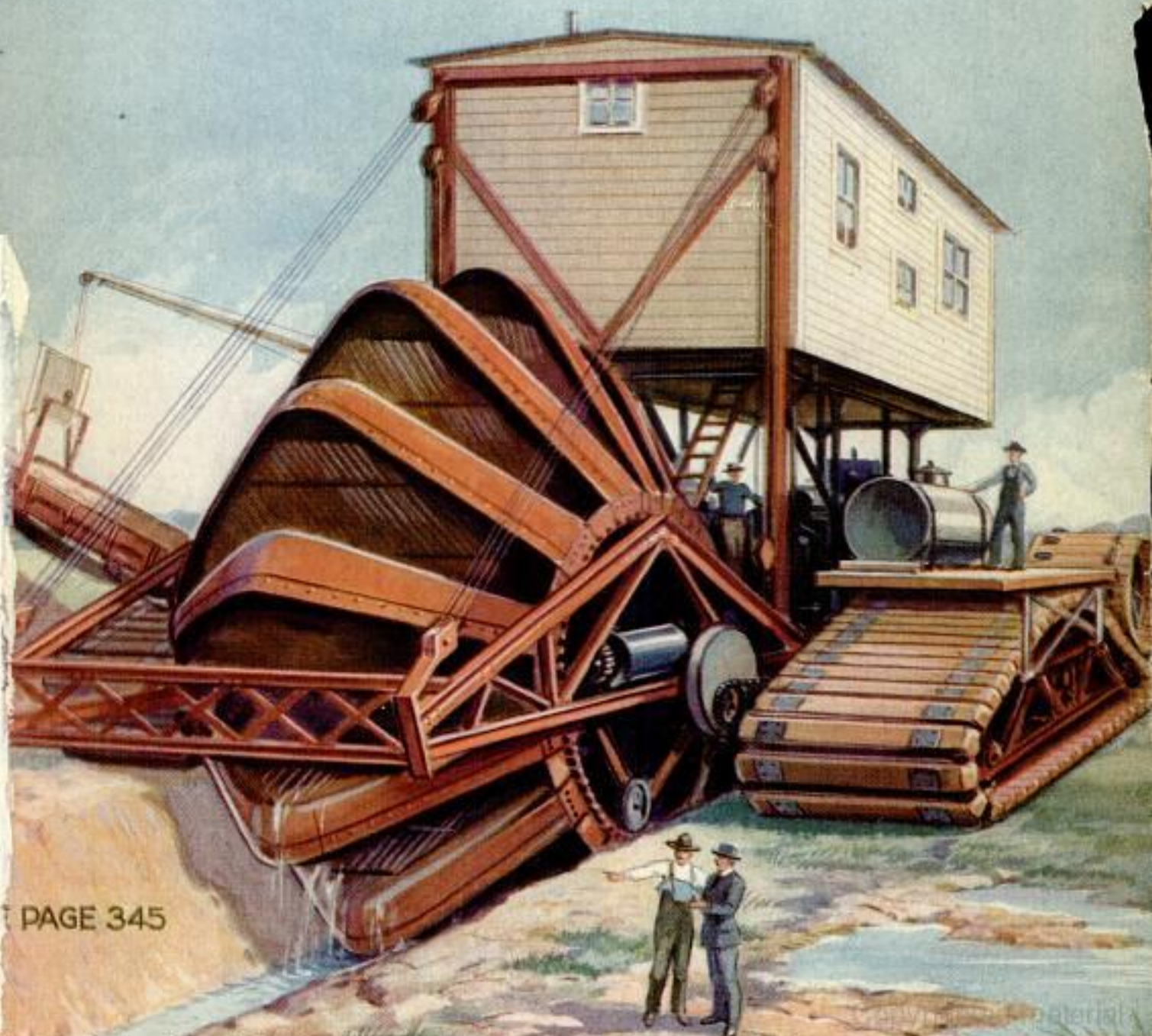


POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D TRADE MARK, GREAT BRITAIN, No. 410426.

REG. U. S. PAT. OFF.



PAGE 345

Motor Secrets That Quickly Put Me On Easy Street

By O. H. Justus

Not so very long ago it looked like I might plod along in the wage rut all my life.

Today I'm living on "Easy Street," and when friends look over my property they say: "Justus, you've been lucky!"

They see a big, busy auto repair shop, new stocks of tires, cars and trucks and scores of cars and customers coming and going. And they wonder how a wage earner could have got hold of such a business.

Well, I didn't do it by "luck," brilliance or somebody else's money. I did it by simply **using** the common sense every man has. And **any** man who wants to can do as well or better.

First, I made up my mind to TRY. Then I saw that the greatest demand for men, best pay and surest future were in keeping our millions of cars, trucks and tractors in repair. But I soon found out that becoming a mechanic by the old "experience" system meant several more years of the grind. I also saw that the men who had learned that way were not getting anywhere, while the good jobs and big money were going to men with special training—men who knew the mechanical secrets of motors. "I don't want to be a grease hound or a second-rate wrench twister," I said to myself. **"I'm going to learn those secrets, too."**

Henry J. Rahe made it possible. Remember his name, because he can do the same for YOU. I read an advertisement about his quick, easy practical course in auto and tractor work in his big shop-schools—**learning with tools, not books**, and from master instructors under Mr. Rahe's personal supervision. Largely out of curiosity, I mailed "the coupon in the corner." And it turned out to be my ticket to "Easy Street."

A few days later I was on my way to one of the Rahe Schools



O. H. Justus and his big agency and repair shops at Parkersburg, W. Va.

which I consider the **ONLY** schools. A few weeks later I was back home, a state graduate—master of all the motor secrets that separate the \$2-a-day laborer from the \$40 to \$100 a week of the **real mechanic**. Easy Rahe training had made me a **free man** for less money than a good Rahe-trained mechanic earns in **three weeks**.

Since then I've never wanted for work an hour. My big pay as a mechanic soon enabled me to open my own shop, which **ALWAYS** has had from a week's to a month's work ahead of it. No job ever has "stuck" me; none of my work has "fallen down." I have employed mechanics who had just "picked up" the trade—almost invariably to my sorrow. But I've never hired a Rahe-trained man who didn't make good. The only trouble was, I couldn't keep them—they **all went into business for themselves**. And, so far as I know, every one of them is now on "Easy Street."

If you want to get somewhere, be your own boss and make some real money, find one of those "coupons in the corner" and send it to Henry Rahe **today**. Then, if you use your wits, it will prove to be **your ticket to "Easy Street,"** too. I'm giving it to you straight. I **KNOW**.

I Want Men! I'll Pay Your Fare to Chicago, Cincinnati or Kansas City

I want to help 500 ambitious men follow Justus to "Easy Street" in the next few months. **YOU**—regardless of your age or education—can get there easier than he did. Today the field is bigger, the demand for Rahe-trained men greater and the pay better. And you can get to my school nearest your home **FREE OF CHARGE!** I'll pay your railroad fare in full to my nearest school, no matter where you live. It's going to be a **BIG** year for Rahe-trained men. Get started early! Just jump on a train for the nearest Rahe school. Every cent of your fare will be refunded the minute you enroll. (Read my 7-day guarantee.)

Master Instructors Wonderful Shops

Every instructor in my three schools is a **MASTER** of his business—trained by me and always under my direction. I keep constantly in touch with each school and see that things are done **RIGHT**. The Rahe shops are really wonderful. They contain **everything** needed to make **YOU**, too, a **MASTER** of this big-money business. You don't need "book learning" to succeed in this business—just a few weeks' pleasant training on actual motors and cars. If you don't want to go into business for yourself, you can make **REAL MONEY** working for others. **Bill Peace, one of my graduates, writes me that he's making \$250 a month and expenses operating a tractor in the**



I've put 40,000 men on "Easy Street." I can and **WILL** do it for you if you'll simply tell me you want to go. Say it **right now**.

HENRY J. RAHE.

oil fields. **THOUSANDS** of Rahe-trained men make reports like this.

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Try a Rahe School a week. Then, if you don't like it—if you don't believe my methods will make you a competent auto and tractor mechanic—you can withdraw and the 7 days' training will cost you **NOTHING**. No other school offers this guarantee. It's your **INSURANCE** of satisfaction. Don't forget—this will be a **BIG** year for Rahe-trained motor-maintenance engineers—thousands will be needed. Get started **QUICK!** Send the coupon or a post card and find out about the **EASY** Rahe way to "Easy Street."

Do it today.

Yours for quick success,

Henry J. Rahe

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Age..... Occupation.....

Address me at my school nearest your home.—H. J. R.

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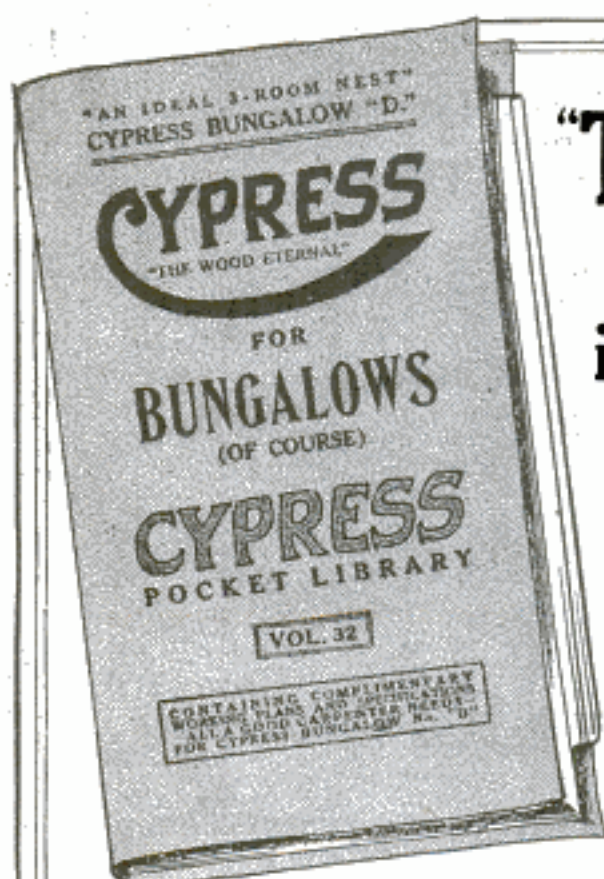
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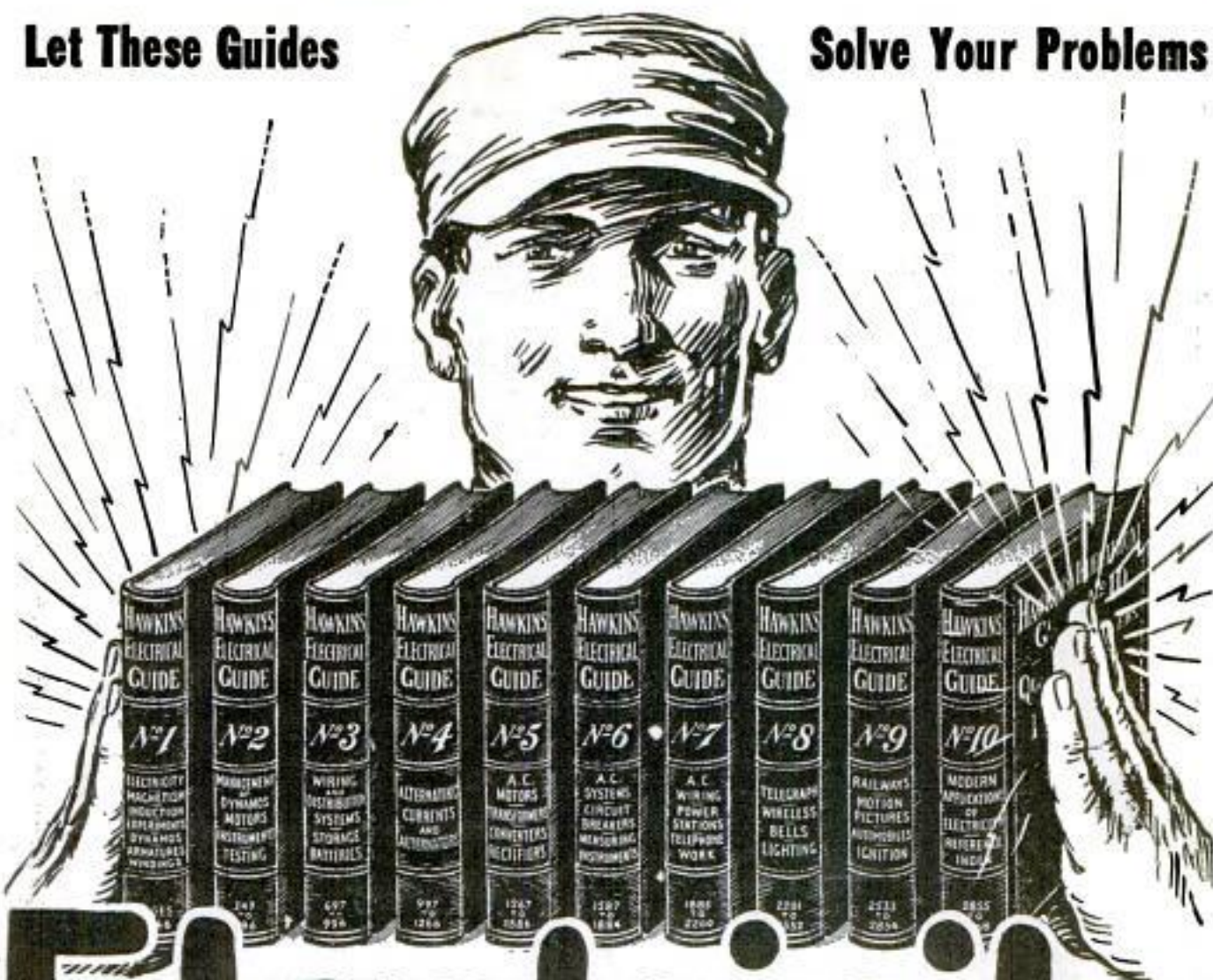
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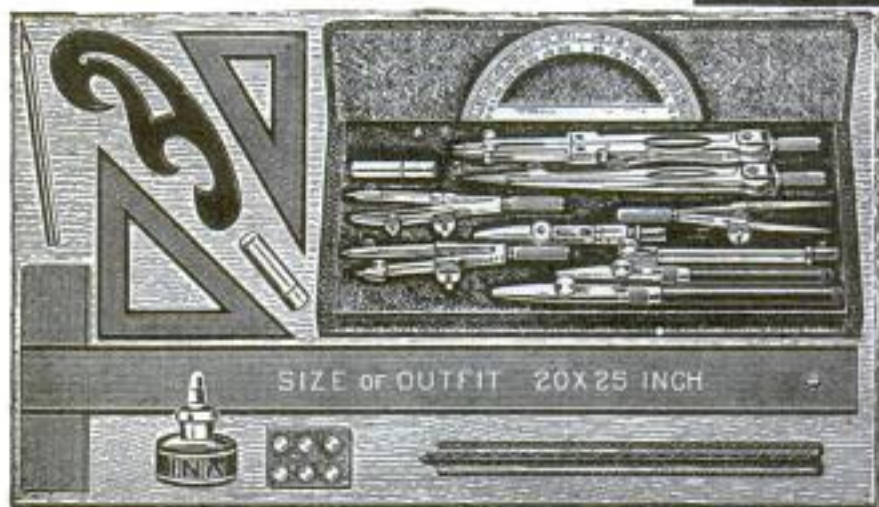
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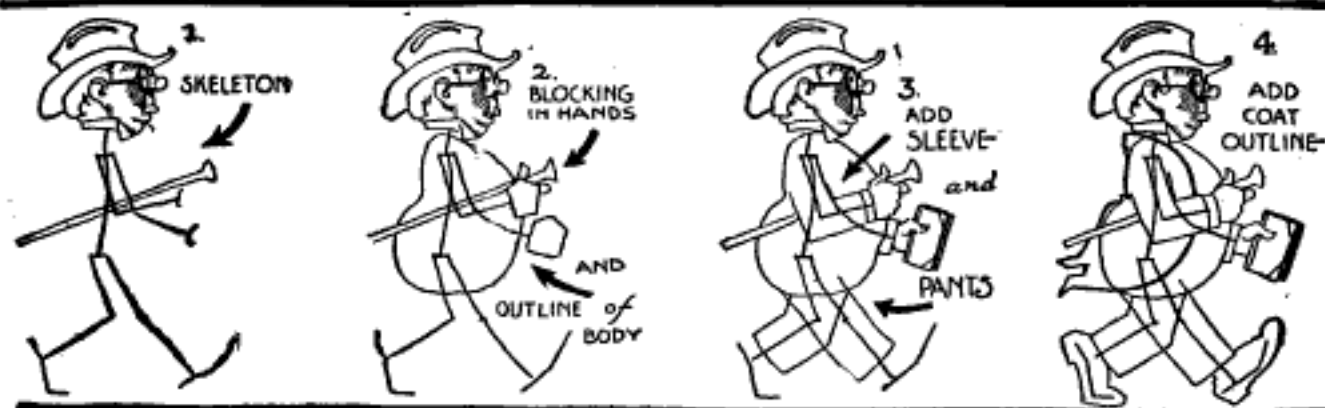
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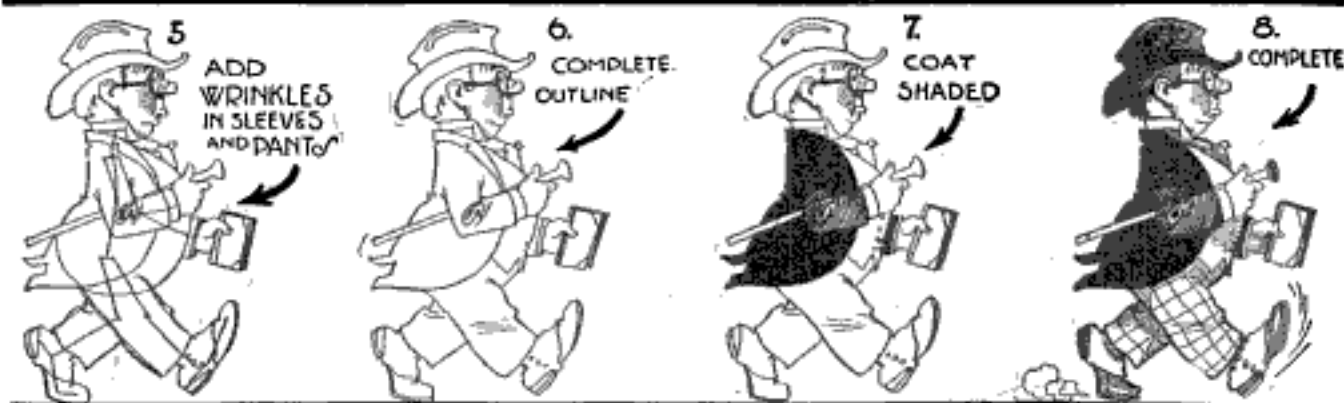
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Establish yourself as a Photographic Expert quickly—during your spare time—under a leading photographer. I'll show you how to start your own business—or command a large salary. Send for my unusual offer—it's only temporary. Act at once. A postal will do. H. Dupont, Pres. INTERNATIONAL STUDIOS
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Bentley of Philadelphia made that. Hundreds making fortunes, too, with **Oliver Oil-Gas Burner**. Heats at turn of valve. No coal or wood. Fits any stove. Burns 95% air, 5% kerosene. 1 minute to demonstrate. Sells big all seasons. No wonder agents clean up.

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Big money in spare time also. **OLIVER OIL-GAS BURNER & MACHINE COMPANY, 2048-O Pine Street, St. Louis, Mo.**



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MAKE MONEY CHALK TALKING. SEND \$1.00 FOR SHARPLY PROGRAM OF TRICK DRAWINGS WITH INSTRUCTIONS BY A PROFESSIONAL CARTOONIST. SATISFACTION GUARANTEED. CIRCULAR FREE. BALDA ART SERVICE, Q1, OSHKOSH, WIS.

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are often paid to traffic managers. Numberless traffic positions pay \$2,500 to \$5,000 per year. Millions of dollars are wasted annually because of ignorance of cheaper ways to ship. You can be a traffic expert—stop losses—make big money for yourself. Thousands of men now needed.

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It's a Shame for *You* Not to Earn \$10,000 a Year

-When Others Do It So Easily



He Does It

"Last week my earnings amounted to \$534.37; this week will go over \$400."—F. Wynn, Portland, Oregon.

WHEN a farmhand steps from \$50 to \$1,000 a month—when a fireman jumps from \$60 a month to a job paying him \$500 for two weeks' work—when a former railway mail clerk at a yearly salary of \$1,600 changes his job and earns \$1,000 in thirty days—and when hundreds of others quickly jump from small pay to magnificent earnings in the same way—then it's a shame for you not to earn your \$10,000 a year.

There is nothing exceptional about these men. They'd tell you that themselves. Many had been clerks, bookkeepers, mechanics. Some had been policemen, farmhands, firemen. And then in one swift stroke, they found themselves making more money than

they had ever dreamed possible. The grind of routine work—the constant struggle to obtain even a small increase—all this was left behind. Today they know the thrill of independence; they are no longer ruled by an office clock. There is genuine enjoyment in every hour of the day, for their work is filled with real fascination. They have found not only the most interesting, but the best paying branch of all business.

A field that they had never dreamed of as theirs they found to be easy and uncrowded. Earnings that they had always hoped to reach were right there in this new field waiting for them. Hundreds have found this new easy way to \$10,000 a year. You can too—let us tell you how.



So Does He

"I had never earned more than \$60 a month. Last week I cleared \$306 and this week \$218."—George W. Kearns, Oklahoma City, Okla.

What these men have done, hundreds of others have done, hundreds are doing today, hundreds will do tomorrow. And you may be one of them! For now the same opportunity that put these men into the big money class is open to you.

In the first place they discovered a vital fact about business. They discovered that the big money is in the selling end of business. In the second place they discovered a new and amazingly easy way that will make any man a salesman, no matter what job he held before.

Salesmen are the very life blood of any concern—upon them depends the amount of profits made. No wonder that man for man Salesmen receive the highest pay. For the men who are in the "Star" class—who are Masters of Salesmanship—there is practically no limit to their earnings. Some receive almost fabulous amounts. And that is how these men and hundreds of others

like them have found the way to their present handsome incomes.

They are all Master Salesmen Now!

Yet previously they had no idea of becoming Salesmen. If you had told them success awaited them in the field of Selling, they would have laughed at you. They would have told you that it was absurd to think of it—for they had never sold a dime's worth of goods in their lives! Then they learned of a great organization of top-notch Salesmen and Sales Managers formed for the express purpose of fitting men for the great opportunities in the field of Salesmanship and to help them to positions in the lines that most appeal to them. Step by step—in their spare time at home—this great organization, The National Salesmen's Training Association—took them thru every phase of selling. Then as soon as they were qualified and ready, the Free Employment Service of this Association helped them secure good selling positions. Almost before they realized it they were in the big money class.

And He—

"The very first month I earned \$1000. I was formerly a farmhand."—Charles Berry, Winter-set, Iowa.



FREE BOOK

The same opportunity that has brought hundreds of others their good fortune is open to you. Whether or not you have ever thought of becoming a Salesman, you should examine the facts about the tremendous possibilities for big earnings in this fascinating field. This will not cost you a penny and places you under no obligation. It simply means

Starts You for YOUR \$10,000-a-Year!

National Salesmen's Training Association
Dept. 12-C, Chicago, Ill.

I simply want to see the facts. Send me FREE your Book on Salesmanship and Proof that I can become a Master Salesman. Also send list of lines with openings for Salesmen.

Name.....

Address.....

City.....

State.....

And He—

"After spending ten years in the railway mail service at salaries ranging from \$900 to \$1800 a year, I decided it was necessary for me to make a change. My earnings during the past thirty days were more than \$1000."—W. Hartle, Chicago.



that you will receive, entirely free, a remarkable illustrated book, "The Knight of the Grip," and the personal stories of men in every part of the country who today are enjoying splendid success and earning five, ten and fifteen times as much money as ever before. Make a start now for your \$10,000 Year. Mail coupon at once to The National Salesmen's Training Association, Dept. 12-C, Chicago, Ill.



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He can turn to the monthly page "For the Boys to Make" and find descriptions—with illustrations and full instructions of just the things a boy can make in wood.

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Write immediately for full list of many positions now easily obtainable. Don't delay. Every day you lose means the loss of just so much chance of early appointment.

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Name.....

Address.....

Use this before you lose it. Write plainly.

How "Modest Jim" Won the \$50 Prize

By WILLIAM LAWRENCE

Author of "The Awakening"

"YES—I remember why they call the Big Boss 'Modest Jim,'" said the Old Timer. "It started way back twenty years ago.

"I was in my third apprentice year when Jim Hadley came to work here—a quiet, bashful boy. His father had died and he was forced to leave grammar school and go to work.

"He was never among the groups of boys dodging the boss or watching the clock nor mixed up in anything that wasn't strictly business. And he never fooled away his time with the bunch after hours, so we left him pretty much to himself. We called him 'Modest Jim.'

"One day Old Man Adams, who owned this outfit in those days, came out into the shop and tacked up a sign over the foreman's desk.

"It seemed that the Old Man and his designer had run into a stone wall or what was Greek to most of us kids those days, and was offering a prize of fifty dollars to anyone who solved the problem. He must have been up against it or he never would have asked our bunch for help.

"About two weeks later, after the rest of us had forgotten all about it, the Old Man rushed out to Jim and fairly pushed five crisp ten dollar bills into his hand. He had solved the problem.

"When the foreman asked him how he did it, he replied, 'Oh, it wasn't anything great. Only a fresh brain on a stale subject.' That's all he ever said about it. But do you know what that boy had been doing? He'd been studying with the International Correspondence Schools in his spare time. No wonder he got ahead!

"And he went right up, and up and up, until today he is the Big Boss. And the rest of us are just about where we started. He's still 'Modest Jim,' but he's earning five times as much as I am.

"Take my advice, lad, and follow along in Jim's footsteps. Don't wait until it's too late to get the special training that is so essential to success."

Employers everywhere are looking for men like "Modest Jim"—men who want to get ahead—who are willing to devote a part of their spare time to training for advancement.

How much longer are you going to wait before taking the step that is bound to bring you a better job and more money?



Isn't it better to make your start now than to wait a year or five years and then wish you had? It certainly is!

No matter where you live, the I. C. S. will come to you. No matter what your handicaps or how small your means, we have a plan to meet your circumstances. No matter how limited your previous education, the simply-written, wonderfully-illustrated I. C. S. lessons make it easy to learn. No matter what career you may choose, some one of the 300 I. C. S. courses will surely suit your needs.

This is all we ask: Without cost, without obligating yourself in any way, put it up to us to prove how we can help you. Just mark and mail this coupon.

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- | | |
|---|---|
| <input type="checkbox"/> ELECTRICAL ENGINEER | <input type="checkbox"/> BUSINESS MANAGEMENT |
| <input type="checkbox"/> Electric Lighting & Railways | <input type="checkbox"/> SALESMANSHIP |
| <input type="checkbox"/> Electric Wiring | <input type="checkbox"/> ADVERTISING |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Show Card & Sign Ptg. |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Railroad Positions |
| <input type="checkbox"/> MECHANICAL ENGINEER | <input type="checkbox"/> ILLUSTRATING |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Business Correspondent |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> BOOKKEEPER |
| <input type="checkbox"/> CIVIL ENGINEER | <input type="checkbox"/> Stenographer & Typist |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Certified Public Accountant |
| <input type="checkbox"/> MINE FOREMAN or ENGR. | <input type="checkbox"/> TRAFFIC MANAGER |
| <input type="checkbox"/> STATIONARY ENGINEER | <input type="checkbox"/> Railway Accountant |
| <input type="checkbox"/> Marine Engineer | <input type="checkbox"/> Commercial Law |
| <input type="checkbox"/> ARCHITECT | <input type="checkbox"/> GOOD ENGLISH |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> CIVIL SERVICE |
| <input type="checkbox"/> Concrete Builder | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> AUTOMOBILES |
| <input type="checkbox"/> PLUMBING & HEATING | <input type="checkbox"/> Mathematics |
| <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Textile Overseer or Supt. | <input type="checkbox"/> AGRICULTURE |
| <input type="checkbox"/> CHEMIST | <input type="checkbox"/> Poultry Raising <input type="checkbox"/> Spanish |
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Name.....

Street and No.....

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

Occupation.....

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Here Is a Simple, Easy Way
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Make a square with pencil, then add to it with pencil as shown in the small squares above. Erase all pencil guide lines after the drawing is completed.

We will not give you any "grand prize," if you draw this picture. Nor will we claim to make you "rich in a week." But if you are anxious to develop your talent with a **successful cartoonist**, so you can **make money**, send a copy of this picture with six cents in stamps for portfolio of cartoons and sample lesson plate, and let us explain more in detail. Some of the **most successful cartoonists** are former students of this school. It is not hard to learn to draw **originals** when you are shown how in a **practical way**.



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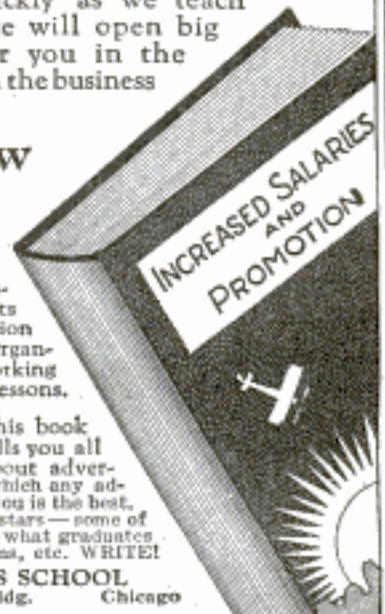
ADVERTISING principles are grasped quickly as we teach them. Our course will open big opportunities for you in the best paying field in the business world. Start now!

Some New Features

Our 27th year; course improved, enlarged, faculty increased for 1922. Students now receive instruction in Modern Business Organization. Complete working outfit free with first lessons.

FREE! This book tells you all about advertising and the course which any advertising man will tell you is the best. Pictures of advertising stars—some of their work in colors—what graduates are doing—prices, terms, etc. **WRITE!**

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If you stammer attend no stammering school if you get my large FREE book entitled "STAMMERING, Its Origin and the Advanced Natural Method of Cure," bound in cloth and stamped in pure gold. Ask for special: union rate and a FREE copy of "The Natural Speech Magazine." Largest, best equipped and most successful school in the world for the cure of stammering, stuttering, etc. No sing-song or time beat. Write today. The North-Western School, 2317 Grand Ave., Milwaukee, Wis.



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U. S. RAILWAY MAIL CLERKS
\$1600 to \$2300 Yearly Work 15 days monthly—paid full time. Travel Free. Hotel expense allowance. No experience required. All men and women over 17, should mail coupon below, NOW.

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Only the trained man gets the big pay. Make your mind right now to be one. Get your training in the best paying of all the professions—Electricity. You can learn Electricity in the Great Shops of Coyne in 3 1-2 months. Then you can go out and command from \$150 to \$400 and more. When you graduate from Coyne in 98 days you can enter any of a dozen or more lines of work—power house operating, telephony, railway signal work, house wiring, electric sign work, motor maintenance, automobile and battery work, street railway service, etc., and earn big money and quick advancement.

YOU CAN DO THE SAME

Read These Letters



"Now the same man is my helper; my pay is bigger than his. He had been in the shop 2 years, but I'm a Coyne Man."—M. E. K.



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You don't need to wait until you have saved up all the money you need to get this Electrical education. Our Welfare Department will help you get a part-time job at which you can earn money to help pay your way.

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If you enroll within a limited time you can get the full course in Automobile, Truck and Tractor Electricity without paying a cent above the cost of the Practical Electrical Engineering Course. **This course can be taken separately if desired** (on another page); if so desired state so when writing us. This is the finest course in America. The equipment is complete in every detail, and you get your instruction under experts in this branch of electricity.

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We want every one of our graduates to succeed in a big way. If you enroll within a limited time, we give you, free, a full course in Business Management. You take this course at the same time you take the others. You learn how to manage a business and make money out of it, regardless of whether you work for others or go into business for yourself. This training, with that in Practical Electrical Engineering, and in Automobile Electricity opens the way to get into a big paying business of your own—you learn wiring, ignition, lighting and starting systems of all cars, trucks and tractors; you learn how to make and repair batteries. You can, like thousands of our men, earn big money in a business of your own—as Electrical Contractors, Auto-Electricians, in Garages and Service Stations, as Armature Winders, Electrical Supply Dealers and as Battery Experts. The field is nation wide and there is a wonderful opportunity for big earnings.

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Learn Electricity. Make big money. Be somebody. Make good and get real pleasure and satisfaction out of life. Own your own car and home and be independent. You can do it. It's easy if you get the right start. Filling out the coupon tonight starts you right. If you never do anything you'll never get anywhere. Will you? Write for full particulars. You will want to reserve the right to get the free courses. **GET YOUR LETTER OFF TONIGHT!**



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Every mail brings letters from some of the two million I. C. S. students telling of promotions or increases in salary as the rewards of spare time study.

What are *you* doing with the hours after supper? Can you afford to let them slip by unimproved when you can easily make them mean so much? One hour a day spent with the I. C. S. will prepare you for the position you want in the work you like best. Yes, it will! Put it up to *us* to prove it. Mark and mail this coupon *now!*

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- ELECTRICAL ENGINEER
- Electric Lighting & Railways
- Electric Wiring
- Telegraph Engineer
- Telephone Work
- MECHANICAL ENGINEER
- Mechanical Draftsman
- Machine Shop Practice
- Toolmaker
- Gas Engine Operating
- CIVIL ENGINEER
- Surveying and Mapping
- MINE FOREMAN or ENG'R
- STATIONARY ENGINEER
- Marine Engineer
- ARCHITECT
- Contractor and Builder
- Architectural Draftsman
- Concrete Builder
- Structural Engineer
- PLUMBING & HEATING
- Sheet Metal Worker
- Textile Overseer or Supt.
- CHEMIST
- Pharmacy

- BUSINESS MANAGER
- SALESMANSHIP
- ADVERTISING
- Show Card & Sign Ptg.
- Railroad Positions
- ILLUSTRATING
- Cartooning
- Private Secretary
- Business Correspondent
- BOOKKEEPER
- Stenographer & Typist
- Certified Public Accountant
- TRAFFIC MANAGER
- Railway Accountant
- Commercial Law
- GOOD ENGLISH
- Common School Subjects
- CIVIL SERVICE
- Railway Mail Clerk
- AUTOMOBILES
- Mathematics
- Navigation
- AGRICULTURE
- Poultry Raising
- BANKING
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Street and No.....

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

Occupation.....

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Hamilton College of Law, 431 S. Dearborn St., Dept. 63, Chicago



How Would This Man's Pay-Check Look to YOU?

Pay-day!

Out in the main office the clerks have just received their slender envelopes. They thumb the contents quickly. Not hard to count, you know; for not a man in the lot draws more than forty dollars a week.

Meanwhile in his spacious office, Blakeley writes his name on the back of a slip of paper and hands it to his secretary. "Will you please deposit this to my account," says he.

Blakeley's check is sizeable.

"Easy money," says one clerk to another. They recall that only a few months ago Blakeley was working at a desk alongside theirs. That was before he was chosen Manager of the Department.

They forget that for nearly a year Blakeley has been devoting several evenings a week to *specialized business training*.

In his spare time he has been steadily equipping himself for bigger responsibilities—

And now by a law as fundamental and as universal as the law of gravitation, *he has won promotion*.

How You Can Win Promotion

On which side of the partition is *your* desk?

Are you sitting out among the routine clerks while other men, with no greater *natural* ability than you, are moving into private offices of their own, and receiving checks that range from \$100 to \$200 or more a week?

If you *are*, you are blinding yourself to opportunity—

For there absolutely is a swift, short cut to promotion—if you will do the work!

Swift Advancement by the Problem Method

During the past twelve years thousands of LaSalle-trained men have *taken* this quicker route—and have *arrived*. Writes R. A. Warner, of Harrisburg, Pa.

"At the time I enrolled with LaSalle I was operating an addressing machine for a local concern, with absolutely no chance to forge ahead. I decided to take advantage of your course in Business Management and also Higher Accountancy. As a result, this training has taken me from the \$65-a-month class in 1915 to a present earning power (in 1923) of over \$7,000 a year. Without a question, LaSalle Extension University has been the direct cause of my present success."

Other men—and the files of LaSalle Extension University are overflowing with their letters—give equally gratifying accounts of their success thru home-study training under the

LaSalle "Problem Method." Not a day goes by but what many statements such as the following from LaSalle-trained men are brought to light in the morning's mail:

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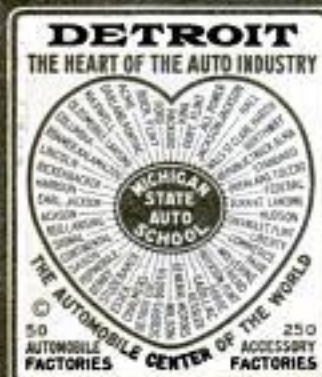
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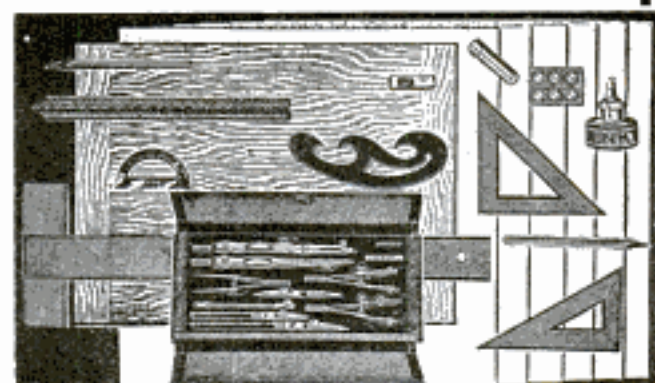
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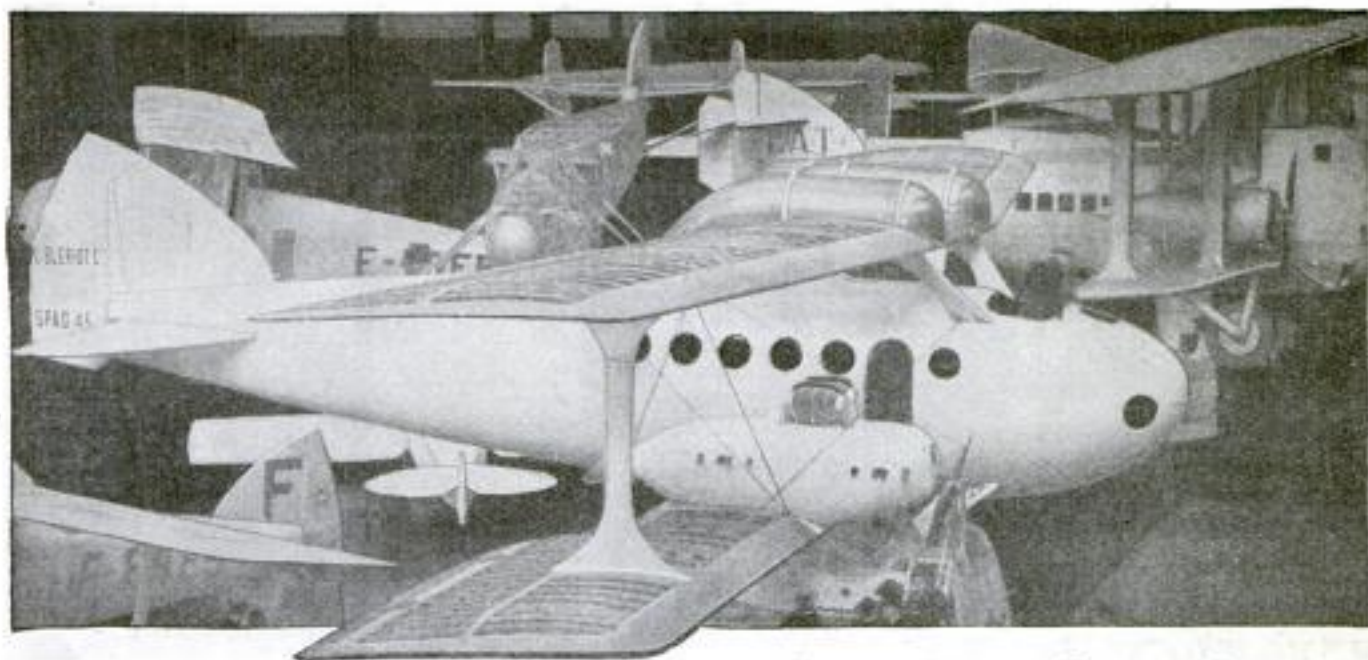
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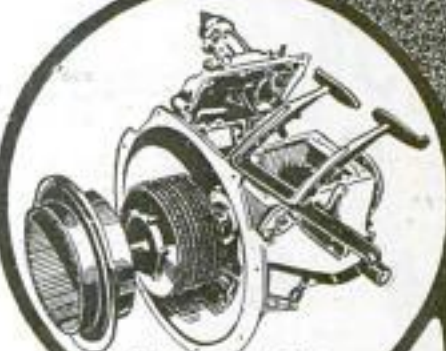
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CLEAN Wallpaper and Window Shades this winter and spring. Big demand. Take large contracts. We show you how. C. Swanson & Sons, Mankato, Minn.

START Profitable Mail Order Business at Home. We teach you by successful method. Particulars free. Waltham Company, Mail Order Dept., Lafayette Bldg., Philadelphia, Pa.

START Galvanizing Business—Tire rims, awnings, signs, boat fittings; hundreds of other things exposed to weather. Address Post Box 583, Charleston, S. C.

MANUFACTURE inexpensive dustless ash sifters. Plan 35c. Wm. Quenore, Camden, New Jersey.

\$12.45 FOR a made-to-measure two-piece suit, the biggest bargain offer ever made by any tailoring house. We are out to beat high tailoring prices. Save 50% on your next suit. You can easily earn \$50.00 cash weekly in your spare time by taking orders for our celebrated made-to-measure clothes. Write us today for our beautiful cloth samples and wonderful offer—sent free; postage prepaid. Act quick. The Progress Tailoring Co., Dept. C-144, Chicago, Ill.

PATENTS—Trademarks. Before disclosing an invention, the inventor should write for my blank form "Evidence of Conception." This should be signed, witnessed and returned to me with sketch or model, upon receipt of which I will promptly render opinion as to patentable nature and send booklet on patents. Highest references. Prompt attention. Reasonable terms. Clarence B. O'Brien, Registered Patent Lawyer, Woodward Bldg., Washington, D. C.

HONEST Mail Order Business in infamy. Alive with unlimited possibilities. 500 high-class, workable plans in detail. \$3.00. Many absolutely new. Others proven very successful. Sworn certified guarantee. If you don't enter business we don't want your money. Send 25c for booklet, "Future Fortunes by Mail." Just published. Universal Advertising Service, Box 321, Oklahoma, Okla.

PATENTS Procured—Trade Marks registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 30 Owen Building, Washington, D. C., or 2276R Woolworth Bldg., New York.

YOUR Chance in life to own dignified profitable business. We teach you practical real estate, insurance and business brokerage. Earn \$5,000 year, no capital required. Office at home. Representatives wanted everywhere. Stamp for booklet. Hayes Realty Association, Cincinnati, O.

