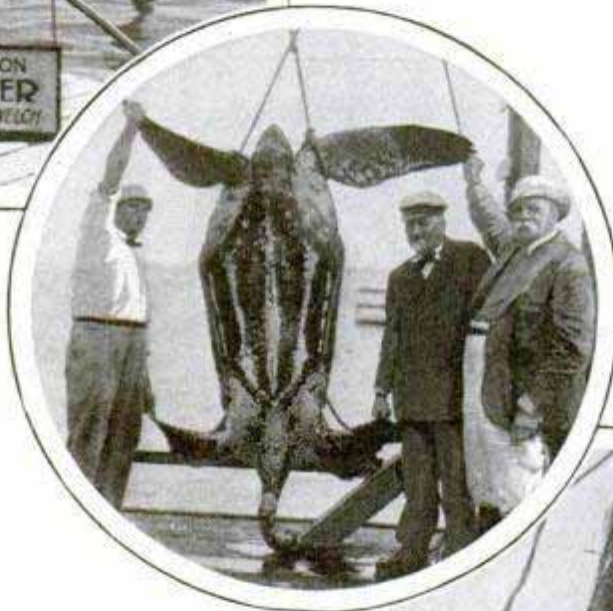


Thompson experienced the greatest thriller of his life, the modern "hook-and-liners" recently have taken to the air; that is to say, the airplanes are now being used successfully in locating schools of fish in order to advise amateur and professional anglers. Harry Rogers, an aviator, fishes directly from his homemade amphibian plane. He knows the waters below almost as well as the ocean of air above the sea. Airplanes are also being used by amateur sportsmen in their quest for huge rays and other harpoon fish. The land planes are employed merely as scouts in sighting the fish. The information is then either signaled or radioed to the sportsmen in an accompanying yacht.

Even elephant hunting in Africa now has its counterpart in "spear fishing." The goliaths of salt water are every bit as courageous, fierce and defiant as the challenging jungle beasts. The great ray, some of which measure thirty feet across the back, better known as the devilfish, is often encountered.

Harpooning hammerhead, shovel-nose, leopard, nurse and mackerel sharks is thrilling sport. These fish pirates usually are short-time fighters, but infuriated and fierce adversaries while their strength lasts. A giant sawfish has been known to tow a thirty-eight-foot motorboat for six hours.

One fishing party from Miami captured a sailfish that was ten and a half feet in length and weighed 152½ pounds, last winter. A thirty-five-foot sperm whale, weighing about twenty tons, was harpooned early one morning, but did not succumb until sundown. This fighter towed the boat more than seventy-five miles while the fishermen bombarded it with powerful rifle bullets and bombs. Once during that thrilling afternoon, a bomb dislodged the harpoon and the wounded whale disappeared in the school of which it was a member, but was speared a second time when,



Devilfish, a Huge Trunk-Back Turtle Weighing 1,200 Pounds, and a Man-Eating Shark

due to ebbing vitality, it lagged behind its mates.

The experienced anglers of the Gulf Stream believe in giving the game fish a good fighting chance. Hence, the majority use light tackle, which consists of a nine-thread line with a breaking strength of eighteen pounds. It is then an odds-even fight between the fish and the fishermen. The skill of the anglers is depicted by the facts that the following record catches have been made in the South Atlantic ocean and Gulf Stream with such tackle: amberjack, sixty-two pounds; marlin swordfish, eighty-eight pounds; sailfish, eighty-nine and a half pounds; tarpon, 112 pounds; barracuda, fifty-five pounds; grouper, fifty-six pounds, and wahoo, sixteen and a half pounds.

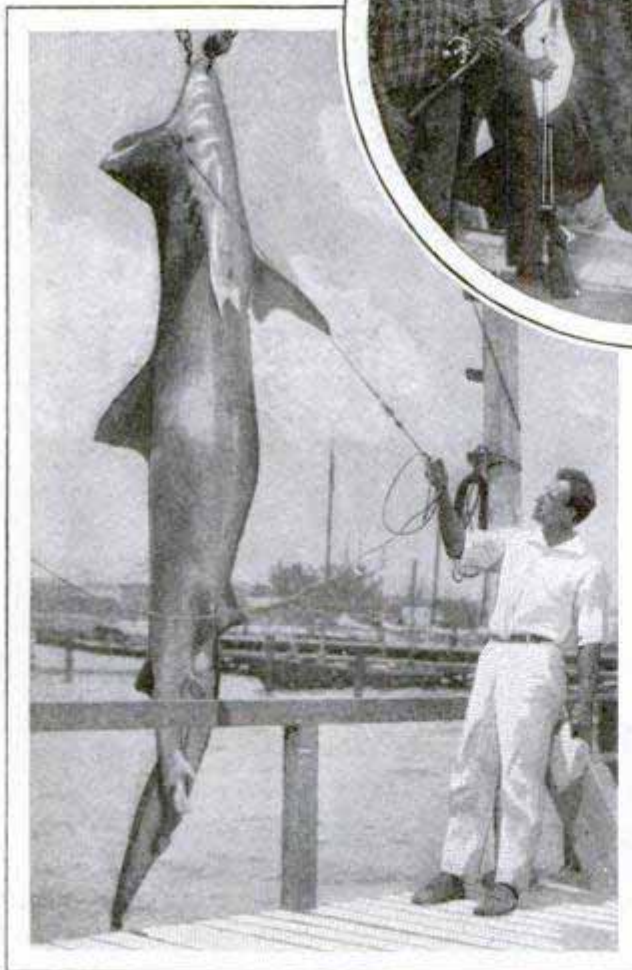
Correspondingly larger fish have been caught by south Florida an-



glers and their guests who have fished with heavy tackle, using twenty-one-thread line with a breaking strength of forty-two pounds. Among their masterly catches are a 208-pound tarpon, 118-pound marlin, 107-pound sailfish, 104-pound amberjack, ninety-two-pound grouper and fifty-eight-pound

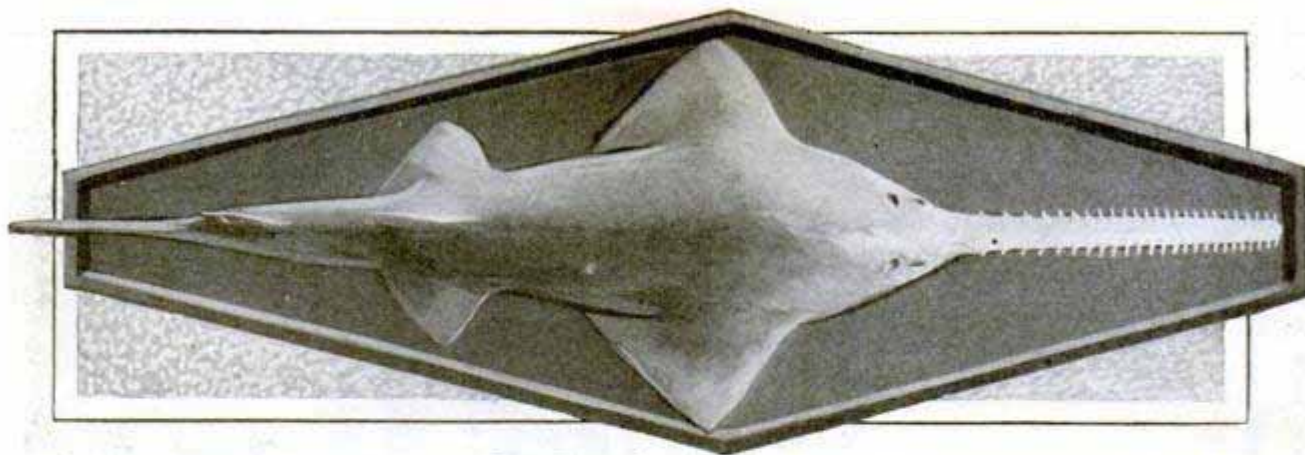
kingfish, not to forget the 150-pound tuna which was caught last winter near Miami.

A New York fisherman established a marathon fight record when he recently fought a tuna for eleven hours and twenty minutes before angling skill finally conquered. William Arnold, of Miami, an angler of seasoned skill, brought to gaff a jewfish weighing 412 pounds after an eight-and-a-half-hour fight, another proof of the fighting excellence of heavy tackle. In fact, it is a moot question among the hook-and-liners how large a fish can be yanked expertly from Davy Jones' locker on a twenty-one-thread line. The chances are that a one-half ton tarpon, if this species of valiant fighting fish grew that big, could be landed with such tackle, for the tarpon, in its charges and countercharges, leaps, dives and wears itself out.



Spine Fish That Blows Up in Time of Danger; a 1,350-Pound Sunfish and a Hammerhead Shark

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790



This Huge Sawfish, One of the Terrors of the Deep, Caught near Miami, Weighed 400 Pounds Before It Was Stuffed and Mounted as a Museum Specimen

A shark, on the other hand, hangs on the hook somewhat like a lump of lead and conserves his strength for the final crucial struggle for mastery.

The size of the fish is not always a true measure of its fighting ability when hooked. The bonefish, which weighs considerably less than ten pounds, is the fastest game fish that swims, and is a dauntless, intrepid fighter. The spectacular sailfish is a surface battler that runs helter-skelter and leaps with amazing force from the water. The tarpon is the peer of high jumpers among the hurdling fish and comes out of the water with a modified roar and thunder, leaping seven to eight feet into the air while it shakes its head vigorously, seeking to throw the hook.

The marlin, like the sailfish, is a surface fighter. The barracuda, a wolf of the sea, is nomadic, a dweller of the deep, and specializes in stealing fish from the fisherman as he is bringing his catch to gaff. The broadbill swordfish now ranks unrivaled as the most savage fighter in Florida waters. This species migrates to the Gulf Stream from the north Atlantic during July and August and every angler who has encountered one will remember the contest as long as he lives.

AIRPLANES CARRY WEED SEEDS

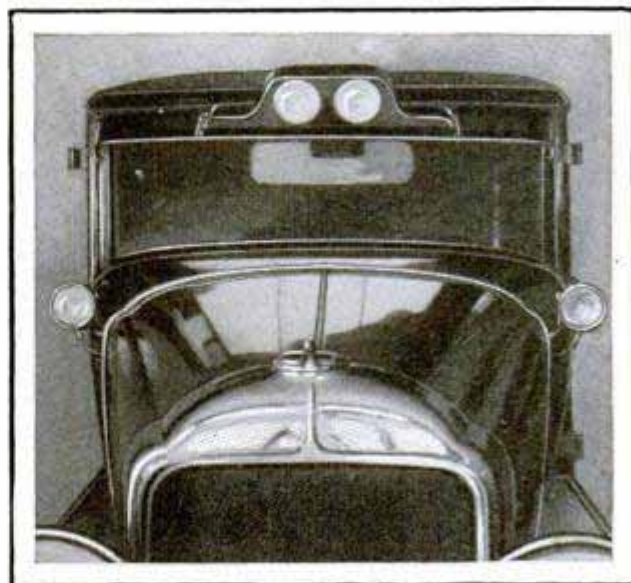
3100 Tumbleweeds and similar pests have taken to airplane travel, recent tests show. Inspection of 110 planes revealed that ten of them had in their tires the spines of puncture vine burrs, one of the most troublesome weeds of the southwest. This weed holds to a tire tread and works its way in like a tack. It is being fought by

*Horticultural Inspector
H. H. Hooper*

highway officials, who have become alarmed by the new trick of the weed to become started in fresh fields by way of airplane rides.

AUTO LIGHTS PLACED ON VISOR TO ELIMINATE GLARE

3350 Headlights for the automobile have been made to fit on the regular visor of the car top in order to eliminate the glare from lights in the ordinary position. Being above the eyes and shining directly on the road, makers of the visor lights say, the angle of illumination prevents the glare which results when ordinary lights shine partly on the road and partly in the air in front of the car. The lights on the visor shine over the radiator cap, illuminating the front of the car so that an ap-



Headlights Placed on the Visor of the Car in Order to Eliminate Glare and Eye Strain

proaching motorist is able to gauge the distance between the cars more easily.

*Chas. W. Byron & Co.
S. H. Henshaw*

Asst. Trade Commissioner 3409

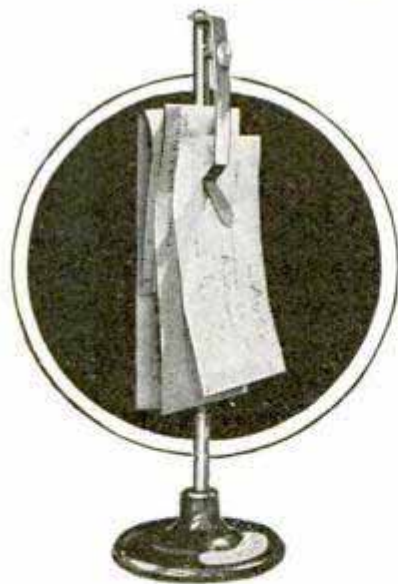
Arnold W. ... 3409

STEEL TROLLEY WIRES SEEN WITH "SLIDING SHOE"

Use of a "sliding shoe" instead of the usual wheel, to make contact with the trolley wire, may permit the installation of steel in place of the more costly copper wire engineers report after a series of tests with the shoe on street-car lines in Toronto. The shoe is twenty-five inches long and is thickly covered with grease which is expected to prevent the formation of sleet in the winter and to reduce the pitting and arcking of the wire. A pressure of from twenty-five to thirty pounds is required to keep the present trolley wheel against the wire, but only twelve pounds is needed with the shoe. This reduces wear and will allow the welding of wires instead of the usual frog at intersections, engineers believe. The shoe has been developed in Europe.

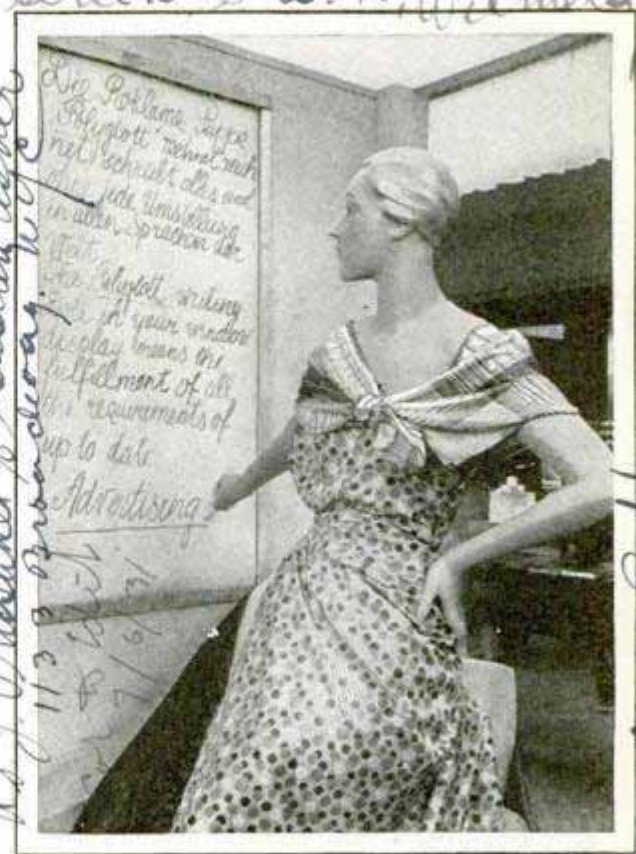
URGENT-MESSAGE HOLDER AIDS BUSINESSMAN'S MEMORY

Businessmen who find themselves forgetting important appointments and tasks are visibly reminded of them by an urgent-message holder intended for the desk.



The holder consists of a base and a tall standard, at the top of which notes calling attention to urgent business may be inserted in a clip. The standard is of such height that the eye cannot fail to see the message as the businessman seats himself at his desk.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.



© Presse Photo
An Attractive Advertising Dummy; It Reproduces Handwriting through a Sending Mechanism

DUMMY REPRODUCES WRITING AT A DISTANCE

Copying the handwriting of a person who may be situated a considerable distance from it, a dummy developed in Berlin has attracted considerable attention. The writing robot faithfully copies, line for line and word for word, the handwriting of the sender who writes on a device which transmits the impulses to the dummy, which in turn transfers these impulses to a blackboard or chart. The dummy is used for advertising purposes.

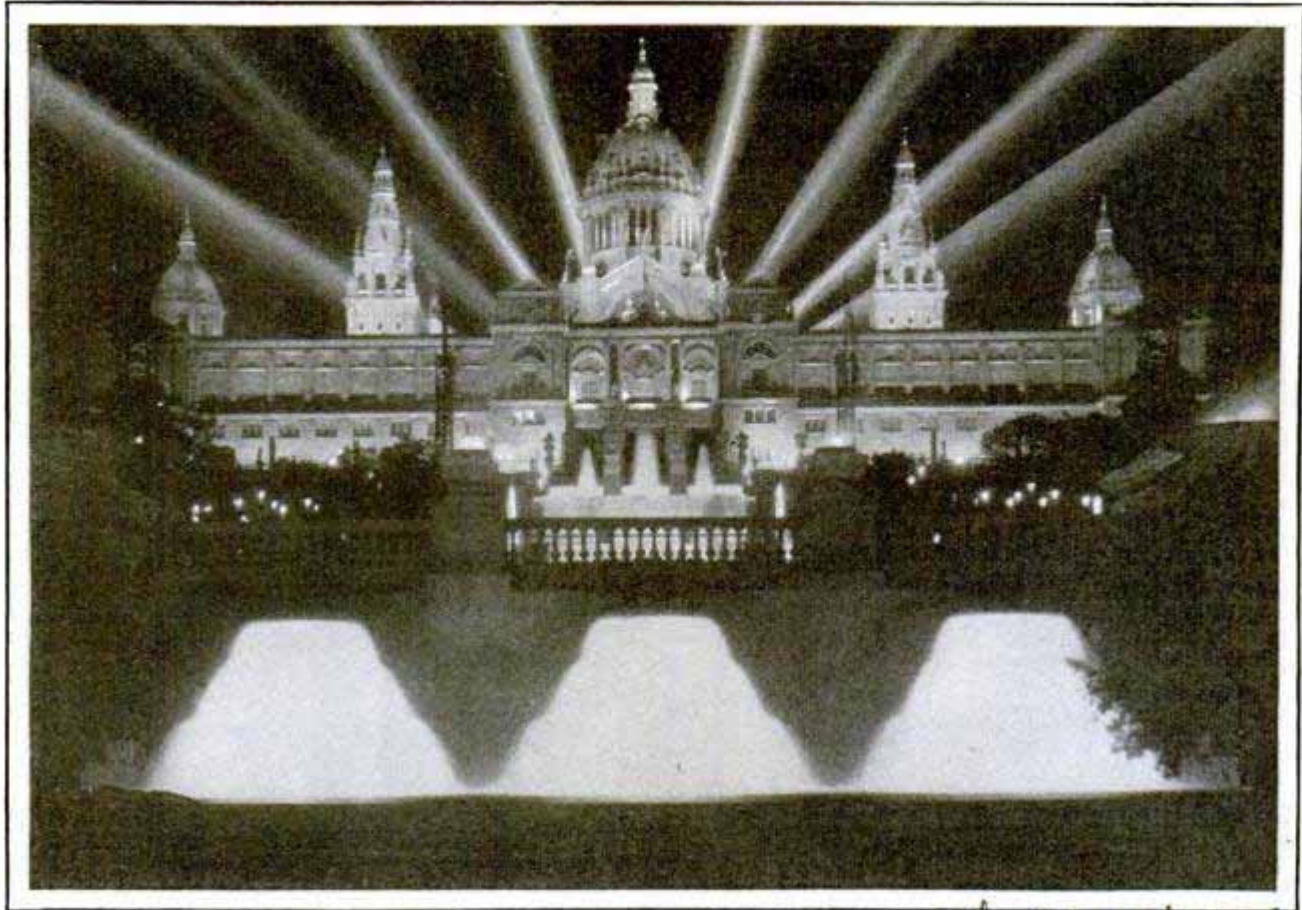
CORNSTALKS ARE CUT LOW IN WAR ON BORER

War against the corn borer is aided by cutting off all stalks at the ground and shredding, ensiling or burning them, but the standard corn binder leaves a five or six-inch stubble. The department of agriculture has developed devices for four makes of binders which will cut the stalks at the surface, and has also made a low-cutting hand hoe for the same purpose. Most of the parts for such an implement can be made in the farm shop.

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792



The National Palace at Barcelona, Spain, Pictured Above, Was Given the Effect of Wearing a Diadem by Eight Powerful Beams of Light Used to Illuminate It for an Exposition

DIADEM EFFECT GIVEN PALACE BY BEAMS OF LIGHT

Eight powerful beams of light were employed to help illuminate the national palace for the exposition at Barcelona, Spain. The beams, aside from lighting the heavens and being visible for miles, gave the palace itself the effect of wearing a diadem. In the center section and flowing down from the palace, were several cascades of water supplying a great fountain spraying water 200 feet high.

DENSITY OF SMOKE MEASURED TO MAKE CITY AIR PURE

New York's smoke abatement campaign is being aided by an instrument which measures accurately the density of smoke in the air. The appliance is used to determine the amount



of smoke issuing from stacks at any given time. It has been estimated that soot costs the city \$96,000,000 a year. The instrument is called an "umbrascope."

CRYSTAL REPLACES PENDULUM TO CONTROL CLOCK

Quartz crystals, similar to those used in radio stations to keep the wavelength constant, are being employed to provide more accurate clocks. Experiments have shown that crystals may be used instead of the ordinary pendulum, and when so used, compare well in accuracy with the observatory clocks. Since a pendulum is not required, the crystal clock does not need the firm base on which observatory timepieces must be mounted, and so could be used in tall buildings, on shipboard, or even in aircraft. When a quartz crystal, properly cut, is placed between two metal plates and a vibrating electric current applied to them, the crystal can be made to oscillate at a certain rate with great accuracy. Crystals vibrating 100,000 times a second are used for the clock, and the alternating electric current thus estab-

3384

Science Service

Health Dept. inspectors

at West Tele. Lab. Laboratory at Wash. D.C.

*made by a
Mabison*

3358

Dayton Aircraft Corp

Dayton Ohio

lished is made the basis of power to operate a motor geared to the clock face in such a way that it keeps correct time when the crystal vibrates accurately. Such a time-piece has been shown to vary within one one-hundredth of a second a day. This compares with the best clocks of late years, but a still more accurate timepiece has been developed in England.



Tandem Motors on This Plane Are Mounted above the Wings to Give an Unobstructed View and Add to the Power

PICTURES IN MOSS AGATE RIVAL PAINTINGS *3336*

Gathering pieces of moss agate bearing designs of unusual beauty, is the interesting hobby of a western man who collects most of his specimens from the bed of the Yellowstone river in Montana. After being cut and polished, the fragments display their unusual markings in striking manner. Miniature forests, lakes, islands and other scenes in soft colors are seen in the transparent stones, some of the effects being so realistic that it is difficult to believe they have been formed by nature. A rotating iron disk is the principal implement used in cutting the rough stones.

TANDEM MOTORS OVER WINGS ADD SAFETY AND POWER

Successful tests have been concluded of a large monoplane with its two motors mounted in tandem fashion, one behind the other, on top of the plane above the wings. It is the first time motors have been placed over the wings of a land plane, and the arrangement gives the pilot an unobstructed view from his compartment in the nose, eliminates the danger of persons walking into the whirling propeller blades, decreases the noise from the engines and adds power by giving an unobstructed draft over the top of the wings and non-interference with the air stream that strikes the underside. The radial-type engines are of 525 horsepower each, the front one having a two-blade propeller and the rear a three-blade of the pusher type. Either motor can carry the plane, which is fifty-three feet long, has a wing spread of sixty-seven feet, provides room for six passengers, pilot and observer, and weighs 9,000 pounds fully loaded. The ship has a maximum speed of 160 miles an hour and a cruising speed of 140 miles.



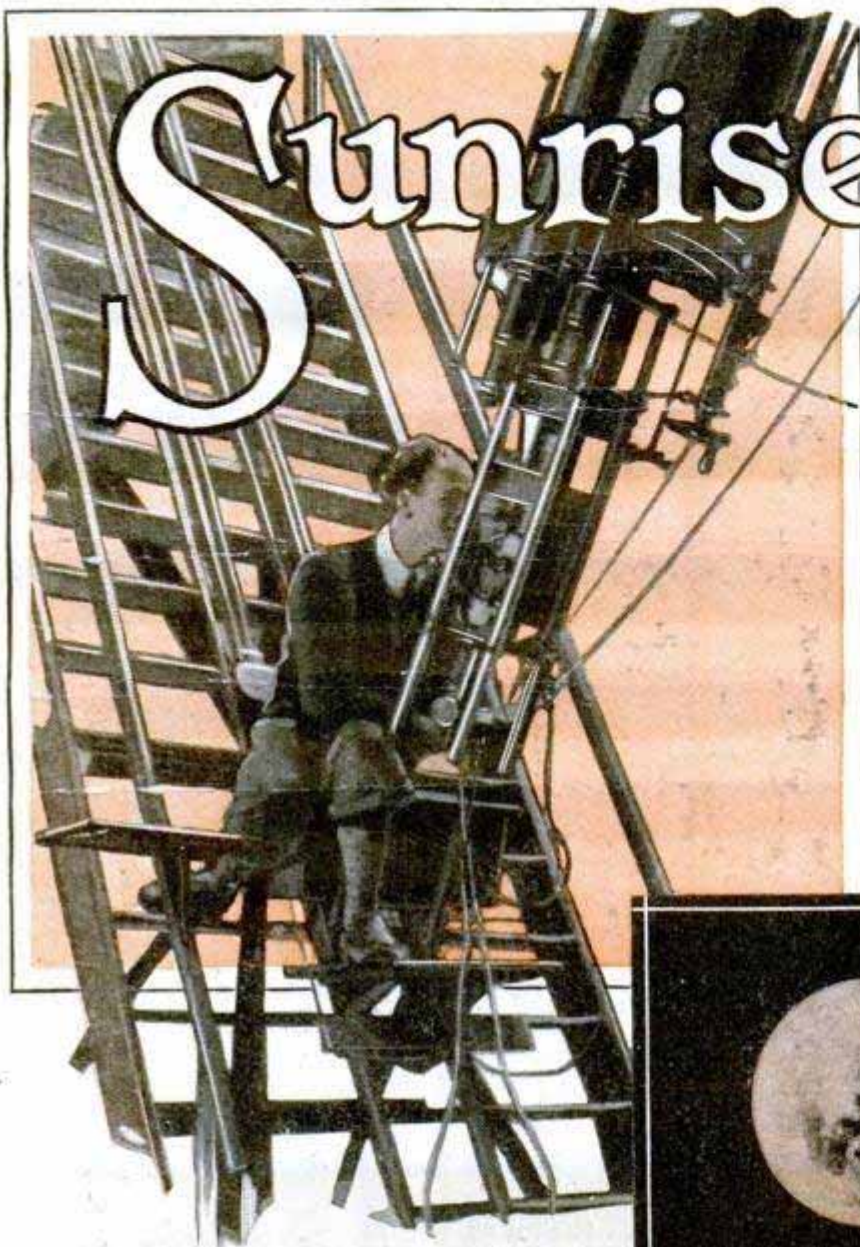
Pieces of Moss Agate Which, When Polished, Often Resemble Miniature Forests and Lakes

☞ To warn motorists against parking near a fire hydrant, a bright red mark is painted on the curbstone in a mid-western city.

*J. H. Monroe
address unknown*

32219

Sunrise on the



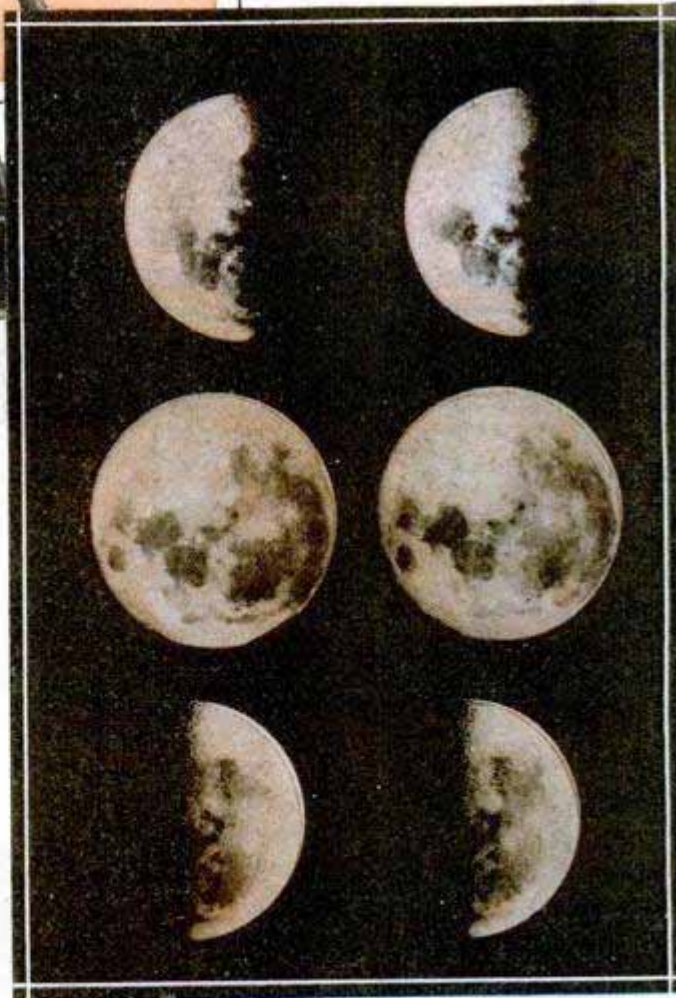
first peeks above the horizon of Luna to gild the lofty summit of Copernicus, burnishing the rim of the vast crater of this extinct volcano, at length wiping out the dense shadow in the crater's depths, and moving on to thrust back the darkness beyond.

It is as though we looked on at this from an airship a mere thousand miles away from the moon, so do the optical instruments of today annihilate distance in space, instead of

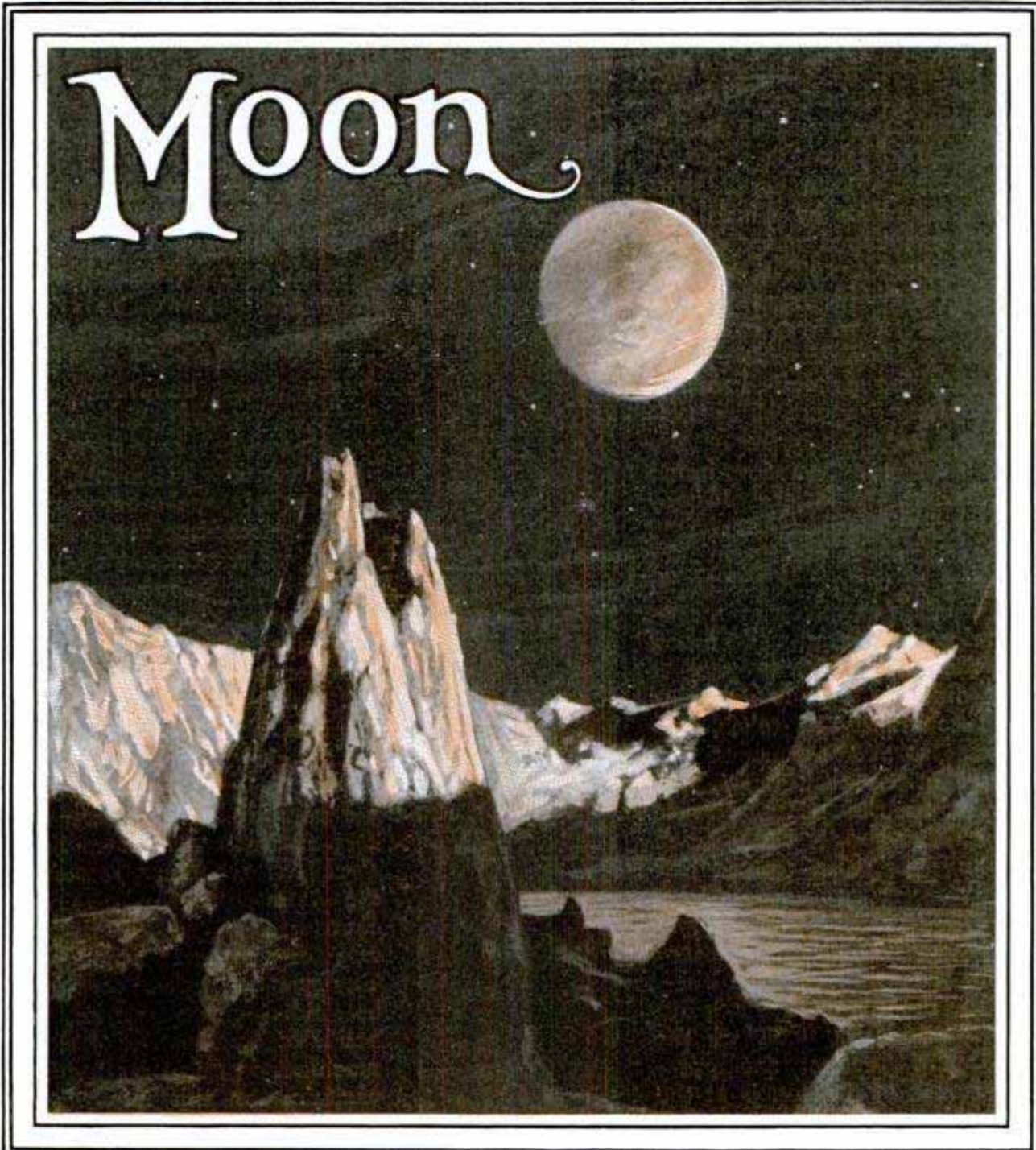
By J. OLIN HOWE 3224

Grand Camera
SUNRISE on the moon! Thrilling intimacy with the great orb which rules our nights is in the first motion pictures to be made of the moon, filmed by a graduate student at Princeton University. Astronomers long have been able to watch through their telescopes as the sun dispelled the black darkness of lunar night across the scarred and pitted face of our nearest neighbor in the heavens. Now the rest of us may share this rare privilege.

Mount Copernicus, perhaps the most magnificent of the moon's mighty peaks, and certainly one of the most fascinating, is featured in this first film of the moon. Upon the screen we see the brilliance of Old Sol's rays as he



Prof. John Quincy Stewart, of Princeton University, Operating Movie Camera Attached to Big Telescope; Below, Moon Photographs



Courtesy The American Museum of Natural History

Imaginative Conception of a Moon Landscape and the Earth as Seen from the Moon, from an Oil Painting by Howard Russell Butler, N. A., in the American Museum of Natural History

the camera's being on the earth, 240,000 miles distant from its objective. And the motion picture which results discloses in a few short minutes changes on the face of the moon which really require twice as many hours to take place, hours of tireless observation on the part of the diligent astronomer.

Motion pictures of the lunar dawn are the idea of Edward G. F. Arnott, Princeton '28, now a graduate student at the university, and of Prof. John Quincy

Stewart, of the Princeton department of astronomy. This was worked out with the co-operation of the former's father, Robert Fleming Arnott, of Upper Montclair, N. J., and of Arthur L. Bennett, of Williamson, N. Y., also a graduate student at Princeton, who has had considerable experience in lunar photography at Lowell observatory, Flagstaff, Ariz.

Bennett made only still photographs there, however. No one ever made a motion picture of the moon until Arnott

conceived his plan of attaching a motion-picture camera to the big telescope in Princeton observatory and having its powerful lens, twenty-three inches in diameter, take the place of the camera's own small lens. The mechanism by which this was accomplished was designed by the elder Arnott, a consulting engineer with experience almost as world-wide as President Hoover's. And the whole affair is under the general direction of Professor Stewart. The camera is a popular make of the type now common for home use, its film the familiar 16-millimeter size. An aluminum frame holds it firmly in position at the eye end of the great telescope, and the film is driven by a special electric motor. The moon and the earth whirl in space at very different speeds and this must constantly be taken into account, as well as the continual change in the position of each relative to the other, minute though these are to the unaided human eye. The moon's day is roughly thirty times as long as ours—from our first glimpse of the new moon's slim crescent to the last vestige of the old—and the moon's diameter is but about a quarter that of the earth. On the moon, the apparent motion of the sun is at the rate of somewhere about nine miles an hour, while it rushes across the surface of the earth at the comparatively high speed of 1,000 miles an hour.

Picture, then, the astronomical cameraman in Princeton observatory in the still watches of night. He and his companions have climbed long flights of steep stairs into the tower, the machinery has rolled back the desired section of its dome, and the operator sits on the suspended seat adjustable to such position as he wishes up or down much steeper steps back of the small end of the great telescope. He is looking at the moon



Movie-Film Strip of Moon at Early Morn.

through an eyepiece which stands out at right angles to the telescope itself, and he sees exactly that portion of the lunar landscape which registers on the film.

Forty per cent of the light which comes through the big lens is diverted to this guide lens, so that the operator may know precisely what he is doing. You see, in each hundred feet of this film there are 4,000 separate pictures, one taken every six seconds, and after each exposure the operator must make two distinct adjustments, independent of each other and absolutely necessary, for the "hour angle," as astronomers term it, and for the moon's declination as it crosses the night sky. The exposure each time occupies but four seconds, camera wide open, full shutter, the remaining two seconds being the operator's.

The clockwork on the telescope, designed to compensate the rotation of the earth and keep the instrument steadily directed at whatever section of the firmament the observer chooses, is not sufficiently accurate for photographic purposes. The great spyglass must now be guided within finer limits by hand, or by electrically driven machinery guided by hand. A variation on this film of even a few thousandths of an inch is a serious matter, to be magnified to a noticeable distortion on the screen.

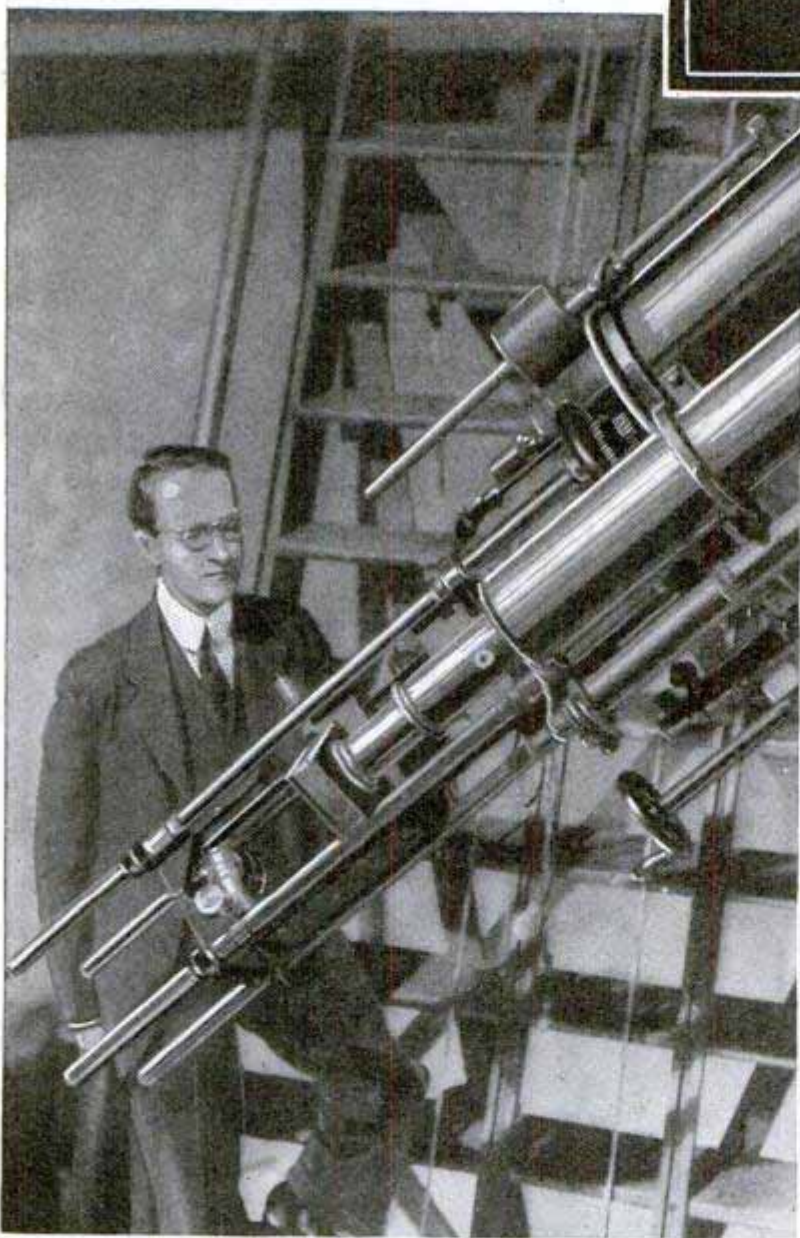
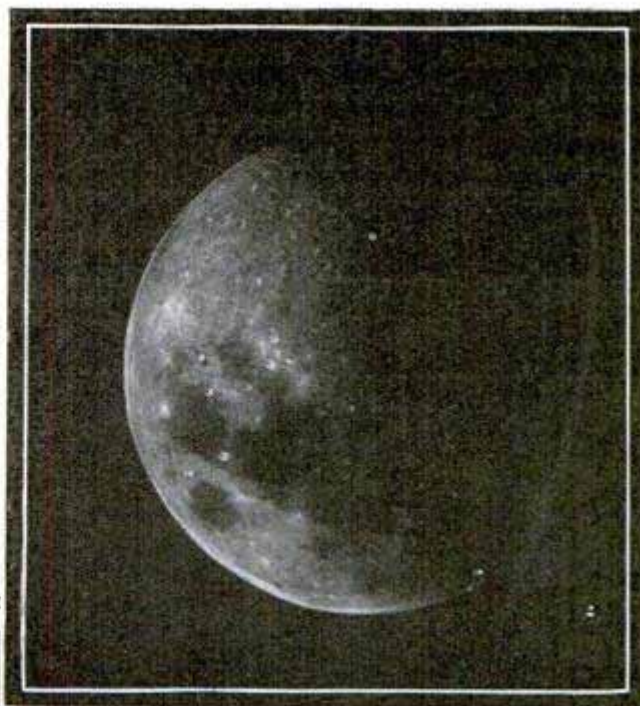
Hence the operator sits, eye glued to the eyepiece, and with an electrically connected push button in either hand makes his two different adjustments ten times in every minute during

those two seconds while the camera shutter is closed each time. Speaking generally, these are horizontal and vertical moves, and neither may be more than one-half of one-hundredth of an inch! Else it will show on the film.

Hour after hour of the night he who

films the moon is as fully occupied as an aviator flying with no other resource than the dials on his instrument board. It requires nearly seven hours of painstaking application to the job to make a hundred feet of this picture.

Nor will a single night suffice to take the full lighting up by the sun's rays of even this one mountain, except possibly one of our longest winter nights. And even then the camera would have to catch it just right. These moon craters are huge affairs. On earth we have no mountain craters over six or seven miles across; the moon has many craters fifty and sixty miles in diameter, and 100 miles in width



is by no means unknown there. The circlet of peaks which forms the crater of Copernicus is fifty-six miles across. By the time shadows were fully gone from its deepest depths the moon would have sunk beneath our western horizon, very likely.

The photographer cannot pick up his task and go ahead the following night, either; twenty hours will have made a great difference in the situation on any part of the moon. He must await conditions similar to those of his first night in the next month and hope for good luck. It took three months for Mr. Arnott to carry the lunar sunshine halfway across the crater of Copernicus and he felt himself especially fortunate to get two nights suited to his purpose in so short a time.

No rose tints paint the mountaintops at dawn on Luna, for the moon has no atmosphere. There are no gradations between darkness and light such as we have; no twilight band interposes between night and day. Before the sun comes, there is blank, black

Above, Photograph of Sunrise on the Moon Just Before Sun Reached Crater of Mount Copernicus, and, Below, Robert Fleming Arnott, Designer of the Moon Movie Apparatus

darkness such as we on this planet can hardly realize. On its arrival, almost instantly the first peaks to catch its rays stand out in full definition in a harsh, untempered glare in sharpest contrast to the dense blackness which obscures near-

by terrain where it is still night. And so slowly does the sun creep across the face of the moon that the tallest upthrust of her mountains is fully illuminated hours ere the shadows recede from neighboring plains.

WIRE TWISTER FASTENS FORMS FOR CONCRETE WALLS



Wire Twister Operated like an Auger, to Tighten the Wires on Concrete Forms

Tying together the forms for concrete walls with tightly twisted wire has been simplified by a tool which eliminates hand twisting, often a slow and dangerous process. By using the twister, the forms may be built in large units, instead of a board at a time, and the wire tightened after the units are placed on the footing. The twister has a handle like an auger and an extension shaft is provided so that it is unnecessary for the person operating it to descend into a narrow form to use it.

WAX FROM A WEED

A weed known by the Spanish name candelilla, growing in profusion on the mountain slopes of western Texas and

northern Mexico, is the source of a wax suitable for the manufacture of phonograph records, floor polishes, linoleum, and for various other uses. Small wax factories in remote localities in the mountains of Texas and Mexico extract the wax in a crude form from this weed and ship it east to be refined and converted to a useful purpose in industry. The little plants in the mountains are usually isolated where automobile or wagon travel is impossible. So, the raw material in the shape of weeds is generally brought to the plants on burros, and the crude product of the factories then transported to the outside in the same manner.

BASEBOARD RADIATOR HEATS FROM LEVEL OF FLOOR

Projecting its heat from the floor level where it is most efficient, a radiator is on the market which is so compact that it projects only a few inches from the wall when exposed, or it may be installed so that it is recessed partly or entirely in the baseboard. The radiator, made in eighteen and thirty-six-inch lengths, may extend straight along the wall, or make a right-angle turn. When recessed, valve connections and traps are incased for concealment. The heating device, only eight inches high and three and one-half inches deep, operates on any two-pipe steam, vapor or vacuum system, and on a hot-water plant of either forced or overhead circulation, sending its heat forth at the floor line where it is most required.



Floor-Level Radiator Installed, Showing How Closely It Fits to the Wall to Save Space

Richmond Radiator Co. Inc. 1480 Broadway

Cont. S. V. Lindau 315 Roseborough Ave.

San Antonio, Texas

3388

88.00

3408

Mar. H. Keller Champagne, Ill.

Myr-

Chicago, Ill. H. H. Mehegan, Dec. 10, 1910

3432

440 - 7. 8/31/29

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Boeing airplane 799

Cinnamomum POPULAR MECHANICS Cassia

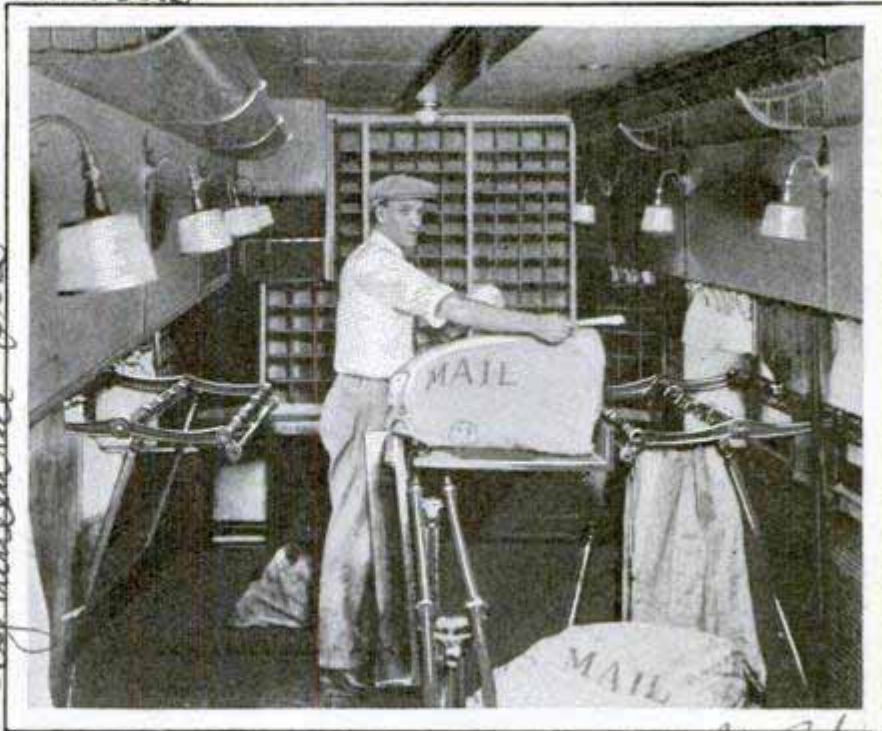
International Land and Livestock Exchange

HIGHEST-PRICED TREE BARK

3431

To be the highest-priced bark in the world is the distinction claimed for a variety of cinnamon tree that grows in the province of Thanh Hoa, French Indo-China. The tree reaches a height of thirty or thirty-five feet, and bears a white-spotted bark. When the tree is stripped, the bark is divided into three parts. That from the upper portion of the trunk is esteemed most highly, and that from the base the least. The king claims two-thirds of the bark from the upper two-thirds of the tree as his own; the rest is auctioned off. The bark of a single tree brings as much as 100,000 francs which even at post-war exchange rates means \$4,000. The Chinese and Annamese native doctors supply an avid market for this bark, as it is regarded as a cure-all.

see Agricultural File



Inside the Mail Plane, Fitted Up like Railroad Car; the Clerk Sorts the Letters as the Ship Flies

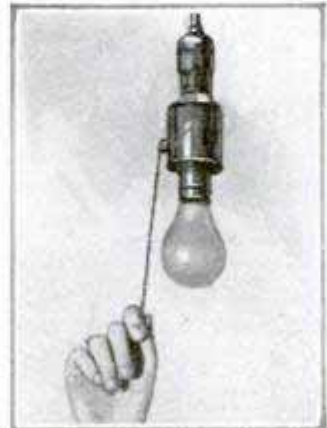
MAIL SORTED ABOARD PLANES OF FLYING POST OFFICES

Airplanes which will serve as flying post offices when Uncle Sam decides to use them, much as railway post offices are now, are being built by the Boeing air transport, which handles mail contracts. By placing mail clerks aboard to sort letters in transit, officials estimate that about three hours can be saved on the run between Chicago and San Francisco. A fleet of eighteen-passenger transports now under construction can be converted without trouble into aerial post offices. The cabins are more than nineteen feet long and seven feet high, and the planes can carry three and one-half tons. The clerks may have their meals aboard, as the planes are equipped with a small buffet.

ELECTRIC-LIGHT TIME SWITCH TURNS OFF CURRENT

3395

Electric-light current is saved by a time switch which may be attached to any socket and which will turn off the light at a given time. The device consists of a coupling between which is a clock, wound by pulling the cord which turns on the light. The clock may be set at any number of minutes and when it runs down the light goes out. It may be fixed for any period from three to ten minutes, and the switch is intended particularly for stock rooms or warehouses where light generally is needed for only a few minutes at a time.



LIGHTED STREETS GUIDE FLYERS

3398

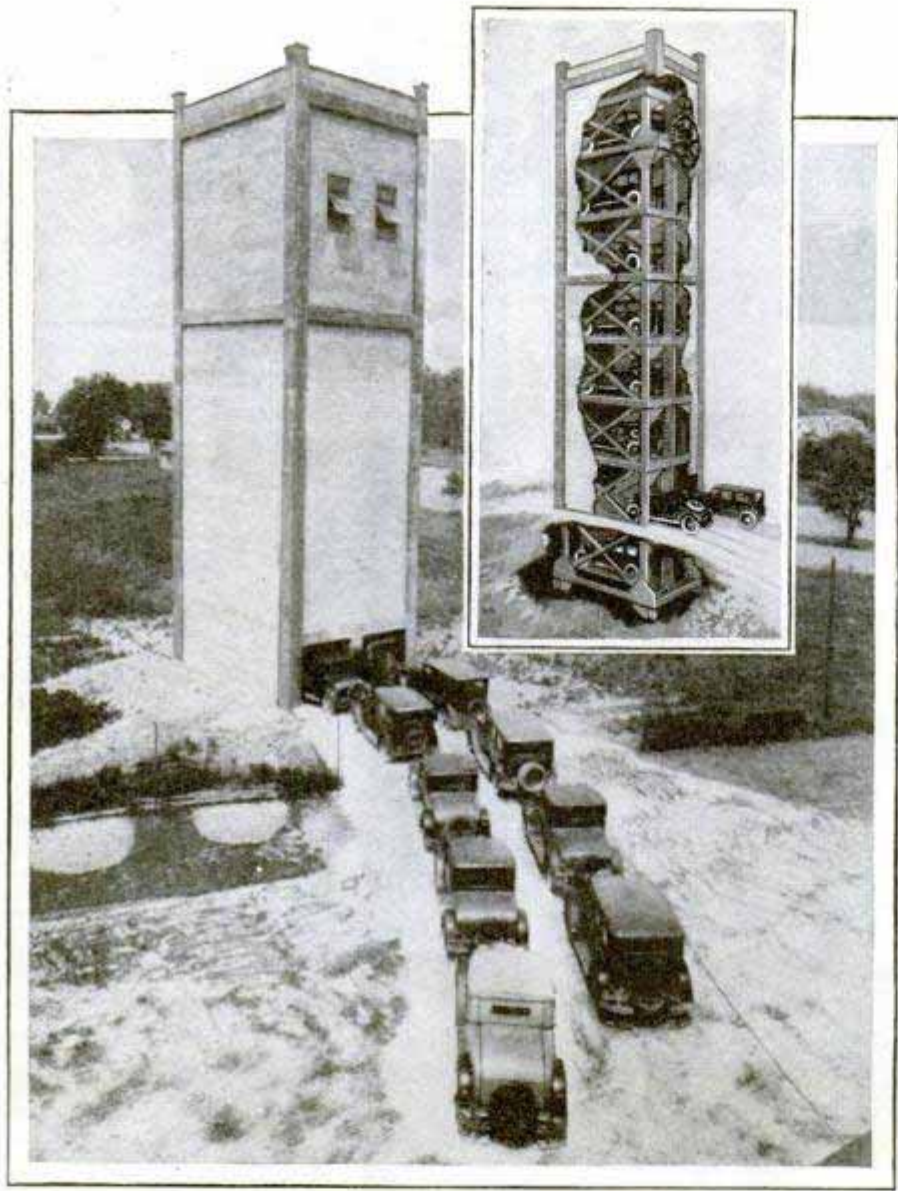
Two converging streets in Cheney, Wash., which form an arrowhead pointing to the airport at Spokane, at night become a guide for aviators hunting the landing field. The two streets have been equipped with sixty-two standards carrying brilliant lights which serve the double purpose of illuminating the thoroughfares and pointing to the airway, the lights from the air resembling a huge arrow.

Uni. John E. Shoemaker Westinghouse Elec. Mfg. Co. 208 Colorado Bldg. E. J. Pittman

117W J. G. Gordon
30800 - 1 - 2nd - 10th - 10th - 10th
Cincinnati, Ohio

Chicago Daily News
8/16/29

POPULAR MECHANICS



This Parking Tower Occupies No More Ground Space Than a Two-Car Garage, but Houses a Dozen Automobiles

PARKING TOWER SAVES SPACE AND HOUSES SIXTY CARS

Parking towers, built on plots of ground no larger than necessary to erect a two-car garage, but rising to heights allowing the housing of up to sixty autos, are being erected to relieve city-traffic congestion where space is at a premium. The tower is made of concrete with platforms of steel for the automobiles, which are moved up and down on an endless chain operated by an electric motor.

FIREPROOF MATCH IS FOUND SAFE AND PRACTICAL

Self-extinguishing cigarets and fireproof matches have been developed by the United States bureau of standards to re-

duce fire hazards. The fire-protection factor of the safety cigaret lies in an inch-long tip lined with water glass, air-excluding sodium silicate. The match is coated with water glass within half an inch of its head. Tossed aside as a fag end, the cigaret went out quickly enough to reduce fire hazards from this cause by ninety per cent, while possibilities of accidental fires were reduced about one-third by the fireproof matches. The annual fire loss from carelessness of smokers has been estimated at \$90,000,000. Investigators, after studying cigaret stubs in highways, byways and building corridors, learned that the stub usually discarded is one and one-fourth inches long. Cigaretts, taking into consideration total national consumption, were found to have a forty-to-one fire hazard as compared with cigars. Through tests, it was found that five seconds usually is taken to light cigarettes and ten seconds for cigars and pipes. The matches were coated with the water glass to allow them to burn for the longer period.

FLY-IT-YOURSELF AIRPLANE

Persons who have a pilot's license, but do not own a plane, now may rent a ship, just as they rent an automobile. A Kansas City company which operates motor-car rental agencies in sixty-five cities has formed a fly-it-yourself company and ordered 100 two-seater sport planes to rent to persons who find it too expensive to buy their own. The rental charge is between \$15 and \$20 an hour and a pilot also may be obtained by a person who wants to rent an airplane but does not have a pilot's license.

3302
3302
I am interested in it. Yours.

MODERN SHIPS ARE MADE UP OF ONE-TENTH COPPER

About one-tenth of a modern 30,000-ton ship is copper, according to the Copper and Brass Research association. The bronze propellers of such a vessel may contain 53,500 pounds of copper, shaft sleeves 53,000 pounds, main propelling machinery 200,000 pounds, electrical gear and wiring 3,000,000 pounds, and even such installations as speaking tubes about 100,000 pounds of copper. Prospective building programs of the world's merchant marines and navies are estimated at 3,000,000 gross tons of shipping a year, the yearly increase in world tonnage being about 1,000,000 tons.

DEVILFISH RELISHED AS FOOD ON NEW YORK'S EAST SIDE

One of the food delicacies of aliens on New York's lower east side is the baby octopus, or devilfish, which, when grown up, becomes the fearsome sea monster with long tentacles reputed to attack swimmers. A small octopus, weighing four or five pounds, is dried, and the purchaser soaks it for forty-eight hours before cooking, after which those who relish it say the meat develops a fine flavor.



Dried Baby Devilfish Which Is Considered a Food Delicacy by Some New York Foreigners



Round Playing Cards Which Those Who Have Used Them Say Are Easier to Shuffle and Deal

ROUND PLAYING CARDS EASIER TO SHUFFLE AND DEAL

Round playing cards are being produced by a British manufacturer who claims these cards, representing the first change in shape to be made in many years, are easier to shuffle and deal. The cards have six spots and numbers distributed around the rims so that numbers and suits are easily read in any position.

COLORED BOMBS FOR POLICE

London police are experimenting with color bombs, enabling them to deal more effectively with thieves who make their get-away in automobiles. The bombs are about the size of a tennis ball, made of thin metal and filled with a liquid described as quick-drying, viscous and luminous. A policeman, seeing the escape of a car containing thieves, throws the bomb at the fleeing auto. When it bursts it spreads a penetrating odor and spatters the machine with the quick-drying enamel, thus "spotting" it so that the next officer seeing it would arrest the occupants.

☉ Clouds are sometimes ten miles thick.

New York City
U. S. Columbia
mfg Co

258-5th Ave

3313
2298
Chicago

John Washington the
108 Albion Road Stoke
Newington
London

3321

Clouds are sometimes ten miles thick

327 4 11 20



The Steel Frame about This Building under Repair Protects Both Pedestrians and Workmen

STEEL FRAME ABOUT BUILDING PROTECTS PEDESTRIANS

Pedestrians and workers are protected from accidents by a huge steel frame that has been erected about the Collegiate Church of St. Nicholas on a busy New York street while the edifice is under repair. The steel scaffolds, which give the building the appearance of a big honeycomb, are fireproof and built to prevent a blaze such as started from wooden scaffolding and destroyed the old Rockefeller church in New York some time ago.

Anthony Hadimez

BREAKING POINT OF CRACKERS

Bakers are measuring the breaking point of cookies and crackers to determine the best "shortening" to obtain as tender a product as possible, which will at the same time withstand handling and shipping. The breaking strength varies

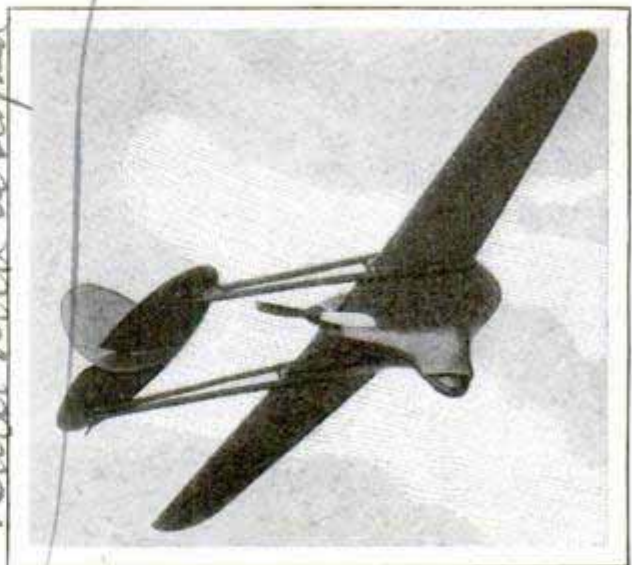
with the kind of flour and type and quantity of fatty matter used. The cracker is placed across two parallel rails and a pressure rod placed on it. Lead shot are poured into a cup at the top of the pressure rod until the cracker breaks, after which the weight of the shot is recorded.

HOTTER SPARK FOR AUTO GIVEN BY EXTRA CONDENSER

Protecting the ignition, increasing the intensity of the spark and preserving the distributor points, a condenser is on the market for automobiles with battery ignition. It helps overcome trouble caused by pumping cylinders, gives a hot spark, enabling the use of heavier oil and a weaker mixture of gas, thus saving fuel. It facilitates starting and gives added power for heavy pulls, the makers say.

AIRPLANE WITHOUT FUSELAGE CARRIES LOAD IN WINGS

Capable of carrying a large cargo and from ten to twenty passengers, an airplane without the present cumbersome fuselage is being built in Los Angeles. The designer claims the elimination of the fuselage not only reduces structural weight but diminishes complications, thereby lessening the cost of construction. The plane has a landing wheel in the center under the wings and ground hooks at the rear, and its wings are thickened at the center to carry passengers.

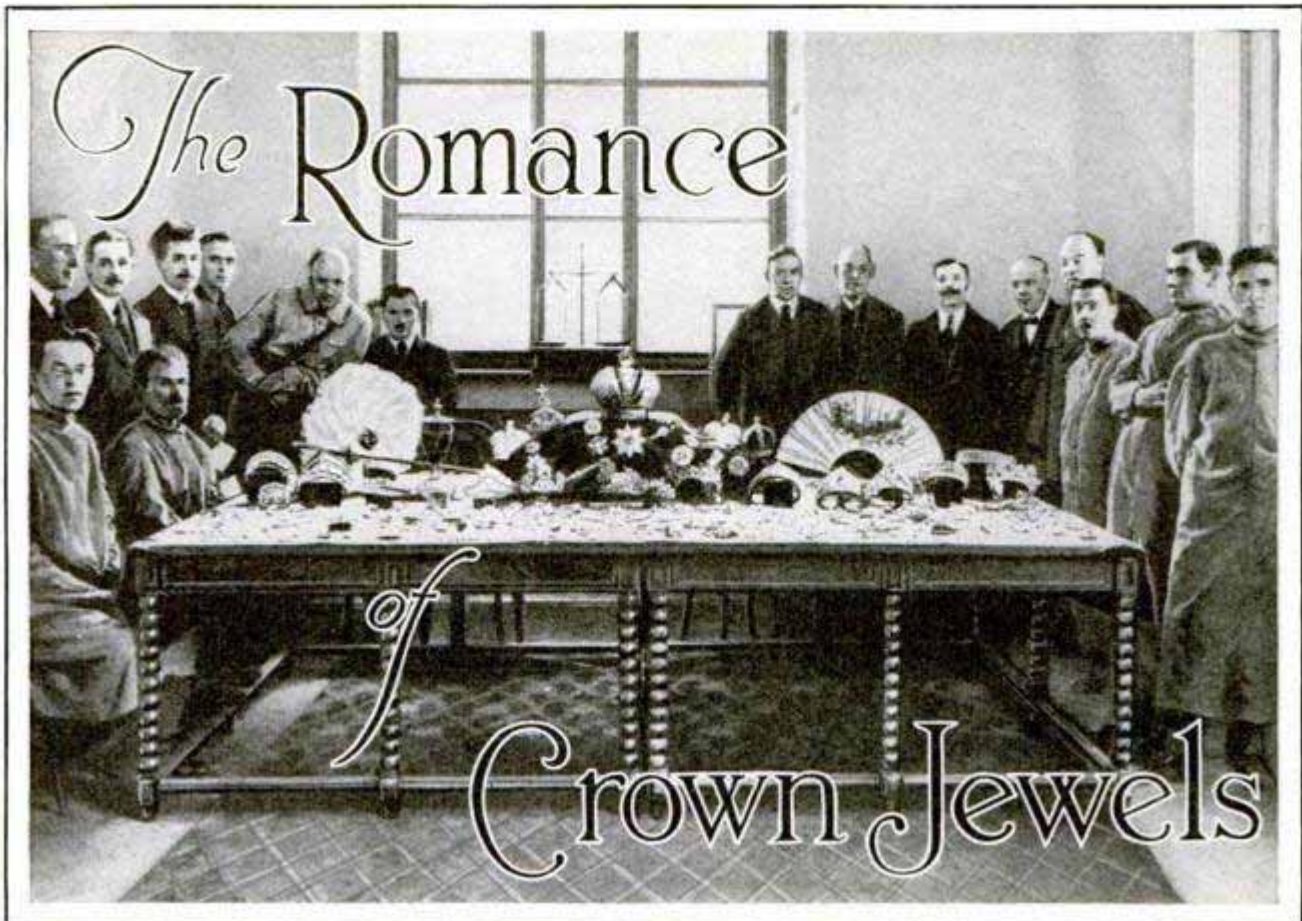


Model of Airplane without Fuselage Which Carries Its Load in the Thickened Wings

Anthony Hadimez

Calif. alt. Gym. Co. 127-0
Los Angeles, Cal. reprints

29 Beavis Road,
Over Sea by Beach on Sunday
Am



Photograph of the Russian Crown Jewels; Their Value Has Been Estimated at Seventy-Five Billion Dollars; Part of the Collection Has Been Sold by the Soviet Government

By HAROLD T. WILKINS, *208 Colombarie,*

TASTE and fashion in gems are as fickle as style in dress. At one time the rage is all for color, then the vogue passes on to white stones.

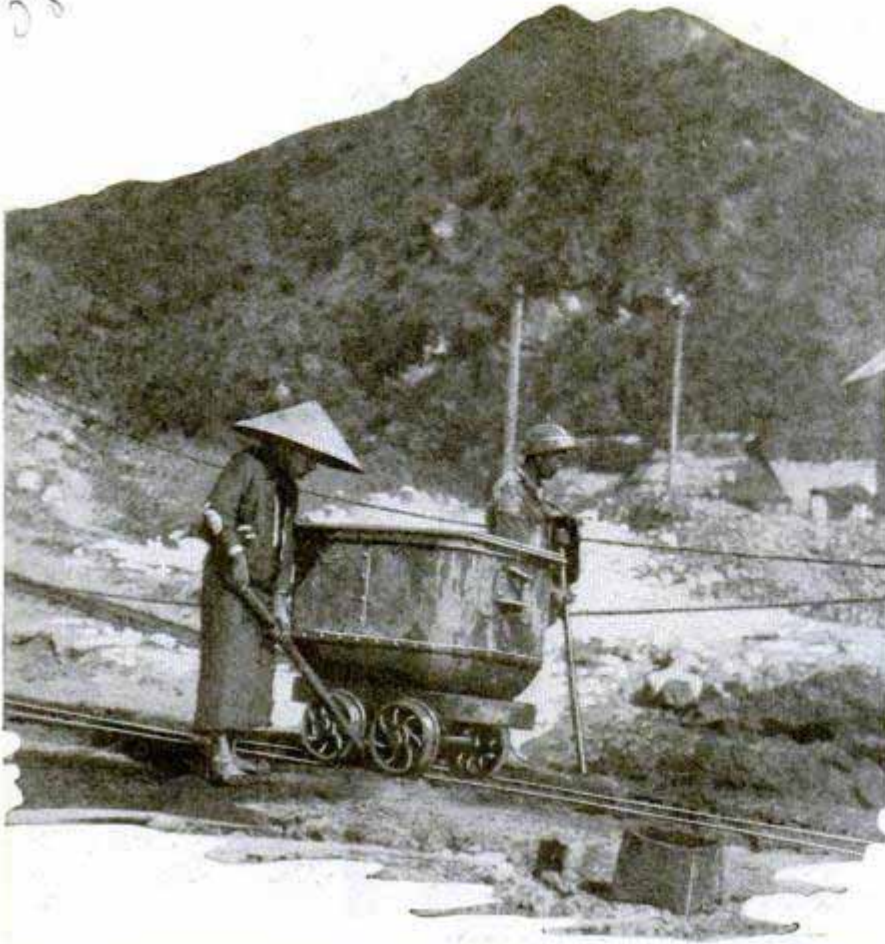
The ruby, "lord of gems," as the Orientals say, has from time out of mind burned in the crowns of kings or on the forehead of an idol in a Hindu temple, flaming redly from the jeweled breast-plates or sparkling from the gold symbols of priests of the oldest and most mysterious of Asiatic faiths. European royalties have always favored colored stones. Princess Mary, Viscountess Lascelles, of England, chose an emerald engagement ring and among the Russian crown jewels are the world's finest rubies. Today, a vivid pigeon-blood ruby costs ten times as much as the finest rose Kimberley diamond of the same size.

From the beginning of history, the world's finest rubies have come from a region of dense forest jungle, rising on ranges of hills above Mogok, and the mines of Mandalay, 400 feet above sea level in Upper Burma.

Millions of years ago, a white-hot flame and molten rock, belching out of the interior of the earth, came in contact with white limestone. The limestone crystallized into calcite and the impurities became the ruby, or corundum.

Hundreds of years ago, a Burman came to Mogok selling tamarinds. He exchanged his fruit for a red stone, which he gave to the king of Ava, who was so fascinated with the gem that he bought the land from which it had come. The ruby became what it still is—an object of worship throughout the East. No white man, in the old days, was allowed to approach the Burmese ruby mines, which were guarded by soldiers. The king of Burma took all the stones, and only a few fine ones were smuggled, at the risk of painful death, out of Burma. When a fine large ruby was found, a procession of grandees and elephants, escorted by soldiers, was sent out to take the gem to the royal treasure house. The king of Burma was called "Lord of the Rubies."

The old kings of England fancied rubies



Natives with Truck Used in Hauling Ruby Earth: the Carrier, Attached to an Endless Rope, Is Pulled to the Washing House

in their crowns and regalias. When the coffin of Edward the Confessor was opened in Westminster Abbey, searchers found a fine gold crucifix suspended from a gold chain. The crucifix was fastened by a massive locket of gold gemmed with large stones, one of them a splendid ruby. King George V has a coronation ring of plain gold set with a large violet table ruby. In the crown of England is a fine large cherry-colored balas ruby, which came from the mountains of Baluchistan, India, more than 600 years ago. It was given to the Black Prince of England for helping Pedro of Castile in his wars. This ruby blazed on the helmet of Henry V at the battle of Agincourt. It is likely that it was stolen by some crusader at the sack of a Saracen city in the days of the great Sultan Saladin. The crusader perhaps brought it to Europe on his return and the gem drifted into the hands of the queen of France, who willed it to her brother, the Emperor Rudolph of Austria.

Gems such as these have pedigrees far more ancient than those of any living European monarch.

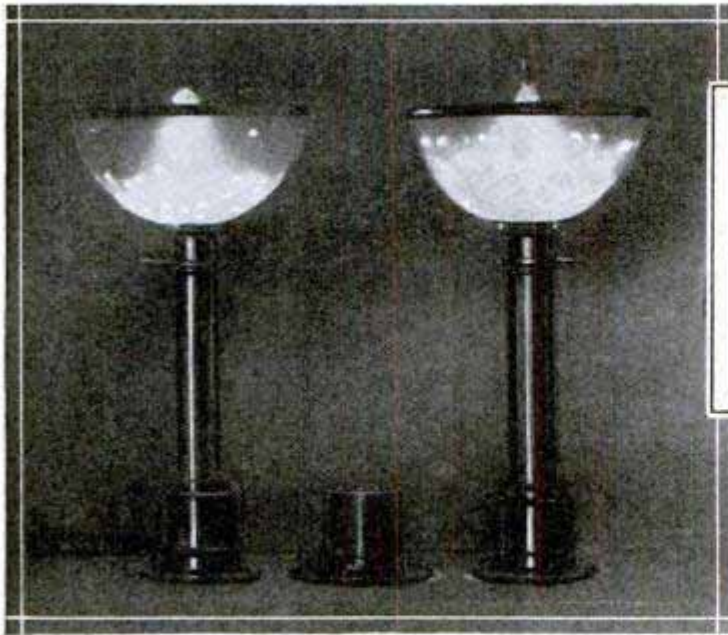
In Paris, there is an old building known as the Mont de Piete, which could tell some strange tales of the secrets of modern European kings. It was set up by the French king Louis XVI, in 1777, and at one time had in its vaults no fewer than forty barrels of gold watches. It loaned money on the security of jewels and valuables and the amount of money lent in the course of a year amounted to \$40,000,000. Many of the jewels were rubies of priceless value.

A mysterious robbery of the French crown jewels which has never been cleared up occurred at the Garde Meuble, Paris. The Garde Meuble had in its vaults and cellars the jewels and regalia of the old kings of

France. Before the time of the revolution, the public could see the regalia but the commune of Paris sealed up the vaults containing the cases holding the crown, scepter and hand of justice, and a golden shrine richly jeweled with rubies and diamonds which had been given by Cardinal Richelieu to Louis XIII. This "chapel" or shrine, weighed more than fifty-six pounds. All of these jewels were stolen during the revolution, but the famous Regent diamond, pawned by Napoleon with the Batavian government, to raise funds for a war, was recovered later.

Kings' jewels sometimes fall into private hands in ways unknown. The old court jeweler of the kings of France, de Berquem, tells of a man of rank in Paris who mysteriously acquired three magnificent rubies which had belonged to French kings and queens. One of the rubies had been set in a gold crown covered with gems with which Pope Stephen II had crowned Louis le Debonnaire in Rheims cathedral. The gem was lozenge-shaped and weighed $123\frac{1}{2}$ carats.

The magnificent rubies, which the mad

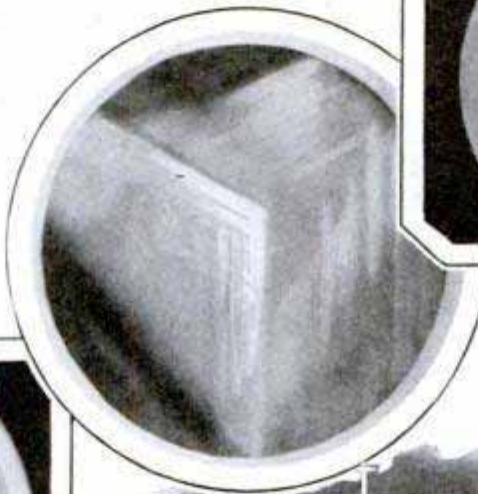


Profusion of Air Bubbles Reveals That This Is a Synthetic Sapphire

Photograph of the "Brilliantoscope" Taken in the Dark; This Instrument Was Developed by the Head of an Institute in Berlin Where Gems Are Tested; a White Sapphire at the Left and a Diamond at Right Are under Examination; the Laboratory, First Used for Private Tests, Has Been Taken over by the German Government for the Jewelry Industry



Above, Stratified Form of Genuine Pearl, and, at Left, Genuine Ruby Revealed by Angular Lines and Absence of Bubbles



Above, Slice of a Cultured Pearl, and, at Right, Testing Pearl at the Berlin Laboratory; the Pearl, Suspended from a Thin Glass Rod, Comes within an Electromagnetic Field When the Operator Presses a Button; If the Pearl Remains Steady, It Is Genuine; If It Oscillates, It Is a Cultured Product



empress Charlotte saved after the execution of the emperor Maximilian in Mexico are known to be lying along with other

Austrian crown jewels in the strong rooms of the American liner "Merida," which sank in a collision during a fog off

Cape Charles, Virginia, in 1911. Several attempts have been made by syndicates of American salvors to fish up these jewels, but without success.

Now and again, the London auction rooms glow and glitter with splendid rubies, crudely cut, sent there for sale by some financially straitened Oriental potentate whose ancestors have worn the gems for hundreds of years. The Persian Shah has a throne of gold—the Takdis—standing on feet of rubies. It was a Persian shah who showed a Venetian ambassador a handkerchief filled with beautiful blood-red rubies, including a splendid table-cut balas ruby of a finger's breadth and weighing two and a half ounces, with other gems.

"What price would you ask for this exquisite ruby?" asked the Italian.

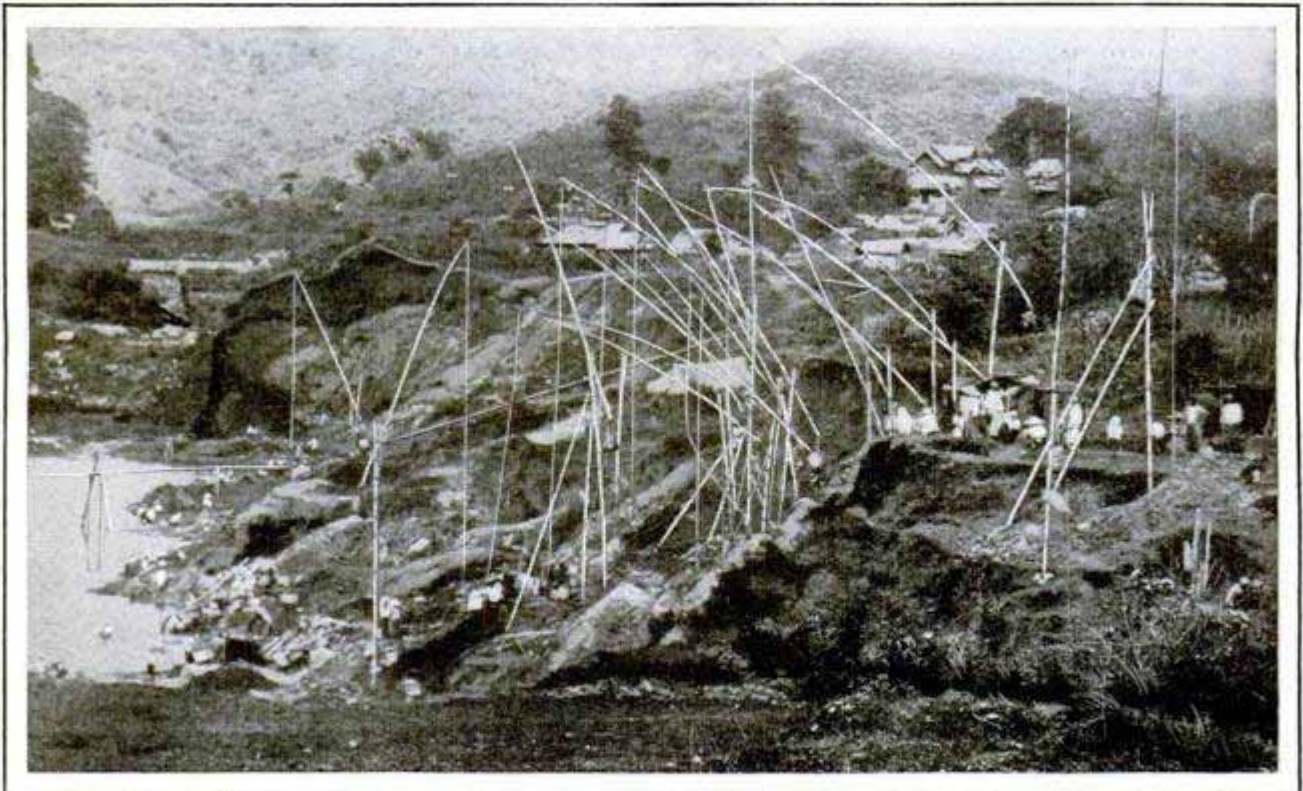
"A kingdom would scarcely buy it!" was the answer.

Runjeet Singh, the Indian ruler of the Punjab, had a ruby weighing half an ounce, engraved with the names of famous Indian emperors and kings who at one time owned the gem. Kingdoms were pawned and subjects and their property put in pledge to buy one of these splendid gems. Flowers made of the finest gems,

and roses made of rubies with leaves of glistening emeralds, glittering with diamond spray, were set by Shah Jehan on the wonderfully beautiful tomb of his wife in the Taj Mahal, near Agra, India. A screen of marble, carved like delicate lace, enriches this tomb, and lilies, tulips, and roses of rich white and red gems are inlaid in the marble.

The gem faker has, of course, tried his hands on the ruby. A case of a skillful imitation which deceived even experts occurred in England a short time ago. A society woman had a very large ruby which she sold in her lifetime, and replaced with an imitation which a jeweler, who valued the imitation for probate duty, said was worth \$50,000. The legatee paid a large tax on the imitation before he found it was a fake.

Some of the world's wildest fakers are to be found in the East. A passenger on a liner calling at Colombo, Ceylon, will be accosted by a handsome Singhalese, who has rubies for sale. The natives of Ceylon dig shallow pits in ruby grounds or wash the gems out of the sands of rivers. When genuine, the Ceylon ruby is a fine, pale rose-colored stone. The Singhalese shows the white traveler what seems a



Courtesy Eric Ramsay

Native Burmese Village near Ruby Grounds; Water Is Raised by the Primitive Hoists to Wash Out the Gems Dug Up by the Native Miners

genuine ruby. Really it is a fake, called a "doublet" or half-stone. The top of this stone is genuine, but the under part is glass joined cleverly with cement. When set, these doublets are hard to detect. If the underpart is glass, a file will show it. Colored foil is used to enhance the effect, but gems "set open," or "azir," are faked by painting or enameling the interior of the setting to throw a color tint into the gem.

What makes the ruby red? This is unknown, but may be a mysterious property of the oxide of alumina. Rubies are really only bits of transmuted clay. Only a diamond is hard enough to scratch a ruby. The most valuable of all rubies is the imperfect gem called the "Star ruby." This star is formed by a silky imperfection in the gem, and shines when held up to the sunlight or artificial light, showing with great distinctness a six-pointed star across the crystal. A fine colored star ruby is very costly. Jewelers take care to get the center of the star as nearly as possible in the middle of the gem.

Red gems for brunettes and white for blondes—that is the fashion rule. Superstitious folk say the ruby keeps the wearer in good health and cheers the mind. If the wearer is threatened with danger, the ruby is supposed to blacken and not regain its color till the danger is gone.

WIRELESS ON FRONT OF ENGINE GIVES ENGINEER WARNING

German railway and air-service engineers and mechanics are making a determined effort to eliminate accidents in the air and on land by creating devices to give warning of danger. One of the appliances is a wireless installation on the front of the boiler of the railroad engine, intended to convey wireless messages to the engineer in the cab concerning the operation of his train or of danger ahead.



Werk



A German Vending Machine Which Serves Hot Sausage, Bread and Mustard for a Sandwich

HOT-DOG SANDWICHES SERVED BY VENDING MACHINE

Germany, famed for its sausage sandwiches, has introduced a hot-frankfurter slot machine which dispenses hot dogs automatically. For ten pfennig, about two cents, the hungry obtains fresh sausage, bread and mustard.

RADIUM FOR FISH BAIT

Radium has been employed by scientists as a lure for fish in obtaining deep-sea specimens off the coast of Bermuda. William Beebe, New York naturalist, used the radium for coating hooks attached to sounding wires about a mile long, which were lowered to depths where no light exists. Among the specimens that bit on the radium-coated hooks was a squid, member of the octopus family; a fish equipped with a rod, line, bait and three hooks and an ability to cast the hooks much as an angler does, and other fish with many patterns of phosphorescent light in blue, yellow and red. One fish observed through a microscope had a stomach so elastic it was able to swallow another fish three times its size.

No information

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Chicago Tribune 8/6/29

Senator French C. ...

3121

105. Veronida
and
Veronida



Russian Children Are Finding Fun by Combining Two Old Sports, the Seesaw Board and the High Swing

HIGH SEESAW PROVIDES FUN FOR FOUR CHILDREN

Combining a swing with a seesaw board, children of soviet Russia have found new thrills in an old sport. Tall poles support the swing and a long plank, to the ends of which ropes are attached, provides the seesaw arrangement on which four children are accommodated.

PUGILISTIC ROBOTS FIGHT TILL ONE IS KNOCKED OUT

Pugilistic robots, mechanical men who box each other with blows twice as heavy as their human models, have been made

by two Pasadena mechanical experts, and are able to put on an excellent fight until one or the other is knocked out. When first constructed, the robots started fighting when a switch was pressed, but to give spectators some part, the control apparatus was connected with a wheel, like the steering wheel of an auto, and some distance from the mechanical men. Pushing the wheel moves the fighters toward or away from each other, a turn pivots them to right or left, and control buttons on the wheel enable the operator to govern arm movements. The fighters were fashioned after a human skeleton, with a framework of iron tubing and aluminum castings. When one robot has been hit squarely on the chin and again on the chest, it falls to the floor. During a battle they even converse in hoarse tones, Each fighter is capable of eight separate movements singly or simultaneously, these movements being governed by

a "brain" consisting of a hollow fiber sphere on whose inner walls are electrical contacts connected to the parts that produce the action. Only decided impulses may be trasmitted to the "muscles."

ATOMS' NOISE HEARD ON RADIO

Making a sound like hail pattering against a windowpane, the noise of atoms recently was broadcast by radio. The sound produced was that of helium atoms leaving the radioactive metal uranium, and bombarding a small piece of metal. A piece of uranium no larger than a nickel was used, the atoms leaving it faster than the fire of a machine gun.

Carl James Sizer
581 Glenwood
New York City, N.Y.

General Electric Co
Schenectady, N.Y.

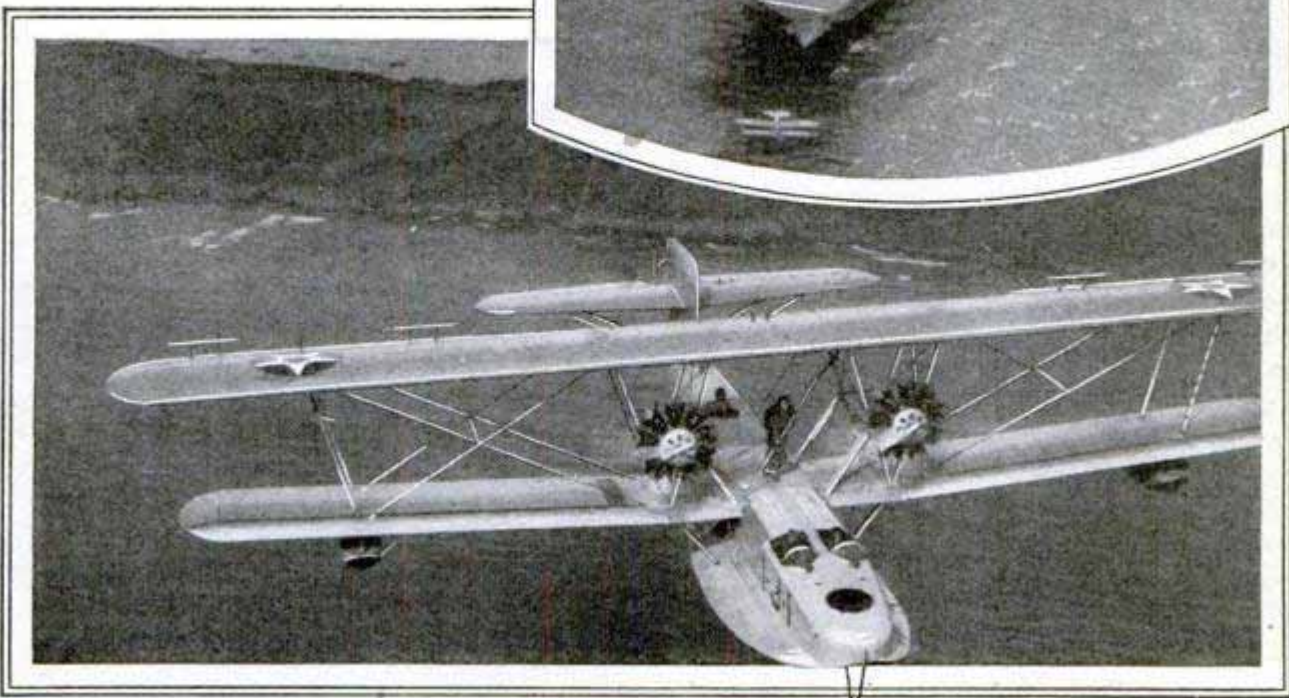
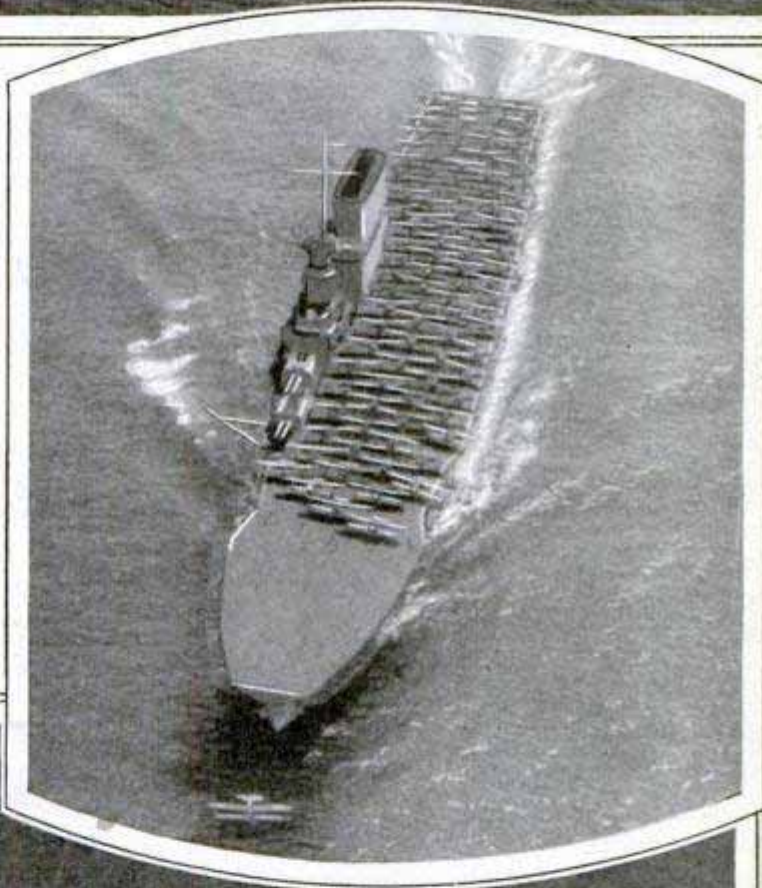
3037

SMOKE SCREENS GUARD FLYING BATTLE FLEET

San Diego, Calif



When the "Lexington" and "Saratoga" Carry Their Broods of Airplanes, They Are Given Not Only Big-Gun Protection by the Fleet and Aerial Safety by Aircraft Squadrons, but Also Are Shielded by Dense Smoke Screens to Hide Their Movements from an Enemy; in the Photograph Above, the "Lexington" Is Emerging from a Smoke Screen Laid Down during Maneuvers on the Pacific Coast; Note the Planes on the Bow Ready to Take Off; at the Right, a Remarkable View, Looking Down on the "Saratoga" and Her Flock of Planes; One Has Just Risen from the Deck into the Air; the Carrier Steams into the Wind at a Speed of Twenty Knots or So, and, After a Remarkably Short Run, the Planes Are Able to Soar Away; Below, One of the Navy's "PN-12" Seaplanes in Flight; These Craft Are So Large That the Aviators Are Able to Leave Their Seats and Walk About between the Cockpits on the Wings, as This Photograph Shows

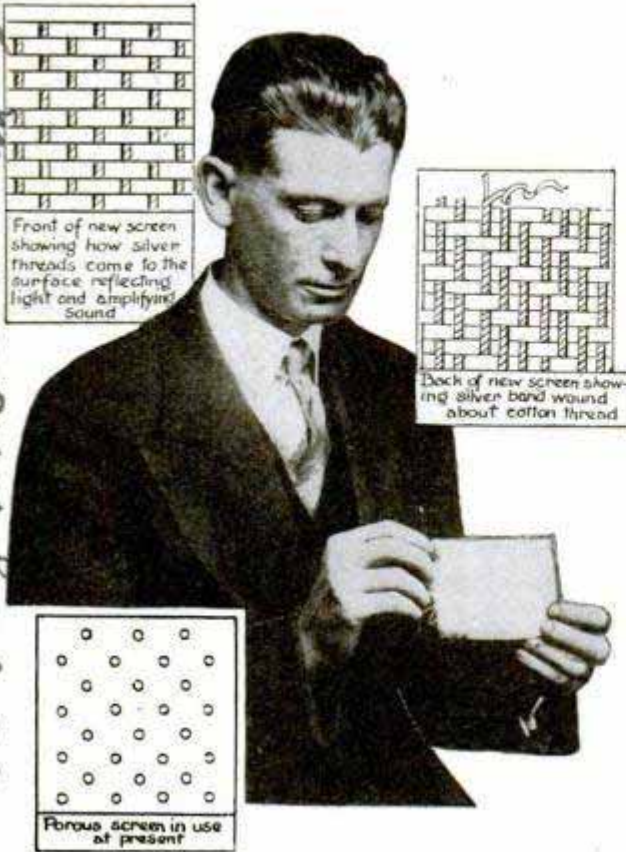


Saratoga

U. M. Charles A. Harrison Boston, Mass

Curt Wilbur

331/
Sarason's Screen & Boston
80



Drawings of Movie-Screen Sections Formed by Winding a Silver Wire about a Cotton Thread

MOVIE SCREEN REFLECTS RAYS WITHOUT DISTORTION

A new talking-picture screen that may revolutionize the projection end of the movie business has been invented. It is said to be the only reflecting, seamless screen that can be made in the new width of forty feet, which soon may be the standard size used for the showing of sound pictures. The inventor's first efforts went toward the perfecting of a process of applying aluminum paint to the existing screens. Then he tried making a screen of glass beads and found that it would work beautifully but could not be manufactured or used practically. His next venture consisted in threading a silver-coated wire at regular intervals through a cotton body, or filling. The talking pictures arrived at this juncture and, when the curtain was tried, it was found to distort the sound. He overcame this difficulty by making his silver-coated wire into a tiny coil wound longitudinally about a cotton thread. He then discovered various interesting features. He had not only a strongly reflective screen but one that added considerable amplification to the sound sent through

it from the big horns. In use, the screen amplifies the sound and casts a brilliant picture, equally clear in the first row of the orchestra and in the balcony.

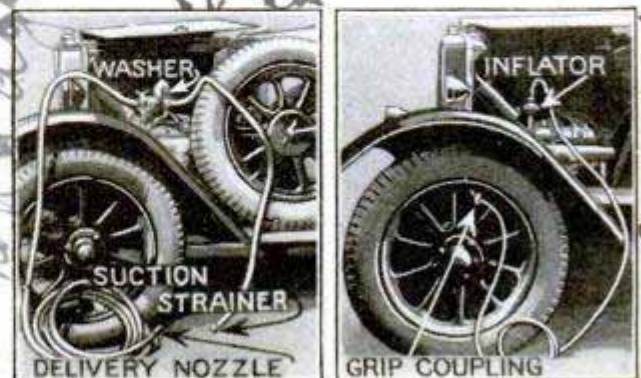
ROCKETS MAY AID AIRPLANES

3314 IN TAKING OFF

Rocket propulsion, not in actual flight but to give airplanes and heavily loaded seaplanes an increase of motive power at the instant of take-off, is the subject of experiments by the German Junkers aircraft makers. The rocket auxiliary propulsion is intended to reduce the length of the run before the take-off, and to aid the planes to rise regardless of the load. The idea was secretly used by the British admiralty during the World War to propel submarines in a hurry to escape an enemy cruiser.

AUTO WASHER AND TIRE PUMP GET POWER FROM CAR

3272
The automobile itself furnishes the water pressure of a car washer and the air pressure for a tire inflator in two motor appliances operating on a similar principle and being marketed by a British company. On connecting either instrument in the place of one of the spark plugs, the reciprocal action of the engine piston is followed by pulsations of a diaphragm in the device. When the diaphragm is drawn in one direction by suction, it creates a partial vacuum, causing the chamber on the other side to become filled with air or water. When the diaphragm moves in the opposite direction, it displaces the air or water and this is driven past a valve into the delivery hose and emerges under considerable pressure.

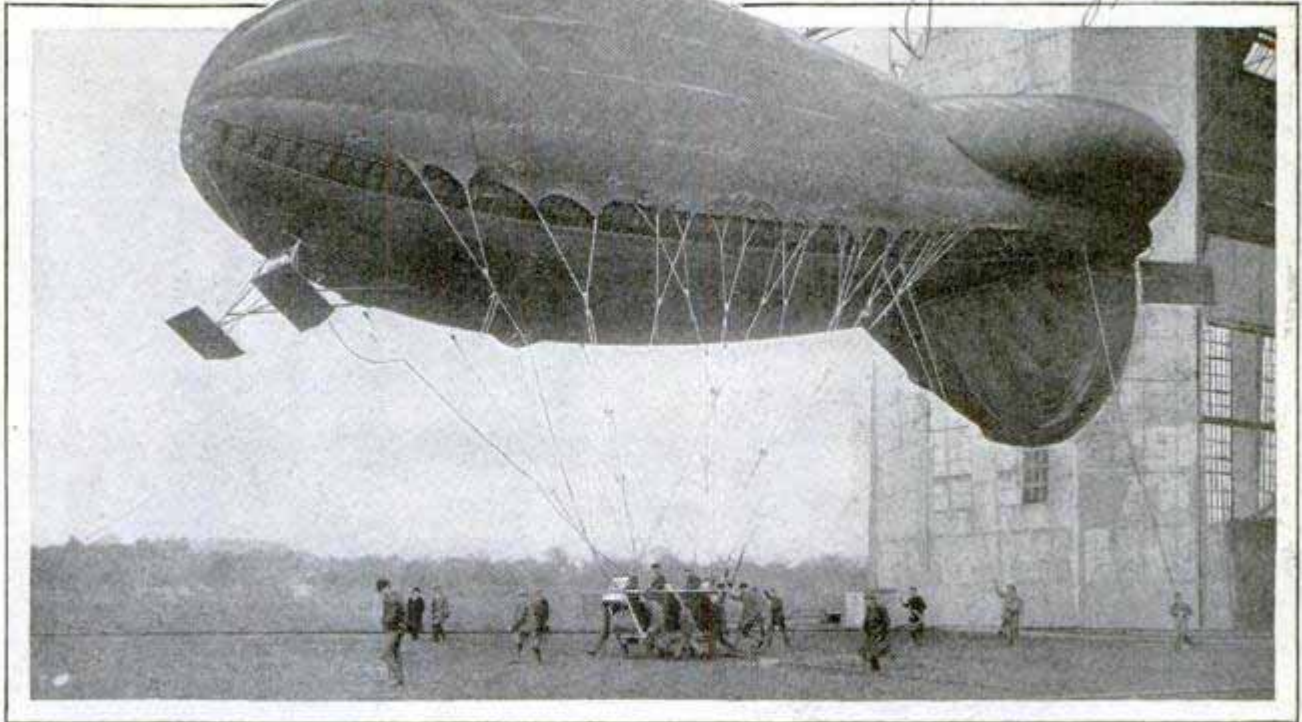


An Auto Washer and Tire Pump, Both of Which Are Operated by the Engine of the Car

Reads Campbell, Ltd
75 Victoria St. Weston

Prove - 15 pulses large inflator

*Designed by August Riedinger
Augsburg, Germany*



This Captive Balloon Is Equipped with a Motor Enabling It to Be Converted into a Dirigible Airship; Three Steering Bags Are Used as Stabilizers for the Convertible Blimp

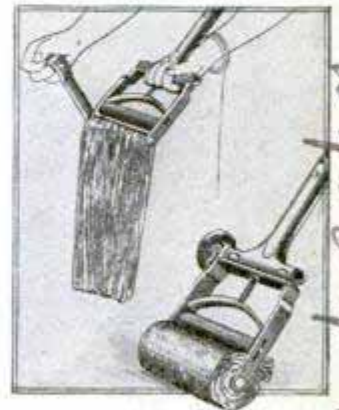
CAPTIVE BALLOON WITH MOTOR CONVERTED INTO DIRIGIBLE

German engineers have developed a captive balloon equipped with an engine which allows it to be converted into a dirigible airship in only half an hour. Three steering bags are used as stabilizers, two lateral ones being filled with gas, and the lowermost one containing air. The rigging for holding the balloon captive attaches to a belt ending on one extremity at the observer's basket, and on the other, at a cross-rope pulley and below the belt, is an elastic section responding to variation in gas pressure. By removing the fastening cable and basket, a motor and vertical and horizontal rudders may be attached, enabling the balloon to be run at moderate speed.

fan draws the air to be used for ventilation. After being washed and cooled, the air is sucked through a drying room, where the humidity is lowered to normal and where warm air may be passed into the stream if necessary to regulate the temperature. A large saving is effected by the system, because the necessity for artificial refrigeration is eliminated.

SELF-WRINGING MOP ON REEL ALSO POLISHES FLOORS

Becoming in turn a mop, a long-handled scrub brush or a floor polisher, a reel mop containing a self-wringing attachment now is on the market. A crank turns the mop against a roller for wringing and the mop may be fastened against the roller in any position. When unrolled, it serves as an ordinary mop, when partly rolled it may be used for scrubbing, and when wrung dry, rolled up and covered with cheesecloth, the mop becomes a floor polisher.



WATER FROM ARTESIAN WELLS KEEPS THEATER COOL

Nature's own cooling system has been harnessed by a Portland, Oreg., theater which drilled artesian wells tapping subterranean lakes 150 feet beneath the surface, to obtain a supply of water which is consistently fifty-two degrees. This naturally cooled water supply is pumped through three banks of sprays through which a

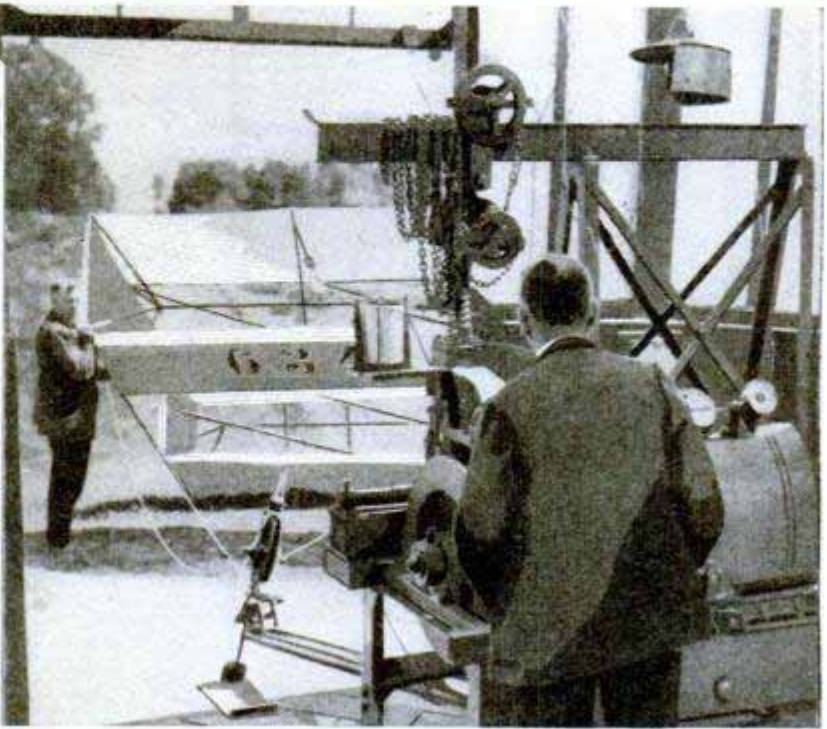
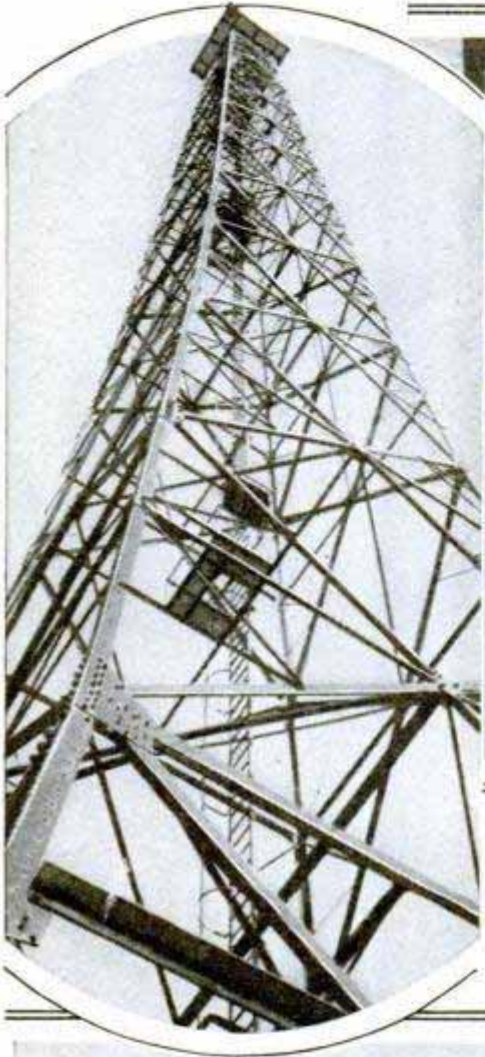
Patent owned by American Blower Corp. } Detroit

*3284
Minnneapolis, Minn*

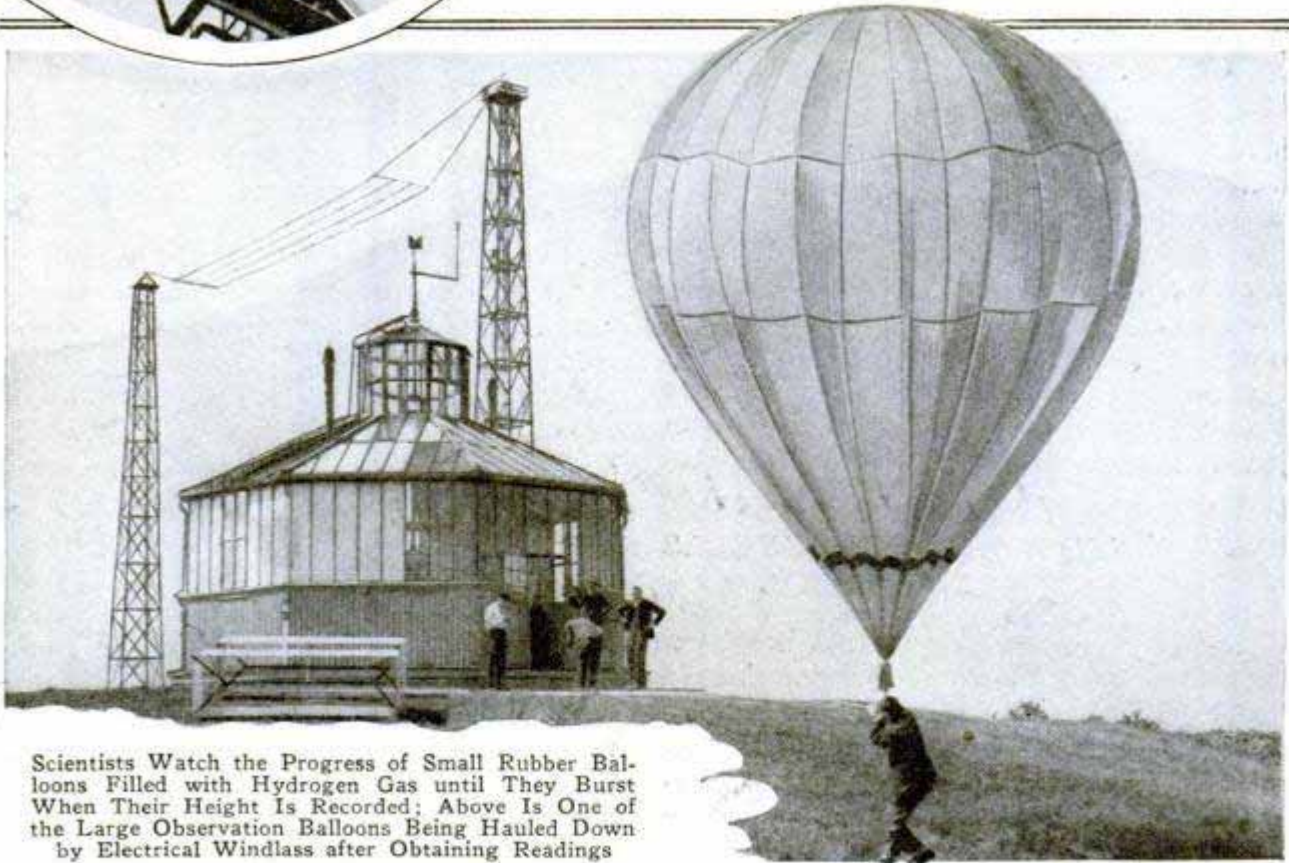
Reel Mop Corp. 301 S. 9th St.

3343

KITES AND BALLOONS GIVE WEATHER READINGS



European Airports Receive Weather Reports from the Great Lindenburg Observatory near Berlin, Where Instruments Attached to Observation Kites and Balloons Are Sent Aloft to Obtain Atmospheric Pressure, Temperature and Humidity at Various Altitudes, the Readings Being Recorded on Paper Cylinders Attached to the Instruments; Above Is Shown an Observation Kite Ready to Be Sent Aloft by an Electrical Windlass, and, at Left, the 295-Foot Radio Tower of the Observatory



Scientists Watch the Progress of Small Rubber Balloons Filled with Hydrogen Gas until They Burst When Their Height Is Recorded; Above Is One of the Large Observation Balloons Being Hauled Down by Electrical Windlass after Obtaining Readings

Tip - use magnetic

SCREWDRIVER IS ADAPTED FOR HARD TASKS

3306

Fitting screws in positions not easily accessible is simplified with a screwdriver which firmly holds the screw on its end while it is being inserted and driven. The tool may be operated with one hand, the blade being slotted to accommodate a steel lever pivoted in the blade by a small pin. At the upper end of the lever is a cam, above which is a knurled sleeve. Pushing down this sleeve; just below the handle, forces the lower end of the lever outward, causing it to grip the screw tightly in the slot, and pulling up the knurled slide releases the lever. The implement may be used as an ordinary screwdriver when the holder is not needed.

\$ 1.50

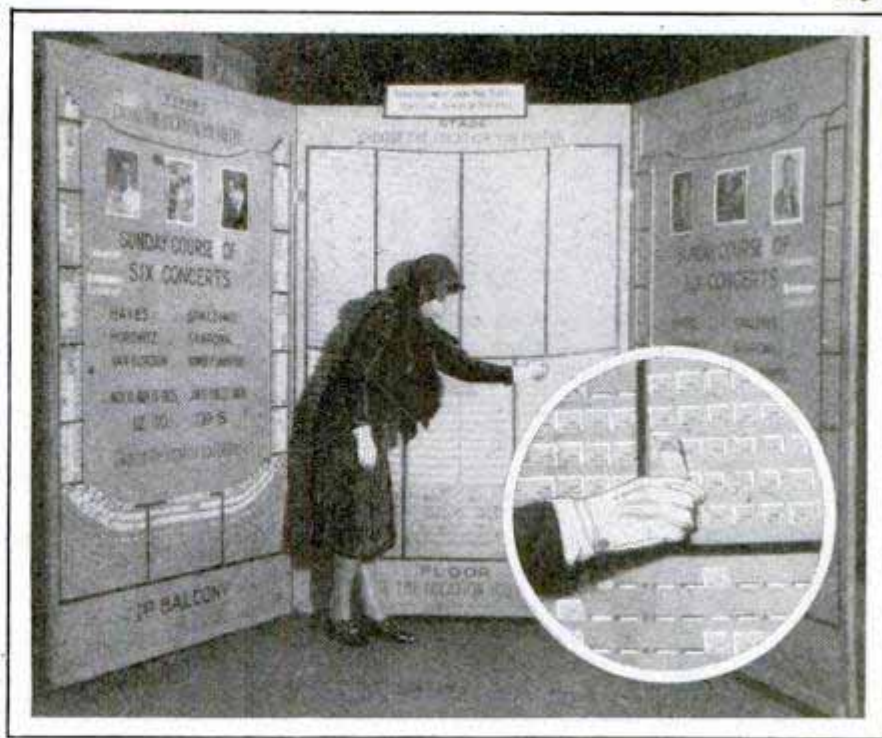
OLD LICENSE PLATES OF AUTOS USED AS CATTLE BLINDERS

Discarded automobile license plates are used by a New York farmer to keep unruly cattle from tearing down pasture fences. A ring is placed in the nose and small chains run from it to the tip of each horn, where small holes have been drilled for fastening. The plate is hung on the chains directly before the eyes, preventing the animal from seeing objects in front of it, but still enabling it to feed. It seems to eliminate the roaming proclivities and the animals become quite tractable.



Cattle That Jump or Tear Down Fences Are Curbed by Blinders Made from Old Auto License Tags

near Schuylerville



Courtesy The Christian Monitor

A Self-Serving Rack Enables Theater Patrons to Pick Their Own Seats without Referring to the Box Office

SELF-SERVICE FOR TICKETS ADOPTED BY THEATER

Persons attending concerts at Boston symphony hall choose their own seats from a portable automatic subscription rack, otherwise known as a ticket "cafeteria," placed in the lobby for their convenience. The rack shows a floor plan of the theater and in each seat location is an application blank looking like the ticket itself as it projects from its pocket. The prospective purchaser goes to the rack, surveys the floor plan, observes what tickets are yet unsold and chooses for himself. All the box-office man does is to accept the reservations. The top half of the projecting pasteboard looks like a ticket stub, but the lower section contains the application for the reservation.

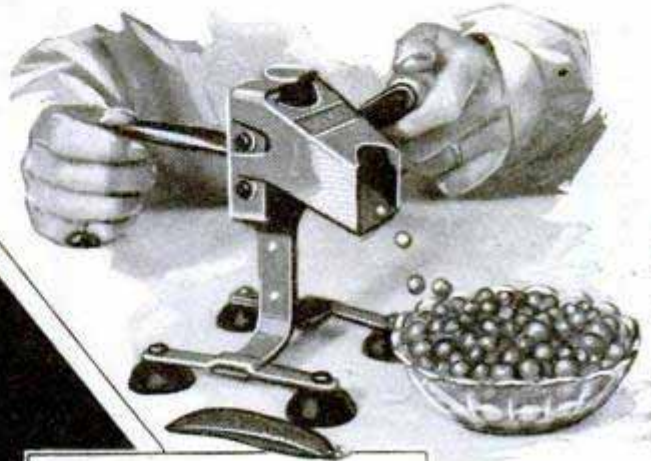
Some frogs lay as many as 8,000 eggs.

814 3095

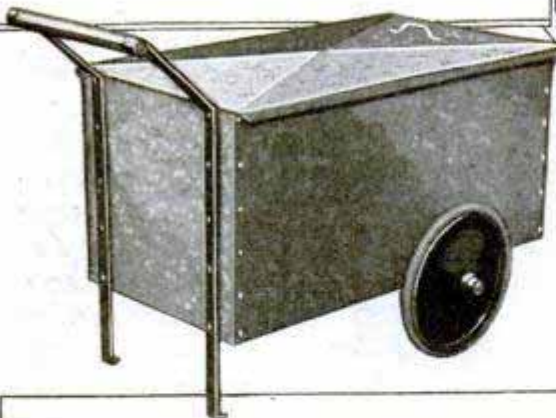
Easier Ways



Automatic Electric Toaster Browns Bread on Both Sides at Once; When the Piece Is Done, the Rack Is Ejected from the Oven; the Time Is Regulated by Setting a Small Lever at the Side



It Shells Peas or Lima Beans at the Rate of a Pound in About Four Minutes, Saving the Fingers; Fastens with Suction Grips

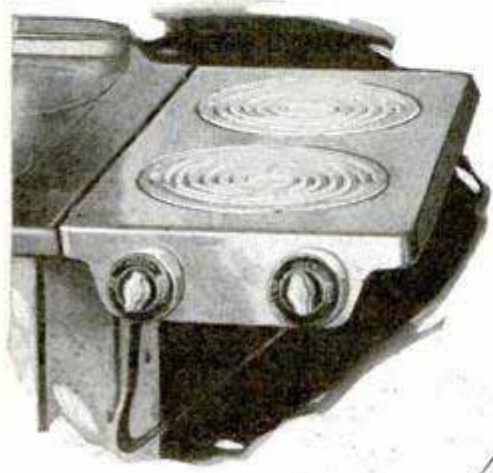


Handy Cart for the Garbage Can Is Supplied with a Box of Crystals That Help Reduce Objectionable Odors; at Right, Is an All-Metal Wired Table on Wheels with Two Electric Sockets for Percolator, Waffle Iron or Other Conveniences; It Saves Handling Annoying Wires at the Table and Is Especially Adapted for Luncheons and Parties; the Wheels Move on Ball Bearings and Respond to a Touch



7 E

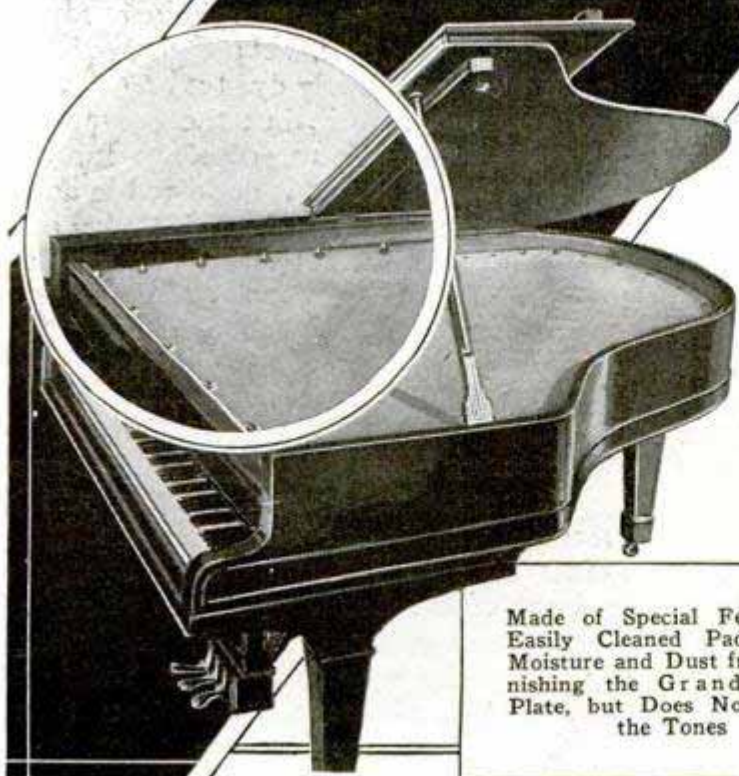
of Doing It



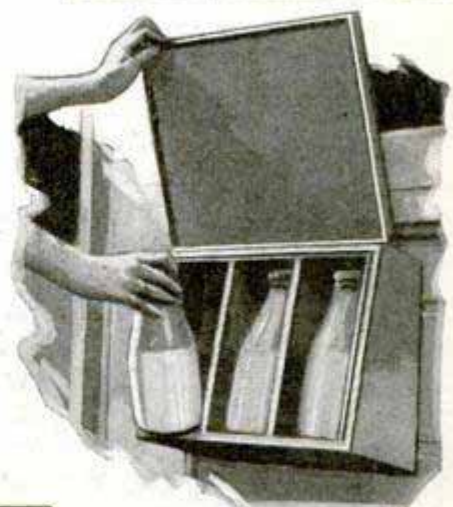
Convenient Electric End Shelf for Attachment to the Ordinary Stove Gives the Benefits of Electric Cooking at Little Cost; Current Is Controlled by a Three-Heat Switch; the Shelf Is Made of Cast Aluminum, Which Is Highly Polished



Play Room and Bassinet Combined Give the Baby Comfort and Safety; the Hood and Screen Are Easily Removed for Laundering by Undoing Straps above the Hood



Made of Special Felt, This Easily Cleaned Pad Keeps Moisture and Dust from Tarnishing the Grand Piano Plate, but Does Not Muffle the Tones



Milk-Bottle Holder Has Compartment for Each Bottle, Keeps Dust from the Caps and Is Insulated against Heat and Cold

Wm. W. A. Suckell,
Managing Director

POPULAR MECHANICS

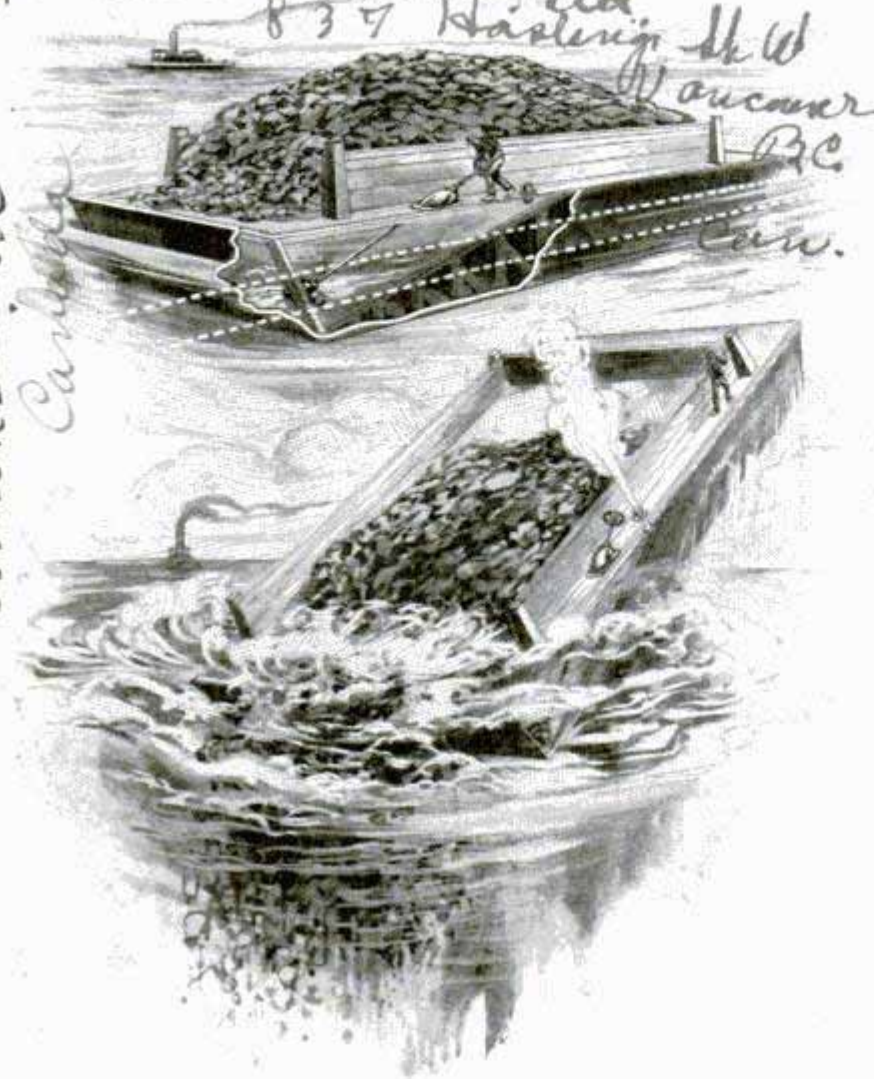
Cont. H. B. Crane,
Route 4, Box 407,
Hayward Calif.

VOLCANO SPOOTS
PAINT, INK AND
DYES

Cont H Webster, 316 3rd St
New Westminster B.C.

816
3278

Coast Quarries Ltd
837 Hasling St W
Vancouver B.C.



This Self-Dumping Scow Leaps on End to Empty Itself When an Air Compartment Is Flooded by the Man Aboard

LEAPING SCOW DUMPS ITSELF WITH MAN ABOARD

Doing in ten minutes work that formerly took eight hours, a self-dumping scow that leaps on end to empty itself with a man aboard, then is righted automatically, is being used in dredging operations at the mouth of the Fraser river in British Columbia. When the inlet valve at one end of the loaded scow is opened by the man aboard, water pours into the flood compartment until that end sinks below the surface, the rear end leaping into the air as the load slides along the deck and into the water. With the load gone, the front end bobs to the surface, bringing the inlet above the water line, and the flooded compartment drains itself, after which the valve is closed and it is ready for another load.

day, it had been partly dyed a bright blue. The vest was ruined, but the prospector abandoned the sulphur diggings for the new project. The soil is dissolved in acid-treated water in a series of tanks and subjected to a second treatment to give the desired coloring.

SOUNDS MADE VISIBLE IN FOG TO PROTECT VESSELS

Protecting ships in a fog is aided by an apparatus making sounds visible which recently was tested on a British ship. Points of light are thrown on a screen in front of the helmsman, the device being much more sensitive than the human ear. It picks up every sound within a wide radius, shows the direction from which it comes, the distance it has traveled and its character. Even the faintest

Cont. H. B. Crane
316 3rd St
New Westminster B.C.

Cont. H. B. Crane, Eng.

3319
490
West End Ave
New York City.

noise is screened, and it is possible for the helmsman to see a signal from a steamer in dense fog or from a regular fog-sounding station. A modified form of the instrument is being tested for use in airplanes when they are caught in fog. It weighs only a few pounds and shows sounds which otherwise would be drowned by the noise of the motors. The apparatus also is being tried to locate distant gunfire and sunken ships, and may be helpful in the locality of strange "blind spots" on the ocean where, it is said, fog signals cannot be heard by the ear.

CHALK-MARKING PARKED CARS AID TRAFFIC POLICE

In a recent campaign against abuse of the parking ordinances, Detroit police saved considerable time and work by using a bamboo stick, to which was attached a piece of chalk, to mark cars left too long at the curb. As the police automobile was driven along the street, an officer made a mark on one of the tires of the parked vehicle. An hour later, tow cars were sent over the route to pull to the pound all automobiles bearing the chalk mark. It was found that eleven police automobiles and one man on foot could make the rounds of the downtown district as quickly as fifty men on foot.



Chalk-Marking Parked Cars from Police Automobile Saved Detroit Traffic Officers Time and Trouble



A Shadowless Light for the Operating Table Formed by Focusing Eight Beams from Various Angles

LIGHT FOR OPERATING TABLE IS SHADOWLESS

Giving complete illumination of all parts of the field of operation, and leaving no dark or shaded portions, a virtually shadowless light has been invented for the hospital operating room. The light is suspended from the ceiling, and illumination is derived from eight widely separated direct light sources, each projecting an intense beam. The eight beams are converged simultaneously to any desired focal point by a single control handle, and are superimposed, forming an eightfold patch of light, eighteen inches in diameter. The light is without glare and produces very little heat.

During the fiscal year 1929, the federal government co-operated with the states in the improvement of 7,022 miles of road.

Sold by Connecticut Telephone & Electric Co.

1501 Paramount Bldg
Trinity Square New York

3215



Hopi Rain-Making Ceremony; Weird Rites Such as These Have Been Practiced by Savages for Centuries in an Effort to Produce Favorable Weather Conditions at Will

By CALVIN FRAZER

The Pictogram
Box 140, Washington DC

THE ARTIFICIAL control of weather is far from being a mere dream of the future. It is already accomplished to a vast extent in all parts of the world.

One of the most familiar methods of achieving this miracle is the wearing of clothes. Everybody except the savage of the tropics carries an artificial climate around with him for the comfort of his body. The interior of a heated house in winter is a man-made torrid zone. That of the up-to-date motion-picture palace in summer sometimes comes uncomfortably near being a man-made north pole. Air-conditioning engineers regulate to a nicety the humidity of the atmosphere in factories. Fruit growers warm up acres of air outdoors in order to circumvent Jack Frost. Farmers produce extensive areas of artificial calm by growing wind-breaks around their fields.

Partly by the control of his atmospheric environment and partly in other ways, civilized man tends to become more and

more independent of weather. The introduction of our modern system of weather forecasts and storm warnings, dating from the middle of the last century, was an important step in this direction. Information flashed by radio enables the mariner to dodge storms at sea, and their effects on land are greatly mitigated by storm warnings, storm-proof construction, insurance and the organized relief measures that follow every great weather disaster.

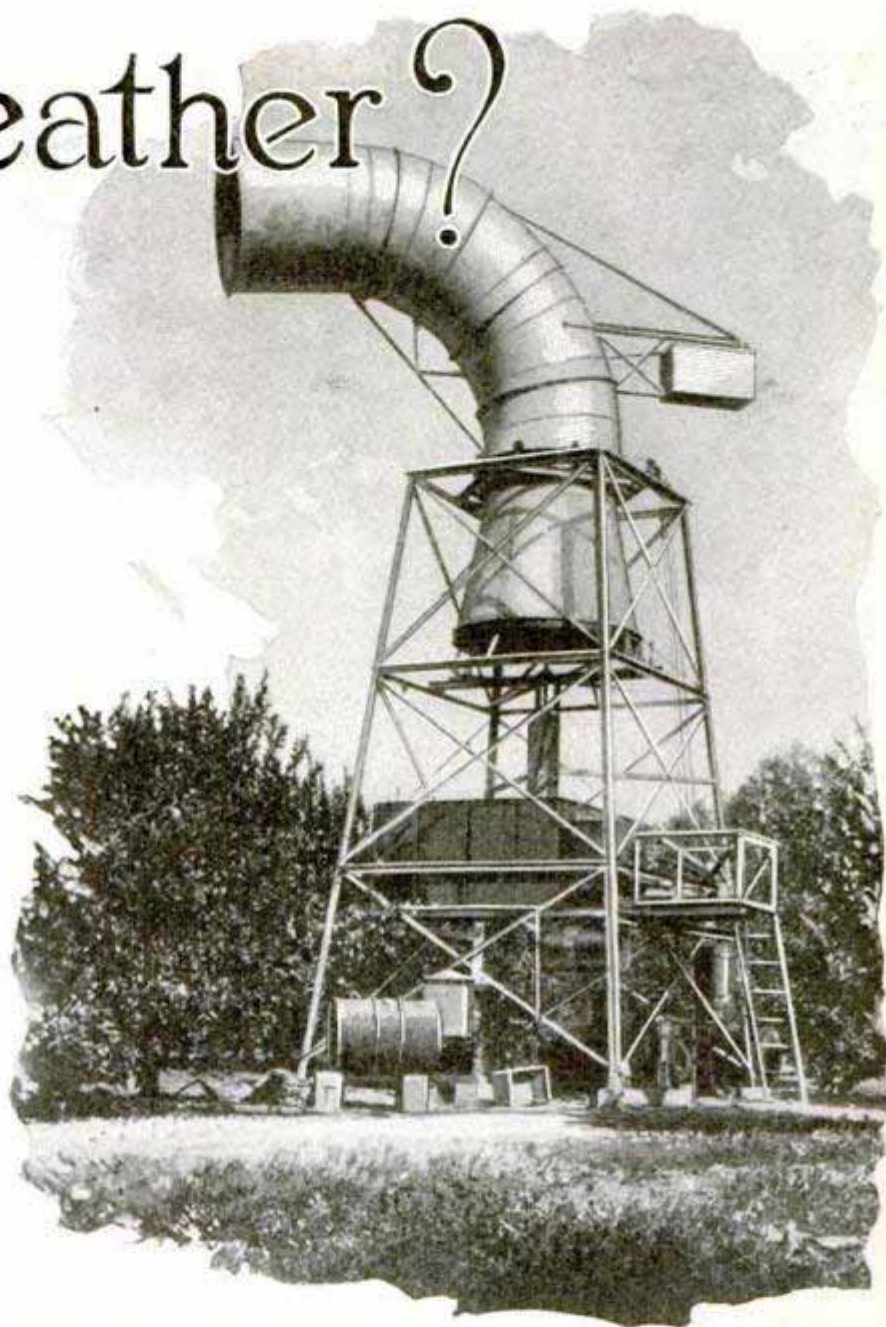
One of the most striking illustrations of our present-day independence of weather is the fact that winter has been robbed of the terrors that it had for our ancestors. Once it was proverbial for gloom and discomfort, but now it is generally regarded, in civilized communities, as the gayest and most enjoyable season of the year. Its cold and darkness and the embargo that its snow and ice formerly laid out upon travel and human intercourse have all been abolished.

the Weather?

Still greater independence of weather will probably be attained in the future, regardless of the progress that may be made in the taming of the atmosphere to man's will. For example, in the course of the next century, or less, the production of foods will probably be shifted to a large extent from the field to the factory, and will thus be removed from weather influences. Not long ago most of the leading dye-stuffs, such as madder and indigo, were obtained entirely by agricultural methods, but now man has learned how to produce them by means of synthetic chemistry, and it seems likely that most foods will eventually be produced in the same manner.

At the present time, however, the world has something like 1,500,000,000 acres of food crops and other agricultural crops subject to damage by drouth, excessive rains, frost and hail, and the like, and this fact alone, even if no other interests were at stake, would justify the intense desire of mankind to obtain further control over the weather. A single drouth in South Africa recently cost \$80,000,000—nearly as much as that country contributed to the World War. Is it strange that, in a region thus afflicted, people take a great deal of interest in doubtful but not demonstrably impossible schemes for making rain?

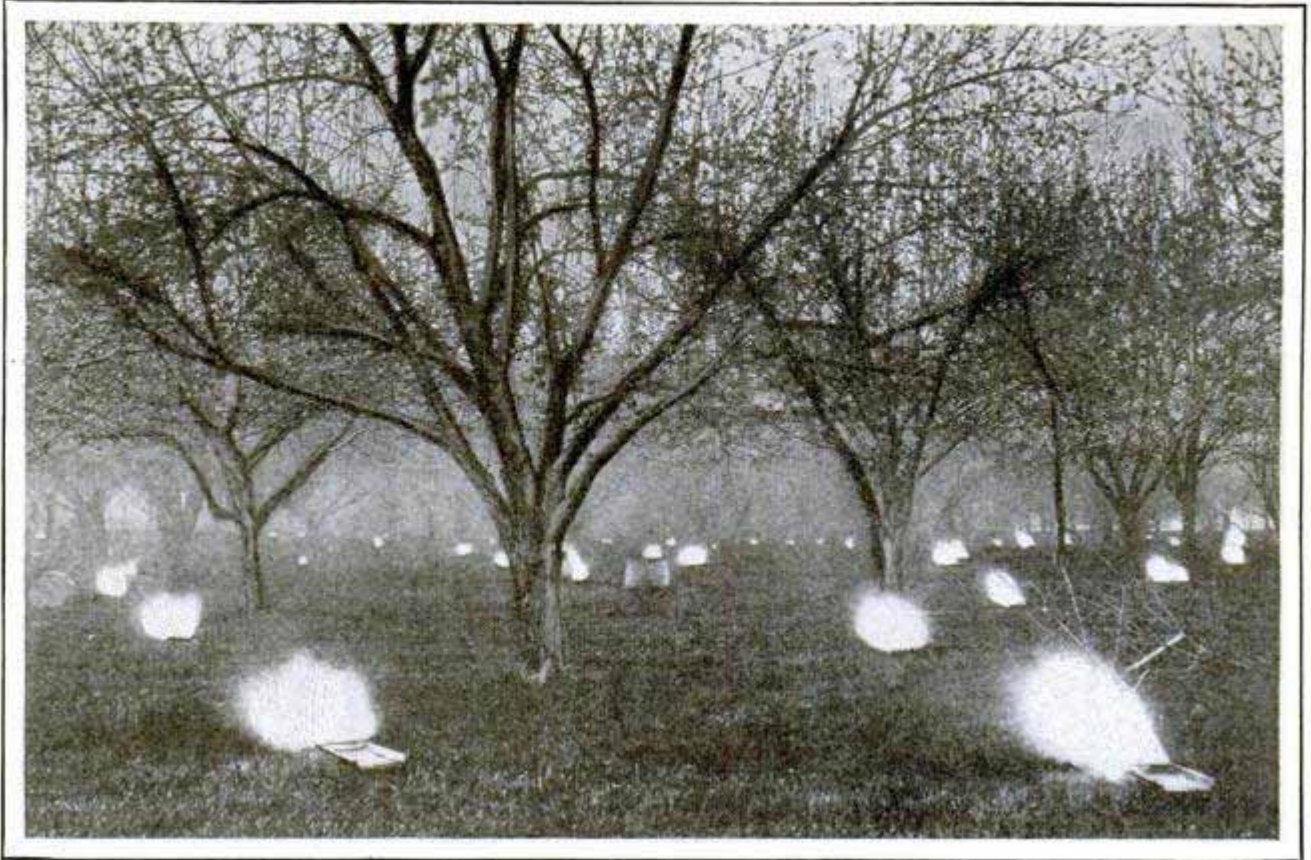
Hail is another costly scourge that humanity has eagerly sought means to avert. The world's annual hail bill is estimated



Huge Blower That Distributes a Stream of Warmed Air to Guard Orchard against Frost on Cold Nights

at upward of \$200,000,000, and in proportion to the area affected, the heaviest losses are borne by the vine-growing districts of southern Europe, which have consequently been, since early times, the proving ground for all sorts of attempts to combat hailstorms. Originally these undertakings were purely superstitious. Bells were rung, horns were blown and firearms were discharged in the hope of frightening away the demons of the storm. Sometimes bullets marked with pious crosses were fired at the clouds.