MEN Handy with tools, carpenters, painters, weatherstrip men, etc., we teach you in first lesson to make \$200 month up at window and door calking in your own vicinity with our Rawhide Elastic Calking and Glazing Compound; will not crack and fall out. All masonry buildings need it. Saves coal, decorations, etc. Weatherproof Compound Co., 709A Federation Bldg., Chicago.

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ROYAL Banner Magazine: Contains hundreds of money-making propositions, new ideas, plans, tips, and special articles. Copy 15c. Year, \$1. 3 months, 25c. Bohm Publishing Co., Wilkes-Barre, Pa.

REAL Money awaits you in cleaning and dyeing business. Big profits. Easy to learn with my course. Particulars free. Byron, Box 27 Sta. I, New York, N. Y.

FORTUNES made manufacturing and selling box lunches. Begin at home. No special training. Small capital. I tell you how. Particulars free. G. Rood, Sacramento, Calif.

PROSPERITY is awaiting you; let our oilproof spark plugs make money for you. Salesman write to Dinger Spark Plug Co., Melina, Wis.

USE your spare time soliciting advertisements. \$1.00 for full instructions, including samples. Community Advertising Co., 1422 East Marquette Road, Chicago.

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BE independent! \$10 daily silvering mirrors. Complete instructions one dollar. Address, Reliable Sign Co., Sault Ste Marie, Ontario.

MONEY in mail-order business. Names of 30 supply houses 10c. Pennell Company, Covington, Ky.

MAKE Big money opening safes and setting combinations. Wayne Strong, Box 1430, Los Angeles, Cal.

ADVERTISE, 28 words 375 country town newspapers \$8.00. Pennell Company, Covington, Ky.

LEARN Fur dyeing. Formulas guaranteed. Address Rubens, 316 Pulaski St., Brooklyn, N. Y.

RAISE Rabbits. Very interesting and profitable. Read this authoritative book, 20th Century Rabbit Guide. Everything worth knowing about rabbits told by an expert of 15 years' experience. 64 pp., fully illustrated. Price 50 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

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START a lucrative business of your own. We teach you how to establish and operate a successful collection business, and refer items to you. Capital unnecessary. Practically no competition. Walter Sanford, Nashville, reports \$92,021.94 gross commissions last year. Joseph Cullen, Washington, sends sworn statement showing gross earnings \$8,439.07 for one month. Orrin Overholser, Dayton, says, "I averaged nearly \$400.00 net commissions monthly last year. Such earnings bought my home and farm." Start now in spare time. You can succeed like 4,700 others. Write today for New Plan. American Collection Service, 802 Cass Building, Detroit, Mich.

PARTNERS wanted to manufacture New Concrete Street and Railroad Ties. This tie will be made and put in place to my idea; it can be made at a price so that any company can use the new tie. This new tie will run with the rail; good chance for a fast growing business. For more detail, write to Pete Jarnowski, 3304 W. Walnut St., Chicago, Ill.

THIS May Be Your Opportunity. A large, modern Middle Western manufacturing institution will consider proposals from inventors and small manufacturers, with a view of manufacturing on royalty basis or of buying outright. Small brass products preferred, but any high-grade proposition will be considered. Address P. O. Box 426 Kokomo, Ind.

WE Start You in Business, furnishing everything; men and women, \$30.00 to \$100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Hillyer Ragsdale, Drawer 4, East Orange, N. J.

"SCHEMER Magazine." Alliance Ohio, prints big profit schemes; one subscriber making \$25,000 from three; another \$10,000 from one. Try your luck. Year, only \$1.00; three months, 25c.

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ENTER a new business. Earn \$3,000 to \$6,000 yearly in professional fees making and fitting a foot specialty, openings everywhere, with all the trade you can attend to; easily learned by anyone at home in a few weeks, at small expense; no further capital required, no goods to buy, job hunting, soliciting or agency. Address Stephenson Laboratory, 11 Back Bay, Boston, Mass.

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REMARKABLE Discovery—Positively removes Tattoos, Coal Marks, Moles; safe, sure, simple process. Original since 1918. Formula \$1.00. Harding Co., 142 Dearborn St., Philadelphia.

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START in your town a business which has no competitors. Make plaster-boards-550 starts you. I teach you by mail how to do it. 21 years experience. Only one to a town of 100,000. Rubenack, A 1451 Amsterdam Ave., New York. Ask for circular.

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SPIT Fire, Iron Solder, Sugar Substitute, Wall Paper Cleaner, Razor Dressing, Transference; six, 50c, or any one, one silver dime. Cal. Manufacturing Laboratories (any Formula 10 cents), Oxnard, Calif.

FORMULA for making guaranteed grease and paint spot remover. Bigger profits making and selling your own. Formula \$1.00. Geo. Dean, Box 54, Belvidere, Ill.

550 RARE Formulas for 25c (coin). We can furnish any formula wanted for 50c. Allen's Enterprises, 1227 Milwaukee Ave., Chicago, Ill.

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STORAGE Battery Men! Make your own battery plates. \$2.00 for complete secret process. W. L. Thomas, Tama, Iowa.

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FORMULAS—Catalogue free "Clover." 5501-CC, North Robey, Chicago.

ABSOLUTELY any formula, \$1.00. Satisfaction guaranteed. Address Robert Tyler, Park St., Newton, Mass.

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WHIRLWIND money-maker for agents—sample free. Sell powdered Hanslick, an absolutely new, non-competitive, and unbeatable hand cleanser. Removes grease, grime, ink, paint, etc., without slightest injury to skin. Its use spreads like wildfire. Cheaper than all others. Sells in cans (or bulk with dispensers) to garages, autoists, mechanics, factory and office folks, to housewives, hardware stores and to auto supply houses. Huge quantities used weekly by mercantile houses. (Names on request.) Big repeat business assured. Exclusive agencies, crews working for you, fast sales, splendid profits and a permanent business for hustlers. Live ones can clean up \$500 a month. Send 2c stamp for postage on Free sample. Complete sales plan goes with it. Write quick to Solar Products Company, 124 W. Lake St., Chicago, Ill.

350% PROFIT: Quick, Easy Seller. Klean-Rite, New Washing Compound. Washes clothes without rubbing. Women wild over it. Write quick for Free package and Special Offer. Bestever Products Co., 1941-K3, Irving Park, Chicago.

AGENTS Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration—car owners, homes, factories, stores practically buy on sight. Our men make \$10 to \$50 a day—exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fyr-Fyter Co., 163 Fyr-Fyter Bldg., Dayton, Ohio.

START in a permanent business of your own selling guaranteed Hosiery and Underwear direct from mills. No capital or experience is needed; many representatives make \$3,000 to \$5,000 per year. Become our district manager—get others working for you. Write for details to Malloch Knitting Mills, 523 Grant St., Grand Rapids, Mich.

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AGENTS, Men or Women, full or spare time, earn \$25.00 to \$100.00 a week and be your own boss representing the Ho-Ro-Co Mfg. Co., manufacturers of the wonderful Ho-Ro-Co Tonic, the great blood purifier and system builder; some profit-maker. Ho-Ro-Co Medicated Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a repeater. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, spices, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for our free sample case offer. We furnish advertising matter and samples free of charge. Ho-Ro-Co representatives are successful. Write today. Ho-Ro-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

AGENTS: Make \$75.00 a week selling our strictly All-Wool made-to-measure suits at \$26.50. You collect profits in advance and keep them. We supply finest selling outfit in America. Many exclusive money-making features. Tailoring, raincoat and side-line men, part or full time, get in touch with us immediately. Address Dept. 483, Goodwear, Inc., 813 W. Adams St., Chicago.

NEW Miracle Motor Gas amazes motorists: 3c worth equals a gallon of gasoline; prevents carbon; engine starts quickly coldest days; increases mileage 15% to 40%. Isom, Idaho, wires. "Ship 500 packages; made \$70 yesterday;" samples free; exclusive territory. 300% profit; get package free money-back offer. Miracle Mfg. Co., Dept. 1340, Toledo, O.

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\$5,000.00 IS yours in 1922. Exclusive contracts, complete line, fastest selling auto accessories made. All you need is Pep. We show you how. Secure your territory today. Leslie P. Muter Company, 32 West 69th Street, Chicago, Illinois.

PLYMOUTH Bags. We are selling this popular bag in green, black, blue and brown leatherette, cretonne lined. \$6-\$6.50-\$7.20 and \$10 per dozen. Sample 65c prepaid. Write for free samples of material. E. Condon, Mfg., 12 Pearl St., Boston, Mass.

OUR Ex-Cel Luminous Crucifix shines brilliantly in the dark. Churches, hospitals and individuals are only waiting for a demonstration before buying. Agents make handsome profits. W. G. Hasman Co., Dept. B, 57 E. 18th St., Chicago.

TRIAL Order, two each Household Aprons, Kiddie Aprons, Bibs and Baby Pants, \$2.25 postage prepaid. Sell for double. Splendid line rubberized specialties. Get details, Agents colting money. C. B. Bresler Company, 148 West 23d Street, New York.

LIVE Agents make \$10 Day selling Eureka Strainer and Splash Preventor for every water faucet. Takes on sight. Widely advertised and known. Get details today. A. B. Seed Filter Company, 73 Franklin, New York.

NEW Patented Safety Pipe Taps, fit any pipe. Save tobacco; no sparks, no burns, no fires. Big sellers; every pipe smoker wants it. Sample 10c. Dozen 50c. Address Sapico Co., Santa Monica, Calif.

MOST complete line of easiest selling sanitary Brushes, Dusters and Mops. We pay 50% Commission. Write for territory, selling plan and circular. Wire Grip Brush Corp., 29 Mercer St., New York City, N. Y.

CHAFFIN Polishing cloth cleans without scratching. 25c seller. 150% profit. \$10 daily easy. Every housewife buys one to three. Free sample demonstrator. Chaffin Products Co., 5511 Euclid Ave., Cleveland, Ohio.

MAKE 600% Profit. Free Samples. Lowest priced Gold window letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Acme Letter Co., 2800-D, Congress, Chicago.

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MAKE Money at home making toys. We show you how. Send 50c (no stamps) for complete working drawings and instructions. DeKalb Designing Co., Decatur, Ga.

FREE Sample, quick-selling patented specialty. Get yours now. Also details \$5,000-year golden opportunity. Agents wanted. H. G. Martin, 51 Cliff St., New York City.

WORLD'S Fastest Agents' Seller. 400% Profit. Needed in every home, office and store. Establish permanent profitable business. Free Sample. Premier Mfg. Co., Detroit, Mich.

PRODUCING Tailoring Agents Wanted. men's made to order clothing (Union Made). Beautiful materials—lowest prices. New Spring swatch line ready. Leeds Woolen Mills, Chicago.

A BUSINESS of Your Own—Make sparkling glass name plates, numbers, checkerboards, medallions, signs; big illustrated book free. E. Palmer, 511 Wooster, O.

AGENTS Sell Neverfall Iron Rust and Stain Remover. Huge profits. Big line. Sample. Write today. Sanford Beal Co., Inc., Newark, N. Y., Dept. 6.

HIGH-GRADE agents for entirely new accessory for any automobile. Makes night driving safe. Can carry in pocket; every car owner buys. Fits any make. Men who can stand big profits and stay on job. Ray Auto Filter Company, Marion, Ind.

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AGENTS—\$50 weekly selling EZ-Way Fruit Jar Openers. Every housewife buys. Sample 25c. Standish & Dillenbeck, Mfrs., Binghamton, N. Y.

AGENTS—Advertising Pencils, ready sellers, excellent sideline. Write for proposition. North American Pencil Works, 310 So. Canal St., Chicago.

AGENTS: Wonderful Sellers; easily handled, quickly sold, big profits. Sample 10c, 4 different 25c. Harvey Teeple, Decatur, Indiana.

GET out of the rut and be your own boss by being only one in your locality in introducing direct to the consumer the highest quality line toilet preparations and household specialties sold in America. None better made, regardless of price. Every human being a possible user and positive booster when sold. You double your money. Experience unnecessary. Open to men and women possessing character and ambition. Full or spare time. As evidence of good faith send 50c stamps, receive one of our specialties, with full particulars. You will then be convinced. The Chemists' Company of New York, Box 115, Long Island City, N. Y.

\$12.45 FOB a made-to-measure two-piece suit, the biggest bargain offer ever made by any tailoring house. We are out to beat high tailoring prices. Save 50% on your next suit. You can easily earn \$60.00 cash weekly in your spare time by taking orders for our celebrated made-to-measure clothes. Write us today for our beautiful cloth samples and wonderful offer—sent free, postage prepaid. Act quick. The Progress Tailoring Co., Dept. C-142, Chicago, Ill.

WANTED—Agents and Salesmen to handle Europe's Famous Wonder Glass, the newly imported Prism "Binoculetto." For theatre, hunting, yachting, races, touring, aviation, etc. This is the smallest and of its size the most powerful Glass in the world. Can be carried in vest pocket or ladies' bag. Retail at \$25.00. Confidential wholesale price to agents \$12.50. Send money with order to George Mayerle Optical Co., General Importers, established 1894, 969 Market St., San Francisco, Calif. (Send for catalog.)

\$60.00 WEEKLY during spring. 32 small sales daily will accomplish this. Mystol vanilla flavor is the housewife's favorite. Just think of it. A full half pint of pure, rich, mellow flavor for fifty cents. No conservative woman can resist such a bargain, or will try to. 34 cents profit by our system. Popular for nearly twenty years and the fastest selling food specialty in America. Write Mystol Corp., Geneva Falls, N. Y.

PATENTS—Trademarks. Before disclosing an invention, the inventor should write for my blank form "Evidence of Conception." This should be signed, witnessed and returned to me with sketch or model, upon receipt of which I will promptly render opinion as to patentable nature and send booklet on Patents. Highest references. Prompt attention. Reasonable terms. Clarence B. O'Brien, Registered Patent Lawyer, Woodward Bldg., Washington, D. C.

AGENTS—Sell Necessities like Tea, Coffee, Baking Powder, Flavors, Soaps, Perfumes and other products. Used every day in the year. Repeat over and over again. Every home a customer and regular user. The smart and experienced agents handle this line, why not you? Write today for Money-Making Plan. Don't delay. Territory going fast. American Products Co., 5723 American Bldg., Cincinnati, Ohio.

AGENTS—Make \$50.00 a week and up in tailoring business. Get our big swatch sample outfit—119 powerful fast-selling fabrics to retail at \$23.00—\$27.50—\$34.50—\$37.50 per suit. \$15.00 to \$20.00 cheaper than store prices. You keep \$5.00 deposit on each sale—we deliver and collect balance. Write D. A. Kennedy, Dept. 100, 202 S. Green, Chicago.

AGENTS—Make \$7 to \$14 a day. Brand new Aluminum handle Cutlery Set. You take orders, we deliver and collect. Pay you daily. Full or spare time. No experience necessary. No capital. We need 1500 Sales Agents, men or women, to cover every county in the U. S. Demand enormous. Write quick. Jennings Mfg. Co., Dept. 1868, Dayton, Ohio.

BUICK, originator of valve-in-head motor and founder of the Buick Automobile, wants sales agents to handle the Buick Hi-Power Carburetor—the 100% efficient and economical instrument—immediately commands attention. Agents making \$20 to \$50 day. Write for particulars. David Buick Carburetor Corp., Desk 15, Detroit, Mich.

AT Last—World's Greatest Adding Machine. Almost human. Retail \$15; work equals \$300 machine. \$500 monthly easily made, demonstrating to stores, offices, garages, factories. Simple, easy; adds, subtracts, multiplies, divides, automatically. Speedy, accurate, durable, handsome. Five year guarantee. Tremendous demand; amazing profits. Liberal trial offer. Protected territory. Write quick. Lightning Calculator Corp., Dept. F, Smith Bldg., Grand Rapids, Mich.

AGENTS: Sell full line of guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles, colors and finest line of silk hose. Often take orders for dozen pairs in one family; permanent customers and repeat orders make you steady income. Write for sample outfit. Thomas Mfg. Co., Class 462, Dayton, Ohio.

AGENTS: Here is something you can sell to every housewife. Most useful household article made. Indispensable in every kitchen, restaurants or hotels. Tyler's Ideal Fibre Cutter tenders meat, chops vegetables, shaves ice, cleaves bones, scales fish, all in one. Low price, quick sales, big profit. Address now—M. H. Tyler Mfg. Co., Dept. S-4, Muncie, Ind.

BIG profits in fastest selling article available to agents. Three-in-One Holder is new invention. Sells two for 25c; costs you half that. You can sell a dozen or more to every home, store, office, factory, shop, garage, institution, etc. Tremendous seller because universally useful. Ribbon Steel Products Corporation, 114 Liberty Street, New York, N. Y.

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TAILORING Agents; wonderful all-wool, one-price line, retails \$29.50 per suit; \$10 to \$20 cheaper than retail prices; you collect profit at once; we ship C. O. D. to customer for balance; exclusive territory; hustlers wanted; none others considered; write fully; state experience. Sales Manager, A-21, 831 West Adams St., Chicago, Ill.

EASY Money—\$20 a day—Something new. "Simplex Ironing Board Covers." Biggest seller in years. Every woman wants one. New agent cleared \$19.50 on Saturday. Another cleared \$6 first hour. Drop dead ones—sell something new and make big money. Write quick. W. J. Lynch, Box 718, Springfield, Ill.

JENSEN sold 3474, Dixon 2025, Harman 700; sell Plate-Too; something new, it's different. Patent pending. Cleans Plates, renews in one operation, wonderful demonstrator. Big repeater. Write for territory before it is too late. Sample \$1.00. Plate-Too Mfg. Co., 614 35 So. Dearborn, Chicago.

AGENTS—\$8 to \$12 a day, taking orders for Music Chest. New invention does more than machine costing 20 times its price. Easily carried with you anywhere. Gratz made \$394 one month. Write for terms and sample. Thomas Mfg. Co., Class 2362, Dayton, Ohio.

SELL Minitmend for tires and tubes—cost 2c. Repair; surpasses vulcanizing, saves 500%. Every auto and accessory dealer buys. Profits amazing. Shaw made \$21 first day. Hart \$155 first week. Particulars and free sample. The Colonial Rubber Co., Dept. 85, Philadelphia, Pa.

AGENTS Wanted for World's best 30x3 1/2 Cord Tire—sells for \$12.50. Write at once, C. D. Hibbs, Ft. Worth, Texas.

BIG profits. Sell Plate Glass Wind Deflectors, Rear View Mirrors, Aluminum Foot Scrapers and 20 nationally advertised accessories. Car owners, Dealers, Garages buy one to gross. Write quick for illustrated catalog and agency prices. Rapid Sales Corporation, 11-D Grand Rapids, Michigan.

AGENTS: Reversible Raincoat. Something new. Latest style. Not sold in stores. Guaranteed Waterproof. Two coats for the price of one. No capital required. We deliver and collect. Write for territory and sample. Thomas Mfg. Co., Class 1462, Dayton, Ohio.

AGENTS: Make \$75.00 per week. Wonderful Instanto Gas Lamp. Lights instantly with a match. Sells to every home. We deliver and collect. Pay you daily. Experience unnecessary. Sample free. Rallen Mfg. Co., Dept. P. M., Baltimore Bldg., Chicago.

PORTRAIT Agents—Earn Big Money selling our Photo Medallions. Everybody buys. You charge \$3.00; make \$2.40 each sale. \$10 daily easy. Big variety designs. 4-day service. Perry Photo Novelty Corporation, Section 16, 369 Bowery, New York.

A VERY profitable business of your own selling our Clean Cutter Can Opener and Acme Universal Kettle Drainer. Wonderful, fast selling, patented necessities demanded in every home. Peninsular Specialty Co., Desk B, 15301 E. Jefferson, Detroit.

BUILD Your Own Business selling our standard products from factory to home at prices that get orders. \$5000 year. Over 150 articles used every day. Write for money-getting plan. Pitkin, 347 Commercial Bldg., Newark, New York.

COMPLETE Line Automobile Necessities that sell to car owners on demonstration. Auto owner agents wanted every county. Make big money. Write today for agent's prices and territory. Crescent Accessories Co., Candler Bldg., New York City, N. Y.

SELL Grito Laundry Tablets. Whirlwind Seller. Big Repeater. Sales guaranteed. Washes dirtiest clothes absolutely without rubbing. Agents coinng money. Send for free sample and particulars today. Grito Soap & Mfg. Co., Dept. 2X, Rochester, N. Y.

PROTECT Your Rights. Write for Record of Invention which contains forms to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612 G. Columbian Bldg., Washington, D. C.

NEW—Fastest selling specialty on market. Sells everyone on sight, 100% profit. Makes income \$15.00—\$25.00 per day certain and easy. All territory virgin. Safety Blade Handle, 1316 No. American Building, Chicago.

GOLD Sign letters for stores and office windows. Photo pillow 1-gs, portraits, frames, sheet pictures, medallions, waterproof aprons, novelties. Samples, catalogue free. Thirty days' credit. James C. Bailey Co., Desk C3, Chicago, Ill.

BIG Pay. Man or woman of character to distribute religious literature. Chance to make \$600.00 or more. Full or spare time. No capital or experience necessary. Universal Bible House, Dept. H, Philadelphia.

AGENTS, Sell Mengo Sticlite Patches for tires and tubes. Every Auto Owner and Dealer buys. Exclusive territory. Write for free sample and sales plan. Mengo Products Co., 537 Rosedale, Pittsburgh, Pa.

AGENTS See our display advertisement on page 138 in this magazine, then write us immediately. Wide awake agents need no other line. Address, Sales Dept., The Kaxo Company, Cambridge, 39, Mass.

AGENTS—Sell Thompson's Washing Compound—washes clothes instantly without rubbing. Makes washday a pleasure—cleanses everything. Fast Seller—Big Repeater. Write—A. D. Thompson Co., 1103 Union St., Indianapolis, Ind.

AGENTS. Sell Wolverine Laundry Soap; 150 other household necessities. Big line. Big profits. Quick repeaters. Free instruction. Write quick for terms. Wolverine Soap Co., 298 Water St., Portland, Mich.

AGENTS: Start little Mail Order business anywhere. Home employment evenings. Send ten cents for Instruction Booklet and Mail Order Samples. Williams, Department H, 72 Coelndt Street, New York, N. Y.

SOMETHING Big. Dime puts you on our mailing list one year. You receive latest money-making opportunities, propositions, from manufacturers and supply houses everywhere. Kentucky Agency, Covington, Ky.

RAYLITE diamonds, marvelous gem discovery, true diamond color — beautiful guaranteed rings, jewelry, specialties, stretching kuff buttons at factory prices. Big profits. Exclusive territory. Master Jewelers, Sheboygan, Wis.

CANVASSERS—Two real money-makers. Self-threading needles and needle books; coat 5c, sell at 15c. Send for samples. S. Lee, 145 E. 23d St., New York, N. Y.

GASKET Display Boards with Assorted Gaskets for popular autos sell to every repair shop. Easy, profitable sellers, steady repeat. Write for agent's prices and territory. Crescent Accessories Co., 220 West 42nd Street, New York City, N. Y.

AGENTS: New reversible raincoat. Not sold in stores. One side dress coat, other side storm overcoat. Saves \$20. Guaranteed waterproof. Big commission. No capital required. Sample furnished. Parker Mfg. Co., 378 Rue St., Dayton, O.

SEND for our Bargain Bulletins. Hundreds of fast-selling novelties for Agents and Salesmen. Our low prices will surprise you. Circle Sales Co., Dept. 29, Moline, Ill.

EVERY Ford needs our Safety Clutch Control. New Patent. Quick Sales. Small Capital. Low Priced. Circular Free. Sample \$1.00. C. C. Moore, 415 Cuyahoga Bldg., Cleveland, O.

AGENTS. Mail order men: Valuable tips, inside information; also 17 automobile specialties. 300% profit. Particulars. Nite Mail Order & Supply Co., 609 27th St., Denver, Colo.

\$40.00 WEEKLY (whole or part time) selling guaranteed Hose, Waterproof Aprons, Shampoo Caps, Toilet and Sanitary necessities. Credit given. Jas. C. Bailey Co., Dept. M6, Chicago.

SELLS like hot cakes; big profits; new ironing wax; perfumes clothes with lasting violet perfume. Working outfit 10c. Yankee Manufacturers, 380 Atlantic Ave., Brooklyn, N. Y.

GENUINE Oriental Goods, all kinds, direct from the importer. Best agency proposition in U. S. Send for list. McCallister Co., Importers, 570 Phelan Bldg., San Francisco, Calif.

AGENTS: We start you: Paying Mail-order Business: Positive results: Particulars. Samples 25c and name in Agents' Directory Free. Trade Secrets Co., 3923, St. Louis, Mo.

AGENTS. Salesmen: Renshine cleaner, polish. Captivating Auto world, household. Free Sample. 200% profit. Permanent connection. Detroit Renovating Materials Co., 4815 Commonwealth Ave., Detroit, Mich.

OUR no trust signs make the customer pay. Every merchant buys; \$1 for 5. Sample and price 25c. Address, Outdoor Advertising Service, Lockport, N. Y.

AGENTS to sell household necessities. Articles of proven worth. Write for territory and particulars. The 4 Paw Mfg. and Chemical Co., West Allis, Wis.

ATTENTION—Crew Managers: Men and Women earn \$10.00 daily with our absolute ladies' necessity. Sample, particulars free. Toddy Co., 93 Park Place, New York, N. Y.

SELL a necessity. Nimrod work and outing shirts sell when other things don't. Good commission. Nimrod Shirt Company, 1930 Cuyler Ave., Chicago, Ill.

COAST to Coast campaign needs 5,000 agents. Sample and terms dime. Dept. 37, Blossom Hair Net Co., 252 Wallabout St., Brooklyn, N. Y.

GALLAGHER made \$330.00 in one week selling guaranteed Collection Systems, used by all business men. Sayers Mfg., 2815 Sheffield Ave., Chicago, Ill.

SALES Folks: You want a timely product; repeat orders sure; profits aplenty; advancement certain; and a plan that's failure-proof? Then write us! The Robb-Tynan Co., Dept. 3, Bellefontaine, O.

EARN \$10 daily silvering mirrors, plating and refinishing metal ware, autos, chandeliers, bedsteads. Outfits furnished. E. Davis Laboratories, 286 Fifth Ave., New York, N. Y.

AGENTS—See Motor-Meter Lock, page 193 February Popular Mechanics. Sample \$1.50 postpaid. E. W. Allen, Room 14, Auzerais Bldg., San Jose, Calif.

BIG Money Solliciting Blades Resharpener, or Selling Finest Improved \$1.00 Double Edge Razor. Standard Safety Razor Corp., Pittsburgh, Pa.

SALESPEOPLE. \$1.00 starts you in business. Costs 15c. Sells for \$1.50. 75c package sent for 4c. Address Texply Co., Somerville, N. J.

AGENTS, male and female: new line necessities, home, office, auto. Sample 50c postpaid. Address Box 82, East Boston, Mass.

GET Posted for Spring. Good prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 30.

300% PROFIT. Retail \$1.00—You make 75c Profit each sale. 4-8-Razor Co., Hutchinson, Kan.

AGENTS—Read my ad in "For Men" column. Givens, 450 E. 48th St., (A) Chicago, Ill.

SELL Advertising Pencils. Big Commissions. Quick Sellers. Write for Proposition. Keystone Pencil Works, Altoona, Pa.

BEST and absolutely new articles for live men to sell to trade and individuals. Big money. Fast sellers. Better repeaters. Smith, 1317 N. American Bldg., Chicago.

AGENTS—Big Profits, Gold Sign letters easily applied, samples free. Liberal offer to General Agents. Dept. C, Interstate Sign, 2620 No. Halsted St., Chicago.

COMB Cleaners. House to house agents wanted. C. W. Partridge & Co., 334 5th Ave., New York City.

MANUFACTURERS' Sales Agents with live organization. 428 St. James Building. New York City, N. Y.

BIG Profits, quick sales; Selling Crimp Grip Clothes-Line Holder. Agents making \$8.00 to \$20.00 per day. Every housewife a prospect. Send 25 cents (to agents only) for agent's examination sample. Clamps the clothes-line instantly; never lets go until you are ready. Visit your towns twice and sell more the second time than the first. Postage prepaid. References—any Belvidere Bank, Crimp Grip Company, 419 S. State Street, Belvidere, Ill.

MAKE big money, whole or spare time, selling high grade Pure Aluminum combination Cooking Utensils with new features that every Housewife wants and can afford. Our unique plans make you welcome and get the business. Exclusive territory—no sales limit. Here's chance to connect with a live one. Unlimited stock—prompt shipments. General Housewares Co., Lemont, Ill.

EVERY Raincoat Agent should get our proposition at once. If you have never sold raincoats now is the time to start. Any man able to talk is able to sell raincoats. Write for our "profit sharing, collective buying, superior quality" offer. Associated Raincoats Agents, Inc., 4143 North Wells, Chicago.

AGENTS—Your name, address and brand free on toilet preparations, soaps, perfumes, etc., on as small orders as 3 dozen of a kind. Build your own business. Repeat orders sure. Boyer International Co., 940K N. Clark St., Chicago.

AGENTS wanted in every town to sell a first-class Ford Timer direct to the owners. A real money-making proposition for spare time. Write for particulars. P. M. Box N, Norwalk, Conn.

CYCLE "Modified Vapor" system makes Ford run hundred per cent smoother. Wonderful heat control without moving parts. Quickly saves cost. Agent's money maker. Cycle Manifold Co., South High St., Akron, Ohio.

MONEY made quickly taking orders for portrait medallions. No investment required. No competition. Send for our 1922 illustrated catalogue and details. Puddin & Goldstein, Dept. A, 259 Bowery, New York.

AUTO Necessity—Start a business of your own. Very little capital necessary. Write for Proposition to Agents. Leech Accessories, 2713 Vine, Cincinnati, Ohio.

FINEST Hosiery at lowest prices. \$9.00 to \$18.00 profit per day easy. We deliver and collect. Big commissions advanced. Experience unnecessary. Moore Knitting Mills, B208 S. La Salle, Chicago.

HAVE new Violet Ray outfit, perfect in all details, selling for less than half of former prices; only \$7.75 retail. Wonderful opportunity for live agents who know the field. Write today for our proposition. Good profits. Yankee Laboratories, Inc., 305-309 East 43rd St., New York, N. Y.

BEAUTIFUL new map of the United States, showing all transcontinental highways. Profit large. Send for particulars. Standard Map Company, 129 W. Ohio St., Chicago.

EARN Big Money Fast applying Lithogram Initials to automobile doors. Every owner buys. \$1.35 Profit on each sale. Full particulars mailed. Address, Lithogram Company, 17-8 East Orange, N. J.

ONE man wanted in each county to sell direct to user complete line of paint and paint specialties, also Kling-Tite Asbestos Roof Cement, most successful product for waterproofing any type of roof. Big demand in town and country; anyone can sell. Permanent business that will make you \$3,000 or more per year. No capital required. We ship and collect. Commissions advanced. Kling-Tite Products Co., 557 Tacoma Bldg., Chicago.

DOES \$120 weekly interest you? Putnam made this selling Mystic, the amazing vest-pocket windshield cleaner; for autoists, motorists, engineers; works like magic; one rub keeps glass clear 24 hours; cleans entire shield; sheds water like a duck's back; not a cloth or glove but chemical felt, the new discovery; enameled steel mountings; very snappy; fits pocket; guaranteed year; sells \$1. Smooth sold 2,000 in 4 days; big profits; exclusive territory amazing details free. Security Mfg. Co., Dept. 545, Toledo, Ohio.

SELL the popular Universal Ray-Deflector for auto headlights. Notable invention far superior to lenses. Meets legal requirements for glare prevention plus giving full light intensity. Retail \$1.75 per set, ready apply any car. Attractive agents' discount. Big steady business. Write now for territory. Approved Appliances Corporation, Ann Arbor, Mich.

FREE Sample. "Rain Shield Wiper." Every autoist buys quickly. Retail \$1.00—Costs You 25c—(300% Profit). No Mechanical Attachment—No Cloth. One Rub Keeps Windshield Clear 24 Hours against Rain, Snow Storm. Wonderful Side Line—Carried in Pocket. Only 1 Free Sample given away in Your Town. Hurry. Write for Yours. NuLife Auto(D)Aid Corporation, Hartford, Conn.

CABBAGE Cutter, 5 knives, slices 20 vegetables finer than aluminum; never dulls; 18,000 users Cincinnati alone; endorsed by Good Housekeeping Institute. Agent's sample 48c. Meyer Co., Orland Ave., Cincinnati, Ohio.

AGENTS—We want more live demonstrator-agents to demonstrate and take orders for our Ideal Fiber Cutter. We furnish advance advertising matter, folders, etc., and guarantee exclusive territory to producers. High-grade article and big profits. Write immediately for details. M. H. Tyler Mfg. Co., Dept. 83, Muncie, Ind.

\$1,000 MADE by Wingo in six weeks selling Never Fail Razor Sharpener. Purely made \$40.50 first day. Other inexperienced men cleaning up big money. Applewhite, La., six orders in thirty minutes. Hurry—investigate—exclusive territory. Write today. Never Fail Co., 126 Allen Bldg., Toledo, O.

UNDERSELL retailers. Complete line, factory to consumer, shirts. Sure, fast sellers. Price sells them; quality gets repeat orders. \$15 daily easy. Free samples to workers. Chicago Shirt Co., 209 So. Wells St., Room 954, Chicago.

AGENTS—\$60-\$200 a week. Free Samples. Gold Sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-C N. Clark St., Chicago.

QUICK Seller. New Improved Midget Collapsible Hangers. Strong—attractive—pocket size in leather case. Everybody wants them. 100% profit. Sample 35c. Write for details. Kalfina Co., 384-B, Alabama Ave., Brooklyn, N. Y.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

AGENTS, we have the finest needle case. You can clear \$50.00 to \$200.00 weekly. Send 10c for sample, sells 25c. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago, Ill.

SELFOLITE—Agents, Streetmen—Selfolite lights any fire while user sleeps, or any time. Performs surprising stunts. Newly patented. Sample 25c, postpaid; money back. Particulars. Kaytwo Mfg. Co., C195 Station A, Boston, Mass.

AGENTS: Big Profits. Genuine Gold Leaf Window Letters anyone can put up. Scripts and 57 varieties. Chicago Agency Co., 842 Altgeld St., Chicago.

AGENTS wanted to sell "Havana Treat" 5c cigars to smokers and stores. Havana Treat Cigar Co., Utica, N. Y.

REPRESENTATIVES: "Success" user in every home. Quick Sales. Big Profits. Address Sales Department, Elms Commercial College, Newark, N. Y.

MAKE \$12.00 daily—wonderful sellers, sample free; write quick, both sexes, steady work. Address Berton Bellis, St. Louis, Mo.

AGENTS—Make 100% profit. Good opportunity for hustlers. Cooper & Co., 141 E. Glenwood, Knoxville, Tenn.

AGENTS Make \$10 a day selling Presur-day Trousers presser and creaser. Connolly, 55 Vesey St., New York.

AGENTS, Canvasers: Enormous profits selling face powder, soaps, other toilet necessities. Permanent repeat business. Highest quality. Lowest prices. National Products, A16 E. 13th St., New York, N. Y.

AGENTS — Wanted — Men or women. Mother Goose Writings Mop is a whirlwind seller. New—Patented—Perfect. Demonstration means sale. Retail \$1.50. More than 100% profit. Sample mailed \$1.00. The Alline Company, 6523 Euclid Avenue, Cleveland, Ohio.

"HOW to Sell Patents" free. Patent News-H, Washington, D. C.

START your Ford in coldest weather, new invention, saves gasoline. Agents, Dealers, Ford Owners, write Jir Specialties Co., Cincinnati, O.

HOW and What to invent for profit. Patent News-A, Washington, D. C.

MAKE \$50 Daily. Something New! 400% profit. All business, professional men need it. Sells \$5. Costs \$1. Brooks, Texas, sold 20 first day, profit \$80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 71-K Asylum St., Hartford, Conn.

MY "Sureshot" Selling Method Free to Agents. K. Home, 1957 Warren, Chicago.

AGENTS wanted to handle good automobile accessory line. Fine commissions. J. D. Ignition Construction Co., 6721 Lowe Ave., Chicago, Ill.

AGENTS—Big profits selling "Wunrub Polish" for Furniture, Woodwork, Autos, Etc. Cleans and Polishes. Fritch's Laboratories, 6431 Magnolia, Chicago.

WONDERFUL article for direct selling. Address, Sanitary Mfg. Supply, Dept. 5, Akron, Ohio.

YOU can make \$12,000 a year selling well-known, standard, advertised make of hand-drawn chemical fire engines, motor fire apparatus, extinguishers, hose, and complete line of fire-fighting sundries. We have several openings in good territories. Other men are making \$1,000 a month in territories not so good as we now offer. Address Ajax Fire Engine Works, Bush Terminal Bldg., 10, Brooklyn, N. Y.

GENERAL Agents. Something New, Whirlwind seller. "Repeat" washing powder. Washes clothes without rubbing. Women throw away washboards. Big profits. Exclusive territory. Write today, free package. Kittredge Co., 8 Putnam St., Tunkhannock, Pa.

GUARANTEED Brushes: 113 different kinds—household—commercial—auto. Tremendous sellers, everyone a prospect. Permanent business—Steady income. Write or wire Desk 6. Universal Brush Company, 181 Quincy Street, Chicago.

AGENTS! A sale in every home for our beautiful dress goods, silks and general yard goods. Quick sales! Big profits! Large book of 1000 handsome fabric samples. Write today, National Importing & Mfg. Co., Dept. 6X, 573 Broadway, New York, N. Y.

PORTRAIT Agents—\$50,000 is what "Picture Man Friedman" made canvassing. Free circular "Profits in Portraits" tells how. 24-hour service prints, finished portraits, frames. Samples free. "Picture Man Friedman," Dept. 8, 127 N. Dearborn St., Chicago.

AGENTS: Self-threading needles. Every home buys. 175% profit. Sample free. Maher Co., Dover, N. J.

\$1,000 PER man per county. Get yours. Inexperienced men pulling down star salesmen's profits. Write for proof: How farmers, ministers, clerks—men in all walks of life—made big money in whole or spare time. You can do it. Amazing proposition—wanted everywhere. Exclusive territory—no sales limit. A hot or cold running water bath equipment for any home at only \$7.50. Self-heating. No plumbing nor water works required. Investigate. Terms. Send no money. Write letter or postal today. Allen Mfg. Co., 654 Allen Bldg., Toledo, Ohio.

PORTRAIT Agents—A new portrait, something entirely different. Write for particulars, also catalogue and price list. Fidelity Portrait Company, Dept. 100, 3047 Harrison St., Chicago, Ill.

BIG Line—Big Profits—Cold Creams, face powders, perfumes, remedies, spices, extracts, pie fillers, baking powder. Catalog free. Western Laboratories, 1964 Van Buren, Chicago.

BIGGEST, fastest sellers. Every woman buys Hawkins' High Grade Toilet and Household Necessities on sight. 100% profit. Colonial Chemical Co., 631A Penn Ave., Pittsburgh, Pa.

BUILD Permanent Business following our Sure Success Plan introducing Guaranteed Hosiery and Underwear from factory to family. Attractive outfit assures quick sales. Large profits. Investigate for yourself. Address C & D Company, 41-B, Grand Rapids, Mich.

MEN and women make \$100 upwards weekly selling greatest labor and money saving household necessity. Big repeater. Good crew managers' proposition. Free sample and particulars. Holly Co., A-1, Hastings, Neb.

AUTOMOBILE Accidents prevented by new invention; costs distributor \$2.50, delivered; retails at \$7; wonderful self-selling plan. Carl Brown, Manager, Dept. 32, Columbus, Ohio.

WE pay \$200 monthly salary, furnish rig and expenses to all who qualify introducing guaranteed poultry and stock powders. Bigler Company, X368, Springfield, Illinois.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Gunmetal Finish Co., Ave. H, Decatur, Ill.

COPPER Pots, all sizes; also anything in copper goods desired. Write today for free catalog. Boyer & Co., 609 Reserve Bank Bldg., Omaha, Neb.

O-HELL-O, why didn't I see this before. \$1 an hour selling new product. Removes iron rust, mildew, fruit, ink, medicine and grass stain. Write for free sample and terms today. C. H. Stuart & Co., 24 Broadway, Newark, New York.

AGENTS Wanted, to sell an improved tool that often pays for itself first time used. Address today, J. 1610 Georgia St., Los Angeles, Calif.

GOLD Leaf Sign Letters; make and sell; profits exceed 1,000%; immense demand; particulars free. Johnston Co., Quincy, Ill.

AGENTS—Texas Remedies 200%. Address Int'l. Remedy Co., 1331 Franklin, St. Louis, Mo.

AGENTS! 1921's greatest sensation. 11-piece toilet article set selling like blazes at \$1.75 with \$1.00 dressmaker's shears free to each customer. Get lined up for Christmas rush. E. M. Davis Co., Dept. 506, Chicago.

FASTEST Selling Sanitary Brush Line in America. Huge profit-making opportunity for live workers, with advancement. Other specialties. Get complete details. Act quick. Best season at hand. A. A. Silver-Chamberlain Co., Clayton, N. J.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

WONDERFUL Winter Auto Necessity invention. \$1.00 sale means 75 cents profit for you. Experience unnecessary. Absolutely New Specialty. Riley made \$108 three days. Slocum first hour made \$10. Every Automoblist buys after each quick demonstration. Carried in Pocket. Prevents Accidents. Better Service. Reduces Operating and Repair Expenses. Write Quick for Exclusive Territory and Free Sample. Secretary, Box 494, Hartford, Conn.

AGENTS—New Invention, Harper's Ten-Use Brush Set and Fibre Broom. It sweeps, washes and dries upstairs windows, scrubs and mops floors and does five other things. Big profits; easy seller. Free trial offer. Harper Brush Works, Dept. X, Fairfield, Iowa.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, O.

IF you need good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

BE Successful Agent—Free sample outfit worth \$2.25. "Quality" beauty preparations. Make big money. Extensive line. Established 50 years. Lynas Co., 216, Logansport, Ind.

AGENTS make 140% profit. Iradium (luminous) crucifix shines in the dark. Sells for \$2.00. Costs 85c. Complete line religious articles, crucifixes, bulbs, switch plates, house numbers and match boxes. Novel! Ornamental! Useful! Every home a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

SELL washing tablets that are different. They work quicker, sell easier and at a greater profit. Get our proposition. Write Newton & Co., 1 Main St., Newark, N. Y.

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.

WRITE for particulars; best article ever offered men; costs 5c, sells quick for dollar; \$15 daily; sworn statement. Besch, 22 Express Bldg., San Diego, Cal.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

SELL Necessities. Everybody needs and buys the "Business Guide." Bryant cleared \$500.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

AGENTS make 500% profit handling Auto Monograms, New Pictures, Window Letters, Transfer Plugs, Novelty Signs. Catalog Free. Write Hinton Co., Star City, Ind.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

AMERICO Booster auxiliary water carburetor makes autos burn water. Eliminates carbon. Low cost; liberal profits; details free. Americo Co., Dept. 178, Cincinnati, Ohio.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, Calif.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessity in every home; big profit; 4 to 10 sales at every house. Write for free sample. Home Curtain Rod Co., Providence, R. I.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. Free samples. Madison Mills, 503 Broadway, New York.

CALIFORNIA Rosebuds selling like hot cakes. Agents coinng money; new stuff. Big profits. Catalog free. Mission Bead Co., PM-2819, West Pico, Los Angeles.