The most interesting fact about these superstitious undertakings in hail prevention is that they have been revived in a



Another Weapon against Frosts to Protect Fruit Trees and Their Crops; Fire and Smudge Pots Do Control the Weather Effectively in Such Emergencies, Saving Huge Fruit Losses

modernized form and on a vast scale in our own times. The noise-making processes of long ago furnished the inspiration for the gigantic "hail shooting" craze that broke out in Austria at the close of the nineteenth century and soon spread to neighboring countries. Special forms of mortars which discharged smoke rings instead of projectiles, were used in these exploits, which cost millions of dollars and were the subject of elaborate scientific investigations.

Various attempts were made to dispel fog even before this problem became of vast practical importance on account of the rise of aviation, which now loses, in time and damaged planes, millions of dollars a year, besides a good many lives, on account of this weather handicap. Sir Oliver Lodge tried electrical precipitation in England many years ago. A little later the similar Cottrell process, which is so successfully applied to treating industrial dusts and fumes, was used on the fogs along the California coast under the auspices of the Smithsonian Institution. The army and navy air services in this country and the royal air force in Great Britain have tried the effects of sprinkling various

dusts in the air, and electrified sand has been similarly employed in the United States. Some of these experiments had in view the possibility of rain making as well as the dispersal of fogs and clouds.

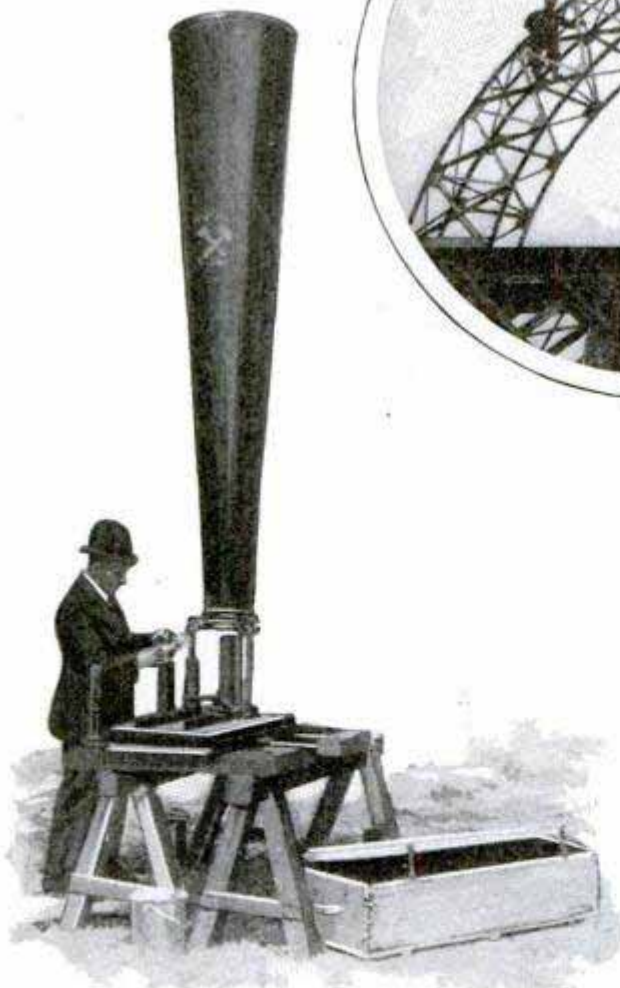
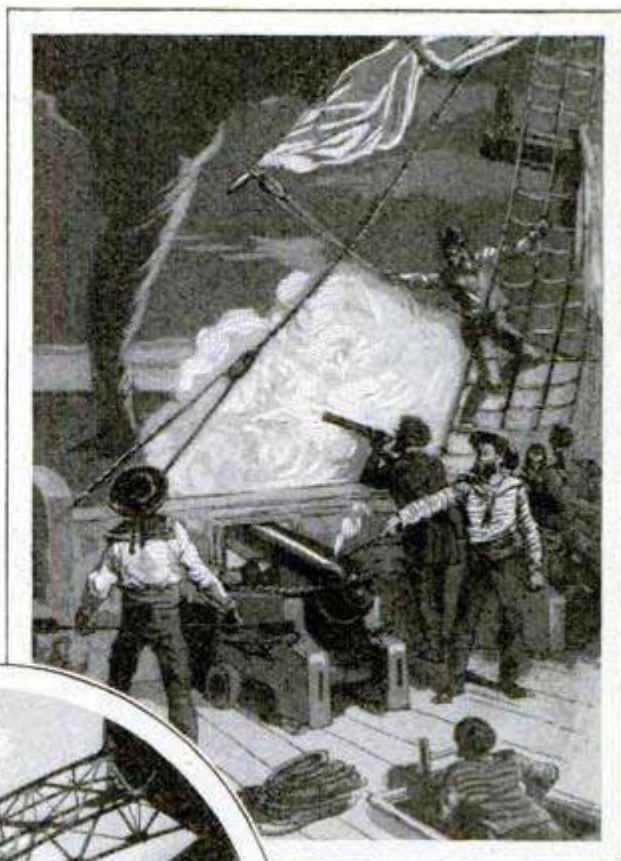
Probably the most ambitious efforts to dispel fog were those that were in progress until about a year ago at the Naval Aircraft factory in Philadelphia, where elaborate machines were constructed for spraying electrified water drops into foggy air in order to cause the fog particles to coalesce and fall to the ground. Lastly, the process of coating the surface of a river with oil to check evaporation and prevent troublesome fogs from forming was tried at Lyons, France, just before the World War, and at Pittsburgh, in this country, about six years ago. In several of the undertakings above mentioned some success was attained, but no process seems yet to have justified itself on financial grounds.

Many of the most striking experiments in weather control have only been carried out on paper. These include the plan, for which a patent was once issued, to break up tornadoes by explosions, set off by the storm itself, and the more magnif-

icent proposal, submitted to the weather bureau by a university professor after the West India hurricane in 1928, to prevent the great tempests of the tropics from getting a good start by blowing them up with explosives at their breeding places.

What, now, do all these plans, experiments and partial successes amount to? What can be done toward conquering the weather? Undoubtedly a great deal, if people were willing and able to pay the price. If the air of an orchard can be warmed a few degrees through a frosty night by the burning of oil heaters, the air over an entire county or state might be kept warm indefinitely by a similar process, though of course the expense would be colossal.

Rain making on a fairly large scale is also feasible, by known methods, when atmospheric conditions are favorable, but not

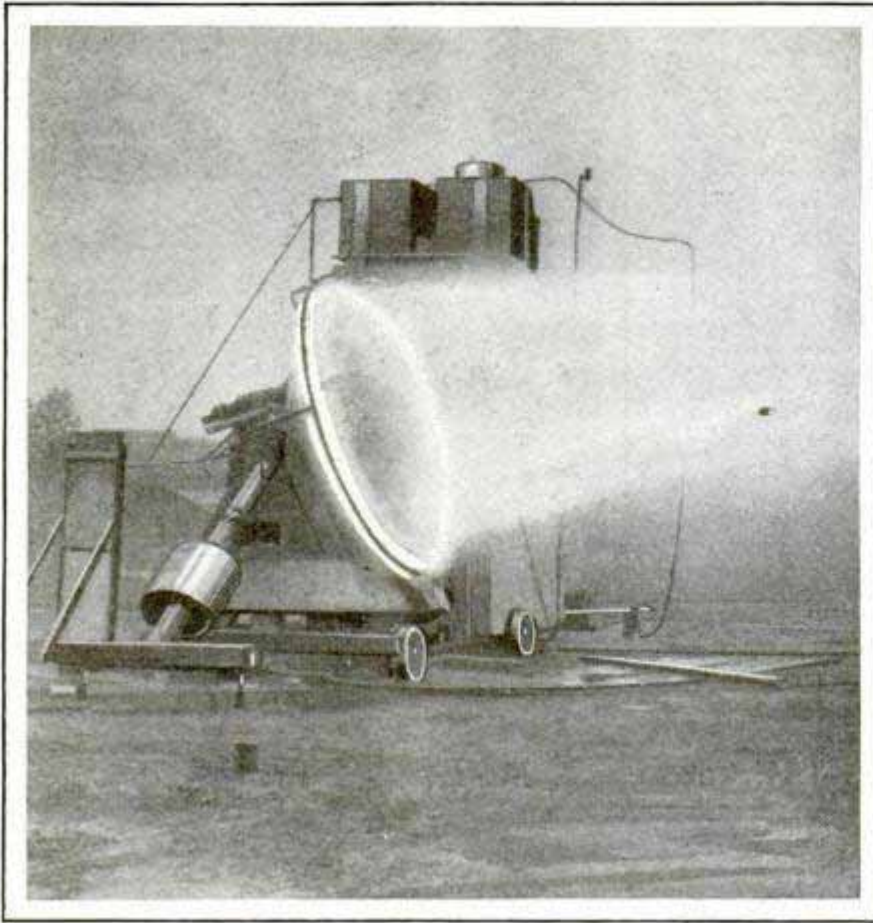


otherwise. It can then be accomplished by building a big fire. On a calm summer afternoon, when the atmosphere is well charged with invisible moisture, the column of warm air rising from a

burning forest or a burning city eventually becomes capped with a cumulus cloud, and in some cases this has been observed to grow into a thunderhead, from which fell enough rain to put out the fire that produced it.

Of course human beings could imitate this process—as they have probably sometimes done by accident—and fires big enough for the purpose could be built without sacrificing either a forest or a city; but until some new and revolutionary method of generating heat at low cost is discovered, the expense of making rain in this manner will remain prohibitive. If we had unlimited supplies of heat at our disposal, we could perform other sensational feats in weather making besides producing rain. It is the heat of the sun that keeps the entire machinery of winds

Top, Shooting at a Waterspout; Center, Futile "Hail Rods" on the Eiffel Tower, and, Bottom, Equally Useless Hail Cannon



Experimenting against Fog; This Apparatus, Tested by the Navy, Sprays Electrified Water Drops in an Effort to Dissipate Mists

and weather in motion, so that when man can rival Old Sol as a fireman, he will also be able to rival him as a weather maker.

Rain cannot be made and fogs cannot be dispelled by concussion. As Prof. Simon Newcomb pointed out years ago, if we stand in the steam escaping from a teakettle and clap our hands we do not produce a shower, though we jostle the water drops much more than does a violent explosion at the distance of a few hundred yards.

The water vapor in humid air can be easily condensed by a little cooling, and we can cause condensation in such air by adding a little water vapor without changing the temperature—as happens when the moisture from the motor of an aeroplane leaves a long trail of cloud behind the plane that might be mistaken for “sky writing.” Condensation can likewise often be induced locally by charging the air with dusts, but most of the substances hitherto proposed or used for this purpose in weather-making experiments are quite costly, and some, such as sulphuric acid, are not desirable to sprinkle over

people's property. Moreover, the problem of the rain maker is not merely to form drops in the air, but to make them big enough to fall as rain; and, likewise, in most attempts to dissipate fog, the aim has been to cause the tiny drops of the fog to unite and form raindrops. It is now generally recognized that drops floating in the air do not readily coalesce unless some of them are electrified. An electric discharge between neighboring drops tends to break down the cushion of air that separates them and permit them to flow together. The best results in rain making and fog dispersal are obtained by electrifying some drops positively and some negatively, by means of alter-

nating currents, either sent into the air in the form of a brush discharge or carried by electrified spray or sand.

These electrical methods are now practicable within narrow limits. In time of war, when money is spent without stint, they might be employed rather extensively for clearing fog from landing fields, and in time of peace, the sprinkling of thin clouds with electrified sand, or some similar process, might save a costly eclipse expedition from spending its time and money in vain. The prospects of general application to rain making and fog prevention do not seem bright at present, but the interests at stake are so enormous that experiments in these and other lines certainly should be continued. After all, who can prescribe limits to the achievements of science and invention? The “impossibilities” of one generation become the commonplace accomplished facts of the next.

☛The longest air line on the American continent has been opened between Los Angeles and Guatemala City, 2,700 miles.

Bertrand 12

3345

Justin - Besancon

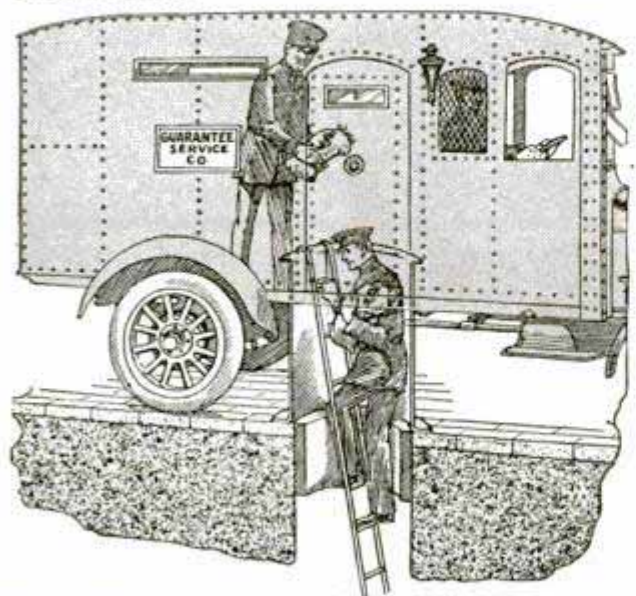
INFRA-RED RAYS REVEAL MORE THAN THE MICROSCOPE

Infra-red rays, the invisible light with which the camera peers into dense fog, have been used to bring to view tiny, living objects that the microscope has been unable to disclose. Use of the rays in medical photography was described before the International Physiological congress. Infra-red is a longer wavelength than red, and an intervening step between light and heat. Because of the extra length of these rays, they are enabled to penetrate into and reveal some of the outer portions of living cells when all visible light is excluded from the photographic plate. The rays in a kidney study showed organisms entirely missing in the microscopic examinations.

Al Howard Medical School 3349

MONEY LIFTED THROUGH HOLE UNDERNEATH TRUCK

To reduce the expense for guards necessary to watch money transported through the streets from one bank to another, a banker has suggested that a bullet-proof truck be equipped with a steel cylinder to be lowered through the floor of the truck directly into the receiving room of the bank. The cylinder would be bullet-proof and large enough for a man to go through, and banks or industrial concerns making use of the appliance would have turrets or receiving cylinders extending from the pavement into their vaults.



Taking Money from an Armored Truck down a Cylinder and Directly into a Bank Vault

Ans. Miller



A Semaphore School Warning Which Is Placed in Position While Pupils Are Departing

SEMAPHORE "SCHOOL" WARNING PROTECTS CHILDREN

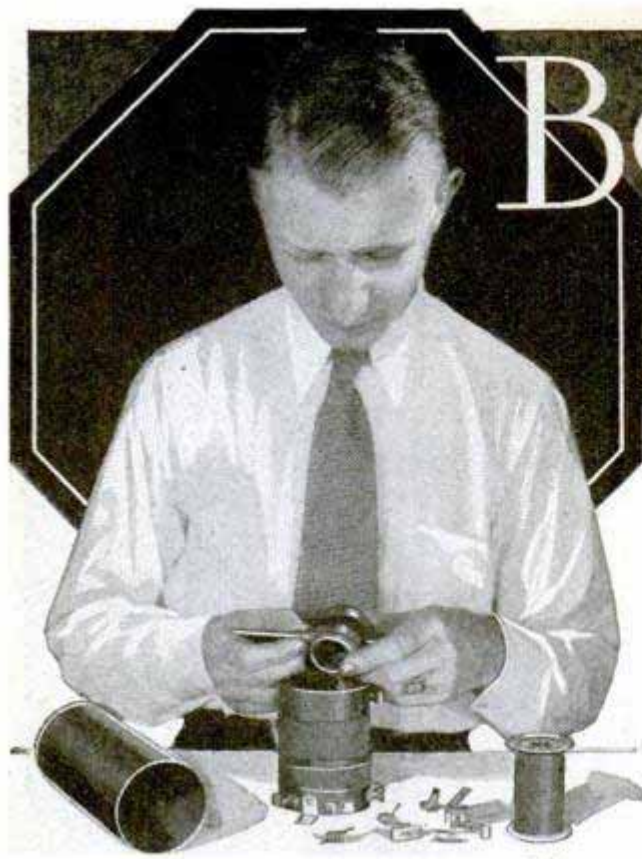
Semaphore school warnings for motorists are being installed along Oregon highways, instead of the usual stationary signs, after tests indicated automobile drivers paid more attention to the semaphore. When school is dismissed, the semaphore board with the sign "School" and the speed warning is swung into place, remaining in position until the children have departed.

AUTOMATIC MAIL BOX WEIGHS AND STAMPS LETTERS

Unstamped letters or cards are handled automatically in a letter box made by a Cologne inventor. The mail is dropped through a slit and falls on a weighing apparatus, a device at the top of the box registering amount of postage required. The sender then places the proper coins in slots and these bring into action a paid-stamp mechanism which marks the missive and dumps it into a container below.

Ans. Carlton Perovak 311
Comingsupally Caley
are

Lyman
H. W. I.
Ans. G. C. Ospeball
of 1111 1/2
Square
Madison



Inserting Shaft in Variable Primary Coil

Beginner's Screen-

A FEW years ago, when the beginner started out with a crystal receiver, tubes and parts were relatively expensive, and the novice was satisfied if he could hear a few strong locals. Tubes are now comparatively cheap and there is no reason why a good tube set for the beginner cannot be built at a cost but little more than that of the crystal receiver. The object of this article is to show the beginner how to build such a set in the simplest form. Next month, we will describe how to add one or two stages of audio amplification without the use of any additional batteries, for loud-speaker operation.

As a one-tube outfit this set has all the volume that can be received in comfort with a pair of headphones, and the range with the screen-grid tube is much greater than would be possible with any former type of tube. The method of using the screen-grid tube, while differing slightly from standard practice, is very simple, and necessitates the fewest possible parts.

The baseboard and instrument panel need not be changed to accommodate the audio stages that are to be added later. The only instrument to be added on the front panel will be a rheostat and there is ample room on the baseboard at the left

of the variable condenser for two resistance-coupled audio stages, as will be noted in the lower photo on page 826. All A, B and C-batteries are placed at the rear on the baseboard as shown in the photo at the top on page 825, making the receiver a self-contained unit.

The front panel is $\frac{7}{16}$ by 7 by 18 in., and the baseboard $\frac{3}{4}$ by 10 by 17 in. The template for drilling the former is given on page 826. Drill the panel from front to back and enlarge the holes with a reamer to pass the shafts of the various instruments.

As there is no coil on the market suitable for this circuit it will be necessary for the builder to make his own or change a standard three-circuit tuning coil to conform to the specifications. The input from the antenna is through the rotary coil; this, the primary coil, may be the rotor of a three-circuit tuner, the secondary being tuned with a variable condenser in the usual manner. The plate coil, however, must have more turns on it than would be necessary in a standard coil of this type. For this plate coil, remove the small primary winding on the standard three-circuit tuner and substitute a 30-turn winding as shown in the diagram. If the tube is not long enough for the 30 turns, wind the coil in a double layer.

The simplest and least expensive method is to wind your own tuning coil exactly like the one used in the model and shown in the diagrams. All that is necessary is two short sections of mailing tube of the diameter and length shown, a piece of brass rod, $5\frac{1}{4}$ in. long, a few Fahnestock clips, a small spool of No. 24 d.s.c. magnet wire and a short length of round busbar wire.

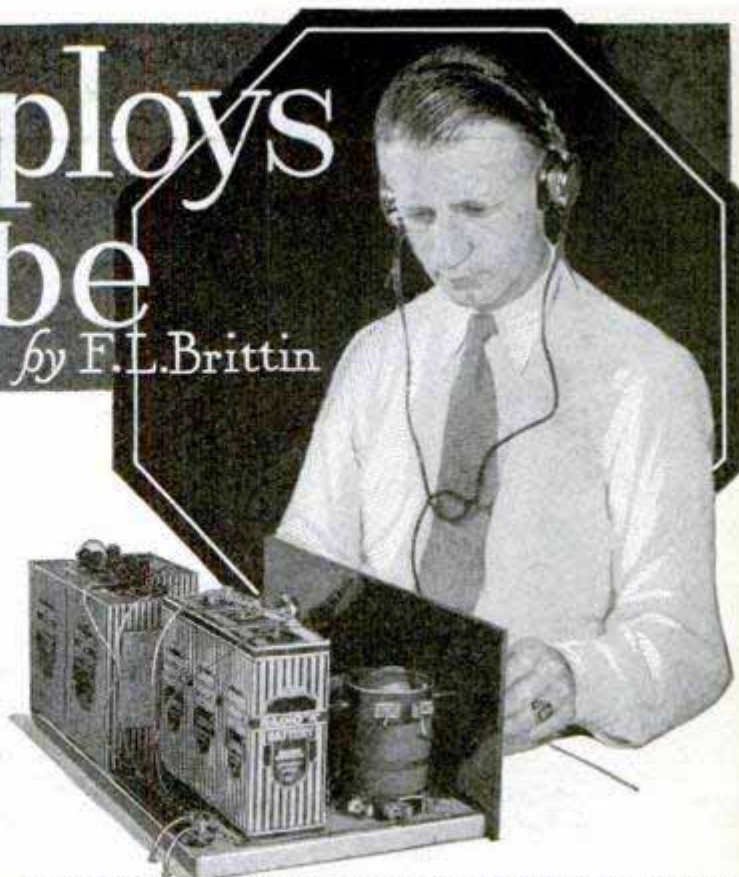
The mailing tubes should be thoroughly dry, and it is a good idea to place them in

Set Employs Grid Tube

by F.L. Brittin

a slow oven for a short time before winding the coils. Also drill holes in the tubing to just pass the shaft, and punch small holes at the points indicated for the start and finish of each winding. This, too, should be done before winding. Start the windings from the inside of both tubes so that the terminals will be inside the tubing. Be sure to leave a sufficient length of wire to reach the terminals, and in the case of the rotating primary coil, the leads should be long enough to allow the coil to be turned freely on the shaft. Insert the wire in and out of the starting and finishing holes so as to hold it tightly in position, to prevent the coils from loosening on the form. Note that all windings are in the same direction.

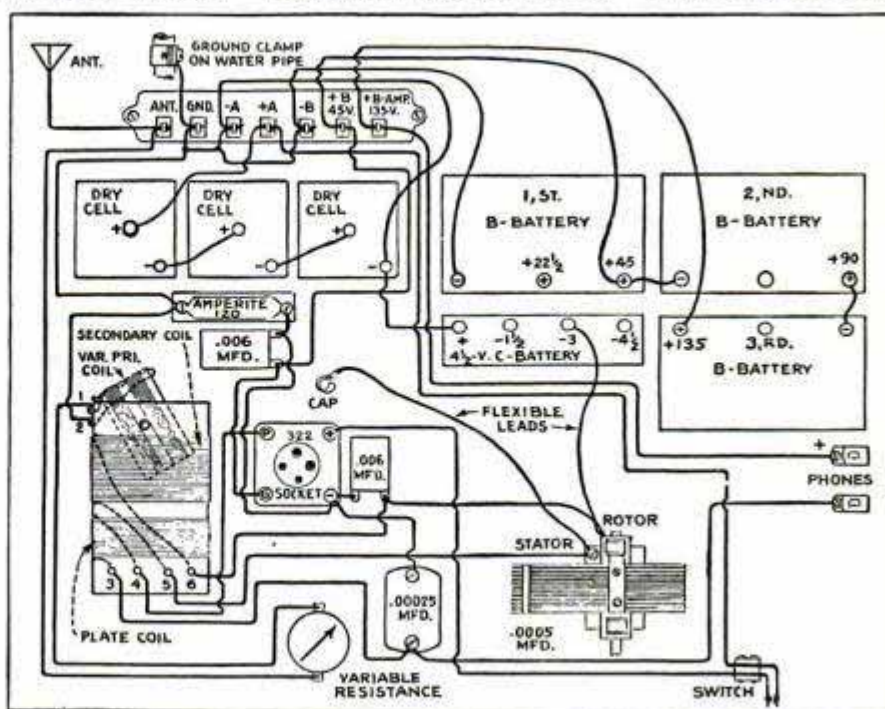
When the coils are completed, insert the shaft in the small primary coil as shown in the photo on page 824. Short pieces of round busbar wire are then coiled around the shaft at front and rear, as shown on page 826, to act as spacers holding the rotor coil in the center of the large tube. The sketch clearly illustrates the idea, and it will be noted that the ends of the spacers pressing against the tube are pushed through the tubing at front and rear above and below the rod. As the coiled wire and tube fit tightly on the shaft, the primary coil



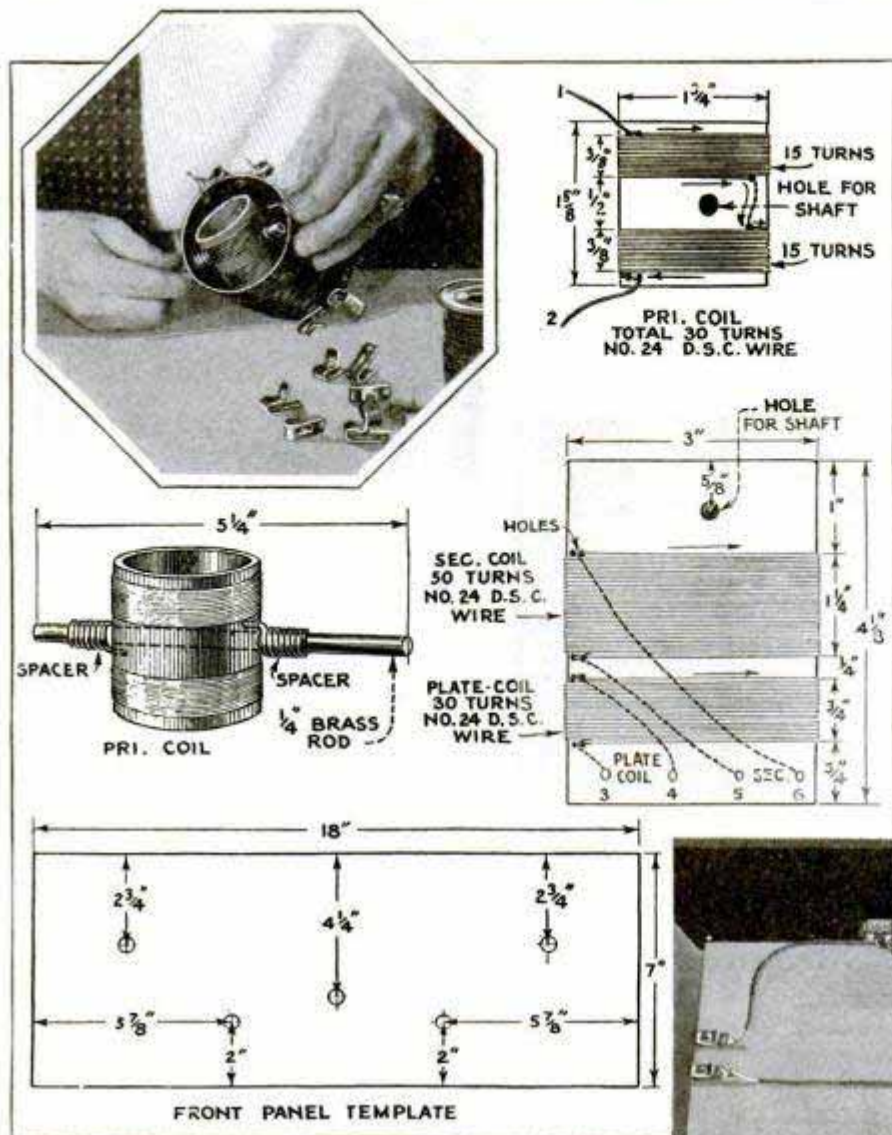
Completed Receiver Showing Compact Arrangement of Batteries on Baseboard

will turn with the latter. The Fahnestock clips are now mounted on the large tube by means of short 6-32 machine screws and hexagon nuts. This completes the tuning unit, which now may be mounted in the position indicated on the baseboard.

The variable condenser is mounted directly on the subpanel. The tube socket,



Simplified Wiring Diagram, Showing the Various Instruments in Their Relative Positions



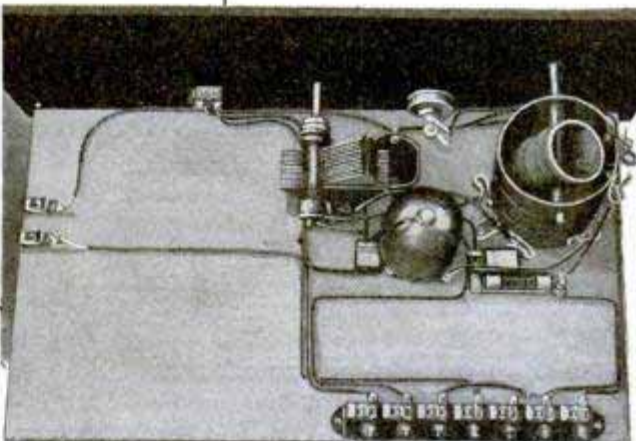
Upper Left, Mounting Variable Primary Coil; Below, Coil-Construction Details and Front-Panel Template; Right, Rear View of Completed Receiver with Batteries Removed

which is a spring-suspended variety, and the automatic filament-control unit for the tube are next mounted in the position shown. The terminal strip at the rear is a complete unit with the various clips mounted on a bakelite strip, although the Fahnestock clips may be mounted directly on the baseboard by means of short wood screws, if desired.

The controls on the front panel consist of a small black knob for the shaft of the primary coil, a dial for the shaft of the variable condenser, a knob for the variable resistance for controlling volume, and the switch for the dry-cell A-battery. The variable resistance employed in series with the antenna for controlling volume is an easily obtained device called a volume-control clarostat. This will be found useful in reducing the volume of strong local stations, which would otherwise interfere

with the reception of distant stations.

The wiring is clearly shown in the simplified diagram on page 825, and in this diagram the various instruments are shown in their relative positions. Use No. 18 tinned-copper wire covered with spaghetti tubing for all leads except for the battery connections and the lead to the control grid cap at the top of the screen-grid tube. These leads should be of flexible, rubber-covered, stranded hook-up wire. The lead to the tube cap may be of the type covered with a



woven metal sheath if desired. If such a lead is used, the metal sheath should not touch the terminal connection at either end and it should be grounded to the negative A-battery terminal.

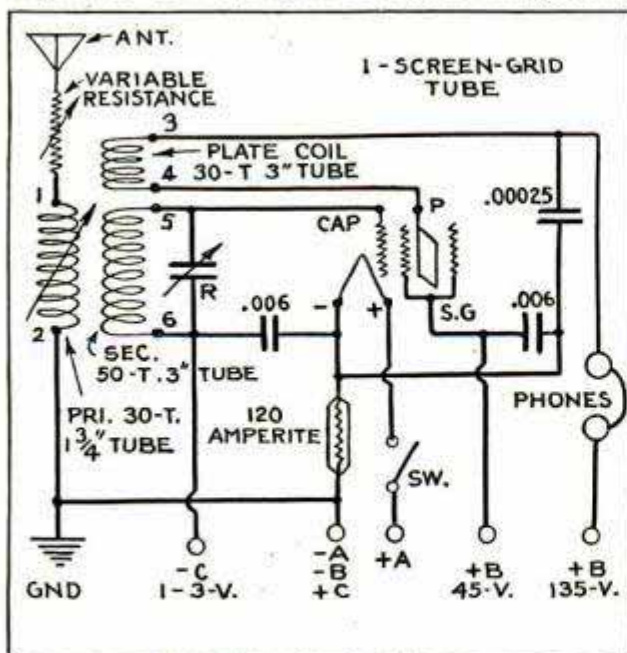
There are several types of tube shields that may be used, such as the one shown in the lower photo on this page, and, when so shielded, the efficiency of the tube is greatly increased. This tube shield should also be grounded to negative-A as in the case of the metal sheath on the control-grid lead. A short piece of fine flexible wire, soldered to the shield and connected to the A-negative post, will answer in both cases. The .006-mfd. fixed condenser is mounted as shown, directly in front of the tube socket. The two Fahnestock clips at the extreme left of the baseboard are for the phones.

The New Inductor Dynamic Speaker

Loud speakers now in common use are either of the magnetic or dynamic type.

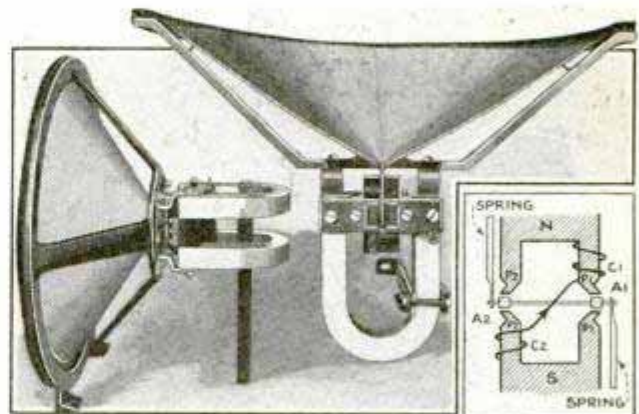
Connect all batteries as shown, and the set is ready for test. Place the tube in the socket and connect the antenna and ground, turn on the filament switch and turn the volume-control knob to the left as far as it will go. Now slowly turn the tuning dial on the variable condenser until a station is heard in the phones. Turn the knob on the rotor-coil shaft until the signals come in at maximum volume and clarity, after which reduce the volume to the strength desired by turning the volume-control knob to the right. The average negative C-bias will be about 3 volts; this value may differ with certain tubes and the condition of the batteries, however, and may be best at 1½ volts. With the correct C-bias, regeneration will be obtained, and on the amount of regeneration will depend the selectivity of the receiver.

If there are any points not clear to the reader, or if further information is desired, write to the Radio Department; there is no charge for this service. A large blueprint of the layout and wiring diagrams, together with detailed sketches that will aid the builder and a material list of the parts used in the model, may be obtained for 25 cents to cover cost and mailing. The material list will be sent free to those who do not wish the blueprint. Address your blueprint orders and inquiries to Popular Mechanics Magazine.



Schematic Circuit Diagram

Radio Department, 200 E. Ontario St., Chicago. Specify blueprint No. 145.

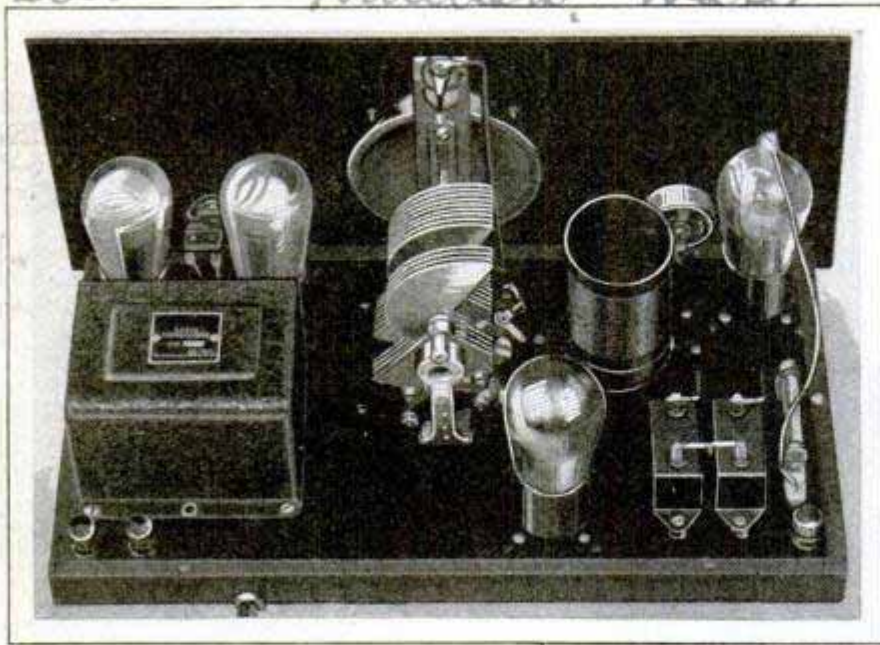


Left, Assembly Ready to Install in Cabinet or Baffle; Right, Cut-Away View Showing the Parts

The former, while inexpensive and simple to operate, is limited in volume and tone range, and the latter, while costly in comparison, has remarkable volume and tone. A new inductor dynamic speaker, so called because of its resemblance in principle to the conventional a.c. induction motor, is a compromise between the two types. The conventional diagram in the insert shows the armature riding freely between the pole pieces P₁ and P₂. The opposite forces on the two armature bars cause it to rest in a position which may be called a magnetic center. The flow of voice current in the coils causes this magnetic center to shift, moving the armature with it. The inductor dynamic speaker needs no separate field-exciting current as in the case of the standard dynamic speaker, although an output transformer or choke-and-condenser combination is required to keep the d.c. high-voltage current of the B-power supply out of the speaker windings. If the new speaker is to be used with a push-pull amplifier, a third lead may be taken from the windings at the point where the two coils are joined and used as the midpoint.

Marker for Normal Meter Reading

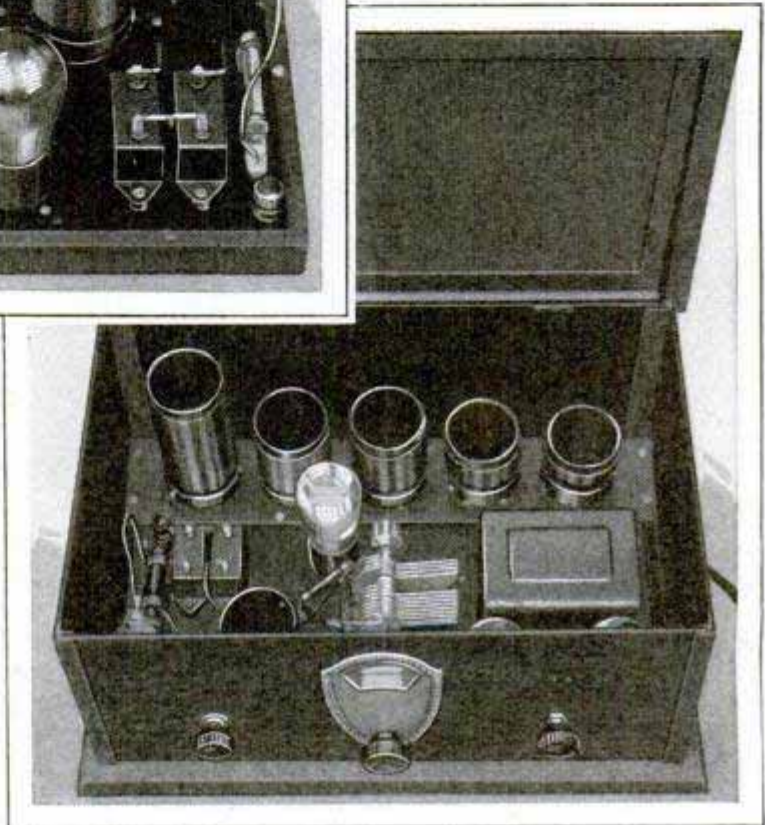
On any apparatus where there is a multiplicity of indicators it is a good idea to mark the normal reading of the most important ones with a small brush dipped in a quick-drying lacquer.—R. J. Plaisted, Cleveland, Ohio.



Top, Simple Layout of Parts; Right, Cover Opened to Show the Socket Storage Arrangement for the Coils

New Kit Set Has Wide Tuning Range

The screen-grid short-wave tuner shown in the photos has been designed for the home builder in response to the demand for a short-wave set capable of receiving the full short-wave range from 15 to 175 meters, and which at the same time would give good loud-speaker operation on the broadcast band. Previous difficulties in the satisfactory design of a set of this kind have been overcome by the use of a special two-section tuning condenser. At the touch of a switch, a large-capacity section for broadcast waves is thrown in or out. Six interchangeable coils are kept in special storage sockets in



the rear of the metal cabinet, protected from dust and always ready for use. The screen-grid tube in the first stage provides good sensitivity and prevents radiation. The two audio units are placed in

one case for compactness and greater simplicity of wiring. The entire set is easy to assemble, compact, light and has a low drain on batteries. The set requires the following tubes: one each CX-322, 300-A, 340 and 371-A. The cabinet is made of sheet metal.

2365-62

Handy Clip for Screen-Grid Tube

A Fahnestock spring clip combined with a cap and soldering lug provides a handy connection to the control-grid post at the top of a screen-grid tube, as shown in the illustration. This device provides for either soldering the wire to



the cap or using the quick method of fastening the wire in the spring clip. The top fits tightly over the post.

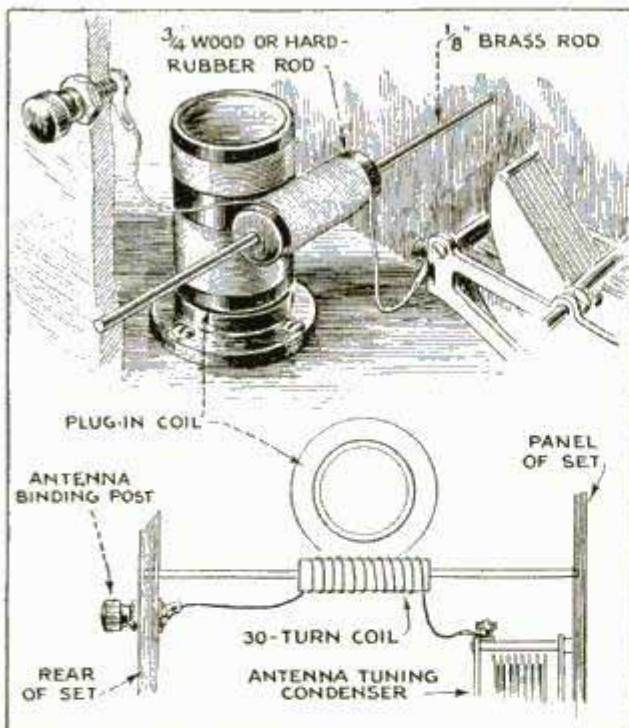
Discolored Tubes Should Be Discarded

If a tube becomes purplish or shows a blue haze while in operation, it is an indication that an excess of plate voltage is being applied to it. Defective tubes, not properly evacuated, will sometimes produce the same effect and should be discarded immediately.

*Fahnestock Electric Co.
Long Island City, N.Y.*

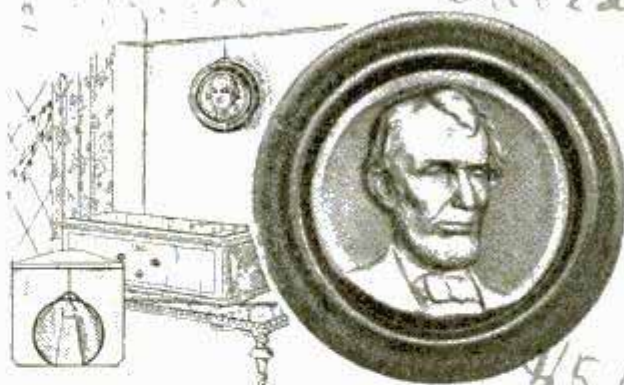
Increasing Volume in Short-Wave Sets

The idea illustrated herewith will increase the volume of the short-wave receiver and at the same time improve tuning qualities and aid in eliminating "dead spots" within the various bands. A hard-rubber or wood rod, $\frac{3}{4}$ in. in diameter and $2\frac{1}{2}$ in. long, is used as the coil form. A hole slightly over $\frac{1}{8}$ in. in diameter is drilled through it to pass a $\frac{1}{8}$ -in. brass rod, upon which the coil may be slid back and forth. Thirty turns of No. 25 s.c.c. wire is wound on the form and anchored at each end. Leads are then extended to reach the antenna-tuning condenser at front and the antenna post at the rear of the set. The brass rod is then inserted in the form and mounted as shown so that the coil will be very near the plug-in coil and at right angles to it. The brass rod can be held rigidly on brackets, or by force-fitting in holes drilled in the front panel and rear of the cabinet. The original lead from the antenna post to the antenna tuning condenser is removed and the coil inserted instead. It is not neces-



Detailed Sketch and Wiring Diagram for Variable Antenna Inductance

sary to have the rod run through the front panel for external coil adjustments, as, when once set by hand for best results, it requires no further adjustment.—C. A. Reberger, Daytona Beach, Fla.



Right, Artistic Indoor Antenna; Left, Two Methods of Installation

Artistic Indoor Antenna

A Lincoln or Washington head, molded in bold relief in either copper or platinum effect and framed in period style, provides a container for an efficient indoor antenna. The winding is tapped for either short or long antenna effect, and is said to reduce static and local interference as well as improve the selectivity of the receiver. The device may either be hung on the wall, placed on the cabinet or on a table where it is supported by the easel shown in the rear-view sketch. The frame is finished in black and the unit is $10\frac{1}{2}$ in. in diameter.

FOR THE RADIO BUILDER

The blueprints below include the best of Popular Mechanics tested circuits. When ordering, simply quote numbers of blueprints desired and inclose proper amount addressed to Popular Mechanics Magazine, Radio Dept., 200 E. Ontario St., Chicago, Ill. Magazines containing full descriptions of the circuits can be obtained. Send 25 cents for each magazine desired, giving date of publication.

- No. 111, Homemade Tube Tester July 1926 . 25c
- No. 115, 15 to 550-Meter Three-Tube Receiver Nov. 1926 . 25c
- No. 116, Three-Tube Loop Set Dec. 1926 . 25c
- No. 123, Economy-Nine Super-heterodyne Nov. 1927 . 50c
- No. 130, One-Tube Short-Wave Adapter Mar. 1928 . 25c
- No. 134, Edison Type B-Battery July 1928 . 25c
- No. 138, Screen-Grid Perfect-Tone Six Receiver Nov. 1928 . 25c
- No. 139, Simple Television Receiver Dec. 1928 . 25c
- No. 140, Power Amplifier and B-supply for Television Jan. 1929 . 25c
- No. 142, Two-Tube Screen-Grid Short-Wave Adapter Mar. 1929 . 25c
- No. 143, Four-Tube Screen-Grid Receiver May 1929 . 25c
- No. 144, Three-Tube Self-Contained A.C. Receiver Oct. 1929 . 25c
- No. 145, One-Tube S-G Set for Beginners Nov. 1929 . 25c
- No. 146, Adjustable B-Eliminator Nov. 1929 . 25c

B and C ELIMINATOR

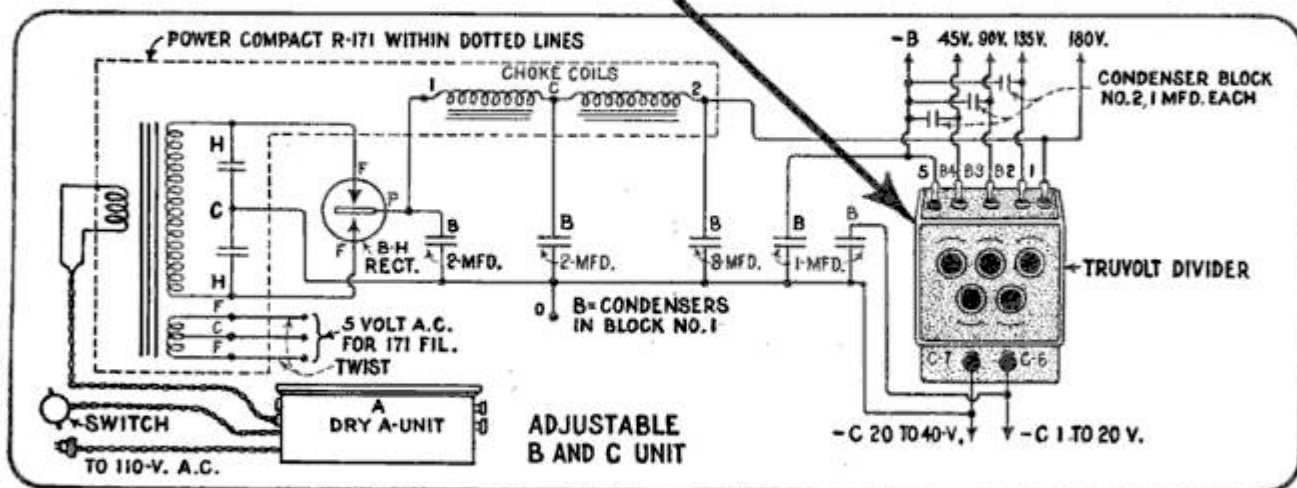


Voltage-Divider Unit Showing Control Knobs; Below, Wiring Diagram of Power Supply

UNLIKE the usual B-eliminator, in that the output voltages are variable instead of fixed, this very simple and efficient B and C socket-power unit leaves little to be desired. When properly adjusted, it will supply ample B and C power for any receiver employing up to eight or nine tubes, including the usual power stage, which may be of either the 112-A or 171-A type. It may be used in connection with any of the standard A-battery eliminators for the complete socket-power operation of any d.c. set not employing power tubes larger than the 171-A type. It is also suitable for operating any of the a.c. receivers recently described in Popular Mechanics

it easy to use the unit with a large variety of receivers without making any changes in the unit itself. The compact nature of the various instruments employed greatly simplifies the wiring, and the entire output may be assembled in an hour or two. An eliminator of this type is ideal for the beginner as the manufacturers of the various parts have co-operated in designing the instruments, so that the terminals have been arranged to permit the shortest possible wiring.

The main parts have been combined into three major units; the first, shown at the left in the photo on page 832, is the power compact. This unit consists of the power transformer, choke coils and small buffer condensers between C and H as shown in the wiring diagram within the dotted lines. The second is the condenser block No. 1, the individual condensers of which are indicated in the diagram at B; the smaller block No. 2 contains three 1-mfd. condensers and is placed immediately in front of block No. 1. The third major unit is the Truvolt voltage divider which is mounted at the front end of the baseboard by means of a small metal bracket that is supplied with it. This is a universal voltage separator, which greatly simplifies the construction of any B-eliminator. The



Magazine, or any other a.c. set within the limits stated.

The adjustable B and C-voltages make

maximum fixed voltage is 180 volts; the 135, 90 and 45-volt outputs are adjustable and, with the conventional re-

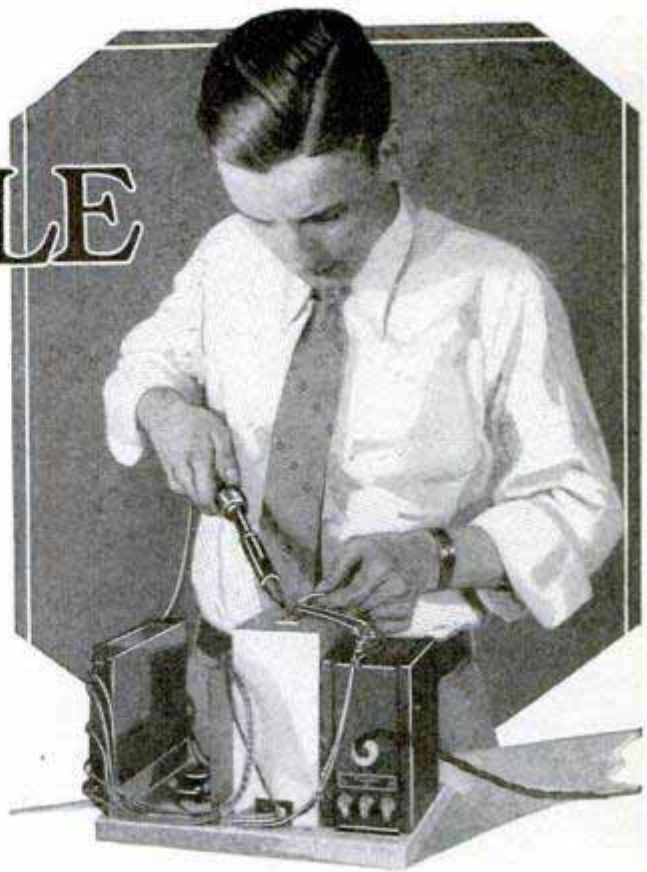
IS FULLY ADJUSTABLE

ceiver, may be varied at least 15 volts above and below the mean voltage. The two grid-bias taps are also variable; the intermediate grid tap will supply a grid bias from 1 to 20 volts negative, and the maximum bias tap will supply a bias voltage from 20 to 40 volts negative.

Connecting the voltage divider is quite simple as soldering lugs are provided on each tap, and the unit is shown in complete detail in the wiring diagram. This instrument provides the front panel of the completed assembly with the control knobs and binding posts for the power unit, which has no other controls. The various parts are mounted on the baseboard with wood screws. The exact size of the baseboard is optional, but one $\frac{3}{4}$ by 7 by 11 in. in dimensions was used in the model.

The rectifier tube employed is a Raytheon type B-H, and the socket for this tube is mounted directly back of the voltage divider in the center of the baseboard. This tube has long life and is designed so that the single tube utilizes both halves of the alternating current for rectification.

The parts are screwed to the baseboard in the order shown in the lower photo on this page. Mount the power compact so that the terminals on the top are nearest the condenser block No. 1. The unit is now ready for wiring. Use nothing but heavy-duty rubber-covered wire for the various leads or, if this is not available, busbar wire covered with a good grade of spaghetti tubing. Use soldering lugs under all terminals

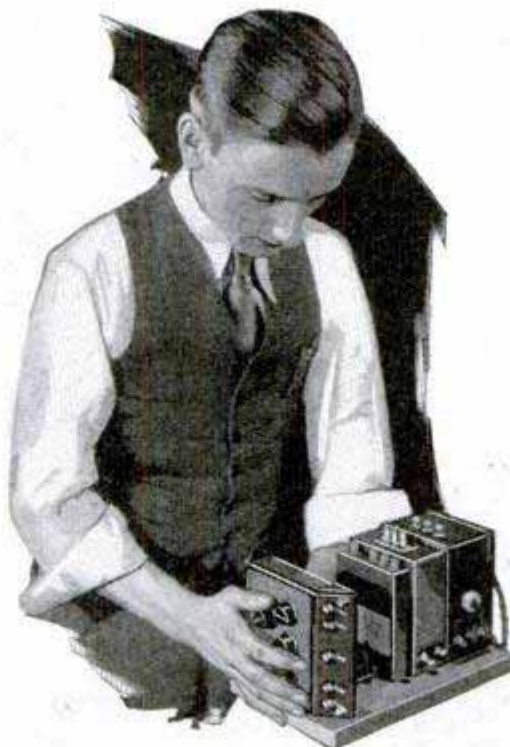


Soldering Leads from Power Compact to Condenser Block No. 1; Below, Units Screwed to Baseboard

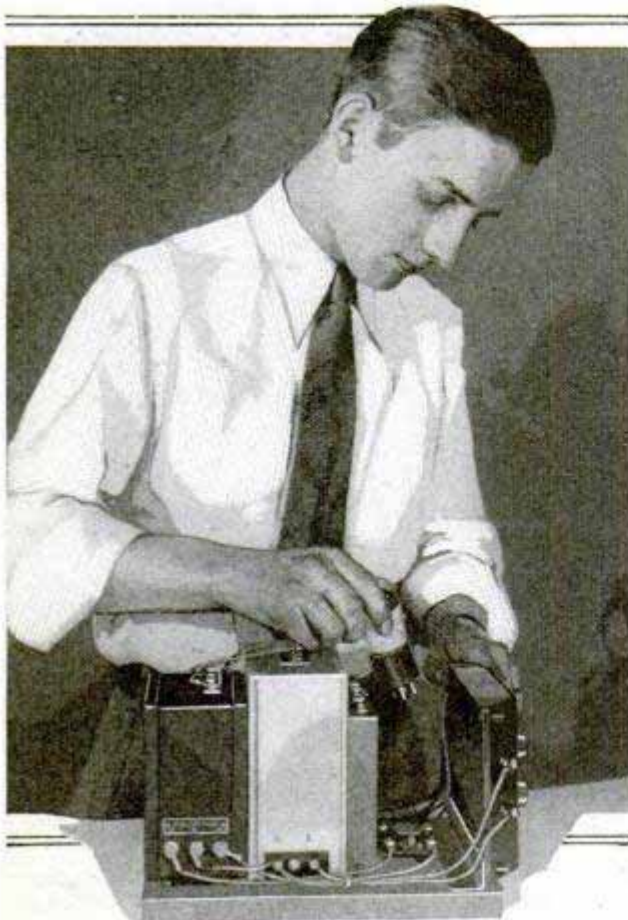
and solder each connection carefully. When connecting the tube socket note that posts F, F, and P are used, and post C is left blank.

The 5-volt filament terminals, F and F, on the power compact for the power tubes, supply raw a.c. voltage; the center tap C is left open. This center tap is normally used in connection with a resistor and by-pass condenser to supply the necessary grid bias for the power tube. In this power unit the C-bias is already taken care of in the voltage divider, so this tap is not used. The filament leads, F and F, should be twisted together between the transformer and the power-tube socket terminals.

To put the power unit in operation, connect the various B and C leads to the set; if there is a positive-C post in the



*Verbal & Visual
Screen Day, Wis*



Inserting the Rectifier Tube in the Socket

receiver, this post is left open as the C-positive is already wired into the power-unit circuit. Place the rectifier tube in the socket and turn the filament switch on the panel of the receiver to the "on" position before plugging in the B-power supply. This is important, and the B-supply should also be turned off before the set switch is turned off. Now, with the set in operation, measure the output voltages at the voltage divider with a B-eliminator voltmeter and adjust the knobs for the necessary voltages to operate the set at maximum efficiency.

The switching operation may be simplified by the use of a standard power-control relay, which may be connected in series with either the positive or negative A-battery lead to the receiver. In case the power unit is used with an a.c. set, this relay switch will of course not be necessary.

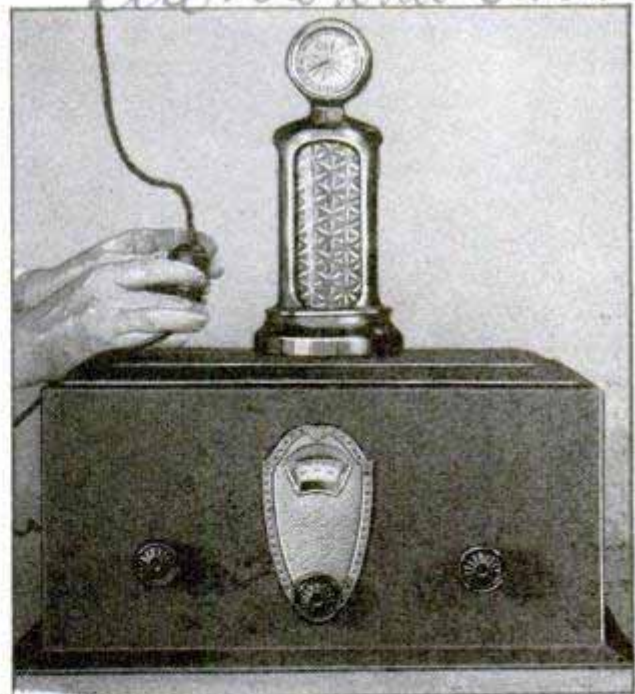
This compact power unit takes up little space and will fit into any modern console, but do not attempt to inclose it in a metal container as plenty of air circulation is necessary. When installed in a console cabinet, holes should be bored

in the rear of the cabinet to permit ventilation.

Blueprint No. 146, describing in greater detail the construction of this power unit, may be obtained for 25 cents together with a complete list of the parts used. The list of parts will be mailed free to readers who do not desire the blueprint.

2298-22
Combination Lamp, Antenna and World Clock

A decorative miniature lamp is combined with an efficient light-socket antenna and, for the benefit of the short-wave fans, a well designed world-time clock to top off the device. A wire is connected to the antenna post on the set and to a post mounted on the base of the unit. The light-socket plug is then inserted in the house-lighting supply. The clock gives the exact time in one-half the world, from Berlin in the east to the Hawaiian islands in the west. A calibrated dial, which moves with the hour hand, indicates the corresponding time in the various parts of the world.

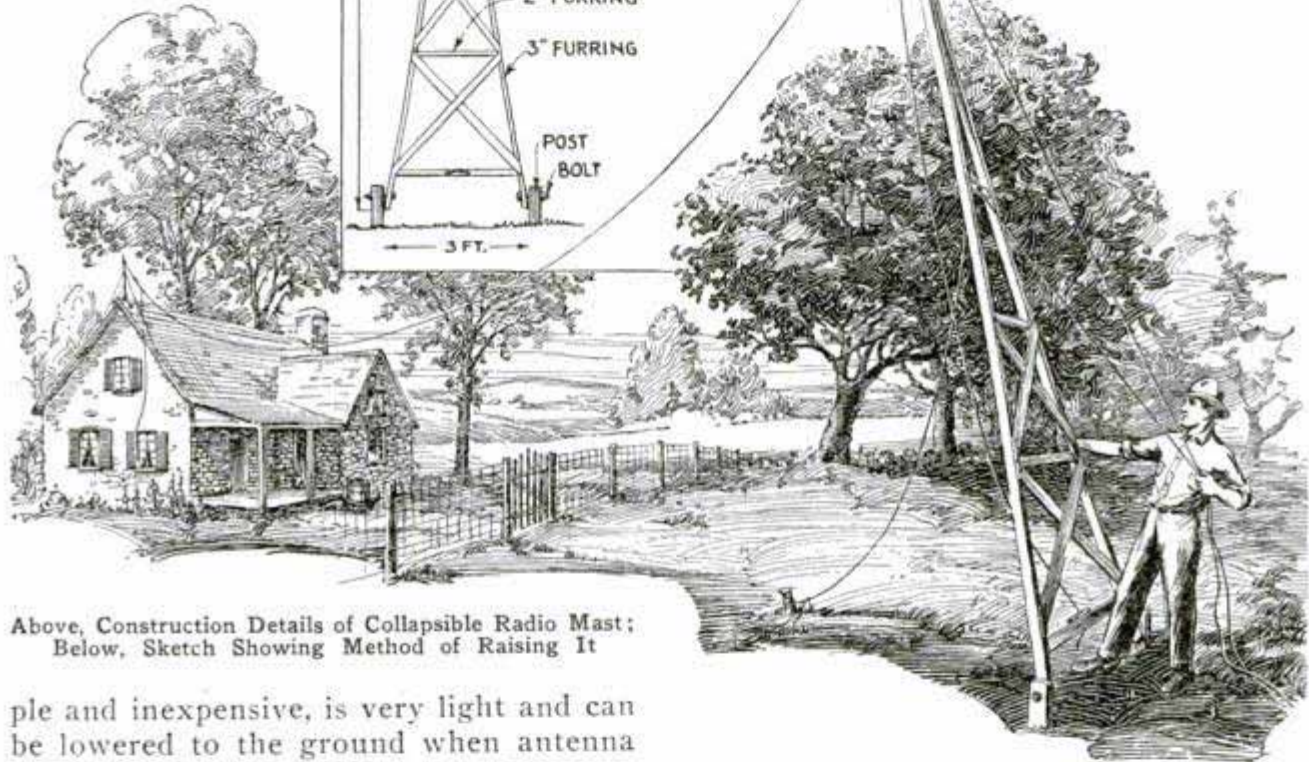
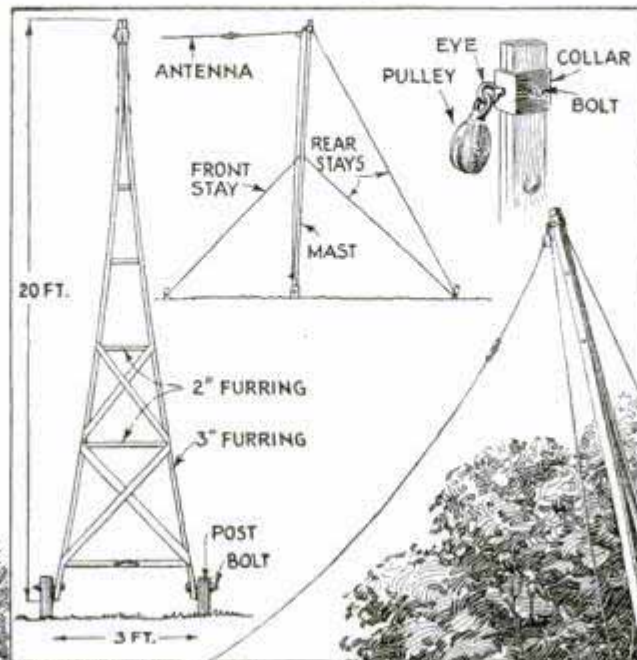


Plugging Combination Lamp, Antenna and World Clock into House-Lighting Circuit

Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your problems, and will promptly answer all inquiries.

Collapsible Radio Mast

The radio antenna must be fastened to a firm support at its outer end. This discounts the use of trees, and neighboring houses are not always available. Some sort of mast is therefore often necessary, and to construct one is a problem for many. The mast shown here is sim-



Above, Construction Details of Collapsible Radio Mast;
Below, Sketch Showing Method of Raising It

ple and inexpensive, is very light and can be lowered to the ground when antenna adjustments are to be made. The two uprights are 20-ft. lengths of 3-in. furring, that can be bought at any lumber yard. Select straight-grained material, as free from knots as possible. Lay them together and bore three holes through one end about 1 ft. apart, starting the uppermost hole only a few inches from the top. Have a collar made at the blacksmith shop or garage, of heavy sheet iron, with an eye in one of the narrow faces. A hole should be drilled also through each of the wide faces. The collar is rectangular, measuring about 3 by 1½ in. Drive it over the tip of the mast and bolt through the upper hole. Then draw the uprights together with two bolts below. Spread the uprights 3 ft. apart at the bottom and reinforce the structure with cross and

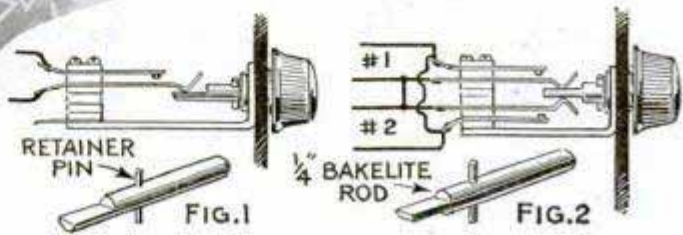
diagonal braces up half its length and with two or three crossbraces above. Set two posts in the ground, slightly farther apart than the width of the foot of the mast, bolt the latter inside the posts with loose-fitting bolts, so the mast will pivot on them. Fasten the back stays to the tip and center of the mast, and a front stay to the middle. Attach a

pulley to the eye in the collar and reeve the antenna halyard through it. The latter is fastened to a cleat on the bottom spreader.

When the mast has been raised, fasten the stays to posts in the ground so it will incline slightly back from the vertical. The antenna pull will keep it taut against the back stays. To lower it, simply release the halyard and unfasten the front stay, and the mast can be quickly dropped flat on the ground. It will be found to be practically free from side sway, and the stays keep it perfectly rigid fore and aft. A couple of coats of white paint will give it a nice appearance and also prevent it from weathering, so that it will last longer.—L. B. Robbins, Harwich, Conn.



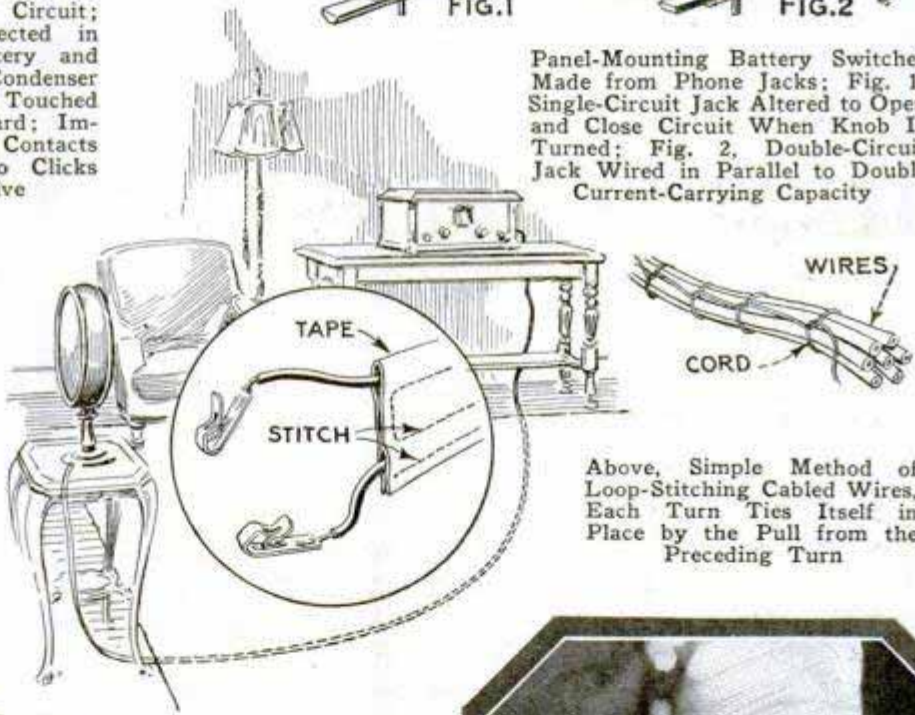
TIPS from the



Above, Testing By-Pass Condensers for Short Circuit; Phones Are Connected in Series with B-Battery and Condenser; When Condenser Terminals Are First Touched Loud Click Is Heard; Immediate Succeeding Contacts Should Produce No Clicks Unless Defective

Panel-Mounting Battery Switches Made from Phone Jacks; Fig. 1, Single-Circuit Jack Altered to Open and Close Circuit When Knob Is Turned; Fig. 2, Double-Circuit Jack Wired in Parallel to Double Current-Carrying Capacity

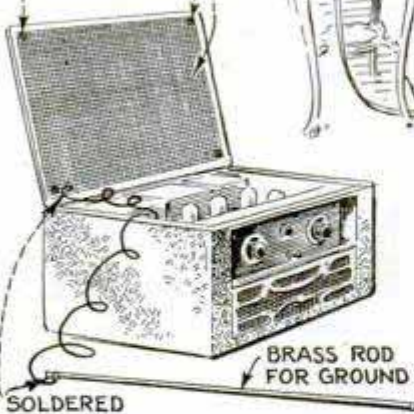
Right, Small Single-Strand Flexible Leads, Stitched in Tape for Long Speaker Connection, Will Lie Flat under the Rug



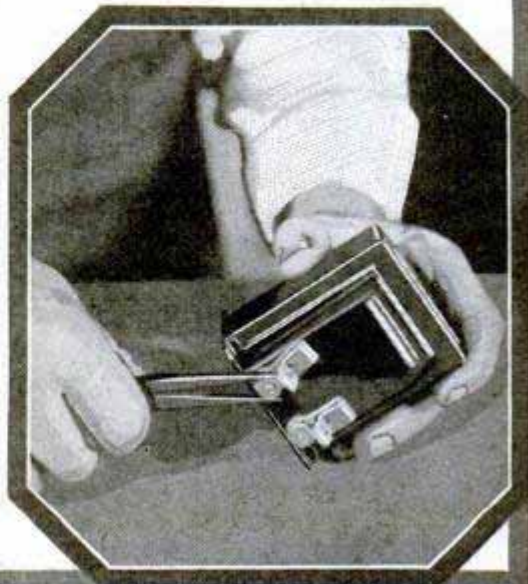
Above, Simple Method of Loop-Stitching Cabled Wires, Each Turn Ties Itself in Place by the Pull from the Preceding Turn

PIECE OF PURE COPPER SCREEN

THUMB TACKS

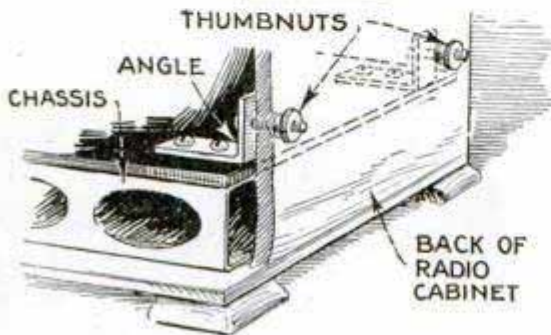
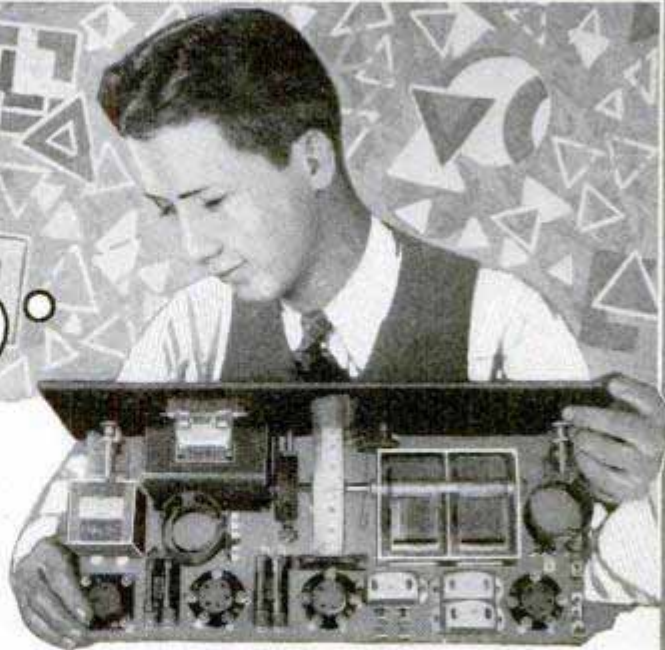


Right, Fahnestock Clips on Transformers, Rheostats and Tube Sockets Make Handy Terminal Connections for Experimental Hookups Which May Be Quickly Dismantled



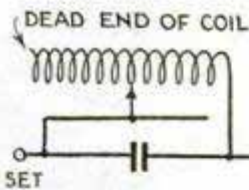
Above, a Field Antenna for a Portable Short-Wave Receiver May Be Made from a Piece of Copper Screen Cut to Fit inside the Cabinet Lid and Held in Position with Thumbtacks as Shown; a Flexible Lead from One Corner Is Connected to the Antenna Post

RADIO LAB.

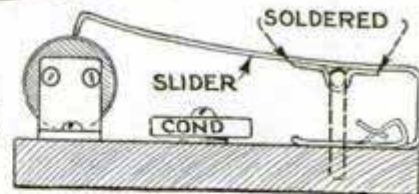
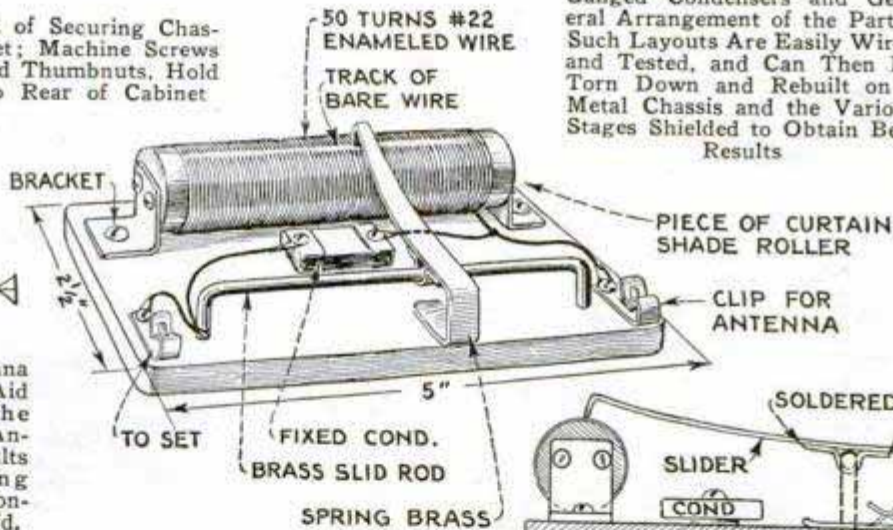


Convenient Method of Securing Chassis in Radio Cabinet; Machine Screws through Angles, and Thumbnuts, Hold Chassis Firmly to Rear of Cabinet

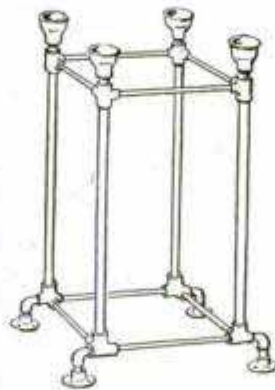
Experimental Layout of the Semi-Breadboard Type, Showing Method of Mounting Ganged Condensers and General Arrangement of the Parts; Such Layouts Are Easily Wired and Tested, and Can Then Be Torn Down and Rebuilt on a Metal Chassis and the Various Stages Shielded to Obtain Best Results



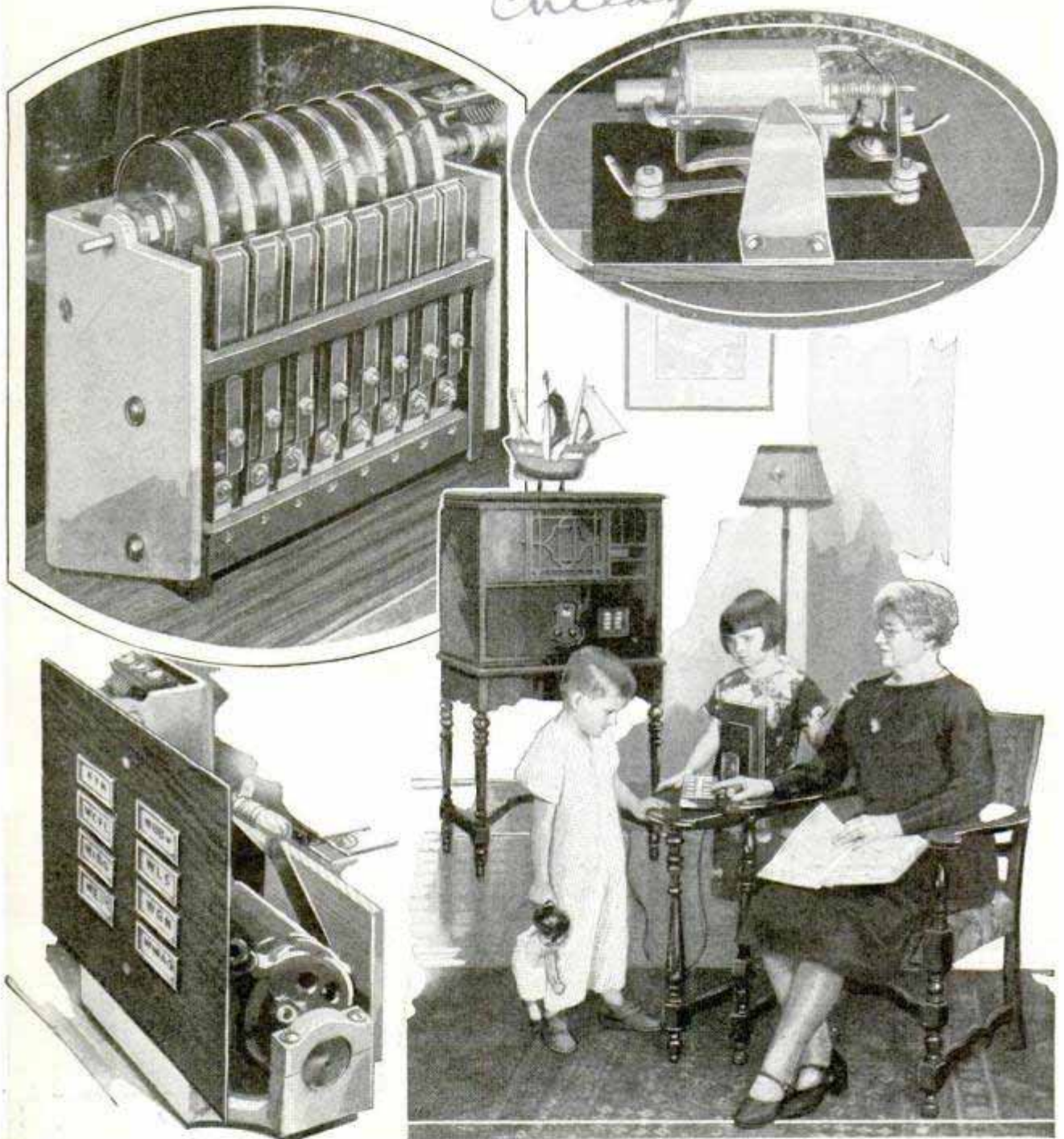
An Auxiliary Antenna Coil Which Will Aid in Adjusting the Length of the Antenna for Best Results on Short or Long Waves; Fixed Condenser Is .0005 Mfd.



SIDE VIEW



Left, a Handy Movable Stand for Any Table-Type Receiver May Be Made at Small Cost; the Frame Is of Standard Galvanized Pipe and Fittings and the Height, Including the Casters, Is 30 Inches; the Reducers at the Top Are Reamed Out to Take the Rubber Feet on the Bottom of the Cabinet; for Stationary Use, the Ball-Bearing Casters Are Left Off; Galvanized Pipe Is Used to Prevent Rust, and, When Completed, the Stand May Be Sprayed with Lacquer or Decorated to Suit the Builder; the Speaker Shelf Is Made of $\frac{3}{4}$ -Inch Veneer, the Corners of Which Are Cut Out to Fit the Bottom Couplings



New Tuning System Has Remote Control

Push a button, snap!—there's your favorite station, and you need not leave your chair to do it. In fact, you may be almost anywhere in the house if you are equipped with a new remote control. The station selector, shown at the lower left and again shown fitted in the front panel of the complete receiver, is made up of a number of little tabs which are also push buttons. The station-call letters are inscribed on these transparent celluloid tabs, which fit into metal frames and are illuminated from the rear. A slight pres-

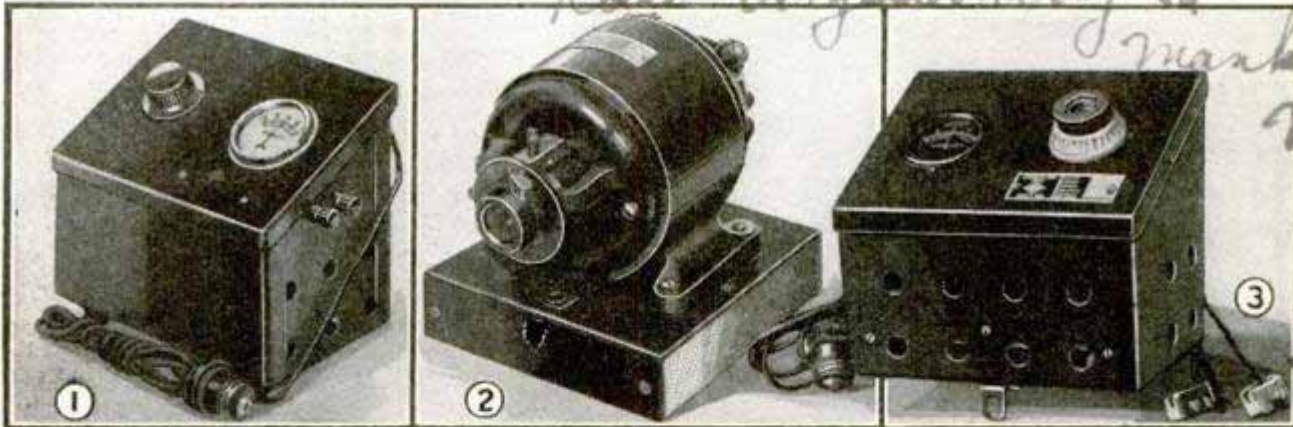
sure on the tabs sets the automatic tuner, shown at the upper left, into operation, tuning the set to the desired station. Any number of tabs may be employed, limited only by the space available. The same selector unit appears in the remote control operated by the lady seated in the chair. The automatic tuner consists of a number of slotted drums with a like number of contact segments or "fingers." This assembly is fastened to one side of the condenser gang of the receiver. It "finds" your station for you, after you have made the selection by pressing the button on the selector. The power for the auto-

matic electric tuner is supplied by a tiny motor which takes its current from the receiver supply and does not interfere in any way with the efficient operation of the receiver. The last unit of the automatic tuner is the relay switch, shown in the upper right-hand photo. This unit is required only when one or more remote controls are installed. Any number of control boxes may be used. They may be semi-portable with exposed cables running to the set, or permanently installed with concealed wiring. The remote control consists of a complete selector unit mounted in a metal box, on which is located a combination on-and-off switch and volume control. Any number of the remote-control units may be connected in parallel with that unit which is built into the receiver.

type of the receiver. The instrument shown in photo No. 3 is a specially designed charger for storage batteries, suitable for either radio or auto batteries, and the third unit for d.c.-set operation is the power unit shown in photo No. 4, which replaces the usual dry B-batteries. This unit provides a constant flow of high-voltage current from the low-voltage source. It is composed of a group of cells of the Edison type, and the cost of operation is said not to exceed five cents a month, even with a large radio receiver. For the operation of any standard a.c. receiver of the self-contained type, where all power is derived from the 110-volt 60-cycle a.c. line, only one of the above instruments is necessary, namely the unit shown in photo No. 2. This is perhaps the most interesting unit in the group as it converts the 32-volt d.c. farm lighting supply to the necessary 110-volt a.c. at low current consumption. The output is carefully filtered and as far as the operation of a.c. receivers is concerned it is a practical proposition. The converter is compact and sturdily built; it may be installed in a near-by closet or an adjoining room.

Standard Receivers Operated from 32-Volt Supply

The owner of a 32-volt farm-lighting plant is no longer limited as to the type of radio receiver he must use. A group of power units specially designed for use



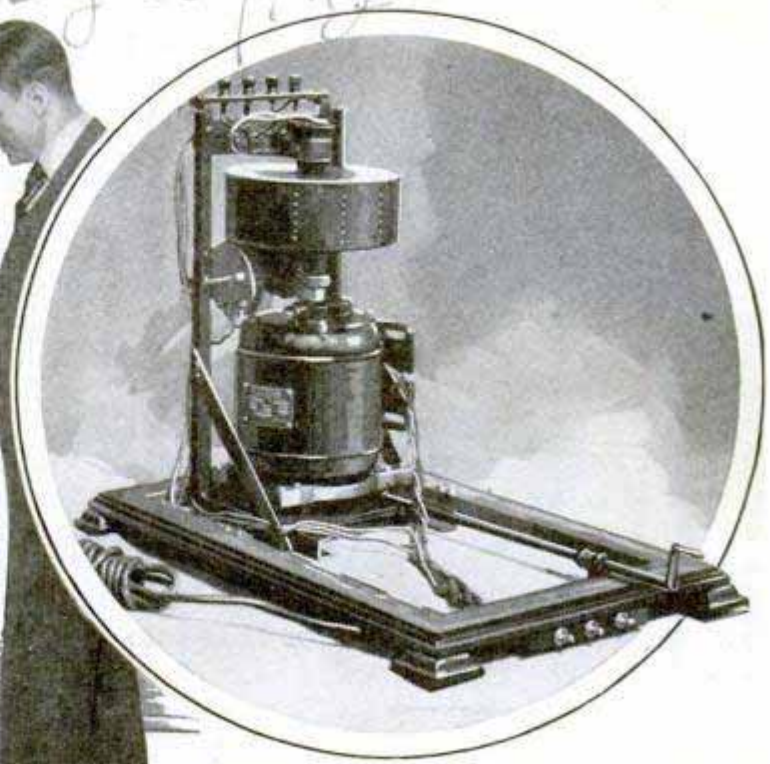
with this supply makes possible the operation of any standard a.c. or d.c. receiver on the farm, with the same efficiency as with a 60-cycle 110-volt a.c. current. For the standard battery-operated sets, the instrument shown in photo No. 1 is an A-battery eliminator which reduces the 32-volt current to the desired voltage for the tubes, regardless of the size or



Kato Engineering Co.
Manhato, Minn.
32 or 110 volt set

2367-21
838

Jenkins Television Corp
POPULAR MECHANICS
Jersey City, N.J.



Televisor for Home Use, Showing the Toggle Switches and Framing Crank; Above, the Instrument Removed from the Cabinet, Showing the Simple Mechanism for Rotating the Entire Motor and Scanning Drum to Bring the Pictures in Phase with the Signals

Compact Television Receiver for the Home

What is generally regarded as the simplest and most practical television receiver yet proposed for home use, has recently been demonstrated by the Jenkins Television corporation. This simplified and compact instrument, shown in the photos, is housed in a neat walnut cabinet, 18 by 18 by 24 in. in size. The front of the cabinet contains a recessed opening or "shadow box," leading to a large and powerful magnifying lens through which the radio movies are viewed, together with three toggle switches and a framing crank. The operation of the new televisor is simplicity itself. The first toggle switch turns on the neon glow lamp; a standard short-wave radio receiver, employed in conjunction with the televisor, is then tuned in the usual manner, until the characteristic buzz-saw note of the television signal is at maximum in the loud speaker. The second switch cuts off the loud speaker and switches the set output to the neon lamp. The third switch turns on the motor and also serves to bring the scanning drum in step with the

picture. The crank is then turned so as to frame the picture from left to right. The synchronous motor and scanning drum are mounted vertically and supported by an angle-iron frame. A special form of distributor serves to flash the four neon-lamp plates in succession, illuminating the four quarters of the scanning drum in four successive revolutions. The scanning-drum holes are viewed through the magnifying lens, giving an apparent screen size of 6 in. square, or sufficient for the simultaneous entertainment of six to eight persons. As for the nature of the entertainment, only the simplest subjects are being broadcast at this time. Instead of attempting very crude halftone pictures, the Jenkins engineers are endeavoring to transmit and receive silhouette or black-and-white movies with a fair degree of accuracy. The demonstration of a thrilling boxing contest in silhouette form can be readily followed on the televisor screen. Complete silhouette pictures and animated cartoons are to be transmitted on a regular schedule by the Jenkins television stations in Jersey City and in Montgomery county, Maryland, near Washington, D. C., shortly.

Balsa Ambroid or a deal airplane Co 19 W. 11th. New York

AMATEUR MECHANICS



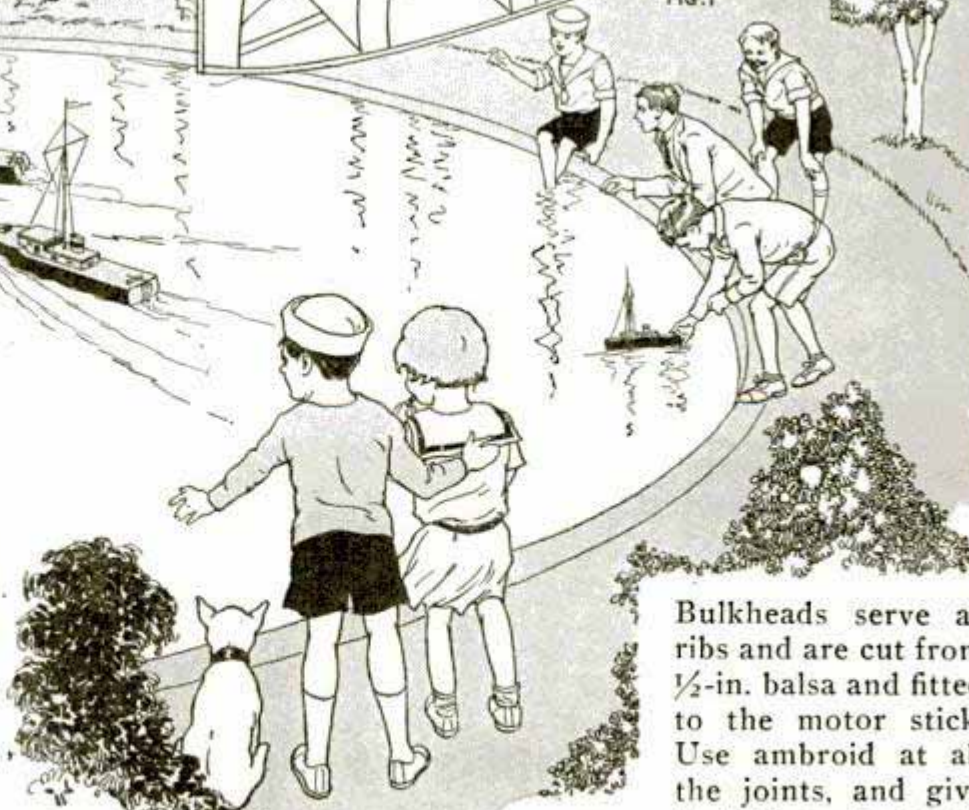
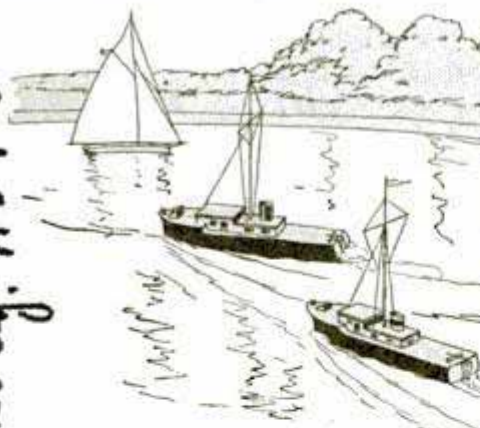
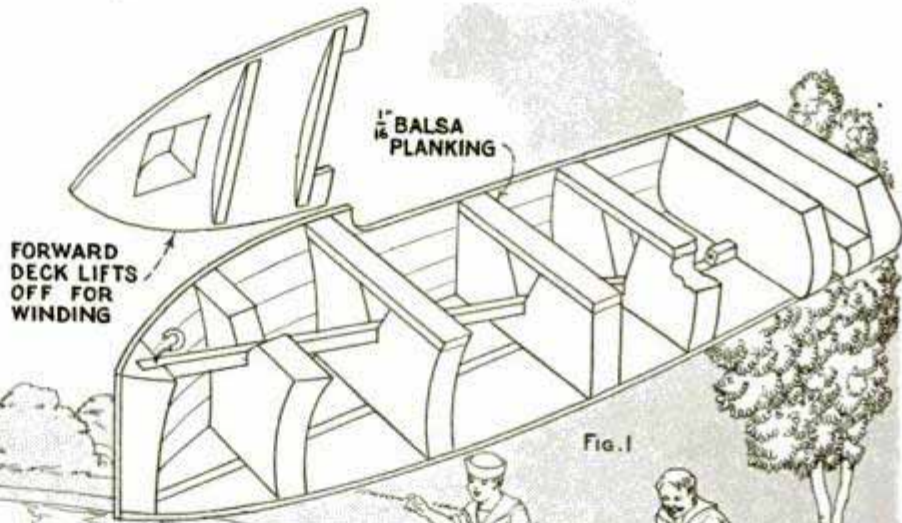
Balsa Cruiser Develops High Speed

WITH all the balsa and ambroid the model-airplane craftsmen are bringing home these days, there is opportunity to apply these remarkable materials in other fields. For light, swift model boats balsa is unexcelled, and ambroid, which does not dissolve in water like glue, makes it possible to use very thin pieces.

Made according to the drawings, the little express cruiser weighs slightly over four ounces and tears over the water at surprising

speed. Its draft is so slight that the propeller shaft needs no tube above the waterline. In fact, it could almost come right through the bottom without causing a leak. The entire hull is literally built around a triangular motor-stick assembly, somewhat sim-

ilar to that used in model airplanes, which forms the backbone of the craft and carries all the load. This is made of clear spruce, and is supported at the bow by the stem piece; at the stern it is bound to the keel and propeller-shaft block.



speed. Its draft is so slight that the propeller shaft needs no tube above the waterline. In fact, it could almost come right through the bottom without causing a leak.

The entire hull is literally built around a triangular motor-stick assembly, somewhat sim-

Bulkheads serve as ribs and are cut from 1/2-in. balsa and fitted to the motor stick. Use ambroid at all the joints, and give it half an hour to

*Balsa-International Engineering 839
Westway Bldg. Washington D.C.*

Had I only 1954 Brugden, Pasadena, Calif.

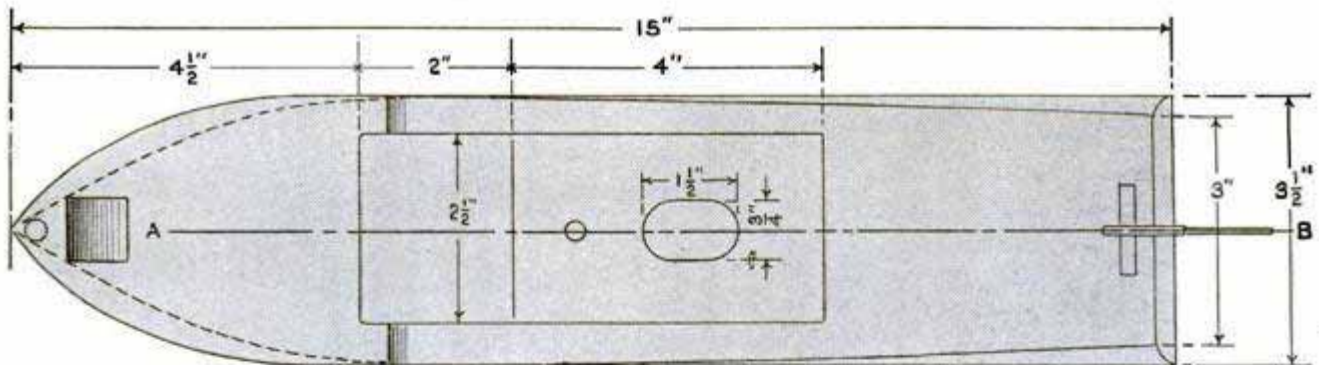
J. H. Moulton Co. 202 Lewis St. New York

harden before applying other parts. See Fig. 1 for details of ribs, and Fig. 2 for motor-stick, keel and stem assembly.

Fit the bottom planks of $\frac{1}{16}$ -in. balsa first and work toward the top. As each plank is fitted, ambroid it to the stern block and central bulkheads first, and let the ambroid harden before bending around the curve of the bow. By sandpapering the bow end of the planks, they will bend more readily. Or you can steam them over a teakettle and bend over a form. But they should be thoroughly dry when installed on the hull frame. Fitting the bow portion will require skill and patience because of the flare or inward curve of the ribs.

The propeller is very easily made from a piece of tin, galvanized sheet or brass. Make the two blades as generous as possible with a $1\frac{3}{4}$ -in. diameter, and give them considerable pitch. Your rubber motor will then unwind more slowly and keep the craft running longer. Before

bending the blades, however, solder the propeller to a short hub, such as the battery nut shown in Fig. 3, and to the wire propeller shaft. Stiff music wire or Bessemer steel rod is good for this purpose, but should be made as straight as possible. Ambroid a washer to the rear end of the propeller-shaft block to take the thrust. The hook for rubber bands must be bent after the shaft is inserted in the block. In case you wish your craft to carry a load or ballast that brings it well down in the water, stuff a quantity of oil-soaked cotton in the hole around the shaft. Fig. 4 shows how the propeller shaft is brought through the stern. It will be noted that two balsa blocks are ambroided together to form the stern block or transom, and that this permits a semicircular cut-out to be made to clear the propeller. This figure also shows the "shaft log," as the part carrying the propeller shaft is called, projecting through the bottom of the craft, as well as the



TOP VIEW
Fig. 5

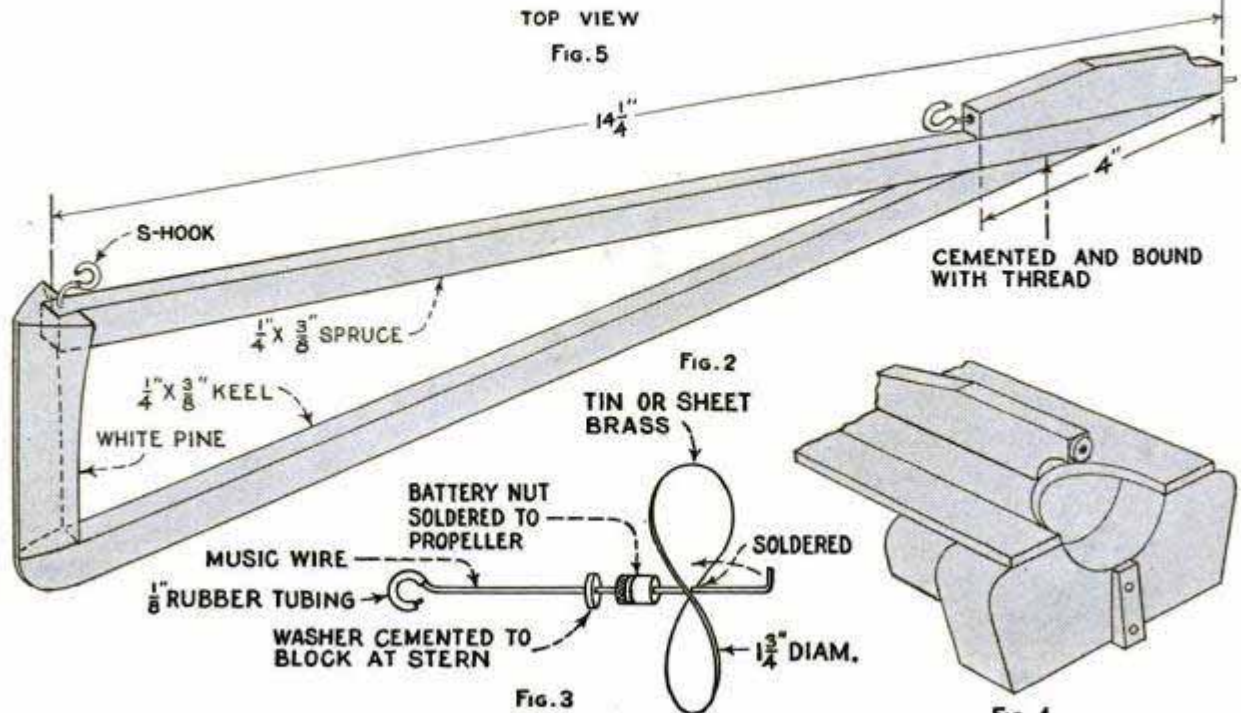
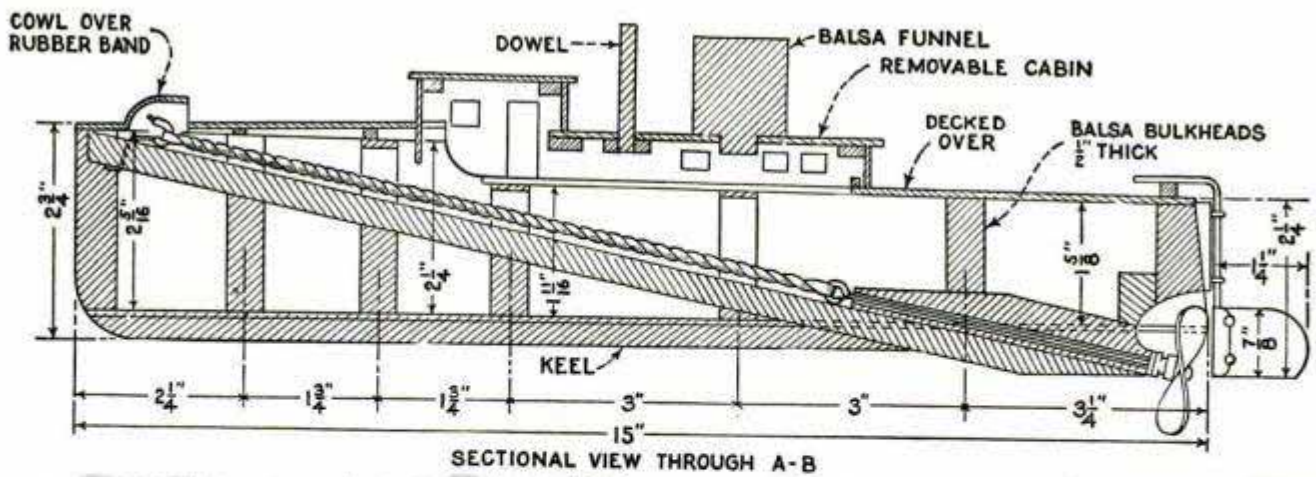


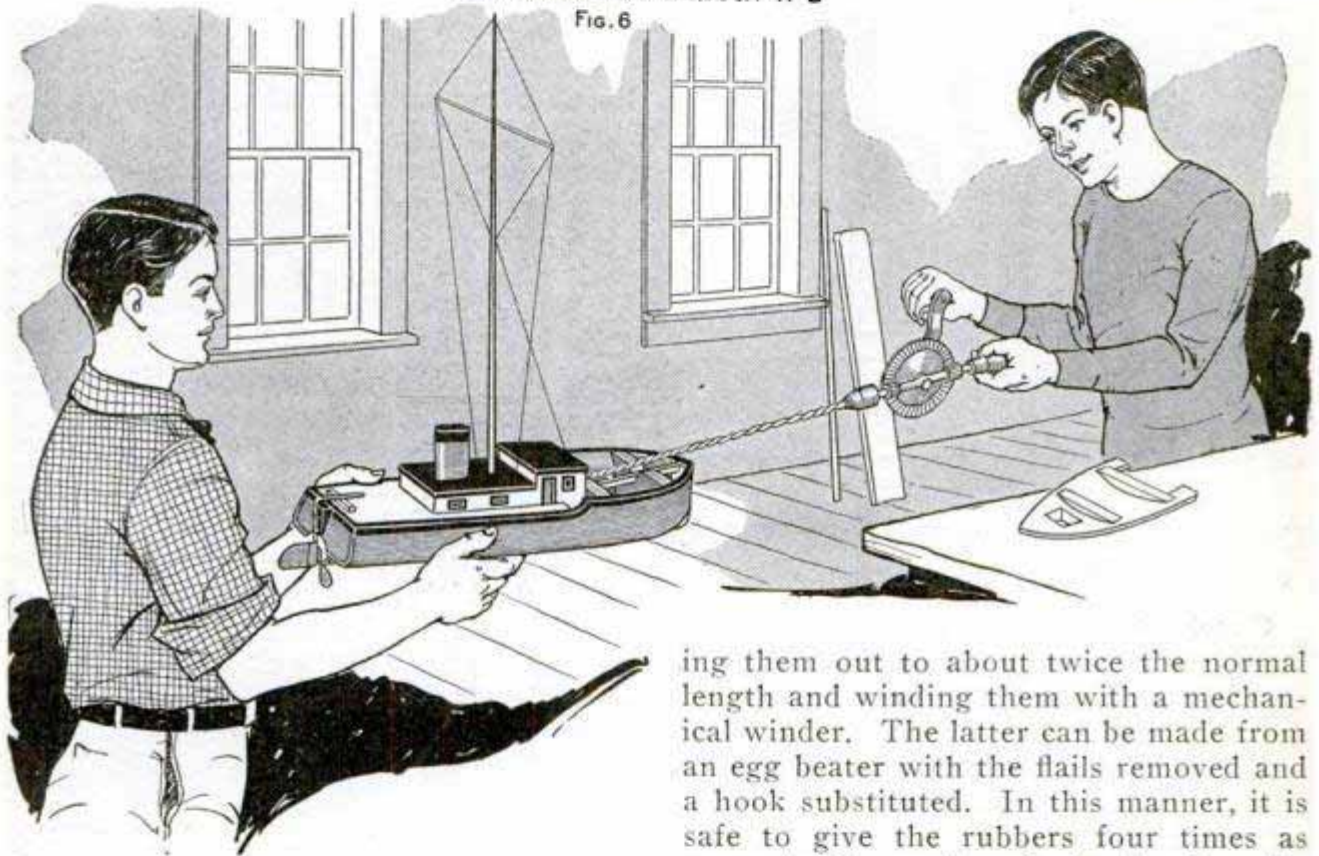
Fig. 3

Fig. 4



SECTIONAL VIEW THROUGH A-B

FIG. 6



little wedge-shaped piece of balsa that is pinned and cemented to the transom to make the rudder stand vertical.

Make the rudder of tin, soldered to a length of brass wire and secured to the stern by means of small wire eyes. A balsa strip on the after deck holds the tiller in position.

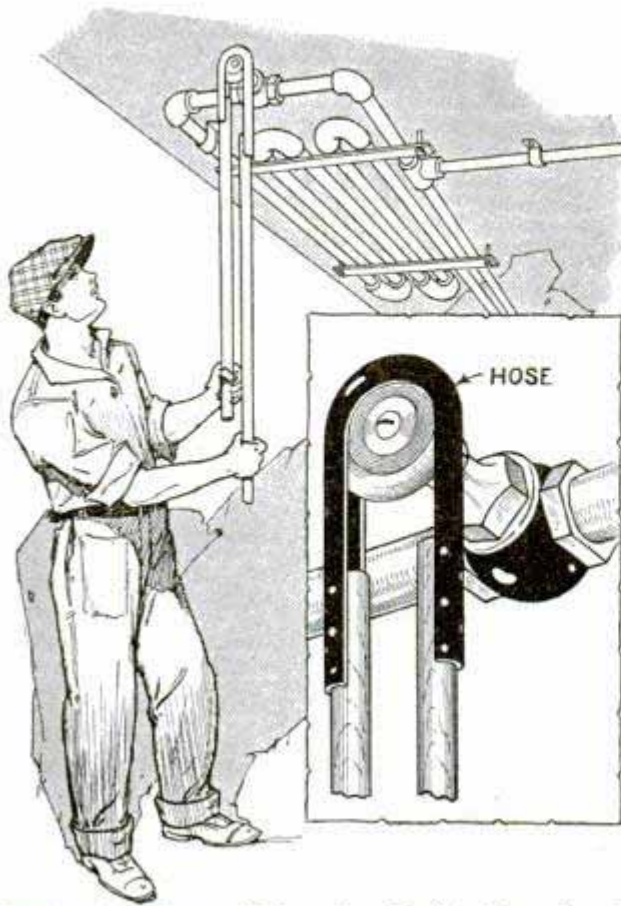
Give the cruiser a trial run before putting on the afterdeck and cabin, and be sure to sandpaper it smoothly and give it two or three coats of paint and one of spar varnish before setting it in the water.

Use four strands of $\frac{1}{8}$ -in. model airplane rubber adjusted so that it is neither loose nor stretched. Best results will be achieved by detaching the S-hook carrying the forward end of the rubbers, pull-

ing them out to about twice the normal length and winding them with a mechanical winder. The latter can be made from an egg beater with the flails removed and a hook substituted. In this manner, it is safe to give the rubbers four times as many twists as by simply turning the propeller. Bear in mind, however, that the average egg beater is geared up to 4 to 1, so that in turning the crank 100 times you have twisted the rubbers 400 times. At first, do not attempt more than 75 turns at the most, either by winder or directly on the propeller.

Now make the forward deck and cabin. The former is crowned, a result achieved by supporting it on curved battens. This forward deck is so mounted that it can be lifted off for winding. The cowl over the opening for the hook is optional.

The first model we made like the diagrams fairly jumped out of our hand when released in a pool, and you can feel safe in entering your swift craft in any speed contest for this class.



Overhead Radiator Valves Are Easily Opened and Closed with This Extension Grip

Convenient Device for Operating Valves on Overhead Radiators

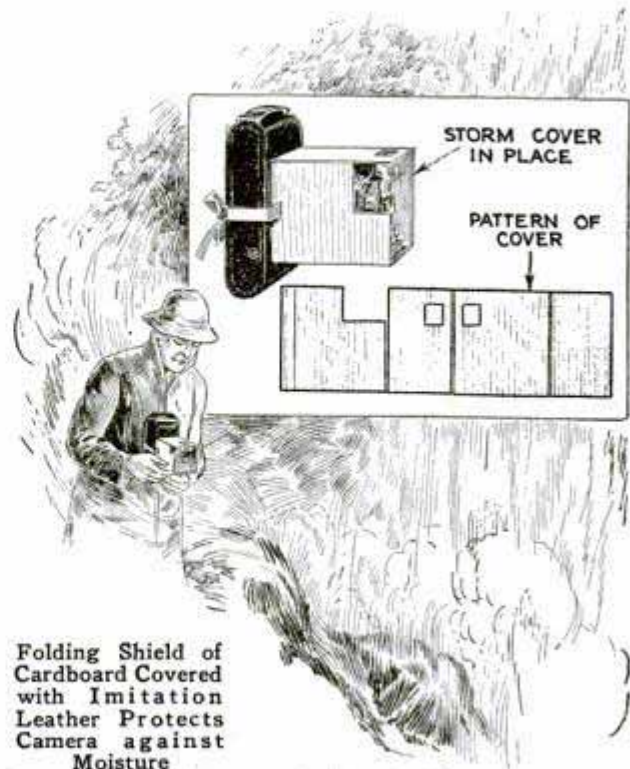
Overhead radiators in shops and basements are ordinarily rather difficult to get at, but if they have round wooden valve handles it is an easy matter to open and close them by means of the device shown in the drawing. It consists of a 12 or 18-in. length of rubber garden hose, cut in half as indicated and tacked to the ends of two wooden handles. In use, the section of hose is slipped over the edge of the radiator-valve handle, and it is then an easy matter to turn the valve either way.—Carl G. Langland, Minneapolis, Minnesota.

How to Clean the Works of a Clock

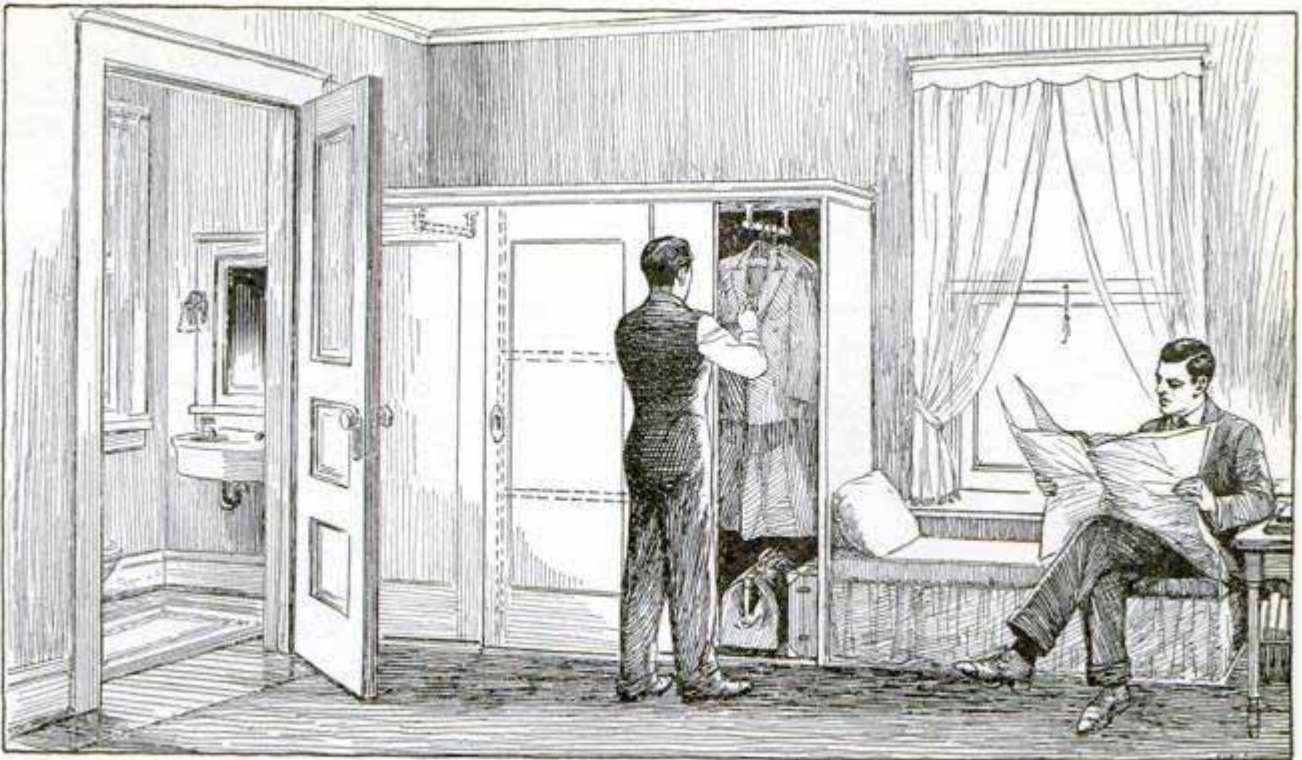
To clean the works of a cheap clock, saturate a cloth or pad of cotton with kerosene and lay it inside of the case on a small disk to prevent the wood from absorbing the oil. The fumes caused by the evaporation of the oil will loosen dust and dirt in the works and cause it to drop. Lubrication is also accomplished to some extent in this way.

Storm Cover for a Hand Camera

When using an unprotected hand camera during stormy weather, rain and snow will soon dampen the bellows and lens front, covering the lens with a film of moisture which spoils the definition of the image. The storm cover shown in the drawing has been found an effective remedy for these troubles. It was made for a particular type of camera, but with a few minor changes, such a cover can be used on any similar type. The material is a cardboard box, cut as indicated and covered with oilcloth, imitation leather or other kind of waterproof fabric. Some linen or cotton tape, about $\frac{1}{2}$ in. wide, is used for "ties." After the individual pieces have been cut out, they are laid next to each other, with $\frac{1}{16}$ -in. space between them to facilitate folding. Coat with glue and press the fabric covering on firmly. Where the fabric covers the holes cut in the cardboard, it is carefully removed with a sharp razor blade. The cover can be folded when not in use and kept in the camera case. A $\frac{1}{2}$ -in. slot, about $\frac{1}{2}$ in. from the end, is cut in the two pieces forming the sides of the cover to receive two 12-in. lengths of tape, the ends of which are glued to the inside of the box. These lengths of tape are tied around the body of the camera to hold the cover in place securely.



Folding Shield of Cardboard Covered with Imitation Leather Protects Camera against Moisture



By Substituting a Wardrobe for the Clothes Closet, and Remodeling the Latter into a Small Bathroom, a Large Room Was Changed to a Small Apartment

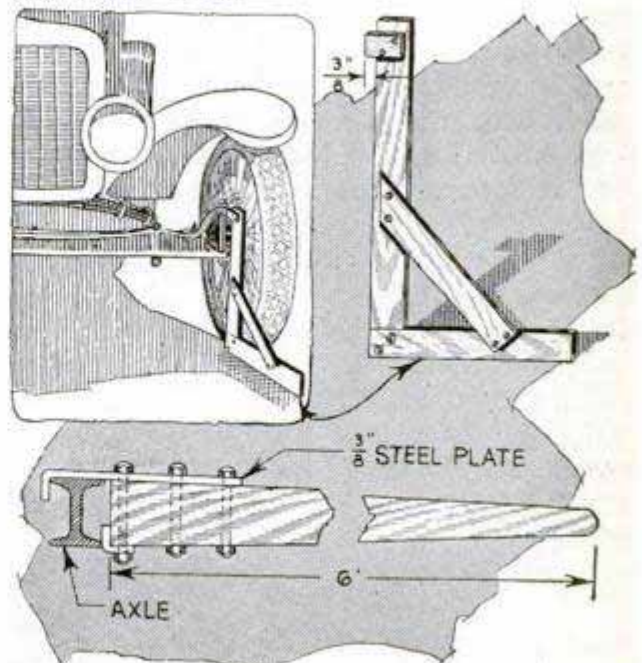
Changing a Large Room to a Small Apartment

One home owner who rented out some rooms changed one of the large rooms to a small apartment with very little trouble and expense. The room had an extra-large closet which was remodeled into a bathroom. As a substitute for the closet, a wardrobe, provided with sliding doors, was built in one corner as shown. Thus, at the comparatively low cost of the plumbing, electric wiring and wood for the wardrobe, the income from the room was increased considerably.—Lester G. Herbert, Auburn, N. Y.

Correcting Front-Wheel Wobble on Ford Cars

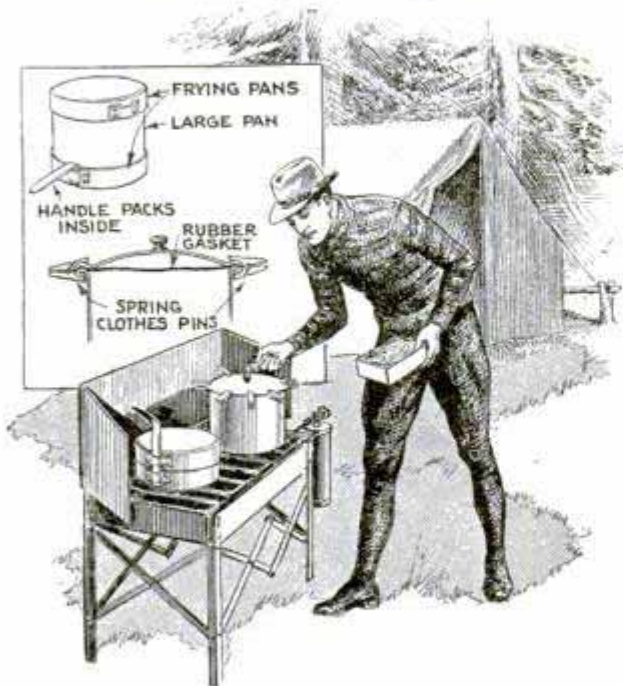
Wabbling front wheels is a recurring fault in Ford model-T cars and involves a certain amount of danger. Tightening the bolts and spring perches or renewing bushings will not remedy the trouble if the front axle is incorrectly tilted. On the other hand, if the axle is correctly tilted, lost motion or looseness in the parts will not cause a wobble unless the lost motion is excessive. The drawing shows a method of correcting the axle tilt. A wooden square is made, slightly

longer than the axle is high. On the upper end of the square a block is added to serve as a gauge, projecting $\frac{3}{8}$ in. This gauge is used at the forked end where the wheel spindle is placed. By means of a long lever, shown in the lower detail, or a heavy wrench fitted with a pipe extension, the front axle is forced either upward or backward, until the gauge shows the upper end of the fork to be just $\frac{3}{8}$ in. behind the bottom end.



Wooden Square Used as Gauge to Correct Wrong Axle Tilt Which Causes Wabbling

A Few Camp-Cooking Kinks



Tightly Sealed Lid on Cooking Vessel Hastens Boiling in High Altitudes

A compact "nesting" set of cooking utensils is always part of the experienced camper's equipment. The large frying pan of such a set usually fits over the largest pot when the set is packed. Smaller pots, a small frying pan and a coffeepot fit within the large pot. The purchase of a second large frying pan will add greatly to the utility of the set. This pan will fit over the bottom of the set when packed, without adding much to the bulk. The two frying pans can then be placed together on the stove, as shown at the left, to make a good Dutch oven. The upper pan is preheated over the burner of the stove before it is placed in position. At high altitudes, as in most of our western national parks, potatoes and other vegetables take a much longer time to boil, owing to the lessened atmospheric pressure. A remedy for this condition is to place a rubber disk, cut from an old inner tube, between the lid and the pot. A number of spring clothespins are then used to clamp the lid firmly on the pot. This sealing will slightly increase

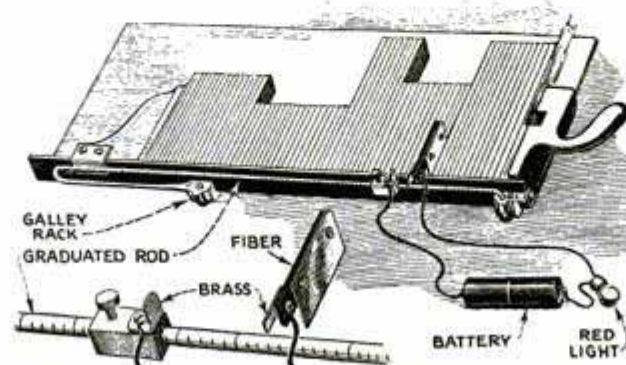
the pressure within the pot and raise the boiling point of the water, so that potatoes can be boiled 10 to 15 minutes quicker than otherwise.—Retta Conley, Los Angeles, Calif.

Coin Aids in Winding Alarm Clock

The small size alarm clock is rather difficult to wind owing to the short and small winding keys, and one is likely to pinch a finger between the keys and the hand-setting stem. The doubled finger-holds of the winding keys were pried apart just enough to allow the insertion of a small coin, and it was found that, with this extension, the trouble was entirely eliminated.—John B. Ingram, Mansfield, Massachusetts.

Linotype Signal Light Aids Operator

When a linotype operator has considerable type to set and arrange around cuts and panels, the simple signal device shown in the drawing can be used to tell him when the necessary depth in picas of each measure has been set. A $\frac{1}{4}$ -in. rod is bent, one end to fit on the front galley-rack bracket, and the other end flattened and attached to the other support. The rod is graduated in picas so that a stop, drilled to fit the rod, can be set at any point. A small clamp, consisting of fiber and brass, is clamped on the first linotype slug, or held between the first two slugs, the brass strip at the top being insulated from them. As the slugs travel along toward the stop on the rod, the brass clamp is carried with them. Electrical connections are made as indicated, two small flashlight cells and a red lamp being used in the circuit. As soon as the clamp touches the stop, the lamp lights, indicating that the desired depth has been reached.



Small Red Lamp on Linotype Galley Rack Helps in Arranging Type around Cuts

¶ If a rock is too large to handle, put a couple of sticks of dynamite on top of it, seal with wet clay, and detonate; the rock will break.

Electric Hotbed Easy to Make

By M. E. BRIDSTON

THE GARDENER or nurseryman who has electricity available would do well to consider the use of electric current in furnishing bottom heat in the hotbed. This has many advantages over the use of manure and is entirely practical, as has been demonstrated by Glen Cushing of Puyallup, Wash. Nurserymen have found it especially valuable, for with the electric hotbed it is possible to start and root plants in three months that took two years by the old method. All manner of plants are being rooted with electric heat, soft rosewood cuttings being ready in three weeks.

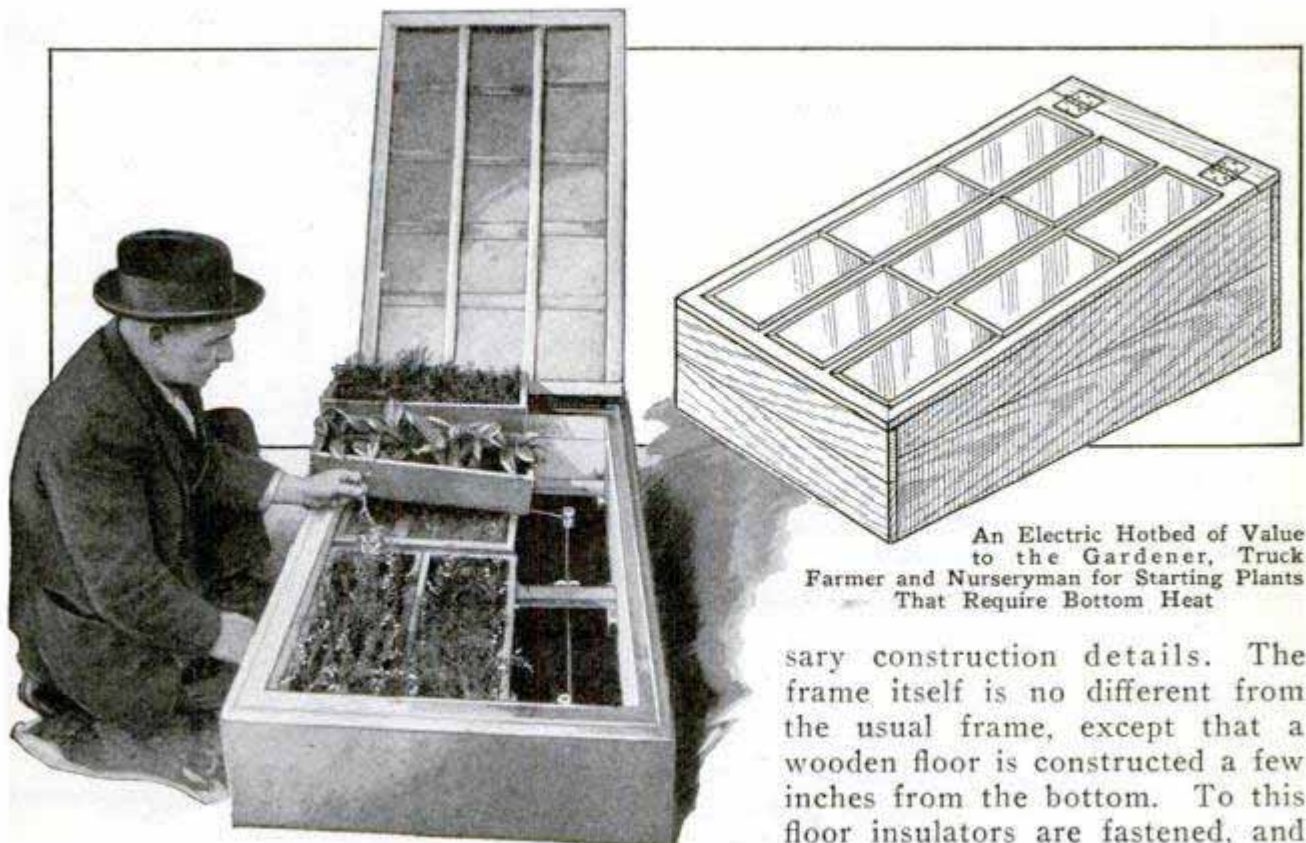
The hotbed is so simple that anyone can make it, the only equipment necessary being electric coils to furnish bottom heat instead of manure. The propagator, having absolute control over the heat, is enabled to force the root growth just when the cuttings require warmth, and this puts within the reach of the small nurseryman the opportunity of rooting those cuttings which are difficult to secure on the market. Every season sees a shortage of lining out plants in certain varieties after

the lists are out. The man with the heat box, however, scans the lists for his needs and proceeds to root those not otherwise obtainable.

This electric frame is also of great value to the farmer and gardener in starting all kinds of garden plants where bottom heat is necessary. The heat can be controlled to any degree desired, which is very difficult when horse manure supplies the heat.

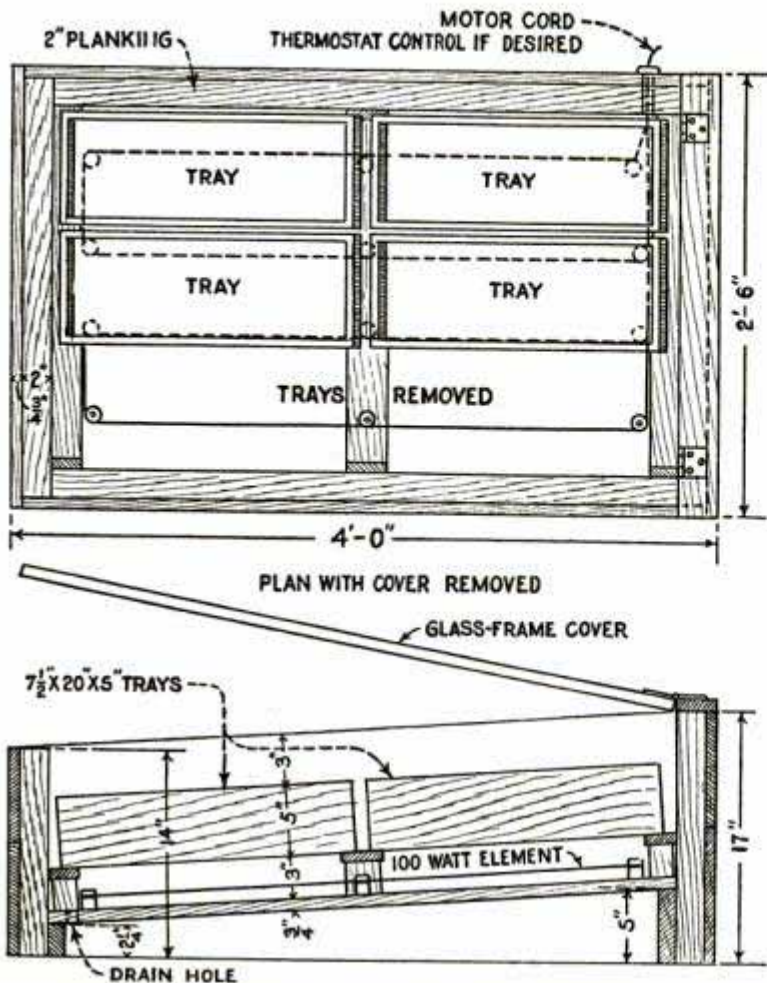
The electrically heated frames may be constructed in any size, from the window box, 8 by 18 in., to boxes many feet in dimensions. The housewife wishing to root her geraniums, or the plant lover desiring to obtain rare specimens, can also do so more easily with the electric frame. A small box, heated from the electric-light outlet, may be run at a cost of a few cents per month, and even the cost of the larger boxes is relatively low.

The first experimental frame constructed by Mr. Cushing was 2½ by 4 ft., and the heat supplied from an outlet on an electric range. The cost of heating this frame is about \$1 per month. The accompanying sketches give all the neces-



An Electric Hotbed of Value to the Gardener, Truck Farmer and Nurseryman for Starting Plants That Require Bottom Heat

sary construction details. The frame itself is no different from the usual frame, except that a wooden floor is constructed a few inches from the bottom. To this floor insulators are fastened, and



to these are attached the 100-watt heating elements. The floor should be sloping to provide drainage, with drainage holes at the lower end, or a metal plate may be placed between the seed trays and the heating elements to catch the drippings incidental to watering the plants. However, this precaution is not essential, for the coils are never hot enough to be damaged by the dripping water. The heating elements may be obtained through the local electrician. The seed boxes or trays rest on a frame rack and are removable.

At times there may be a slight advantage in having thermostatic control of the heat, although this is not essential. However, any cheap thermostat will serve the purpose, and thus the propagator will be assured of an even temperature that need not vary over a few degrees.

Repairing Aluminum Ware

To mend a hole in an aluminum vessel, get some solid wire rosin (not the kind having a rosin core) and cut off a piece about $\frac{1}{8}$ in. long. Ream out the hole in

the vessel to the exact diameter of the solder, which is then inserted in the hole and the projecting ends peined down with a hammer. The result will be a water-tight job and one that will last. If the hole is so large that a single rivet is found insufficient to close it, use two next to each other and run them together with a hot soldering bit.—F. A. Wilhelm, Mullica Hill, N. J.