AGENTS; Big Money Monogramming by Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

SELL Pudding Powders—Delicious dessert. Fast sellers; quick repeaters; big profit. Send for terms and sample. C. H. Stuart Co., 65 Union, Newark, New York.

AGENTS make one dollar per hour selling "De Luxe Art Panels." Newest thing in art. Men with automobile make forty dollars per day. Tremendous demand. Write for samples and expense money. Consolidated Portrait Co., 225 North Green St., Chicago.

\$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2806D Congress, Chicago.

MAKE \$25 to \$50 Week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 31, Philadelphia, Pa.

YOU can letter Automobiles, Doors, Trunks etc., without any previous experience by Transfer Process. Make \$27.50 on \$2.50 Outfit. Auto Monogram Supply Co., 16 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 160 N. Wells, Chicago.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 201 Olive, St. Louis.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Rejects credited. Catalog free. The Pioneer Corporation, 1259-A West 63rd St., Chicago.

AGENTS; Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stairbrite Co., 1115 Second Ave., New York.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 402 Blue Island Ave., Chicago, Ill.

MAKE \$2 an Hour. Article that removes iron rust, grass, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, Newark, N. Y.

AGENTS; Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

AGENTS make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

WANTED—Tailoring Sales Agent—Make big money from very start—\$60.00 to \$75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolsens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. H. F. Foster, Sales Manager, Lock Box 483, Chicago.

MOST Wonderful Seller. 96c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Bead Co., 1617 Iroka, Los Angeles, Calif.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 80%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

AGENTS—If you are making less than \$300 a month our proposition on Sentinel Burglar Alarms for windows and doors will interest you. Many agents earn \$20 daily. Brand new inventions. No wires, batteries or nails. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. Sentinel Alarm Co., 140 S. Dearborn St., Chicago, Ill.

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.

YOU can be your own boss with our Key Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 30 cents. Pease Die Works, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

BIG money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

DICHINOLINDIMETHYLSULPHATE. It's a Chemical Millers' The Chemist supplies Latest Manufacturers' Formulas for Food, Beverage, Household, Automobile, Summer Specialties in all lines. Grape-ola New Beverage with the Kick. Stamp brings Lists, Valuable Information to start a business paying Fifty to Five Hundred Dollars weekly with small investment. Miller, Chemist, Tampa, Florida.

FASTEST Selling Auto Specialty on market; 500,000 will be sold next six months. Splendid proposition; write quick; \$5.00 brings samples and full details. Write O. B. Herth Mfg. Co., Inc., Hartford, Conn.

SIGN letters for windows at honest prices. Genuine gold leaf, \$50 week easily made. Chicago Sign System F, 150 W. Austin Ave., Chicago.

HIGH-GRADE SALESMEN WANTED

ROOF Cement Salesmen—To sell Roof Cement and other Asbestos products direct to factories, industrial plants and large consumers. If you are now producing business but feel you are not getting sufficient pay for it, here is an opportunity to become associated with a million dollar concern and the pioneer manufacturer of roof cements. Commission basis; full protection on territory. We want only real successful salesmen. Our proposition is worth better than \$10,000 to the right man. Give full information regarding yourself and territory you are now working. Armstrong Paint & Varnish Works (Est. 1854), 5A No. LaSalle St., Chicago.

LEARN the secrets of Star Salesmanship and qualify for \$3,000 to \$10,000 a year as City or Traveling Salesman. Free Employment Service. Send now for free book about our amazing system, also list of lines. National Salesmen's Training Association, Dept. 128-C, Chicago, Ill.

MOTOR Ignition Amplifier—A Wonderful Invention! Gives new power to an old motor and more power to the new. Sell to garages, accessory dealers and users. Quick action, big money and satisfaction. Write for prices and literature. Motor Ignition Corporation, Mrs., Albany, N. Y.

SPECIALTY Salesmen calling on Garages and Accessory Dealers, to handle side line, "Oil King" Piston and Compression Rings. Dygert & Siemers, Chamber of Commerce Building, Los Angeles, California.

GREAT demand everywhere for high grade solid leather specialties. Can you sell the best quality at the lowest price? Write David H. Zell, 532-534 Broadway, New York, N. Y.

ASKO Salesmen to sell Auto Accessory as side line; can carry sample in vest pocket; sells on sight; big commission. Allen Specialty Co., 2721 W. Lake St., Chicago.

SOMETHING new, a necessity. All business and professional men need it. Sells \$7.50, costs you \$2.50. Big repeater. Sample free. Merchants Ass'n, Minneapolis, Minn.

SALESMEN, rare proposition, regular or side line, possesses wonderful selling argument. Meritorious article. Ideal for hardware or lumber trade. Only deal of its kind on the market. Quick seller. \$30 sale, \$10 commission. F. P. Brokamp, 3354 Evergreen Ave., Chicago, Ill.

ARE you the man we are looking for? We want men in this territory to sell the Sprywheel Tractor to gardeners, nurserymen, seed growers, and others intensively cultivating row crops. No rows too close, no plants too high. Intensive cultivation from seedtime to harvest increases yields, and decreases fertilizer expense. You can build up a profitable business selling this little tractor that costs only \$150.00, yet saves the work of four men at the cost of one gallon of gasoline. Write for particulars, H. C. Dodge, Inc., 35 Alger St., Boston, Mass.

BEST Seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 80%; put it on cold, vulcanizes itself in two minutes; guaranteed to last life of tire or tube; sells to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa., Dept. 510.

SALESMEN! There are some very attractive territories available for real hustlers on our well known line of high grade shoes for men, sold direct from factory to wearer. Liberal commission. We protect repeat and recommendation orders of men and help you build up a permanent, profitable business. Write for catalog and proposition today. Address Box 274, Stoughton, Mass.

GOOD proposition for state managers selling famous little "Cataract" Auto Washer for cleansing automobiles. Attaches to garden hose—water gushes through mop, keeping it free from grit. Won't mar finest varnish. All brass—can't rust. Sample \$1.50—Profit \$15.00 doz. Cataract Auto Washer Company, Topeka, Kan.

SALESMEN—To sell the Victor, first high-class adding and listing machine at a low price. Reduction to \$100 makes it greatest seller in the business. Sold on small monthly payments if desired. Commission basis. F. B. Willis, 3047 Carroll Ave., Chicago.

BIG Profitable Business of Your Own easily established, selling Pondola Cigars direct to smokers and retailers. Pondola is a winner, on the market 20 years, sells on sight; repeat orders come regularly, assuring steady income. Pondola Cigar Co., Albany, N. Y.

SALESMEN—Just peeped. Oil and moisture-proof automobile lubricating spring-boots. Send \$5.00 for samples. Be first in your territory. Direct to car owner. Proposition worth consideration. H. H. Shelters, Burlington, Vt.

MAKE thousands of dollars selling our exclusive Oriental Pearl Necklaces at importers prices. Enormous demand. Special sales plan mailing circulars. Write quick. McCallister Co., 570 Phelan Bldg., San Francisco, Calif.

SALESMEN—Fastest \$5.00 seller to homes and biggest money-maker ever invented. Saves 1/2 gas, makes cooking better and easier. Stanley Manufacturing Company, 417 So. Campbell, Chicago.

OIL Gauge for Fords. Remarkable new invention. Sells on sight. Big profits easy. Exclusive distributors wanted. Address Sales Mgr., 12, Sta. C., Omaha, Nebr.

FASTEST Seller of the day. Every housewife a prospect for Crimp Grip Clothes-Line Holder. Five minutes will clinch average sale. Agents making \$8.00 to \$20.00 per day. Send \$1.80 for sample carton containing six pair, postage prepaid. Money back if not satisfied. Reference, any Belvidere bank. Crimp Grip Company, 419 S. State Street, Belvidere, Ill.

IF you are a producing tailoring salesman and want exceptional line selling direct to wearer, write Diehl, Kane & Diehl, Dept. 7, Cincinnati, Ohio.

"WEAR-EM-LOOSE" be comfortable! "Outosite" aluminum side suspenders unify shirt and pants; agent's sample set 30c. Woods, 501 North Seventh, St. Louis.

ACCEPT this offer if you want real money. Sweet made \$652 last month. Murphy \$636. Largest company of its kind in America. Your profit \$3 to \$8 per order. We furnish full equipment. All you do is call on our customers and take their orders for famous all-weather coats. Big, permanent proposition. Spare time or full time. No capital required. Write quick for offer that will put you on the road to success. The Comer Mfg. Co., Dept. W-57, Dayton, Ohio.

PREVENT accidents. Wonderful seller. Send \$1 for samples. Highway Automobile Accessories, Portland, Ore.

ONLY one policy a day means \$250 per month profit; same on renewals. Policy pays \$5,000 death; \$25 weekly benefit for injury or sickness. Premium \$10 yearly. Full or spare time. Easy seller. Write quick for territory. Underwriters, Dept. K27, Newark, N. J.

\$5,000 EVERY year. \$2,000 easy in spare time. We share profits with you besides. Sell "Weather Monarch" Raincoats—Ask about "Dual Coat" No. 999. Get your sample raincoat free. Associated Raincoat Agents, Inc., 4414 N. Wells, Chicago.

SALESMEN—Sell State Pocket Maps, showing auto roads, to advertisers and dealers. Easy to sell. Get our splendid offer. Standard Map Company, 127 W. Ohio St., Chicago.

SPECIALTY salesman, sell the sun glare to dealers. Niftiest Auto Visor ever constructed. District and state managers developed from salesmen. Here is your chance! Have you the ability? Address Dept. A, Pugh Lattner Auto Specialty Co., New England Bldg., Topeka, Kans.

SALESMEN can make \$5.00 a day selling our Calendars, Fans, Pencils, Signs, Advertising Novelties, Yard Sticks, Whistles, etc. Liberal terms. Sells entire year. Fine side lines. Local and traveling agencies. Model Calendar Company, Dept. 226, South Bend, Ind.

\$200 PER month and bonus guaranteed salesmen successfully demonstrating wonderful new adding machine. Retail \$15.00. Work equals \$350 machine. Genuine opportunity. Full time or side-line. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

AGENTS—\$60-\$200 a week. Free samples. Gold sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

\$200 TO \$400 Weekly. Free Samples. Lowest priced Gold Sign Letters for Stores, Offices. No experience necessary. Large demand. Appoint subagents. Excellent side-line. Acme Letter Co., 2806H Congress, Chicago.

LIVE Wire Distributors and Dealers everywhere make money selling Seal-Fast Inner-tube repair kits because of the unequalled efficiency and our aggressive and helpful sales promotion and advertising cooperation. Write Sales Manager for particulars. Robert M. Bowes Co., Indianapolis, Ind.

WANTED—Salesmen—soaps, greases, oils; old manufacturer. Baum's Castorine Co., Rome, N. Y.

SELLS on Sight—The Perco-Pot—a patented aluminum cooking utensil that cannot burn or boil over. Needs no watching. Food needs no stirring. Cooks thoroughly by percolation. Nationally advertised, already sold direct to thousands of housewives. Most phenomenal seller of the season. Here is a fortune for good salesmen and crew managers. Exclusive territory and liberal assistance. Write Perco Ware Company, Desk 10, Milwaukee, Wis.

\$20.00 A day easily made introducing Rite-Way Auto-Life—The newly perfected paste auto polish; demonstrates in two minutes. Makes old cars look new. Retail for \$1. Every car owner buys. Send \$1 for 2 full size cans, instructions, territory reservation and free sample-case offer. Sheldon Booth & Co., 322 East 41st St., Chicago.

57 MILES per gallon made with new patented gasoline vaporizer. Write for particulars. Vaporizer Co., Pukwana, S. Dak.

SALESMEN for Patented Cigar Lighters and Cigar Case Moisteners. Sell to Cigar Stands everywhere. Thousands in use. Exclusive or side line. Start Now. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAKE \$50 Daily. Something New! 400% Profit. All Business, Professional Men Need It. Sells \$5. Costs \$1. Brooks, Texas, sold 20 first day, profit \$50. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 71-D Asylum St., Hartford, Conn.

EVERYBODY Eats Every Day. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee, and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

HELP WANTED

DISTRICT Managers—Big Profits! Men capable of organizing and managing crews of lady solicitors can easily clear \$100 to \$200 per week with the B. & G. Protector, the original and best Protector on the market. Every woman between fifteen and fifty needs and buys it. Two grades, Flesh or White. B. & G. Rubber Co., 618 Penn Avenue, Dept. 129, Pittsburgh, Pa.

DISTRICT Manager: 150,000 sales of a household appliance in New England have paid District Managers upwards of \$3,000 yearly. We are ready to expand. Office work entire or side line. The Reeves Co., 64 Broad Street, Milford, Conn.

YOUNG men, women, over 17, desiring government positions, \$130 monthly, write for free list of positions now open. R. Terry (former Civil Service examiner), address 1504 Continental Bldg., Washington, D. C.

START a pressing, cleaning and dyeing shop; splendid field, excellent profits. We tell you how. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, N. C.

FIREMEN, Brakemen, Baggage-men, Electric Motormen, Conductors, Sleeping car and train Porters (colored). Railroads everywhere. \$140-\$200. 810 Railway Bureau, East St. Louis, Ill.

\$12.45 FOR a made-to-measure two-piece suit, the biggest bargain offer ever made by any tailoring house. We are out to beat high tailoring prices. Save 50% on your next suit. You can easily earn \$60.00 cash weekly in your spare time by taking orders for our celebrated made-to-measure clothes. Write us today for our beautiful cloth samples and wonderful offer—sent free, postage prepaid. Act quick. The Progress Tailoring Co., Dept. C-143, Chicago, Ill.

A BETTER Job now. If you have no trade you can get a good one in a few weeks. Learn the auto business. Repairs—men always needed, get good pay; 10,000,000 autos, trucks, tractors need expert service. You can get in this business in a few weeks. Our free 188-page illustrated catalog gives full particulars. Send name today. Michigan State Auto School, 23 Auto Bldg., Detroit, Mich.

MEN—Women, over 17. Get U. S. Government positions. \$92-\$192 month. Quick sure raise. Steady work. No "layoffs." No strikes. Sure pay. Life positions. Work pleasant. Paid vacation. Common education sufficient. Influence unnecessary. List positions easily obtained free. Write today sure. Prompt action advisable. Franklin Institute, Dept. B3, Rochester, N. Y.

START little mail order business anywhere. Home employment evenings. Send ten cents for instructive booklet and mail order samples. Williams, Department M, 72 Cortlandt Street, New York, N. Y.

BECOME Government Railway Mail Clerks, \$133-\$192 month. Steady. Men—boys, over 17. List Government positions free. Write today sure. Franklin Institute, Dept. B21, Rochester, N. Y.

GOVERNMENT needs Railway Mail Clerks, \$133 to \$192 month. Write for free specimen questions. E-2 Columbus Institute, Columbus, Ohio.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads. Outfits furnished. E. Decie Laboratories, 286 Fifth Avenue, New York, N. Y.

GET Government Jobs. \$92-\$192 month. Men—Women. Steady work. List positions free. Write immediately. Franklin Institute, Dept. B21, Rochester, N. Y.

FINGER Print Lesson based on Henry System included with Detective Course. Particulars free. Write George Wagner, 1968 Broadway, New York.

\$133-\$192 MONTH. Become Railway Mail Clerks. List positions free. Write today sure. Franklin Institute, Dept. B21, Rochester, N. Y.

CORRESPONDENCE courses and educational books sold, rented and exchanged. Bargain list free. (Courses bought). Leo Mountain, Pisgah, Ala.

GET Posted for Spring. Good prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 30.

BECOME Railway Mail Clerks, \$133-\$192 month. List positions free. Franklin Institute, Dept. B21, Rochester, N. Y.

MAKE from \$1,000 to \$5,000 per year and share profits besides. No investment or experience necessary. Best season ahead. Free raincoat. Associated Raincoat Agents, Inc., 8444 N. Wells, Chicago, Ill.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

BE a Finger Print Expert. Particulars free. National System, 155 E. 79th, New York.

UNITED States Government Wants Men. Excellent positions at attractive salaries. Railway Mail Clerk Examination soon. Let our expert (former United States Civil Service Examiner) prepare you for this and other fine positions. Write today for free catalog PM, Patterson Civil Service School, Rochester, N. Y.

BE a Railway Traffic Inspector! \$110 to \$250 monthly; expenses paid after 3 months' spare-time study. Splendid opportunities. Position guaranteed or money refunded. Write for free booklet CM-46, Stand. Business Training Inst., Buffalo, N. Y.

GOVERNMENT Wants Railway Mail, Postoffice Clerks, Other positions. Salary \$135 month. Experience unnecessary. Write for information concerning positions and instruction. Columbia School of Civil Service, 411 Pope Bldg., Washington, D. C.

START a Paying Business of Your Own. Be a business man. Any location. 3,000 new Tire Vulcanizing and Repair Stations needed. Business always good. Are you ambitious? \$100 will start you. Write at once. Wonderful opportunity. Equipment Co., 175 Canal, Cincinnati, Ohio.

WRITE Articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyright book free. Press Syndicate, 553, St. Louis, Mo.

GOVERNMENT Clerks Needed soon. (men-women). \$1600-\$2500. Permanent. Few to travel. Write Mr. Osmont, Former U. S. Government Examiner, 101 St. Louis.

SIGN Letter Agents and Painters; 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 431D N. Clark St., Chicago.

CALIFORNIA Rosebuds selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Head Co., SP2819 West Pico, Los Angeles.

SALESMEN—Become Independent. Own your business; experience unnecessary; selling our \$7,500 Accidental Death, 350 Accident, \$25 Sick Weekly Benefits; \$12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department, Registration Dept. A, Newark, N. J.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Wainwright, St. Louis.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 829 F, Washington, D. C.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Slann Sign System, St. Antoine St., Detroit, Mich.

WANTED: Railway Mail Clerks—\$1,600 to \$2,300. Exams everywhere. Write today for full information. Patterson, Civil Service Expert, Box 4025, Rochester N. Y.

SITUATIONS WANTED

EX-SERVICE man wishes to tour U. S. and appoint agents—any line. Address, Fred Hubert, Latty, Ohio.

FOR ADVERTISERS

REACH best paid workers in Grand Rapids, Saginaw, Battle Creek and Muskegon through our advertising columns. Two cents a word. Michigan Associated Labor Press, Houseman Building, Grand Rapids, Mich.

ADVERTISEMENTS! Display: inch \$6.50, half \$3.50. Classified: 60 wd. \$1.75, 12 wd. \$8c. Printed, mailed (stamped envelopes) 10,000 homes (selected list). Box 325, Fredonia, N. Y.

SPECIAL!!! Inch display advertisement 161 Magazines Thrice \$15. Year \$50. Wood's Popular Services, Atlantic City.

ADVERTISE. 30 words 100 magazines \$1.50. Pennell Company, Covington, Ky.

COMMERCIAL Engraving and Printing—the most practical and complete book on engraving, printing and allied subjects ever published. Over 800 pages and 1500 illustrations presenting over 3500 distinct ideas on 35 separate subjects. Cloth. Price \$15.00 prepaid. We highly recommend this book. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

CONSULT us before Advertising. Jacobus Advertising Service, Irvington, New Jersey.

ADVERTISE in 1,000 Corn Belt Weeklies. \$10.00 line. 25 words. 24 big Dailies. \$15.00. Booklet free. Address Union Advertising, Baltimore Bldg., Chicago.

INFORMATION

MUSSEL Shoals, Florence, Alabama; Tennessee River information that you want, we have it for electricians, mechanics, merchants, manufacturers, farmers, laborers. Get posted—only \$1.00. W. L. Sherwood, Florence, Ala.

LETTER SPECIALISTS

LETTERS \$10. Exceptional style. Suggestions free. Morse, 133 W. 103rd., New York.

BUSINESS SERVICE

DRAFTING, all kinds; quick, accurate, confidential. Box 390, Decatur, Ill.

YOUR Business represented here for \$5.00 monthly. Letters forwarded 5c each. Kennedy's, 1906 Broadway, New York.

INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

MAILING LISTS

ACCURATE printed list of names, addresses, make and model of 480,000 Michigan automobile owners \$75. Special—6,000 Dodge owners \$25. A. W. Campbell, 2233 Lamothe, Detroit.

2000 NEBRASKA Farmers, \$4.00, Jes-ton's Service, Box 749, Omaha, Neb.

LATEST Official List Iowa Auto Dealers—Garages \$3.00 per 1,000. Automobile owners \$1.00 per 1,000. State Supply Co., Cedar Rapids, Iowa.

BIG money compiling mailing lists; experience unnecessary; complete guide and instructions, one dollar. Order today. A. L. Bump, Dwight, Ill.

NAMES of agents and farmers our specialty. Pennell Company, Covington, Ky.

TYPEWRITERS AND SUPPLIES

UNDERWOOD Typewriters at far less than manufacturer's price; rebuilt, all worn parts replaced, guaranteed good as new. Cash, installment payments. Write for Catalogue 1513. Typewriter Emporium, estab. 1892. Montrose and Ravenswood Ave., Chicago, Ill.

\$100 USED typewriters, \$6 up. Guaranteed. Write for Bargain Bulletin No. 90. Mannco, 320 Goethe St., Chicago.

FIVE-DAY Free Trial—Underwoods—Remington—Smith—Royal—Oliver, etc., \$3 deposit, balance small monthly payments. Five-year guarantee; liberal discount for cash. Write for catalogue before buying. See page 55 for our display ad. International Typewriter Exchange, 177 N. State St., Dept. A-5, Chicago.

TYPEWRITERS, \$20.00 up. All makes. Easy payments. Free trial. Payne Company, Rosedale, Kans.

REBUILT Typewriters. All Makes, \$10.00 Up. We sell for cash at prices 20 to 30 per cent lower than installment houses. Every machine fully guaranteed. Send for free descriptive circular. The M. & M. Typewriter Co., 42 N. Wells St., Chicago.

DUPLICATORS AND DEVICES

"MODERN" Duplicators. Business Getters. \$2.25 up. 50 copies from pen, pencil, typewriter. No glue or gelatine. 40-000 in use. Free trial. Need one? Booklet Free. J. E. Durkin-Beeves Co., Pittsburgh, Pa.

"QUICK Process Duplicators." Makes 100 copies in 10 minutes. Remarkable time savers. Thousands in use. Circular Free. Heyer Duplicator Co., 160-PM, N. Wells St., Chicago.

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-A, Hollywood Ave., Chicago.

MAKE Calculating Machine that adds, subtracts. Parts, instructions, \$25. James Novelty Co., 421 Bayard Ave., Wilmington, Del.

FREE Trial. Marvelous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals \$350.00 machine. Price only \$15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalogue and free trial offer. Lightning Calculator Co., Dept. E, Grand Rapids, Mich.

PRINTING, ENGRAVING AND MULTIGRAPHING

PRINTING. 5000 8x6 inch circulars printed Free. We will print your copy of 150 words or less, using good paper, type and will mail for but \$1.00 per 1,000, making the mailing cost you only \$5.00. The Printing is absolutely Free. This is a Special, and copy with \$5.00 should reach us by return mail. Weber's Press, 5309 Forest, Dept. A-6, Kansas City, Mo.

1,000 HAMMERMILL bond letterheads or envelopes \$4.50. Glick Printing Co., Ridgefarm, Ill.

ADVERTISING Stickers!!! Rubber Stamps!!! Interesting Samples Free!!! Edward Harrison, "Artistic Labels," Baltimore.

CITY Printing at Country Prices. Samples Free. Royal Printers, Sugar Creek, Ohio.

100 ARTISTICALLY process engraved patent book-form cards, \$1.50, business size \$2.00. Elegant case and binding. Agents wanted. Book-Form Card Shop, 3461 Clark St., Chicago.

WE specialize in Ad-Pencils. Sample, with your name on in gold 10c. S. Mustal & Co., 422 Walnut St., Yonkers, N. Y.

100 BOOK-FORM Cards with case, 85 cents; business size, 300 for \$1.75, postpaid. Samples free. Artcraft Printshop, 19 Highland Ave., Elizabeth, N. J.

PERSONAL Stationery, 100 plain envelopes and 200 sheets printed with name and address, \$1.00. High grade stock, good work. Write plainly. Wilson Stationery Co., Dept. 12, Sturgis, Mich.

BOX Gold monogram and gold bordered stationery, 25 calling cards, \$1.10. Use 1 to 3 initials. Artcraft Press, Gary, Ind.

200 HAMMERMILL Bond Letterheads, Envelopes, Billheads, or Business Cards, \$1.00 postpaid. Race Printing Company, Hudson, N. Y.

5000 CIRCULARS 5 1/2 x 8 1/2. 5000 Envelope slips \$5.00. Bargain list—Samples—Free. Good's Printery, Harrisonburg, Va.

225 FINE Bond letterheads, envelopes, billheads, cards, \$1.35 each; combination, \$4.00. Economic Press, Leonia, N. J.

GOOD Printing quick. Gummed labels. Samples free. Pennell-Standard, Covington, Ky.

200 GOOD bond letterheads, printed and mailed, \$1.25, cash with order. Ed. F. Newton, Monticello, Indiana.

250 LETTERHEADS or Envelopes, \$1.50; other printing. Samples, stamp. H. Honey, Paris, Mo.

QUANTITY Users save 30%. Wolf Roll Labels, Sta. E, Philadelphia.

PRE-USED Printing Presses, Type and supplies. List for stamp. Popular Bargains, Richland, Pa.

EMBOSSED business, personal stationery. Samples, stamp. Daniels Co., Pittston, Pa.

1,600 LETTERHEADS or Envelopes, \$3.00, sent prepaid. Samples Free. Monitor Press, Morrisville, Pa.

REDUCED prices for better printing. 1,000 Bond letter-heads, \$5.00; 1,000 good envelopes, \$4.25; 1,000 four-page folders, 3 1/2 x 8 1/2 inches, \$12.00. Catalogues, circulars, booklets our specialty. All printing at reduced prices. Samples free. Fantasy, 525 S. Dearborn St., Chicago.

TWO-COLOR Quality Printing for price of one. Samples. Arrow Print, 3535 Walnut, Waterbury, Conn.

1000 FULL-SIZE Hammermill Bond Letterheads \$3.65. Postpaid. Other stationery in proportion. Business building Multigraph letters cheap. Samples free. Charles B. Hatfield, Box 353, Oswego, N. Y.

250 LETTERHEADS, 250 White Envelopes, printed and mailed, \$3.00. Samples printing free. Write Sun, Mohawk, N. Y.

2,000 LETTERHEADS or Envelopes \$7.50 prepaid 3rd zone. Samples Free. Quality Printery, Marietta, Ohio.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

FOR MEN

IMPORTED Safety Razors—Uses Gillette blades; not a toy, but a real usable razor. Wonderful imitation of a highly advertised \$5.00 safety razor. Razor complete in classy metal box, 65c. Agents wanted. Given, 450 E. 48th St. (A), Chicago, Ill.

I WANT to send Free to every chronic pipe smoker in the country a good, big, generous sample package of my pure, sun-cured, nature-flavored Old Green River Pipe Tobacco. No money to pay. If you are a tobacco crank, all the better. Try the pure stuff. No syrup, flavoring or dope. After you try it free, I'll show you how to cut your smoke bill one-half and get more pipe joy. Just send name and address, and say whether you want mild, medium or strong. Pete Moberly, Box 820, Owensboro, Ky.

SHAVE with comfort. Flexible Mirror helps wonderfully. Descriptive circular free. Brandaw Company, 971 Atlas Bldg., San Francisco, Calif.

WHY Many Men Are Old at Forty. Men—If depressed, if backache, sciatica or tender feet annoy you—if nerves are gone—if your sleep is disturbed, send for a simple drugless treatment that cannot interfere with your work or doctor's care. If you are suffering you will bless this book. Write now before you forget. The Electro Thermal Company, 2126 Main St., Steubenville, Ohio.

RAZOR AND BLADES SHARPENED

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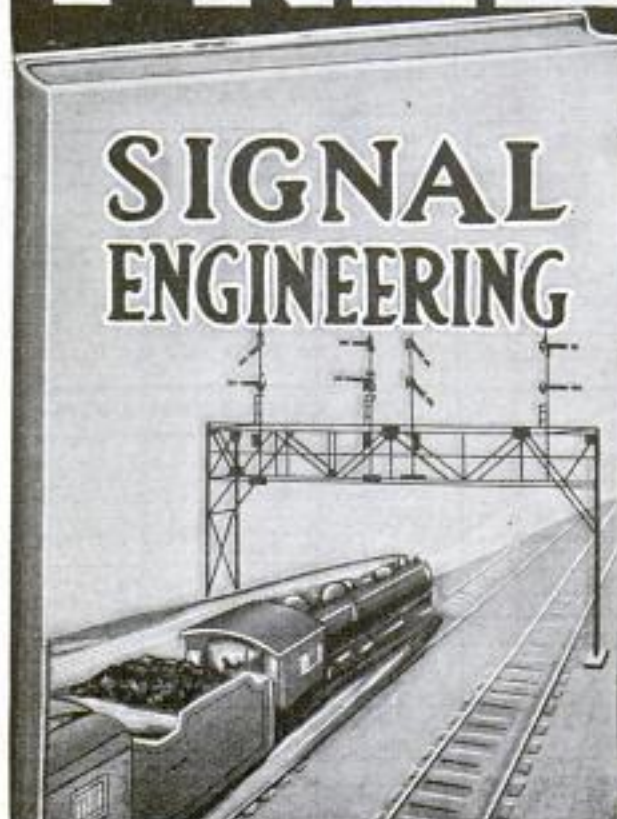
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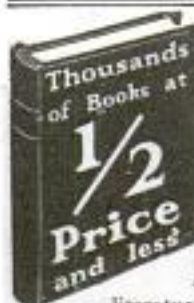
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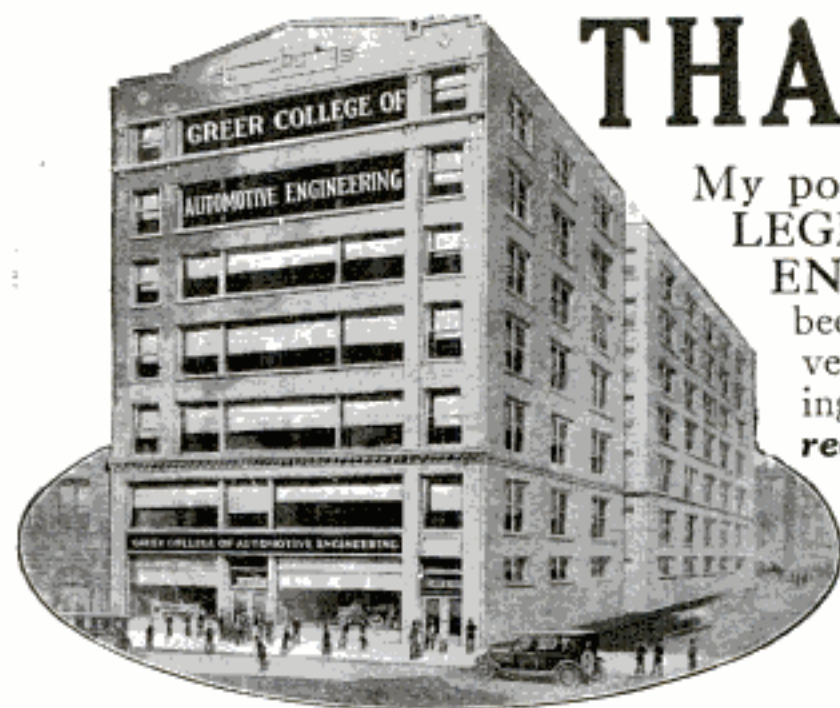
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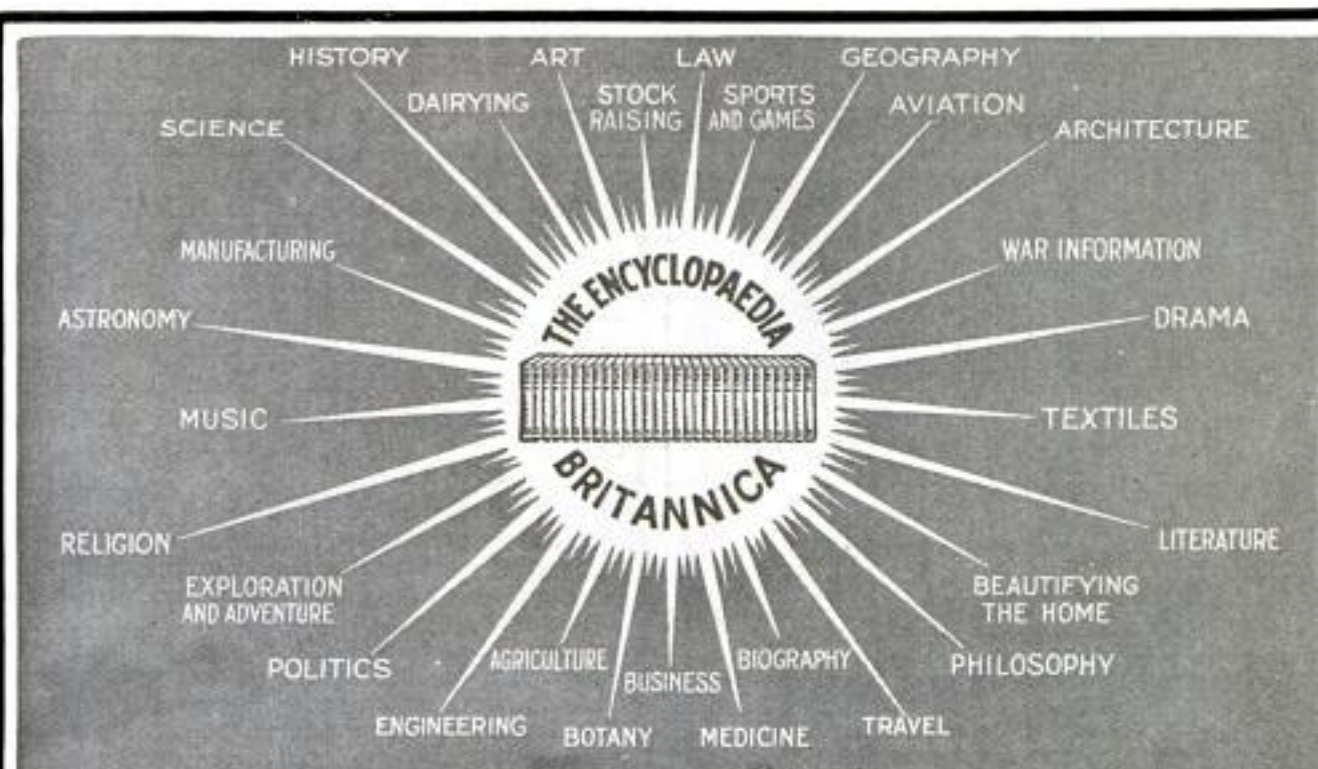
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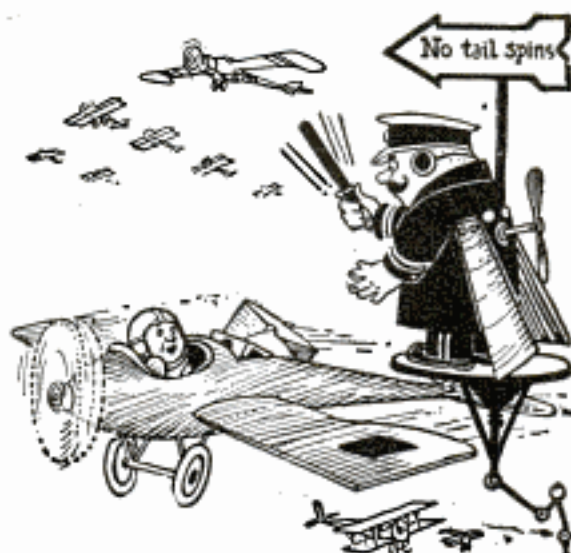
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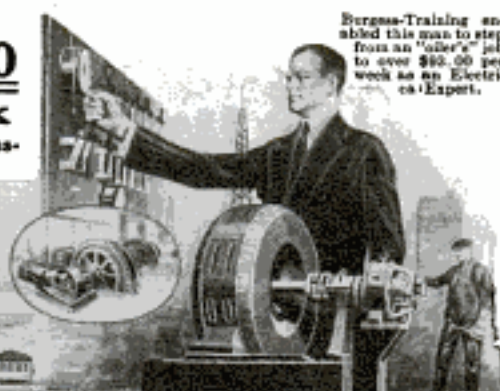
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Yours truly,
Milton H. Johnson.

October 1st, 1921,
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First Hawaiian Conservatory of Music,
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I shall certainly be very glad to recommend your course whenever the chance is mine to do so. Mr. W. R. Johnson has not phoned me yet, and if he does not phone in a day or so, I will write him. Am sending a letter to Miss Helen Blavik today which I think may help to secure her enrollment, and I shall be glad at any time to write a personal letter to anyone whom you may suggest.

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By Wm. S. Coulthard



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I have been offered positions writing show cards, but I am not interested, as my present position is perfectly satisfactory, but I certainly am glad I enrolled in your school—my spare time money is exceedingly attractive. Besides, I find show card writing an interesting occupation that fills in those evening hours that used to drag so. In fact, it is really a hobby now with me—and a profitable one, as you can well imagine. Only last week I received a check from your school for \$70.00 for work done over the last three weeks. Of course, you'd have paid me regularly each week if I'd bothered about it, but I was too busy to tell you the amount of work I'd finished.

There are times, however, that I feel show card writing by your simple method is almost too good a thing—that's when I have so many orders ahead that I cannot see my way clear to finish them—and have to turn down work.

Your system of supplying work to your students has certainly helped me, but sometimes you send too much—I'm only working at it in my spare time, you know. Please note this, and don't try to overload me too much.

By the way, I think you'll be interested to know that previous to enrolling in your school I had never tried my hand at any work of this nature.

I'm glad to thank you for what you've done for me—and you can certainly use my name and tell prospective students, for I feel I'll be doing anyone a real good turn if I can help them get started in this profitable work.

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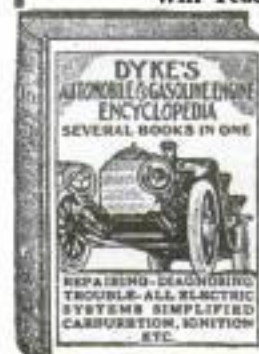
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The public is warned not to pay any money intended for subscriptions to Popular Mechanics Magazine to agents of either the "Magazine Service Co., Masonic Temple, Chicago," or the "National Magazine Distributors, Woolworth Bldg., New York City," as there are no such companies at these addresses. Canvassers claiming to be agents of these fake companies are soliciting subscriptions to this magazine, and usually others also, offering a year's subscription at a cut rate of \$2.50 and an Atlas free.

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Popular Mechanics Co.,
By H. H. Windsor,
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Chicago, Dec. 16, 1921.

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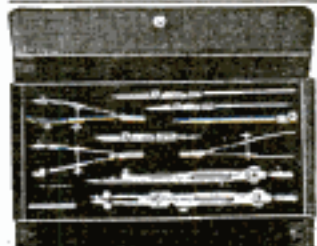
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Because He Knows Law!

Are you *in earnest* when you say you would like to increase your income—qualify for the management of big affairs?

Then there is one thing you should do just as quickly as possible—**STUDY LAW!**

No *guess work* about this, mind you; it's the verdict of the most prominent executives in America—the very men who are naming *other* men for positions paying from \$10,000 to \$50,000 a year.

"What must I do?" asked Leonard Livingstone, when Percy H. Johnston (now President of the great Chemical National Bank of New York) told him that the man who *prepared* would go along with him to bigger responsibilities.

"Study law!" replied Mr. Johnston.
"A good sound knowledge of the law," writes D. P. Kingsley, President of the New York Life Insurance Company, "is becoming more and more necessary. I would advise any man who intends to equip himself for the management of large business interests not to consider his training complete until he has taken a law course."

"Whether I went thru college or not," advises William Maxwell, Vice-President of Thomas A. Edison, Inc., "I should surely study law."

"In looking over the field," writes a prominent Eastern manufacturer, "I find that nearly all the positions commanding a salary of \$10,000 or more are filled by men who have studied law."

Be a Law-Trained Man

Why stand still while other men are steadily preparing for the job you want? *You can train just as well as they!*

Right in the quiet of your own home, under the LaSalle Problem Method, you can study the same cases you would read at the resident universities, master the fundamental principles of law set forth by some of the most eminent authorities in the profession, develop under their direction a sound understanding of business relationships, a power for keen and logical thinking, a facility for analyzing *business* problems that in later years will make *you* the man the directors pick for an important and high-salaried position.

LaSalle text-books, "lesson talks," lectures, quizzes and examinations have been prepared by leading members of the American bar—prominent practitioners, judges, law professors in the great universities. You graduate with the degree of LL.B.—possessed with all the advantages of a thoro legal training as a foundation for independent practice or for a responsible position with one of the big corporations.

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During the past few years literally thousands of ambitious men have doubled and tripled their earnings as a result of specialized business and professional training under the LaSalle Method. We will send you, if you like, the names and

addresses of 1,089 LaSalle members reporting definite salary increases during a three months' period. Read these typical statements from their letters:

"Passed the bar examination with second highest honors in a class of 71."

"Three years ago I was earning \$22.00 a week. Today I am comptroller of a good-sized corporation with an initial salary of \$4,500."

"Promoted to General Manager."

"Now Service Manager, with 466% increase."

"Passed bar examination in 'Class A', in competition with five graduates of resident universities."

Sign the Coupon

Whether you aim to practice law as a profession or to use it as a stepping stone to the big rewards in business, opportunity is fairly thumping on your door. It stands revealed in the coupon at the foot of the page. This coupon, signed and mailed, will bring you full information regarding the training you are interested in, together with details of our convenient-payment plan; also your free copy of that inspiring book, "Ten Years' Promotion in One."

Mail the coupon NOW and make TODAY your starting point toward big success.

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Gentlemen: Send without obligation to me information regarding course indicated below:

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| <input type="checkbox"/> Higher Accountancy | <input type="checkbox"/> Modern Foremanship and Production Methods |
| <input type="checkbox"/> Traffic Management—Foreign and Domestic | <input type="checkbox"/> Personnel and Employment Management |
| <input type="checkbox"/> Railway Accounting and Station Management | <input type="checkbox"/> Expert Bookkeeping |
| <input type="checkbox"/> Commercial Law | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Industrial Management Efficiency | <input type="checkbox"/> Commercial Spanish |
| <input type="checkbox"/> Banking and Finance | <input type="checkbox"/> Effective Speaking |
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Name

Present Position

Address

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I'll Pay Your Railway Fare to Kansas City



My Big Announcement This Season—

I am bringing this great Sweeney Million Dollar School right to your door—No matter where you live. My big announcement means that you can come to Kansas City—to this great Trade School at no more expense than if it were located in your home town, for I am paying your railroad fare—I rebate to you the railroad fare from any point in the U. S. to the Sweeney School.

MECHANICAL TRAINING—it's the thing young men are thinking about today—it's what you are thinking about for it holds the big paying jobs. Thousands of young men have taken the first important step—wrote me for My Big Free Catalog—came to the Sweeney School—today, in all parts of the country they ARE MAKING GOOD.

These men **TOOK THE FIRST STEP**. They wrote for my catalog, and date their present success from that moment. They will tell you: "**Don't make any mistake. Take up the Auto Business. Learn it right. LEARN IT AT SWEENEY'S.**" But These Men Never Had the Opportunity You Have Right Now. The railroad fare to Kansas City is a big item. Lots had to pinch and scrape to make it.

But I Will Now PAY Your FARE!