Vacuum Cleaner Forces Draft for Stump Burning

Successful use has been made of an ordinary vacuum cleaner for stump burning by R. N. Miller, of the Washington state college extension department. A number of lengths of hose are attached to a fitting connected to the blower opening of the cleaner, and short pieces of iron pipe, serving as nozzles, are slipped into the ends of the hose. Several holes, about 4 in. deep, are bored in the roots of the stump, near the ground, and fires are started in the openings. The nozzles are then inserted in the holes and the vacuum cleaner is started to provide draft. After the blaze is well started, the nozzles may be removed.



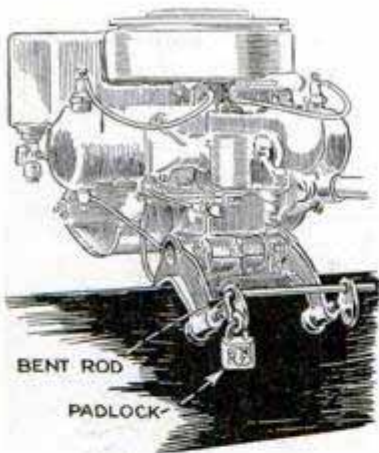
Stump Burning Made Easier by Draft Supplied by Vacuum Cleaner

Removing Old Cold Patches from Auto Inner Tubes

In the repair of auto inner tubes, there is usually some difficulty encountered in removing an old cold patch that leaks or is close to a hole. It can be removed very easily, however, by application of heat. Light a match and hold the flame to the old patch until it gets hot all over. It will then come off easily without tearing the tube.—Wilton Elwick, Collinsville, Ill.

Lock for the Outboard Motor

Because of its market value and ready portability, an outboard motor is tempting loot for the sneak thief. A simple and effective locking device to foil him can be made as shown in the drawing. The clamping wingnuts on most motors have holes drilled in them. Get a steel rod of such diameter that it can just be slipped through the holes, and about 4 or 5 in. longer than the distance from the center of one wingnut to the other. The rod is bent over at right angles near one end and an eye formed, of about the same size as the wingnut hole and alining with



one wingnut hole, so that a padlock can be inserted through both. Besides making it nearly impossible to remove the motor from the boat, if the clamps are securely tightened, the

rod will prevent the clamps from loosening by the vibration of the motor.

Use of Proper Sand in Mortar

In brickwork, the thickness of the layer of mortar determines to a great extent the size of sand to be used. Customarily the thickness of mortar between bricks in standard bricklaying practice is from $\frac{1}{4}$ to $\frac{3}{8}$ in., and the sand used should pass through a No. 12 sieve. Finer or coarser sand is used for thinner and thicker joints.

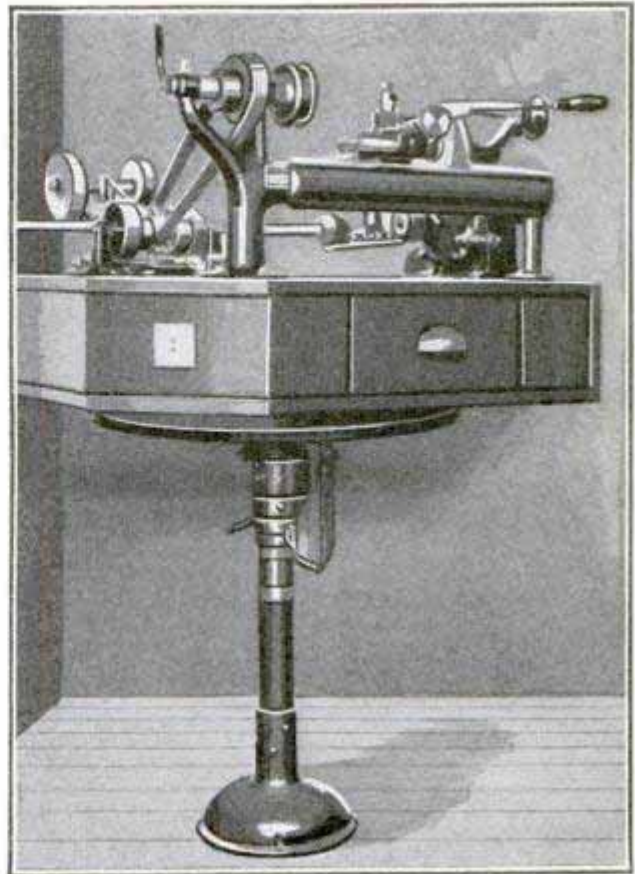
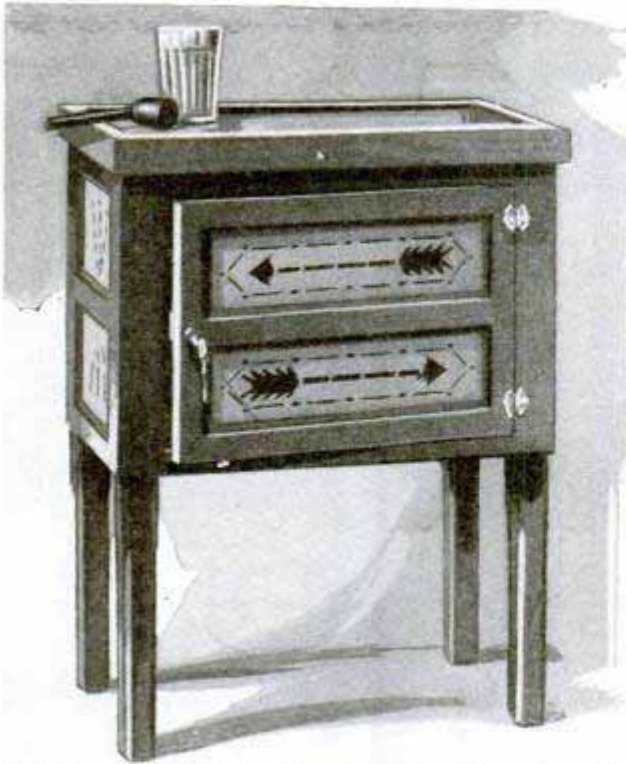


Table Holding Small Lathe, Grinder and Buffer Can Be Rotated to Obtain Good Light

Revolving Table for Small Lathe

My small lathe, grinder and buffer are mounted on a revolving table, permitting the tools to be turned around in any position in order to get the best light possible when working with them. The table top on which the tools are conveniently mounted is about 6 in. high and is fitted with several drawers. The revolving base on which the table is set consists of a rear-axle housing of an auto securely bolted to the floor, and a 24-in. wooden disk arranged to revolve on the top but fastened so that it will sustain considerable weight. The table holding the tools is then set on the disk and balanced, after which it is bolted down. Very little effort is necessary to turn the table in any desired position. In this particular instance no separate cord was run to the motor on the table, but a commutator arrangement was used to make constant contact while the table is being turned.—Richard Ton, Inglewood, Calif.

When cutting threads on wrought iron or steel, either in the lathe or with a die, use plenty of lard oil as a lubricant.



Old Pieces of Furniture Can Be Made Like New with Sandpaper Overlays

Sandpaper Overlays for Ornamenting Novelty Furniture

There are various objects of novelty furniture and cabinetwork whose appearance can be greatly improved by sandpaper overlays applied to the surface. A sample of such work is shown in the photo. Coarse sandpaper is used and designs are cut out to make the paper resemble a stencil. The surface of the wood under the cut-out sections is first painted or lacquered in suitable colors, which can be made highly glossy for contrast, and the sandpaper is then glued on with the rough side exposed. Molding, which can be obtained in all kinds of shapes and sizes, is used to cover the edges of the paper. This method of ornament is especially useful on furniture made of cheap wood, or old pieces of which the surface is marred beyond refinishing. The sandpaper itself can be painted or lacquered also.—Claude West, Chicago.

Kink for the Trout Fisherman

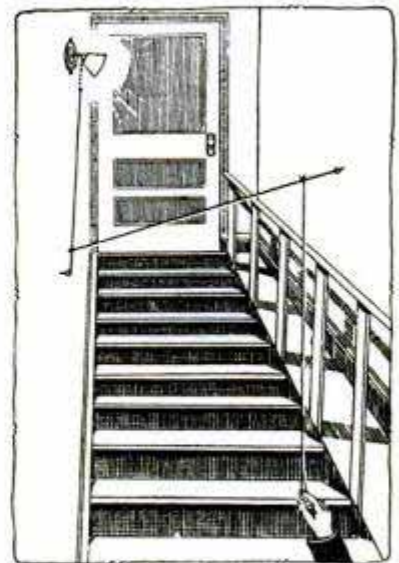
The trout fisherman will save himself many a ducking and an occasional bruise by wrapping a length of chain, having small pressed links, around the feet of his fishing boots. The chain will prevent slipping on wet, moss-covered rocks.

Cleaning Photographer's Flash Lamp

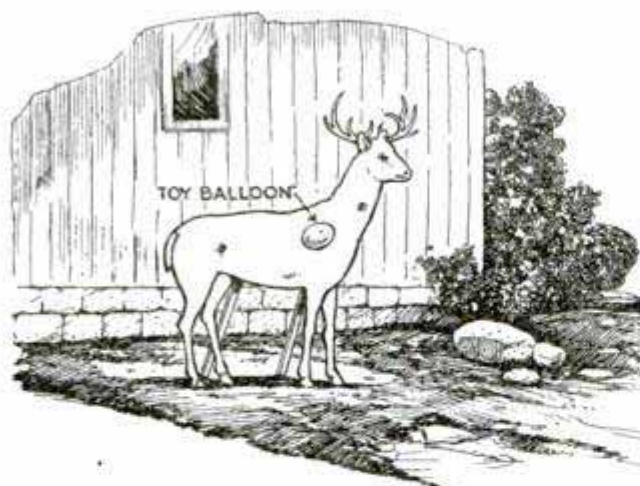
A photographic flash lamp will function properly only when it is kept clean and free from burned-powder residue. The cleaning is usually rather difficult because the powder clings like paint. An easy method of doing it is to submerge the lamp in boiling water, remove it while still hot and immediately sink it in cold water. The sudden expansion and contraction of the metal will instantly loosen the burned powder. This method is quite effective and will not injure the lamp.

Remote Control for Light Socket

When a long cord is used as a remote control on a chain-pull socket, an installation often found in hallways and stairways, the cord is usually passed through one or more screweyes to a convenient location. The objection to the usual installation, where the cord must make right-angle turns, is that there is quite a bit of friction between the cord and the screweyes, which wears out the cord quickly and also makes it rather difficult to turn on the light. A better installation is shown in the drawing. In this case it was necessary to make two right-angle turns with the cord. Three separate lengths of cord are used. One length is tied to the socket chain and to a screw-eye, where the first turn must be made; the second length is tied to the first cord and second screw-eye, while the third length is tied to the second near the second screw-eye, as indicated in the drawing. In this way a side pull is exerted on each cord, this having



the same effect as an end pull without the objectionable feature. The drawing, of course, is merely illustrative.—Carl G. Langland, Minneapolis, Minn.



Archery Practice Is Made Much More Interesting If Wooden Figures of Animals Are Used as Targets

Animal Target Adds Interest to Archery Practice

Much more enjoyment can be derived from archery practice if there is something to shoot at besides the conventional round target. With very little expense and work, realistic-looking animals can be cut from $\frac{3}{8}$ -in. plywood, a material that is very strong and able to stand considerable abuse from the arrows. After being cut, the figures are painted in natural colors both for the sake of appearance and for protection against moisture, which otherwise would loosen and warp the plywood in a short time. Narrow parts, such as the neck and legs, should be reinforced with 1-in. strips on the back. Braces, made of 1-in. stock, are hinged to the top

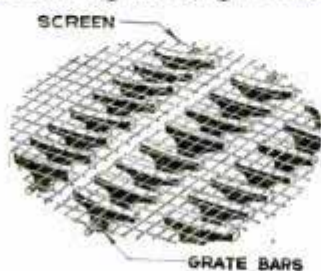
of the figure, and when these are pulled out, the target rests against them at a slight angle to the ground, preventing an ordi-



nary breeze from blowing it over. The vital spots of the animal may be marked in order to add extra zest to the game. In one case, a toy balloon was blown up and pushed into a hole cut in the figure to represent the heart. Upon being struck with an arrow, the balloon burst with a bang.—C. Homewood, Hollywood, Calif.

Emergency Wood Grate for the Furnace

When coal cannot be obtained, or it is desired to burn wood for any other reason, the grate bars of the furnace must be sufficiently close together to prevent the burning embers from falling through into the ashbox. In my coal-burning furnace, the grate bars were too far apart, and, to remedy this condition, I cut a circular piece of heavy galvanized screen, the kind used for ash sifters, making it slightly smaller in diameter than the diameter of the firepot just



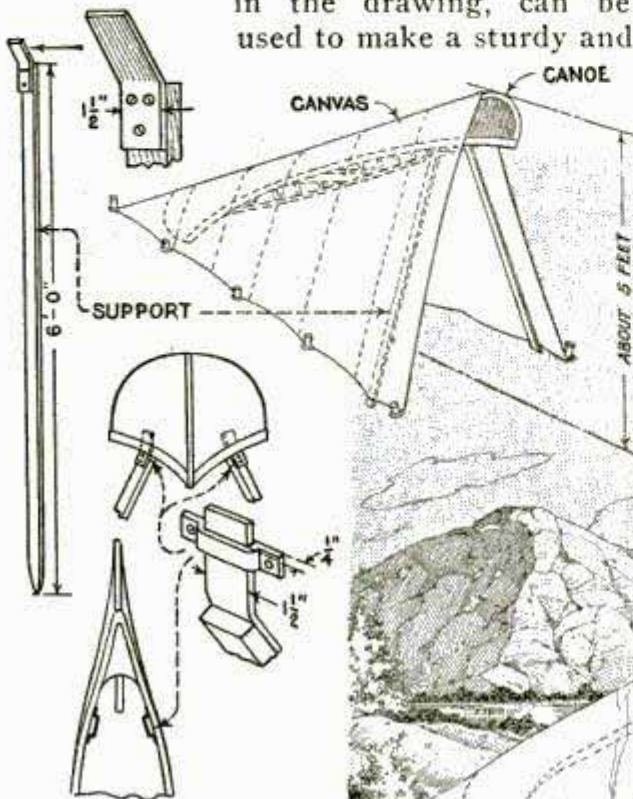
above the grates. After cutting the piece in half, so that it could be passed through the furnace door, I laid it on the grates as shown in the drawing, and found that it kept the wood embers from sifting through, and at the same time permitted the necessary draft.—L. B. Robbins, Harwich, Mass.

Rubber Mat Protects Door

Children often kick against doors when opening them, which mars the finish. To prevent this, a neat rubber mat can be tacked on the bottom of the door. The mat can be obtained from a five and ten-cent store, and will not spoil the appearance of the door.—Chas. Latour, Jr., Plattsburg, N. Y.

Camper's Canoe Helps to Make Shelter

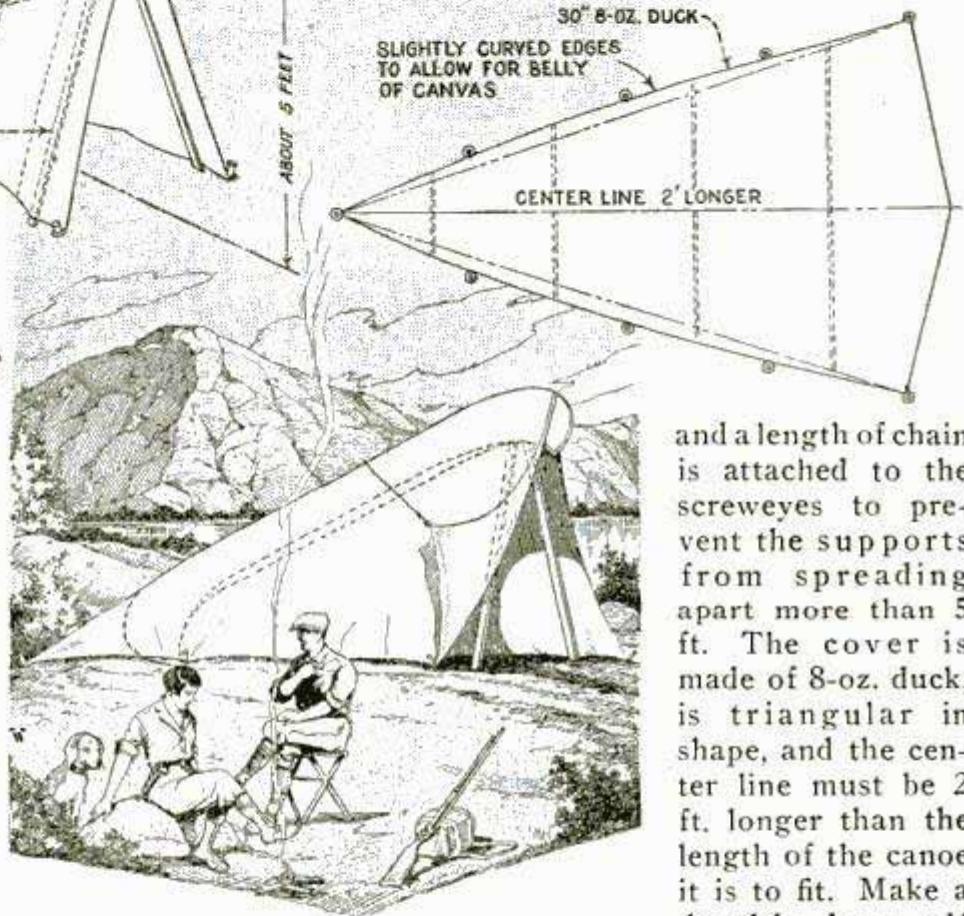
Any canoe, set bottomsides up and covered with a large piece of canvas, as shown in the drawing, can be used to make a sturdy and



roomy shelter, eliminating the necessity of carrying a separate tent and thus reducing the weight of the camping outfit considerably. Two 6-ft. poles of $\frac{3}{4}$ by $1\frac{1}{2}$ -in. stock, preferably

hardwood, are used to raise one end of the canoe about 5 ft. above the ground. The lower ends of the supporting sticks are pointed. To the top ends $\frac{1}{4}$ -in. flat-iron tongues are attached; these fit into brackets made of the same material, and screwed to the inside of the gunwale or

rail near one end of the canoe. The tongues should be a sliding fit in the brackets so that they can readily be inserted and removed and they must be slightly bent so that the supports will spread about 5 ft. apart at the ground. After this adjustment has been made, a heavy screw-eye is driven into each support, near the top,



Large, Triangular Piece of Canvas Staked Down over a Canoe, Makes a Sturdy and Roomy Shelter for the Camper and Eliminates the Need of a Separate Tent

and a length of chain is attached to the screw-eyes to prevent the supports from spreading apart more than 5 ft. The cover is made of 8-oz. duck, is triangular in shape, and the center line must be 2 ft. longer than the length of the canoe it is to fit. Make a double hem all around the edge and sew in four

rope loops on each side, spacing them apart at equal intervals. Throw the canvas over the canoe and stake down as shown. Nothing short of a real hard gale will blow this shelter over, and the occupants will be kept entirely dry.—L. B. Robbins, Harwich, Mass.

Selecting House Plants

House plants, like pets, undoubtedly do much to keep the home more cheerful during the winter months, but they have to be chosen with regard to their ability to withstand indoor conditions. These, in modern homes and apartments, are none too good for humans, and pretty hard on

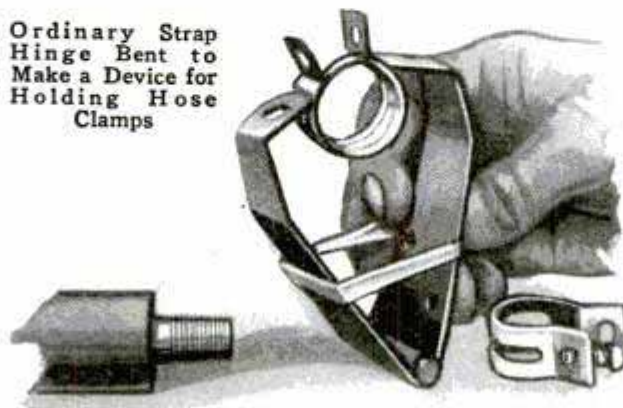
plants. The best method of meeting the situation is to choose plants that can stand draft and, if possible, also endure having their roots flooded and deprived of air occasionally. Some of the old favorites, like geraniums and oleanders, are of this kind. The native home of the oleander is in Mesopotamia, where it is accustomed to standing with its roots in

river mud and its leaves in air that would discourage anything short of cactus. In general, you can guess whether or not a prospective house plant possesses this kind of hardiness by looking at its leaves. If they are well covered with hairs, like the leaves of a geranium, or if they are thick, hard and have a polished waxy or horny surface, like the leaf of an oleander, they can probably endure the conditions found in our homes and apartments. Primulas and some of the begonias belong to the former class, while the Jerusalem cherry, and the Boston fern belong to the latter. Their leaves hold out against drouth because they save the water in the plant by cutting down the evaporation loss. Another of nature's methods of reducing evaporation is to limit the number of leaves. The cactus does away with leaves altogether, and the Christmas thorn and the poinsettia, both of them desert-dwelling euphorbias, develop leaves but sparingly. The century plant and aloe keep their leaves but make them thick and stemlike, and at the same time build up water-storing pulp, cactus-fashion, within them. Other plants meet the water-shortage peril by storing the indispensable fluid in their bulbs or corns, calla lilies, amaryllis, tulips, narcissi and jonquils being examples of this group.

Compressing Hose Clamps

For compressing hose clamps in order to enter the screw, a simple jig can be made from a common strap hinge. It is bent to the shape shown in the photo so that the ends will have a viselike grip on the clamp. A small notch is filed on each edge to keep a rubber band in position, the band serving to hold the jig in position against the hose clamp. The hinge is then placed in a vise which is used to compress it. It takes only a few minutes to make this device which will be of considerable utility.—F. W. Bentley, Jr., Missouri Valley, Iowa.

Ordinary Strap Hinge Bent to Make a Device for Holding Hose Clamps



Section of Old Inner Tube on Radiator Spout Protects Finish

Splash Guard Protects Auto Finish

Lacquer finishes on auto radiators are quickly attacked by anti-freeze solutions containing alcohol. To prevent damage from such liquids, provide a rubber splash guard cut from an old inner tube. It should be a square piece, as large as possible, with a small hole that will fit tightly over the filling spout of the radiator, as shown in the illustration. The natural curl of the section of inner tube forms a sort of trough which will guide any liquid spilled and allow it to drip off on the ground.—G. A. Luers, Washington, D. C.

Old Inner Tubes Used for Tractor Hose

During the harvest season, the water hose of our tractor became so badly rotted that it was impossible to retain water in the cooling system. To make a quick repair, we cut the hose in two about midway between the ends and slipped a length of 3-in. inner tube over the cut to form a sleeve. Twine was wrapped around the ends, and the improvised repair held out the entire season without any leak.—Geo. G. McVicker, North Bend, Nebr.

Stunts for



"YEAH, but who goes to parties?" The answer is: "Everybody." It may be a full-dress affair with all the trimmings, or maybe just a quiet foursome in Joe's back room, but everybody goes to parties. The only fellow who is a total abstainer is the wooden cigar-store Indian, and, today, "there ain't no sech animal!"

Try this one: It's quite simple; you merely kick at a matchbox. And how! Mark a line out on the floor. Take a matchbox and place it in front of you, on the floor, just exactly three lengths of your foot from this chalked line, as shown in Fig. 2. Now, toeing this line, and standing on one foot, can you kick the box of matches with the toe of the other foot, as in Fig. 1? Maybe you can do it, maybe not!

①

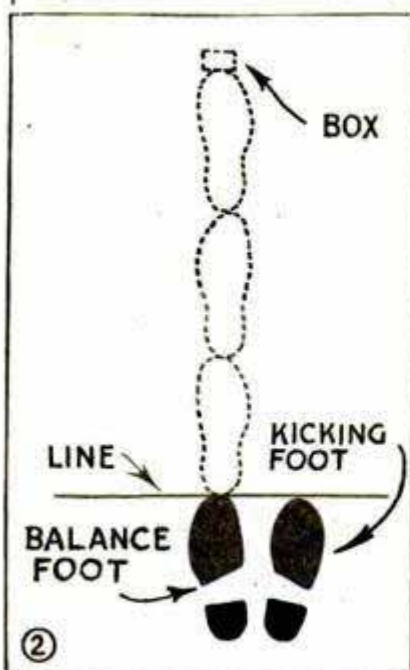


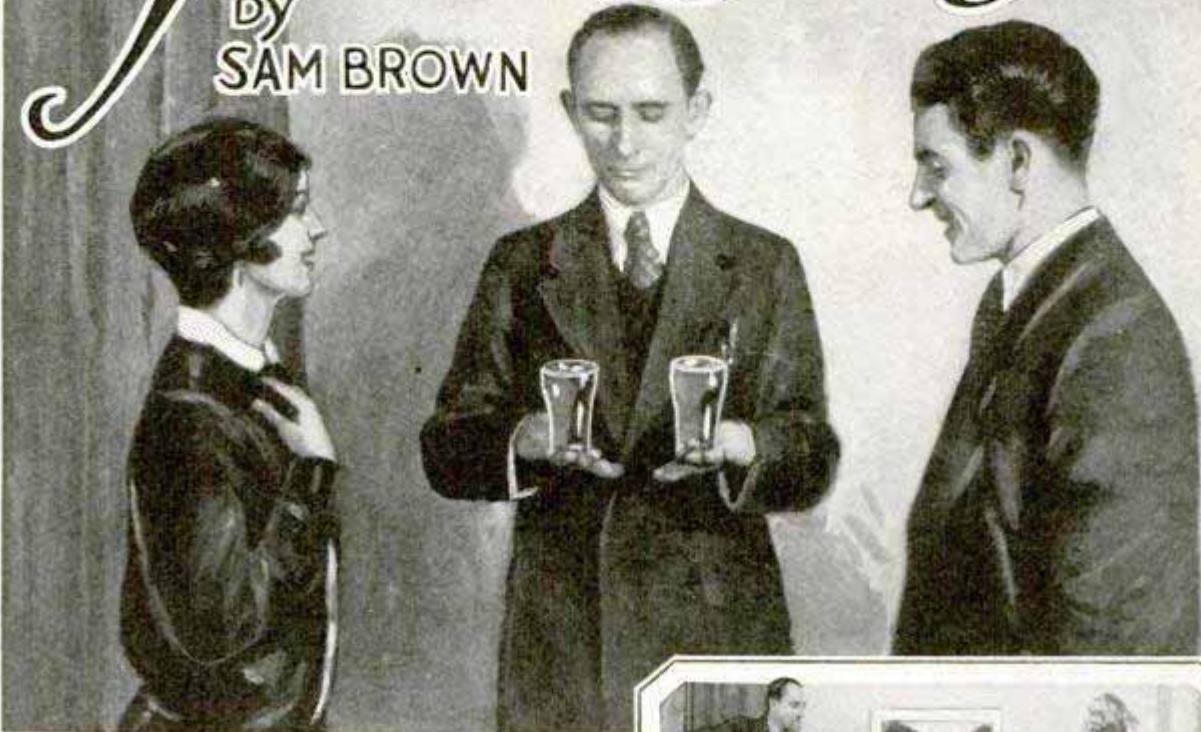
Diagram of Box-Kicking Stunt

Rules for this stunt do not allow you to score if you lose your balance; neither do you score if you change the position of the balancing foot. Try it! If the next morning finds you with a crick in your back, forget it. You ought to be in better shape, anyhow.

After the bridge game breaks up, try this little stunt of "In your hat." Here's the idea: You place a hat, open side up, on the floor several feet distant from where you sit. The trick is to toss the cards into the hat, as pictured in Fig. 4. At first sight, this may look like a simple little bit of byplay, but, get the bunch started and watch the fun. Score is kept by counting the number of cards "hatted" by each player, and the low-score man is "permitted" to pick up the cards at the completion of each round. Here's a tip: If you will hold the card by the upper left-hand corner between your first and second fingers, as shown in Fig. 3, you will find your aim considerably improved.

Your Party

by
SAM BROWN

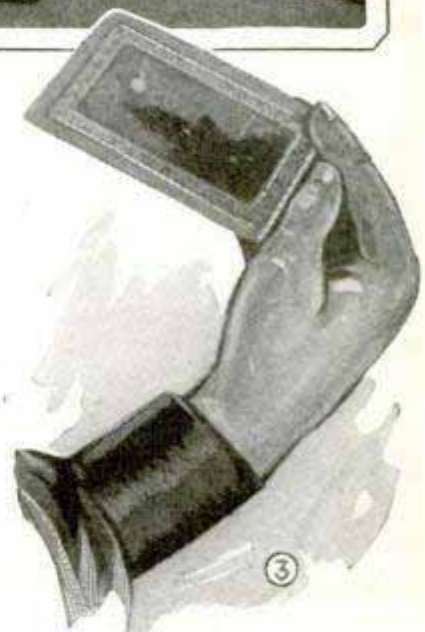


If at any party there comes the "felleh" you would gladly push into the river if nobody were looking, try to inveigle him into this: Tell him you can tell whether he is of the same dominating type as Jack Dempsey, Lindbergh, or Barney Google (thumbs down and take your choice) by a very simple expedient. This expedient calls for two glasses of water. Ask the friendly enemy to hold out his hands, fingers extending and palms down. Now, place the two glasses of water on the back of his fingers, one on each hand, as shown in Fig. 5. Tell him he must look very serious for ten seconds and look into the glasses.

Of course, he does this easily and smiles at you triumphantly. But, it's a short-lived grin! It rapidly changes into a sickly smile and then a look of utter dismay as he becomes aware that everyone is withdrawing from his vicinity, leaving him to wonder "how in heck" he is going to put the glasses down. His dilemma furnishes considerable amusement for everybody. Of course there is a way in which he can set down the glasses. But figure it out for yourself!

The next one is a "chestnut." In fact, it's so old that it is practically unknown to the younger generation.

Here's the layout: Get a bottle and place it, on its side, on a table. Put a cork in the mouth of the



Best Way of Holding Card

bottle, this cork being considerably smaller than the bottle's mouth. Wager anyone that he cannot blow the cork into the bottle by blowing from his mouth directly upon the end of the cork, as pictured in Fig. 6. "Zat so?" he grunts, and the fun begins.

Actually, the stunt is an impossibility to anyone not in the know. It will be found that the cork stubbornly refuses to enter the bottle, and instead, flies out with some force into the face of the blower. This is due to the pressure of the air from



the inside of the bottle, which cannot escape around the cork owing to the external pressure of air caused by blowing. Well, then, how ya gonna blow the dern thing in? Simple! Merely take a soda straw, or roll a piece of paper to form a tube, and with this tube direct your breath so that it strikes the exact center of the cork, as shown in Fig. 7. It will then be found that the cork will be forced into the bottle, the displaced air escaping without obstruction.

The next little conceit is pretty rough business. At least they think so in the army. Get a curtain ring and tie it up somewhere with a piece of string. Hand a spectator a cane, yardstick, or what have

you, and ask him if he can advance steadily on the ring from a distance of about ten feet and run the end of the stick through the ring. Believe it or not, it takes a good eye. What's that? Oh, yes, in the army they do it with a long lance, and on horseback, and the ring is a large hoop, and they ride full tilt. If that makes any difference.

Can you do this one? Look at Fig. 9. You see a matchbox cover on top of a matchbox drawer. The thing is: Can you change the relative positions of these two parts of the matchbox, that is, place the drawer on top of the cover, and all this by using the thumb and forefinger of one hand only? Think it over. Give up? All right: Merely bend over, and place your mouth squarely over the end of the matchbox cover, as shown in Fig. 10. Inhale sharply. The resulting vacuum will cause the drawer to cling to the cover with sufficient tenacity to enable you to quickly raise it to an upright position, as shown in Fig. 11. In this position, you take the cover with the thumb and forefinger of your right hand—one hand only, mind

you—and then triumphantly return it to its place on the table. It's as simple as all that!

Here's something else: Tie a small ball, ring, or anything else that is handy, onto the end of a piece of string.



This should be done beforehand so that you can take the equipment from your pocket and announce, very gravely, that this key and string is possessed of a very magical property. This magical property has to do with the detection of males and females. The whole procedure calls for the subject taking a sitting position on a chair. He (or she) is then requested to look up at the key, which the performer holds suspended directly above her nose, as in Fig. 13. If the key swings backward and forward, it is "talking" to indicate that the subject is a lady; if the key swings from side to side, the subject is a gentleman. There is no visible movement of the performer's hand, and the divination is absorbingly mysterious.

As for the secret—there isn't any! The key actually swings the way you want it to! You merely think "backward and forward," running your eye from one end to the other of an imaginary line in this direction, and the key, slowly at first and then with increasing momentum, will swing in unison with your



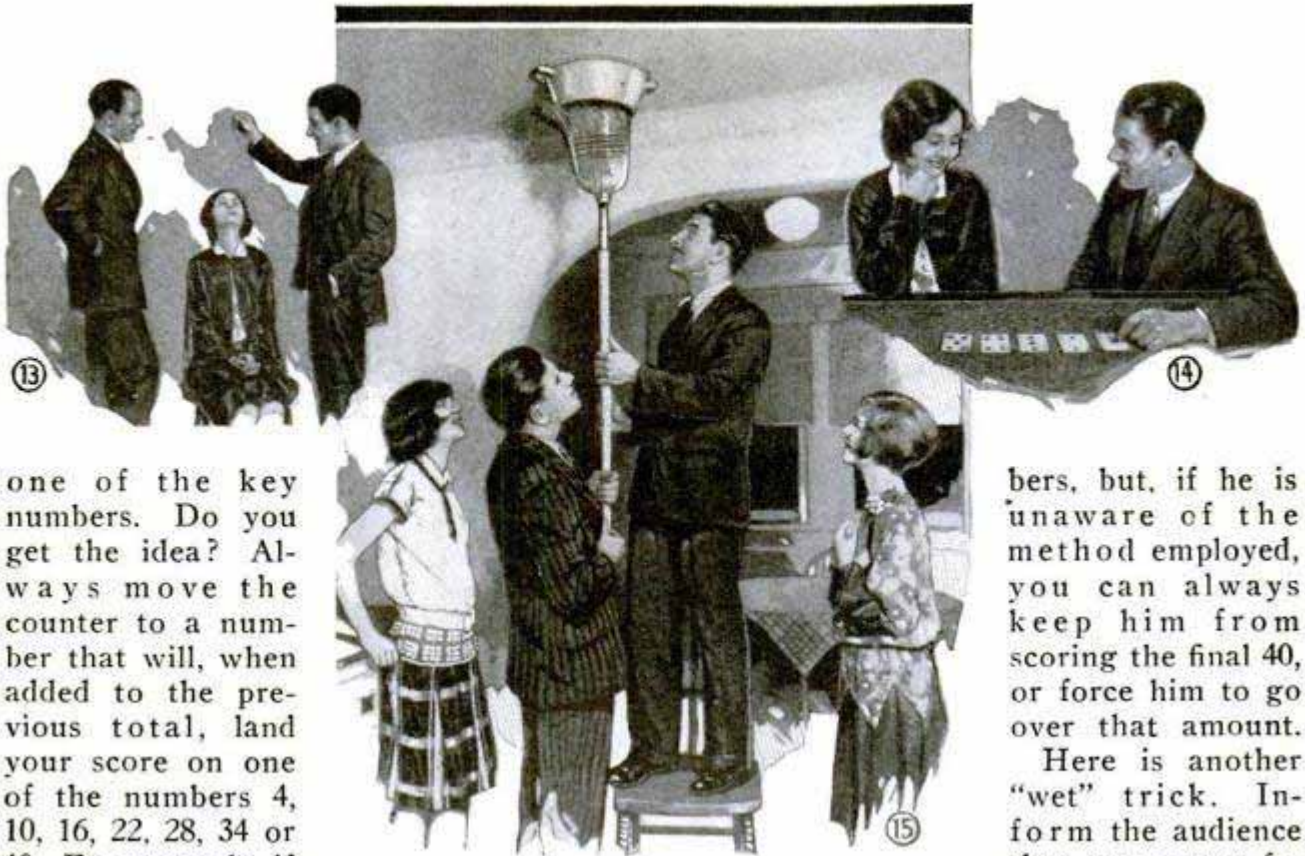
lecting aces, deuces, treys, etc. Two people play the game and each has one set of five cards. The first player places a counter, which may be a poker chip, a coin or anything else that is handy, on one card, say the four. This scores 4. The second player places his counter on any card of his set, let's say the 5. This is added to the first figure, making

the second player's score 9. The first player then moves his counter to another card, the 1, and this is added to the 9, making the total score, so far, 10. The big scramble is this: The player who first scores 40, or who forces his opponent to score more than 40, wins the game.

thoughts. There is no visible movement of your hand—it is apparently made of iron—yet the unconscious muscular vibrations are of sufficient strength to sway the magic pendulum.

Here is one kind of game that everybody likes to play—you can win every time! Place two sets of five cards on the table, each set numbered from one to five. Ordinary playing cards will answer, se-

Now, for the big swindle. How can you win every time? Like this: You start the game, always playing the 4. The key numbers that you must plan to reach after the initial play are 10, 16, 22, 28, 34 and 40, which are all multiples of 3, plus 1. You may let your opponent start, if he or she insists, but as soon as possible you should make your play so that your score, when added to the previous total, will fall on



one of the key numbers. Do you get the idea? Always move the counter to a number that will, when added to the previous total, land your score on one of the numbers 4, 10, 16, 22, 28, 34 or 40. For example, if he starts with 5, you play 5 also, and your score will be 10. If he, in his haste to reach the final score, plays the 4 (the counter must be moved for every play), making his score 14, then you play a 2 and land on the 16. Your opponent may beat you to a possible two out of the key num-

bers, but, if he is unaware of the method employed, you can always keep him from scoring the final 40, or force him to go over that amount.

Here is another "wet" trick. Inform the audience that you are a famous juggler. You'll get nothing but shouts of "prove it!" Take a mental note of the "felleh" who hisses the loudest; it comes in handy later. Now, what you propose to do is to balance a basin of water on the end of a broom handle. To get this difficult maneuver under way, you take a chair, and, standing on this, press the basin of water to the ceiling of the room. The broom handle is then centered squarely against the bottom of the pan, so as to hold it against the ceiling, as shown in Fig. 15. The performer then asks a spectator (remember that fellow who hissed the loudest?) to hold the stick while he gets down from the chair. This is done, and the chair is removed.

And there you are! A certain party gradually becomes aware of the fact that everyone is watching him intently. This "certain party" is the man holding the stick—with the pan of water at the other end. He may think this absorbed attention rather strange at first (he isn't doing this juggle, is he?) and then, suddenly, he realizes that without help he cannot get the pan down from the ceiling.

Believe it or not, his facial expression is worth watching. Of course, someone may eventually come to the holder's assistance. Needless to say, this is not ab-



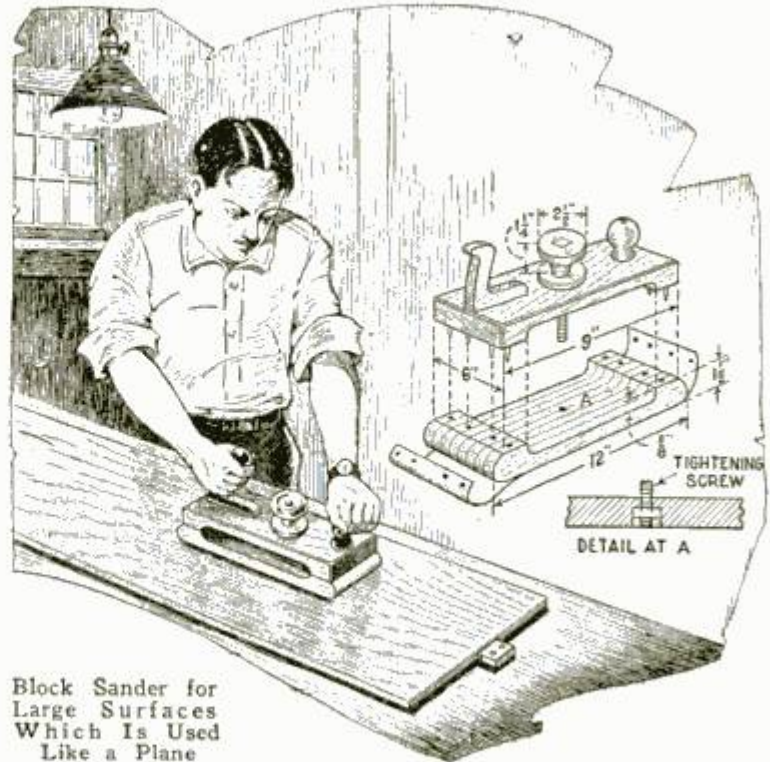
solutely essential. It makes a magnificent trick the other way. After the water is spilled, somebody mops it up good-naturedly, and all is well again. Very few murderers are convicted, in any case. Somebody suggests that you do the stunt in the kitchen!

A Locking Tool-Box Handle

A handle for the tool box, which will save considerable time, can be made of heavy flat iron, as shown in the illustration. It can be made of two separate lengths with a wooden grip between them as indicated, or if desired, it can be made of one length of flat iron bent to a U-shape. The sides of the handle are drilled and slotted as shown and are pivoted on two screws driven into opposite edges of the lid, so that, when the lid is swung back, the handle goes with it as in the lower detail. Notches, filed lengthwise in the ends of the handle, allow it to be slipped over another pair of screws, also driven into the edge of the lid. In this position, the handle is used for opening and closing the lid. When it is necessary to use the handle to carry the box, the lid is closed and the handle is disengaged from the screws just mentioned, after which it is brought to a vertical position. This action causes



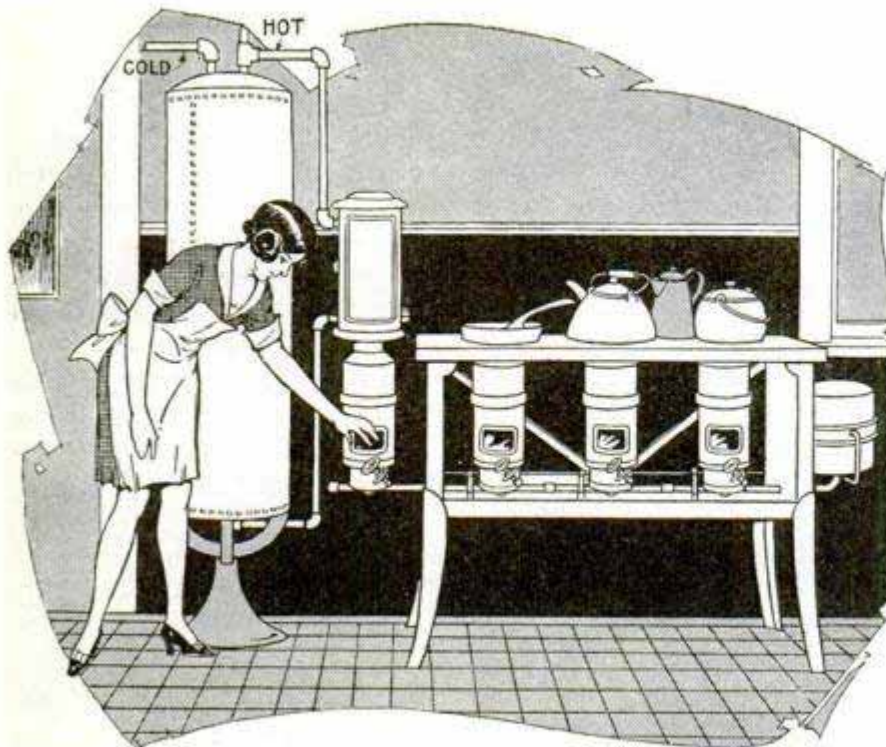
two notches, which are filed half way across the width of the handle and at a slight angle, to engage with a third pair of screws driven into the sides of the box at a point in line with the notches. The handle always clamps the lid securely down on the box when the box is carried, preventing the loss of tools and equipment.—G. A. R. Peterson, Alma, Kansas.



Block Sander for Large Surfaces Which Is Used Like a Plane

Sanding Block for Large Surfaces

Using a piece of sandpaper on an ordinary block of wood is rather inconvenient as one must hold the paper against the edges of the block, and must exert a downward pressure at the same time. Anyone who has to sand large surfaces occasionally will therefore appreciate the sandpaper plane shown in the illustration. It consists of two sections between which the paper is clamped securely. The lower section is made up of a number of pieces of 1-in. material, preferably maple, nailed and glued together, or it can be made from a piece of 2 by 6-in. stock. The upper section is made the same size, the dimensions being given in the drawing. To insure a tight grip on the sandpaper, a number of nails are driven through the upper piece in a row, near each end as indicated, so that they will project on the underside about $\frac{1}{4}$ in. The two sections of the sander are then pressed together and tapped with a hammer to drive the nail ends into the lower part, a piece of sandpaper being inserted between them. A tightening screw is provided in the center and regular plane handles are attached to the top piece. The old paper can be removed and a new one inserted in a few seconds.—W. Clyde Lamme, Downers Grove, Ill.



Extra Burner on an Oil Stove Used to Heat Water Coil in the Range Tank during the Summer

Water-Heating Installation for Oil Stove

In our home we have running water but no gas. The kitchen-range boiler has always given plenty of hot water during the winter, when the range was in use, but until we connected a heating coil to it and installed an extra burner on the oil stove to heat the coil, it was entirely useless during the summer. The oil stove was placed so that the extra burner would be located directly under the heating coil. The effect is the same as a gas heater, except that it is slower. It is an easy matter to attach an extra burner to the stove: Remove the cap from the pipe, substitute a coupling and then screw in a section of pipe taken from a discarded burner. The pipe is cut and threaded to fit and the cap is replaced on the new end. A suitable method of bracing the extra burner is also easy to improvise, if braces are needed. —A. C. Dayton, Cheshire, Conn.

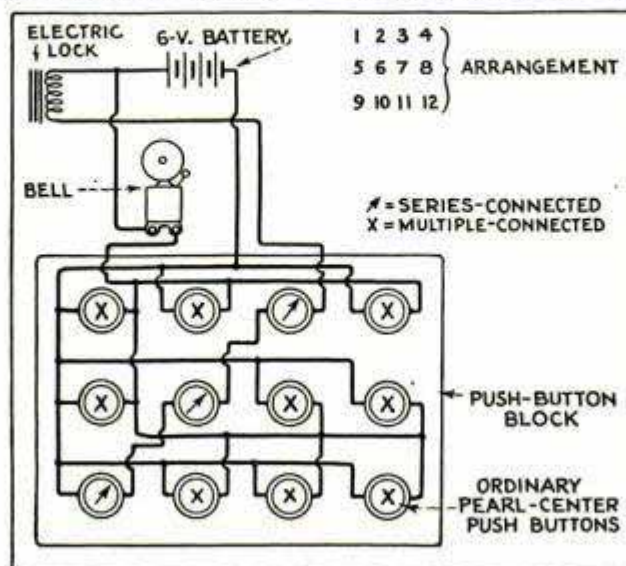
Patching Dents in Boat Hulls

Red lead and Portland cement mixed, half and half, with oil to a putty consistency, form an excellent patching material for holes, up to the size of a silver dollar, in boat bottoms. The edge of the hole should be dry, rough, and pegged with small galvanized nails, projecting slightly to reinforce the cement. The patch hardens very slowly, hence it is best to do this work in winter, or while the boat is out of commission. For a quick repair, cement and water is fairly satis-

factory. It is then unnecessary to have the wood dry, and the boat can be put to use again, without danger to the patch, in about two days.

Thief-Proof Wiring Arrangement for Electric Lock

The diagram shows a wiring system for operating an electric lock by means of a block of push buttons, three of which, wired in series, open the lock, while all the others will ring an alarm bell when depressed. One not familiar with the key will not tamper with the switches, as the bell indicates his presence and causes him to depart before the owner appears. The switches should be arranged on a hardwood, metal or slate panel attached to a wall, both panel and wall being drilled for the wires so they cannot be tampered with and the panel bolted through the wall, if possible.—W. J. Murrow, Macon, Ga.



Wiring Arrangement for Operating an Electric Door Lock and Alarm Bell

One-Man Winder for Model Planes

By HI SIBLEY

THE ONLY proper method of putting power in a model airplane is with a mechanical winder, but this requires an assistant. There are, therefore, some disadvantages in that. Sometimes the experimenter wishes to try out a new model alone; again, assistants are not always available, especially in the early morning when air conditions are good.

The simply made winding frame described here will enable one pair of hands to do a more uniform job of winding than two, and should be a part of the amateur's regular equipment. A glance will show how easily it is made.

Start with the main frame member, Fig. 1, using material about $\frac{3}{4}$ by 1-in. wide. The length depends entirely upon the size of the plane you expect to use. We will assume we are building the frame for a standard commercial type with a 30-in. fuselage. In this case, the long frame

same width as the piece it rides on. Guides made of sheet metal, screwed to the top, allow it to slide along the main frame.

At the front end of the carriage, attach a slotted piece of flat iron, bent in the manner shown, to support the propeller when winding. This carries all the load, a V-block supporting the rear of the fuselage merely to keep it in line. There is no strain whatever on the fuselage. Note that the V-block, detailed in Fig. 2, is slightly offset so that rubber strands will clear the tail structure while winding.

In a convenient position for the thumb of the left hand, which holds the frame, install a brake for the cord shown. This brake is simply a piece of hardwood cut to the shape indicated in Fig. 2. A rubber band acts as a spring to keep it free when not required, and a slight pressure of the thumb clamps the wood against the cord. For the latter, use a stout cord

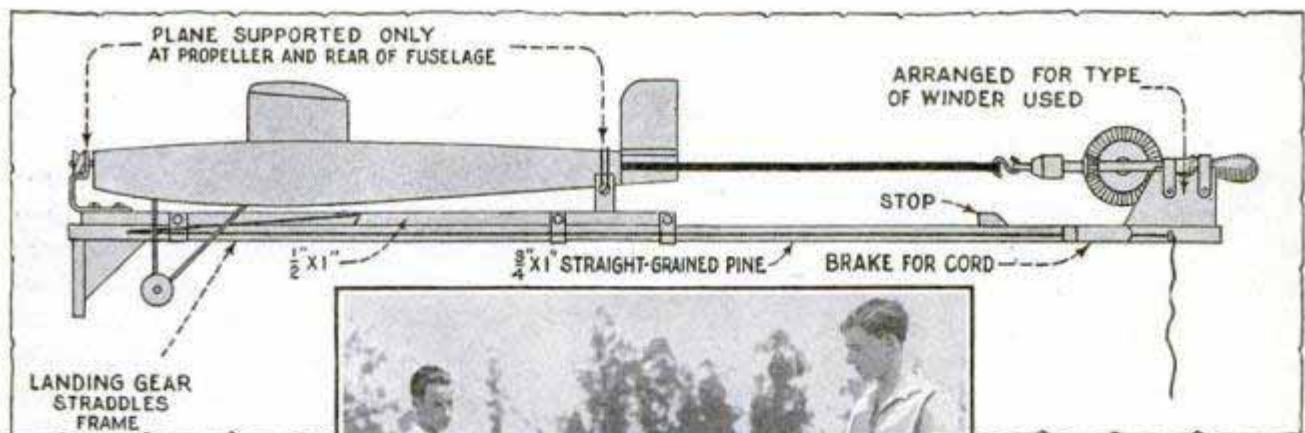


Fig. 1

piece should be about 6 ft. 10 in. in length, so that the rubbers can be stretched about two and a half times their normal length in winding. A straight-grained piece of spruce or pine is ideal for this. The carriage for the plane should be about the same length as the fuselage and need be only $\frac{1}{2}$ in. thick, but the



The Simple Mechanism in Fig. 1 Enables Builder to Wind Motor Single-Handed

similar to a mason's chalk line. Lead the cord from a screw-eye in the carriage, forward through one in the frame, then back to the rear and under the brake.

If a hand drill is used in connection with this frame, the shape of the block shown will serve to hold it in position. For the egg-beater winder the block must be altered a little

This Drawing Shows How the Model Winder Is Operated; the Plane Is Allowed to Move toward the Operator as the Motor Is Wound Up

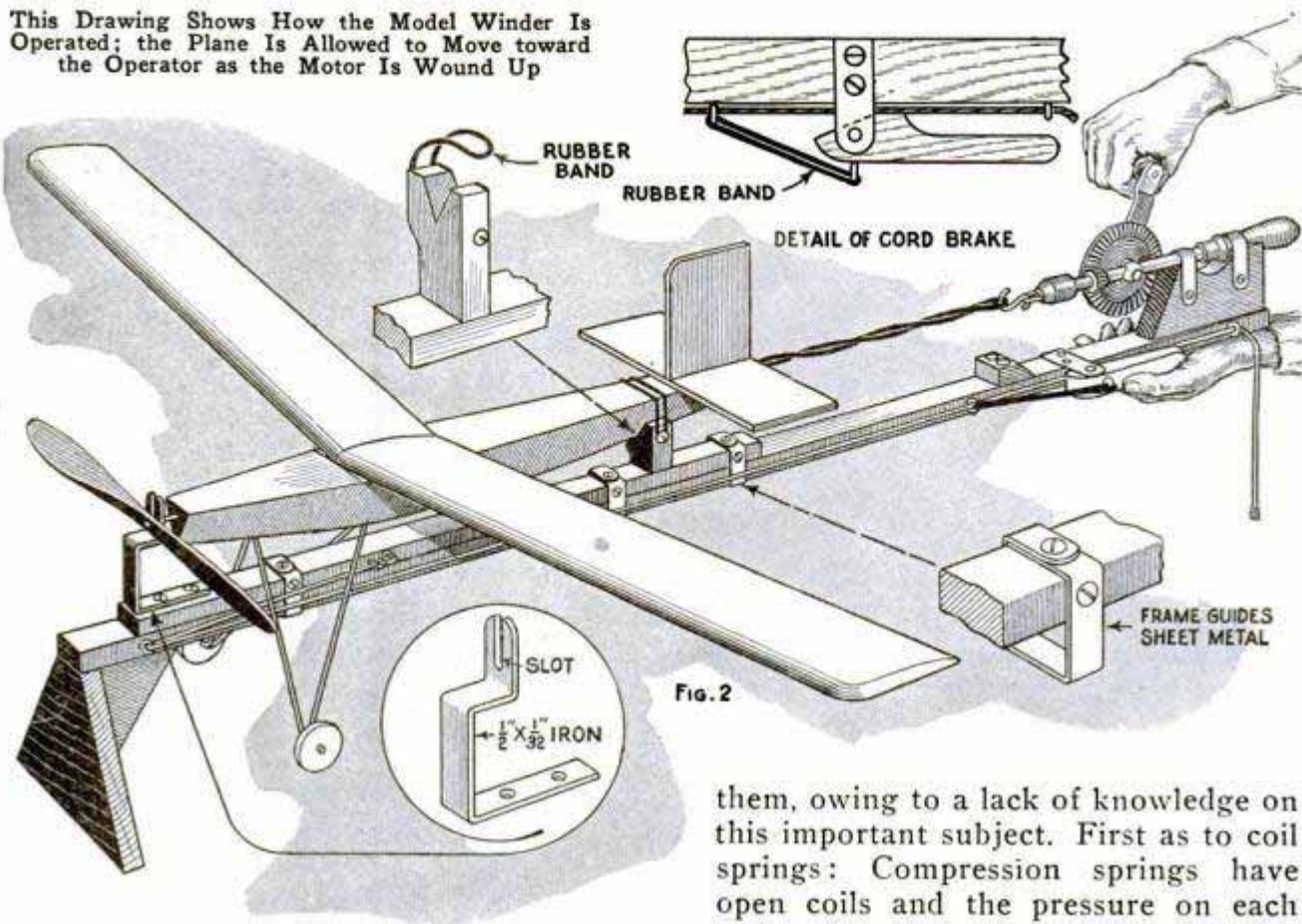


Fig. 2

in size and shape. A triangular block under the front end of the main frame rests on the ground when not in use and eliminates tendency to twist sideways.

To wind the motor, slip the propeller shaft into the slotted support and secure the fuselage by drawing a rubber band over the V-block, before detaching the S-hook. Now adjust the distance between winder and tail to your satisfaction, clamping it in the position temporarily by giving the loose end of the cord a couple of twists around the end of the frame. Next attach the S-hook to the winder, press the left thumb on the brake and begin winding, at the same time gradually paying out the cord by pressing so that the plane moves toward you. This will insure a more uniform job than could be done with the aid of an assistant. A stop on the frame keeps the tail of the plane from striking the winder when the carriage is back all the way.

Making and Using Coil Springs

The experimenter or mechanic often spends time trying out springs that could not possibly do the work expected of

them, owing to a lack of knowledge on this important subject. First as to coil springs: Compression springs have open coils and the pressure on each end is toward the center. Tension springs have their coils wound close together; the working pressure on their ends is away from the center. A compression spring of greater strength is made by increasing the size of the wire; making fewer coils per inch of length, or decreasing the outside diameter of the coils. When this kind of spring is compressed, its outside diameter is slightly increased. Where a spring fits in a hole, this should be allowed for. A given weight will compress a long spring more than a short spring, otherwise of the same dimensions. In building a mechanism with a spring that is to be compressed, see that in the extreme closed position there is room left for the spring itself. A stronger tension spring is made by increasing the size of the wire, or by decreasing the outside diameter of the coils; and a weaker one by changes in the opposite direction. A compression spring of fair quality may be made from a tension spring by spreading the coils with a screwdriver. The loop on the end of a tension spring can be made, with pliers, from the end of the spring wire. Springs may be coiled from spring wire, brass or steel, or from piano wire. Spring wire comes an-

nealed or tempered; if the former is used, the spring has to be tempered after it has been coiled.

Chest for Men's Hats

Usually a man's hat is laid on a shelf or hung on a hook in the closet where it is exposed to dust and where it is likely to be knocked down, which results in soiling it and getting it out of shape. A chest of four or five drawers, each just large enough to take one hat, can readily be made by anyone handy with tools, or if desired, can be ordered from a cabinet-maker. The chest provides an excellent place for storing hats not in use. It keeps them out of the way but easily accessible whenever needed. Com-
modes of this type are supplied by one New York hat retailer, as a



convenience for his customers.—D. P. Hill, Long Island, N. Y.

Packard Woodside
Cure for Wet Distributor

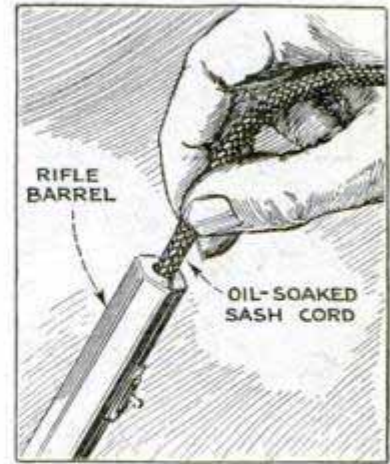
An oilcan filled with gasoline is a simple cure when a wet distributor will not permit a car to start. The gasoline, squirted over the wires at the top of the distributor, spreads over them and the bakelite surface, displacing or insulating the moisture particles that do the harm. A very small amount is sufficient.—A. Stenson, Gardena, Calif.

Removing Coffee and Milk Stains from Clothing

To remove coffee and milk stains from clothing, proceed as follows: Make a solution consisting of glycerine, 1 part, ammonia, 1/2 part, and water, 9 parts. Apply it to the spot, using a small brush, and then immerse the stained part of the clothing in the solution for 8 to 10 hours.

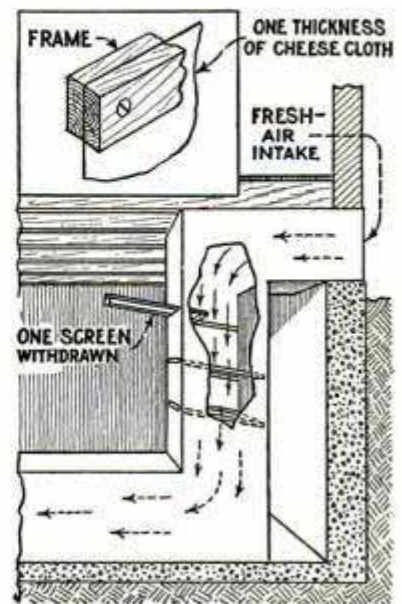
Keep the Rifle Barrel Bright

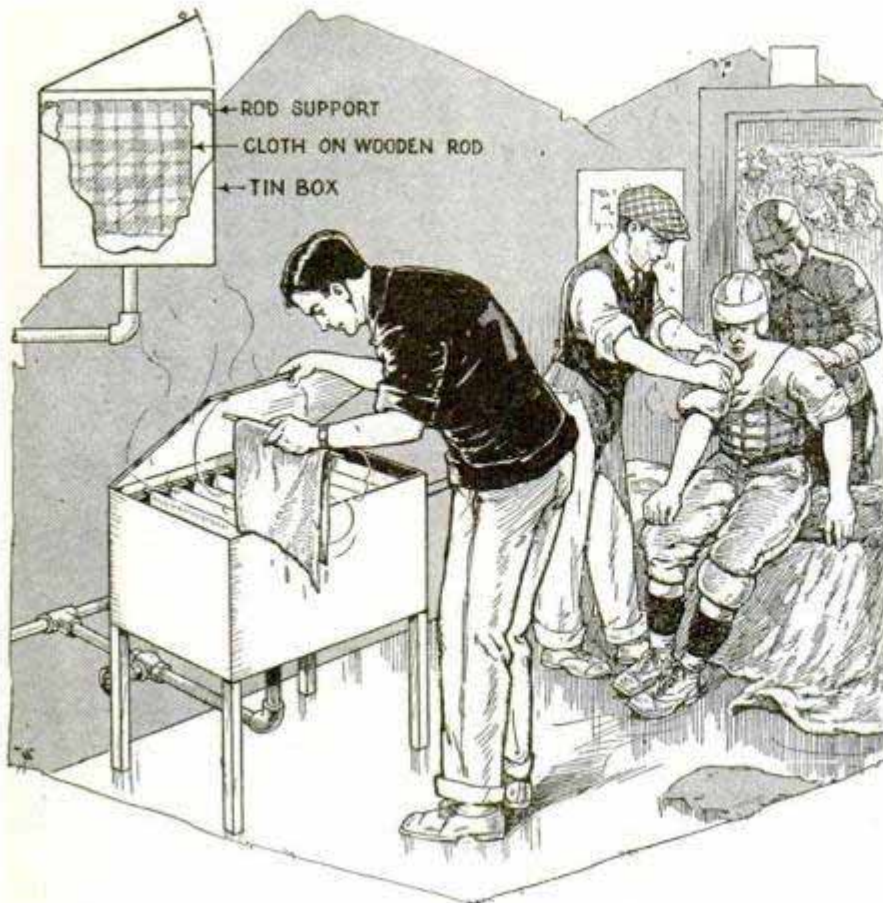
One of the best methods of keeping a rifle barrel well oiled is shown in the drawing. Get a length of sash cord a trifle longer than the barrel. Tie a knot at one end and wrap several turns of silk thread around the other end, after which a small screw can be driven into this end. To the screw head tie a stout cord. Soak the sash cord in a good grade of oil and pull it through the barrel by means of the smaller cord. The sash cord should fit snugly in the barrel and will keep it in good condition even if not used for long periods of time.—Dale R. Van Horn, Lincoln, Nebr.



Air Filter for the Hot-Air Furnace

In some localities in cities where there is considerable smoke and soot, the illustrated air filter for the hot-air furnace will be found beneficial. This arrangement applies only to cases where the air is taken from the outside. All that is necessary is the provision of three screens, the frames being made of 1 by 2-in. strips of wood, and fitted with cheesecloth. Besides keeping out soot and dust, the screens will check excessive draft. They are slid in grooves made by nailing two slats parallel on each side of the fresh-air intake pipe, which is usually square and of wood. L. H. Georger, Buffalo.





This Sheet-Metal Steam Box, Handy for the Preparation of Packs, Was Installed in the Football Training Quarters of the Wisconsin University

Steam Box for Fomentations

For the preparation of fomentations or packs used by football and hockey squads, the illustrated steam box has been used and is highly recommended by "Bill" Fallon, head trainer of the University of Wisconsin football and hockey teams. It is a sheet-metal box about the size of an ordinary cedar chest, set on a suitable stand made of angle iron, and connected to the steam-heating system as shown, a valve being provided to control the steam flow into the box. Wooden cleats are provided inside of the box to hold a number of wooden rods, cut from dowel stock. In use, woolen or flannel cloths are hung over the rods and the cover is tightly closed. When packs are

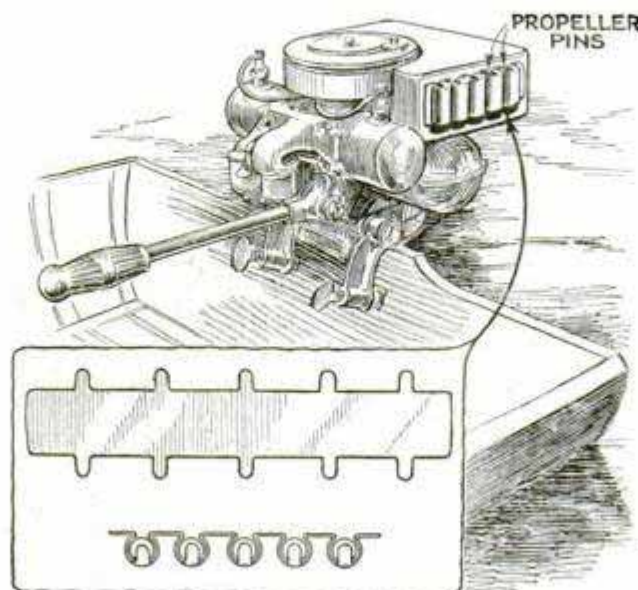
needed, steam is turned on and in a few moments the lid is lifted off, permitting the removal of a hot cloth ready to be applied to a sore muscle or stiff joint. The cost of making and installing such a box is less than \$10.00, and the operating cost is negligible.—Theodore S. Holstein, Madison, Wis.

Extra Propeller Pins for Outboard Motor

It is highly annoying to an outboard-motor enthusiast to have a propeller pin sheared off and then find that he has no spare pins with him. The shearing of propeller pins is a common occurrence, as the pins are purposely made of softer metal than

other parts of the propeller assembly so that they will shear off when the propeller hits an obstruction, thus avoiding damage to other parts. The installation of a new pin is only a moment's work, provided an extra is at hand. A convenient method of carrying a number of them is shown in the drawing. A small holder is made of sheet copper or galvanized sheet iron, cut and bent to the shape shown, so

as to form a number of cylindrical pockets, and soldered to the side of the fuel tank. The lugs are bent over to retain the propeller pins which are placed inside.—Dick Cole, Los Angeles, Calif.



Container for Extra Propeller Pins Is Soldered to the Fuel Tank of Outboard Motor

ⓘ Instead of coiling the garden hose in the usual way, lay it down in the shape of the figure 8, and turn each successive coil the same way.