I've got over 46,000 graduates all over the United States and a lot in foreign countries and I like to think they are all my friends. If you could read my mail you would believe they were. They ask me for Sweeney graduates, they are boosters for Sweeney training. That's **ONE REASON A SWEENEY man don't have to go about identifying his diploma. A SWEENEY diploma MEANS SOMETHING.** If a man goes to an unknown school and has a feeling of loyalty he says: "And that's a good school." But if he comes from Yale or Harvard he doesn't have to say it's a good school for the world knows it. And the world knows about the **SWEENEY SCHOOL** and the automobile man looks to this school like a soldier

looks to West Point. Now that's a mighty big reason for you to **WASTE NO TIME** but come right to the Sweeney School and be **RIGHT** from the start.

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I like to talk to go-getters. I want the man who is looking for the real things in life. I want the man who is looking for independence and success. **AND I WILL HELP HIM.** We have all got to make a living. I say make it doing the thing you like. I don't care if you have never had any mechanical experience. I don't care if you are not a book scholar. The Sweeney System uses tools instead of books. If you are in earnest and will work, there is a **REAL JOB LOOKING FOR YOU.** Write me today. Don't put it off. Get busy **NOW.** **BE A GO-GETTER.** Write for that big free catalog today and I'll guarantee to open your eyes to **DOLLARS** that you are overlooking and **HAPPINESS** and **INDEPENDENCE** that you are missing. Make a start **RIGHT NOW.** Write me at once! Yours very truly,

EMORY J. SWEENEY, Pres.



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SCHOOL OF AUTO-TRACTOR-AVIATION
997 SWEENEY BLDG. KANSAS CITY, MO.

SCHOOL

LEARN A TRADE AND GET A GOOD JOB!

MEN WANTED! IN AUTO BUSINESS Mechanics Needed Everywhere

Young men mechanically inclined, get into the automobile business now and make real money. And remember you are never too old. Henry Ford was 40 when he started the Ford Co.

Get Jobs Like These

SWEENEY trained men are in demand everywhere at good wages, **\$50 a week and more**, from garages, tire shops, welding concerns, auto repair shops, etc. Thousands of men are hunting jobs, but the autos still keep running and no trained mechanic has to hunt a job. Top wages are paid, but **SWEENEY TRAINED MEN ARE WANTED**. The skilled man is in demand; the untrained man walks the street. Here's the proof:

The Million Dollar Sweeney School—Greatest **SUCCESS** Factory in America

Hundreds of Openings For Men!

Pick the Job You Like

Chauffeurs - -	\$90 to \$150
Truck Driver - - -	\$125
Tire Vulcanizers	\$100 to \$200
Welders - -	\$140 to \$200
Battery Man -	\$150 to \$200
Auto Mechanic	\$6 to \$10 a day
Auto Electrician - -	\$225
Tractor Engineers	\$10 a day
Garage Manager	\$150 to \$400
Demonstrator and Salesman -	\$150 to \$500

South Dakota wires: "Will pay most any price for a good man. Send him right away." Neck City, Mo., says: "Put us in touch with a first class repair man. Excellent opening." Indiana says: "Want one more Sweeney man for my new garage. Steady work at good prices." Kansas appeals: "Send me a man who understands Ford Car from A to Z. Will pay top wages." Mississippi telegraphs: "Want a post graduate mechanic. Will pay all he is worth. Wire at my expense." Florida calls: "Want head mechanic. Will pay \$50 a week. Let me hear by return mail." **Thousands of Sweeney graduates now owning their own business** in various parts of the country naturally favor the Sweeney trained men. Sweeney loyalty is wonderful. Our daily mail is conclusive proof that the trained man with a Sweeney diploma can secure jobs like these at **\$50.00 a week and more**.

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Send free, without any obligation, your 72-page catalog. Tell me of the opportunities in the Auto and Tractor Business.

Name

P. O. State

Free

I will gladly send my 72-page illustrated catalog FREE. Also a free copy of the Sweeney School News, a most interesting monthly school paper published here. You will enjoy them. Read the worth-while stories of men like yourself who came to Sweeney's and found success. Read how Frank Powell and Harry Wilson built up a \$20,000 business in about two years after graduating. Read how Elbert A. Pence built up a \$25,000 yearly garage business at Clearmont, Mo. These stories and others are told by the Sweeney students. Also I want you to learn how my students enjoy themselves after work in the swimming pool, the club and reading rooms, etc.

EMORY J. SWEENEY, President

Send Coupon Right Now!

Do You Want a Better Job?

DO you want a better job than you have now? Do you want to be sure of this job no matter whether business is good or bad? Do you want a job with a larger salary—a future?

You can have such a job if you really want it. Yes, you can!

Right now, despite all the unemployment, there are thousands of good jobs open for trained men. It is only the untrained man who is at the mercy of business conditions.

If you want to make sure of your present job—if you want a better job—start now to become a trained man!

You can do this easily in your spare time at home, without denying yourself a single pleasure—without losing a day or a dollar from your present work.

Let the International Correspondence Schools show you how easy it is—how fascinating—how profitable.

This is all we ask:—Tear out and mail the coupon below. This does not obligate you in any way, but it will bring you the full story of what the I. C. S. can do for you.

Right now is the time to take your pencil from your pocket and do the thing you know is for your own good.

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Without cost or obligation please explain how I can qualify for the position, or in the subject before which I have marked an X in the list below:

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- Electric Lighting & Railways
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- Marine Engineer
- ARCHITECT
- Contractor and Builder
- Architectural Draftsman
- Concrete Builder
- Structural Engineer
- PLUMBING & HEATING
- Sheet Metal Worker
- Textile Overseer or Supt.
- CHEMIST
- Pharmacy

- BUSINESS MANAGEM'T
- SALESMANSHIP
- ADVERTISING
- Show Card & Sign Ptg.
- Railroad Positions
- ILLUSTRATING
- Cartooning
- Private Secretary
- Business Correspondent
- BOOKKEEPER
- Stenographer & Typist
- Certified Public Accountant
- TRAFFIC MANAGER
- Railway Accountant
- Commercial Law
- GOOD ENGLISH
- Common School Subjects
- CIVIL SERVICE
- Railway Mail Clerk
- AUTOMOBILES
- MATHEMATICS
- Navigation
- AGRICULTURE
- Poultry Raising
- BANKING
- Spanish Teacher

Name.....

Street and No.....

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

Occupation.....

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Mastering electricity is no longer a problem. The keysheet system has been perfected at a cost of \$10,000. Your problems worked out in advance.

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after enrolling for our course in Show Card Writing. We will train you to write show cards for us. No canvassing or soliciting; we supply you with work; distance no object; will pay you good money for work done.

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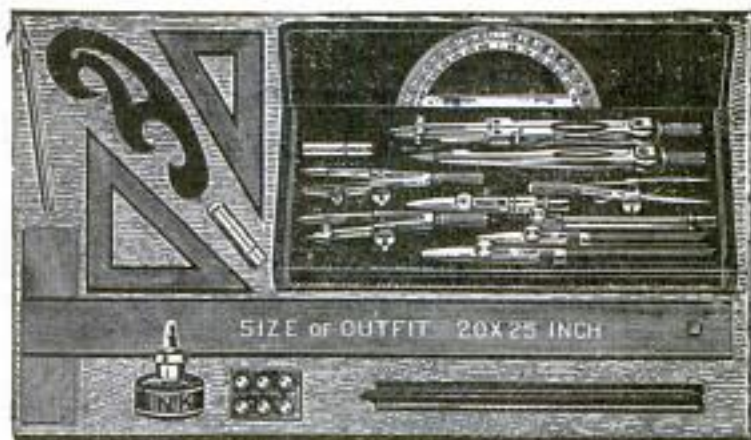


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It costs you nothing but a stamp to send the coupon for my free book, "Successful Draftsmanship" that tells you all. It tells you how my students get the good positions and how I can afford to train you until you get YOUR position. Remember, 6,000 men wanted every month. So hurry. Register early because I can take only a few students. Send coupon NOW!

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THE SCIENTIFICALLY BUILT WATCH

Every American Boy

Should know something about fine watchmaking. The Waltham Watch contains all the great principles of scientific engineering. And many profound laws of physics are exemplified in its "works." The lever, the screw, the fulcrum, the spring, and many more mechanical perfections, are there related to the different parts in a most wonderful manner. The "movement" of a Waltham Watch is one of the most perfect examples of motor mechanism ever evolved by man. It pulsates 420,000 times every twenty-four hours. And it keeps up this marvelous performance for a lifetime with very little care. Some of the parts are so tiny that you can barely see them with the naked eye, yet under the microscope they are amazingly perfect. A screw is used which exhibits 257 threads to the inch; 47,000 will barely fill a small thimble — and it takes one hundred and eleven of them to weigh one grain. But the most wonderful fact of all is the marvelous machine which makes automatically these little screws. The Waltham factory is filled with miracle-working machinery, all invented and perfected during the past seventy years by Waltham inventors, men whose names are famous wherever watches are made. The Waltham Watch made our country famous for watchmaking and has invariably defeated all foreign watches in competition for excellence in precision and reliability. Every American Boy should be proud of this achievement. All are invited to visit the great factory at Waltham, Mass. to see how these world-famous watches are made. Or, to write for a beautifully illustrated booklet which is a liberal watch education.

Makers of the famous Waltham air-friction quality Speedometers and Automobile Time-pieces used on world's leading cars

WALTHAM

THE WORLD'S WATCH OVER TIME

Where you see this sign they sell Waltham Watches

GIFTS THAT LAST

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 37

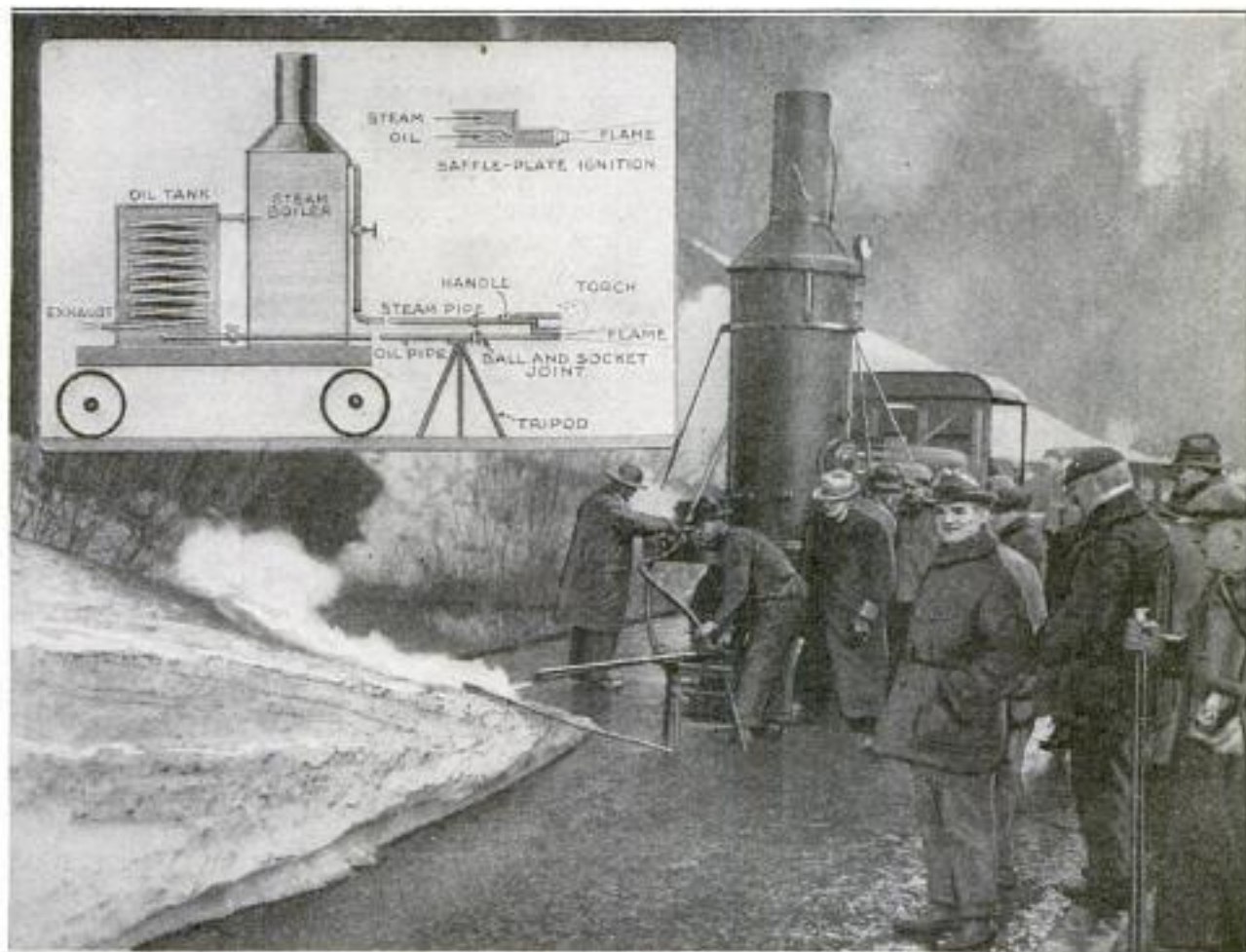
MARCH, 1922

No. 3

Flame-Throwing Machine Melts Snow ^{Removal}

VERY heavy drifts of snow, packed and hard to handle by any method of removal, are now being cleared away much more easily and rapidly by demolishing, instead of moving them. The snow is melted by a stream of flame thrown at it in much the same manner that fire is quenched by a stream of water from a nozzle. The flame thrower also has a nozzle, which is connected to a pair of pipes, one leading to a boiler with steam at 50 to 70-lb. pressure, and the other to a tank of crude oil, which is kept at a temperature of about 90° F. by a coil of pipe connected to the boiler, the whole forming a unit mounted on a small motor

truck. Behind the nozzle the steam pipe is spouted into the oil pipe, acting upon the oil in a manner similar to the action of the steam on the water of a boiler injector, thus forcing the oil out of the nozzle in a spray under high pressure. A kerosene torch, or other means, located beside the nozzle, ignites this oil spray, which consequently forms a stream of fire about nine feet long. In clearing away a snowdrift on a street, the flame is aimed high enough to do no damage to the pavement. As it bores a tunnel into the drift, the water drips onto the snow beneath, and helps to thaw it. Complete penetration of the drift demolishes it.



Flame-Throwing Machine Used for Melting Heavy Hard-Packed Drifts of Snow: This is Melted Much More Rapidly Than It could be Loaded into Wagons and Moved Away. The Inset Shows the Machine in Sectional Elevation, with a Detail of the Nozzle, All Fully Explained by the Notations

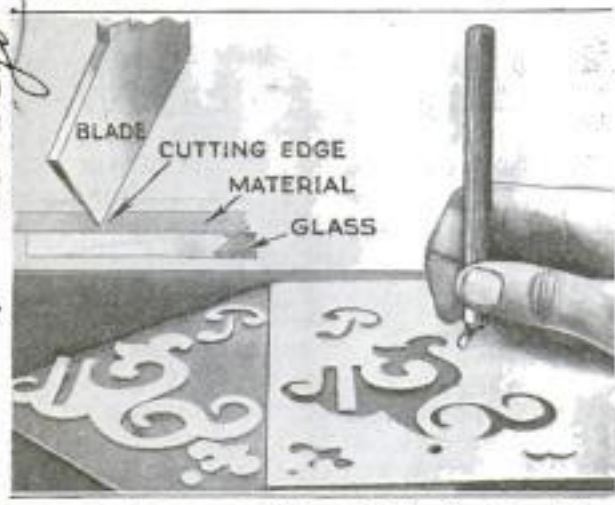
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326

Refer inquiries to:
Walbrunn, Kling & Co. Chicago.
327 S. Clark

CURVE-CUTTING KNIFE CUTS DIFFICULT SCROLLS EASILY

A curve-cutting knife, designed for the cutting of stencil board, also leather, oil-cloth, and other stiff material, has its



Small Knife Blade, Swiveled in Handle, Cuts These Intricate Scrolls with One Continuous Stroke without Twisting the Handle or Lifting the Blade

small pointed blade swiveled in the handle, like a caster, so that difficult scrolls can be cut rapidly with one continuous stroke, and without lifting the blade from the material. This is laid on top of a piece of smooth glass, and the cutting is all done by the blade edge. In time the point becomes dull, but this does not matter, as long as the edge is kept sharp.

Distributors - Kerye Cutter Co., Chicago, Ill.
19 E. Cedar St., Chicago, Ill.
Emb. Charles H. Dorr
241 Waverly Place, New York, N.Y.

from eight designs that were submitted in a contest. On one side is represented the Porte Chaussée, back of which are seen the ruins of Verdun. The other side portrays the heroic struggle between the armies, represented by the figures of two Titans in combat, and bears the inscription, "Ils ne Passeront pas," which means, "They shall Not Pass"—the famous watchword which inspired the French defenders during their year-long resistance against the German attacks.

SERVICE OF WEATHER BUREAU SAVES LIVES AND PROPERTY

The importance of the service of the U. S. Weather Bureau is made very clear in its recently issued annual report. This service, besides its direct economic benefits, has been the means of saving many lives, by forecasting great atmospheric disturbances, particularly since there has been such a great increase in aviation. Many shipwrecks have, in the past, been avoided by timely warnings, and now a similar service is furnished to all engaged in aeronautics. Another very important branch of this service is in connection with the protection of forests from fires, and in their control after having been started. Highway weather service, at present confined to great highways, has been very valuable, and is now deemed essential wherever the traffic is heavy. The report contained the interesting announcement that 106 separate earthquake shocks, strong enough to be felt, occurred during the last fiscal year.

HUGE CANADIAN POWER PLANT COMPLETED AT NIAGARA

Construction work, started in 1914, on a mammoth power project owned by Canadian interests at Niagara Falls, was brought to a termination recently, and water turned into the 12½-mile Chippewa-Queenston Canal. Completion of this channel raises the total water-power development at that place to more than 1,000,000 hp., the latest addition being 650,000 hp., all of which has been accomplished since 1895, at which time the first of the many hydroelectric stations located there began operation. Representatives of American and Canadian cities were present and assisted in the impressive opening ceremonies.

GOLD MEDAL COMMEMORATES DEFENDERS OF VERDUN

In commemoration of the valorous defenders of Verdun, the United States has presented a gold medal as a gift from the American people, to that city. The medal, which is 4 in. in diameter, was designed by a sculptor of this country, and chosen



This Gold Medal Which was Presented by the People of the United States to the City of Verdun, will be Placed in the Hotel de Ville in That Famous City

9213

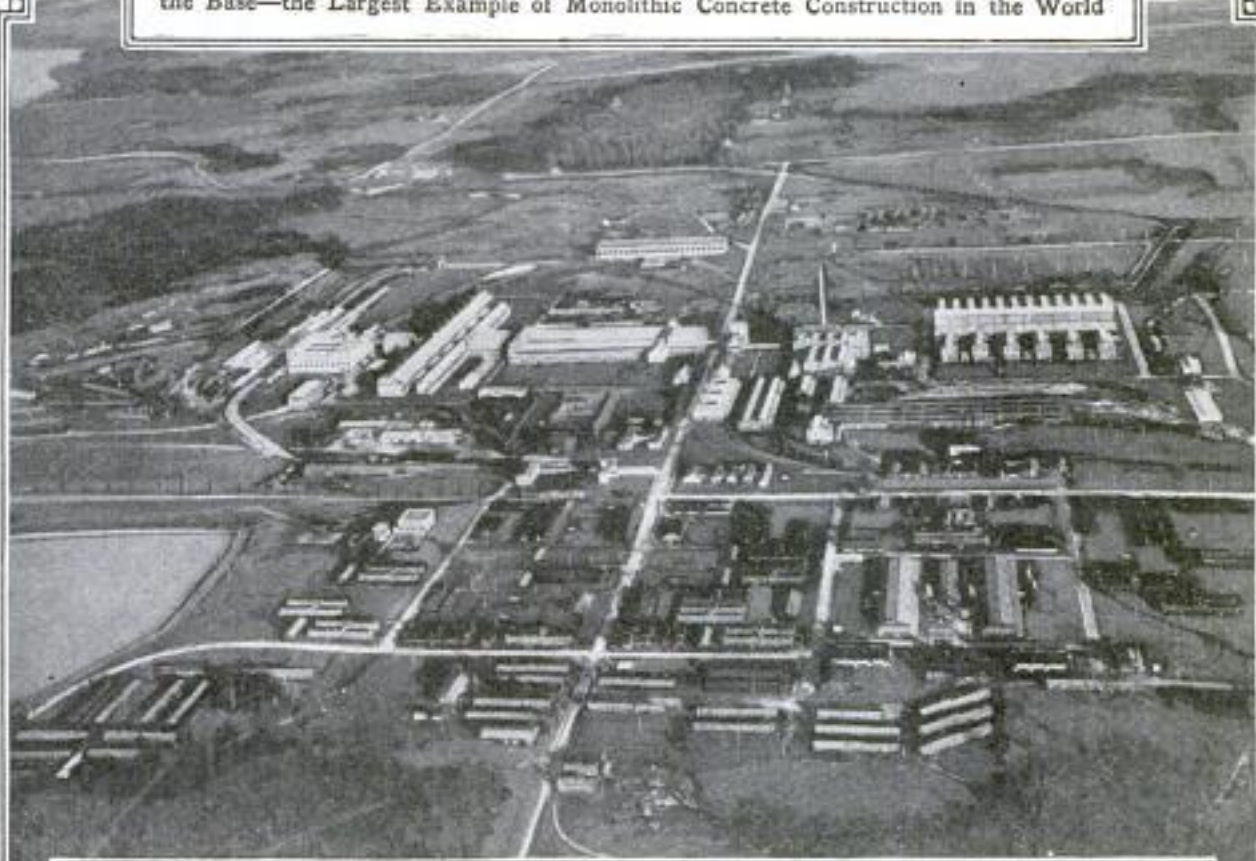
Detroit Free Press
1/22/22

8086 Akers Airphoto Corp.
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Chicago

AIR VIEWS OF MUSCLE SHOALS AND NITRATE PLANT



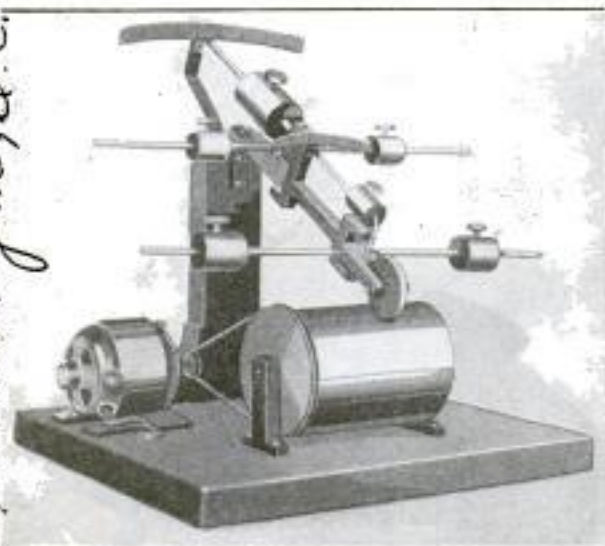
Airplane Photograph of Muscle Shoals, Located on the Tennessee River, near the Northwest Corner of Alabama: Across the Shoals is Seen the Wilson Dam, Now About One-Third Finished, Which will Be 4,426 Feet Long, and 160 Feet Wide at the Base—the Largest Example of Monolithic Concrete Construction in the World



Looking East from Muscle Shoals, Air Photo of the Nitrate Plant, Which Is Now Idle, and Which Cost \$60,000,000 to Build and Equip: It Has a Yearly Capacity of 110,000 Tons of Ammonium Nitrate. One of the Largest Phosphate-Rock Deposits in the United States Lies Adjacent to Muscle Shoals, Which Has a Potential Horsepower Next to That of Niagara

AIRPLANE STABILITY DEMONSTRATOR

New and ingenious mechanical devices to aid in the study of the airplane in flight continue to be developed at the

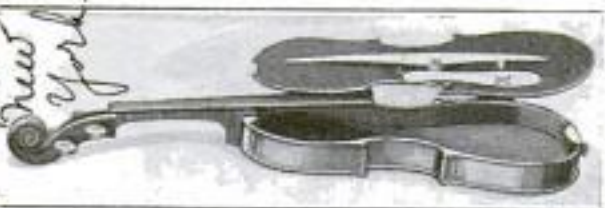


Through the Use of a Double Pendulum and a Recording Cylinder, the Stability of an Airplane in Flight is Shown Diagrammatically

Langley Memorial Laboratory of the National Advisory Committee for Aeronautics. The latest is a device for illustrating airplane stability. The principal part of the machine is a double pendulum. Attached to the lower end of the pendulum is a wheel which rests on a drum. When the drum is revolved by a small motor, the pendulum imitates the motions of an airplane in flight. This machine will greatly interest lecturers on aeronautics, and scientists and mathematicians who study the behavior of airplanes in laboratories. There is a possibility that it may greatly assist in solving the problem of automatic stability.

8/103 TONE PRODUCER FOR VIOLINS AND SIMILAR INSTRUMENTS

It is said that a modern violin, of any ordinary make, can be converted into the equivalent of a Stradivarius, or other violin of Italy's golden days of string-instrument making, by the attachment to it of a

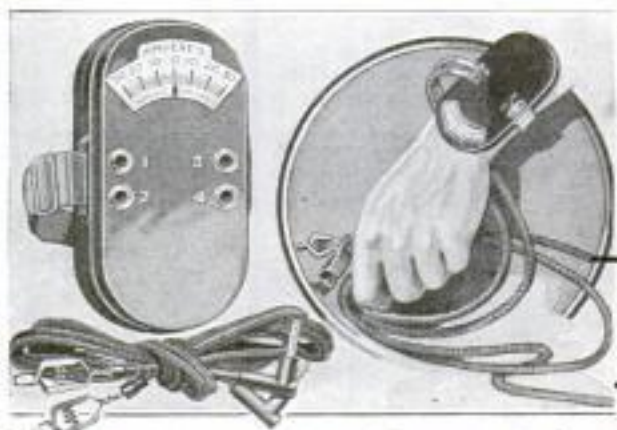


By the Use of This Tone Producer It is Claimed Tones Equal to a Stradivarius can be Produced on an Ordinary Violin

newly invented tone producer. The device, applicable to any kind of string instrument, is made of specially prepared wood, and is so constructed that it conforms to the shape of the instrument to which it is attached. It fits to the underside of the top of a violin, and similarly on other string instruments. On an enlarged scale, it may also be used on pianos and piano players.

7953 WRIST METER FOR MOTORISTS DETECTS ELECTRICAL FAULTS

Motorists will appreciate a new wrist meter, which was designed to aid in the detection of battery, starter, and ignition troubles on a car. The meter fastens on the wrist, thus allowing the freedom of both hands in testing for grounds, short circuits, broken wires, weak batteries, etc. Included in the instrument is a small ammeter which is automatically protected against burning out, and a tiny buzzer to give audible indications in making certain tests. A complete manual has been compiled for use in conjunction with the



Electric "Trouble-Shooter" That Fastens on the Operator's Wrist, Leaving Both Hands Free When Testing for Short Circuits and Other Troubles

apparatus, giving in detail the faults to look for if the car does not run properly, so that one need not be an expert mechanic to locate trouble of an electrical nature quickly.

2203 PORTUGAL PRODUCES IMMENSE QUANTITY OF CORK

Few people realize that Portugal produces more cork than all other countries combined, the annual production being about 188,000,000 lb., harvested from more than one million acres of cork-oak trees. This is not its only industry, however, for Portugal produces more than 15,000,000 gal. of olive oil, besides employing more than 18,000 persons in the flour-milling industry.

Board of Trade Journal 10
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Underground Cables Send Electric Waves Miles into Air Which Pilot Airplanes from Starting Point to Landing Place

Frederick Lee's BY H. A. DANE *London Studios, Paris, 66 Rue St. Honoré,*
Acting upon this principle, a French inventor, W. A. Loth, has perfected an *Paris France*

WORLD interest has centered upon recent developments which have proved to be of inestimable value to the art of practical aeronautics in solving one of its most perplexing problems—that of making a safe and ready landing at night, in fogs, or under other adverse weather conditions. Navigation of the air is being developed until it will soon be as safely carried on as is that of the sea, which, through the invention of Earl C. Hanson, is made comparatively easy as far as pertains to narrow and dangerous waterways. In brief, the Hanson method consists in submerging a cable in the proper course for a ship to follow in entering a harbor, and then sending an electrical current through it. The waves radiating from the cable are picked up by receiving instruments on the ship, and the intensity of these serves as a guide to the pilot, who sets his course over the cable.



This Boat was Used in Making Experiments on the Seine River in Connection with the Magnetic-Cable Guide. The Receiving Frames are Seen at the Extreme Ends of the Apparatus on the Stern

arrangement for use with all types of flying craft. In the adoption of the electrical-cable idea, M. Loth differed to the extent that he buried it in the landing field. He had previously discovered, through personal investigations, that in the case of aviation at sea, the "listening zone" in the air directly over a submerged cable, was nearly two miles in height. Having established this fact, the Frenchman equipped a plane with specially designed antennæ, of the frame type, and conducted extensive experiments which resulted in the present practical application to aeronautics.

In making the tests, it was demonstrated beyond a doubt, that air craft could be guided just as effectually as seagoing vessels were controlled. When a current was sent through the buried cable, the electrical waves radiating therefrom impinged upon the receiving frames on the plane, and were then transmitted to receivers fastened to the ears of the pilot. Due to the character of the current and the instruments used, there was produced in the listener's ears a singing noise which has been likened to the

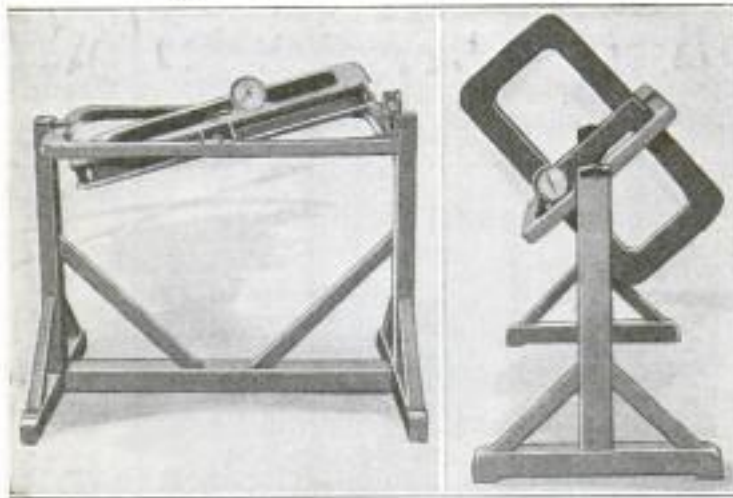


Listening to the Sounds Made by the Impinging of Electrical Waves upon the Receiving Frames of a Large Airplane: The Speaking Tube Shown Terminates at the Pilot's Station

sound of a miniature siren. The sound was heard in little volume when the machine was barely within range of the

would link all the aerodromes with electric cables for the guidance of air craft at night, and in foggy or stormy weather.

Then the pilot could follow his course with positive assurance, instead of having to grope his way through the night, or vainly endeavor to pierce an enveloping fog, as he strove to navigate his craft with its passengers and cargo safely to its haven.



Left: Horizontal Oscillating Receiving Frame. Right: Combined Horizontal and Vertical Oscillating Receiving Frame for Use on Air Craft in Determining the Source of Electric Waves

FREAK LIGHTNING KILLS MAN AND HURTS WIFE

Lightning is always playing queer tricks, but one of the most unusual occurrences happened in Michigan recently. During a severe electrical storm a woman was standing at the kitchen door of her home. Her husband had just brought his team in from the field, and was standing at the door of the barn watching the storm. Suddenly there was a bright flash of lightning, and the woman saw her husband fall and knew that he had been struck. She immediately ran to him and seized his hands. As she did so she received a shock so severe that it rendered her unconscious.

BRICKS MAY BE BY-PRODUCT OF OIL-SHALE INDUSTRY

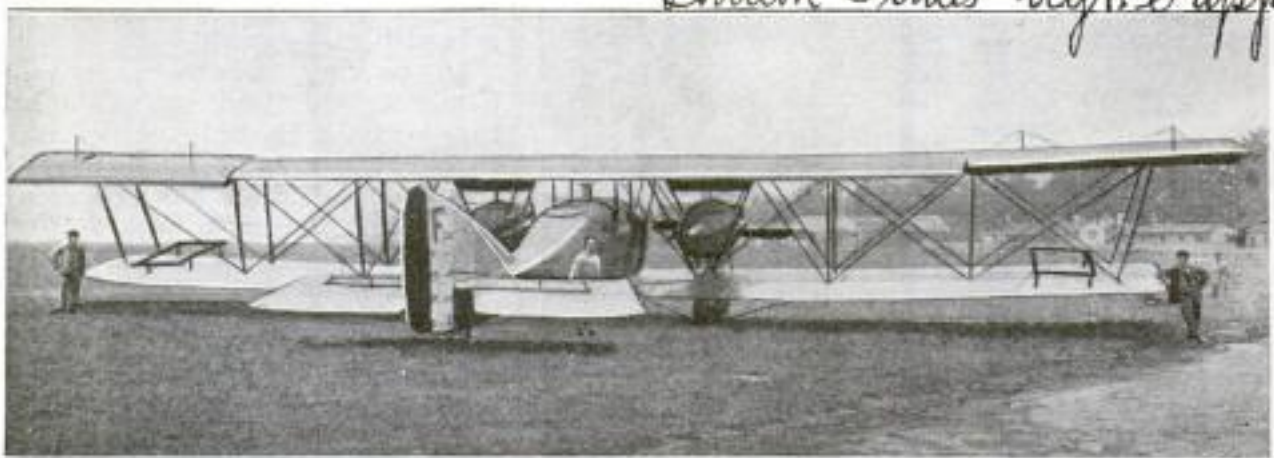
The experiment of making bricks from the spent shale of the oil-shale mines of Scotland is now being tried. The finely ground shale is mixed with a small percentage of lime, enough water being added to form a thick paste, which is then pressed into the shape of bricks and dried in steam tunnels. It is claimed that they are superior to clay bricks.

only. Often all the papers of the newspaper contain articles.

waves, but as the center of the aerodrome was approached, there followed a steady increase in tone, until, from a position exactly over the cable, the notes became sharp and piercing. After passing beyond the cable, the sound gradually decreased until the plane traveled out of range.

Consequently it is apparent that the adaptation of the original marine idea for aviation, is going to prove a boon to the rapid evolution of the lighter-than-air machines. Particularly in the instance of the passenger-carrying planes, which now operate upon regular schedules in European countries, will it cause a greater feeling of security to those who wish to journey in this manner. The transit companies will no longer be obliged to arrange the itinerary of their carriers so as to conform with the duration of daylight. Tentative plans now under advisement

London Times Ingr. Supplement 10/11



Large Biplane on Which are Installed Specially Designed Receiving Frames of the Horizontal Type Located at the Extreme Ends of the Lower Plane: The Latest Machines to be Fitted with Receiving Frames have These Placed within the Fuselage So That They are Completely Hidden

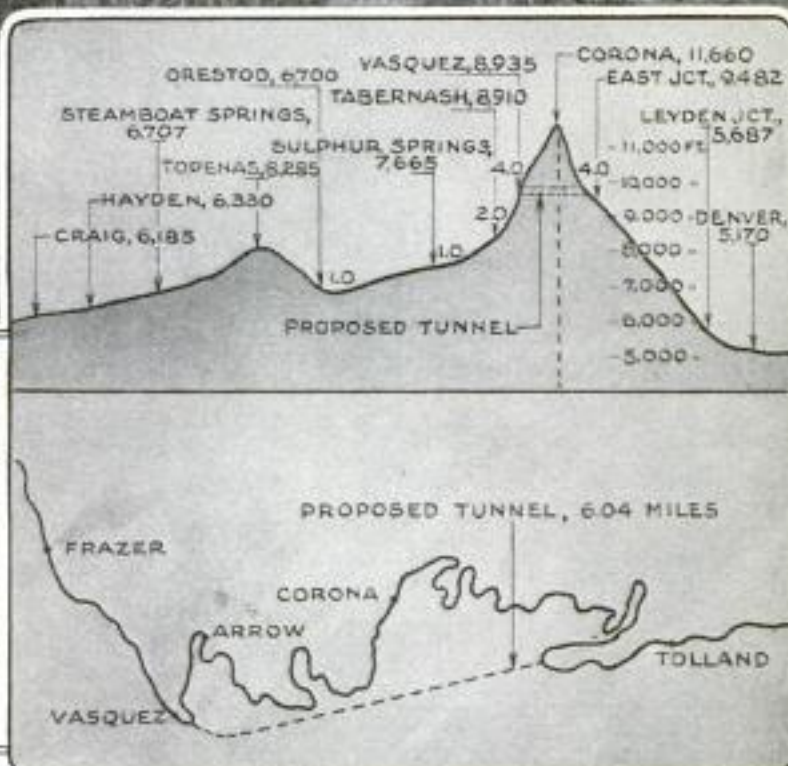
SEVEN LOCOMOTIVES PULL LONG TEST TRAIN TO RIDGE OF CONTINENTAL DIVIDE

BY GEORGE F. PAUL,

900 Ellsworth
Bldg., Chicago



Above is a view of part of the Continental Divide on the Denver and Salt Lake Railroad, showing a test train, composed of 34 cars, hauled by seven locomotives, climbing the divide. Lower right: sketch showing, with dotted line, the route of the proposed six-mile tunnel to obviate the necessity of climbing the divide. The full line shows the present route of the railroad with its numerous sharp curves. In the sketch above is a profile of the railroad with notations that show the relative elevations and grades between Denver and Craig.



AIR-BRAKE tests recently made with heavily loaded trains on the steep grades between Corona and Denver on the Denver and Salt Lake Railroad, may prove important in the development of the Yampa coal fields in Routt County.

Up to the present it has been impossible to haul many loaded cars at a time because of the heavy grades and numerous curves. As a matter of fact, 50 per cent of the mileage consists of curves. These curves vary from radii of 11,459 ft. to 359.3 ft. In addition, there are 58 tunnels on the line, with an aggregate length of 24,763 ft. Of this number, about one-half are located on the eastern slope of the continental divide.

Denver has an altitude of 5,170 ft. above sea level. For 13 miles west from Denver the track climbs at the rate of 1.65

per cent. Then for 40 miles there is a rise of two per cent, and from there on comes the stiff climb of 12.41 miles to the summit, up a grade of four per cent. The summit has an elevation of 11,660 ft. This means that in the 65 miles there is a climb of 6,490 ft. On the western slope, conditions are practically the same, for the road drops over a four-per-cent grade for 15 miles, then over a two-per-cent grade for four miles, followed by easier grades for 66 miles to Orestod. Then comes the climb over the hill at Topenas, followed by an easy descent to Craig.

The difficulties of handling freight over this line have made it practically impossible to develop the great Yampa coal fields, and yet there is an urgent need for the coal that could be produced in this region. The coal itself is bituminous and declared

7782

to be remarkably free from impurities. Furthermore, the mining end of the operations can be readily cared for if the shipping problem can be solved.

The haul over the four-per-cent grade is the bad feature. In the wintertime snowfall is always heavy from December on, and intense cold is all too often the rule. The summit rises about 1,500 ft. above the timber line. This means that snow blockades can become very serious. When the wintry gales are sweeping over the mountain tops at 60 miles an hour, filling the air with powdered snow, it takes only a few minutes to fill the cuts so that a train cannot operate.

It has been proposed to do away entirely with these four-per-cent grades by the simple expedient of tunneling through the continental divide, but this in turn means a tunnel six miles in length, an undertaking not to be started on the spur of the moment.

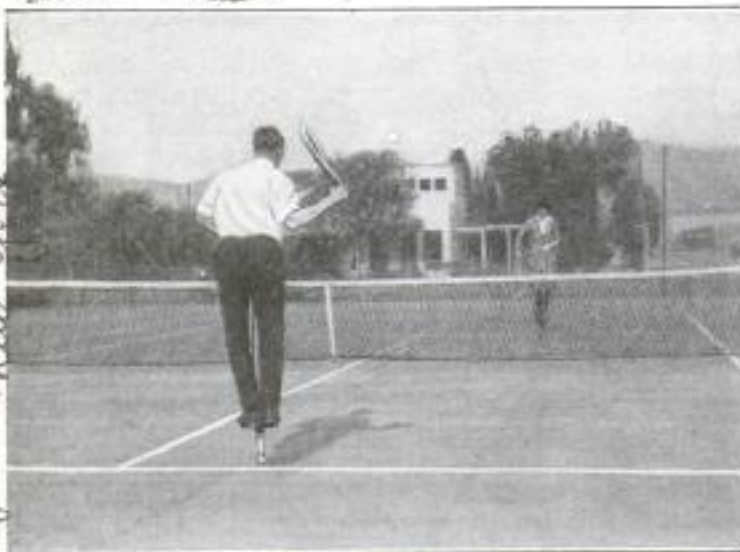
To negotiate these grades calls for two Consolidation and two Mallet locomotives to handle a train of 1,250 tons. These four locomotives have a tractive effort of 244,000 lb. Because of the great risk of runaways on the descending grades, trains have been limited to this tonnage.

For demonstration purposes on these grades, a train of 34 cars and weighing 2,431 tons was used. The cars were equipped with a special automatic straight air brake. The test was made to determine whether a train equal in length to the number of empty cars that one engine could haul back could be taken

down the grade. The train pulled east out of Tabernash and up the foot of the four-per-cent ascending grade, being pulled by three Mallets and two Consolidations, the five engines having a total tractive effort of 322,000 lb. At the foot of the heavier grade, two more Mallets were hooked on. These seven engines had a total tractive effort of 478,000 lb. Before leaving Corona for the descent of the eastern slope and the run to Denver, all of the engines were removed but one, leaving the train to be handled by a single Consolidation locomotive. All of the triple valves were placed in graduated release position, the brake-pipe pressure raised to 100 lb., and the piston travel limited to 6 in. One of the chief troubles of operation on this slope arises from hot wheels due to brake application. The 12.5 miles of the four-per-cent grade were covered in 1 hour 40 minutes, or at the average running rate of 7.5 miles an hour. Stops were made at Dixie Lake and Antelope for inspection. It was found that the temperature was very uniform, there being only a few cars in the train with wheel temperature slightly higher than the average of the others, but any wheel in the train could be touched with the fingers without discomfort.

Officials who witnessed the demonstration declared that, with modernized equipment, the tonnage down the grade could be doubled with safety, and operating expenses per ton-mile trimmed to half. If this proves true, far greater activities in the Yampa coal fields are assured.

2956
TENNIS ON "POGO STICKS" LATEST FAD IN SPORTS



Playing Tennis on "Pogo Sticks": The Manipulation of a Racket in a Tennis Game, or the Handling of a Pogo Stick, Is Enough for Most People Separately; Their Combination Fascinates Experts

Tennis on "pogo sticks," which is rapidly becoming a fad on the Pacific coast, was first suggested by a Los Angeles sportsman. The "pogo stick" is a slender upright pole, with steps on opposite sides for the feet and a handle at the top. The base operates against a heavy spring contained in the stick. Balancing on the stick, one starts to hop, and the spring accelerates the bouncing so that each hop takes one two or three feet into the air. It requires considerable skill to handle the stick and, when the maneuvers of tennis are attempted, falls are almost unavoidable. Needless to say, the game furnishes plenty of amusement for those that are watching it.