SHOP NOTES



All Shop Notes published in 1928, in book form—Fifty Cents—from our Book Department

Keeping Your Saws Fit

By W. CLYDE LAMMEY

ON MOST of the popular workshop saws, a combination rip and crosscut blade is regularly furnished. However, many owners still prefer separate blades for ripping and crosscutting, and it is true that the common ripping blade is considerably faster in the cut. Another excellent saw is that known as the "planer" blade, which is hollow-ground

and runs without set. While slow, it cuts extremely smooth and clean in either rip or crosscut. It is especially fine for trimming end grain and eliminates much hand work. While the essentials of filing the blades apply to the various styles of saw blades, there are certain exceptions to be observed in each particular case, such as the angle of the file, the coarseness of the

set, etc. As it is impossible to give rules covering all cases of saw filing, the amateur should give his blade a careful examination before he attempts to file it. In this way he will, if a keen observer, learn much about the method of sharpening the blade he has in hand. The form of the teeth, before they have been filed, is the best guide,

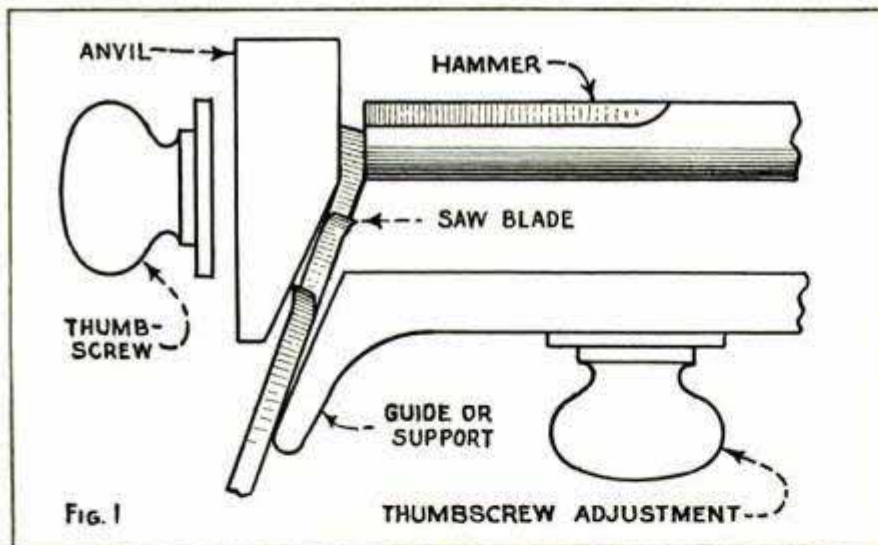
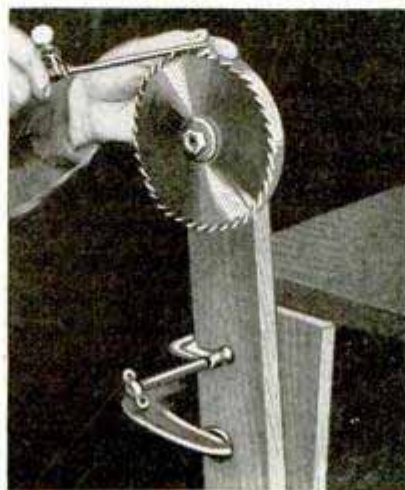


Fig. 1 Shows the Three Parts of Setter Used for Circular Saws; Photos Show, Left, Holder for Saws While Filing; Right, a Setter in Use

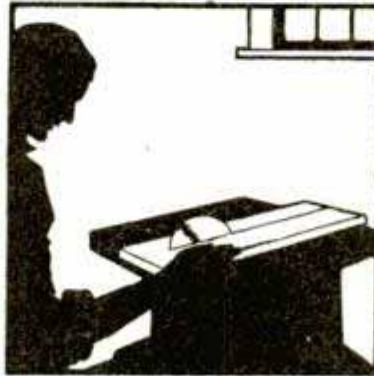


Saw set - E. C. Atkins Co
402 S. Illinois, Indianapolis, Ind.

and the aim of the filer should be to preserve this original form.

First you must remember that the three principal operations, namely, setting, jointing and filing, all contribute equally to the success of the job. If any of them is omitted or carelessly executed, you will have an ill-running saw, no matter how painstaking you are with the other two. First examine the set of the teeth. Unless they have been damaged by striking a nail or other metal, the form of the set can be easily seen. On small blades, the teeth are almost invariably set by bending them and the bent portion is generally one-third of the length, unless it has been set for special uses. The teeth of the ripping blade are filed square across, while those of the crosscut blade are filed at an angle with the blade both vertically and horizontally. If the teeth are merely dulled by long use, they must always be set before jointing or filing. If damaged, they should first be jointed, then brought to a point, after which they are again jointed off lightly, repointed by light filing, and the gullets cut down to give the proper clearance. The set should be put in after the preliminary jointing and pointing. In any case, the set is a major consideration, and as a rule it should be done first.

Fig. 1 shows the three principal parts of a saw set adapted to setting a circular saw. It will be seen from this that any adjustment of either the anvil or guide will change the form and coarseness of the set. With the better makes of saw sets, it is possible to adjust them very accurately to any depth desired. The set is best adjusted by placing the tool over the teeth while the blade is on the arbor. Make a trial adjustment and set several successive teeth, bending them in the same direction as before. Sight across the teeth edgewise to best determine what has happened. Remember that the power-driven saw does not require the same amount of set as the handsaw. Fig. 2, detail A, shows the correct medium set for a ripping blade. Where the blade is to be used almost exclusively in soft wood, the depth of the set, that is with relation to



the length of the tooth, may be slightly greater, but the width across the points should never be as great as that shown at B, where a "valley" appears between two adjacent teeth. The formation of a valley must be carefully avoided, as this will cause the ripping blade to vibrate excessively and "run" in the cut with greatly lessened capacity. Any discrepancy of this kind may be taken out by resetting the blade with the tool properly adjusted.

For all ordinary purposes, the coarseness of the set should never exceed that shown in the detail A of Fig. 2. If the saw is to be used mostly for hardwood, the set may even be less. After checking over the setting, bend each alternate tooth in the same direction, so that two adjacent teeth will be set on opposite sides of the blade. Be sure to reset the teeth on which the trial setting was made so that they will be uniform with the rest. After every second tooth has been set on one side, reverse the set or the blade, whichever is most convenient, and finish the remaining teeth. Two precautions must be carefully observed, namely, that the adjustment of the tool does not shift while setting, and also, that the tool does not slip when the pressure is applied, causing the hammer or plunger of the tool to pinch off the points of the teeth. Always hold the tool firmly, with the guide bearing against the blade when setting each tooth. When setting a combination blade, omit setting the cleaner tooth.

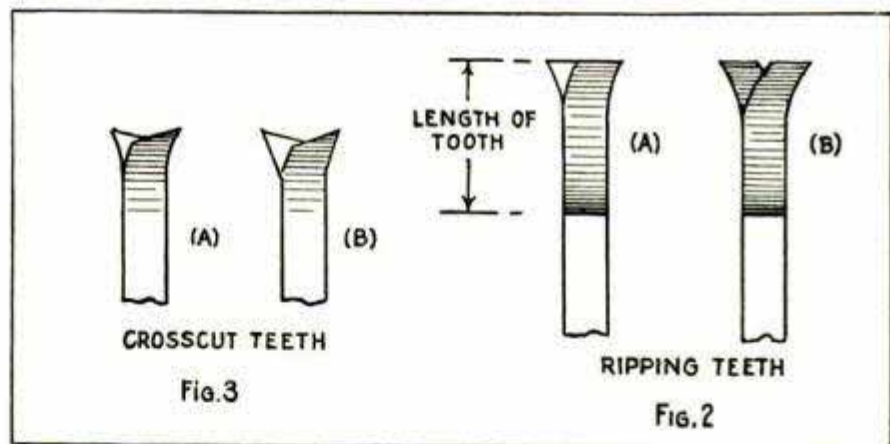
After setting, the blade must be jointed. Although this is easy to do, it is nevertheless of considerable importance, as it determines to a great extent the behavior of the blade while in the wood. This is even more true of the circular saw than of the handsaw. Fig. 4 shows a simple method of accurately jointing a small circular saw on the arbor. Get two narrow strips of wood the length of the saw table and clamp them down, one on either side of the blade. Put the blade on the arbor so that it will run backward. Raise the table until the teeth are just below the top edges of the strips. Hold a carborundum stone, coarse side down, on the

strips directly over the blade and start the motor. Lower the table slowly with the handscrew until the teeth of the saw strike the stone. Give the handwheel an additional half turn, then stop the motor and examine the saw. This operation strikes the teeth off evenly so that they will run in the same arc. Carefully continue this procedure until each tooth comes in contact with the stone, which will be sufficient. Never take off more than is necessary to even the teeth. On a table without an elevating screw, revolve the saw blade by pulling the belt by hand while adjusting the height.

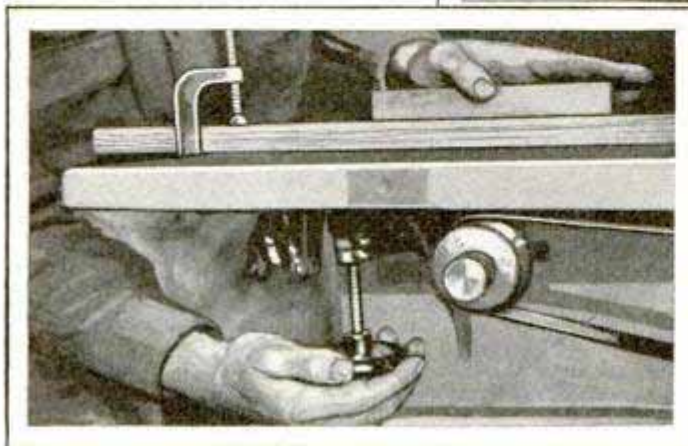
The blade is now ready for filing. It is better to use new files. Never attempt to sharpen a blade with a file clogged with an accumulation of dirt and grease. Make a support for the blade as shown in some of the photos. Saw out a disk of wood, about $\frac{1}{2}$ in. less in diameter than the blade, and if the hole in the blade is $\frac{1}{2}$ in., drill a hole of equal size in the center of the disk. Get a length of 1 by 4-in. stock and drill a $\frac{1}{2}$ -in. hole near one end. Put a short $\frac{1}{2}$ -in. bolt through the hole, place the disk over this and tighten the blade to the disk. Clamp the support to a table or bench with a suitable clamp or hold it in a vise. Never attempt to hold the saw itself in a vise when filing, for even though the jaws of the vise are of wood, the set is likely to be altered or taken out altogether in places, mak-

ing it necessary to reset the entire blade.

When sharpening the ripping blade, the file stroke must be made straight across, with the file held at right angles to the blade. Take care to bring each tooth to a point and keep the original form. When filing crosscut teeth, the file must be held at an angle with the blade both vertically and horizontally, so that the teeth will be shaped at an angle, as shown in details A and B, Fig. 3. Detail B shows the medium form of the crosscut tooth on the combination blade, and detail A the common form of the tooth on the crosscut blade. Note that the angle of the cutting edge in detail B is slightly greater than in detail A. The common crosscut tooth is sharpened with the file held more nearly square with the blade than in the case of the combination blade. A deeper valley on the combination cutting teeth will make the blade cut faster in a ripping cut and be in no way a hindrance when cross-cutting. This deeper valley allows the



Figs. 2 and 3, Proper Set and Tooth Shape of Crosscut and Ripsaws; Center, How Sides of Filed Teeth Are Dressed Down Evenly and, Below, How Saw Table Is Let Down Slowly When Jointing



cleaner teeth to sever the lengthwise fibers of the wood when making the ripping cut.

When filing the cross-cutting teeth, run the file cut down into the gullet to keep the original form of the teeth and to prevent the formation of a shoulder in subsequent filings. Although it takes longer, the best method of filing accurately is to disregard

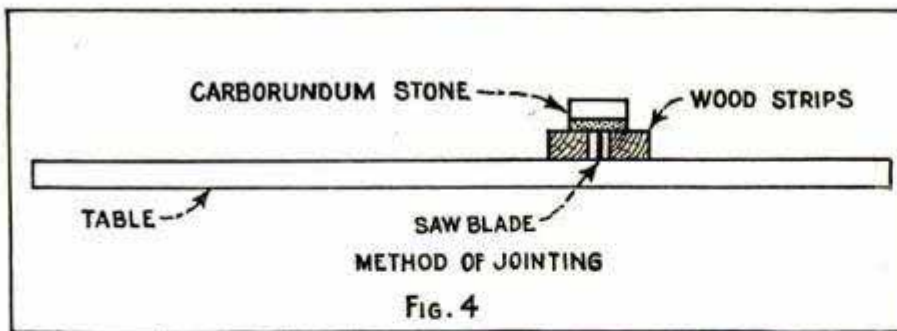


Fig. 4 Shows How Wood Strips and Carborundum Stone Are Used for Jointing and the Photos Show Side-Dressing and Filing Operations

the pointing of each individual tooth and adopt a uniform stroke of the file. For instance, give each alternate tooth two one-way strokes with as uniform a pressure as possible. Continue this until one complete set of teeth have been given two strokes of the file. Turn the blade around and repeat with the other set. In this sense the word "set" indicates all the teeth bent one way on the same blade. When finished, turn the blade back again and bring the teeth very carefully to a point, taking care not to alter their shape. Bring the other set to a point in the same manner. This makes four operations, and while it is not always done, owing to the time required, this method enables one to turn out as nearly perfect a job of saw filing as is possible by hand methods. While filing, it is essential to have the blade in the very best available light so that the result of each stroke may be seen readily, especially when pointing the teeth. Always use a flat file when sharpening the cleaner teeth of the combination and planer blades and make the stroke straight across as in filing the ripping tooth. Give the cleaner teeth one extra stroke with the file after bringing to an edge. This will bring the cutting edge to the correct position, which should be very slightly less than the arc of the cutting teeth.

It will perhaps be well to add a word concerning what is commonly known as "gumming." This operation consists in filing the round gullets between ripping teeth, to obtain maximum tooth clearance and prevent breakage. After the first two filings of a ripping blade, the



gullets should be filed with a small round file of suitable diameter. The stroke is made straight across, and it is best done before setting and jointing. Two strokes of the file in each gullet should be sufficient at each filing of the saw. The cutting teeth of combination, crosscut and planer blades are more or less automatically gummed by each filing, owing to the slightly rounded corners of the file used, and as a rule need no further attention on the smaller blades.

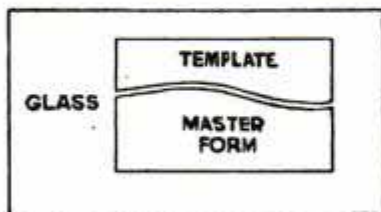
After the filing is finished, the teeth will need to be dressed, to bring the cutting points in line so that the saw will cut clean and smooth. To do this, tighten the blade on the arbor, running the right way, and bring up the rip guide. Lay the carborundum stone against the guide, with the edge up and the fine side next the saw. Do not allow the stone to strike the upcoming teeth but only those going down. Leave the guide free so that it may be easily moved by hand. Start the motor and bring the stone against the teeth very lightly, allowing it to touch only the sides of the points. Keep the stone flat against the guide. Repeat the operation on the other side of the blade. Be very careful not to take off too much.

Grind down just enough to even the points and bring them in line. Where the rip-guide assembly will not permit this procedure, lay the blade on a flat surface and rub the teeth lightly with the fine side of the stone, as shown.

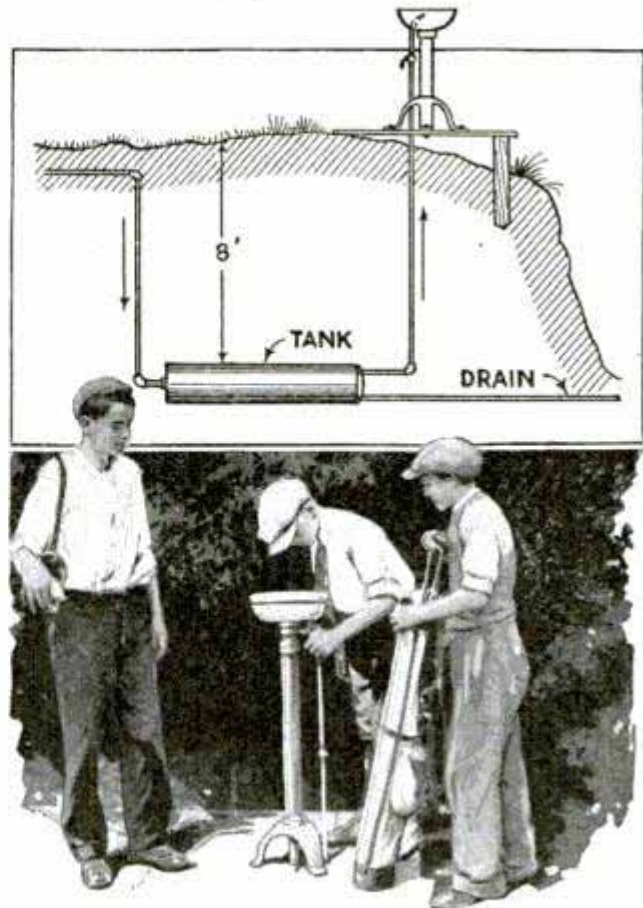
A small dado head may be accurately jointed and filed by using practically the same method as for the saw blade. To joint the head, use the strips clamped to the saw table as before, and assemble all the separate cutters on the arbor so that they run backward. Use the coarse side of the stone, as before, in jointing. If this is done carefully, no harm will result to the stone either in this operation or in that of jointing the saw blade, if both are run backward. Remove the head and carefully file the two outside cutters. Note the shape of the cutting teeth and take care not to alter their shape. Remember that the original form of the tooth is the very best guide in filing it. When the filing is complete, give each cleaner tooth an additional stroke with the flat file, as on the combination and planer blades. Assemble all the inside cutters on the arbor, running backward, and joint them again very lightly. Remove and file the top of each tooth straight across, just back of the cutting edge, to remove the rounded portion caused by jointing. Carefully done, these simple operations will put the small dado head in excellent shape.

Making Accurate Templates

A flat piece of window glass simplifies the usually difficult job of making accurate templates. As the glass is transparent, the inaccuracies can be readily seen and corrected while the work is held flat by the glass. If other methods are used, it is almost impossible to hold the work properly and at the same time see the errors.—C. Kugler, Philadelphia, Pa.



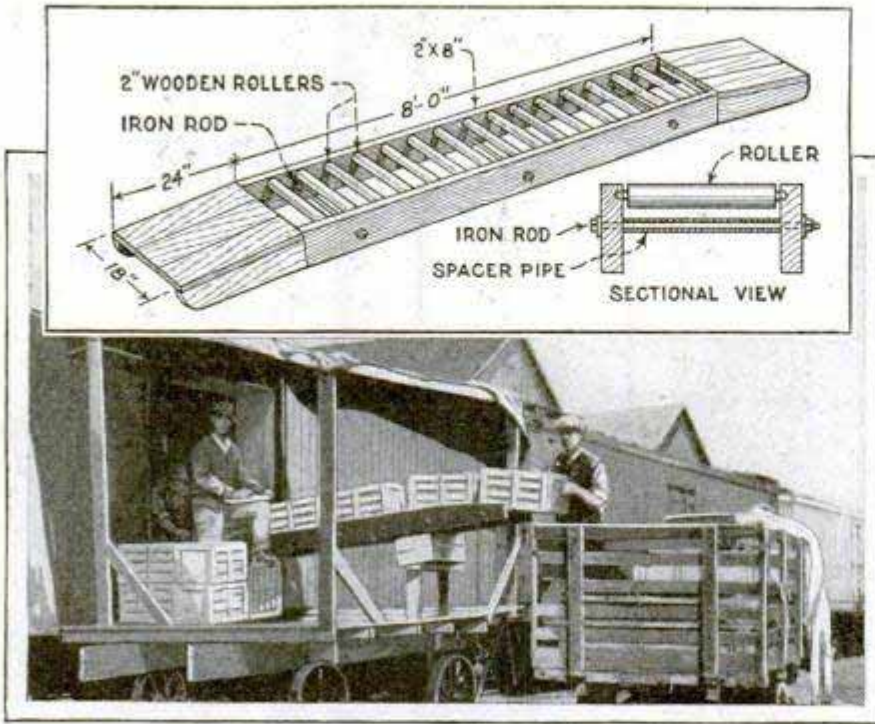
Handles on machinery are usually set so that a clockwise movement actuates the part controlled forward, and the reverse, backward.



Cool Drinking Water from Fountain Obtained by Passing Water through a Buried Tank

Cooler for Fountain Water

Coolers of the kind shown in the drawing are used on a golf course near Akron, Ohio. The system consists of a galvanized-iron tank, such as a hot-water heater for the home, about 30 ft. of pipe and a fountain. The tank is buried in a horizontal position and at least 8 ft. under the ground. The feed pipe from the water supply is fitted to one end and a second pipe leads from the other end of the tank to the fountain above. In this particular case, a drain pipe was also provided to permit cleaning the tank or emptying it during cold weather. Of course, if it is desired to install a drain pipe, it is necessary to place the tank near a bank, as indicated. The fountain recommended for the purpose is of the angle-flow type, which is sanitary, and it is advisable to locate it in the shade. It was found that water in the pipes laid near the surface of the golf course often become hot, while that taken from the fountain had an average temperature of from 50 to 60°. The same system can be used wherever it is desired to have cool drinking water.—Walter E. Burton, Kenmore, Ohio.



Portable Loading Shed with Roller Conveyor Enables Quick Transfer of Perishable Fruit from Farmers' Wagons into Refrigerator Cars

Portable Conveyor Speeds Loading

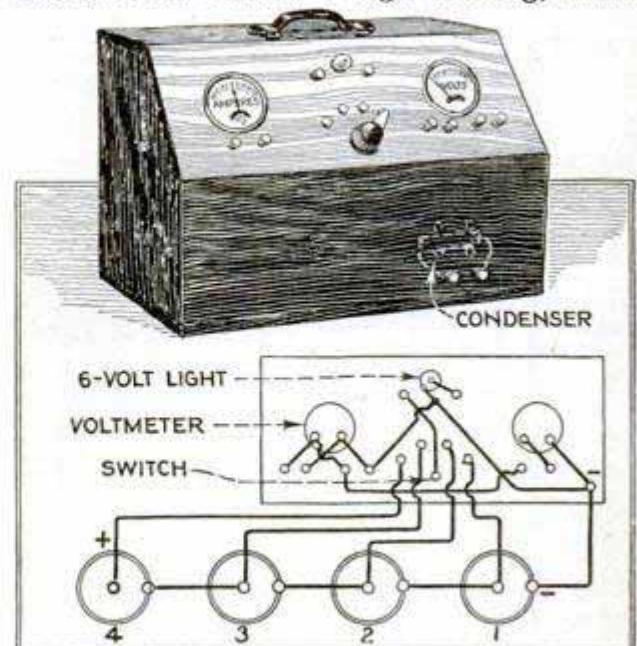
Quick action is necessary when loading strawberries, grapes and other perishable fruits into refrigerator cars. Under the old system, which is still generally in use, wagons containing the fruit are unloaded at sheds beside the railroad tracks, the crates handled over the tables for inspection, after which they are picked up and carried into the car. Hence, it is usually necessary to move the cars to points most convenient for loading them. To increase the speed of loading, a portable shed, equipped with a roller conveyor, was designed by Ira Graham, general manager of the Berry Growers' association, of Springdale, Ark., and it was highly successful. The shed can be moved from one car to the next in a few moments without waiting for a switch engine. The fruit is transferred directly from the farmers' wagons onto the roller conveyor in the shed, where it is examined and then pushed into the car.—Ira D. Mullinax, St. Louis, Mo.

Test Box for the Automotive Electrician

For testing the electrical systems of cars, the illustrated box, which holds a number of dry cells and has a voltmeter, ammeter, condenser and a number of

tapped switches, will be found of great utility. The box can be made any suitable size. A pocket of heavy fabric is attached to the back to carry two testing leads, which are fitted with test points at one end and small battery clips at the other for quick attachment to the parts to be tested. The switch contacts are made from No. 22 gauge rifle shells, and the connecting wires soldered to them, whereupon they are pushed into holes drilled in the panel. The switch lever can be obtained from a radio shop. The test condenser was made from

an old Ford-coil condenser, wrapped with tape and with leads soldered to the terminals. The dry cells are connected in series, and the negative end is connected to a terminal on the panel, while taps are taken to the switch points. In order to test ignition coils, the voltmeter must be connected in series with the dry cells, using 6 volts to test the secondary winding of the coil, in which case the voltmeter should read from 2 to 3 volts, owing to the resistance of the coil winding. A short circuit causes a high reading, while



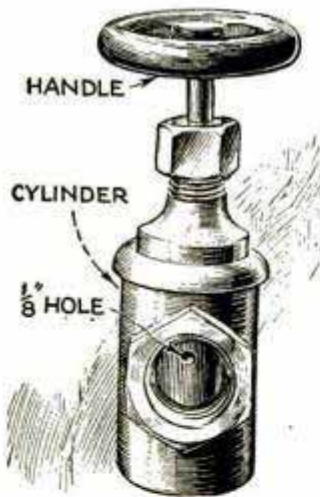
Portable Test Box for the Auto Electrician Contains Dry Cells and Is Equipped with Meters

an open circuit gives no reading at all.—
Harold L. Flinn, Arnold, Pa.

Cement-Bandage Repair on Large Pipes or Cylinders

For mending leaks in irrigating pipes, cracked pumps or cylinders, steam-heating pipes, etc., a bandage of cement and cloth makes a good job. Mix Portland cement and water to a paste; next take a long strip of loose-woven cloth, burlap, or cheesecloth, 3 in. wide, and roll it into a roll like a surgeon's bandage. Work the loose end full of the mortar, and wind it around the leak, taking a handful of the cement mortar and working it well into the cloth, at each round. Continue until the bandage is 1 in. thick; then finish over the surface with the mortar, and let it stand for 48 hours, well protected from wind and sun. It will then be ready for use. If there is a heavy pressure in the pipes, wrap wire mesh around to reinforce it. Leaks in 8-in. irrigating pipe have been mended by this method.

Valve for Hot-Water Radiator



Hot-water radiators are often ruined by freezing. Usually this happens when people shut the valve and neglect opening it until too late to prevent the damage. Such damage can, however, be overcome by slightly altering the inside of the valve. If it is of

the revolving-cylinder type, as shown in the drawing, or a flat-surfaced gate valve, drill a $\frac{1}{8}$ -in. hole through it. If it is a flat-seated disk valve, cut a small groove across the face of the disk. This treatment will allow enough water to pass the valve to prevent its freezing as long as there is any fire in the furnace. At the same time, the flow of water is so slight that to all appearances the radiator is entirely closed.—James E. Noble, Toronto, Canada.



Extended Cuff on Carpenter's Trousers Makes Handy Nail Sack When Laying Flooring

Handy Carpenter's Nail Sack Attached to Trouser Cuff

When a carpenter is laying flooring he will find a nail sack attached to his left trouser cuff a great timesaver. The sack may be either separate, having strings to tie it around the ankle, or it can be made a permanent part of the trouser or overalls by merely extending the cuff. The latter method is preferable as it is always in place when needed.—H. H. Siegele, Emporia, Kans.

Hand Guard for the Bucksaw

Anyone who has grasped the handle of a bucksaw quickly and felt the teeth dig into his fingers, or has smashed his knuckles against the wood when making the forward stroke, will appreciate the illustrated guard to prevent such injuries. It consists of a strip of galvanized sheet iron bent to a U-shape and screwed to the handle of the saw as indicated.

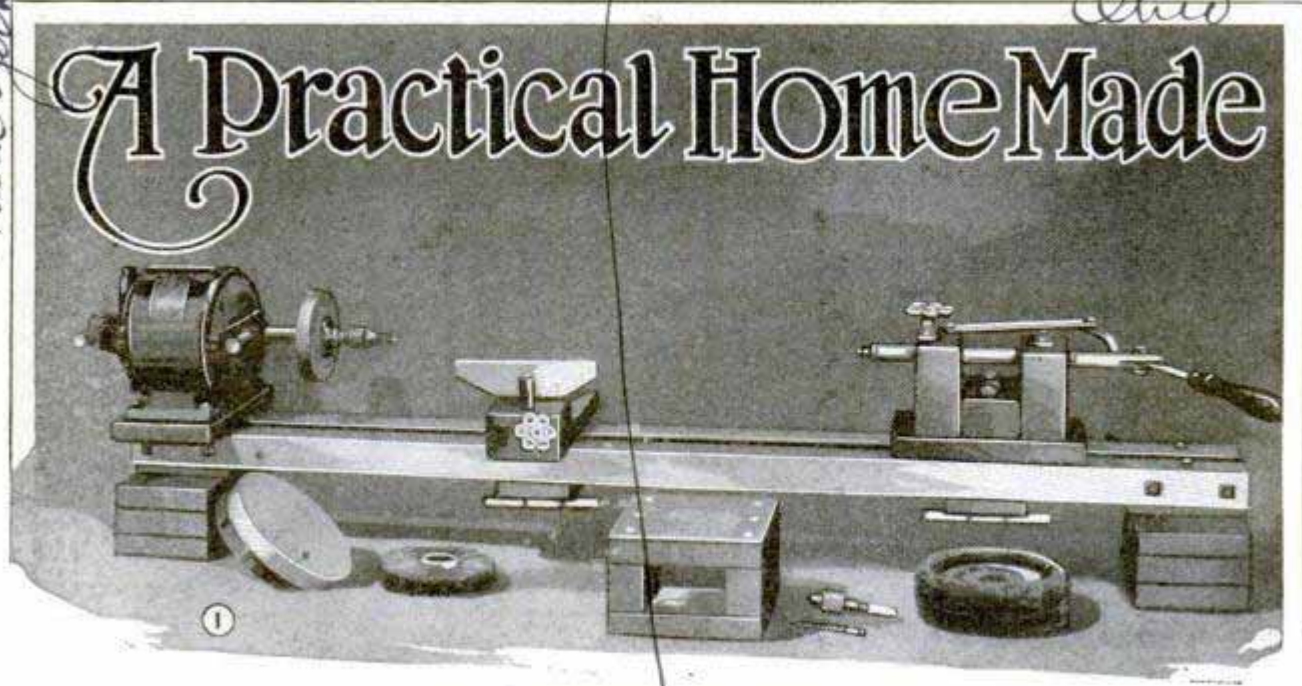


The saw is used in the customary manner with the fore or index finger fitting inside of the guard.—Raymond B. Wailes, Bethesda, Md.

Bearsville. Water County, New York City

1111 Power, Cleveland, Ohio

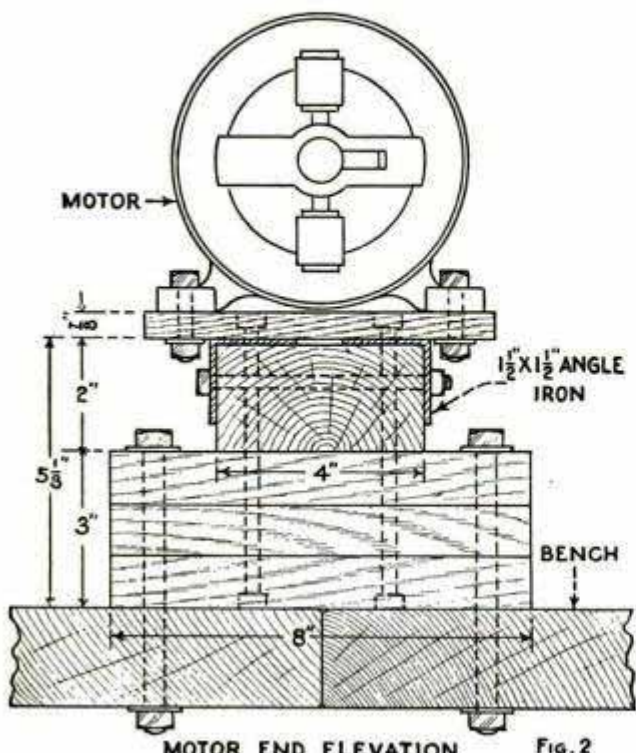
A Practical Home Made



By EDWARD THATCHER

A THOROUGHLY practical combination workshop for turning, drilling, grinding, polishing, sanding and planing may be very easily built at home without the use of machine tools, ordinary hand tools, such as form part of the equipment of the average amateur's shop, being used throughout. The machine is inexpensive to build, runs smoothly and quietly, and will do quite as good work as its commercial counterparts, which it closely resembles both in appearance and results.

The writer has a well-equipped workshop for experimental and practical work, most of the machines being driven from a main shaft belted to the gasoline engine that drives his light plant. Several small motors are used, and the one shown on the lathe in the accompanying illustrations was formerly used to drive a small circular saw. For this I had purchased a motor-shaft attachment to hold an emery wheel, drill chuck, etc., and I found this exceedingly convenient, but it had one disadvantage: When in use on the motor, the saw table was always in the way. One day I picked up some pieces of angle iron from an old bedstead, and this gave me the idea of constructing the combination machine, as the angle stock, being rigid, straight and true, seemed to be ideal material for a lathe bed. I proceeded to build up the unit, using scrap pieces of iron, blocks of wood, bolts, handwheels from an old oil stove, etc. When it was finished, I was enabled to do a great deal of work that was formerly impossible; I had added a practical lathe to my equipment, and all my turning, grinding, polishing, etc., could be done on the combination unit without starting up the gasoline engine.



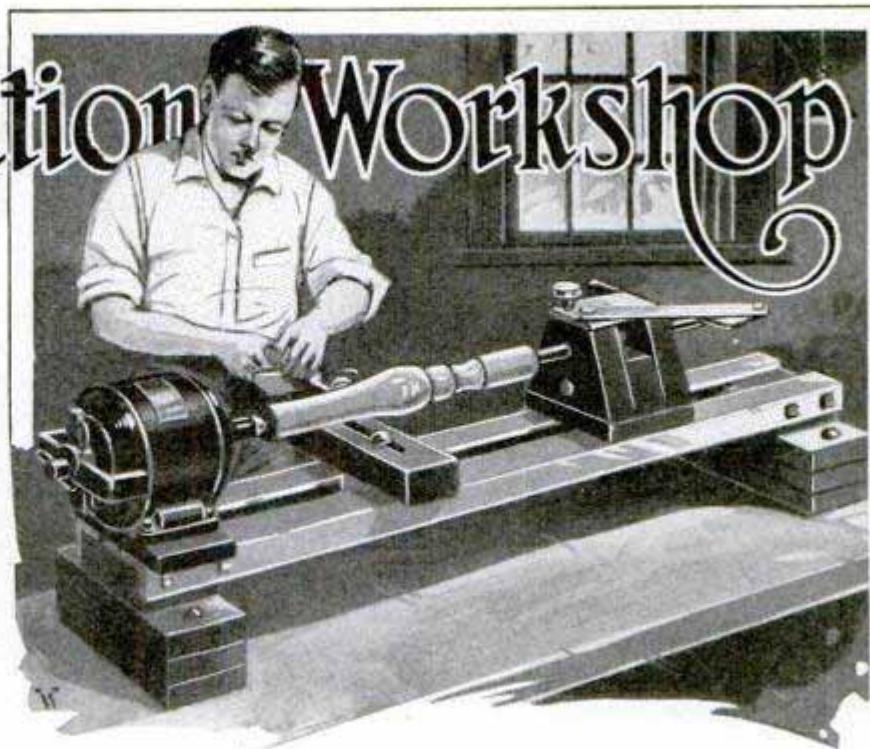
MOTOR END ELEVATION Fig. 2

Combination Workshop

ning at 1,750 r.p.m. will be ample for most work. New motors of this size can be obtained at prices ranging from \$7.50 to \$15, while secondhand motors, in good condition, can often be picked up for very much less. There is no reason why a ½-hp. motor could not be used for heavier work in the same way, as motor-shaft attachments can be purchased, fitting shafts up to 5/8 in. in diameter.

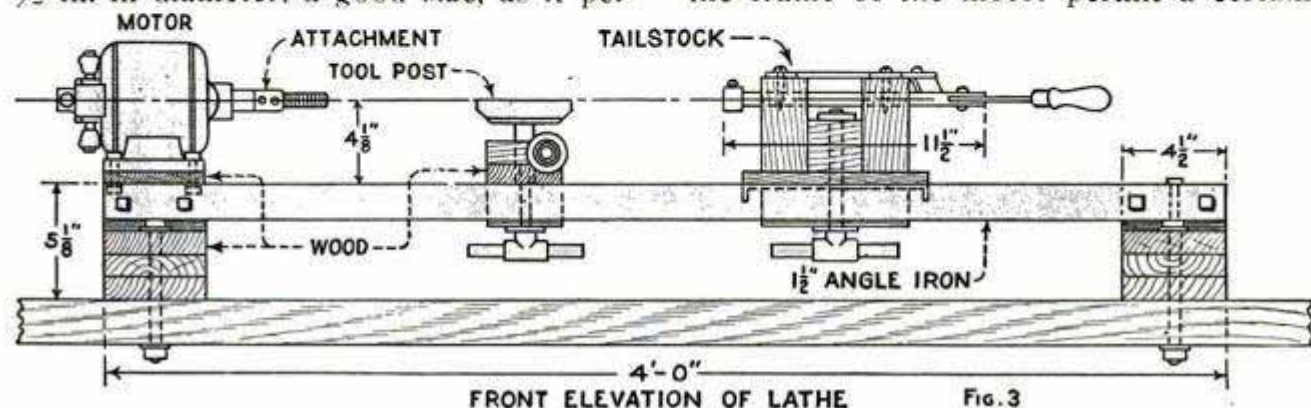
The angle-iron bed of the lathe can also be made heavier or longer if desired for special purposes, although, if this is done, the bed should be braced, at about 30-in. intervals, with auxiliary legs. The angles used for this lathe were 1½ in. wide and 1/8 in. thick. Angles, 3/16 or even 1/4 in. thick, would be still better for longer beds. The bed on the original is 4 ft. long, accommodating work 26 in. long and of 8-in. swing. It is a simple matter to increase the swing merely by increasing the height of the blocking under the motor, and making the tailstock and other parts to suit.

The shaft of my motor is ½ in., so this was the size of the shaft attachment purchased. The attachment consists of a sleeve bored to fit the motor shaft and locked in place with two setscrews, the outer end being threaded to accommodate the drill chuck, collars for emery and polishing wheels and the nut. This end is ½ in. in diameter, a good size, as it per-



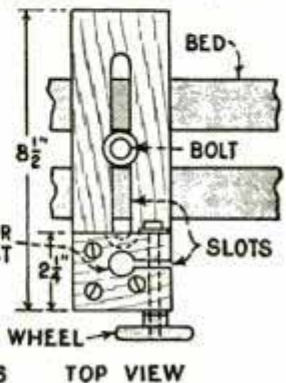
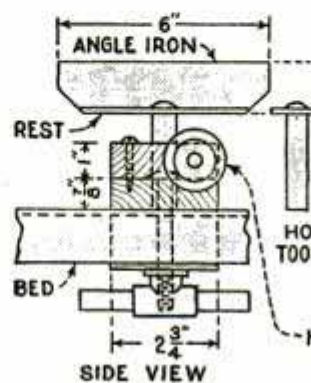
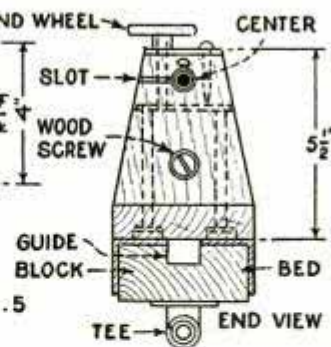
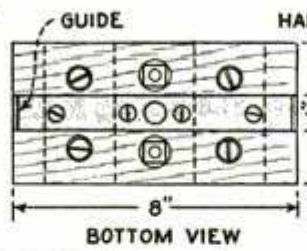
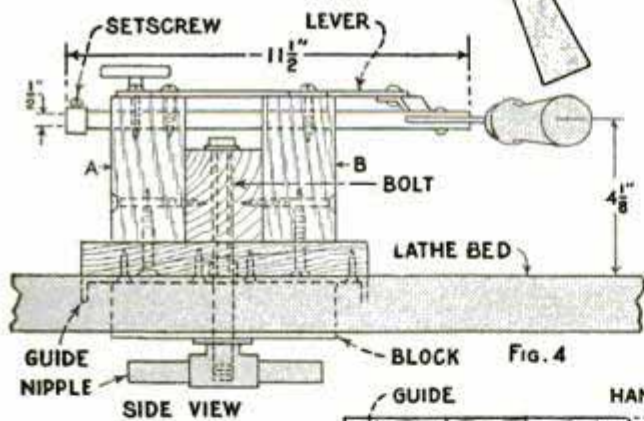
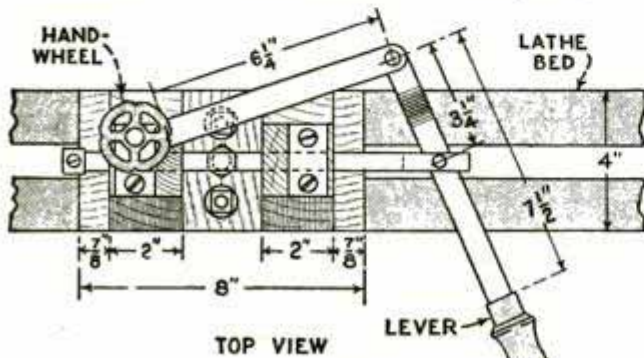
mits the use of a number of inexpensive lathe-head attachments of other makes. Such attachments may be purchased at from \$1 to \$2.50 each. It is important to see that the motor shaft runs true in the first instance, and that the attachment, when fitted, also runs true and straight.

The angle irons forming the bed of the lathe are bolted to the wooden blocks forming the legs or supports, as shown in Figs. 1 and 2. The blocks are preferably of hardwood, although soft wood may be used if hardwood is unobtainable. A clear straight-grained piece of 2 by 4-in. stuff is bolted between the angle irons at each end, spreading the angles and thus forming the slot in the bed. The piece at the motor end is as long as the bed of the motor. A piece of clear maple is bolted on top of the angles to form the motor base, the bolts running down through the spacing block and the supports. The slots in the frame of the motor permit a certain



amount of side adjustment when lining up the lathe. The support blocks are bolted to the bench. Care should be taken to keep the lathe bed as level as possible, and, of course, the spindle of the motor should be kept parallel to the bed.

The tailstock, Figs. 3 and 4, is built up of hardwood blocks, preferably beech, maple or some similar hardwood of fine, even grain. The spindle is made of conduit, 1/2 in. in inside diameter. To strengthen this on the end where the centers are fitted, it is threaded, and a coupling is



screwed on, after which the coupling is filed or turned off even with the end of the spindle, and made square. A hole is drilled through the coupling and spindle and tapped for a setscrew, which holds centers or a drill chuck with 1/2-in. shanks. The other end of the spindle is slotted with the hack-saw to take the lever feed.

The body of the tailstock is built up as shown in Fig. 4, using heavy wood screws to hold the blocks together. Underneath the flat block that rides on the lathe bed is screwed a length of 1-in. flat iron. The ends of this are bent down to fit in the slot of the lathe bed and form a guide for the tailstock. This piece must

be a good sliding fit in the slot, as it must keep the tailstock in line with the motor. Build up the body completely, but do not drill it for the spindle. See that it slides evenly and truly on the bed and that it may be clamped firmly in position. Mount the drill chuck on the motor shaft, and, with a 1/8-in. twist drill, drill through the blocks A and B on the tailstock body, moving the body up to the drill, while keeping it pressed down on the lathe bed. It will be necessary, after drilling block A, to reverse the tailstock to drill B. This small hole marks the exact height of the lathe centers, and forms a guide for an auger bit, of the right size for the tailstock spindle used. Remove the blocks and bore halfway through each block from each side, with the drilled holes as guides. A 3/16-in. bit was just right for the 1/2-in. conduit used on the original. The spindle, in any event, should be a good sliding fit in the blocks, and should center accurately with the headstock spindle. It should also be parallel to the bed.

Block A is slotted on one side of the spindle hole, as shown in Fig. 5, to permit clamping the spindle. Halfway between the spindle hole and the back of the block, bore a hole that will allow a 1/2-in. bolt to be screwed tightly into it. Enlarge the hole above the slot so that it will not bind on the bolt, cut off the bolt long enough to screw firmly down into

the lower hole, and still allow enough thread to project above the block to take the handwheel. Drill a clearance hole for the bolt in a piece of flat iron, and screw this to the top of the block (Figs. 4 and 5) to

take the pressure of the handwheel and to prevent marring or splitting the wood. If a handwheel to fit the bolt is not available, a common nut may be used to clamp the spindle. The construction of the lever feed is quite simple, and is perfectly clear from the drawings. This type of feed is very handy for drilling, and is decidedly easier to make than the screw feed.

The tool post and tool rest are shown in Fig. 6. The base, which rests on the

bed, is made of a slotted length of hardwood; the part that clamps the tool rest is made from another block, attached to the first with three screws, as indicated. The inner portion of the second block, beyond the saw slot, is not screwed down, as the bolt draws this in on the shank of the tool rest, making the rest adjustable for height. In this case, the clamp bolt goes right through the block, with its head toward the bed of the lathe. The rest itself is made of a length of angle iron, riveted to a shouldered post or shank. The offset thus given the angle makes it possible to set the rest close to small work. The rest, of course, may be made any desirable length.

The faceplate, Fig. 7, is made by first sawing out a wooden disk $\frac{7}{8}$ in. thick and 6 in. in diameter. Another disk, $1\frac{1}{2}$ to 2 in. thick and 3 in. in diameter, is glued and screwed to the first, to serve as a hub. Drill a hole through them slightly smaller in diameter than the threaded headstock spindle, screw the plate in place and turn to shape and size.

The table for use with the faceplate, when sanding, is made up of wood, as in Fig. 7. It is clamped to the lathe bed in the same manner as the tailstock and tool post. The table should be at right angles to the faceplate. The table can be made adjustable, to permit work to be sanded at a bevel, by hinging the front edge, and providing supports for the table when raised. Fig. 8 shows the table and face-

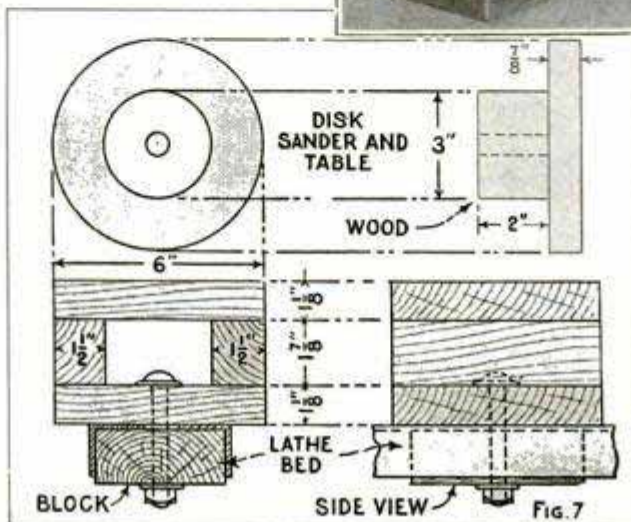
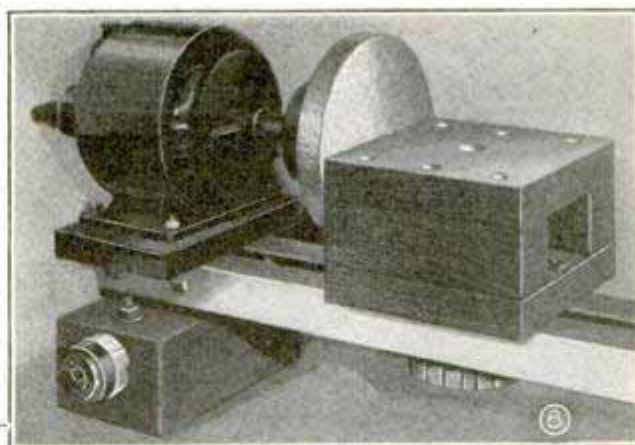


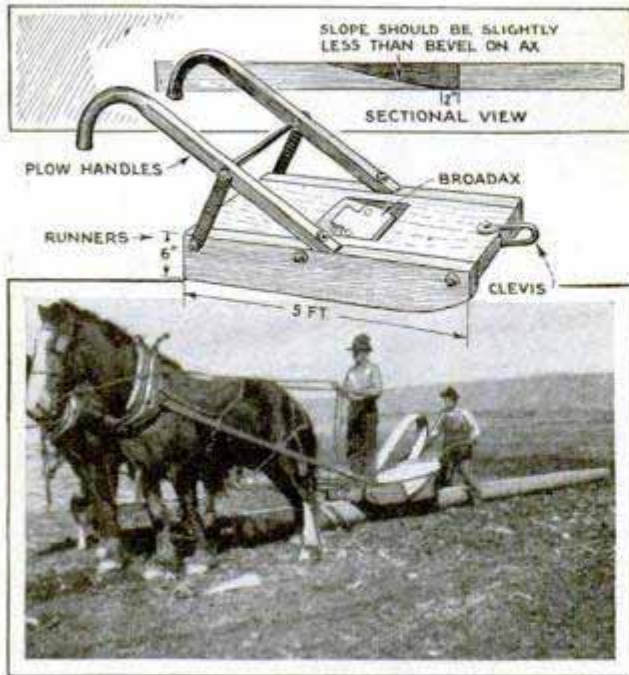
plate in position on the lathe. Note the conveniently placed snap switch for starting and stopping the machine. The clamping wheels for the various attachments may be made up of old valve wheels, drilled out and threaded to fit the

clamp bolts. Even wheels taken from old toys will sometimes serve the purpose. In the absence of wheels, clamp nuts may be made up of pipe and fittings, as indicated in Figs. 3, 4 and 6. A $\frac{1}{4}$ -in. tee and two nipples make a good clamp, the side outlet being tapped to fit the bolt.

(To Be Continued)

Cements for Pipe Joints

Cement for making screw joints in pipes steam-tight may be made from graphite and heavy cylinder oil. Just enough oil is mixed with the graphite to form a thick paste. A good cement for both water and steam pipes has this composition: whiting, 4 lb.; fine yellow ocher, 10 lb.; ground litharge, 4 lb.; and $\frac{1}{2}$ lb. of hemp cut into fine particles. These ingredients are mixed thoroughly with linseed oil to form a paste, which is applied on the threads of the pipes and fittings. For ammonia piping, a cement made of litharge and glycerin is used. Sufficient glycerin is added to the litharge to form a putty. Only enough of this cement should be mixed to serve immediate needs, as it sets quickly.



With This Horse-Drawn Plane Thick Slices Can Be Removed from Huge Logs

Horse-Drawn Tool Planes Timbers

Anyone who has to deal with timber will find the horse-drawn plane shown in the illustration a great labor saver. It consists of a wooden frame made by using 4 by 6-in. planks for runners 5 ft. long, a 4-in. top piece, fastened to the runner with $\frac{3}{4}$ -in. bolts through holes in both runner and top, and a broadax, set in the top piece as shown, a section of the top being cut out for this purpose. The broadax is securely bolted to the sloping edge of the top, the angle of which should be slightly less than the bevel of the ax. It is necessary to countersink the screw or bolt-heads which fasten the broadax, especially if it is desired to cut wood for making shingles. A pair of plow handles and a clevis complete the tool. The logs should be set against a stop to prevent them from sliding when a heavy cut is made. A stout post driven into the ground, so that only 6 in. projects makes a good stop for this purpose. For ordinary planing, a $\frac{1}{4}$ -in. bite should be taken, and a heavier cut for shingles. When cutting shingles, make cross saw cuts in the log, every 16 or 18 in., to within 2 in. of the heart.—Eden W. Robinson, Grand Haven, Can.

☐ When soldering, if there is any suspicion of grease or oil on the surface, clean off with carbon tetrachloride before applying the flux.

Simple Test Distinguishes Wood and Denatural Alcohols

It is often difficult to tell the difference between refined poisonous wood alcohol and denatured alcohol. A thin piece of celluloid, if put in a vial of the alcohol in question, will quickly reveal its nature. Wood alcohol will dissolve the celluloid, while denatured alcohol will have no other effect in 12 hours than to remove the polish. In handling these chemicals it should be borne in mind that wood alcohol is not only a deadly poison if taken internally, but that one may be poisoned by breathing its fumes or by absorption through the skin.

Convenient Bolt and Rivet Trays

In a large Denver machine shop, a number of bolt and rivet trays have been put in use and found entirely satisfactory. The frame consists of four 30-in. lengths of 2-in. pipe, flattened at one end and bent at right angles to form feet, and two siderails, flattened and drilled as indicated, for attachment to the top of the legs. Three sheet-metal troughs, ranging from 8 to 14 in. in width, and as long as the frame, with one partition across the center, are welded between the legs at suitable heights for the easy filling of the trays and handy removal of the contents. When not in use, the outfit is kept near the sup-

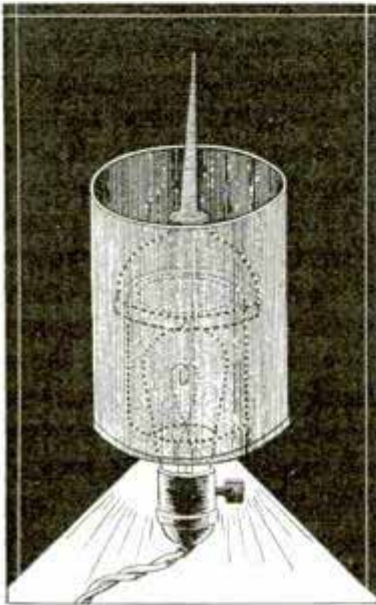


Rack of Sheet-Metal Trays on Pipe Frame Used for Holding Bolts in Machine Shop

ply bins, so that they can be quickly loaded up when required and carried to the job.—Jos. C. Coyle, Denver, Colo.

Keeping Lard Oil Warm

To keep lard oil warm during cold weather so that it will run easily, get an extension cord, a small lamp, a pipe coupling that will fit around the lamp, and a tin can which will allow both lamp and coupling to fit inside of it, as shown in the drawing. Cut a hole in the center of the bottom of the tin can just large enough for the neck of the lamp to pass through. Punch a hole through the side



of the can and screw it to the wall. Place the coupling around the lamp so that it will extend above it, as shown. It will then serve as a grate for holding the oil can, as indicated, thus preventing the latter from coming in contact

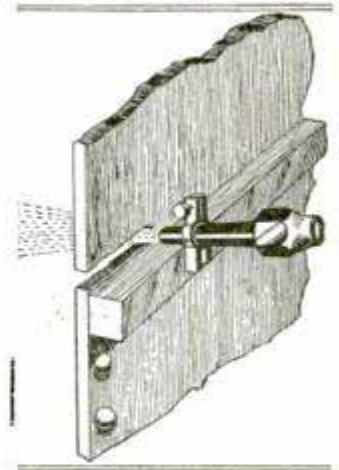
with the lamp.—W. W. Parker, Lead, South Dakota.

An Improvement for Electric Bells Having Small Transformers

In electric-bell installations, dry cells are being superseded to a considerable extent by small transformers. This source of power is usually stronger than a battery current. For this reason the contacts are likely to occasion trouble, a particularly important consideration in view of the almost prohibitive cost of platinum. Ordinarily, there is no need for a loud signal, and in offices, and similar places, a quiet buzzer is desirable. Under these conditions the make-and-break system of contacts was disconnected, and the magnetic coils connected directly with the circuit. As the transformer current is of the alternating type, a good signal is obtained by adjusting the vibrating armature closely at the screw contact. When so arranged, a vibration of 120 per second is obtained on the 60-cycle current.

Adjustable Gauge for Acetylene Blowtorch

The sharpness of the cut made with an acetylene blowtorch depends to a great extent on the steadiness and regularity with which the torch can be moved along. With the aid of the adjustable gauge shown in the drawing, it

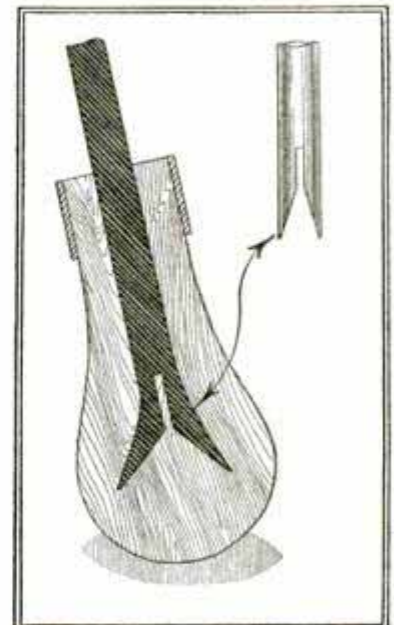


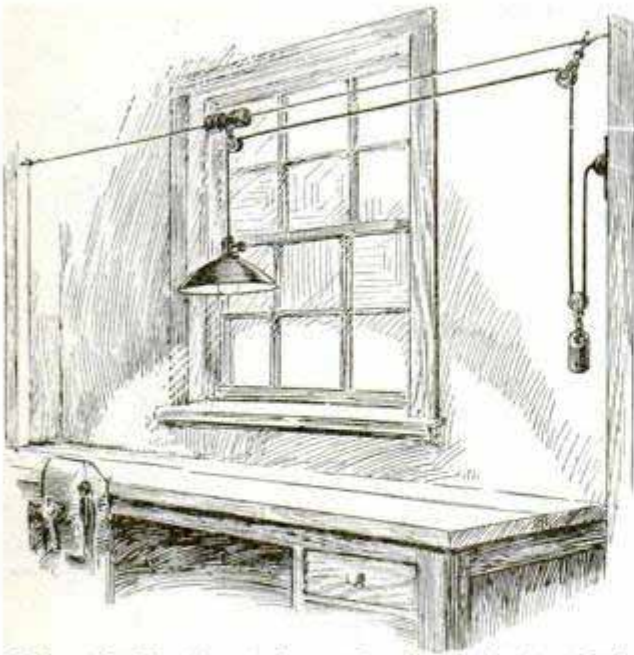
is easy to make a neat, narrow cut, both edges of which will be sharp and the lower one almost free from oxide. The gauge consists of a clamp fitted with a thumbscrew allowing it to be opened or closed on the nozzle of the torch in various positions. The body of the gauge is set at right angles to the nozzle so that it can be slid along a guide strip.

Anchoring Screwdriver Shanks

Screwdriver shanks can be securely anchored in a wooden handle without any risk of splitting by merely making a slit in the shank with a hacksaw and filing the edges to sharp points, as shown in the accompanying illustration. When the shank thus cut

and filed is driven down into the handle the sharpened edges will spread, providing excellent anchorage, and preventing the blade from turning, no matter how much force is applied in using the screwdriver. In fact, the handle will break before the shank will turn.—John A. Blaker, West Auburn, Mass.





Adjustable Workbench Lamp Can Be Set in Any Position and Height Desired

A Convenient Bench Light

Where it is necessary to move a light over a workbench to various positions, the method of suspension shown in the drawing will be found highly satisfactory, as it allows the lamp to be moved about with the least effort, and it always stays just where it is put. A stout steel wire is stretched taut between two screwhooks driven into the wall at each end of the bench. A porcelain insulator used in electric wiring is slipped over the wire and a small pulley is attached to the knob. An extension cord is slipped over the pulley and over a similar pulley held by one of the screwhooks at the end. A third pulley with a small weight attached serves as a counterweight and is slipped over the cord at the plug end. A cleat receptacle or a wall receptacle should be installed in line with the wire and cord as indicated. The double advantage of this installation is that the bench light can be slid to any point

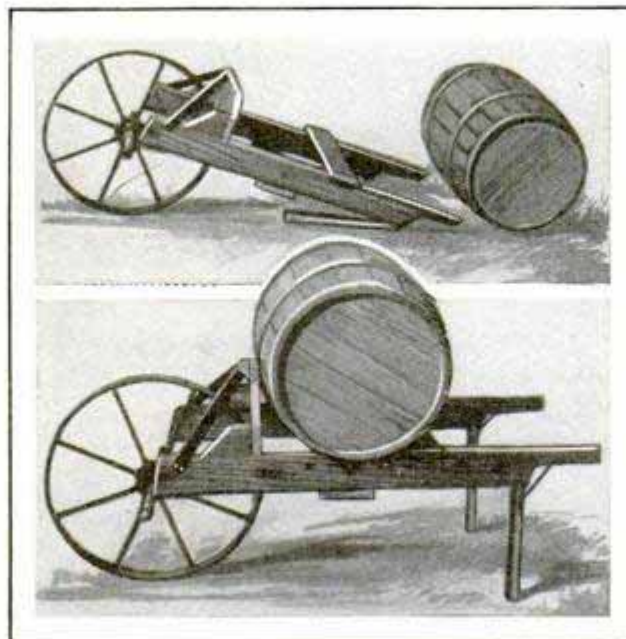
along the wire and it can also be adjusted to any desired height.—Hal Kramer, Allston, Mass.

Ventilating Photographic Dark Room

Photographic dark rooms should, of course, be light-proof, and in an effort to obtain this condition, the question of ventilation is often neglected. Good air is necessary for the comfort of the operator, and is especially essential in summer, to reduce the room temperature. A hot dark room means poor photographic results. The best method of securing ventilation is to force air into the room. This cannot be done handily by an electric fan in a direct opening in the wall, because of the admission of light. A wooden conduit, 12 in. high, 14 in. wide, and 8 ft. or more long, solved the problem. It was built to permit cool, fresh air to enter the room near the floor, and suitable provision was made for the exit of the warm air, near the ceiling. The air was blown into the room by an electric fan placed at the opening. The factory photographer who devised the arrangement found it indispensable.

Hinged Legs Make Barrow Easy to Load

Anyone who has loaded barrels of oil or other heavy material on a wheelbarrow knows what a job it is, and will therefore appreciate the type of barrow shown in



Folding Legs on Homemade Wheelbarrow Make It Easy to Load Heavy Barrels

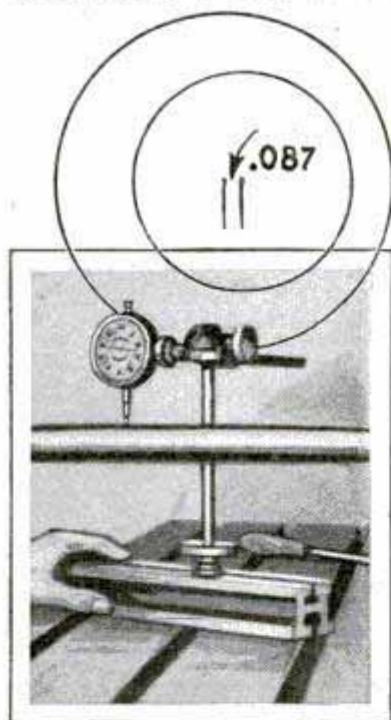
the drawing. It has folding legs, which permit the handle end to rest on the ground so that the barrel can be rolled onto it. The whole barrow is homemade. The legs are hinged so that they will drop in place when the barrow is lifted. Hooks are attached to the underside of the handles to engage with screweyes driven into the legs in order to lock them securely when they are in use.

Cutting Disks or Rings Accurately from Sheet Metal

It is difficult to hold a piece of sheet metal to the faceplate of a lathe without boring holes in it. This is a difficulty that may be readily overcome by proceeding as follows: Warm the piece of sheet metal slightly and place upon it a piece of paraffin, sufficient to spread out and cover the surface when melted. Remove the faceplate and set it, face down, upon the paraffined surface of the metal. When the paraffin has hardened, the metal will be held against the faceplate firmly, permitting accurate cutting of disks or rings, if care is used.

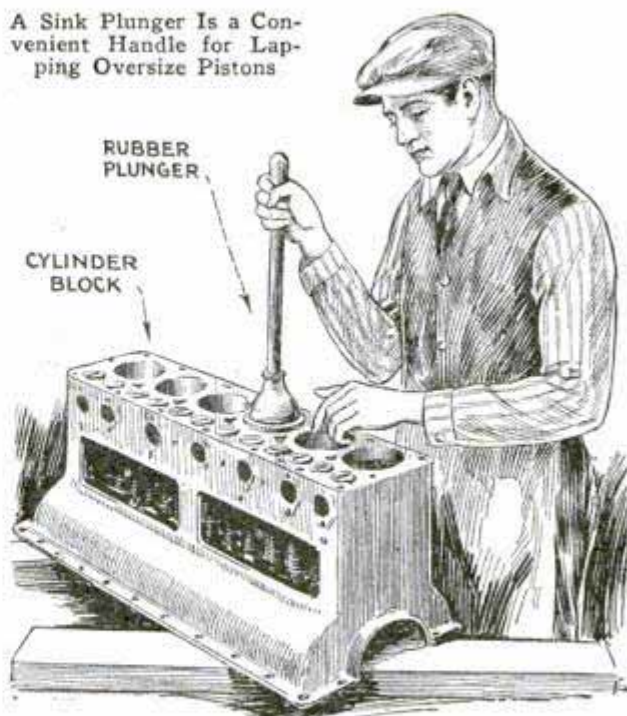
Dial Indicator Facilitates Turning and Boring Eccentrics

A quick method of gauging an exact throw or "cam" by turning is to use a dial indicator as shown in the drawing. A recent turning job required a shaft that would give a reciprocating movement of



.087 in. to a plunger. The shaft was first laid in V-blocks, and lines were drawn on the two ends, one on center, the other approximately .087 in. out of center. Light prick-punch marks were then made, the shaft placed between centers, and the dial indicator was fed up to indicate the low spot on the shaft's diameter. While taking a reading of the dial, the shaft was turned one complete revolution to determine if the difference between the low and high reading on the dial was .087 in. By noting the readings, the prick-punch marks could be shifted so that the throw would be exactly .087 in.—J. McIntyre, Hartford, Conn.

A Sink Plunger Is a Convenient Handle for Lapping Oversize Pistons

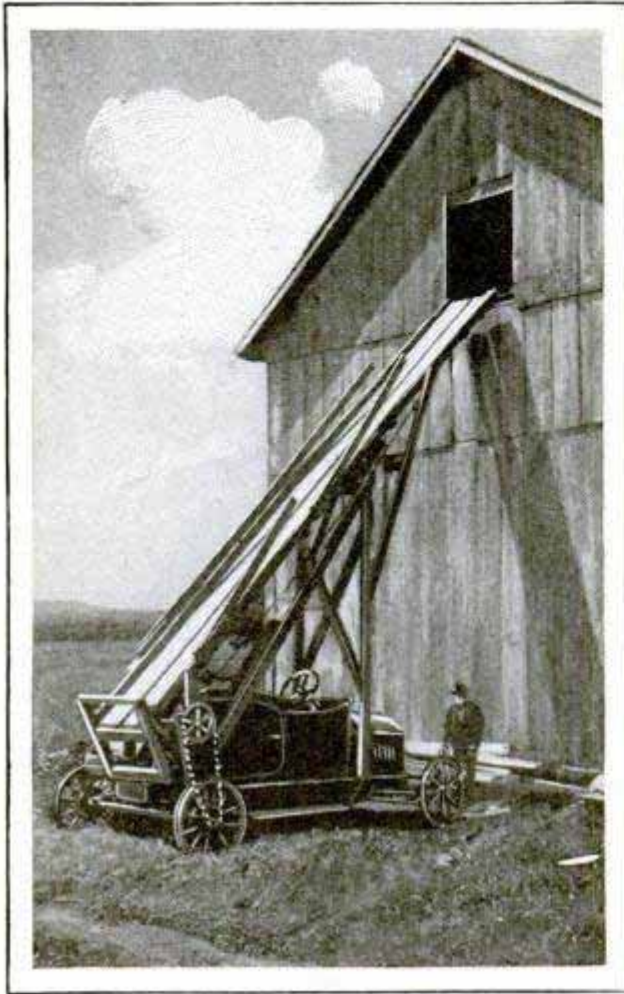


Sink Plunger Holds Cylinders for Lapping

Usually, during the process of fitting oversize pistons in an auto engine, the lapping of the pistons and rings is done by putting the piston in the cylinder upside down, so that the connecting rod can be used as a handle. This practice does not give very accurate results owing to the taper of the bore, which is caused by wear. The lapping of the piston should be done in its normal position in order to avoid compression leakage and oil pumping. To do this, a sink plunger will be found convenient, as it can be pressed on the top of the piston firmly and will retain its grip unless the suction cup is defective.

Novel Repair for Cracked Water Jacket on Engine

A cracked water jacket may be repaired satisfactorily as follows: Drill and tap a small hole at the end of the crack. Thread in a copper wire, or rod, and cut it off flush. Next drill another hole beside the first one, and close enough to it, so that the threads of the plug, screwed into it, will lap into the first plug. This process is repeated until the crack is filled. The heads of the plugs are then riveted, to close the small intervening spaces. With careful workmanship, this method will provide a water-tight repair that will give indefinite service.