The Pogo Co. 35 E. 19th St. New York

Emb. Frank B. Howe

412 Mason Opera House Bldg, Los Angeles

Agent. Abercrombie + Fitch Madison Ave. N.Y. 45 St. N.Y.



Mormon Temple Which is Built in the Form of a Maltese Cross and has been Designed on Strictly Straight Lines: Work has been under Way for Several Years on This Building, Which is Located on the Prairies of Alberta, Canada, Not Far from the United States Border

George H. Paul, 900 Ellsworth Bldg Chicago
MORMON TEMPLE IS DESIGNED ON STRAIGHT LINES

Mormonism in Canada will center around the town of Cardston, in Alberta, where a large temple is being constructed by people of this faith. Here has been the greatest gathering place of the immigrants from Utah, who have established themselves in a land that is wonderfully fertile and promising. The temple, which will cost \$1,000,000, is built in the form of a Maltese cross, and from a distance gives the impression of a huge pyramid, being 118 ft. square and more than 100 ft. in height. On closer inspection, however, the beauty of the structure becomes apparent, with its light-gray granite and concrete outer walls, 6 ft. in thickness, and its simple straight lines.

A decided contrast to the impressive severity of the exterior is found in the richness of the interior decorations and paintings, which are the product of some of the foremost mural artists of America. The woodwork and paneling are especially pleasing to the visitor, who, upon entering, finds himself first confronted by the baptistery. The principal feature of this is a mammoth marble font, which rests upon the backs of 12 life-sized oxen, representing the 12 tribes of Israel. Next are seen three special rooms, which have been designed for use in connection with

the elaborate marriage ceremonies of this cult.

In the first of these, known as the "creation room," are depicted upon the walls scenes representing the various phases of the creation of the world. A second, designated as the "garden room," contains illustrations of the Garden of Eden, while the third, termed the "world room," portrays conditions on the earth after the entry of discord. Above these three, is another room, luxuriously furnished, which is intended to suggest celestial glories, and which has three prayer compartments in it. The decorations of this "heavenly room" are in mahogany, onyx, and marble, the cost of which amounted to nearly \$100,000.

This temple has been under construction for several years, and sometime during the summer of 1922, will be held the dedication services. After these rites, entrance to the edifice will be denied to all nonbelievers, and even to those of the same religion who do not totally abstain from the use of tobacco, coffee, tea, and alcoholic stimulants, which abstinence is among the requirements of those desiring to be in good standing among the Mormons, according to their iron-clad rules.

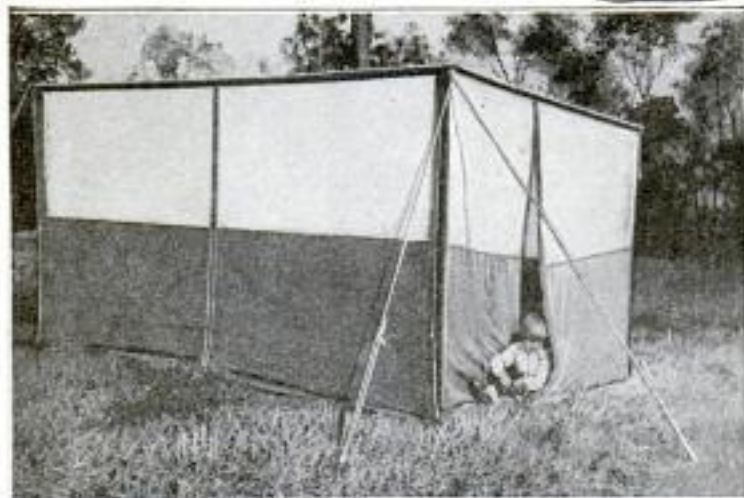
Auto Bed Camp Co,
2201 Penn St., Kansas City, Mo.

33488

POPULAR MECHANICS

Camping Aulfer

LIGHTWEIGHT KITCHEN TENT FOR MOTOR TOURISTS



To meet the demand of motor tourists, a special lightweight kitchen tent is being made. It is not intended as a weatherproof shelter, but as a protection against sun and insects when cooking and eating in the open. The flat roof and the lower part of the walls are made of light olive-drab drill, and the upper half of the walls of fine-mesh bobbinet, reinforced with drill. It occupies an 8 by 10-ft. space and is 6 ft. high. The entire weight, without the poles, is only 15 lb. and it folds into small compass so that it can be conveniently carried.

Lightweight Kitchen Tent Specially Designed for Motorists as a Protection against Sun and Insects When Cooking in the Open

8064

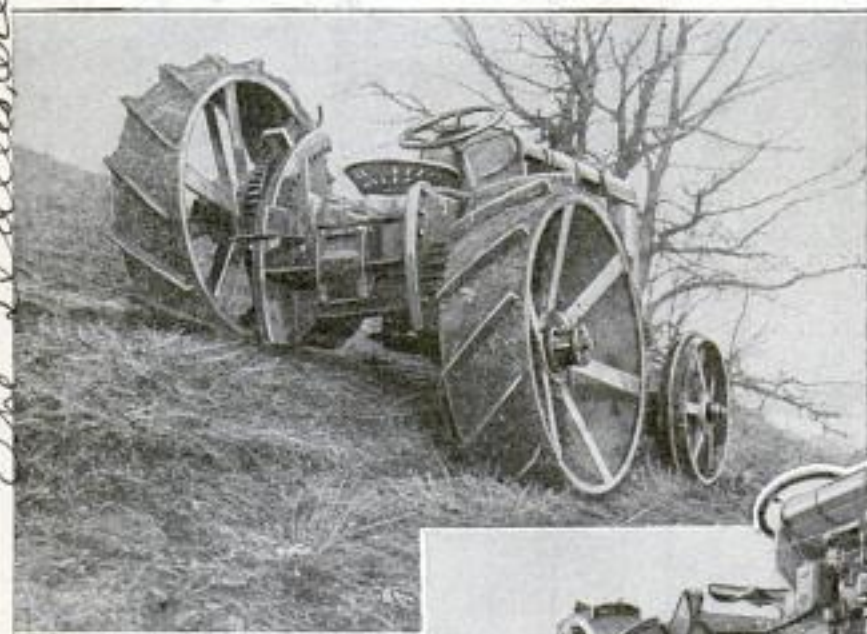
Accessories

TRACTOR HAS LEVELING ATTACHMENT FOR HILLSIDE

Tractor owners have experienced considerable difficulty in operating their machines upon the hillsides, and to offset this disadvantage, an Oregon man has con-

and a front axle composed of three flexible bars which work on the parallelogram principle in assuming the same position as the rear wheels. A lever controls the

adjusting mechanism, which is driven by power from the motor, and which can be operated while the tractor is in motion, or when it is stationary. Due to this successful overcoming of the tractor's serious drawback, it is thought that the leveling attachment will be enthusiastically welcomed by all users of agricultural implements of this kind.



Hillside Tractor with Leveling Attachment as It Appears on an Incline, Showing Plainly the Sideplates, by Means of Which the Wheels are Raised or Lowered



Another View of the Hillside Tractor, Showing the Front Axle Which Works on the Parallelogram Principle in Maintaining the Level of the Machine Constant

*Adamo Sutehill Tractor Co
The Hillside*

structed a leveling attachment for use with ordinary implements of this type. The leveling is accomplished by using rising and lowering sideplates which have stub axles, for the rear wheels,

8126

deposits

RADIUM-BEARING MINERALS FOUND ON BRITISH COLUMBIA ISLANDS

BY FRANCIS DICKIE, *Herald Otago, B. C., Canada*

AFTER nine years of persistent searching in a great many parts of the world, from South Africa to Alaska, H. E. Neave, a mining engineer and prospector, recently discovered two radium-bearing ore deposits on the islands of Valdez and Vancouver, off the coast of British Columbia. The story of the long hunt for an area of radioactive rocks is in a way reminiscent of those of the searchers for the Holy Grail, the fountain of youth, or the philosopher's stone, and other mythical objects, for, like them, Neave was actuated by an altruistic purpose. Though not a man of independent means, he continued his search for nine years, supporting himself and family by at times working small gold claims, come upon while searching for radium, or acting in the capacity of mining engineer. But always foremost with him was the search for the most precious mineral in the world, the twentieth-century wonder-working radium, which has in it nearly all the powers that the ancients sought for in various ways.

With the need of more of the precious metal foremost in his mind, Mr. Neave, nine years ago, decided to devote his time to field work in search of radioactive areas, for while there were plenty of men experimenting with the medical and scientific possibilities of radium, there was no one, as far as he could learn, making a systematic search for the areas which undoubtedly must exist on the earth's surface where this precious substance was hidden. So he started out. He covered a good deal of South Africa. He came to North America and covered on foot the mountain regions of Idaho, Montana, and Washington, a great portion of the heart of British Columbia in the Rossland, Fort Steele, Vancouver, Sloacan, and adjoining regions, where the mineral might possibly be discovered. Following this, he prospected the west coast of Vancouver Island, one of the most difficult portions of the Pacific coast. He spent two years on Cook Peninsula, a desolate and uninhabited region, where

landings have to be made through several miles of surf from a coasting steamer. In this region, while conducting his prospecting, he found that for some unknown reason the flora was unusual, particularly the hemlock trees. Whole forests of these had their branches growing in an inverted way, that is, the branches were small at the trunk and grew larger outward, ending in natural twigs and foliage. This was also true of other trees and shrubbery. Here the wild-pea vine yielded peas as large as the cultivated variety, which were used satisfactorily for food.



H. E. Neave, the Discoverer of Radium on British Columbia Islands

Moving down the coast after two years of ineffectual search, he discovered, in the fall of 1920, after nearly nine years of searching, a stretch of radioactive rocks on Tahsish Inlet, Vancouver Island. These he tested in two ways, by using an electro-scope, and also by taking photos, or radiographs, two of the principal tests for radium-bearing strata. Radiographs are taken by utilizing the rays given off by the rocks to obtain photographs of coins, keys, etc., through

such opaque substances as lightproof paper on a sensitized photographic plate. At the time of making his discovery, Neave was not in possession of an electro-scope, a very sensitive instrument. But he was of an inventive turn of mind, and manufactured one which answered the purpose. This homemade electro-scope consisted of a small glass jar with a rubber cork through which passed a metal rod. On the rod (and inside the bottle) a piece of gold leaf was suspended by its center. The rod and gold leaf were charged with electricity generated by rubbing a piece of ebonite with a silk handkerchief, this causing the two ends of



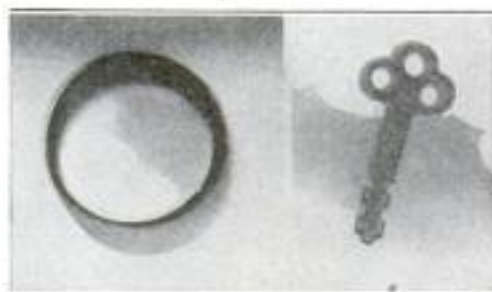
A Scene on Vancouver Island: The House Is within a Few Yards of the Area Where the Radium-Bearing Ore Deposits were Found

gold leaf to fly apart; in a little time, the gold leaf slowly drops to its original position, but if a radioactive rock is brought near the instrument, the gold leaf drops suddenly.

Though the discoverer found radioactive rocks covering a considerable area, he was still anxious to locate another area, and guided by his knowledge of geology at once began exploring near-by islands, with the result that in August, 1921, he made another find on Valdez Island at a place called Open Bay, an uninhabited stretch of logged-off land, where copper mining had formerly been carried on. The tests applied this time, in addition to using the electroscope, and making photographs by rays from the rocks, also consisted in using the scintilloscope. This is a high-powered magnifying glass mounted at the proper focus above a sensitized screen or plate of glass which is coated with zinc sulphide. This latter chemical has the property of becoming luminous when struck by the Alpha ray or helium particles, which radioactive substances emit at the enormous velocity of 18,000 miles a second. A good sample under the instrument shows numberless twinkling pin points of light.

Satisfied with the area of these two fields, Neave forwarded samples of the rock to Sir Ernest Rutherford, the famous British radium expert. The mere analysis for simple rocks costs \$250, and for complex ones much more. Sir Ernest's reply, fully confirmed his own experiments as to the highly radioactive nature of the minerals found. At this writing, of course, no estimate as to the new field's productive possibilities can be ventured. Development work alone will reveal the amount of radium which may be anticipated. But with the

very few fields as yet in existence in the entire world, and the pitiful smallness of their output, the finding of any radium-bearing region is of great importance. It was in anticipation of exciting prospectors to hunt out this precious metal that the British Columbia Provincial Legislative Assembly passed an act respecting the discovery and conservation of radium. The act reads in part: "To the person proving to the satisfaction of the Lieutenant-Governor in Council that he has discovered radium within the Province, the Lieutenant-Governor in Council may pay a reward not exceeding



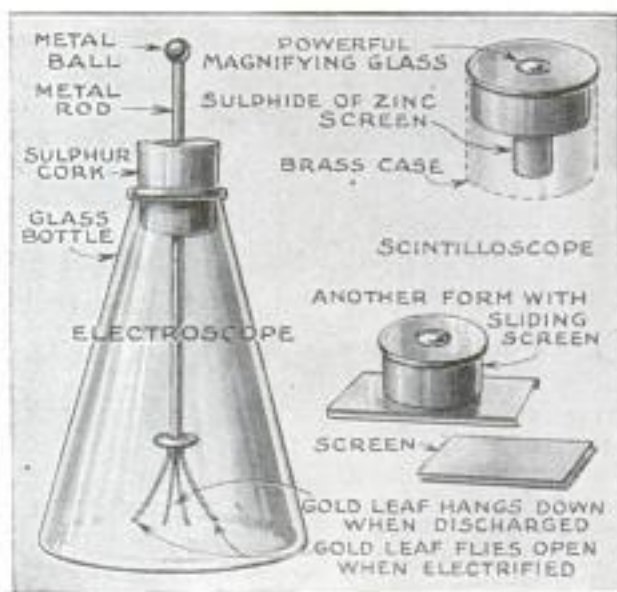
Photos of Key Ring and Key, Made by Exposing Them through Light-Proof Paper, against a Photographic Plate, to Rays from Radioactive Rocks

\$5,000; and also make provision of a retention for the crown of an interest, not exceeding fifty per cent, in all radium produced from such lands." Previous to this strike, the island of Madagascar was the last place where radium was discovered.

WATER-POWER EXPANSION IN OHIO RIVER BASIN

Nowhere more than in the Ohio River basin are there great opportunities for

future expansion of water power. Although its drainage area is only about one-third that of the upper Mississippi and Missouri, its average water flow is very much greater than their combined flow. The Ohio River, with about half the drainage area, has a water discharge which is much more than that of the St. Lawrence River at Ogdensburg, N. Y. These conditions result from a greater rainfall in the Ohio basin, and from the general character of

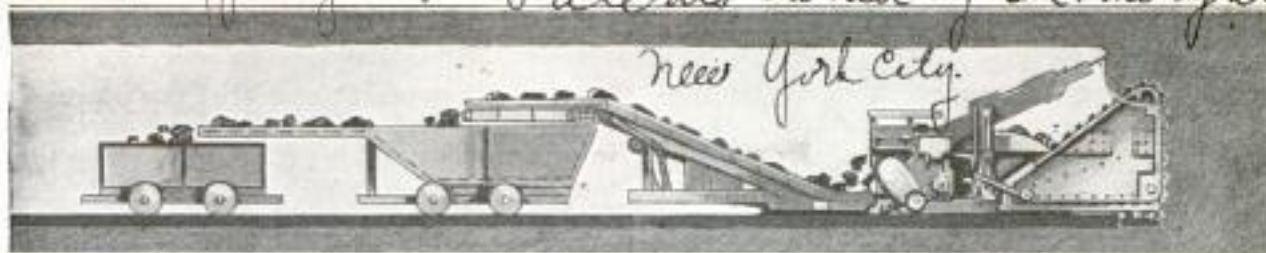


The Homemade Electroscope Which the Discoverer Used to Prove the Radioactivity of the Ore Deposits He had Located, and the Scintilloscope

the region. Added to this advantage in water flow is the great number of exceptionally favorable sites for storage, many of which have already been located. Some of these give opportunity for developments.

N.Y. Times 12/21/21 P-8
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Jeffrey Mfg. Co., Columbus, Ohio
 Patents owned by E. C. Morgan,
 New York City.



Here is Shown Diagrammatically the Coal-Mining Machine Advancing into the Coal: All of the Operations of Cutting, Breaking, and Loading are Carried on at the Same Time

COAL MINER NOW BECOMES OPERATING ENGINEER

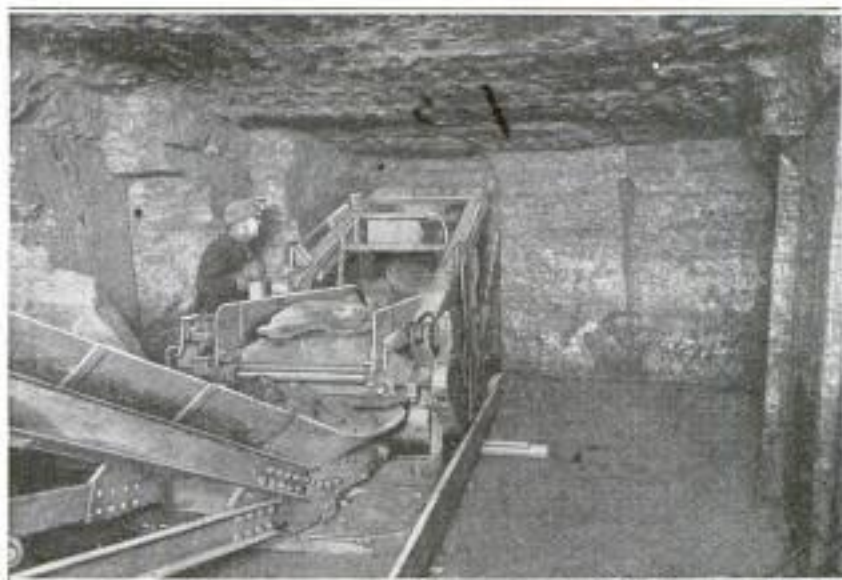
BY EVERETT J. LOVETT

WITH the rapid development of labor-saving methods, the coal miner is being transformed into a keen-eyed operator of a powerful machine which not only mines and loads the coal, but does it in a safer and more economical manner; safer, because the coal is broken down without the use of explosives which tend to shatter the roof and make it dangerous, and more economical, because it produces more lump coal and fewer fines, and does it more rapidly.

One machine developed for this work

the handle raises or lowers the ram. It is customary to leave 6 in. or more from the top of the shears to the roof in order to prevent the shearing chains from interfering with the roof in handling the machine. The forward feed of the machine is 7 ft. Thus, from each cut in a 6-ft. vein, is taken out a volume of coal 5 ft. wide, 6 ft. high and 6 ft. deep, or 180 cu. ft., the equivalent of $7\frac{1}{2}$ tons. The time required for making the first cut in the face, ordinarily called the "sumping cut," is about 20 minutes.

The machine is mounted in a pan and fed forward by means of a steel rope. When the cut has been made, the machine is pulled back in the pan by means of a rope; then, this rope is hooked over a sheave on the forward side of the machine and the eye fastened to a jack at the face of the opposite rib. By this means the machine is pulled sideways the width of the cut. This



Coal-Mining Machine Making "Sumping Cut": Coal is Sheared on Both Sides and Undercut. A Powerful Ram Breaks Down the Coal onto a Conveyor

consists of an undercutting frame with cutter chain, and a shearing frame on each side of the machine. In the undercutting frame is a conveyor. There is provided a powerful ram which breaks down the coal onto the conveyor. This ram can be directed at any height of the coal face. A slight touch on



A Storage Hopper with a Conveyor Receives the Broken Coal from the Mining Machine and Loads It into the Mine Cars. By Using the Storage Hopper the Mining Machine may be Operated Continuously

requires about three minutes. The machine is then ready to take another cut.

Where the coal is tough and does not break down readily after being sheared on both sides and undercut, one or more hydraulic jacks are fitted in one of the shearing frames. When the machine has advanced into the coal a certain distance—20 or 30 in.—water is pumped into the jacks, which will exert an enormous pressure on the coal and crack it so that it makes easy work for the ram to bring it down.

The machine can be used in combination with a movable storage hopper provided with a loading conveyor. By this

system the machine operates continuously during the time the loaded mine car is being removed and replaced by an empty one.

One great advantage of the use of the machine is the rapid development of the mines. Under the present system it may take as long as three years to develop enough entries and start sufficient working chambers to obtain a good output. This means that there is no return on the investment, which sometimes amounts to a million dollars, for the first three years. With these machines the entries can be driven very rapidly, and the desired output can be obtained in a few months.

8099 CHICKENS ARE VACCINATED LIKE HUMAN BEINGS

Chickens are now being made immune from chicken pox in the same way as human beings are protected from small-pox—by vaccination. At a number of ranches in California thousands of chickens have been treated in this manner. The



One of Thousands of Chickens on a California Ranch That are Vaccinated for Protection against Chicken Pox

vaccination is done exactly as in the human operation. The chickens have the advantage of not suffering any disfigurement from the resulting scar, for this is concealed by their feathers.

Mr. Morris, Petaluma, Calif.

8215 ANCIENT LAKE IN NEVADA THAT HAS DISAPPEARED

Where there now remains only a comparatively small body of water, called Pyramid Lake, in northwestern Nevada, there existed in a comparatively recent geological age a huge lake that covered an area of 8,400 square miles, according to reports from the U. S. Geological

Survey. This great lake, now almost completely gone, was called by geologists Lake Lahontan, in honor of Baron La Hontan, one of the early explorers of that region. Part of the old lake bed is now covered with sand dunes, forming a vast field of sand that is slowly traveling eastward. This movement is irresistible and has caused much trouble to the roads and telegraph poles in the southern part of Little Humboldt Valley.

8155 CORNET-PLAYER ATTACHMENT ELIMINATES FINGERING

The principle upon which the mechanical piano player operates has been applied to the cornet, and a simple device has been developed which, attached to the instrument, will finger the keys to produce the proper tone. It is only necessary then for the performer to blow through the instrument as one would blow a trumpet. A knowledge of music is not required to operate the mechanical cornet player. It is an English invention.



The Strip of Perforated Paper is Fed Through Mechanically, Causing the Proper Keys to be Depressed

Dr. W. P. Private Journal, Cornet Player, Army of Occupations on the Chinese, August 1st, 1911, New York City

N.Y. Times 12/21/21 P.9.

Central News Photo Service 100 W. 40th St. New York City



Elaborate Set Built by a Motion-Picture Company for the Filming of a Beautiful Bubble Scene: In the Fore-ground can be Seen the Huge Iridescent Mass of Bubbles Which were Manufactured from Hundreds of Barrels of Soap, and in Which the Dancers are Performing

MOVIE BALLET PERFORMS AMONG SOAP BUBBLES

Beautiful scenes are common in the motion-picture studios, and many mechanical effects are produced which fairly dazzle the eye of the onlooker. As a climax to an unusually gorgeous "set" a director recently called for a dance in the midst of soap bubbles. Accordingly, since a space 20 by 40 ft. had been designated to be filled with the frothy substance, a metal sieve of this size was fitted in the floor. A soap solution, made with 200 bbl. of the product and mixed in the same manner as plasterers prepare lime, was piped to the porous floor, and steam forced

through it. The immediate transition into bubbles began, and these soon rose to a huge scintillating mass, in which the dancers performed, the whole presenting a scene of fairylike splendor.



Behind the Scenes, Showing the Soap Solution being Mixed in a Large Vat Preparatory to Piping It underneath the Sieve-like Stage Where It was Transformed into Bubbles

a European radio company which will also build a substation at Para, in the northern part of the same country.

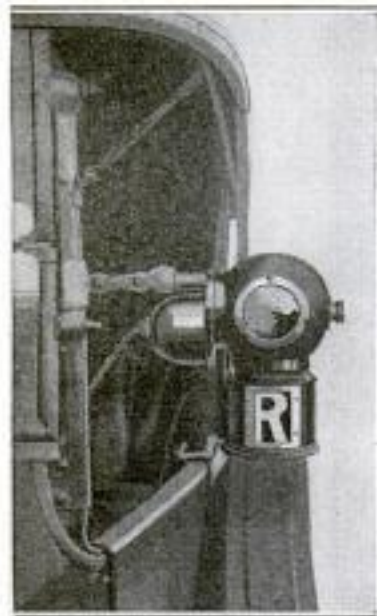
Ⓒ Brazil will have an international radio central at Rio de Janeiro, according to the announcement of recently completed plans, which will be modeled after the gigantic station at Port Jefferson, L. I. The new venture will be constructed by

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marcott Auto Signal Co,
103 1/2 5th St., Olympia Wash
POPULAR MECHANICS

AUTO SIGNAL HAS DISTINCTIVE AND PENETRATING LIGHTS

Another automobile signal has appeared and is being marketed on the Pacific coast.



It is mounted on the left side of the windshield, and is electrically operated by current from the car batteries. An upper lens is provided with a stationary light and revolving colored lenses which produce a distinctive "attention" signal, visible for a mile or

more at night. Below is a direction signal, visible from front and rear, the letters "R," "L," and "S" indicating right, left, and stop, respectively. The light is said to be remarkably penetrating and visible for a great distance, even through a dense fog.

back for the A and E-strings, and a pine front and cherry back for the D and G-strings. The bridge used has a broader base than the ordinary type, so as to span the space which separates the two halves of the instrument.

8092 MILITARY RIFLE-RECOIL PAD PASSES SEVERE TESTS

In tests, recently held at Fort Snelling, Minn., a new rifle-recoil pad proved highly satisfactory for use with military rifles.



A recess in the stock of military rifles, to hold an oilcan and field cleaner, opens through the butt plate and would be inaccessible with ordinary pads. This pad is either hinged to the stock or attached with clips and studs so that the recess remains accessible. It is made of sponge rubber, covered

with leather. In the tests, two men fired, one using the pad. The second man was forced to quit after 250 rounds, because of a sore shoulder. The next day his shoulder was badly swollen, while the first man showed no bad effects.

8190 AMERICAN DRUG TRADE BOOMING IN BOMBAY

The unrest in India is apparently not hurting some lines of business, for an American drug company, with offices in Bombay, reports that the sale of medicines in the country districts around that city is increasing so rapidly that it is impossible to fill all orders. The business is conducted on aggressive American lines by extensive advertising and the missionary work of traveling agents, and possibly this more than counteracts any adverse conditions. The goods are shipped from Bombay cash on delivery.

8094 VIOLIN OF DIFFERENT WOODS FOR HIGH AND LOW TONES

Daniel H. Neely, Bradford, Pa.

Violin construction is controlled by the desire to produce the clearest of tones, and the materials of which these instruments are made are always selected with the greatest of care. A Bradford, Pa., man has introduced a violin, in which two kinds of woods are used, his theory being that hard-wood vibrates faster and favors the

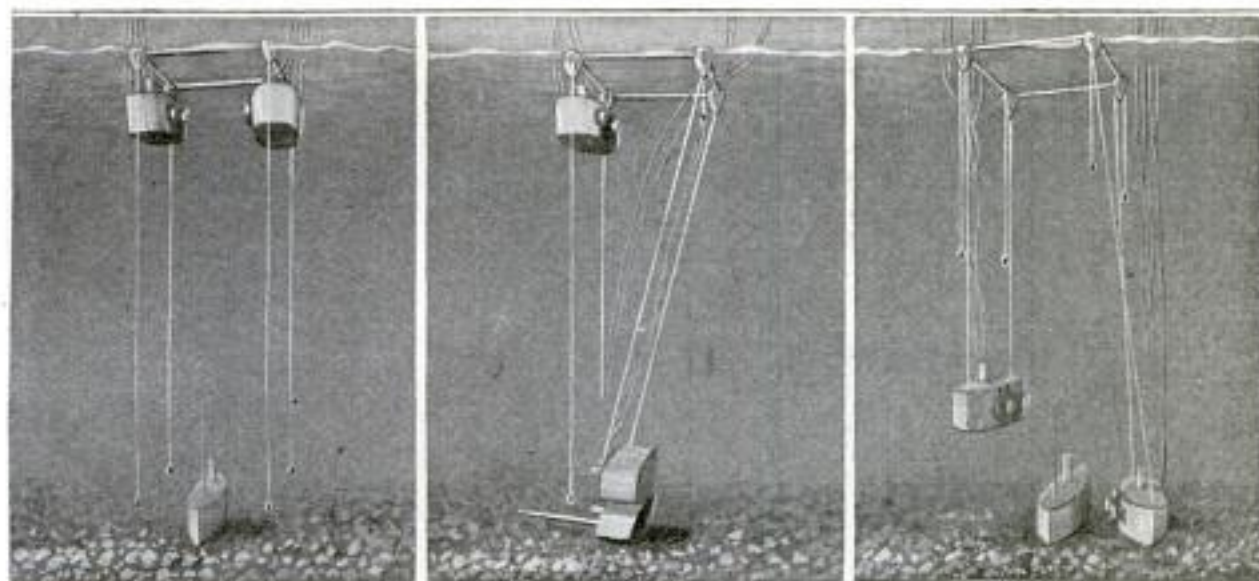


higher tones, while softer wood has an opposite effect. His invention has two sections, with a hemlock front and maple

higher tones, while softer wood has an opposite effect. His invention has two sections, with a hemlock front and maple

Mr. J. D. Kennedy, 1/10 Arthur Williams, 319 Cedar St., Providence, R.I.

Chicago Bulletin
76 W. Monroe, Chicago.



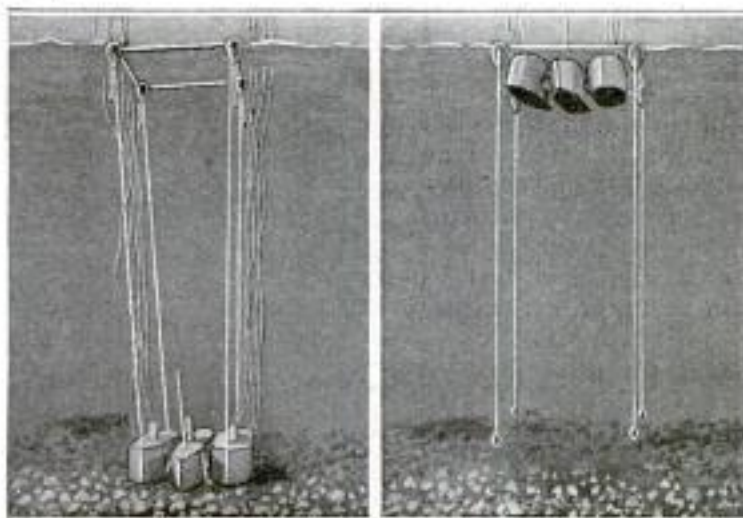
Diagrammatic Representation of the Operation of Pontoons in Salvaging a Wrecked Vessel, Showing, from Left to Right: Pontoons in Position above Wreck and Ready to be Lowered; Method of Dealing with Vessel Lying on Its Side; One Pontoon Lowered, and Other on Its Way Down to the Other Side of the Wrecked Vessel

WRECKED VESSELS SALVAGED WITHOUT DIVERS

Methods used, at present, for salvaging wrecked vessels, sunk in deep water, involve the employment of divers, whose powers of endurance are limited. A depth of about 200 ft. is considered the greatest in which divers can operate, but great hardship is experienced at much less depth. Thus, it has hitherto been considered that vessels sunk in the high seas are unsalvageable. A great deal of study has been given to this subject in England, and an electromagnetic system of salvage has been evolved which has demonstrated the possibility of salvaging vessels at any depth without the use of divers. The system is based upon the use of submersible pontoons, to one side of which are attached powerful electromagnets. These pontoons work in conjunction with tugs, from which all electrical and air controls are directed. Each pontoon is subdivided into a number of airtight compartments, one of which is made habitable by means of maintaining atmospheric air

pressure within it, independently of the depth of the water. Here the crew operates, and in connection with it is a conning tower. The pontoons are sunk by filling the other compartments with water, and the crew has control over these compartments, so that the pontoon can be tilted at any angle to make the best possible contact with the sunken hull. The current is then turned into the electromagnets, which cling to the wreck with sufficient force to move it. The wrecked hull is secured in this manner between two of these pontoons. By compressed air the water is blown out of the compartments in

the pontoons, which then have a buoyancy sufficient to rise to the surface. The pontoons are of various sizes, suitable to the size of the vessel to be raised.



Left: Both Pontoons in Position for Raising the Wrecked Vessel, to Which They are Electromagnetically Attached. Right: Wrecked Vessel Raised, Ready to be Hauled Ashore

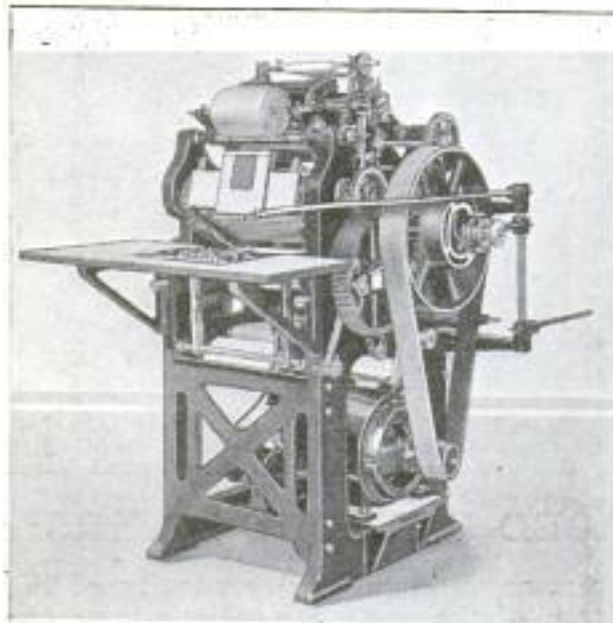
means of maintaining atmospheric air

duced from entirely unmixed coal from the Sarre basin.

By a new system, the discovery of a Paris chemist, a hard and resistant metallurgical coke has been pro-

8101
**POWER PRESS PRINTS FROM
COPPER OR STEEL PLATES**

Up-to-date plate printing has been done on hand-operated presses, but a machine has now been developed which performs

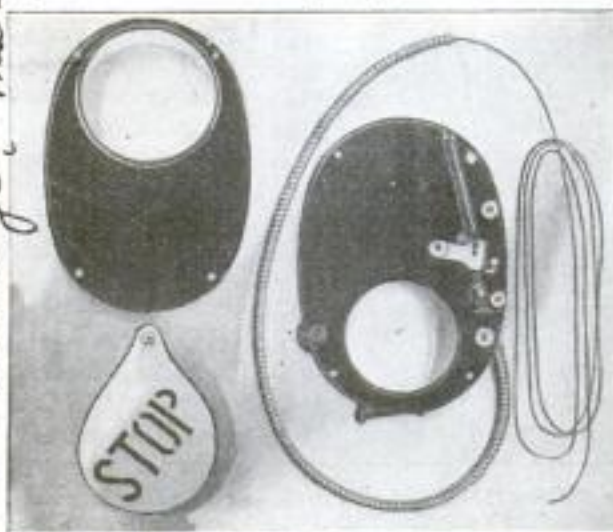


An Automatic Power Press Which Performs All Operations of Plate Printing Mechanically

all the operations of plate printing automatically. The plate being set up, it is only necessary for the operator to feed in the stock and remove the finished work. Results are said to equal the finest handwork.

8159
**MECHANICAL STOP SIGNAL
SIMPLE AND PRACTICAL**

Stop signals are many and of various makes, but one of an extremely simple type, which has lately appeared, deserves

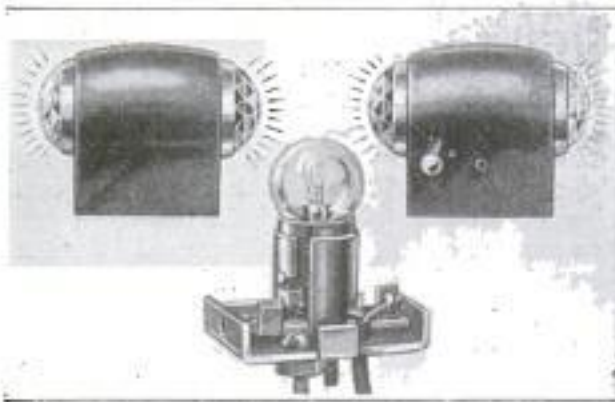


Upper Left: Plate Which Fits over Tail Light. Lower Left: Shutter That Swings across Opening in Plate. Right: Plate with Armored Tubing Containing Operating Wire

recognition. The accessory is fastened over the tail light, and has an opening in it large enough for the rays to shine through. An iron wire, to which tension is applied by pressure on the brake, causes a white-enameled shutter to swing across the aperture. Stamped out of this shutter, is the word "Stop," in two-inch letters, which are covered with red silk, thus allowing them to be strikingly illuminated at night, while in the daytime they are readily seen as a warning.

8150
**ATTRACTIVE PARKING LAMP
OF UNUSUAL DESIGN**

Every driver of an automobile knows the danger of leaving his car parked at night without showing lights, so a new parking light will be of interest, as it shows a light at front and rear, but uses very little current from the battery. Aside from the built-in appearance of the lamp, it has other attractive points. It uses only a 2-cp. 6 to 8-volt bulb, and in case it becomes necessary to replace a



Parking Lamp with Two-Candlepower Bulb and Concealed Switch Which Shows a White Light Forward and a Red Light Rearward

bulb, the cover of the lamp is snapped off, leaving the socket fully exposed.

8263
**ELECTRIC POWER FOR SEATTLE
FROM SKAGIT RIVER PLANT**

A great hydroelectric project on the upper Skagit River is being undertaken for the purpose of furnishing electricity for the city of Seattle, Wash. At a point where the river makes a great bend a tunnel is being driven through the solid hill, which, when completed, will carry water from the river to the turbines that drive the electric generators. The tunnel will be more than two miles long and will take two years to complete. A dam is to be constructed at the upper end of the tunnel to form a storage reservoir. The transmission line to Seattle will be over 100 miles long.

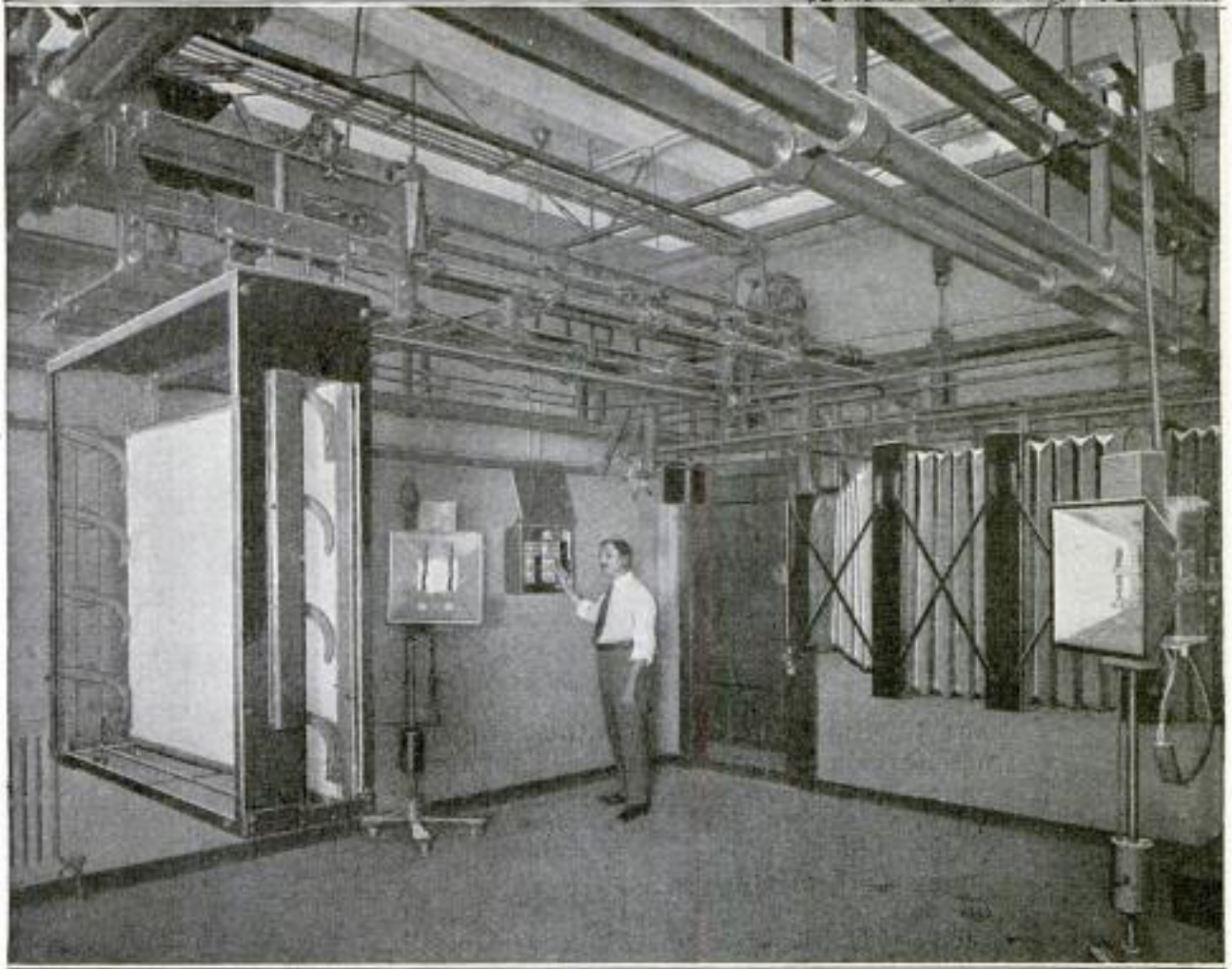
Jiffy lamp mfg. Co., 90 S. Peering St. Milwaukee, Wis.

Emil E. C. Hughes 57 Austin St. Cambridge, Mass.

Poepffel Novelty Works The Christian Science Monitor
1800 Dearborn Ave. Chicago 9/17/22

8142

Designer. A. H. Linsenmeyer
 Cont. S. Q. Winters, 702 Electric National
 POPULAR MECHANICS Bank Bldg. 13
 Washington D. C.



Electric Map-Making Camera: At the Left Is the Huge Copyholder and at the Right Are the Bellows, Both Operated by Cranes. Overhead Is the Rigid Tubular Framework Suspended by Springs to Avert Any Possible Vibration of the Various Units of the Camera

MAMMOTH ELECTRIC CAMERA USED IN MAKING MAPS

In the photographic laboratory of the Geological Survey, Department of the Interior, is located a camera of such huge dimensions that it has to be operated by means of small electric cranes. A rigid tubular-steel framework is suspended from the ceiling of a large room by springs, to avert any possible vibration of the various units of the camera which are hung from this frame. In one corner of the room is placed the plate holder, which is at all times stationary, and which extends through the wall into the adjacent dark room. The bellows, terminating in the lens and prism, are just in front of the plate holder, as in ordinary usage, and are fastened to a carriage or crane for focusing purposes. The copyholder, or frame, consists of two 4 by 6-ft. plate glasses held in a steel frame, and also affixed to an electric crane for centering the copy. Lenses of 31 and 42-in. focal length are attached to a heavy brass

plate and will produce any-size photograph accurately in this 7,000-lb. camera. The entire mechanism is electrically operated, and electrical contacts are arranged according to a scale, so that the operator can easily determine when he has the proper focus with the gigantic outfit, by the lighting of signal lamps. The camera was built by the government for the sole purpose of reproducing maps.

RADIO TO BE USED IN TRACING LOST SHIPMENTS OF GOODS

New uses for the radiotelegraph and telephone are being found every day, so it occasions no surprise to learn that an eastern company is planning to use this means of tracing shipments of goods lost in transit. In tracing strayed or stolen goods, the question of time is of vital importance, and this was one of the governing reasons in adopting this means of communication. The plan, as outlined, contemplates the establishment of 35 radio plants in all parts of the country.

Christian Science Monitor
 1/16/22

Edw. E. Isarotta, Esq.

Electrical World

3, Via Settembrini

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POPULAR

MECHANICS

1/21/22

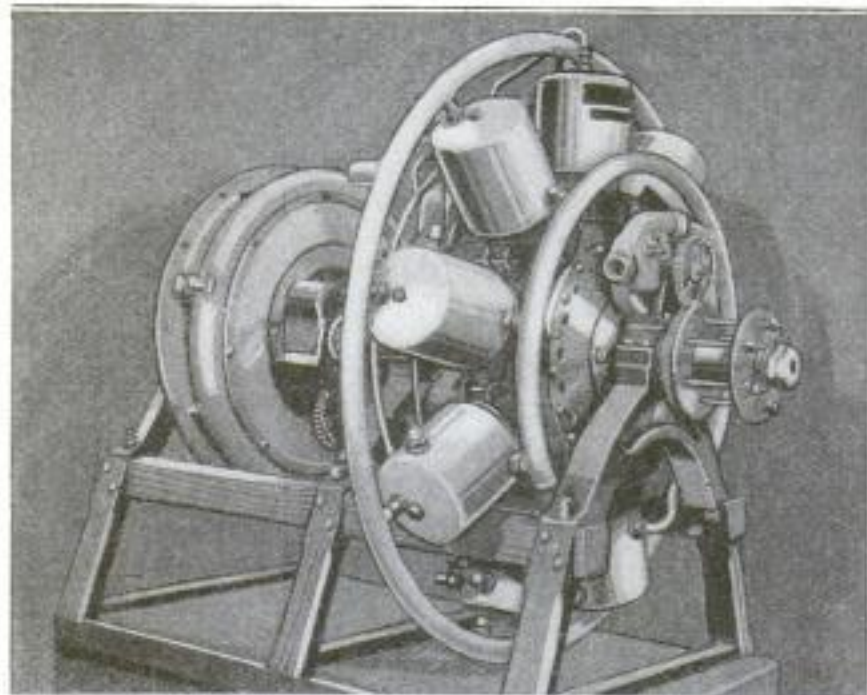
8169 MILANO ITALY
ITALIAN AIRPLANE ENGINE
OF DIESEL TYPE

THAW SLEET FROM WIRES
BY SHORT CIRCUIT

8269

A water-cooled Diesel engine of radial-cylinder type has recently been designed

Sleet storms periodically wreak havoc with electrical transmission lines, and as



This Formidable Looking Airplane Engine is Designed to Operate on Heavy Fuel Oil. It Has Auxiliary Magneto and Carburetor for Starting with Gasoline

in Italy. It is claimed that the engine will operate on any of the heavy fuel oils, and will develop 1 hp. for less than 2 lb. of engine weight. It is equipped with magneto and carburetor for starting with gasoline, and also has a special device for reducing compression when starting.

ice to the customers was delivered as usual, during the 15 hours required entirely to free the wires from ice.

When Paris suburban trains arrive late, slips giving the time of arrival are presented to passengers upon request.

BIG DITCHER QUICKLY TURNS SWAMPS INTO FARMS

The immense scale on which reclamation of swamp lands in Freeborn and Mower counties, in southern Minnesota, is carried on, means that, within a short time, great tracts will be added to the productive lands of that state. Work is being concentrated on a tract of 15,000 acres, which has been subdivided into eight units of from 1,000 to 3,000 acres each. Each unit is in turn subdivided into farms, most of which contain either 80 or 120 acres.

The chief agent in this reclamation work is a wheel excavator of unusual design and capacity. This 76-ton ditching machine crawls steadily ahead like some great land monster, and as it advances it digs a ditch that is 12 ft. wide on top and 7 ft. deep. A huge revolving wheel scoops out the dirt and a conveyor belt is kept

busy carrying it out 20 ft. to the side, where it builds up a spoil bank. Working steadily with a crew of five men, the machine, which is 65 ft. long over all and has a 110-hp. engine, can drive a ditch ahead at the rate of about a quarter of a mile in a working day.

After the tile drains are laid, the sides of the ditches are thrown in to cover the tile. This work is done with a grading machine drawn by a tractor. Submains and laterals are added after the main drains have been laid. Then follows the building of bridges, roads, and groups of farm buildings. Work is done on a big scale, dozens of teams, workmen, and tractors being employed. Artesian wells are driven, fences built, and in a short time the marshlands have been changed into highly productive farms.

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3, Via Settembrini
Milano, Italy
7959

7959 Buckeye Traction Hitcher Co,
Windsor, Ohio



The View Above Shows the Rear of the Big Ditch Digger at Work Excavating Drain Trenches in Southern Minnesota Marshlands. It Makes a Ditch 12 Feet Wide at the Top and 7 Feet Deep, Depositing the Excavated Dirt, by Means of a Conveyor, along the Side of the Ditch



The Immense Excavator, Weighing 76 Tons and Equipped with a 110-Horsepower Engine, is Here Seen from the Front. It is 65 Feet Long over All, and 33 Feet Wide; the Front Wheels Are 8 Feet High by 7 Feet Wide, and the Track-Layer Wheels in the Rear, 20 Feet Long by 8 Feet Wide. The Crew Eats and Sleeps in the House on Top of the Machine

*Hulophane Glass Co.,
342 Madison Ave*

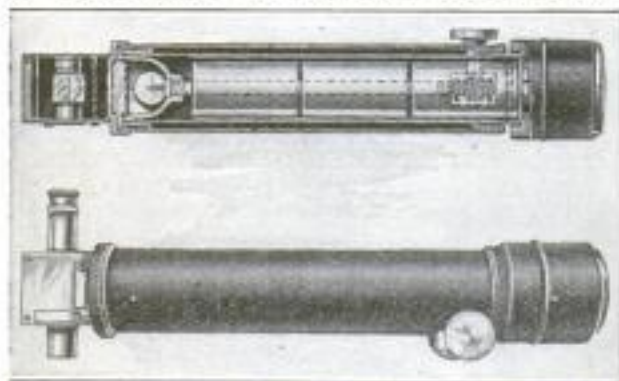
346

POPULAR MECHANICS

New York City

**NEW ILLUMINATION METER
PORTABLE AND ACCURATE**

Until recently illumination meters have all been large and heavy, never really



By Adjusting the Thumbscrew the Strength of Any Light may be Compared with the Strength of the Test Lamp

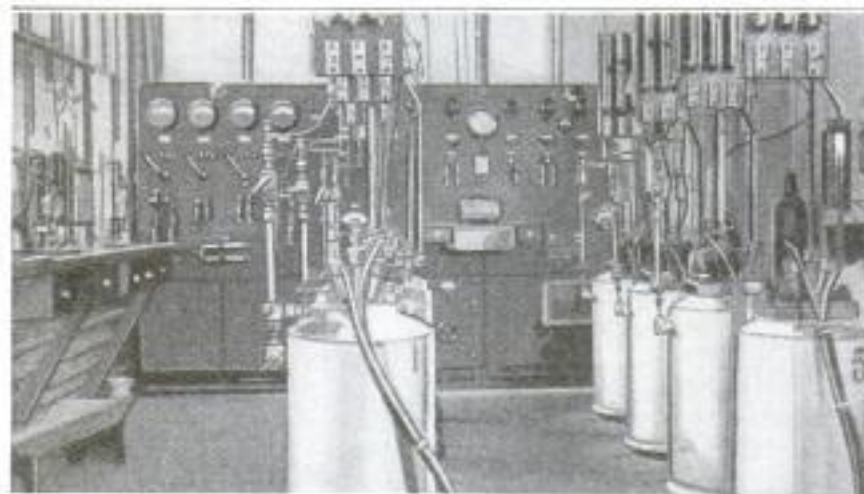
portable. Now a light meter has been placed on the market which measures only 11 in. in length, but is entirely accurate. It is designed for measuring foot-candles, Lamberts, candles per square inch, candlepower, coefficients of reflection, transmission factors, and for color matching. It is supplied in a compact carrying case.

☐ Nearly 4,500,000 acres of land have changed hands in Scotland since November, 1918, this vast amount being practically one-fourth of the entire country. About 800,000 acres were sold in 1920 alone, and in 1921 the total was more than 600,000. It is estimated that, altogether, land to the value of over \$260,000,000 has been sold since the signing of the armistice.

TESTING CHEMICAL ACTION UNDER GREAT PRESSURE

Nitrates, the basis of explosives and fertilizers, can be produced chemically, and one step in the process is the formation of ammonia by combining hydrogen and nitrogen in proper proportions in the

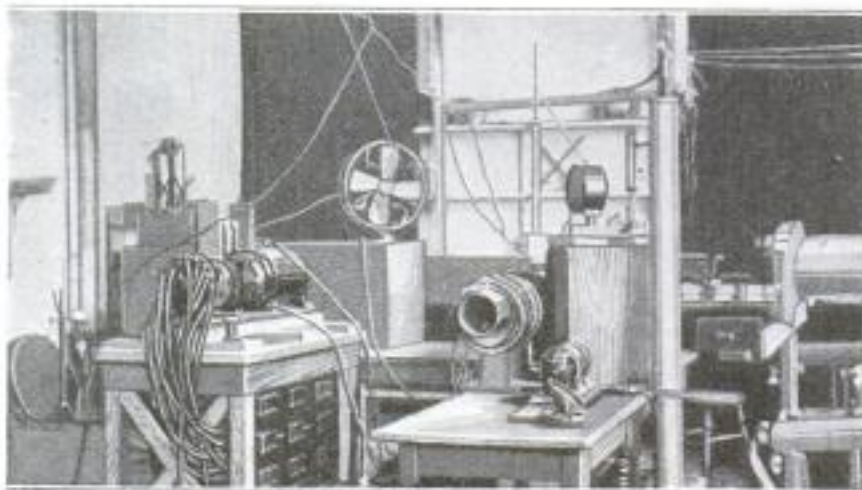
American University
catalyst developed by the Fixed Nitrogen Research Laboratory in Washington is said to be the most efficient yet discovered, and its behavior at various temperatures and pressures is now being studied. For this purpose it is placed in metal cylinders called "testing bombs," where the chemical action takes place at different temperatures and at various pressures up to as much as 1,500 lb. per square inch.



Above: In the Metal Cylinders, Called "Testing Bombs," the Action of the Catalyst is Studied at Various Temperatures and Pressures

Right: The Recording Instruments on Which the Reactions are Observed and the Records Carefully Compiled

presence of a catalyst. The quantity of ammonia that is produced depends, among other things, on the nature of the catalyst and upon the temperature and pressure at which the chemical action takes place. A



☐ Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

LIGHTING THE MISSISSIPPI

By Lewis R. Freeman
287 E. California St.
Pasadena, Calif.



Setting Up a Beacon on a Sand Bar on the Mississippi River: It Is One of 700 Similar "Aids" That have been Established along the 1,200-Mile Course of the River between St. Louis and New Orleans, to Direct Navigation of the Constantly Shifting Channel

MARK TWAIN, in his "Life on the Mississippi," devotes a number of pages to an almost interminable list of things that the river pilot of the old days had to remember in order to stand a chance of avoiding disaster in the 1,200-mile run between St. Louis and New Orleans. So slight were the shades of differentiation between the marks that spelt danger or safety, that one is surprised, not to learn that the lower Mississippi is paved with an average of a half dozen wrecks to the mile, but that it was ever possible to carry on navigation at all.

The almost prohibitive difficulties in the way of lighting and marking a channel that was here today and there tomorrow, made progress slow in the matter of safeguarding navigation on the lower Mississippi, and no comprehensive system was worked out and put into operation until a number of years after the crest of traffic was past. Then, over a long interval during which river trade dwindled year by year, the lights were maintained with the characteristic thoroughness of the U. S. Lighthouse Service. Channels

that scarcely were churned once a month by a dilapidated stern-wheeler were kept dredged, sounded, and marked, although the cost of the service must have been far and away in excess of the benefits accruing from it. But now, with the establishment of Federal barge lines and

rehabilitation of river traffic generally, the long chain of little beacons of what is called the Fifteenth Lighthouse District is finally beginning to justify its establishment.

I think I am well within the truth in stating that none of the great navigable rivers of the world offers so baffling a lighting problem as does the "Father of Waters" in its twisting, turning, caving-banked reaches from the mouth of the Missouri to the Gulf. I might mention parenthetically that all the old river pilots and skippers resent the use of the masculine gender in speaking of the great river. Anything that changes its mind as often as does the lower

Mississippi, they say, ought to be called she. And she they call it—when they aren't calling it something worse.

It is this capriciousness, this unstable-



Carrying a 12-Foot Aid Post up a 20-Foot Bank, on Top of Which It is to be Erected

ness of mind (which the lower Mississippi gets from the Missouri, and which the latter, in turn, has got from the Yellowstone) that makes the stretch of the river from St. Louis to New Orleans so hard to light effectively. A river that flows in front of a town one day and behind it the next, cannot, obviously, be lighted with fixed beacons. Indeed, if changes of this description—which have, in several instances, had the effect of transplanting a town from Missouri to Illinois, or from Mississippi to Arkansas—were at all common, it would be out of the question trying to light it at all. Since for the most part, however, changes of channel go on steadily but slowly, it has been possible to devise and maintain a lighting system that is of incalculable assistance to the navigator of the great river.

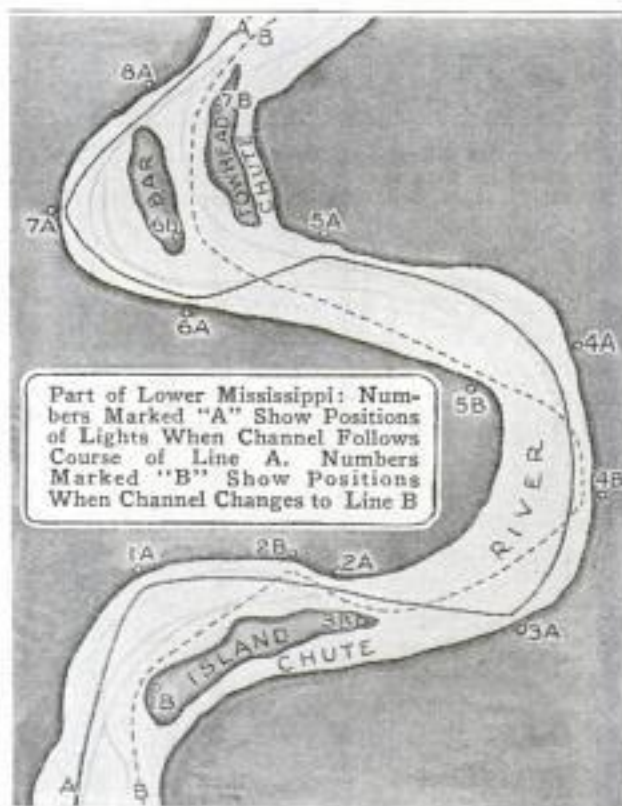
The lights on the lower Mississippi are officially referred to as "aids to navigation." The term light, or lighthouse, is reserved for a fixed beacon, the purpose of which is to warn a ship away from a shoal or dangerous point. An aid, on the contrary, is almost invariably intended to give a pilot an approximate bearing for a course that will keep his steamer in the always narrow and winding channel. As this channel is constantly changing as the river rises and falls, it follows that the position of the aids will have to be shifted in order that they may help rather than mislead. The task of sounding out the channel and moving the aids to conform to it, is only one of the multifarious services performed by the government lighthouse tender that is kept in constant operation between the mouth of the Missouri and New Orleans. Two smaller tenders are operated on the Ohio and upper Mississippi, respectively, but the work of light tending is far less onerous than on the lower waters.

The type of aid that is uniformly used on the Mississippi and Ohio (and on the lower Missouri in the event navigation is

ever opened up regularly there) consists of a heavy post, about 12 ft. in height, deeply set in the ground and furnished with props, crossarms, stairway, and a bracket to receive the lamp. All parts of the structure are painted white. The lamps hold enough oil to keep them burning continuously for 72 hours. A highly refined grade of kerosene is used, furnished under specifications which require that it shall burn the full three days without depositing any soot upon the glass. In order to simplify the work of tending, the lamps burn in the daytime as well as at night, so that the principal thing to do is to refill them every third day.

In my recent boat trip down the Mississippi, I found that the aid, or light, at the mouth of the Missouri bore the number 686, and that the Westwego aid, five miles above the foot of Canal Street, New Orleans, was numbered 1. As several of the intervening aids bore the same number, differentiated by the addition of a letter, I think it probable that there are something over 700 aids scattered at irregular intervals along that 1,200-mile stretch of river.

The manner in which the aids are placed to help the pilot keep to his channel, will be plain from the accompanying diagram, which shows a 10-mile section of the lower Mississippi. With the steamer channel following the course indicated by the line A, the aids would be placed approximately as shown by the points marked 1A, 2A, 3A, etc. But if soundings made by the lighthouse tender at the end of the spring high water were to show that the channel had shifted to the course indicated by the dotted line B, then the position of the lights would be altered at the first opportunity to conform roughly with the points marked 1B, 2B, 3B, etc. Immediately after making the fresh sounding and shifting the aids, the captain of the tender forwards a report descriptive of the new channel to the headquarters of the Fif-

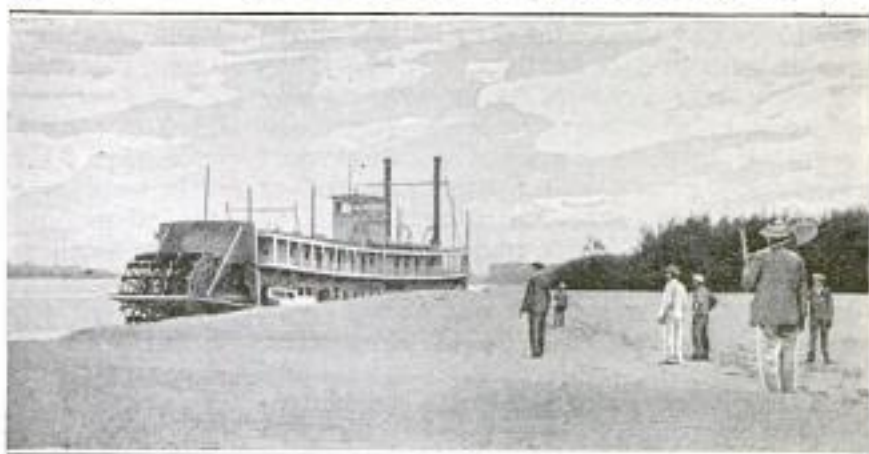


teenth Lighthouse District, in St. Louis. Here this is manifolded and copies dispatched to every master navigating a boat on the lower river. The latter immediately enters a summary of the fresh data at the proper point of his latest light list, where there are blank spaces left for remarks, changes, etc. The full report is kept ready to hand in the pilot house in the event difficulties develop in navigating the stretch covered by it.

The language of these reports is in the purest "riverese," a lingo of its own, and quite distinct from ordinary nautical jargon. A deep-sea sailor would be as much at a loss to get the sense of one at first reading as would the landlubber. With a little study, however, the meaning of the strange phrases will become plain to a person of average intelligence.

The word "towhead" is one that crops up often in Mississippi parlance. It might best be defined, perhaps, as a cross between a sand bar and an island—an island in the making. It is usually formed in the first slack water below a point where the river has cut heavily into its

banks. The first year or two after it begins to appear above water, it is covered with a thick growth of young wil-



Men Returning to the "Oleander," the Lighthouse Tender for the Lower Mississippi, after having Shifted a Light on Account of a Change in the Course of the River Channel



Old Negro "Mammy" Who Tends the Aids at Pecan Point, Arkansas

lows. Later, cottonwood trees appear and choke out the willows. If a towhead augments, or holds its own long enough for the cottonwood to attain a growth of 20 or 30 ft., it attains the dignity of, and is thenceforward called, an island. A "chute" is a narrow back channel behind an island. If there is water enough, a steamer taking it may often save many miles of distance over the main channel. Directing a steamer down "the shape of the bar," or "the shape of the bank," means that it should

run fairly close to bar, or bank, and on a parallel course.

The lighthouse tender for the lower Mississippi is the "Oleander." It has been commanded from the day it was commissioned by Capt. Thomas Good, who has spent a long lifetime as pilot and master on the river. The duty of the "Oleander" is to cruise back and forth between St. Louis and New Orleans as fast as the exigencies of water, weather, and coaling permit, sounding out the channel, shifting, repairing, or replacing lights, and replenishing the supplies of the keepers. Under favorable conditions, it may average 100 miles a day on a downstream run, and perhaps 75 going up. A keeper may tend from one to ten lights, though I only recall one man with so many as the latter num-



Light on Lower End of a "Towhead," or Mississippi River Island in the Course of Formation

ber. If he has more than three or four lights, he will need a motorboat of some kind to get around to them. As all of the river fishermen have power boats, it is only to be expected that they should make up the bulk of the keepers. Those tending only one or two lights are usually squatters cultivating a small patch of corn or cotton outside the levee. To support a family without other work, a keeper should have at least five or six lights, as the pay per light is not high.

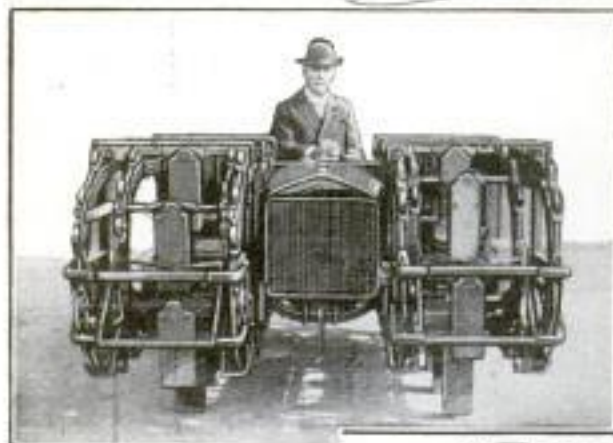
The duties of a keeper are: to keep the brush trimmed away in front of his light, so that it will always be in clear view from the channel; to replenish the oil and keep the wick trimmed and the light burning day and night; to set back the light in case the bank below it is caving, and in such a way as to maintain approximately its former bearing from the channel; to report to St. Louis his needs far enough in advance to allow the "Oleander" to be prepared to bring, or do, what is necessary on its next trip. If a light is carried away entirely, it is the duty of the keeper to set up a spare lantern on a post, or tree, and keep it burning until the "Oleander" comes along with the materials for a new installation. If, as

occasionally happens through the tender being delayed, a keeper runs out of kerosene, he is expected to buy enough to keep his lights going, at his own expense, trusting to the government to reimburse him later. As it is impossible to buy kerosene of anything approaching the high quality furnished him by the tender, a keeper confronted by an emergency of this kind is always in for a very trying period of smoky lights.

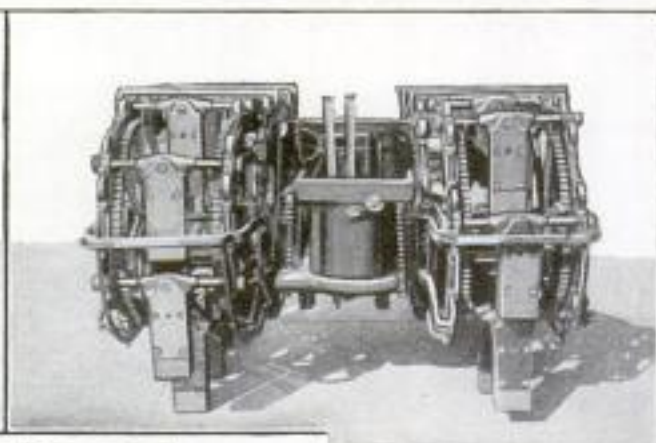
Although running the whole gamut of the social scale from the old black "mammy" to an effete scion of British nobility (I met both tending lights on the river), there is still to be found a remarkable *esprit de corps* among the keepers. Every effort is made by Captain Good to impress his keepers with the fact that the maintenance of their lights in all weathers, and in the face of every difficulty, is a matter of life and death importance. A number of men have lost their lives while endeavoring to save their lights in flood time, and of actual betrayals of trust there have been almost none. This is a wonderful showing, especially when one considers the strange odds and ends of humanity with whom it has been necessary to work.

John H. Mansel

267! "WALKING" TRACTOR FOR USE ON PLOWED SOIL



Front View of Tractor, Showing the Clearance between the Bottom of the Engine and the Ground



Rear View of Tractor, Showing the Driver's Seat and the Method of Lifting the Feet from the Ground



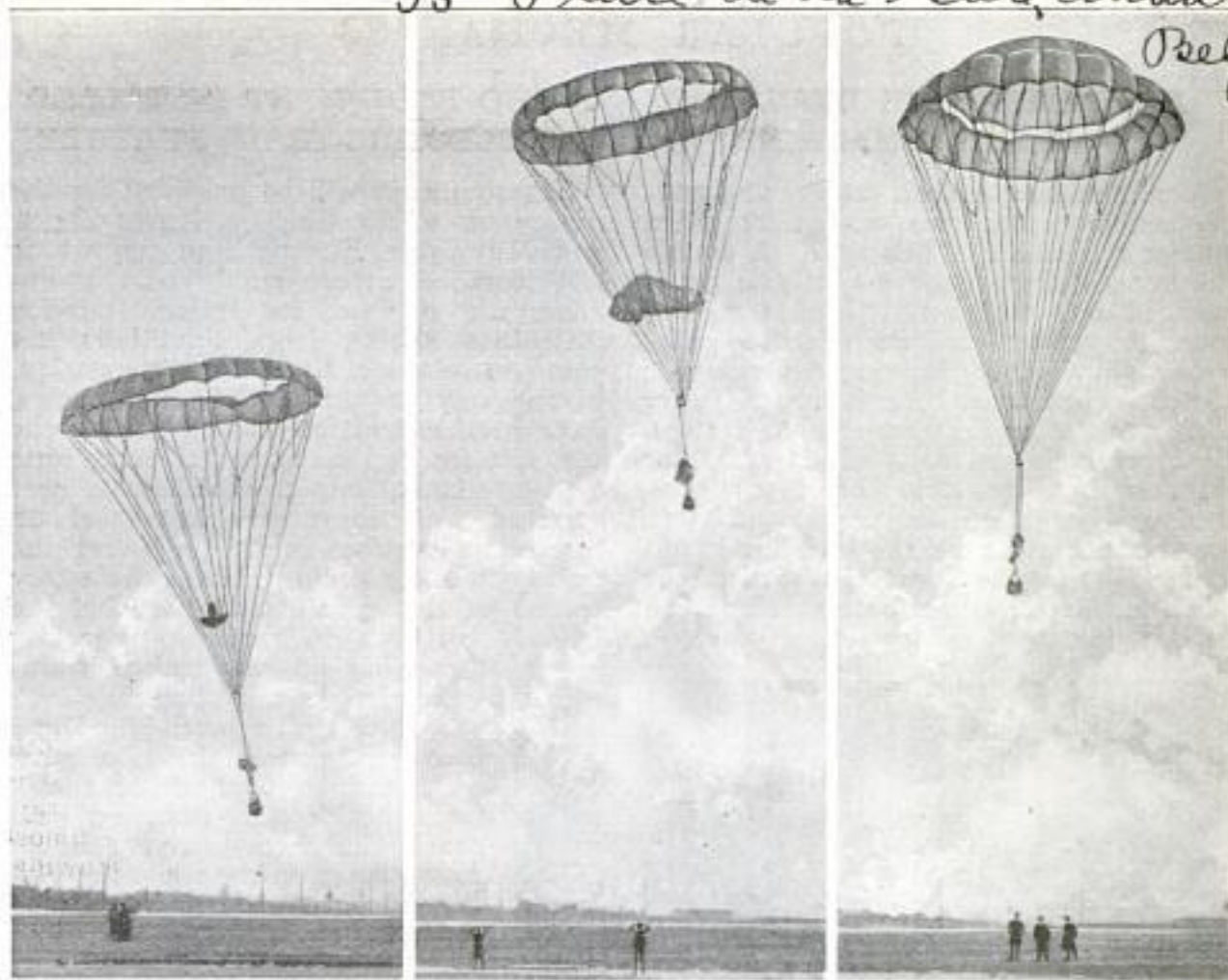
Side View of the Tractor, Which Illustrates How the Machine Has Four "Feet" on Each Side to Rest Upon

Loose, muddy, or sandy soil will not hinder the planting or cultivation of crops if a new "walking" tractor is used. The tractor travels on "feet" which extend 12 in. below the frame, and these are set in an endless chain, so arranged that they take, or leave the ground in a perpendicular

position. Thus only small holes, instead of continuous tracks, are left in the soft earth. The engine is mounted between the two rows of feet, and can be raised or lowered to accommodate the height of the crop being cultivated, so that there is little chance of its receiving any damage.

I. W. S. J. Corbith, 802 W. Broadway, Enid, Okla.

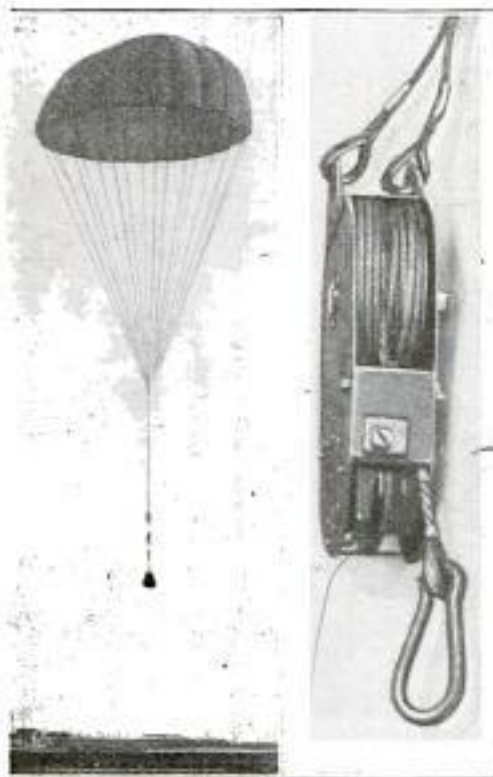
8219 *Com. Maurice E. Belgrims*
 35 *Place de la Scaire, Antwerp*
Belgium



Successive Stages in the Opening of the Two-Part Parachute: First, the Outer Ring Opens, Checking the Fall; Second, the Inner Parachute Moves Up into Place; and Third, It Opens, Nearly Filling the Ring

Aeromobile
PARACHUTE IN TWO PARTS REDUCES SHOCKS

The parachute holds the same relation to the air craft that the life preserver holds to water craft, and even when air travel has become reasonably safe, the parachute will continue to play its part in case a forced landing is necessary. As the speed of air travel increases, the strain placed upon the parachute in leaving the air craft becomes greater, and the danger of rupture of the fabric is also increased. To reduce this hazard and to lessen the shock on the person using the parachute, the two-part parachute has been tested in Germany. In making a jump, the outer parachute, which is merely a ring of fab-



Ordinary Parachute, Fitted with the Special Brake, Shown at the Right

ric, opens first, checking the speed of fall, whereupon the inner parachute then opens and the falling speed is reduced to not over 15 ft. per second.

Another device destined to accomplish the same result, using the regular parachute, is in the form of a brake which is interposed between the parachute and the jumper. When the initial pull on the parachute is greater than the fabric will stand, the cables take up the shock by unwinding, somewhat on the order of the spring counterweight. The tension of the brake may be adjusted to compensate for the different weights of the jumpers.

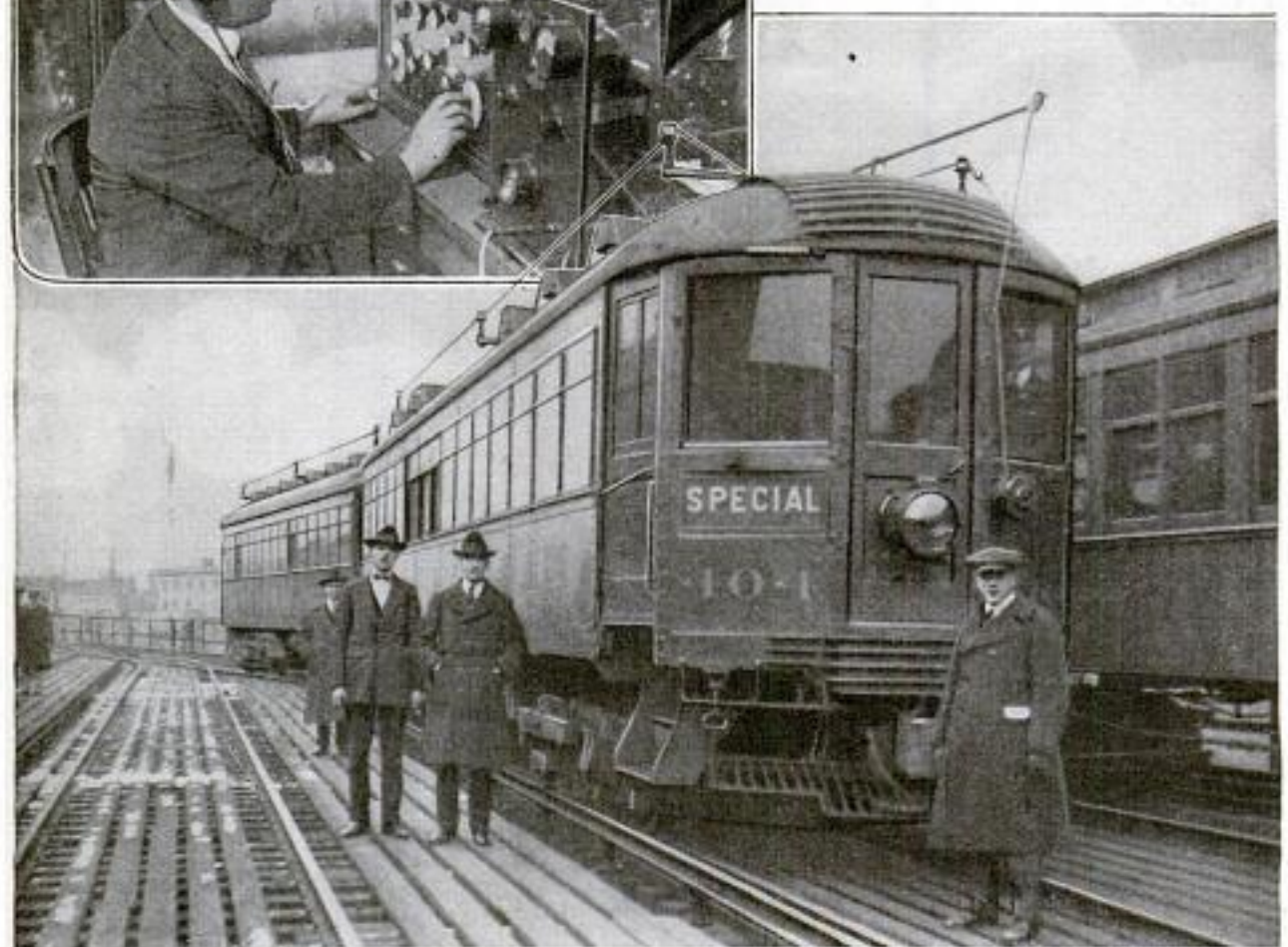
COMBINED CASH DRAWER AND ADDING MACHINE

A new combined cash drawer and adding machine occupies a distinct place among equipment of this type. A double roll is used, with a narrow strip of paper overlaid on a wide strip. Each item and total is printed on both strips. The wide strip rewinds, forming a permanent record. The narrow strip is torn off, after each transaction, as a customer's receipt. Cash received and paid out is added or subtracted. The clerk or department, cash or charge, on account or paid out, are indicated. When the machine is unlocked, the rewind forms a record of the day's business. The adding machine can be instantly detached for ordinary use.

8328

RADIO EQUIPMENT INSTALLED AS ELECTRIC-TRAIN FEATURE

Entertainment will be provided for the passengers of the Chicago, North Shore, and Milwaukee Electric Railway, which has installed experimental radio equipment on one of its trains. Serious difficulties arising from conditions not common to the ordinary wireless station, in the way of the trolley and motors, have been successfully overcome by the engineer for this company. During tests made recently, music for dancing was received, and conversations carried on between a station in Chicago and the swiftly moving train. The satisfactory results of the experiments have led the officials of the railroad to consider equipping all the limited trains with wireless, and supplying each passenger with a receiver. These instruments will have a plug which can be inserted in a receptacle beside the seat, so that those who choose may, while en route, listen to the radio news or music now broadcast from many stations.

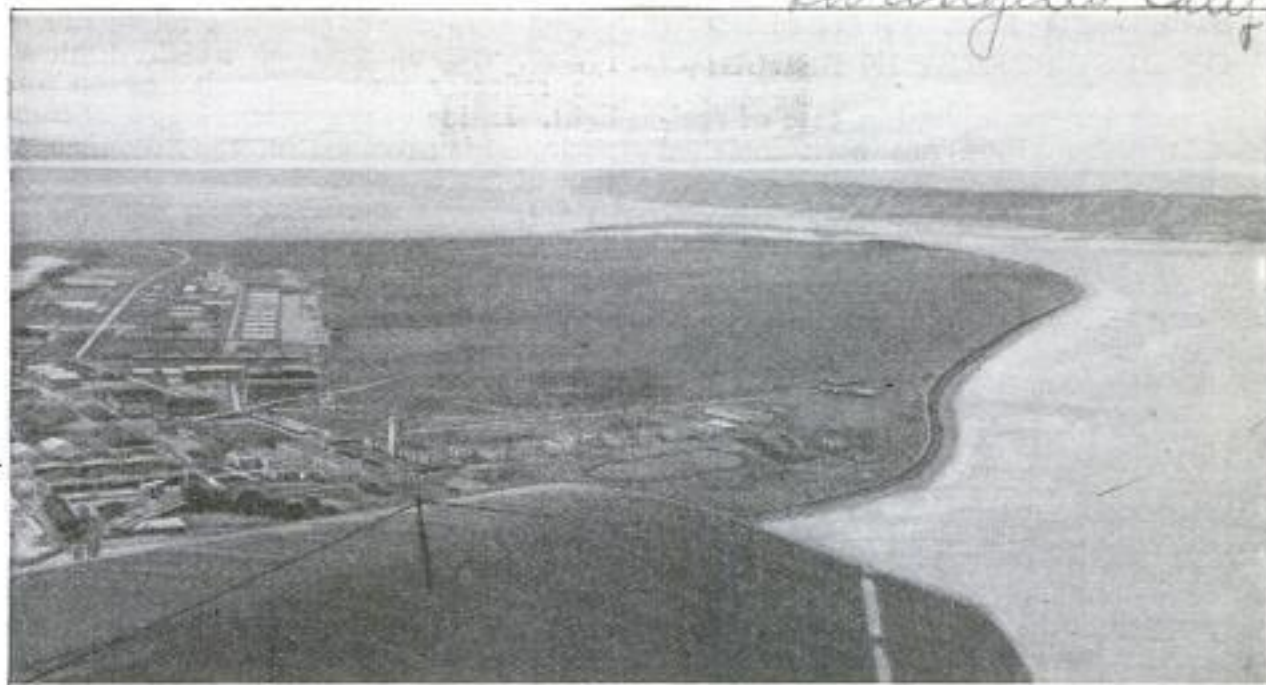


Electric Railway Train That was Equipped with a Wireless Outfit from Which Satisfactory Results were Obtained in All the Experiments Attempted. Above: Part of the Equipment Installed inside the Train

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8218 Cont. Hays + Ford, 416 Union
League Bldg.

Los Angeles Calif.



Airplane View of North Island, Showing Its Broad Expanse of Almost Level Ground: This is Said to Be the Most Nearly Ideal Air-Craft Base in the World. Sunshiny Days, Gentle Winds, and Even Temperature Make This a Wonderful Location for Aeronautical Experimentation

8218

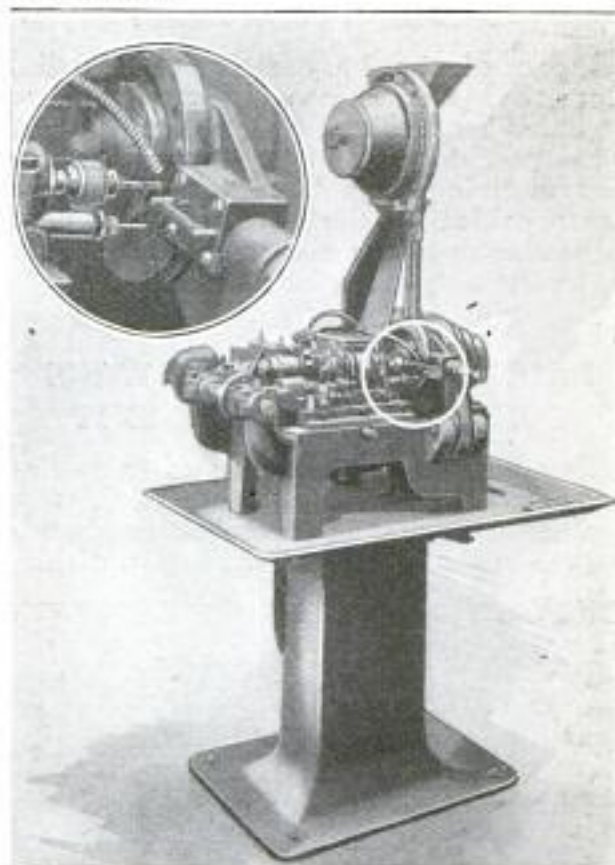
CLIMATIC CONDITIONS PUT FABULOUS VALUE ON LAND

That the climatic conditions may justly be taken into account in fixing the value of a piece of land, was recently exemplified when the government purchased North Island, near San Diego, Calif. The island is to be used as a training station and air-craft base, its exceptional climate making it particularly suited for this purpose. Fifteen years ago North Island was merely a flat piece of land, worth probably \$5,000. Today it is an ideal aviation base worth \$5,000,000, this value being due primarily to the climatic conditions, which make it possible to carry on aeronautical experiments during the entire year, obtaining maximum results with minimum risks. With the rapid advances that are being made in science, who can say what will be the value of land which today is worth only a nominal amount?

TUBULAR-RIVET MACHINE HAS 8.52 INGENIOUS TELLTALE

Because of the small size of the drill used in making small tubular rivets, close attention to the drilling machine has been necessary to prevent the passing through of spoiled work, in case the drill should break. This has led to the development of a telltale that automatically inspects the rivets for proper drilling. The rivets being held in the V-slots, the drill and telltale are moved forward by a cam, and

if the rivet has not been properly drilled, the telltale pushes it into a compartment separate from the compartment for the properly drilled rivets. The telltale may be adjusted for different depths of drilling if necessary.



The Tubular-Rivet Machine: The Insert Shows the Drill with the Telltale below It. Improperly Drilled Rivets are Rejected by the Telltale

Reichel + ...