Homemade Baled-Hay Hoist Built on and Powered by an Old Auto

Old Auto Makes Good Hay Hoist

The photo shows a convenient baled-hay hoist built on and powered by an old auto. This contrivance was used with much success on the farm of Russell Brothers, of Winfield, Kans. It consists of a wooden slide extending from the auto at an angle to reach the hay door of the barn. The slide is slotted in the center from the bottom to the top. A hoisting chain, equipped with corn-binder lugs, runs directly under the slot so that the lugs project upward through the slot and engage with the bales that are placed on the slide. The hoisting chain is driven indirectly by means of three sprockets and a second chain, which engages with a sprocket attached to one of the drive wheels of the auto. An adjustable idler sprocket mounted under the slide keeps the chain tight. After a bale of hay is placed on the slide, the first lug that comes along catches the bale and pulls it up. Four wooden spars, mounted over the slide, catch any bale that happens to slip

back and hold it on the slide until the next lug again engages with the bale and carries it up. While the hoist is being operated it is, of course, necessary to jack up the car wheel, to which the driving sprocket is attached. The hoisting speed can be varied by using the gear shift of the car in various positions, and by adjusting the throttle. The hoist shown in the photo raises the bales 20 ft., but it is obvious that a hoist of any practical height can be built and operated in the same way. —Stanley Russell, Winfield, Kans.

Using Plumb Bob in the Wind

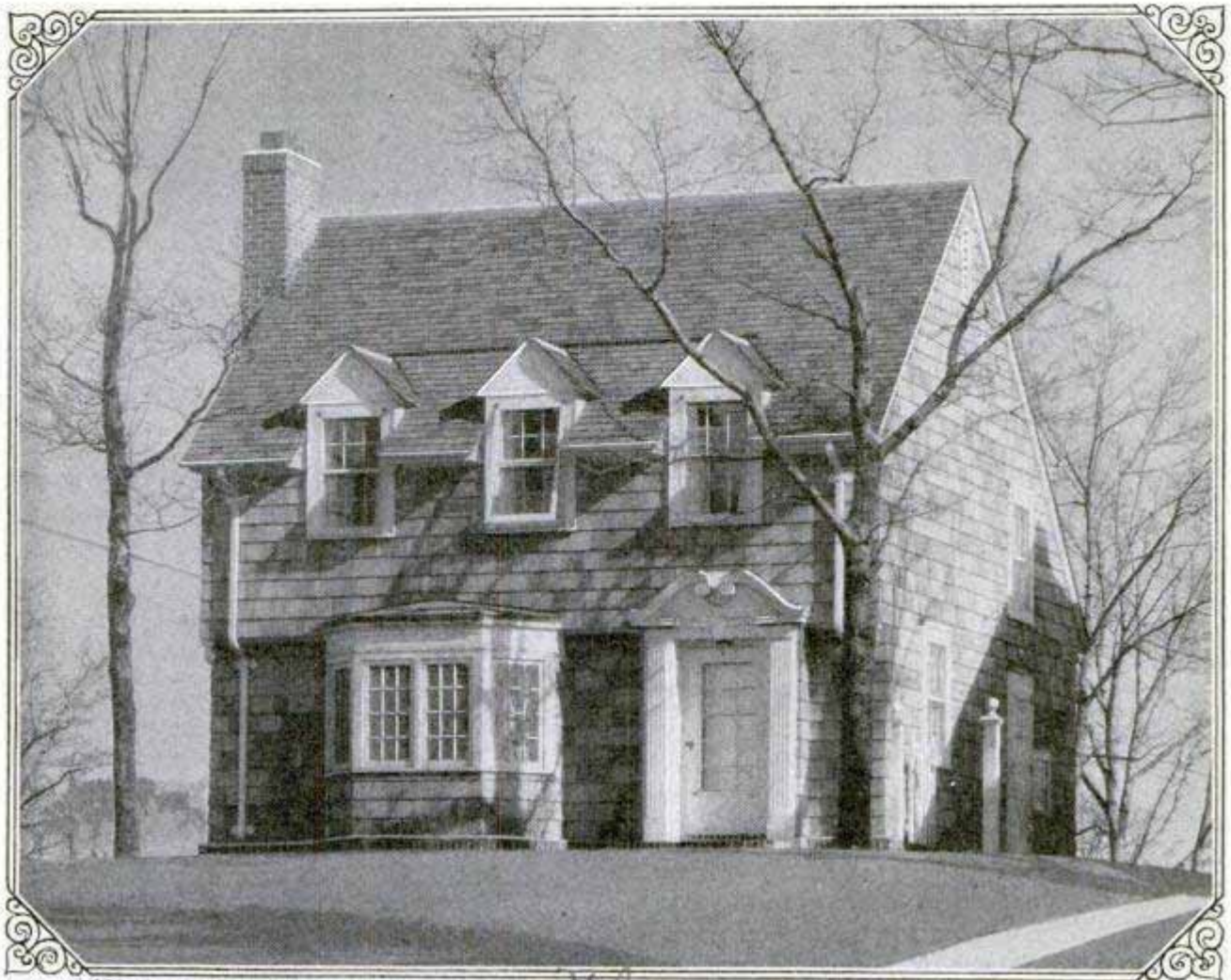
When the wind is blowing, accurate measurements with a plumb bob are impossible. The difficulty can be remedied by placing a pail of water so that the bob will be submerged in it. A thin, light line or fine wire should be used for suspending the bob to decrease the wind resistance.—Miss Cleo Conley, Los Angeles, Calif.

Celluloid End Strips Keep Bolts of Cloth Tidy in Store

Dealers in bolts of cloth know the necessity of keeping the bolts tidy. A grimy appearance of the bolt ends can readily be prevented by pieces of white celluloid, cut a trifle shorter and narrower than the bolt boards and attached to the latter with bright-headed thumbtacks as indicated. The bolts are neatly stacked in piles, all at the same angle. It is easy to clean the celluloid ends with a moistened cloth.



Celluloid Endpieces on Bolts of Cloth Eliminate Grimy Appearance



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PLAN NO. 5-W-14

M. Lagg.

A Style That Never Grows Old

STYLES in houses come and go like styles in cars. You buy a car in the latest style and after you have driven it a little while, it's out of date because the makers have changed the body lines.

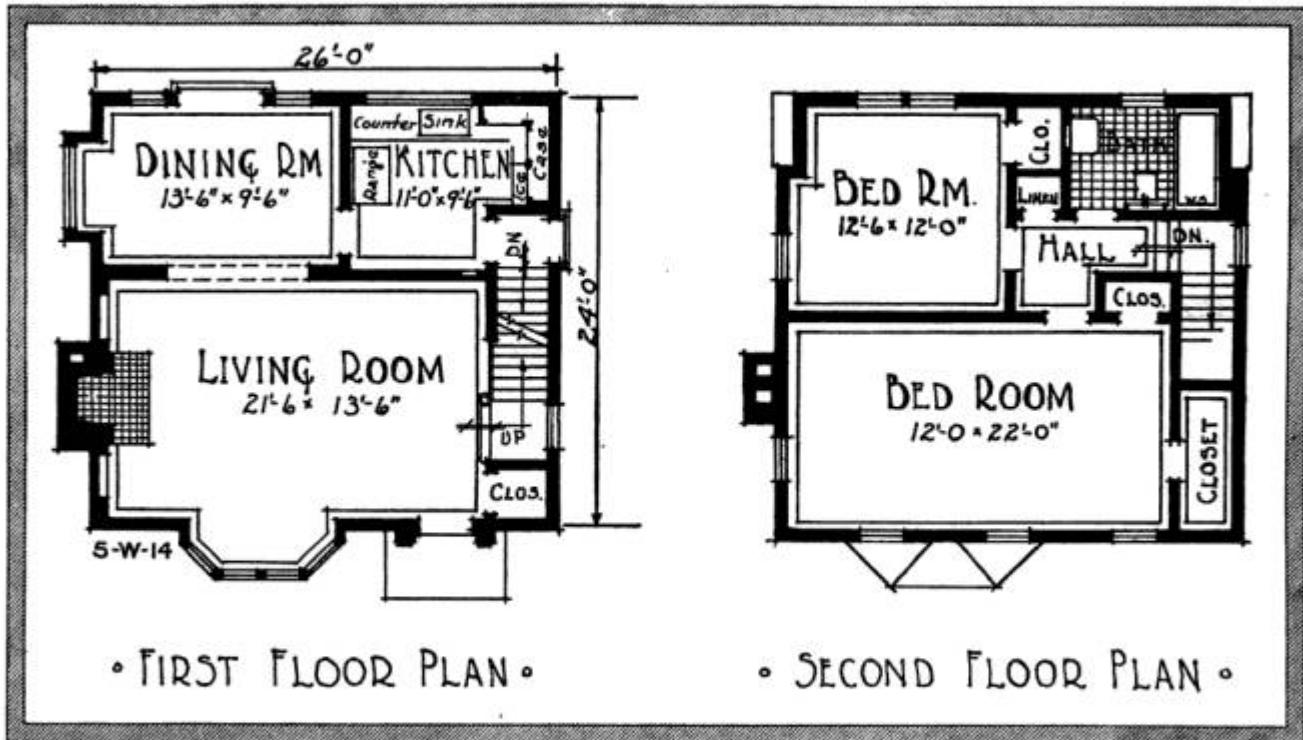
When building or buying a house, remember that style is an important factor in protecting your investment. It may be the determining factor in establishing good resale value for your house ten or fifteen years hence. It pays to build in a style as liquid in public approval as a Liberty bond at a bank. Colonial is such a style. Three reasons for its enduring popularity are these: First, in plan and construction colonial is the outgrowth of simple, honest housing

requirements of our forefathers—requirements which in many ways have not changed greatly since the days when Thomas Jefferson built Monticello and Washington lived at Mt. Vernon. Second, colonial is economical to build due to its simplicity in plan and freedom from over-ornamentation; third, it has good proportions.

The early colonial houses were for the most part built of wood, though brick was also used. The house illustrated this month therefore follows tradition. It is patterned after Cape Cod colonial with slight variations here and there that give it the touch of smartness typical of modern tendencies.

HOW TO GET A BLUEPRINT

To help our readers get started on one of life's most glorious experiences—building and owning a home—Popular Mechanics Magazine will supply readers a one-sheet blueprint of any house appearing in the magazine for \$1. This blueprint does away with the necessity of first purchasing a complete set of plans to find out whether you can afford to build. It contains floor plans, elevations, a section detail, size of joists, studs, etc., and also a brief specification. Submit it to tradesmen and dealers for building estimates.



Shingle sidewalls were used extensively in pioneer days. They were called shakes and were hand-made. Modern machine-made shingles are not as crude as the early variety. Today, numerous shingle stains have added color to houses as well as a preservative for the shingles. There are three rules to remember when selecting wood shingles for your house: First, buy edge-grain shingles; second, lay them with rust-resisting nails; third, on the sidewalls of the house expose as much of the shingle as you can pay for.

There are two kinds of wood shingles. One is cut flatwise of a log like a board is cut. These are the less expensive shingles. Others are cut so the surface radiates toward the center of the tree. You will notice lines or ribs running lengthwise of the shingle. When these are used and well nailed, they lie flat and will not curl. The thick butts or ends cast shadows on the sidewall of a house and produce a texture much admired by architects. These shadows form horizontal or parallel lines and have a tendency to make a house appear lower and nearer the ground, melting into and out of the landscape, so to speak.

The colonial house above is a five-room affair planned for a forty-foot lot and a model house in many ways. If you want a third bedroom on the second floor, this may be had by slight rearrangement of

the large bedroom into two somewhat smaller sleeping rooms.

The house is of frame construction, fully insulated, has a full basement and attic space. Both roof and sidewalls are edge-grain red-cedar shingles.

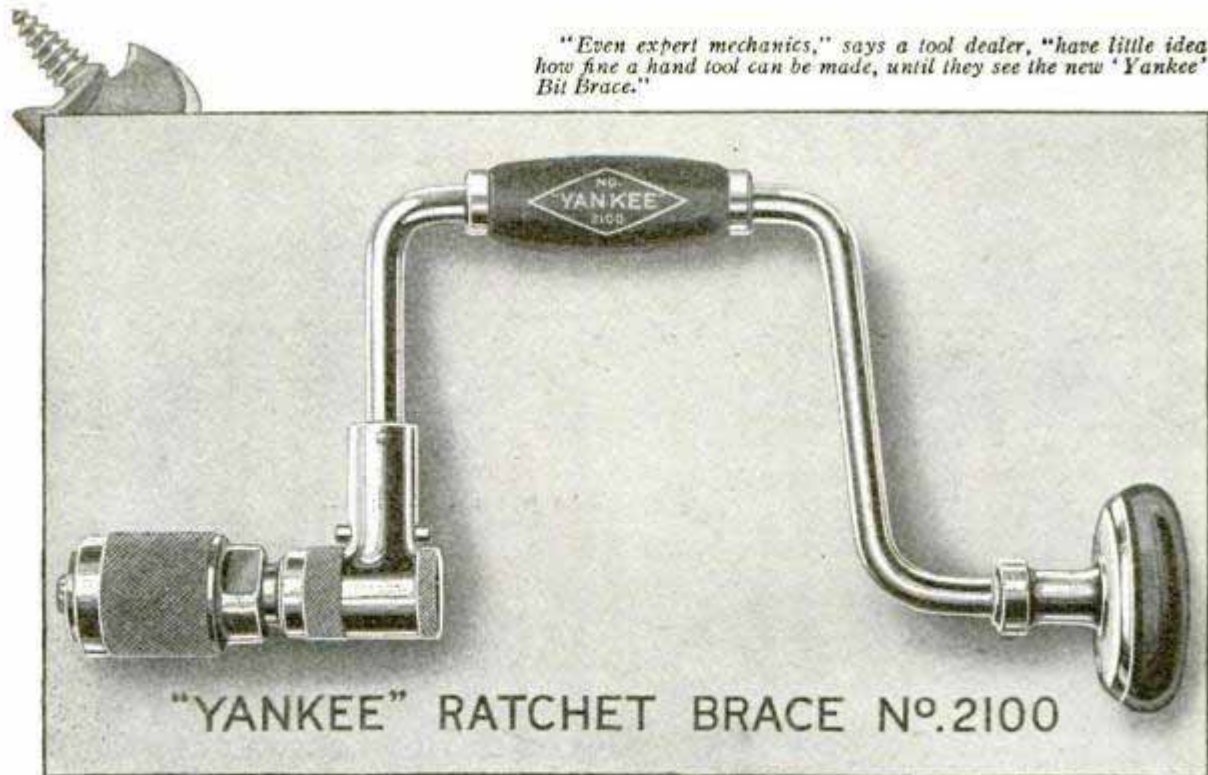
The colonial doorway can be obtained from standard stocks made by various mills, or can be built up to order, and the same is true of other millwork in the house. Trim assembled from standard parts saves the cost of preparing new cutting knives for special orders, and therefore is much cheaper, as a rule.

Here you have a small house in a style that does not grow old and one that should make your dollars buy safe investment as long as the house stands. In round numbers, this is a \$6,000 house complete. Costs, however, will vary, depending upon where you build and the materials you use. The house would look well built of brick, either in skintled pattern or face-brick veneer. It would be difficult to plan a more roomy arrangement in so compact a floor area. Study the plan. It has many excellent qualities.

PLAN BOOK FOR READERS

A NEW BUNGALOW BOOK: Sixteen selected low-cost bungalows in popular styles, at prices ranging from \$5,000 down to \$2,000. Each house fully described and illustrated. Send ten cents in stamps to cover mailing.

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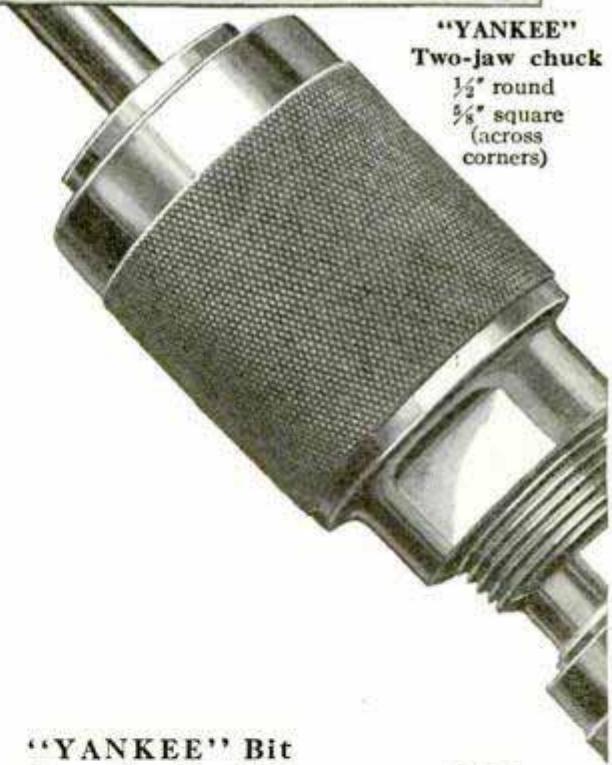
NO NEED to hold chuck to keep from turning back: "Yankee" Ratchet is smooth, silent, powerful. Adjustment is instant, positive, and *visible*. A glance tells how ratchet is set; a finger-touch changes it. Bronze encased—against dust and moisture.

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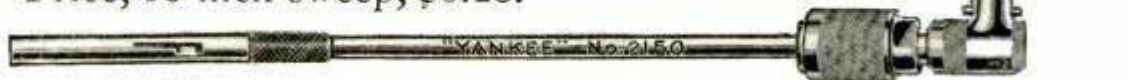
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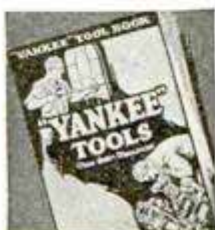
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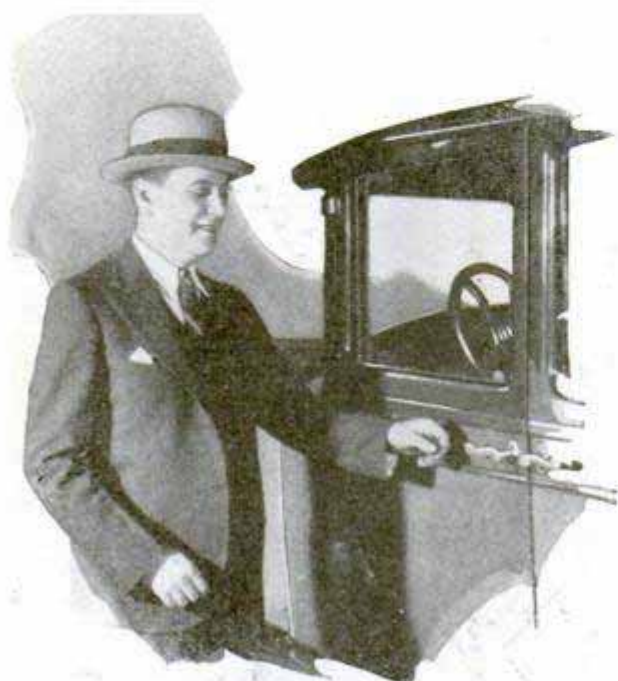
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USE the right type of saw for the work: a Disston cross-cut saw for cutting across the grain of the wood, and a rip saw for cutting with the grain. The teeth are shaped differently, and work differently. For all-around work, use a cross-cut saw with 8 points to the inch, and a rip saw with 5½ points to the inch.

Keep your saws sharp and set properly. To start the cut, rest blade on waste side of line, support side of blade with left thumb, and draw saw toward you a few times until a slight groove is formed; then cut straight.

In cross-cutting, it is best to maintain an angle of 45° between edge of saw and face of work. Stand so saw, arm and shoulder are in line with cut. In ripping, keep angle of 60° between saw and work. (See illustrations.)

Take long, easy strokes. Don't twist or force blade in the cut. Raise work high enough to keep blade from striking floor. Remember that a Disston saw is a fine tool: do not throw it around. Keep your saw oiled and hung up when not in use.

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Teeth of cross-cut saw and proper sawing angle



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THE biting winds of winter contract your skin, make it rough—hard to shave. Your razor then has a far more difficult job to do than it has in summer.

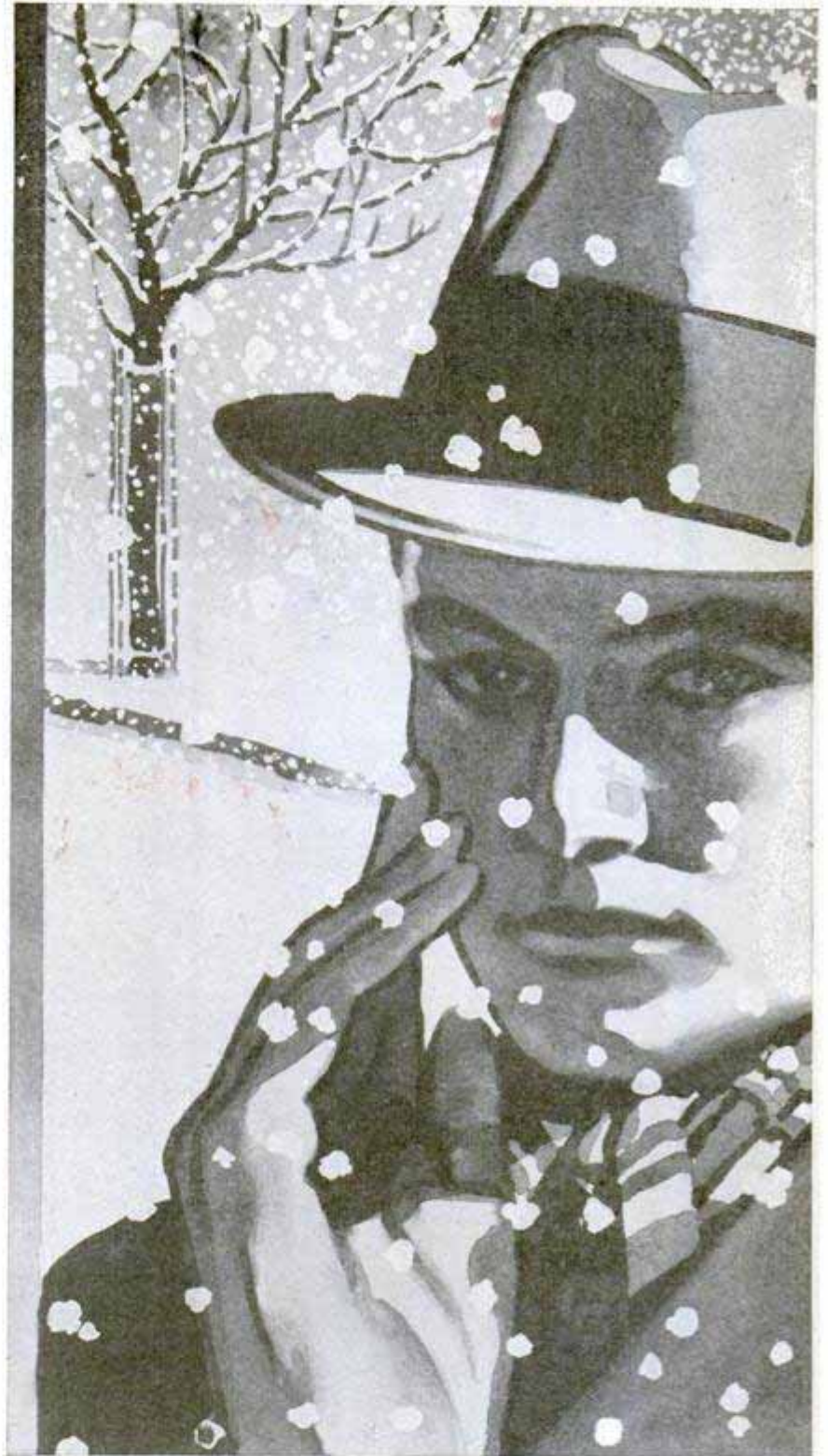
Yet you can always get a comfortable shave, no matter what the weather does to your face. Why?

Because your smooth, sure Gillette Blade never changes, under *any* conditions. It can't. Machines, accurate to one ten-thousandth of an inch, ensure its even precision.

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You may not wear the same face in November that you do in May, but count on Gillette Blades to shave you smoothly, swiftly, surely. They keep your face feeling young, and looking it. Gillette Safety Razor Co., Boston, U. S. A.

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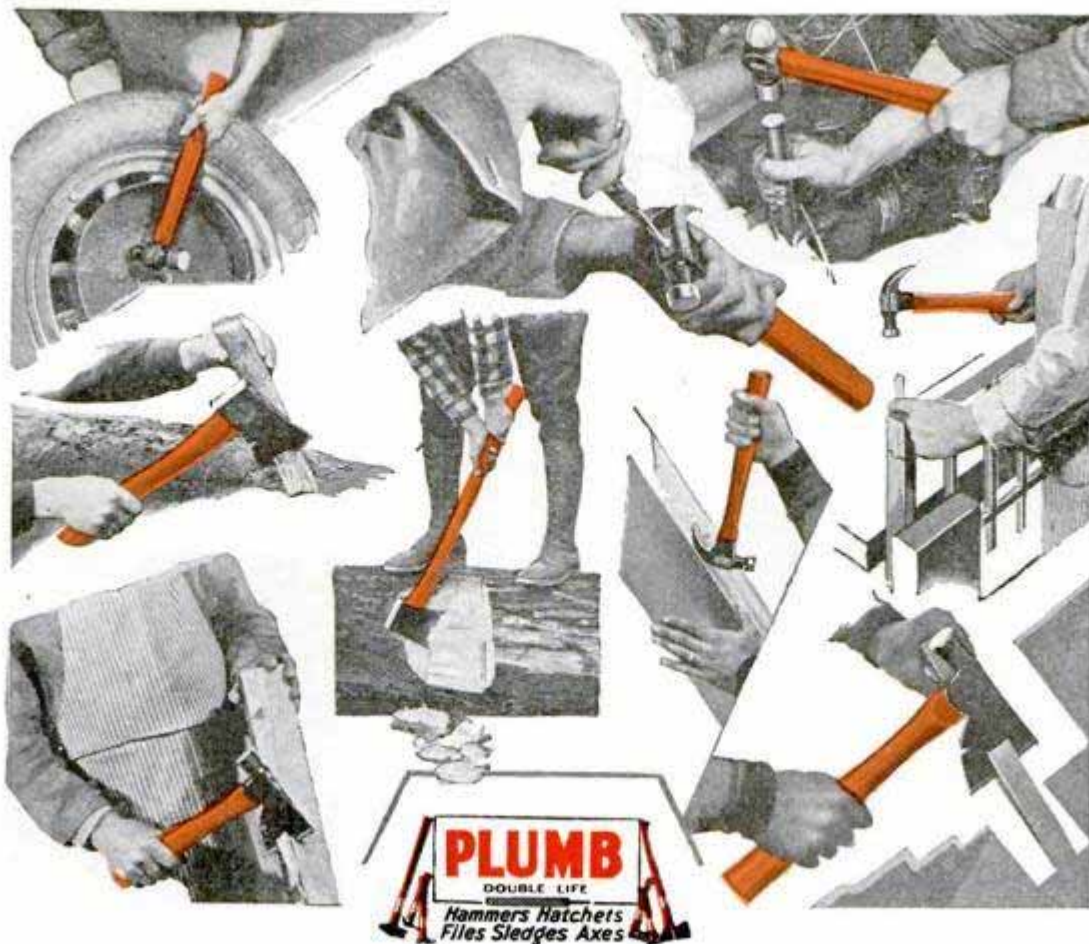
There's a lot of difference between the cold, wind-stiffened skin of late autumn and the tanned, freely perspiring face of July — and it makes a lot of difference in shaving. Yet it's easy to enjoy shaving comfort all the year round. Simply take ample time to soften your beard. And use a *fresh* Gillette Blade frequently.



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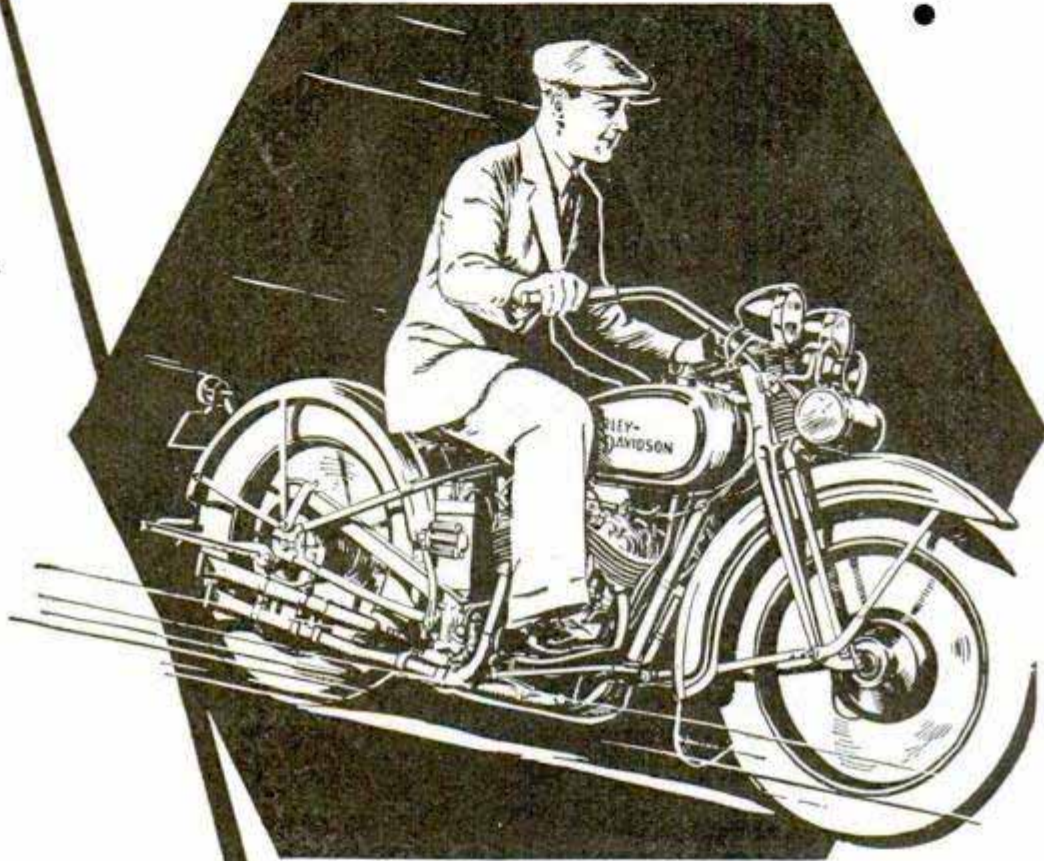
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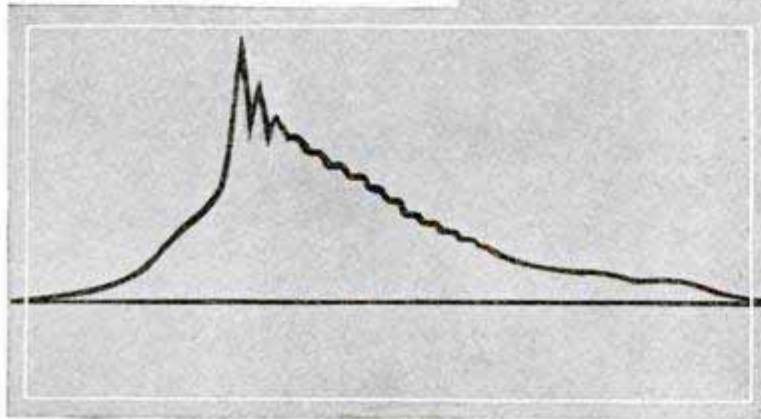
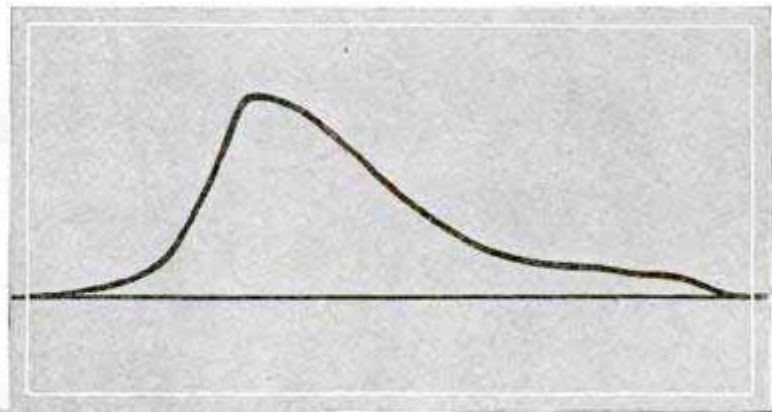
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My age is 12-15 years 16-19 years 20-30 years 31
years and up. Check your age group.

What is that "KNOCK"?

This is what happens in the cylinder of a gasoline engine when it is running smoothly. The pressure gradually increases after ignition until the mixture is nearly all burned. Then it grows less and less.



But when the gasoline is causing the engine to "knock," just see what happens. Is it any wonder that the engine loses power? Ethyl Gasoline prevents that jagged saw-tooth by "knocking out that knock."



THE "knock" was a mystery in the automotive world until the scientists in General Motors Research Laboratories started on its trail. Before they finished they not only found what that elusive "knock" was, but were actually able to take a picture of it! This was made possible by the development of the Midgley Indicator, which records the pressure inside the cylinder of a gasoline engine.

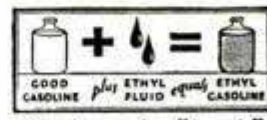
It showed that gasoline, when compressed beyond certain limits, explodes too fast—that is, "knocks" and loses power. Then the problem was to find something to mix with gasoline to control its combustion rate as

compression was raised. After years of research it was found that Ethyl fluid, containing tetraethyl lead, was the solution.

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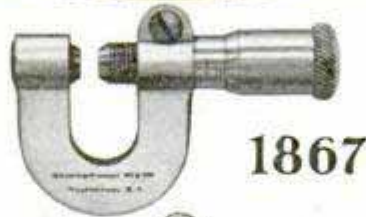
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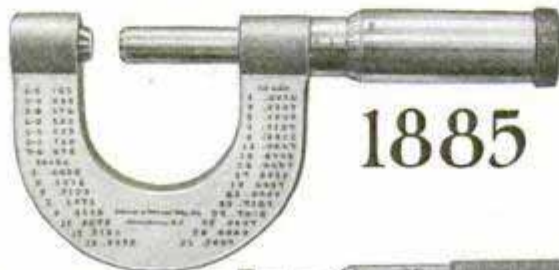
FIRST FOR 62 YEARS



1867



1877



1885



1929

THE FIRST Brown & Sharpe Micrometer Caliper was made in 1867. At that time it was received as an important contribution to the science of accurate measurement.

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Today, the Brown & Sharpe line of micrometers includes a variety of models and sizes to fit every requirement. Many of these meas-

ure to ten-thousandths of an inch. The preference for Brown & Sharpe Tools by skilled mechanics the world over has been built upon years of satisfactory use on every conceivable kind of precision work.

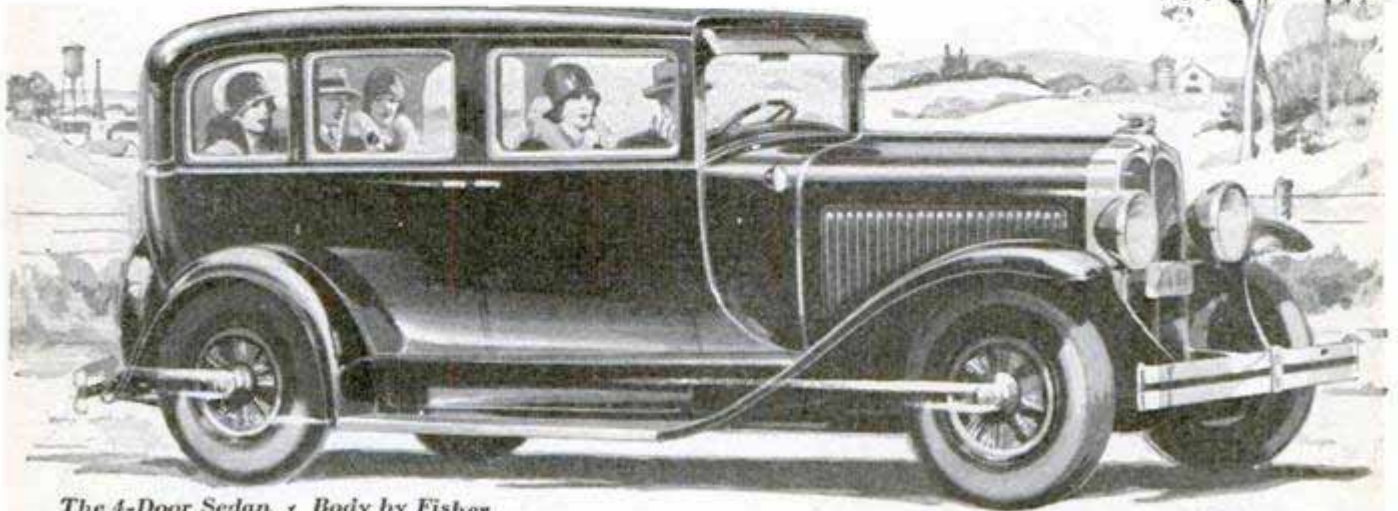
Our new Small Tool Catalog No. 31 illustrates over 2300 useful tools, including over 400 different micrometers. Ask your hardware dealer for a copy or write to us. Address Dept. P. M., Brown & Sharpe Mfg. Co., Providence, R. I. U. S. A.



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BROWN & SHARPE TOOLS

Compare its mechanical features with those of any other low-priced six



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1. A 200-cubic-inch L-head engine.
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3. The G-M-R cylinder head.
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8. A 1 $\frac{1}{4}$ -inch carburetor with internal economizer and accelerating pump.
9. Gasoline pump, introduced by Oakland.
10. Patented expansion-type piston pins.
11. Full-pressure lubrication.
12. Crankcase ventilating system.
13. Internal-expanding four-wheel service brakes of the most efficient type.
14. Special moulded, brake bands. Positively no squeaking when stopping.
15. Coincidental ignition and transmission lock.
16. Individually mounted instruments, including gasoline gauge.
17. Foot-controlled headlights.
18. Small wheels with ten massive spokes.

A most convincing method of testing Pontiac's value is to compare the mechanical features of the Pontiac Big Six with those of other cars in its price field. Here are 18 of these features—each one an important factor in Pontiac's long life, dependability and big car performance. Put them side by side with the mechanical features of any car selling for less than \$1100. The more familiar you are with automobiles and their construction, the more quickly will such a comparison cause you to recognize the exceptional value offered by the Pontiac Big Six at \$745.

Ask your Oakland-Pontiac dealer about Pontiac's many other unusual features—particularly about those responsible for its wonderfully low cost of maintenance and operation. And let him appraise the car you are driving. You will be surprised when you see the actual figures and learn how economically and conveniently you can own and enjoy the Pontiac Big Six.

Pontiac Big Six, \$745 to \$895, f. o. b. Pontiac, Michigan, plus delivery charges.

OAKLAND MOTOR CAR CO., PONTIAC, MICH.

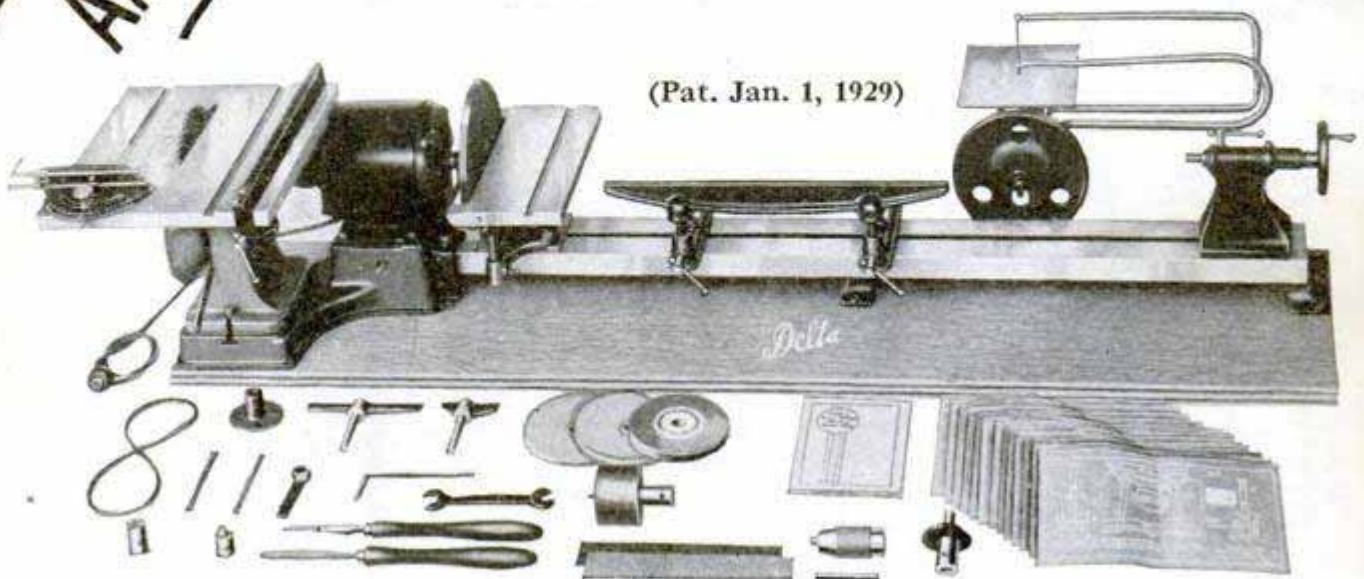
PONTIAC

BIG SIX

PRODUCT OF
GENERAL MOTORS

\$745
2-DOOR SEDAN
F. O. B. PONTIAC, MICH.

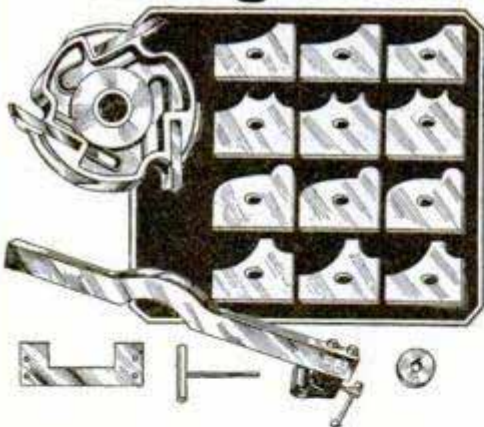
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"Delta" Electric Handi-Shop

A complete motorized workshop for craftsmen including all necessary equipment for Circular Sawing, Wood Turning, Scroll Sawing, Sanding, Drilling, Grinding and Buffing. Full instructions and blue prints furnished.

New "DELTA" Moulding Cutter



Cuts Over 50 Moulding Shapes With Only 4 Sets of Blades

Interchangeable high speed blades produce over 10,000 cuts per minute at 3500 RPM. Blades require no individual adjustment. Quickly and easily locked in position. Special guide fence. Unusually low price. Below are a few of the many attractive mouldings that can be made with this Delta Moulding Cutter.



Practical Design—Dependable Quality Plus Many Exclusive Features

that's what you find in every woodworking unit bearing the Delta trademark. Craftsmen, artisans, farmers, mechanics—all who use wood in their daily labors or spare-time hobbies—are delighted with the sturdy construction, splendid efficiency and moderate cost of Delta equipment. They appreciate keenly such practical constructional features in the Handi-Shop as:

1. Two-shaft motor that permits carrying on two important operations at one time without continually dismantling set-up.
2. Heavy U-shaped Lathe Bed (no rods) guaranteed not to chatter.
3. Automatically Oiled Bronze Bearings.
4. Patented Tilting-Tables.
5. Circular-Saw Raising lever.
6. Absence of interference when sawing large pieces of lumber; and many other important improvements found only in Delta products.

10-DAY TRIAL EASY TERMS

For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. You will learn also how you can try any Delta equipment for 10 days under actual working conditions at our risk. Your choice of three convenient payment plans. Mail coupon on opposite page today. It describes numerous items of interest to those who work with wood.

Delta SPECIALTY Co.

Delta Woodworking Units

for HOME CRAFTSMEN, FACTORIES,
SHOPS, CONTRACTORS AND FARMERS

The introduction of the Delta Jointer and Circular Saw Units marks a new era in moderate-priced woodworking equipment. Now, for the first time, are available sturdy, practical machines in compact, convenient form at price levels astonishingly low. The new Delta Units include:

Combination 4-Inch Jointer 8-Inch Circular Saw Motor Driven

A convenient, efficient combination. Permits sawing, sizing, and smoothing in one quick operation. Both Jointer and Circular Saw are run from the same motor with separate belts. Neither Unit interferes with other. Can be operated together or separately. Mounted on sturdy welded steel stand of convenient height. A rugged portable outfit at an attractive low price. Furnished with or without motor as desired.

4-Inch Jointer Unit

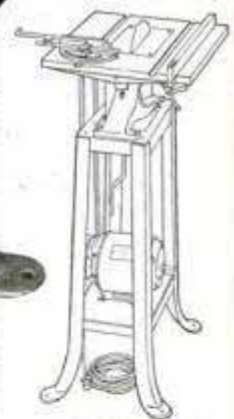
Consists of new Delta 4-inch Jointer mounted on separate welded steel stand. Produces smoothly finished work in surprisingly short time. Built to give years of satisfactory dependable service on production work. Incorporates numerous exclusive features such as Self-Aligning Fence with accurate graduations permitting fence to be set quickly at any angle from 0°-45°; Fool-proof guard; Automatically-oiled bronzed bearings; Non-slipping V-belt drive. Furnished with or without motor.

8-Inch Circular Saw Unit

Consists of new Delta 8-inch circular saw on gracefully designed welded steel stand. Practical design and sturdy construction make it ideal for steady production work. Has Automatically-oiled bronze bearings; Patented tilting table; practical Miter-gage and Rip gage; Raising and Lowering Crank Screw permitting micrometer-like adjustment; V-belt drive. Furnished with or without motor.



4-Inch
Jointer
Unit



8-Inch
Circular
Saw Unit

"DELTA"
Means Quality in
Every Detail

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- I am particularly interested in Delta Electric Handi-Shop.
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Address.....



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(Reg. U. S. Pat. Off.)

The leg has split and the caster is off—it's hard on floors, furniture and tempers. But Plastic Wood, forced into the split and the socket, will hold the caster firm again. This amazing product—that Handles like Putty and Hardens into Wood—also holds fast to metal, plaster, fabric, tile, porcelain or glass! It is ideal for filling in furniture dents and gouges, too, and can be stained, painted or lacquered to any desired color. Waterproof and greaseproof.

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For the bathroom, when tile or porcelain splits, cracks open up around the tiles, or a wall fixture comes loose, Plastic Wood White Waterproof Tile Cement is of immediate value. It will hold broken pieces, seal cracks, is impervious to water, and dries to a hard flat white. At the same prices as Plastic Wood.

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Plastic Wood dries rapidly, and often when using it becomes necessary to soften or thin it. Plastic Wood Solvent will renew the wood that has started to dry or will clean tools after using. In 25 and 50-cent cans at your dealer's.

Handles
Like
Putty



Hardens
Into
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1 lb. can \$1.00

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LePage's Complete Plans and Instructions Show You How to Make it Yourself

Rolled beside a comfortable chair this handsome, convenient cabinet brings your favorite books and magazines and favorite smoking things in easy reach for an evening of solid comfort. It even holds your book for you. The door of the smoking compartment when open becomes an adjustable book rest. And you can make it yourself—easily—by following the instructions in LePage's Job Plan No. 19.

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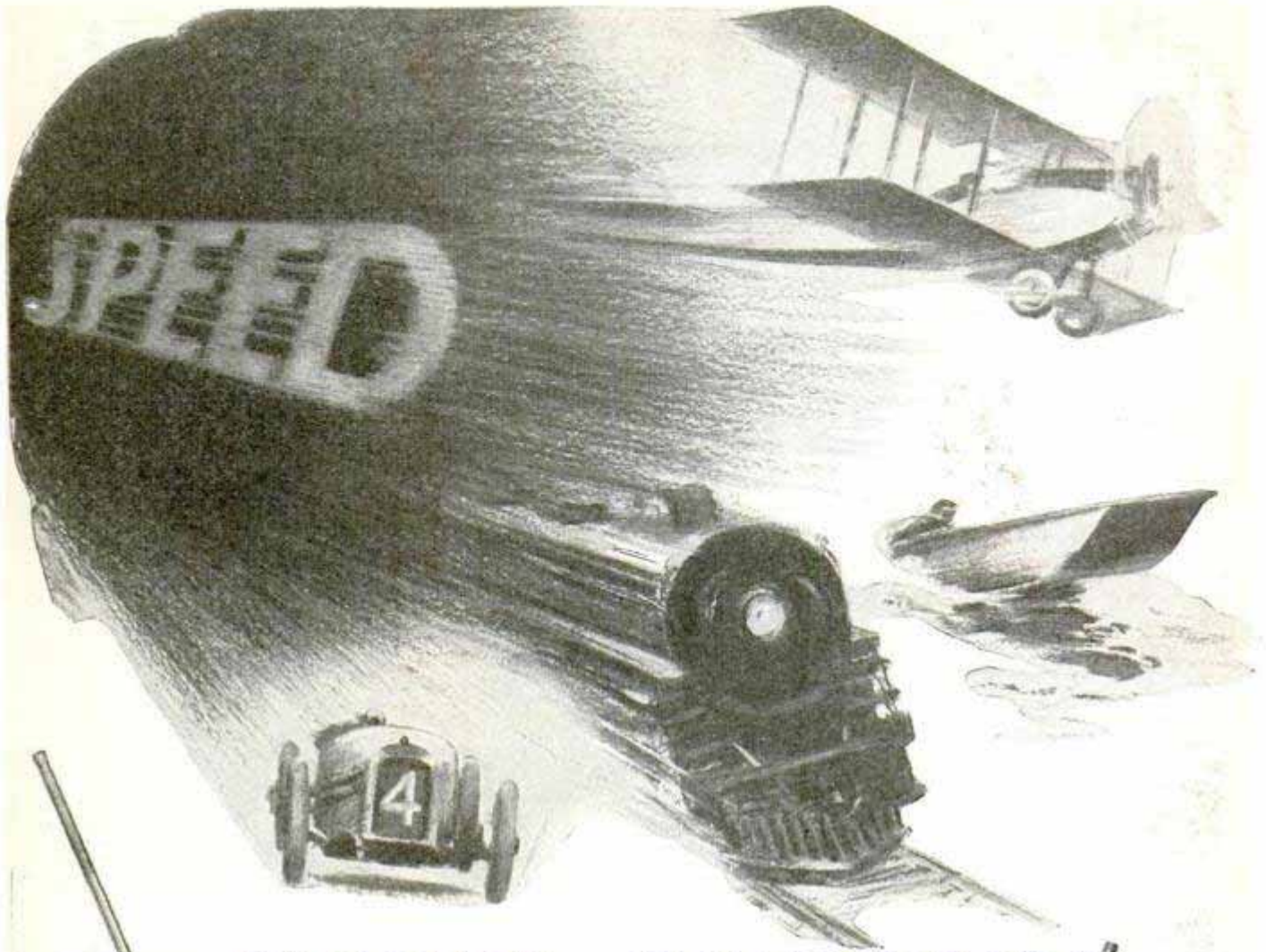
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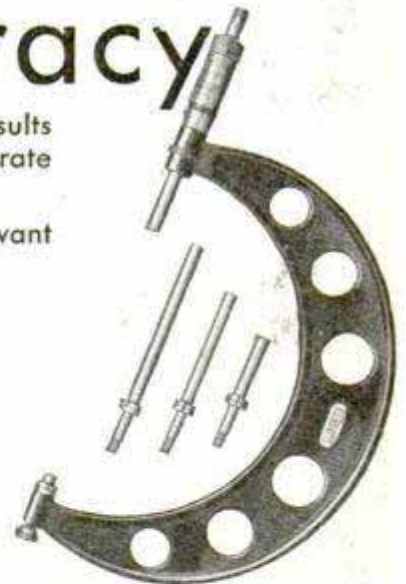
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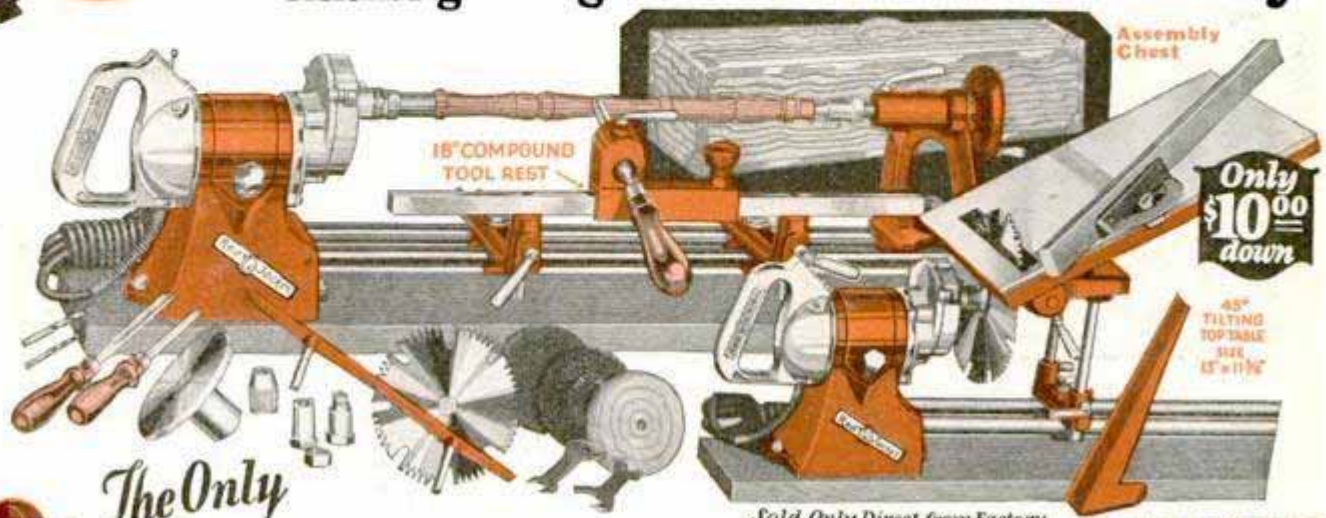


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INVITES YOU TO BE A REAL CRAFTSMAN

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Red Jacket Equipment is designed, tested, approved and guaranteed by Wm. L. Aylward, a nationally known craftsman and manufacturer who has developed his own life's hobby into a cooperative association of thousands of amateur and professional craftsmen. He invites you to join. He will instruct, guide and help you. A new zest in doing things awaits you.

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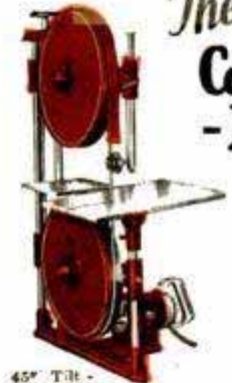
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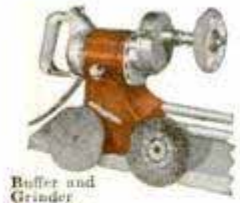
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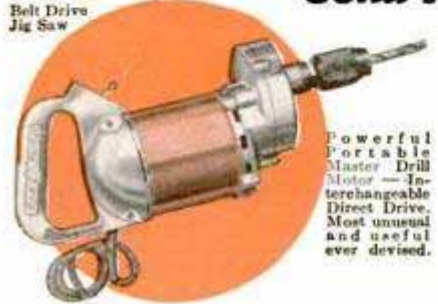
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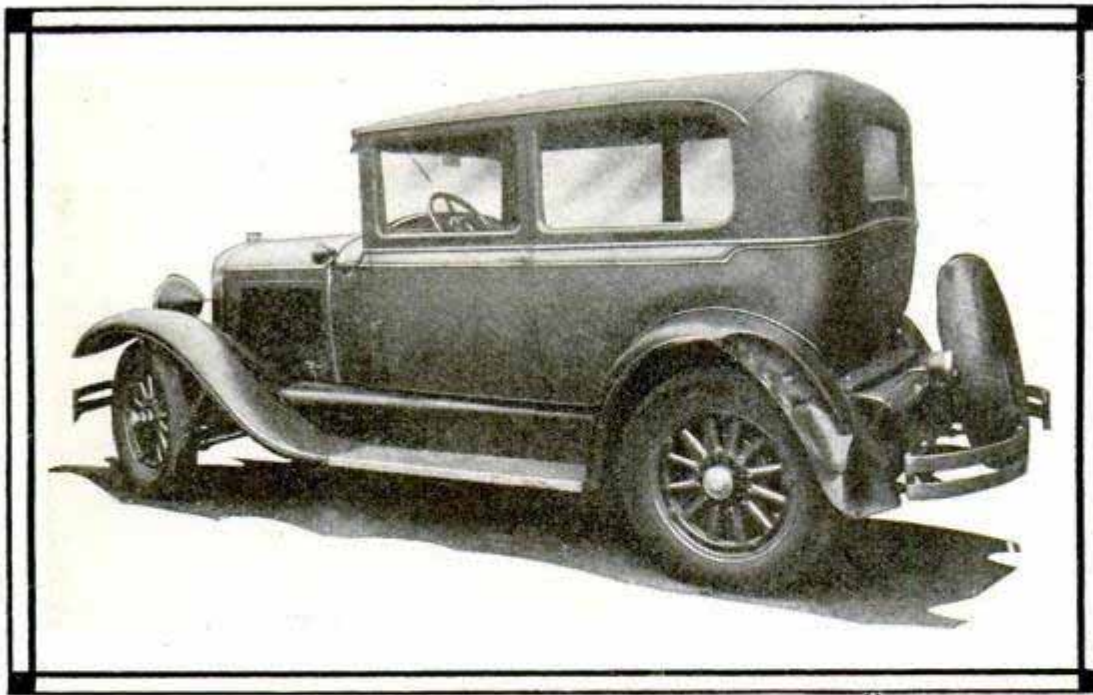
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New Britain, Conn.



“The Choice of Most Mechanics”

STANLEY TOOLS



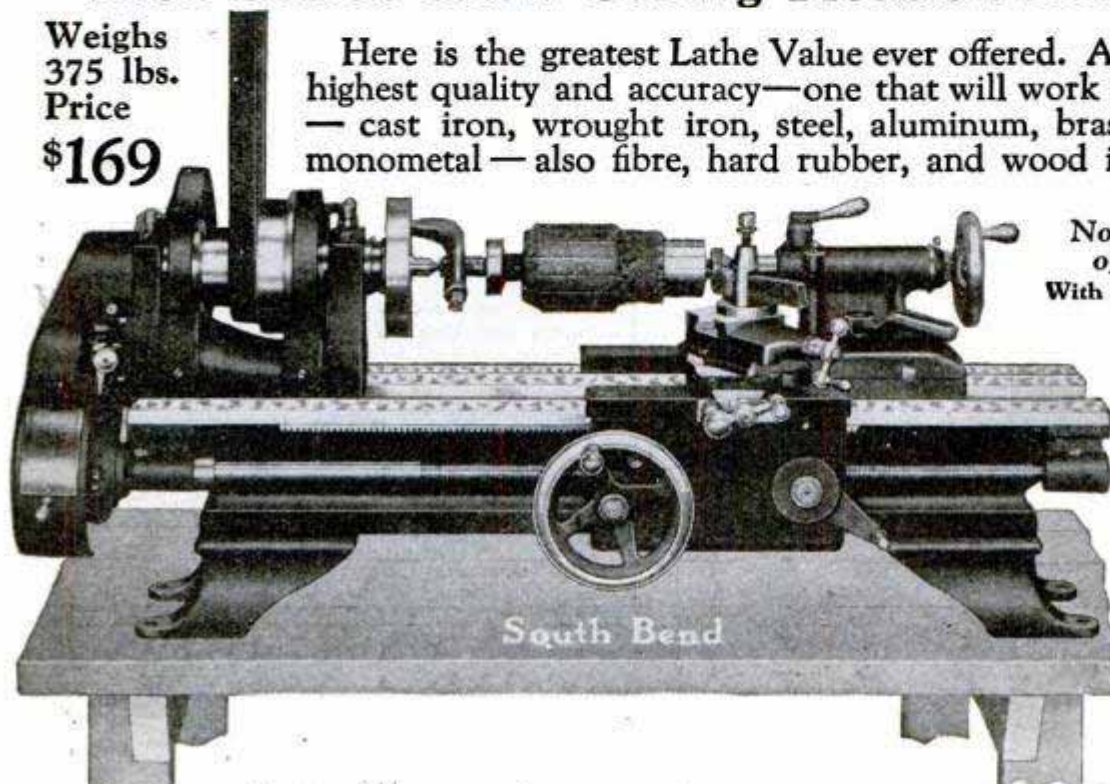
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For This 9" x 3' New Model South Bend Back Geared Screw Cutting Precision Bench Lathe

Weights
375 lbs.
Price
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Here is the greatest Lathe Value ever offered. A Universal Tool of highest quality and accuracy—one that will work metals of all kinds—cast iron, wrought iron, steel, aluminum, brass, bronze, copper, monometal—also fibre, hard rubber, and wood in pattern making.



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Specifications

9 $\frac{1}{4}$ " x 3' Back Geared Screw Cutting, swing over bed, 9 $\frac{1}{4}$ "; distance between centers, 18"; width of belt cone drive, 1"; length of bed, 3 ft. Power required, $\frac{1}{4}$ H.P., shipping weight, 375 lbs.

FREE with Each Lathe!

Complete Book of Instructions, Countershaft and Equipment

It is as easy to learn how to run a Lathe as to learn to run a car. The operator soon becomes proficient, especially if mechanically inclined. With each South Bend Lathe, we send most complete book of instructions, telling just how to do all kinds of work on the Lathe.

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9" x 4'	29 in.	425 lbs.	182.00	36.40	12.74
9" x 4 $\frac{1}{2}$ '	36 in.	450 lbs.	190.00	38.00	13.30

Write for FREE CATALOG and Booklet No. 22

Booklet No. 22 tells all about this unusual South Bend Lathe now priced at only \$169. Also shows same Lathe with 2 $\frac{1}{2}$, 3 $\frac{1}{2}$, 4 and 4 $\frac{1}{2}$ ft. beds in bench and floor leg types. Free Catalog shows 96 types and sizes of New Model South Bend Lathes from the 9" swing to 24" swing.

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Lathe Builders for Twenty-Two Years
—45,000 South Bend Lathes in Use.

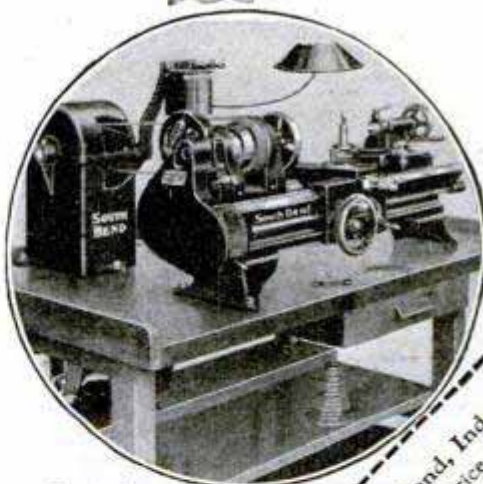


Illustration above shows New Model South Bend Junior Lathe, equipped with Horizontal Motor Drive. Connects to any ordinary light socket for power. Price, with Motor, \$254. Easy Payments. \$17.78 a month.

SOUTH BEND LATHE WORKS
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Manufacturing Machine Shop Garage Work

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Now a closer shave because of extra efficiency of small-bubble lather.

MEN who use Colgate's do not worry around five o'clock as to whether to shave again . . . or to try and "get by." Such men know the superiority of Colgate's small-bubble lather—that it gives a longer-lasting shave—one that makes you feel comfortable and clean-faced.

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Instantly your beard gets moist . . . easier to cut . . . scientifically softened right down at the base.

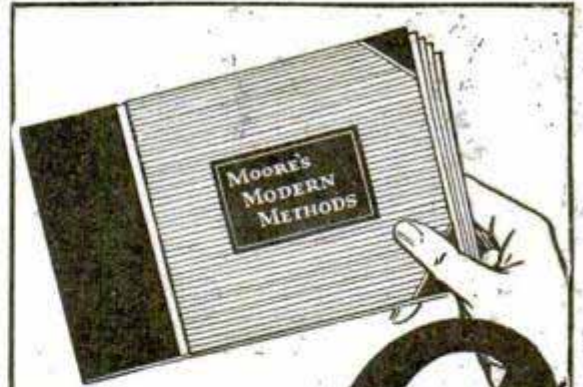


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does every sawing job from straight cutting to intricate scroll and design work; crosscuts, rips, miters, bevels; inside and outside jig sawing and scroll cutting. One saw instead of several.

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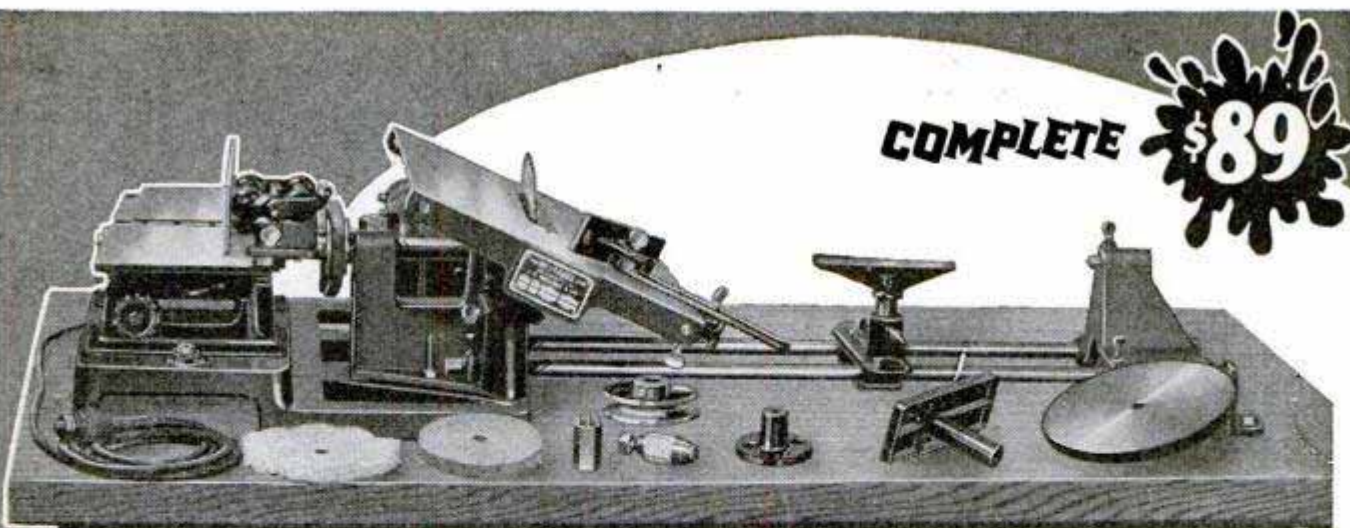
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Low Price

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- 4" Planer
 - 8" Circular Saw
 - 6"x36" Lathe
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 - 6" Buffing Wheel
 - 5" Emery Grinder
 - 1/4" Drill Chuck
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 - Endless V-Belt, two 4" and one 2 1/4" V-Belt Pulleys, Cast Iron Sub Base and 10 ft. Cable with separable Plug.
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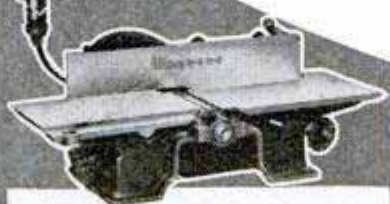
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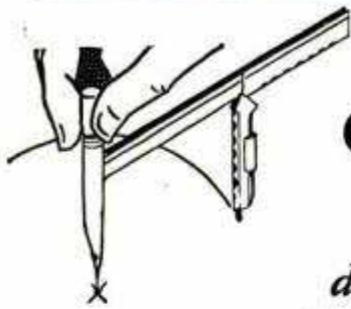
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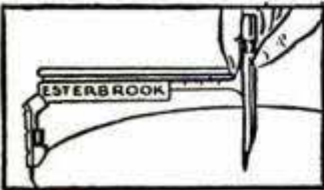
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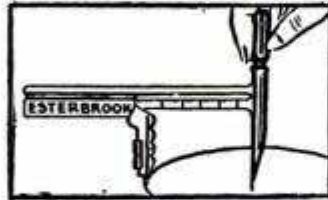
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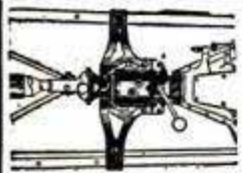


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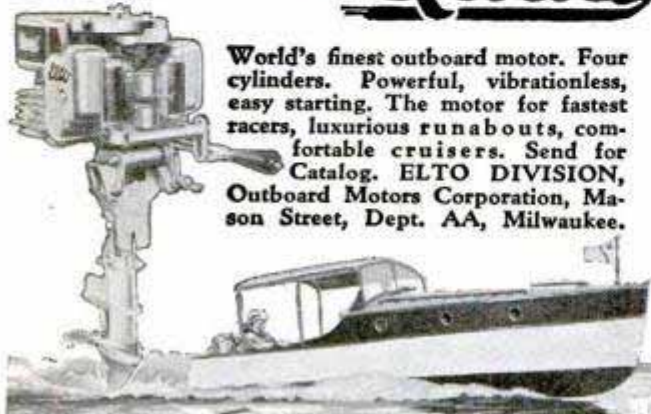
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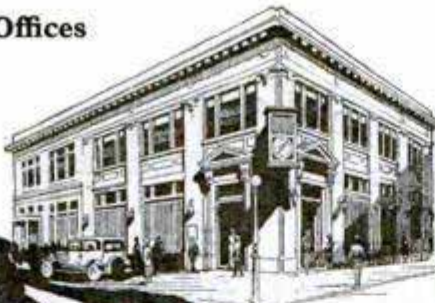
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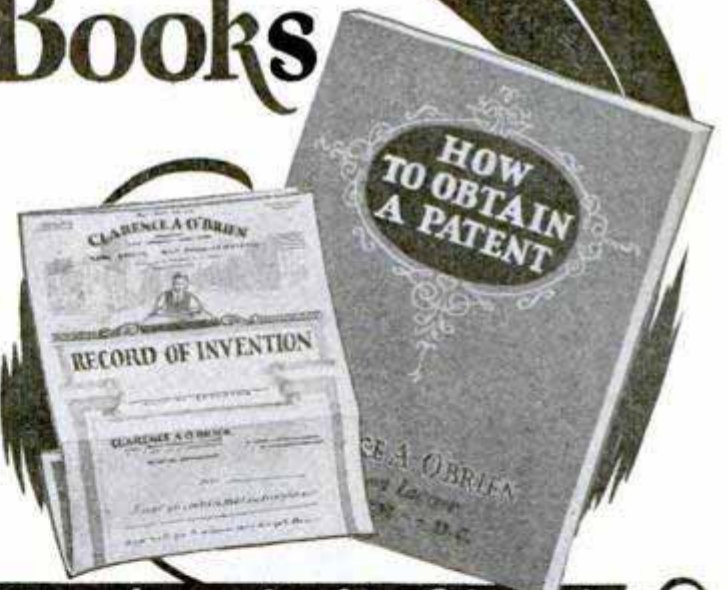
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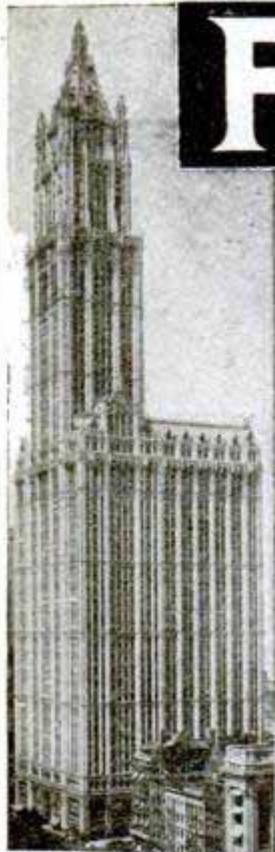
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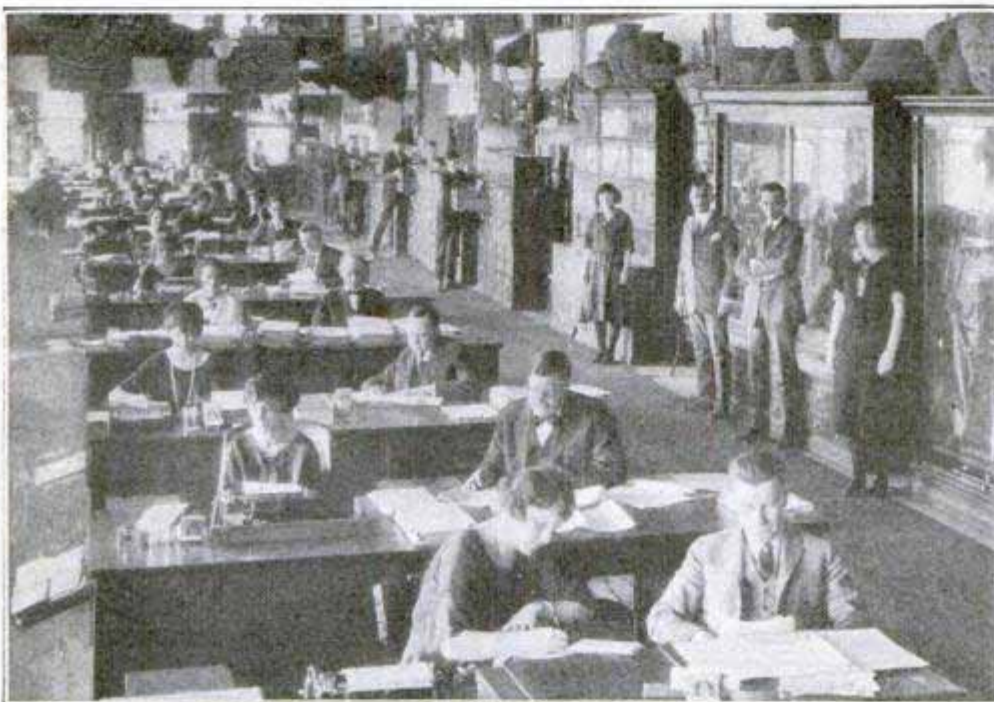
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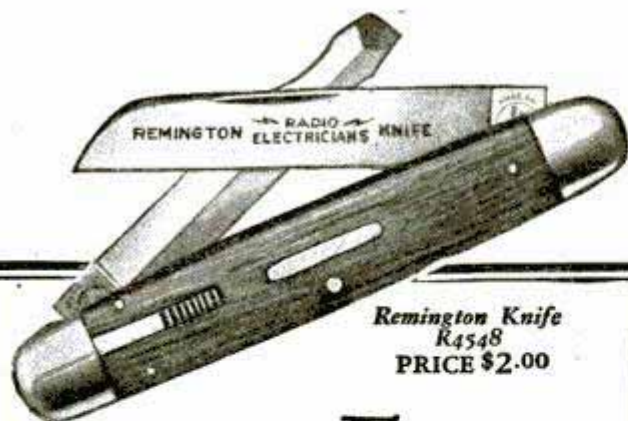
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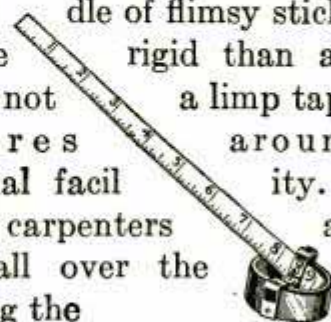
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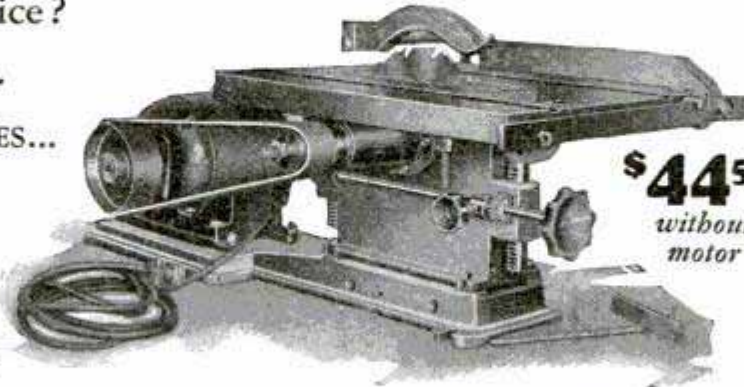
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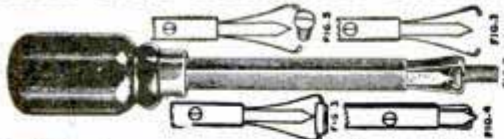
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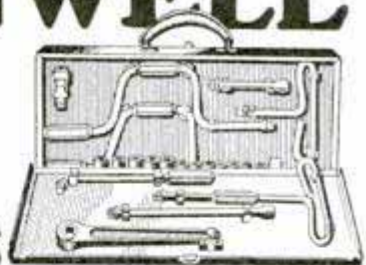


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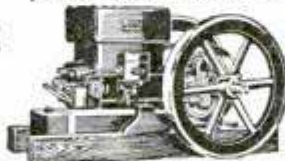
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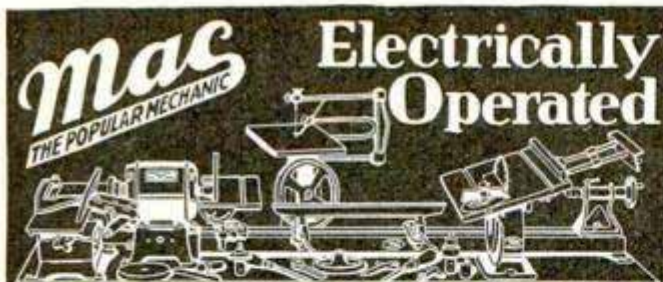


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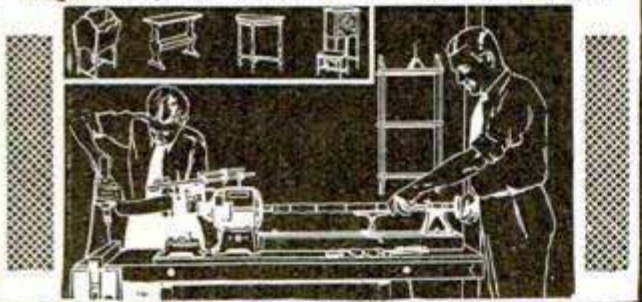
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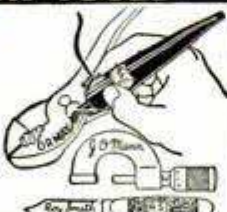
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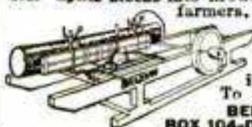


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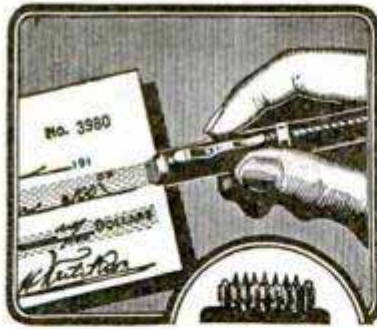
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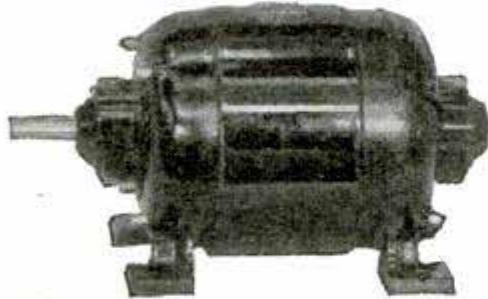
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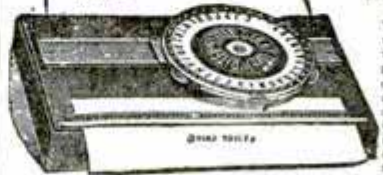
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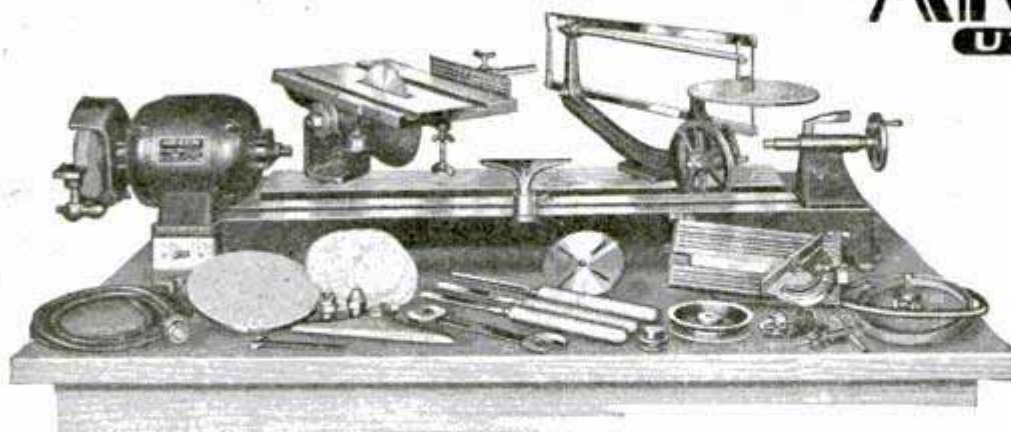
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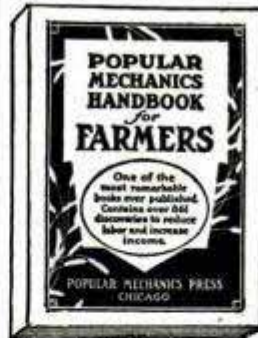
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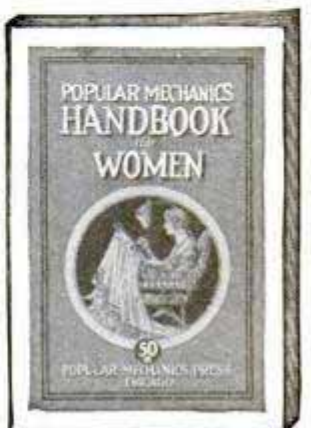
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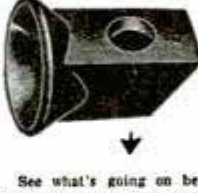
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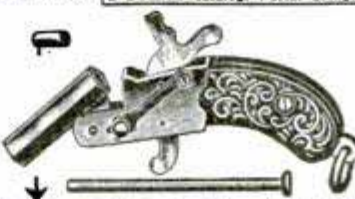
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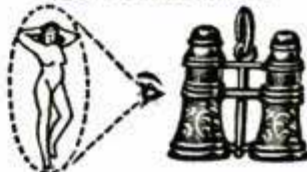
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Our outfit includes 3/4rd H.P. Double Extension Shaft Motor; table tilts to 45 degree angle, and may be raised or lowered to cut any depth from 0" to 2 3/4". We also include necessary attachments to Rip, Crosscut, Bevel, Grind, Mitre, Groove, Sand, Mortise, Tenon and Polish.

Everything is complete, ready to plug in any light socket. Note base which holds Saw and Motor. It is Portable. Same specifications, but with Ball Bearings, and 12" by 18" table top—\$45.00. **Catalog Free** in which this Saw Outfit is more clearly pictured. It also contains Bench Lathes, 12" Band Saw, Complete Work Shop and Hardware Specialties.

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Ten of these sensational demonstrations a day should pay you \$50 a week. No experience necessary—we show you how.

BOYS-LEARN TO FLY

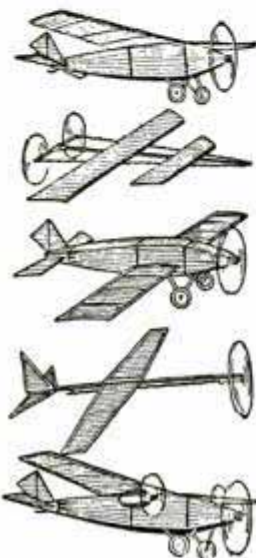
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Join the CLINTON JUNIOR AVIATORS

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At left are a few of the many model designs you will make under this Club Plan.

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Only \$1.00 to Join

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The Ranger Radio is a result of 7 years' development. It is to-day fast becoming the most favorably known radio—now leading the field, as its predecessor, the Ranger Bicycle, has for 30 years.

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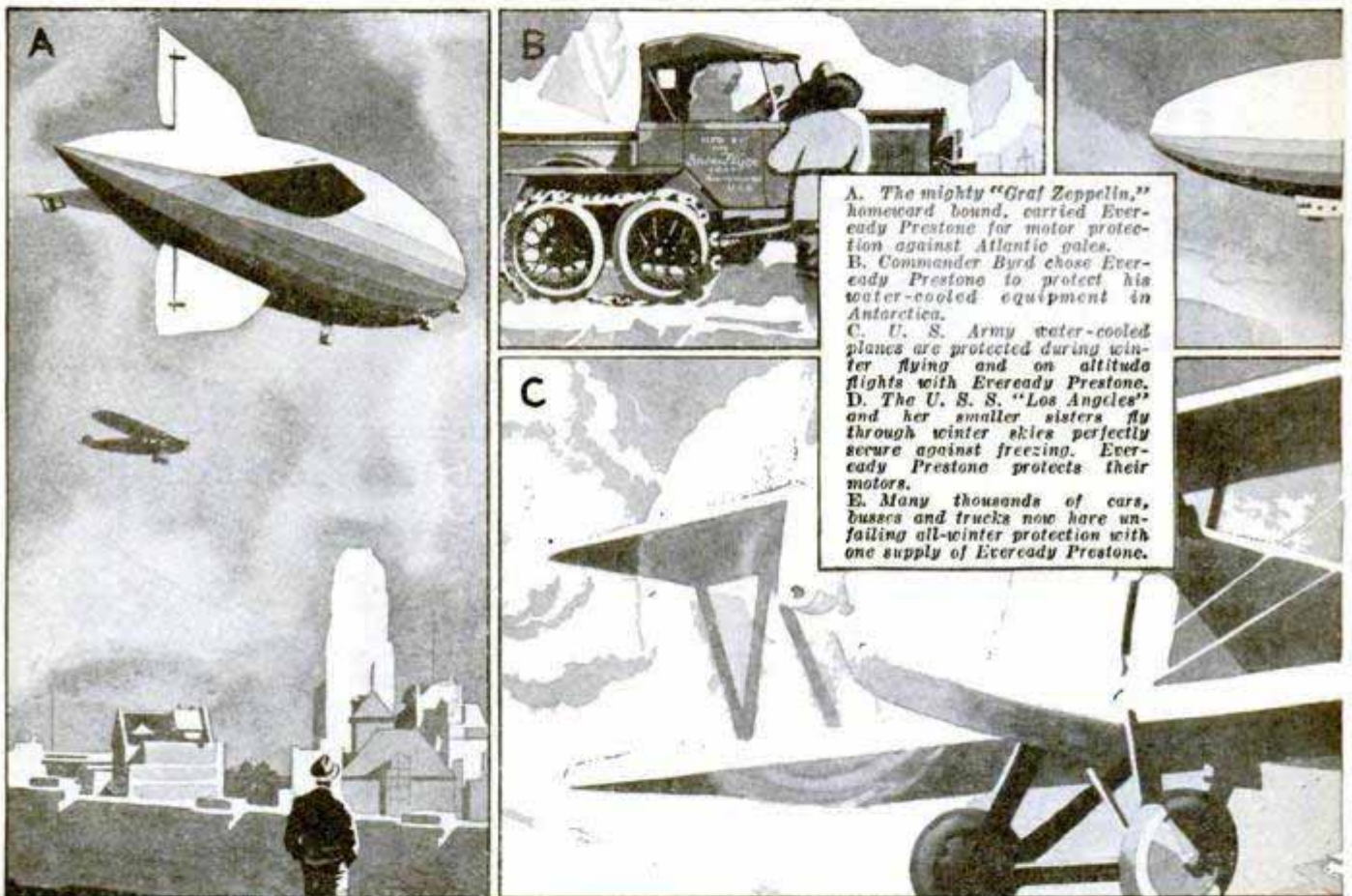
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THE unfailing, harmless protection against frozen motors provided by one supply of Eveready Prestone has won for this perfect anti-freeze the highest endorsement wherever it has been used. When giant dirigibles take the air in winter weather, when a water-cooled Army plane ventures into frigid altitudes, when motors must operate in the intense Antarctic cold, Eveready Prestone is the first thought for protection. It possesses *all* the properties which the National Bureau of Standards has pointed out as essential for an anti-freeze.

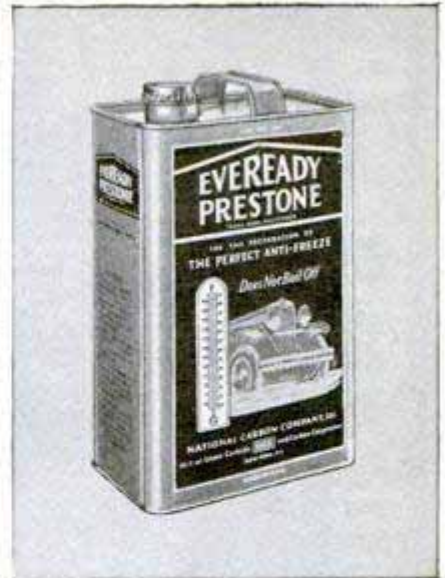
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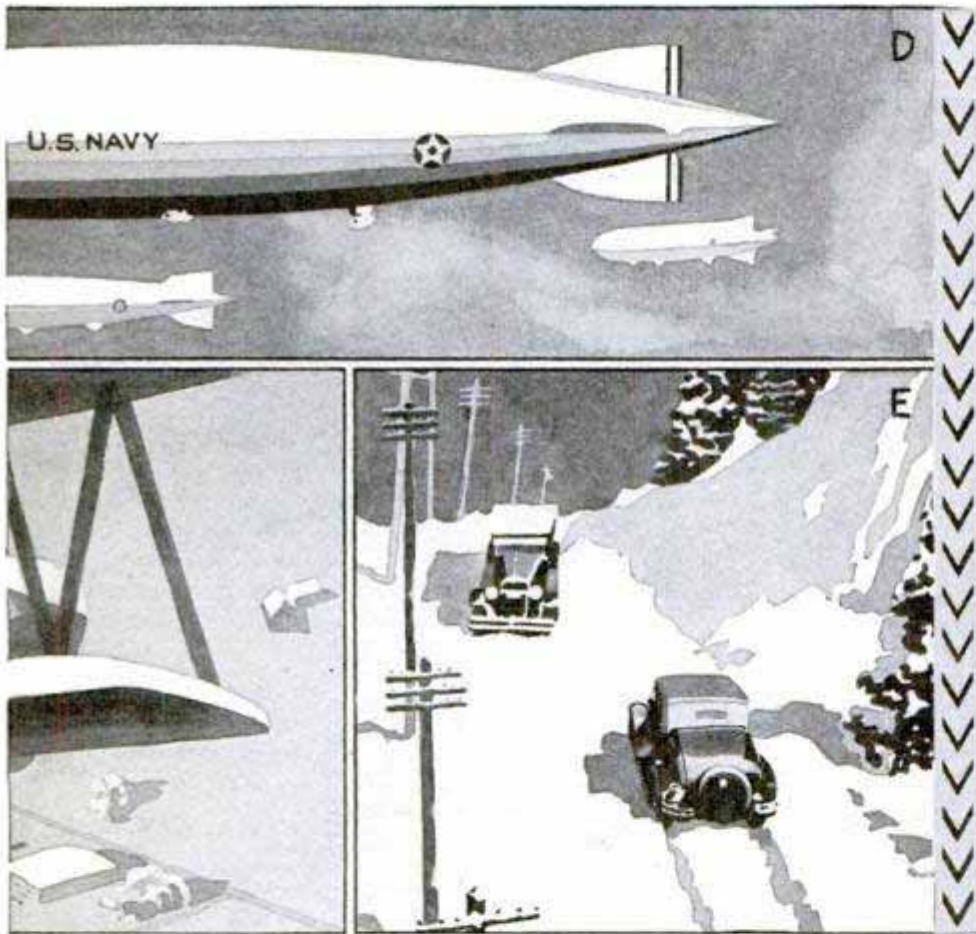
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It is time now to have Eveready Prestone in your automobile. Before you add anti-freeze, however, be sure your car is ready for winter. Cold-weather driving demands free-flowing, winter-grade lubricants in

« EVERYWHERE THAT MOTORS OPERATE IN FREEZING TEMPERATURES YOU WILL FIND THIS PERMANENT, TRUSTWORTHY PROTECTION »»



Eveready Prestone does not contain any alcohol or glycerine.



9 POINTS OF SUPERIORITY

- 1 Gives complete protection.
- 2 Does not boil off.
- 3 Positively will not damage cooling system.
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- 9 Economical—one filling lasts all winter.



Thoroughly tested and 100% approved by the American Automobile Association.

EVEREADY PRESTONE

FOR PREPARATION OF THE PERFECT ANTI-FREEZE

crankcase, transmission and differential. Battery, spark plugs and ignition cables ought to be at their best. The all-important cooling system should be in perfect order. Have the radiator and water-jacket *clean and tight*—see that all of last summer's collection of scale and rust is flushed out. Vibration and jar tend to loosen joints and hose connections. Make certain that these and all pump parts, gaskets, drain cocks and radiator are absolutely free from leaks. Then add water and one purchase of Eveready Prestone, and your car will be ready for all winter.

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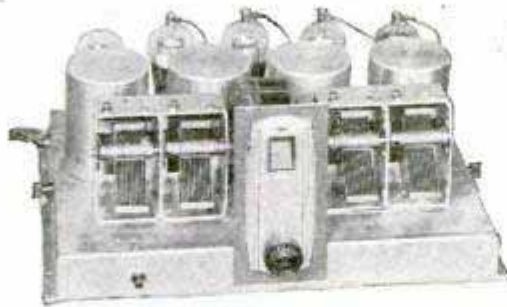


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Table 8-inch dia. Tilts 45 degrees. Stroke 1 1/2 inches. Capacity 10 in. to frame. 600 R. P. M. 6 sizes of blades \$12

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Specifications: Built up model—wood frame. 20 inch wing spread. Fuselage 14 inches. WEIGHS ONLY SEVEN-EIGHTHS OF AN OUNCE. This remarkable light weight has never before been achieved in any commercially built scale model of this size. Practically CRASH PROOF and has flying qualities galore. The record to date is 92 SECONDS.

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We are offering semi-monthly prizes of five dollars in gold to the boy or girl who sends in the best flight record obtained with this model. Full instructions and prize entry blanks are included with every eagle model. Get yours now.

Send check or money order. No stamps or C. O. D. The price is low—order your model now and compete for the prize awards. CONSTRUCTION SET—Complete with all parts, plans, instructions and prize entry blanks. Postage free. \$1.00.

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New
AUTO LIGHT
Amazes Motorists!



Great!
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**THIS
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It's one of the really novel features. Convenient, too, because it makes BRITE-LITE useful as headlight or parking light in emergency.

**BRITE-LITE
Sticks ANYWHERE**
Besides this handy innovation, BRITE-LITE can be used as an ever ready flashlight. Camps, tourists, and others find it a truly convenient accessory.

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BRITE-LITE startles autoists! They actually gasp with astonishment when they see how this sensational new product works. A single demonstration—hardly two minutes work—often sells 4 or 5 lamps on the spot.

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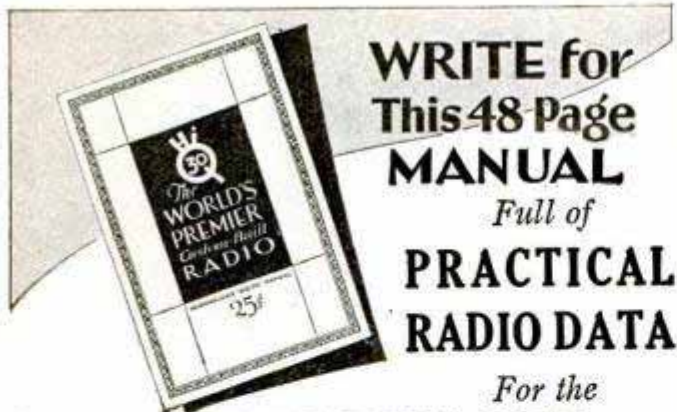
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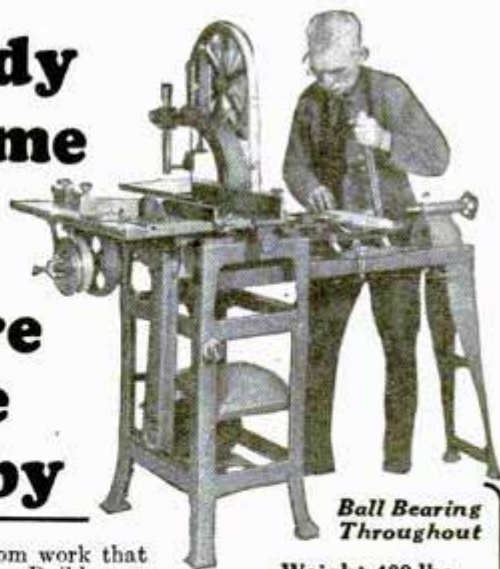
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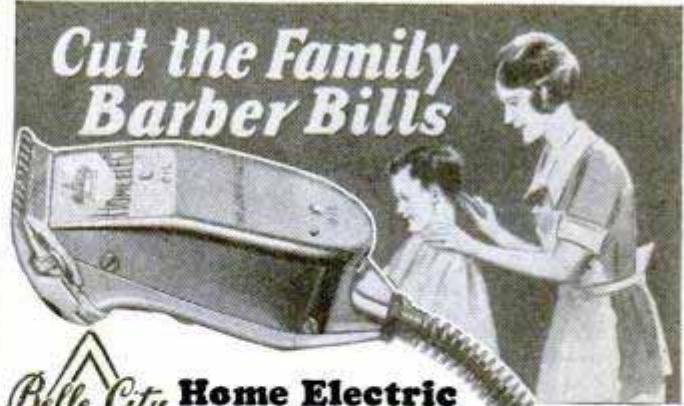


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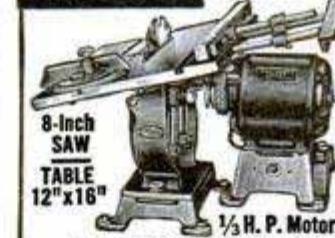
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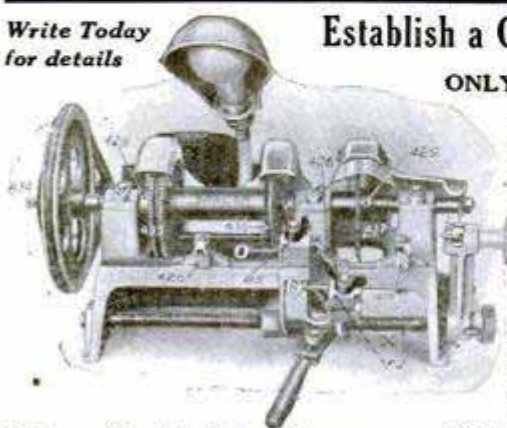
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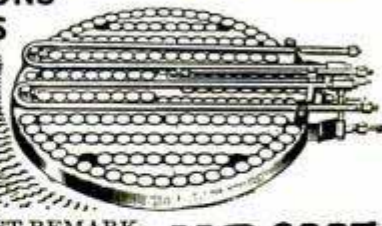


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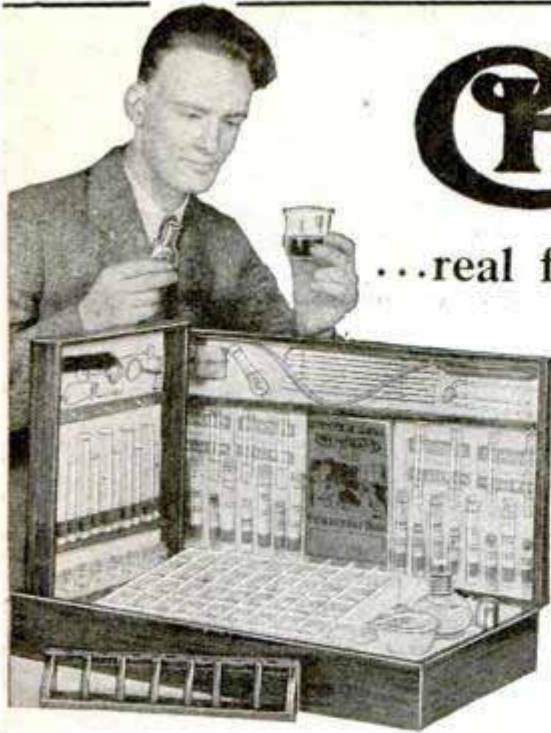
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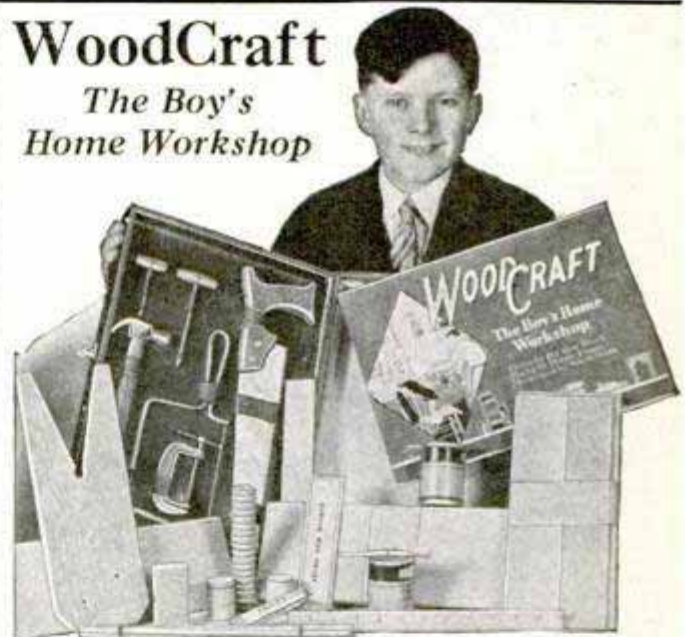
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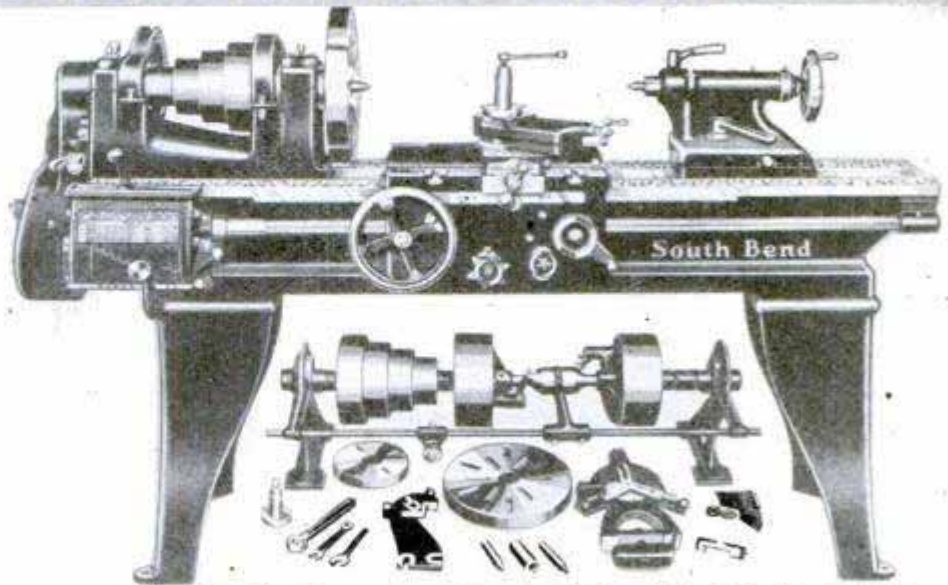
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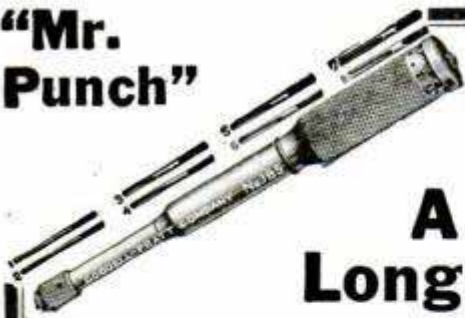
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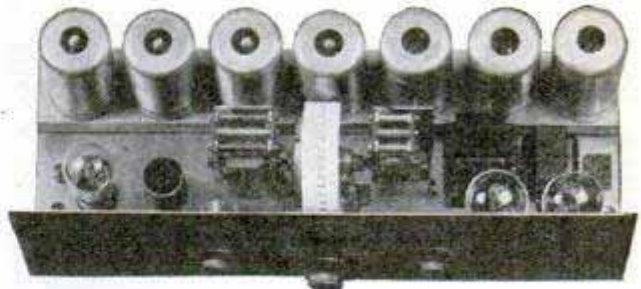
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Built and Assembled by H. F. L. Engineers—Shipped Ready to Operate!

After two years of tireless research and tests under all conditions, H. F. L. engineers have perfected *the Mastertone*—a radio that sets an entirely new standard of performance.

Such startling realism! Such unflinching accuracy. Its great power and sweet tone will thrill you. Its keen sensitivity and positive 10 Kilocycle selectivity will amaze you. With only a wire screen or metal base aerial built in the cabinet, *the Mastertone* gets distant stations sharply, clearly and distinctly over entire musical scale, with magnetic, dynamic or horn speakers, and without a bit of hum.

THE MASTERTONE in Detail

All metal completely shielded chassis: 7x21x7½ inch. Fits nearly all consoles. 11 tubes operating at peak efficiency (5-224; 3-227; 2-245; 1-280). Single dial positive one-spot tuning; Humless AC Operation; Uses 5 Screen-Grid tubes, 5 Tuned R. F. Circuits; High Power Screen-Grid Detector, with 175 volts impressed on plate; Automatic line voltage control inbuilt holds voltage against fluctuating; 100-volt DC dynamic field supply incorporated; 3-stage phonographic amplifier; Finest quality precision made parts.

Built by Hand—Yet Low Priced

Quality—not quantity—the H. F. L. Mastertone standard. One demonstration will convince you that it's the master receiver of all times. Fully guaranteed.



**H.F.L.
Power Master**

Not an ordinary power pack, but a specially developed unit of the Mastertone, built separately to simplify installation. Has oversized transformer, full wave type 280 rectifier tube.

**Write Today for Complete Description
and Price**

HIGH FREQUENCY LABORATORIES

28 N. Sheldon St. Dept. 40 Chicago, Ill.

GET GOING!

Low pay, long hours, no future—more than 1700 Popular Mechanics readers have licked them through answering an ad just like this. They are Clarke FlorKraftsmen now. They're members of a real and new profession. They've learned how to earn \$500 to \$700 a month.

Are you facing a tough proposition to make the money you need? Do you want to get out of the wage struggle—to some day own a home and a new car that's all paid for and have money in the bank? If you do then mail in the coupon at the foot of this ad, for that's how these others have started toward financial independence. There's not a bit of cost or obligation to getting these facts this coupon brings.

No Books to Study

You don't need to buy or study any books to be a FlorKraftsman. A few hours practice with the Clarke Sander teaches you to sand a velvet surface onto new floors, or to remove the old varnish and make beautifully smooth old floors in houses already built.

That's the science of Clarke FlorKraftsmanship. It lets you earn money right from the start. And here's what it pays you.

**\$25 to \$75
per Day**

You can surface 900 to 2200 square feet of new floor in 8 hours. The pay ranges from 3 to 5 cents per square foot—or \$27 to over \$75 per day.

Surfacing old floors takes more time, but

CLARKE SANDING MACHINE COMPANY,

Dept. T-211, 3831 Cortland St., CHICAGO, ILL.

*Originators and, for over 12 years,
Manufacturers of Portable Sanding Machines.*



the pay is bigger. 300 to 1000 square feet a day and 7 to 15 cents a square foot are the figures. That's \$21 to over \$100 a day.

You don't have to open an office or make any heavy investment to become a FlorKraftsman. About \$100 is all you need to get started. And you earn you big pay *right from the start*. No long training period to eat up your time and money.

Maybe you've read one of these ads we've been running here in Popular Mechanics. If you have, just stop and figure that every month other men no smarter than you have started from these ads and are now earning this big money.

What they've done you can do. Why waste one more month in which you can be earning \$25 and up per day?

Do what these other Popular Mechanics readers did. Tear out this coupon and mail it. It doesn't obligate you to become a FlorKraftsman or to spend one penny. But it does bring you the full facts about how other men are earning \$500 to \$700 a month.

Clarke Sanding Machine Co.,
Dept. T- 211,
3831 Cortland St.,
Chicago, Ill.
Gentlemen: Please send me, without obligation, full details on the Clarke Sander, and the money-making possibilities of FlorKraftsmanship.

Name

Address

City State

MAIL THIS COUPON



SALES KIT WORTH \$15.25

Set Yourself Up In Business For Only \$4.75

BE our special sales representative, full or part time. Enjoy pleasant work taking orders for one of America's largest leather goods concerns. Sell quick-moving, fine-quality genuine leather articles suitable for gifts and personal use. *Big commissions!* Call on your friends, business people, lodge brothers. Every article in extensive line made by the owners of the Famous Halvorsen Patents. This guarantees the quality.

Order the kit now; receive excellent assortment of sample articles at cost, \$4.75: Halvorfold Calfskin Billfold (Value \$5.00), Halvor-Key Case of Pin Seal (Value \$3.75), Halvor-Card Case of Steer Hide, laced and embossed (Value \$3.75), Morocco Letter Case (Value \$2.75), all articles cornered in gold. Also handsome pocket kit case for carrying outfit, with your name in 23K Gold across cover. Order book and price list included. Retail value \$15.25.

Remember, \$4.75 sets you up in business. Act now! Whether you work full or part time you'll make big commissions. Get complete information. Send coupon at once! The gift season is on! Get in on the profits that are easily yours.

Dept. PM, U.S. LEATHER GOODS CO. 564 W. Monroe St., Chicago, Illinois I want to be your special sales representative and am enclosing \$4.75, cost price of complete kit as described. Send full sales equipment. My name as below to appear on kit in 23K Gold. I am to receive liberal commission. If not satisfied in any particular, I will return outfit and my money will be refunded immediately.

Name _____
Name to appear in 23K Gold

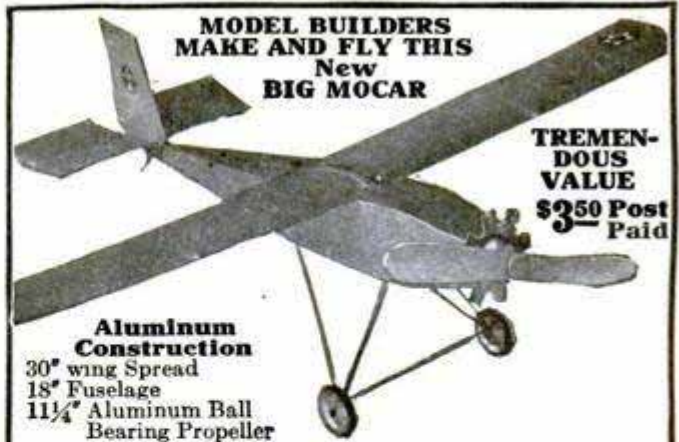
Address _____

\$125 per Week in YOUR OWN Business!

Many men are earning \$125 to \$200 per week with the H-B Rug-Washer. C. B. Taylor, Philadelphia, writes: "I alone have often earned \$75 in a day with my H-B Rug-Washer." C. J. White, Louisville, says: "\$100 worth of business in 6 days—never a complaint." C. H. Williams, Joliet, writes: "Gave up a railroad job to buy H-B cleaner. \$390 worth of work last month and business is increasing." Frank Diedrich writes: "I started business with one H-B Rug-Washer. Today I own large Milwaukee store with 4 machines." Thousands earning quick, easy profits. Electricity does the work. Finishes rugs like new, on customer's floor. Write today for booklet.

EASY TERMS Inexpensive equipment. No shop necessary. Hundreds of customers in your vicinity and in nearby towns—residences, hotels, offices, schools, clubs, theaters. Backed by \$33,000,000 Company. Used by the United States Government.

FREE Book Send today (no obligation) for booklet illustrating Rug-Washer and telling how you can earn large profits at prices below other methods; how you can build a permanent year around business; and how you can pay on easy terms. Enjoy a larger income. Mail a postcard or letter today—NOW. H-B Co., W-6098 H. B. Bldg., Racine, Wis.



MODEL BUILDERS MAKE AND FLY THIS New BIG MOCAR

TREME-DOUS VALUE \$250 Post Paid

Aluminum Construction
30" wing Spread
18" Fuselage
11 1/4" Aluminum Ball Bearing Propeller

A GREAT CONSTRUCTION OUTFIT A SWEET FLYING JOB

Boys—Never in your life have you seen such a wonderful buy as this Big Mocar aluminum construction model plane! Just think—a real aluminum construction outfit—with 2 1/2 ft. wing spread and 18 in. fuselage—and how it does fly! Many special features, cambered wing construction, the big 1 1/4 in. ball-bearing propeller, with a powerful long-running motor that carries this plane soaring and zooming, won't break up even after many flights.

It is a real scale model—great fun to make—wonderful to fly. It will be your pride and joy. And you can fly it, too. It is made to stand the shocks. The Big Mocar construction outfit M-200 is complete with full instructions, mounted on board with all parts marked for easy assembly, rubber-tired wheels, covering material, cement and colors. Pliers only tool necessary.

Don't let a day pass without sending for this. You won't be disappointed. It's the greatest value and finest flying model ever offered at a popular price. It's yours for only \$3.50 postpaid. Model M made up ready to fly \$5.00 postpaid. Catalog showing many model planes from 75c to \$5.00 (glider given with catalog) 10c.

The American Model Aircraft Co., Dept. P-11, New Haven, Conn.



Beautify your NOSE to shapely proportions—while you sleep!



Gold Medal Won 1923

ANITA NOSE ADJUSTER is SAFE, painless, comfortable. Speedy, permanent results guaranteed. Doctors praise it. No metal to harm you. Small cost. Write for FREE BOOKLET



ANITA INSTITUTE, M-12, Anita Bldg., Newark, N. J.

FREE RADIO CATALOG

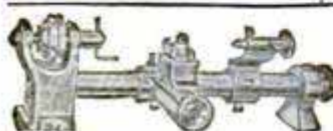
GREATEST OF ALL! Nothing to compare with new 1930 Wholesale Radio Service catalog. Fully describes biggest bargains ever offered. Unequaled dollar-for-dollar value. **VERY LATEST EQUIPMENT** Shows all standard equipment, kits, parts, batteries, accessories. Everything offered at substantial savings. **FREE RADIO ADVICE** and information.

WRITE TODAY FOR COPY Get your copy of this great radio guide and catalog **ABSOLUTELY FREE**. Don't miss this offer! Simply send name and address. Postal will do. But you must act quick before supply is exhausted. Write today!

1930 RADIO CATALOG
WHOLESALE RADIO SERVICE CO.

Dealers and Agents: Lowest wholesale prices offered on all equipment. Confidential price list. Personal advice. Write for our plan.

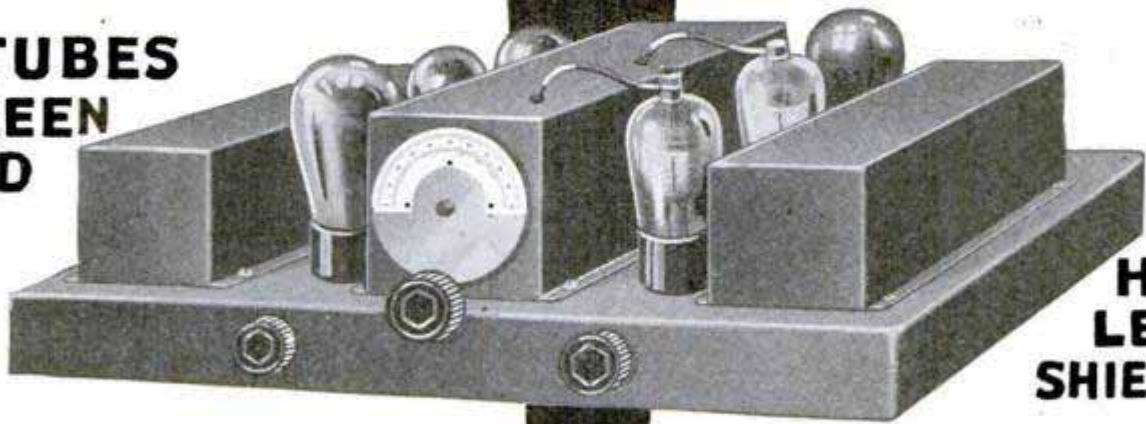
WHOLESALE RADIO SERVICE CO., INC.
36 VESEY ST. Dept. B-11 NEW YORK



WADE AMATEUR MECHANICS, REPAIR SHOPS, INVENTORS, STUDENTS BENCH LATHE
A real machine tool for the home work bench—capacity 4" dia. x 12" length. For Metal—Wood—Composition materials. Turning—Facing—Boring—Drilling—Winding—Thread Cutting. Accurate—Strong—Quiet—Compact. Slide rest has travel entire length of bed. Leadscrew inside bed. No. 1 Lathe, plain headstock, \$40.00. No. 2 Lathe, back-geared headstock, \$58.00. Extra for lathes with 18 inches between centers, \$7.00. Complete line of accessories at equally low prices. Write for free catalog.
THE GEROLD CO. Dept. P-57 120 Liberty St. New York

"AC" RADIO

**6 TUBES
SCREEN
GRID**



**HUM-
LESS
SHIELDED**

**AGENTS
WANTED**

Here at last is the radio everybody has been waiting for! A high-powered, long distance, 6 tube set with 2 stages of screen grid. No "AC" hum. Illuminated single dial drum control. Plenty of volume to operate power dynamic speaker. Beautiful clear tone, equal to high-priced sets. Guaranteed to give years of perfect satisfaction. All for the unheard of low price of \$24.00! No wonder it has become an overnight sensation! No wonder it is going like wildfire—selling itself almost at sight! And no wonder our agents are cleaning up \$60 to \$75.—yes, even up to \$200 a week during spare time—evenings!

**BIG PROFITS, QUICK
Choice, Exclusive
Territories Still Open**

This is your opportunity to tune in on station S-U-C-C-E-S-S! All you need is a sample ELGIN to find out what you really can do. Try it. Compare it with others for results. Demonstrate the ELGIN to your friends. When they hear its marvelous performance

**ONLY
\$24**

**ACT QUICK for
Exclusive
Territory**

**Live wires are tying up
choice territories on ex-
clusive contract. You
can do the same in your
territory if still open.**

**EXCLUSIVE
TERRITORY**

and the astonishingly low price—it's a sure sale nine times out of ten. The more people you see, the more you sell and the more money you make.

**START MAKING \$60 A WEEK
But You Must Act NOW!**

Today, without quitting your job, you can begin making real money, supplying the big demand for the new ELGIN. Work a few hours every evening—and before you know it, you have a profitable business of your own.

No miracles. No luck in this deal. Just plain facts. It's being done every day by our enthusiastic, successful band of Elgin agents. You can, too. No experience necessary. All we ask is your willingness to work—to get out and demonstrate the great new ELGIN. Now is the time to start. Fill in and mail the coupon today and you're all set to make money—yes, sir, *real* money—if your territory is still open. Find out now. Don't delay. Mail coupon or, better still, wire! **Be sure to give your county.**

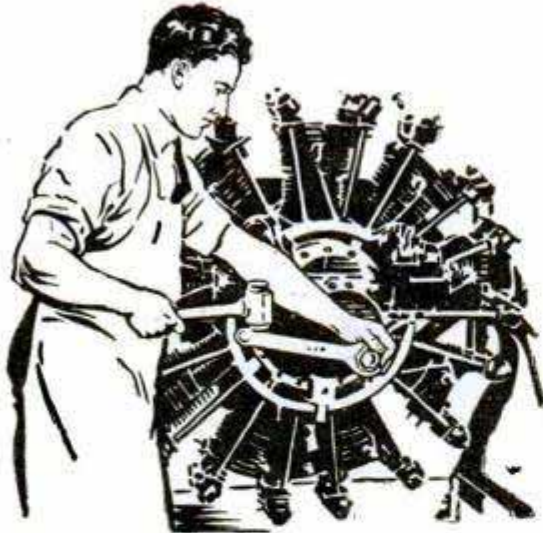
DON'T LET A 2c STAMP STAND BETWEEN YOU AND SUCCESS!

ELGIN RADIO COMPANY, 4953 North Crawford Ave., Chicago. (Be sure to give your county.)

Please let me know immediately if the opportunity of cashing in on the new low-priced Elgin Radio is still open in my territory.

Name.....

Address..... County.....



Do you want a career in Aviation?

A GENERATION AGO, when the automobile business was just beginning to grow, a group of young men determined to make it their career. To get the mechanical training they needed for success, they studied at night with the International Correspondence Schools. You know their names. Many of them are leaders in the motor world. Walter P. Chrysler, President of the Chrysler Motor Corporation; Jesse G. Vincent, Vice-president of the Packard Motor Car Co.; Hiram Walker, Chief Engineer of the Chandler Motor Car Co., and John Moore, designer of the famous Ansted Motor, are among them.

The same marvelous opportunity is yours, today, in the newer field of Aviation! Months of time and thousands of dollars have been put into the preparation of a great new I.C.S. Course in Aviation Engines, specially adapted to your needs.

You don't have to have experience, or a large amount of capital. You don't have to give up your present job. At home, in your spare time, you can quickly gain the knowledge of aviation motors that will qualify you as an expert mechanic.

The course is thoroughly modern and complete. It gives you a working knowledge of every up-to-date type of aviation engine—principles, construction, operation, maintenance and repair. It has been prepared by nationally known experts—such men as Lieut. Commander D. M. Carpenter, U.S.N., formerly in charge of ground training at the Pensacola Naval Air Station.

Find out today, without cost or obligation, just what this course offers and what opportunities it will bring you. Mark the coupon and mail it, *right now!*

INTERNATIONAL CORRESPONDENCE SCHOOLS
 "The Universal University"
 Box 5650-F, Scranton, Penna.

Without cost or obligation on my part, tell me how I can qualify for the position, or in the subject, before which I have marked an X.

AVIATION ENGINES

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|---|--|
| <input type="checkbox"/> Complete Automobile Course | <input type="checkbox"/> Gas Engine Operating |
| <input type="checkbox"/> Automobile Electric Equipment | <input type="checkbox"/> Complete Gas Engine Course |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Architects' Blueprints |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Civil Engineer <input type="checkbox"/> Mining | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Agriculture |
| <input type="checkbox"/> Plumbing and Heating | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Steam Engineering | <input type="checkbox"/> Mathematics <input type="checkbox"/> Radio |

BUSINESS TRAINING COURSES

- | | |
|---|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Advertising |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Show Card and Sign Lettering |
| <input type="checkbox"/> Accounting and C.P.A. Coaching | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> English <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Spanish | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> French | <input type="checkbox"/> Illustrating |
| | <input type="checkbox"/> Cartooning |

Name.....
 Street Address.....
 City..... State.....
 Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal



The Real Sport of Out-board Motor Boating Is to Build Your Own Boat **\$98⁰⁰** F. O. B. Factory

The famous Bossert Pirate Kid may be bought unassembled and built by any amateur—any boy with only ordinary knowledge of every-day tools can build one.

This is the boat that is breaking all records with B, C, and D motors.

World's Champions such as Malcolm Pope, Jack Kerr and many others are now driving Bossert Pirate Kids in all their stunts and races. They know good boats when they see them.

Walter Peterssen built his own boat and has won many big races as well as broken records in time trials in the boat he built himself.

Ask Pop to let you build your own—a lot of fun and you surely will like it much better than if you bought your boat all completed.

Many boys have already built their own Bossert Pirate Kid—A wonderful model.

The price is \$98.00 F.O.B. factory and the freight will average less than \$5.00 most any place in the U. S. Send in your order now.

You can also earn one of these boats for nothing for after you purchase your boat you are listed with us as an agent and then from every order you get for us you receive a bonus of 10% so you see if you are able to induce only 10 other boys to join you get your own boat free.

Write now for order blank and further particulars.

LOUIS BOSSERT & SONS, INC.

1350 Grand Street

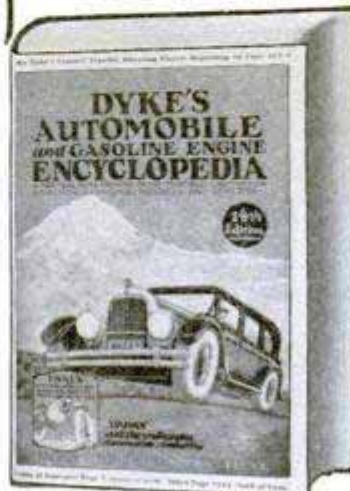
BROOKLYN, N. Y.

The Model A Ford Car is treated in a special supplement to the latest edition, the 15th, of Dyke's Auto Encyclopedia

For 15 years "Dyke's" has been the one recognized and undisputed authority on the Automobile. Each succeeding edition has surpassed the last one. Now comes the greatest book of all—the wonderful 15th Edition—A. L. Dyke's crowning triumph—the super auto book of all times.

Some "High Spots" of the New Book!

- 1,249 pages covering every known auto fact.
- 4,200 Pictures, Plans, Diagrams and Charts.
- 15,000 lines of Index by which you can instantly locate any subject you want.
- A new section of "Trouble Shooting" Charts in Colors to enable you to quickly locate any major or minor trouble on any car.
- Special instructions on testing and adjusting every part of the automobile.
- Specifications of Gasoline Passenger Cars, Trucks and Tractors.



Specifications for Replacements, Accessories, Interchangeable Parts and Equipment.

Large colored Combination Chart which shows the working principles of the Automobile.

Large Charts showing the working principles of Trucks and Tractors.

Cloth \$6.00; Limp American Morocco \$7.50

Sent postpaid upon receipt of price.

Will be sent C. O. D. if preferred to any address in the U. S.

POPULAR MECHANICS PRESS
 Room P-11
 200 E. Ontario St., Chicago

The Power of the Whirlwind

Stops Gas Waste

Gasoline in a liquid state will not give power. Touch a match to a spoonful of liquid gasoline and it will burn, leaving carbon, but will not explode. Take another spoonful of gas, shake it in a can, thoroughly mixing it with air and it will explode immediately when touched with a match. The more thoroughly the gas is vaporized, the greater will be the explosion. Carbon also disappears when complete combustion occurs. The principle of the Whirlwind is to turn the otherwise wasted gasoline into power-giving added mileage and a saving to you. Figure up your gas bills for the year and the amount you are spending will surprise you. You are paying for a Whirlwind every day whether you have one or not. **PUT ONE ON YOUR CAR NOW AND LET IT BEGIN PAYING YOU DIVIDENDS.**

FITS ALL CARS

In just a few minutes a Whirlwind can be installed on any make of car, truck or tractor. It is actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. **THE MORE YOU DRIVE THE MORE YOU WILL SAVE.**

Power in Gas | GUARANTEE

Automotive engineers claim that just a portion of the power in gasoline is being used. The

No matter what kind of a car you have—no

power is in the gas—it is merely the question of utilizing it by more complete vaporization. The Whirlwind utilizes a portion of this waste, turning it into power, and more miles to the gallon.

A Whirlwind on your car will give you 100% driving pleasure. You can instantly feel the smooth flow of power and quick pick-up.

Predicts an Increase in Gasoline Mileage

Detroit—C. F. Kettering, president, General Motors Research Corporation, predicts that mechanical perfection of automobiles will soon allow twice as much efficiency from fuel supply as is now received.

Mr. Kettering says that there is enough energy in a gallon of gasoline, if converted 100 per cent to mechanical energy, to run a small 4-cylinder car 450 miles.

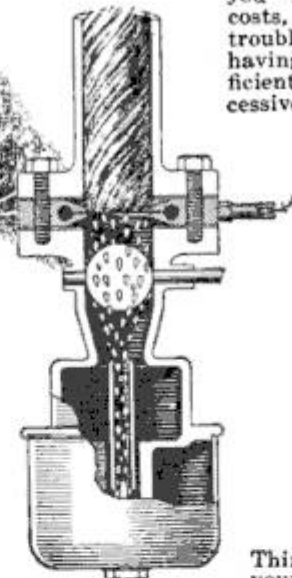
Automobile manufacturers have made considerable progress, he says, but there remains a great deal to make automobile driving economical and efficient.

matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than pay its cost in gasoline saving alone within thirty days or the trial will cost you nothing. **WE INVITE YOU TO TEST IT AT OUR RISK AND EXPENSE.** You are to be the sole judge.

From nature the Whirlwind secures a scientific principle, and with it DEVELOPS AMAZING POWER FROM ORDINARY GASOLINE. Just as a Whirlwind lifts and lowers, twists and twirls, scatters and tears apart things within its reach, so the Whirlwind carbureting device whirls and churns the liquid particles of gasoline into a vaporized gas that give added power and increased mileage. Anyone who has seen a Whirlwind with its spiral twisting action will quickly grasp the principle used in the Whirlwind.

SAVES MOTORISTS Millions Yearly

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Gasoline saving is simply a matter of properly vaporizing gasoline—to thoroughly break down the liquid particles into a dry power-giving gas that eliminates waste and stops unnecessary wear to motor parts. The Whirlwind accomplishes this saving by three different proven and acknowledged principles of vaporization ALL COMBINED IN ONE SIMPLE DEVICE. Besides the big saving in gasoline, the Whirlwind also saves by aiding in quick starting. It also minimizes oil dilution by keeping the unvaporized gasoline out of the crank case oil. By giving your motor properly vaporized gas you save carbon cleaning costs, eliminate spark plug trouble, save on repairs by having a well lubricated efficient motor and save excessive depreciation by giving your motor long life.



I have had my Whirlwind for three years, winter and summer it gives the same perfect service, instant starting, smoother running and what I have saved in gasoline these last few years has bought other luxuries.

A. W. Scott.

Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the oil companies profit by your waste? Find out about this amazing device that will pay for itself every few weeks.

Free Trial Coupon

WHIRLWIND MANUFACTURING CO.
999-33-A Third Street, Milwaukee, Wis.

Please send me full particulars of the Whirlwind and your free trial offer.

Name

Address

City State

Agents and Salesmen Wanted

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just mail the coupon.



Now PILOT'S ELECTRIC SUPER-WASP

Short Wave
PLUS Screen Grid
PLUS A. C. Operation



10,000 Mile Range
—Covers all bands
14 to 500 Meters

Employs Super-Sensitive Screen Grid Tube and New 227 PILOTRON especially developed for A. C. Super-Wasp

Now you can enjoy the thrill of international short-wave radio from your electric light socket! Utterly uncanny is the A. C. Super-Wasp's ability to jump 10,000 miles, "pulling in" novel short-wave broadcasts from all over Europe, Central and South America, Canada, South Africa and Australia! Easily assembled in single evening.

The Pilotron 227 used as detector is a new type tube developed especially for the critical requirements of short-wave reception! Precisely because of this it is an eminently superior tube for any broadcast receiver!



A. C. Operated SUPER-WASP

(Catalog No. K-115)

Custom
Set-Builder's
Price in U. S. A.

\$34⁵⁰

*Slightly Higher West
of the Rockies*

Power Pack extra
(Pilot K-111 ABC Power
Pack is recommended)



Battery-Operated SUPER-WASP

(Catalog No. K-110)

Custom
Set-Builder's
Price **\$29⁵⁰**
in U.S.A.

*Slightly Higher West of the
Rockies.*

**Special Notice to
Owners of
BATTERY-OPERATED
SUPER-WASPS**

Some S. W. fans will continue to prefer a battery-operated Super-Wasp. However those who desire to change over to A. C. operation, will find full details in Pilot's Special Data Sheet, obtainable free from your Pilot dealer or direct from the factory.

Join the Guild!

50c brings you four quarterly issues Radio Design, official organ of Radio International Guild. Subscription also includes one year's Guild membership with membership pin and certificate furnished without charge. Timely construction articles include full story on new A. C. Super-Wasp. Radio Design, Department 6, 103 Broadway, Brooklyn, New York.

Qualified Dealers!

Financially responsible and technically informed dealers are invited to secure details of Pilot's authorized Agency Plan.

PILOT RADIO & TUBE CORP.

WORLD'S LARGEST RADIO PARTS PLANT — ESTABLISHED 1908

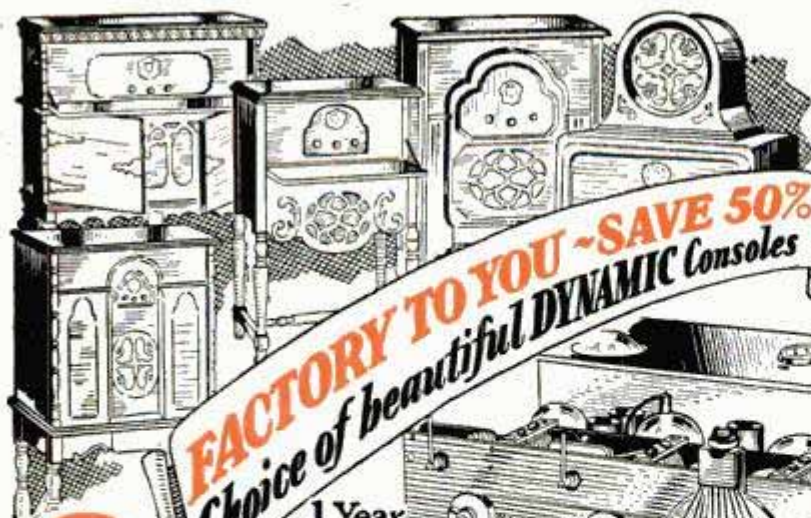
323 BERRY ST.

BROOKLYN, N. Y.

Trade Mark



Registered



TRY IT 30 DAYS FREE BEFORE YOU BUY

FACTORY TO YOU - SAVE 50%
Choice of beautiful DYNAMIC Consoles
1 Year Guarantee



9

tube-perfected
SCREEN GRID, PUSH-PULL

MIRACO
 TRADE MARK REGISTERED

\$49⁸⁸ only
COMPLETELY ASSEMBLED

CATHEDRAL TONED, SUPER SELECTIVE, POWERFUL DISTANCE GETTER

Compare with costliest sets before you buy!

You needn't send us a cent! America's big, old, reliable Radio Factory springs its 10th Anniversary Surprise in high-grade full-year guaranteed sets at history's lowest prices! With its latest perfected Screen-Grid, push-pull, super-powered and hum-free AC electric Miraco's—you are guaranteed satisfaction, values and savings unsurpassed.

At our risk compare a Miraco with highest priced radios, for 30 days in your home. Surprise and entertain your friends—get their opinions. Unless 100% delighted, don't buy! Your decision is final—no argument!

Only marvelously fine radios, of latest perfected type, at rock-bottom prices, can back up such a guarantee. Send postal or coupon for Amazing Special Factory Offer!

Don't Confuse with Cheap Radios
 With Miraco's rich, clear cathedral tone, quiet operation, razor-sharp separation

of nearby stations, tremendous "kick" on distant stations and latest improvements—you'll be the envy of many who pay 2 or 3 times as much!

Send for proof that delighted thousands of Miraco users cut through locals, get coast to coast, with tone and power of costly sets. Miraco's are custom-built of finest parts—product of 10 years' successful experience. Approved by Radio's highest authorities.

DEAL DIRECT WITH BIG FACTORY

Miraco outfits reach you splendidly packed, rigidly tested with everything in place ready to plug in! No assembling! Entertain yourself 30 days—then decide. Liberal year's guarantee on each set. Play safe, save lots of money, insure satisfaction—deal direct with Radio's old, reliable builders of fine sets—10th successful year. SEND POSTAL OR COUPON NOW!

MIDWEST RADIO CORP., 407-EN Miraco Bldg., Cincinnati, O.

Get our Send No Money 10th Anniversary Offer

Dealers Write! - mail coupon right Now!



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