8.52 is copyrighted material
circled

8/82 **FIRST-AID BOX INSTALLED ON BUSY STREET IN BERLIN**

To care for the injured in case of accident, a first-aid box has been installed

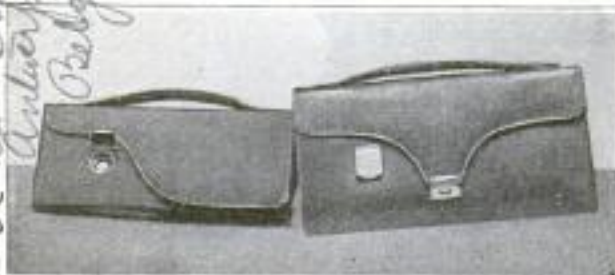


Conveniently Placed near the Curb, This First-Aid Box Contains Essential Articles Which may be Needed in Case of Accident

on one of the busy streets of Berlin, Germany. One compartment of the box contains a stretcher, while others contain bandages, drugs, and necessary accessories for giving first aid. Advertising spaces are provided on the outside of the box. A road map to the nearest hospital seems to be the only thing lacking.

8/84 **LADIES' HANDBAG CONTAINS CONVENIENT FLASHLIGHT**

European manufacturers of novelties have added to their extensive lists a flashlight which is fitted into a ladies' handbag. On the outside of the bag, a nickel-



Left: Handbag with Snap Open Exposing Reflector of Flashlight. Right: Another Form of Handbag with Snap Cover Closed

*Emi. Maurice & Pignone
25 Place de la Bourse
Antwerp, Belgium*

*made in Germany
no record of mfr. made in*

plated snap cover, about 5/8 in. square, is placed, the opening of which discloses the reflector and also switches on the light. Inside of the article, a special compartment is provided for the accommodation of the battery.

8274 **TELESCOPE LONG IDLE NOW PUT TO USE**

Harvard College Observatory will soon put to use one of the largest telescopes in the world, which has been idle since its purchase 20 years ago, at which time it was declared unsuited for the work for which it was intended, because of certain features of construction. However, developments in the science of astrophysics, or astronomy, during the intervening decade, have served to find new fields for these instruments, so that now the 60-in. telescope can be utilized for special investigations of the stars and planets.

n-y. Post 10/22
COAL CHUTE INCLOSED

8168 **TO REDUCE DUST**

As a means of overcoming the dust and dirt nuisance attendant upon the unloading of slack coal, a Texas engineer has produced an inclosed chute. The chute, constructed of galvanized sheet steel and



Inclosed Chute Placed in Position over a Manhole for the Purpose of Unloading Slack Coal without Producing the Usual Dust

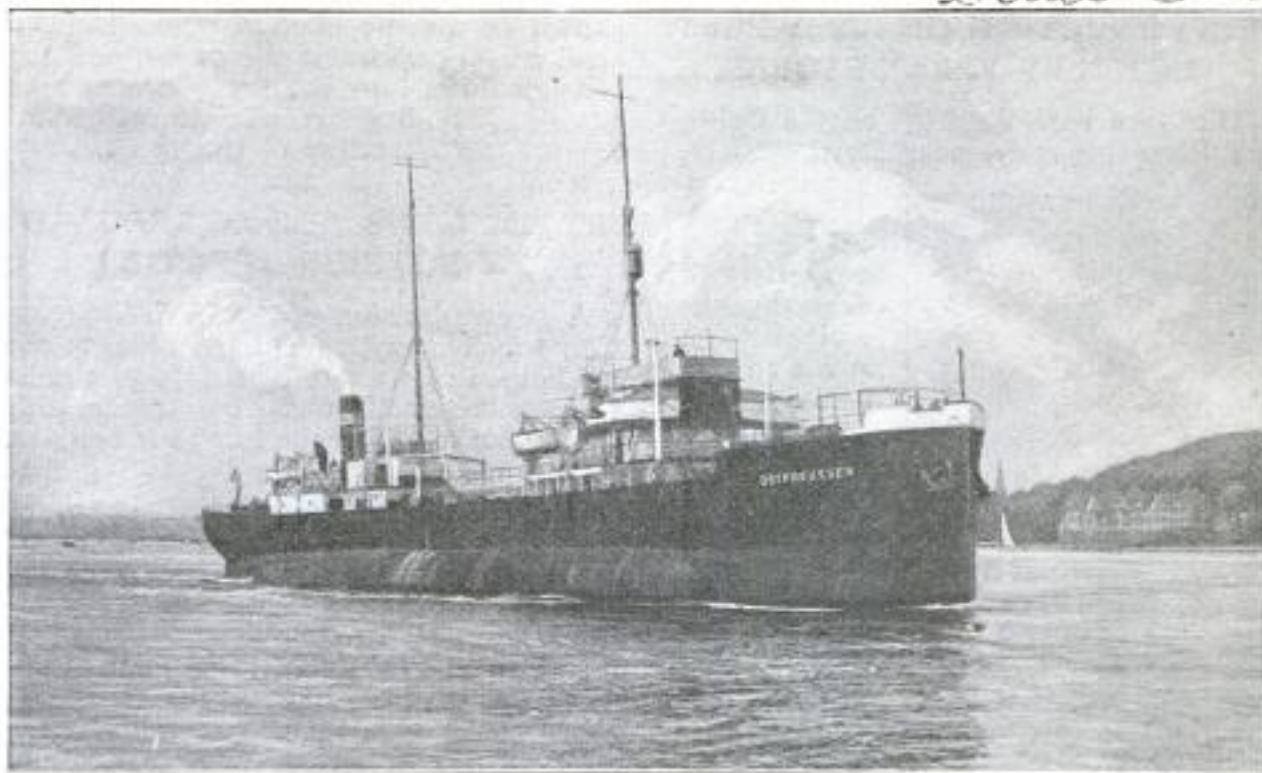
angle iron, has an opening at the top about 3 by 5 ft. square, tapers down to the size of an ordinary manhole at the bottom, and when in position, its height is the same as the common type of coal wagon.

According to recent estimates, 62,000,000 sq. yd. of concrete highway were laid during 1921, almost double the figure for the previous year:

*Emil. John R. Munn, Jr., 1619 Rowley St.
Dallas, Texas.*

Universal Leather Goods Co 442 W. Chicago

8181 Atlantic-Photo Co.
Berlin & W. H. Koeniggratzer
POPULAR MECHANICS
E. Haese 355 62



CONDEMNED U-BOAT HULLS CONVERTED INTO TANKSHIPS

A GOOD example of German thriftiness is their utilization of their condemned submarines. Out of the hulls of two of these U-boats they have built a twin-screw motor tankship, called the "Ostpreussen." A sister ship, the "Oberschlesien," which made its first trip with oil from Texas to Hamburg, encountered very bad weather, and proved its thorough seaworthiness. These ships were built at the Germania Yards at Kiel. They are the first attempts to convert U-boats into trading vessels.

8161 Parkinsons Ltd. Box 87 Revelstoke,
B. C., Canada.



FISH LADDERS ON RIVER OBSTRUCTIONS IN CANADA

FISH ladders are universal at dams and river obstructions in Canada, being compulsory by law. Therefore, they are comparatively more common there than in this country. A good example is one at Calgary, Alberta, at a dam on the Bow River. This ladder enables fish, in the spawning season, to surmount an otherwise impassable obstacle on their way upstream to the glacial waters in the Rocky Mountains.

Civil. Harold B. Day
Portland Telegram

Chicago Tribune
1/17/22

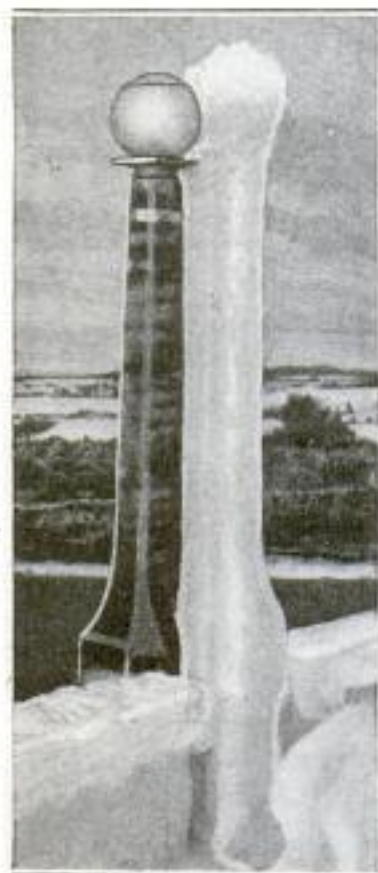
POPULAR MECHANICS

Portland Oregon

356
8229

REPRODUCTION OF LAMP-POST
IN ICE BY FREAK STORM

During a recent storm on the Columbia River highway, near Portland, Ore.,



when rain froze as fast as it fell, some very freakish formations resulted. One particularly quaint, was at a substantial concrete lamp-post, high and very much exposed, where the wind blew so hard that it forced the rain away from the windward side of the post to the leeward, where it quickly froze. The accumulating frozen rain drops grew gradually larger and larger until finally an exaggerated reproduction of the post was formed in ice and snow.

aggregated reproduction of the post was formed in ice and snow.

CHECK PROTECTOR ON PEN
PREVENTS FORGERY

Protection against the activities of forgers is aided by the introduction of a new fountain pen, which has a check-protector attachment. The innovation consists of a small self-inking steel cutting wheel, which is built into the end of the pen, and exposed by unscrewing the cap. After the check is written, the cap is removed, and the red-inked cutter is



Top: Illustrating the Method of Using the Check Protector. Bottom: Cap of Pen Removed, Showing Steel Cutting Wheel of Protector

Kritikson Bros. Inc.
New York City

drawn across the filled-in amount. The steel wheel perforates the paper, and the red ink flows into the perforations; thus rapidly providing an efficient safeguard against any alteration of the check.

STATE LAWS ARE OVERRULED
BY FOREIGN TREATIES

A recent decision of the U. S. Supreme Court makes any state law relating to the holding of real estate by a foreigner subject to the conditions of a treaty with the nation to which the foreigner belongs. The decision establishes the ruling that the California law that prohibits an Italian from holding property in that state is invalid because it is in conflict with the treaty with Italy made in 1871.

ELECTRIC WATER HEATER HAS
HOT-WATER STORAGE TANK



For household use in the kitchen, bathroom, or laundry, a new electric water heater, in combination with a 10-gal. tank, heats the water in the tank in 30 minutes, and if necessary keeps the water hot for 24 hours or more. This is done by means of special insulation between the double shell of the tank on the same principle as in the fireless cooker. The heating elements are between these steel walls.

NEW NATIONAL FOREST
IN PENNSYLVANIA

According to an announcement of the U. S. Forest Service the Allegheny National Forest is to be created on the headwaters of the Allegheny River in northern Pennsylvania. The tract will consist of some 400,000 acres, of which, it is expected, at least 50,000 acres will be acquired during the coming year. The balance will be acquired as fast as appropriations are made by congress.

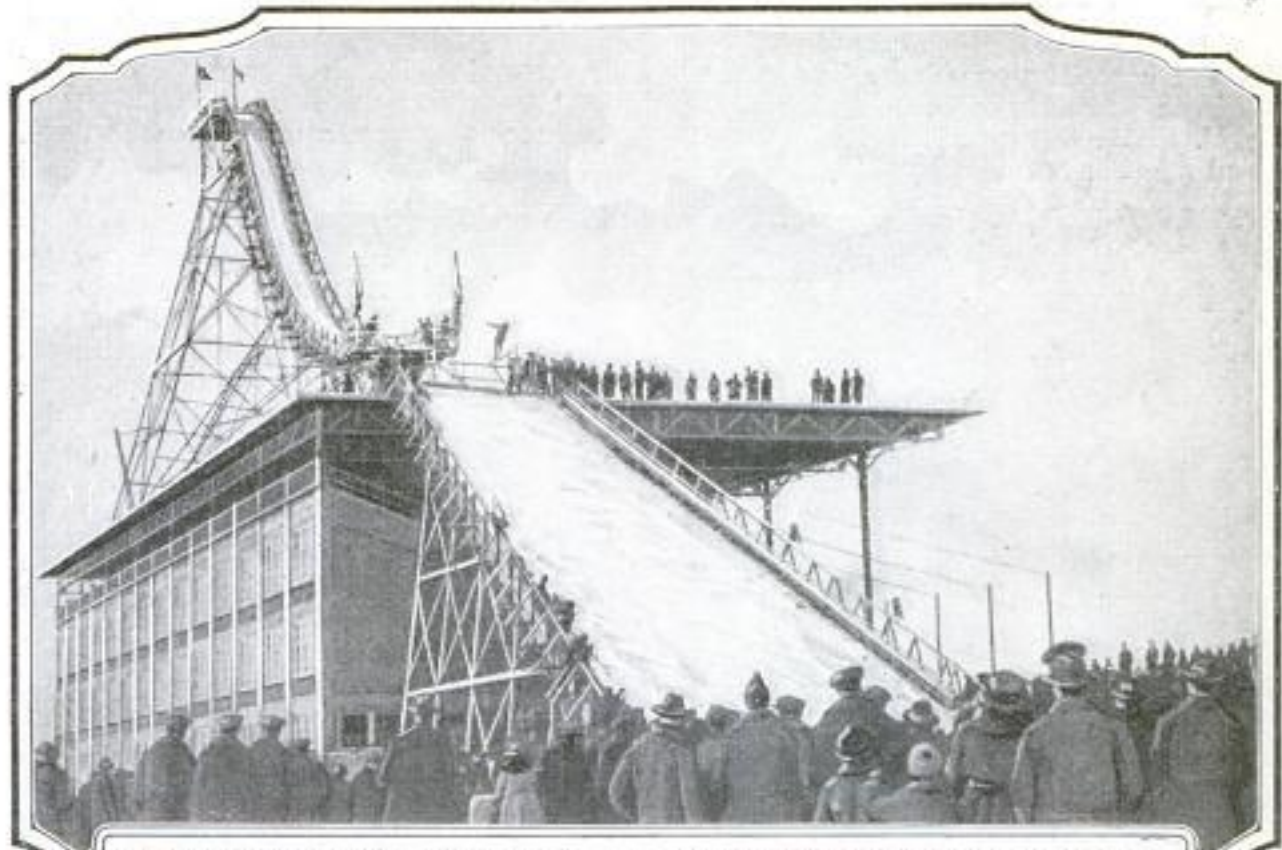
Engineering News Record 1/19/22
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Studebaker Pen Co. 116 W. Illinois St. Chicago

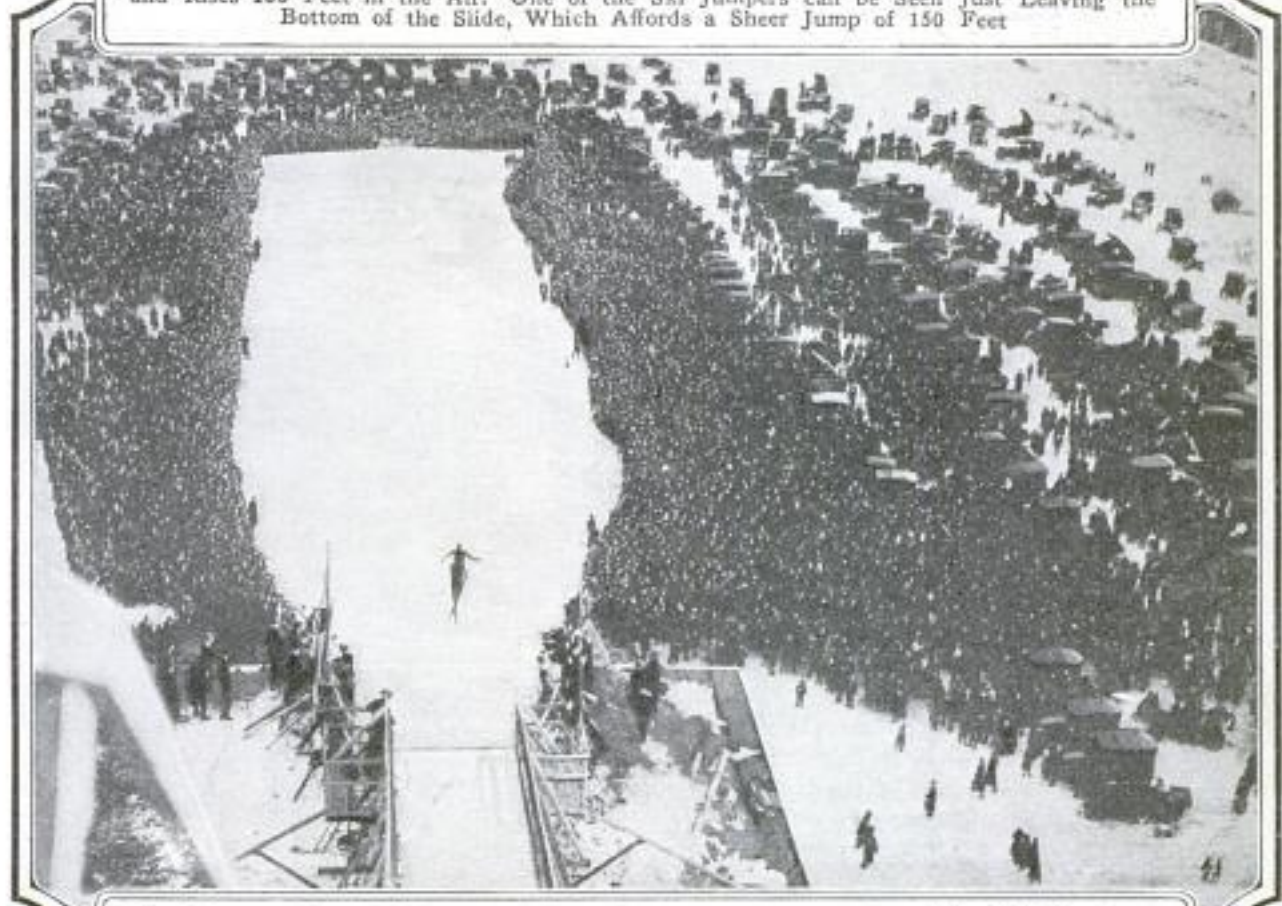
Cook Electric Heating Co. 917 Blankfort Ave

8279

CHAMPIONSHIP EXHIBITIONS OF SKI JUMPING



This is the Largest Ski-Jumping Slide in the World and is Located at Calgary, Alberta, in Canada. It is Constructed of Steel, upon the Roof of the Provincial Exhibition Building, and Rises 150 Feet in the Air. One of the Ski Jumpers can be Seen Just Leaving the Bottom of the Slide, Which Affords a Sheer Jump of 150 Feet



The Mammoth Steel Ski-Jumping Slide as It Appears from the Top of the Tall Structure: In the Foreground can be Seen a Jumper in Mid-Air. Around the Base of the Slide are Gathered Many Thousands of People Who Stand in the Snow and Bitter Cold to Watch the Championship Events, Which Always Arouse the Greatest Interest

MINING METHODS APPLIED TO DAM CONSTRUCTION

BY S. R. WINTERS

*402 District
National Bank Bldg Washington
D. C.*

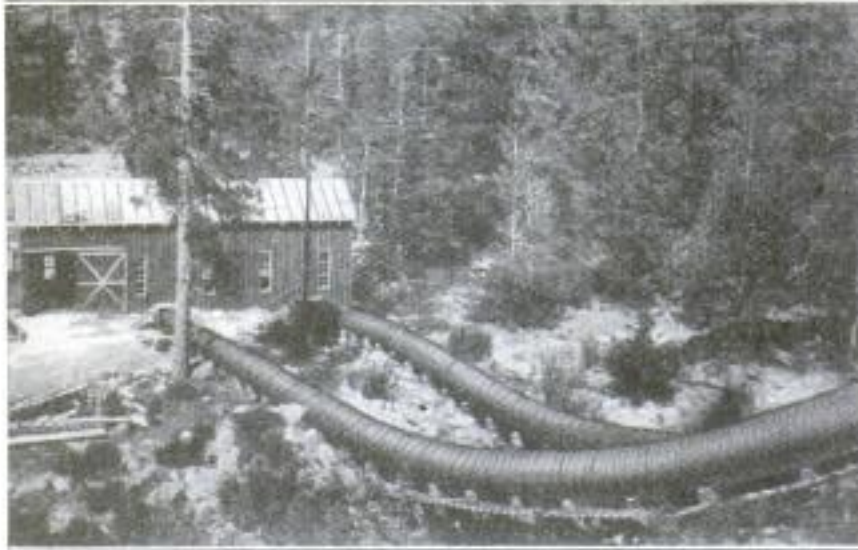
IN the construction of the Tieton dam of the Yakima project in Washington, the U. S. Reclamation Service will have added another noteworthy achievement to

230 ft. and a length along the crest of 900 ft., with a top width of 25 feet.

A concrete corewall will extend through the full length of the dam and from its

crest into the bedrock. The nature of the bedrock encountered will determine the depth to which the corewall will be extended, but in all cases it will be carried to a point where a solid footing is assured. Below the ground level, the corewall will be 5 ft. thick without reinforcement. Above the ground level, it will taper from 5 ft. at the base to 1 ft. at the crest, and will be heavily reinforced. During the placing of this corewall the river is being carried in a diversion tunnel, 2,200 ft. long and approximately 21 ft. in diameter, which will later be used as part of the water-control system.

The excavation for and placing of the



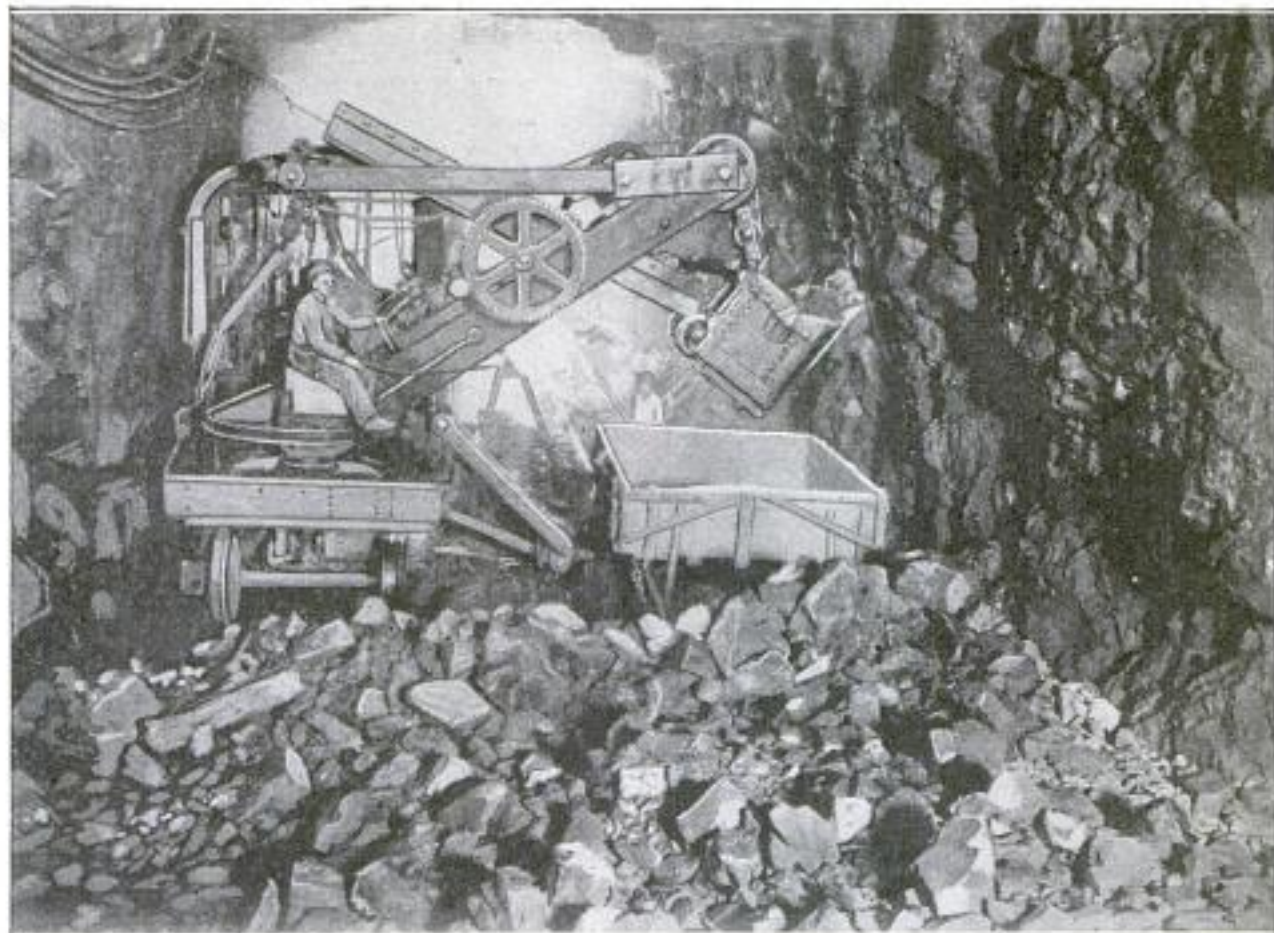
During the Construction of the Diversion Tunnel, a Temporary Power Plant was Installed Which, Taking Water through a Stave Pipe, Converted It into Electric Power to be Used for the Power Shovels and Rock Drills

its already long list. The dam itself will be one of the largest earth dams in the United States, having a visible height of



Site of the Tieton Dam, Which will Rise to a Height of 230 Feet, Being One of the Highest Earth Dams in the United States: A Corewall of Concrete will Extend through the Center of the Dam for the Full Width of the Cañon

7753



Remodeled Power Shovel with Short Boom, Used for Loading Cars during the Construction of the 2,200-Foot Diversion Tunnel: This Tunnel is Driven through the Solid Rock and Is Approximately 21 Feet in Diameter

corewall is one of the features of the work. In the river bed it will be necessary to excavate to a depth of approximately 110 ft. in order to secure a proper foundation. The following method is being used: Three shafts are sunk from the surface of the ground into the bedrock. At the bottom of each shaft a large sump is cut and a pump is installed. Drifts, 6 ft. high and 5 ft. wide, are then driven in both directions along the line of the corewall. The depth of these drifts in the bedrock depends on its nature and contour, but in no case is it less than 5 ft. After the lower drift is completed, a second drift is driven immediately above it. The material from this second drift is broken down into mine cars placed in the lower drift, and from there is taken to the shaft and hoisted to the surface. After the two drifts are completed, the lower drift is filled with concrete from cars running in the second drift. A third drift immediately above the second drift is then driven, and the process is repeated until the surface is reached. This method, known in mining as "stopping," while unusual in dam construction, has proved very satisfactory and has shown marked advantages over the open-trench method.

The embankment will be a hydraulic fill blanketed with rock, the upstream slope with a 3-to-1 grade, and the downstream slope 2 to 1. Material will be brought from borrow pits to a central pool, where a pump will be installed. The fine clayey material will be pumped against the upstream side of the corewall, while the fine sandy material will be placed against the downstream side. The completed dam will contain nearly 2,000,000 cu. yd. of material, and will create a reservoir having a capacity of 202,500 acre-feet.

823 / AIRPLANE HELD MOTIONLESS BY WIND OF HIGH VELOCITY

One of the airplanes of the Air Mail Service was recently caught over Mineola, L. I., in a gale of such violence that it was almost impossible to make any progress against the wind. By careful handling, the airman was able to make a landing, nosing down in an almost perpendicular line with his engine running at full speed.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Bell + Howell Co
1803 Marchmont Ave.
Chicago

La Nature 12/3/21
120 Boulevard de
Serravallo
Paris France

360

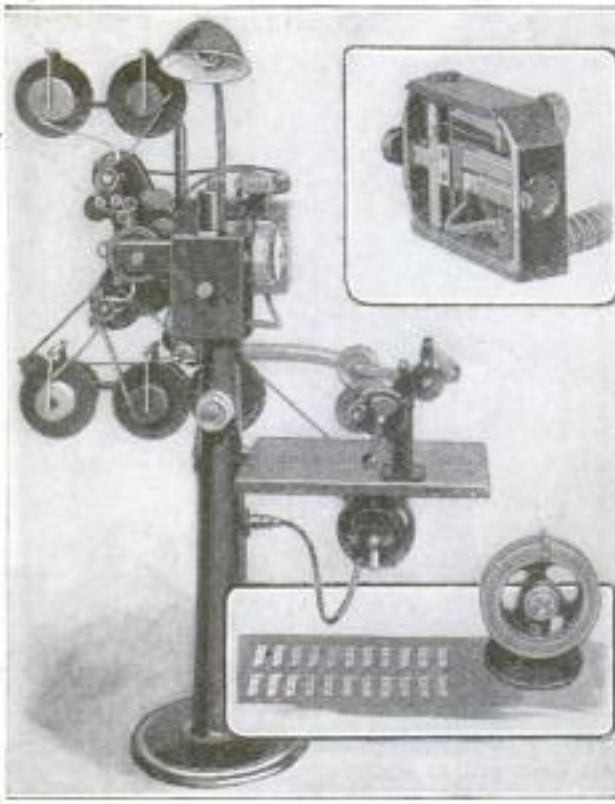
POPULAR MECHANICS
8196
**LIGHT-DENSITY CONTROL
FOR FILM PRINTER**

8022

**REINDEER ACCLIMATIZED
IN BAFFIN LAND**

In printing moving-picture positives it has been found that as many as 22 different degrees of light intensity may be nec-

So complete has been the success of the acclimatization of reindeer in Alaska, that the Canadian government has been tempted to do the same thing in Baffin Land, that great barren island situated between Hudson Bay and Davis Strait. For this purpose herds of reindeer have been bought in Norway, and Laplanders have been engaged for a period of three years to take care of the animals. Six Lap families and their herds embarked, late last fall, at a northern Norwegian port, on a ship specially equipped for their transport.

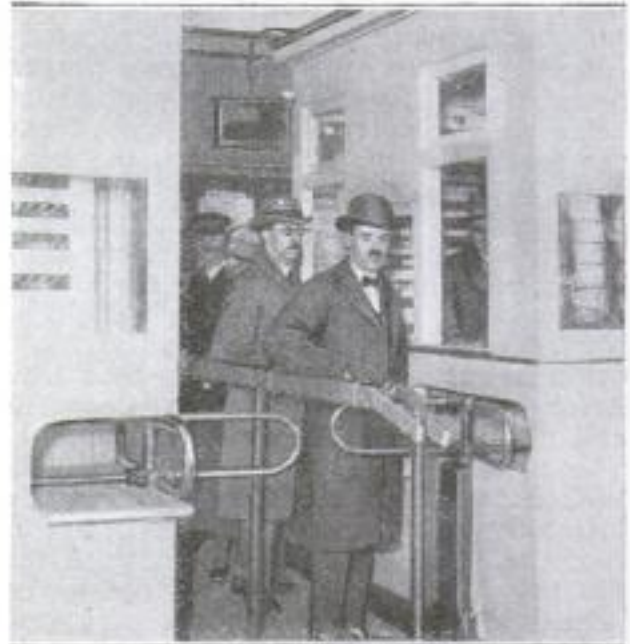


As Film is Printed, Control Keys in the Dial Change the Volume of Light as Necessary

essary in a single reel to compensate for the different densities of the negative. Up to date it has been necessary for an operator to change the amount of light as required by a manual control, but this is now done by a control device which is mounted upon the disk and in which a different key is inserted for each necessary change of light. As each key comes into position, the light density is automatically changed by electrical control of the shutter.

8209
**TIMESAVING DEVICE SPEEDS
SALES OF RAILWAY TICKETS**

On systems such as the elevated railways of large American cities, where a flat-rate fare exists for all destinations, passenger tickets are dispensed with, but in a system such as the underground railways of London, Eng., where the fares vary with the destination, tickets are essential. In these conditions, every second saved in issuing tickets is of importance, and a new device is now being tried out that automatically dates the tickets, clips them, and at the same time registers the



Timesaving Ticket-Selling Device being Tried Out on the Underground Railways of London, England: Tickets are Dated, Clipped, and Recorded Automatically, Before the Buyer Passes the Self-Registering Turnstile

8261
**METAL OXIDATION PREVENTED
BY ALUMINUM TREATMENT**

A process for preventing the surface oxidation of metals or alloys exposed to high temperatures has recently been patented. The metal to be treated is placed in a retort filled with fine-powdered aluminum and heated to redness. The aluminum penetrates the surface of the metal, and when exposed to high temperatures after this treatment, the surface becomes coated with a layer of aluminum oxide, which prevents further oxidation of the metal beneath.

operation on a cyclometer, before allowing the buyer to pass a self-recording turnstile.

General Electric Co. Inventors
Schenectady, N.Y.

The Engineer 12/30/21

Wide World Photos
229 W. 43rd St. New York

Users of process } E. S. Doljambé } 1122
 } J. C. Hall } Washington
 } } Calif. - La



Los Angeles
 Calif.

This Seven-Room Bungalow, with all Modern Conveniences, was Built by the New Cement-"Shooting" Process and Has Walls Five and Six Inches in Thickness. The Surrounding Garden Wall Is Only Two Inches Thick and Has Seats Constructed into It in Such a Manner That the Whole Is One Solid Mass

"SHOOTING" HOUSES FROM A "GUN"

BY CLEVELAND GAINES

Concrete Work

"SHOOTING" houses out of a "gun" is the startling latest wrinkle in concrete construction. This radical method of building dwellings in short order, not only has proved successful in the first two houses on which it was tried, but has shown itself to have a number of advantages not possessed by other methods of construction. The gun itself consists of a nozzlelike affair at the end of a 3-in. hose. Dry concrete is put into a container and water forced through it. The mixture is thus made at the last moment before it is applied.



Interior of the Bungalow, Showing the Method of Shooting the Concrete around the Door and Window Frames

In building the first of the houses in this fashion, a one-sided framework of tar paper and chicken wire was erected. Iron reinforcing rods were placed against this and the concrete shot against it with the use of the gun. A wall 2 in.

thick was "shot" in this way, allowed to dry, and the tar paper and chicken wire peeled off. The result was a solid concrete wall. Doors, windows, and plumbing were put in place and the wall shot around them.



Exterior of the Bungalow, Showing One of the Outer Walls before Shooting the Concrete Mixture against the Framework

In similar fashion, ceilings, floor, a fence around the yard, and other parts of the house and yard were shot. Seats were shot into the wall at one place, decorative designs in another, and so on. The resulting house and yard was a complete home in one piece—a monolith.

The second house built with the gun employed wallboard in place of tar paper and chicken wire, with even better results, for the former was much

main office - The Cement Iron Co., Allentown, Pa. Copyrighted material

*4 1/2 Mason Pella
 (C. and C. Home) Los Angeles
 Calif.
 Winter Concrete Bungalows Co., or
 Los Angeles
 Calif.*

more quickly put into place, ready for the gun work. It is probable that this will be the method of forming the framework against which to shoot the concrete, which the inventors will finally adopt.

With the gun method, the walls of a five-room bungalow can be completed in two days. The concrete is applied at a pressure of 30 lb. to the square inch, thus packing it as no other force could do. Concrete improperly mixed is automatically rejected—it does not stick—therefore there is no chance of imperfect materials going into the house. The concrete is practically mixed at the instant of application; thus there is no loss of strength in the concrete, due to partial drying before it is applied. These are a few of the outstanding advantages of the shooting method of house erection. There are many others which must be obvious. It is not necessary to mention the great saving of time effected through the fact that there is no need of building forms into which to pour the concrete, nor the saving effected by having no waste of lumber, such as is the case where forms must be built of wood.

There is no need of detailing the innumerable possibilities or advantages of the method, nor to draw upon the imagination to illustrate them. The few high lights mentioned do that sufficiently. There is no limit to the thickness of the structures shot by the gun—it is simply a case of shooting on more concrete until the desired thickness is attained. In the first house, one of the garden walls is 6 in. thick.

Concrete engineers are of the opinion that this method of applying concrete will eventually replace that of pouring it in forms, as is common at present. There seems no logical reason why it should not, and the many advantages it offers make it very desirable that it should do so. Within a few years, all concrete construction may be by the gun method.



Garden of the Bungalow, Illustrating Some of the Ornamental Effects Obtained by Using the Cement-Shooting Process

8262 — *Signal*
NEW SUBMARINE CABLES OF GREAT CAPACITY

Two new cables to be laid during the year, one between New York and Germany and one between San Francisco and Japan, will have a sending capacity at least six times greater than that of the present cables, if the claims of the engineers are fulfilled. One great difficulty in submarine cables has been the loss of current through leaks and faulty insulation. Recent research has developed an alloy of steel which, it is claimed, will prevent this seepage, and this new alloy is to be used as the insulating cover for the copper core in the new cables. With the seepage loss reduced, the strength of the sending current will be increased, and the speed of sending messages will consequently be much greater.



Another View of the Bungalow Garden, Showing a Corner of the Surrounding Wall into Which is Built an Artistic Seat. The Wall and Seat are Constructed in One Solid Mass

That the Panama Canal is being used to advantage was recently proved, when a new high record for commercial tonnage passing through was set. Eighteen merchant vessels carrying cargo of more than 76,000 tons and yielding revenue of nearly \$80,000 passed through in one day.

*N.Y. Times 1/11/12 8.1
Commercial Cable Co.
20 Broadway New York*

N.Y. Times 1/18/22 P. 15 *Mfr. Bell + Howell Co*
Chicago Tribune 1/23/22 P. 13 *1804 Larchmont*
Ar. Chicago

8271

SNOW REQUIRED FOR SKIING TRANSPORTED BY TRAIN

With one of the largest ski slides in the world, a structure 115 ft. high, built on top of the highest hill at Fox River Grove, near Cary, Ill., and with a chute 360 ft. long, everything was ready for the most sensational kind of skiing at the National Ski Tournament—everything except the snow. The absence of this quite indispensable element in the performance of skiing did not prove to be an insuperable obstacle to the success of the tournament. The Norge Ski Club, which was in control, followed the example of Mohammed, and as the snow would not come to them, they went to the snow, situated in ample quantities at Baraboo, Wis. Thence they brought it by train—10,000 loads of it—displaying their utter independence of the weather man. Although the slide was not in such perfect condition as it might have been, the tourney, which was held on January 22, and attended by 20,000 onlookers, proved to be one of the best ever staged in the history of ski sport. In order to make up for his remissness in the matter of the snow, the weather man provided perfect atmospheric conditions.

METAL END FOR GAS TUBING FITS ANY HOSE CONNECTION

A metal end for gas tubing that will fit any-size hose connection on any stove, hot plate, or gas fixture, without any other adjustment than screwing it tight.



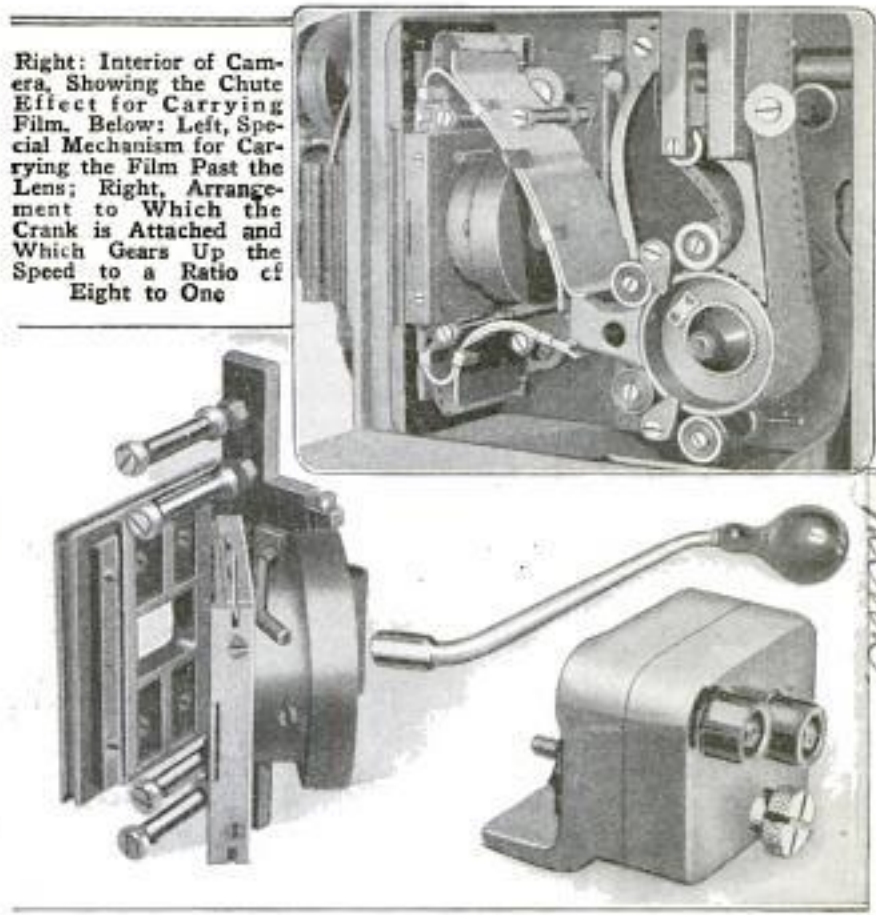
is composed of a thin metal ferrule, partly threaded, and with four longitudinal slots that make it compressible. Over this ferrule is a hollow nut, threaded at one end and tapered at the other, so that when it is screwed on the ferrule, it compresses it and the hose end as tightly as desired on any gas connection, making it leak-proof.

Atlantic Tubing Co
Providence, R. I.

CAMERA ATTACHMENT TAKES "SLOW-MOTION" PICTURES

Formerly a specially built camera was required for taking "slow-motion" mov-

Right: Interior of Camera, Showing the Chute Effect for Carrying Film. Below: Left, Special Mechanism for Carrying the Film Past the Lens; Right, Arrangement to Which the Crank is Attached and Which Gears Up the Speed to a Ratio of Eight to One



ing pictures, produced by running the film through the camera at high speed and projecting it at normal speed. Now an attachment is available by the use of which any motion-picture camera will produce films at the rate of 128 to 200 exposures per second, instead of 16 per second, the normal rate. A special shutter mechanism is used, and a gear which gives eight revolutions of the driveshaft to one of the crank. For carrying the film to and from the lens, an extra-heavy chute is used, to withstand the strain and eliminate vibration and static electricity due to friction. The device can be attached or removed in about one minute, and when removed, the camera may be used in the regular way without further change.

Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages, but this information is kept on file and will be furnished free by addressing our Bureau of Information.

Carl. Arthur Halstead
317 Cedar Ave. Newmarket
Virginia

Cml E H Lemonon, 27, Rue d'Engliën,
Paris, France.

Armandus. Lucas

364

POPULAR MECHANICS

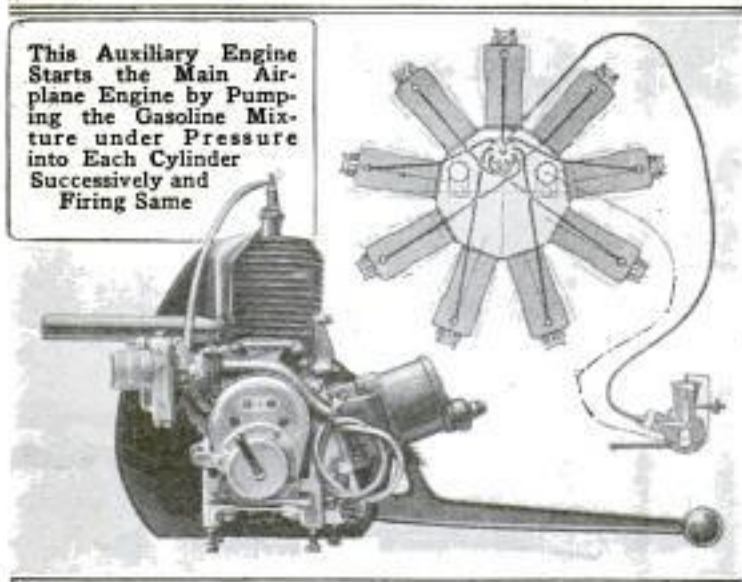
P133

AUXILIARY STARTING ENGINE FOR AIRPLANES

Anyone who has seen a large airplane engine started by turning the propeller

by hand knows what a strenuous and dangerous task this is. To make this dangerous practice unnecessary, the auxiliary starting engine has been developed. It consists of a single-cylinder air-cooled engine mounted on the same shaft with a pump. The pump draws a rich mixture from the auxiliary carburetor and forces it under pressure to the proper cylinder of the main engine, through a distributor which is geared to the main-engine shaft. This causes the engine to start revolving, and, ignition being furnished from the auxiliary magneto, after one or two revolutions the engine begins to fire, and thereafter will be supplied with gasoline and spark from its own carburetor and magneto.

This Auxiliary Engine Starts the Main Airplane Engine by Pumping the Gasoline Mixture under Pressure into Each Cylinder Successively and Firing Same



8276

"CONVERSATION" UNDERSTOOD BETWEEN BLIND AND DEAF

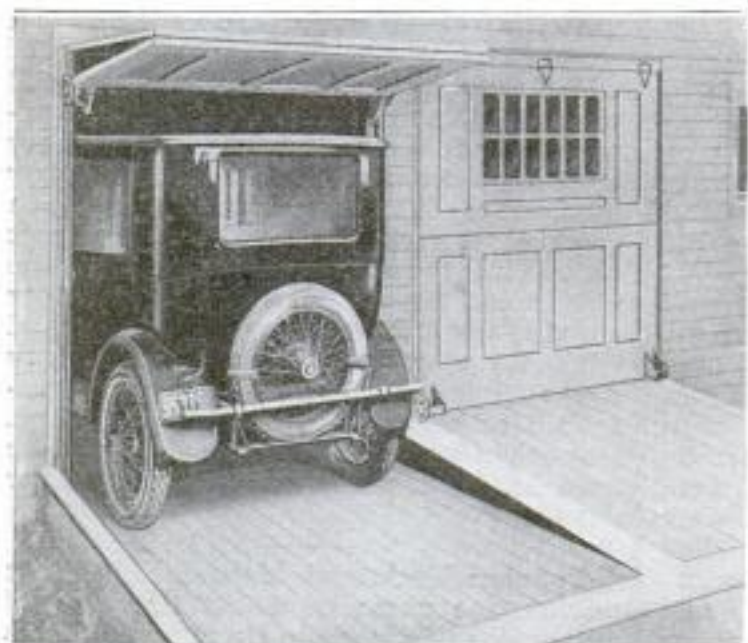
24 Times

1/22/22
P.14

Two blind and deaf girls who have attained world-wide fame, recently carried on a "conversation" by placing their hands on the face and chest of the other, to interpret the vocal sound vibrations. Miss Willetta Huggins, of Janesville, Wis., and Miss Helen Keller were the principals in the demonstration, and each was easily

able to understand the meaning of the other. Miss Huggins also possesses the peculiar ability of distinguishing colors by her highly developed sense of smell, as described in the January, 1922, issue of this magazine.

Subjecting glass in the soft state to a pressure of 3,000 lb. per square inch, to eliminate bubbles, is the basis of an application for a British patent.



Garage Door That is Automatically Opened by Weight of Car on Hinged Platforms, of Which One is Placed on Either Side of the Doorsill, and Closed When the Weight of the Car is Removed from Both Platforms

7801

GARAGE DOOR OPENS AUTOMATICALLY BY WEIGHT OF CAR

Quite a simple form of automatic garage door that is opened and closed by the action of a car entering a garage or leaving it, is composed of a door, pivoted at the top, that folds horizontally at its center, and is raised above the top of the car by the depression of a hinged platform. There is a platform on each side of the doorsill for entry to, and exit from, the garage. The downward movement of the platform raises the door by means of pulleys and small guide wheels, and when the weight of the car is removed from both platforms, the raised door falls to a closed position by gravity, and automatically locks itself.

Edw. Arville C. Johnson, Acars, Ill.



Above: Left, One of the Halves of the House Which was Cut in Two Parts, as It Appeared When Finished and Ready for Occupancy; Right, the Other Half of the Dwelling after having been Given a Covering of Tar Paper While Waiting for the Carpenters to Begin Remodeling. Below: The House Immediately After It had been Severed in Twain, with One of the Halves being Moved to a New Location. The Unusual Undertaking was Made Possible by the Substantial Manner in Which the Old Mansion was Originally Constructed



7990 Alteration
TWO HOUSES MADE FROM ONE *Crankcase*
TO MEET HOUSE SHORTAGE *8/45* **OIL-TESTING INSTRUMENT** *rel. 40*
FOR AUTOMOBILE ENGINES

An ingenious method of meeting the housing shortage was displayed when an architect and a contractor in Pittsfield, Mass., made two houses out of one. Like most communities, Pittsfield has been seriously affected by the lack of house construction during the past few years, and like many towns, especially in New England, it contains a number of large houses, the old mansions of some of the early wealthy families, built in the days when good material and good workmanship were inexpensive. When the owner of one of these residences died, it was closed up and offered for sale. Its 20 rooms, with the attendant expense for care and heating, were too much for any of the present-day families, and it remained empty. Finally the plan of cutting it in two was hit upon. The halves were moved to new locations and finished as separate houses, of nine and ten rooms. Because of the fine construction, they were unusually desirable and easily sold, at a price which yielded the contractor a very profitable return on the investment.

An instrument, similar to a hydrometer that measures the density of water, has been specially designed for ascertaining the condition of the lubricating oil in the crankcase of an automobile engine. On its graduated stem it has a thin celluloid sleeve which can be raised or lowered. On this sleeve are four horizontal spaces denoted successively: good, fair, poor, and dangerous. Any convenient container, such as a pint measure, is first filled with new oil of the kind used in the crankcase. Into this the instrument is placed, and the sleeve is adjusted so that a line marked "new oil" is just at the surface. The instrument is then placed in the used oil to be tested, and the condition of the oil is indicated on the stem by the depth to which the instrument sinks. The "new-oil" line is on the sliding sleeve just below the space marked "good."



S. S. Jackson Co. material
29 N. La Salle, Chicago

4674

366

Mr. Clifford L. Burdick
Berrien Springs Mich
Auto. Mech.

The Engineer
10/14/21

POPULAR MECHANICS

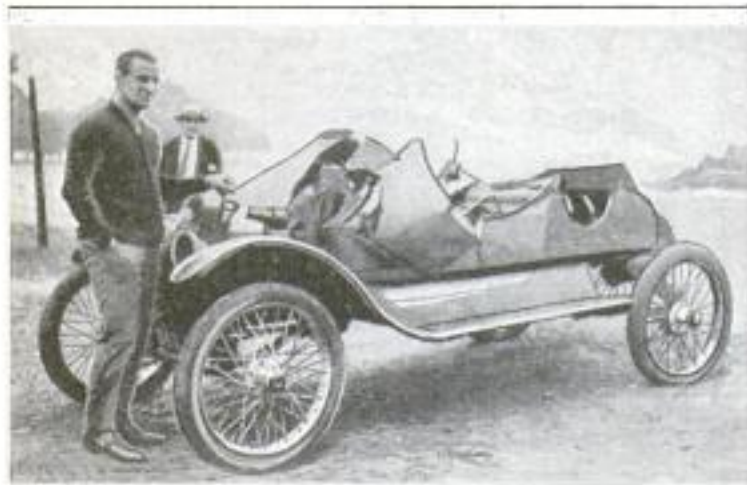
8/93

PNEUMATIC TIRES FOUND WELL INFLATED AFTER SIX MONTHS

RAILWAY SYSTEM OF MOROCCO CHANGED TO NORMAL GAUGE

In one case, at least, automobile tires have remained well inflated for six

Transportation in the French zone of Morocco has heretofore been accomplished over narrow-gauge railways, which were originally constructed for military purposes. With the throwing open of these railroads for commerce, it was quickly discovered that the narrow-gauge type was incapable of handling the constantly increasing amount of traffic. Therefore it became necessary to build roads of normal gauge, and accordingly a program was started which will give the country approximately 720 miles of track, when completed. Coal-burning locomotives will be used in the beginning, although electrification of the system is under consideration, as is the use of oil-



Racing Car Just after having been Dragged from a Lake Bottom Where It had Reposed for Six Months: Note Fully Inflated Tires

months. Two machines were racing on the ice on Lake Winnebago, at Oshkosh, Wis., when one car suddenly broke through. The driver escaped, but the machine went to the bottom. More than six months later, a reward of \$50 was offered to anyone who located and recovered the machine. By dragging the lake it was found in 18 ft. of water. A diver fastened a chain to the axle and a tug dragged it ashore. The tires were found to be fully inflated. After six months on the bottom of the lake the machine was taken to the garage on the old air.

burning engines, should recent indications of an oil field in Morocco prove to be of substantial worth.

8065
IMPROVED VENTILATOR COWLS PRESERVE SHIPS' CARGOES

An improved ventilator cowl has been tried out on several Pacific liners and found very satisfactory. The improvement consists of a simple appliance on the inside of the mouth of the cowl which prevents rain or spray, or even sea water shipped in heavy weather, from running down an open ventila-



tor. This allows uninterrupted ventilation in the holds, with the result that there is no damage to the cargo from sweat, as is common with ordinary ventilators that have to be closed in heavy weather.

The Popular Mechanic's 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.

Mr. J. M. Brown
1402 9th Ave. N.E.
Seattle, Wash.

821
SANITARY MILKING STOOL FOR MODERN DAIRYMAN

In the modern dairy, with its sanitary conditions and white-clad attendants, the old-fashioned milker's stool would be entirely out of place, but an aluminum stool which can be sterilized is now available. A hole through the seat makes it possible for the milker to carry the stool over his arm and still have both of his hands free.



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La Nature 7/31/21

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8198

POPULAR MECHANICS

8080 Brooklyn, N.Y. 367

REPRODUCING ORGANIC CELLS FROM INORGANIC SUBSTANCES

EIGHT GAMES TO BE PLAYED ON THE PHONOGRAPH

Remarkably successful experiments have been made by a Mexican scientist in the artificial reproduction of organic cells from inorganic substances. The biological importance and general presence of fluoro-silicates in cells and tissues have been recognized for some time. In his work of reproduction, the Mexican scientist placed a drop of silicate under a thin plate to which pressure was applied by placing on it a weight of 50 lb. Under a contiguous plate a drop of chloride of calcium was subjected to pressure by a weight of 11 lb. These plates were covered by a glass vessel containing wet rags. The outside of the vessel was coated with plaster, as commonly done by chemists on retorts, to prevent the drying out of the solution. After 24 hours the product was washed, colored, and mounted on balsam, when microscopic inspection showed it to have a remarkable likeness to living cells.

Playing games on the phonograph is the latest form of amusement. A card-board disk is placed on the turntable.

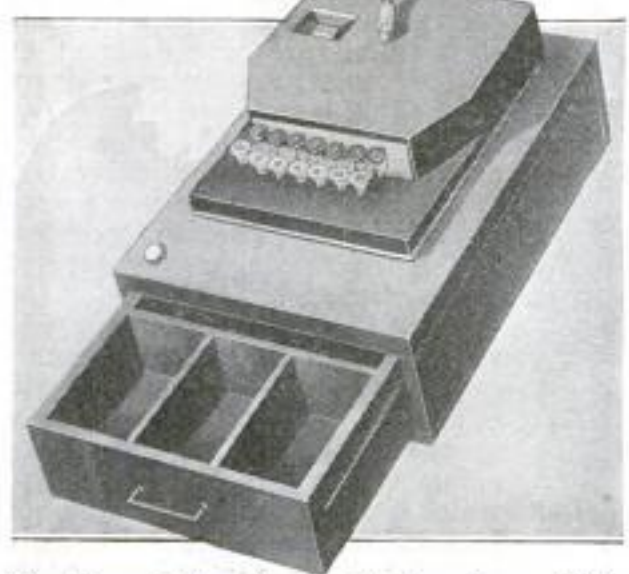


Playing Games by the New Method of Placing a Card-board Disk on a Phonograph: Inset Shows Appearance of Disk and Indicator Used

8247 LIGHTWEIGHT CASH REGISTER IS ADDING-CHECKING MACHINE

A very compact little machine which combines the functions of a cash register, adding, and checking machine, has recently been invented. Used as a checking machine, it is light enough to be easily supported with one hand while the keys are operated with the other hand, yet it is of substantial construction. There are no levers to manipulate, and there are less than 100 working parts, all told. The cash drawer is operated by a push button on one corner of the machine.

This disk has eight circles of letters, numbers, colors, and so on, printed on it. A strip of cardboard, with a hole at one end, is placed over the center pin of the turntable and its other end bent down to support it clear of the disk. This strip has an indicator printed on it for each circle on the disk. The turntable and disk are revolved and stopped. The games progress according to directions and the signs pointed out by the indicator.



Two Rows of Keys Control the Operations of This Combined Cash Register, Adding, and Checking Machine, Which Weighs Less Than Five Pounds

8173 DUST-PROOF RUBBER CAPS FIT AUTOMOBILE-TIRE VALVES

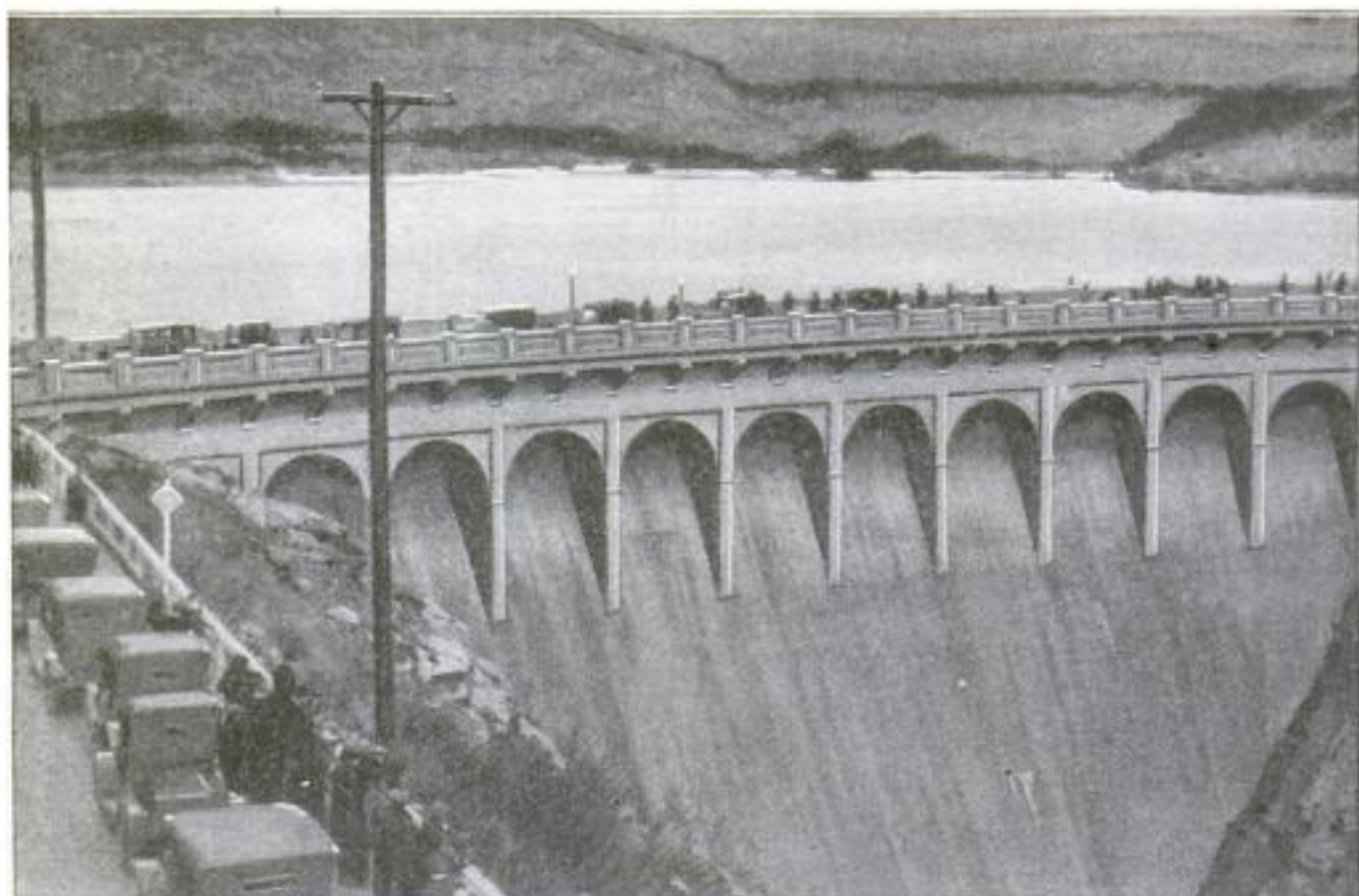
Dust caps for the tire valves of automobiles are now being made of rubber. They are made so that they slip onto the valve stem tightly, without any screwing, and are as secure and dust-proof as a metal cap. Being made of rubber, they are, of course, rust-proof as well.



Letter sold to reader 4/13/26

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Panoramic View, Showing the Huge Dam with the Automobile Drive on Its Crest: The Lake Formed by the Impoundment of the Spillway at the 89-Foot Level, and Some Idea of the Size of the Steps may be Had by Comparison with the People

MUCH WATCHED DAM PROVES SUCCESS

By FRANK B. HOWE

IT will be remembered that some time ago there was chronicled the completion of the Devil's Gate dam in southern California, a piece of engineering involving several new and radical features, whose construction was examined with the greatest interest by engineering experts. With the completion of the dam, there remained nothing to be done except

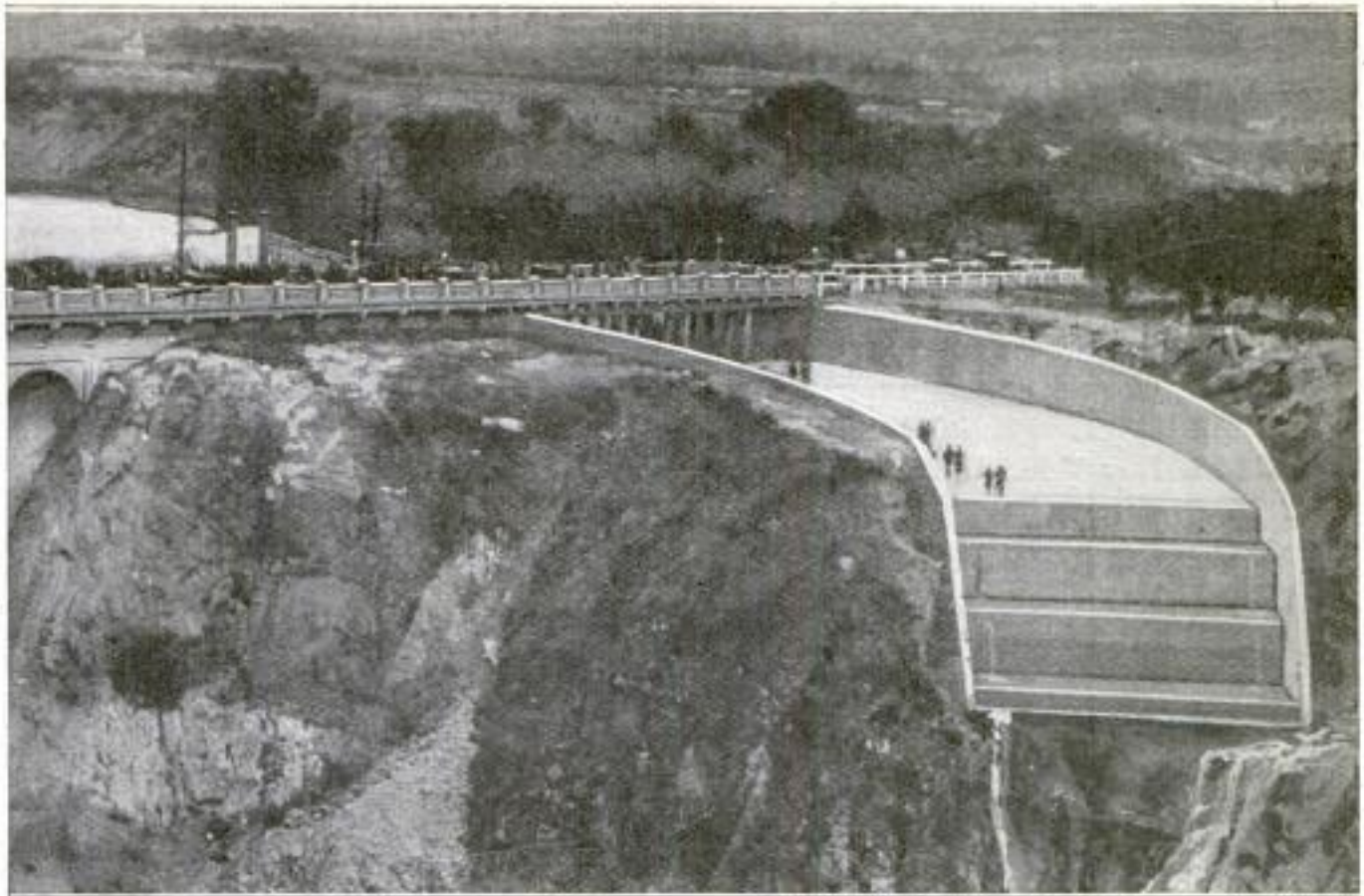
to wait for a storm to see how the innovations would work out in practice.

The test was more than the contractors bargained for. It so happened that the greatest flood southern California has had in 32 years came along to do the work. In three days, a lake 2½ miles long and three-quarters of a mile wide had formed behind the dam. Heretofore storm waters had gone rushing down the Arroyo Seco, spreading destruction as they went, and causing great loss of life and property. Instead, this time the huge dam held the entire mass of water. As an ordinary dam, it was a success, but the greatest interest lay in the functioning of its several special features.

At 89 ft. a large concrete spillway had been constructed around one end of the dam, to carry off overflow water and prevent a great accumulation of water from going clear over the dam, on top of which is an automobile boulevard. It had been expected that this spillway would rarely be needed. The unexpected storm, however, showed the extreme wisdom of



The Outlet of the Flood-Control Tunnel is Located at Some Distance down the Cañon in Order That the Released Waters Rushing Out may Not Undermine the Foundations of the Dam



ed Waters Is Two and One-Half Miles Long and Three-Quarters of a Mile Wide. The Giant Stairway at the Right Is Who are Walking along It. The Spillway is Used Only as an Auxiliary Means of Controlling the Height of the Water

the structure. The water rose to the 89-ft. level on the third day and started to gush over the spillway in great quantities. Here is where the second feature of the dam came in.

An outlet tunnel had been built from the bottom of the dam, not to the other side, but sufficiently far down the cañon from the dam, to prevent its opening from causing a rush of water that might undermine the dam. As the water reached the top of the spillway, this outlet tunnel was opened and the water kept just under the spillway level by drain-



The Spillway Acts Only as an Emergency Overflow in Case of a Sudden Rise of Water in the Storage Reservoir



The Dam Presents a Curved Surface on the Upstream Side and Has the Appearance of a Concrete Wall along a Lake

ing it from below. This water, liberated from the outlet tunnel, was hurled dozens of yards with terrific force; yet, being a long distance down the cañon, it did no damage to the dam, and permitted control of the height of water behind the dam. At its height, a pressure of 12,000 lb. was exerted against each square foot of the dam.

Controlling the waters in this way has done away for the first

time with the peculiar problem with which California is confronted—that of rainfall coming in sudden and torrential quantities. Coming in this way, the resultant waters have swept everything in their path, doing millions of dollars in damage. Heretofore no one has been able to devise a means of handling this water.

The basic principle of the Devil's Gate

dam is to catch this water and stop it; then to let it out gradually and in small quantities, thus permitting its disposal (in the ocean) without causing any damage en route. The success of the dam in its greatest test—southern California's greatest flood—proves the unqualified success of the system, and is a tribute to modern engineering.

8121
**CITY HALL OF PHILADELPHIA
 BRILLIANTLY ILLUMINATED**

Reverence is felt by the inhabitants of Philadelphia toward City Hall, the most

the high tower, and the lighting effect first displayed on New Year's Eve. The tower, sharply silhouetted against the night, served as a beacon to guide the throngs of celebrators who always journey to City Hall Square, silently to watch the huge and lofty clock toll off the last few minutes of the old year, and to greet the new with loud acclaim, thus at the same time paying the old building added homage.

8203
**WATER-POWER DEVELOPMENT IN
 SOUTHWESTERN STATES**

Among the many projects now under consideration in the southwestern states for the development of water power, one of special interest is actually under way in Arizona. The building of a dam in the Grand Cañon, above the intersection of Diamond Cañon, is being promoted by a number of copper companies. The power developed, approximately 150,000 hp., will be distributed throughout the state, especially among the mines of the southwestern part, which are now dependent on fuel oil and coal, the cost of which is constantly increasing. Another project, under consideration in southern

California, is the construction of dams in Boulder and Black cañons that, besides power development, would impound so much water that millions of acres of now idle land could be made arable by irrigation.



City Hall of Philadelphia Illuminated for New Year's Celebration: Two Faces of the Huge Clock are Seen on the Tower. Insert: Plan View of Building, Illustrating the Lighting Arrangement. Each Extreme Corner Has 38, and the Intermediate Points 37 Lamps

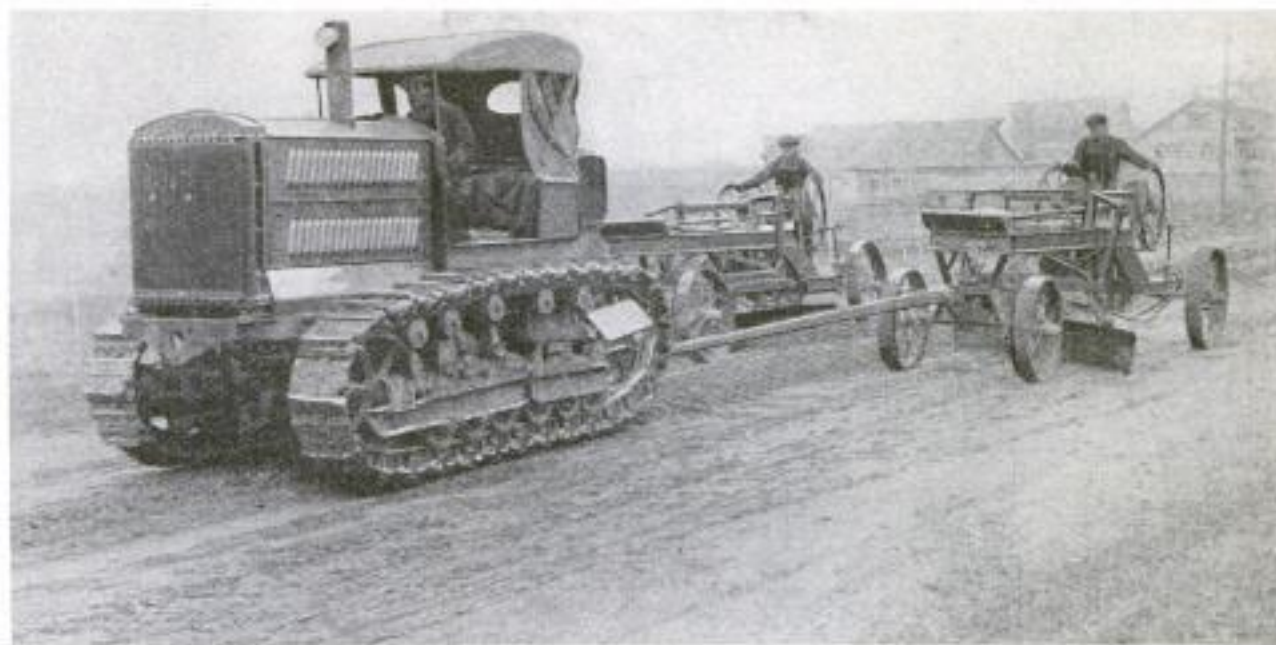
famous of their buildings, and the culmination of this feeling was the brilliant illuminating of that structure. Eight batteries of floodlights, of 500-watt size, and totaling 300 lamps in all, were installed in the form of a square around

*She Mohave County Mince
 + Our Mineral Wealth*

Kingman, Ariz.

Cmd. E. V. Wenzell, 328 N. Redfield St. Philadelphia

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The 10-Ton Tractor Pulling Two Eight-Foot Graders Abreast: More Even Working of the Road is Assured, as the Graders are More Inclined to Keep in Proper Relation to the Crown of the Road

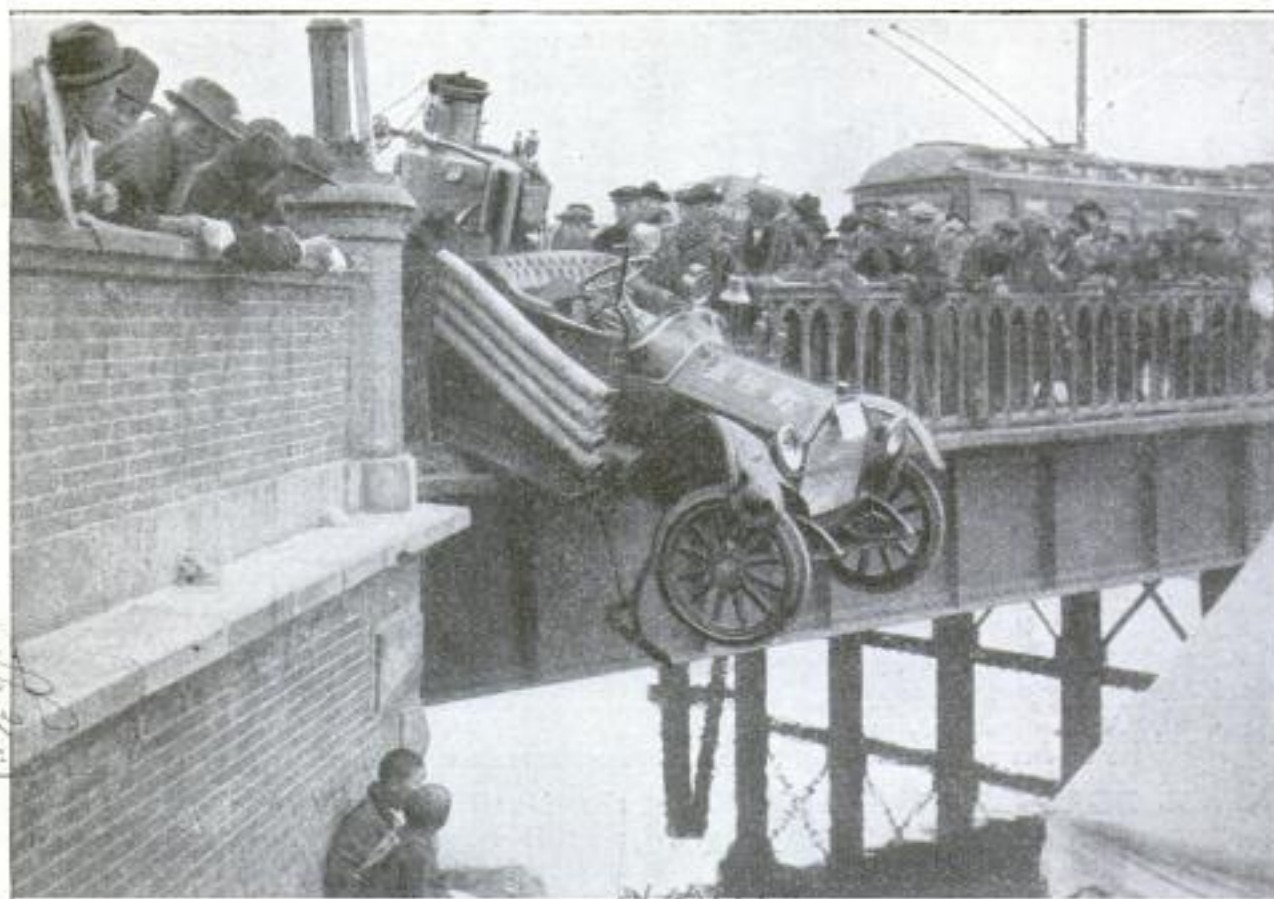
NOVEL ROAD-GRADING METHOD USES TWO GRADERS ABREAST

That such a commonplace operation as the grading of dirt roads is susceptible of improvement has been shown in Wisconsin. It was to be expected that the tractor would displace the four or six horses formerly used for pulling the grader, but

the idea of putting the two graders abreast behind the tractor is novel. A 10-ton tractor pulling two 8-ft. graders has been covering an average of 30 miles of road in a 10-hour day. The crown of the road may be leveled off by adding a small drag in the center, behind the graders, in this way smoothing off the ridge that is usually left.



Showing How the Tractor Keeps to the Center of the Road: The Space between the Graders may be Varied to Suit the Width of the Road. The Cable is Used as a Towline in Crossing Narrow Bridges



JAPANESE MOTOR FIRE ENGINE HAS NARROW ESCAPE

ONLY the guard rail and the weight of the boiler in the rear saved this motor fire engine from a disastrous plunge into the river from the Watanabe bridge in the city of Osaka, Japan. Evidently the Japanese fire departments also believe in speed.

8163
SCENE PERFECTLY PORTRAYED
IN NATURE'S MIRROR

It is seldom that a pool of water is so absolutely motionless that the reflection of a rural scene on its bank is so perfect that in a photograph it is difficult to tell which is the landscape and which the reflection. A recent photo of this kind shows a rustic building, surrounded by trees in full foliage, mirrored in this perfect way in a body of water beside them.

8197
AMSTERDAM STOCK EXCHANGE
SENDS WIRELESS REPORTS

Stock-exchange reports in Amsterdam, Holland, are sent at frequent intervals throughout the day, to nearly 200 banks in that country, by means of wireless telephony. Thus is illustrated another practical use to which this method of communication has been adapted, in the transmitting of the latest prices on the stock market and other commercial information. This, so far as known, is the first instance of such usage of wireless in Europe.



In This Example of Nature's Mirror, Reflections Are So Perfect That It Is Almost Necessary to Indicate on Photo Which Is Which

The Engineer

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7850

Printed by: Broatch & Magendesh
Ice Co., Pepin, Wis.

RAILROADS USE CUTTING MACHINES TO HARVEST ICE

BY F. L. CLARK *McGregor, Iowa*

THE Mississippi is a splendid source of ice for refrigeration uses of the railroads in the northern Mississippi Valley, particularly for lines operating in Wisconsin, Minnesota, and Iowa. At McGregor, Ia., large amounts of ice are annually cut and shipped to various ice houses on the Chicago, Milwaukee, and St. Paul system. At Lake Pepin, ice-harvesting operations are carried on on a large scale every winter for the Burlington company.

The lake is an unusually good place to harvest natural ice because of its size, the fine quality of ice which forms over it, and also because it stays frozen so late in the winter that operations may be carried on for a longer time than elsewhere on the great river. In early steamboating days, when lines of steamers were run from St. Paul in connection with the railroads which terminated on the east bank of the Mississippi, at Prairie du Chien, Wis., and Dunleith, Ill., navigation of the Mississippi below Lake

Pepin was resumed each spring considerably earlier than navigation above it.



Elevating and Loading Machines for Conveying to Railroad Cars, on the Burlington, Ice Cut on Lake Pepin, in the Northern Mississippi Valley. Which on Account of Its Size, Is a Good Place for Harvesting Ice

The word the railroads, river men, and shippers waited for with utmost impatience along in April was, "Ice has gone out of Lake Pepin."



One of the Gas Ice-Cutting Machines, Which have Supplanted Horse-Drawn Machines in the Northern Mississippi Valley: They can be Used on Ice Too Thin to Bear the Weight of Heavy Teams

Gas cutting machines there, as at McGregor, have supplanted horse-drawn machines. They are more efficient and economical, and have this great advantage that in open winters, when ice does

not freeze to great thickness, they can be used with the ice not more than 8 or 10 in. thick, when it would be extremely dangerous, if not impossible, to use heavy teams.

With elaborate elevating gas-run machinery and long scaffolding supporting loading runways at the level of the top of freight cars, whole trains are loaded by the Burlington ice crews at once. The trains are sidetracked beside the runways with doors open, and as the cakes of ice are sent hurrying down the runways, a whole train is quickly filled.



Loading a Whole Train at a Time with Ice on the Burlington Railroad: The Train is Sidetracked alongside the Runway from Which the Ice is Quickly Pushed through the Open Car Doors

N. Sakata 10 Isachome,

Idamachi, Kojimachi-Ku,

374

POPULAR MECHANICS

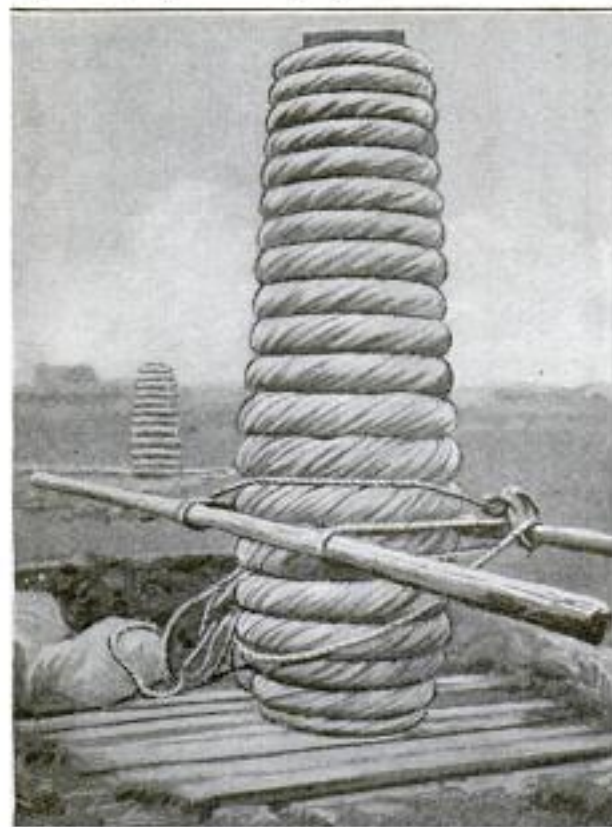
4912

RETURN OF CROWN PRINCE
CELEBRATED BY JAPAN

7548

MARINE-ENGINE CONDENSER
OF NOVEL CONSTRUCTION

When the crown prince of Japan returned home after his recent six months' trip through Europe, he was received

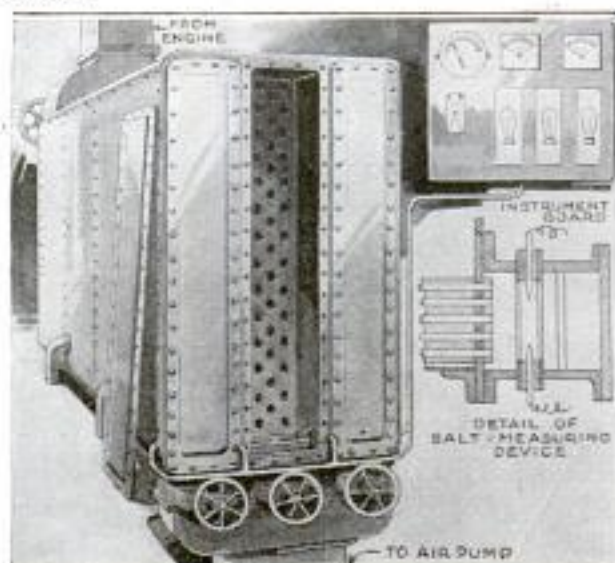


Pyrotechnical Cylinders, the Largest Ever Built in Japan, That Furnished a Brilliant Display of Fireworks to Celebrate the Return of the Crown Prince

with a celebration which was without precedent in the history of the country. One of the striking features was a magnificent display of fireworks. Some of the single pieces cost as much as 300 yen, about \$150, and the balls measured 2 ft. in diameter. The largest balls ever made before that time measured only 5 in. in diameter. When discharged, these great balls expanded to a diameter of 4,851 ft. in the air, and shed sufficient light to read a newspaper anywhere within a radius of four miles, it is said. Not only the prince, but also the emperor and empress, were cheered by the people, a demonstration which has occurred only twice before since the restoration of the present imperial family. Traditional etiquette demands great formality and silence in the presence of the imperial family of Japan, but they seemed to enjoy this exception.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Considerable attention has been attracted to a surface condenser for marine engines that has been invented in Belgium, and patented in several countries. The object of the invention is to eliminate automatically all causes for engine breakdown due to defective feed water, preventing the entrance of salt water into the boilers, and maintaining in the condenser a constant state of cleanliness. The condenser has a steam chamber at one end connected to the engine exhaust, and another at the other end connected to the air pump. Between these two chambers, in the main body of the condenser in which the water circulates, are series of pipes, divided into two or more separate groups, so that one group can be cut off by a shut-off valve from the others, and can be attended to without requiring the stoppage of the engine. In connection with each of these groups is a specially designed salinometer—an instrument for measuring the quantity of salt that there may be in solution in the water of the condenser—that is electrically connected with an instrument board in the engine room, containing warning lamps that by ignition indicate a dangerous condition of the water. At intervals each of the separate pipe groups can be shut off successively, and can have its water spaces cleaned out, so that no salt or grease will ever be there in sufficient quantities to do any harm. Thus the condenser can be kept running continuously, and at the same time be maintained in perfect condition.



Marine-Engine Condenser, Showing Cover Removed from One Group of Pipes, Which can be Cleaned While the Other Two Groups Remain in Operation: Inserts Are Self-Explanatory

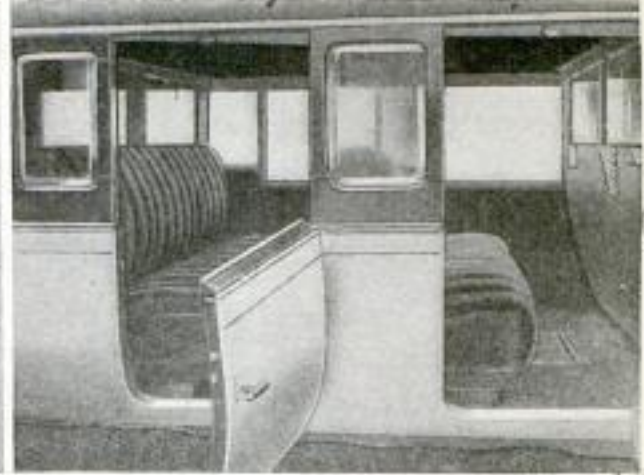
Cl. no. Q. 7548, 68 Patent No. 1111111 (1111111) Amoco

8200

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1106 Pine, Seattle, Wash.

Alex Christie & Co. 1100 E. Pike, Seattle, Wash. 375

Build to order



PACIFIC-COAST MOTOR BUS SEATS FORTY PASSENGERS

TRANSPORTATION on the Pacific coast has been greatly facilitated by the introduction of large motor busses which have a seating capacity of 40 passengers. Five compartments, holding eight persons each, are built in the bus and are separated by glass partitions, so that parties of this number may journey in comparative privacy. The machines, besides being elegantly upholstered, are especially designed to insure comfortable riding, and it is claimed that the average rate of fare is less than that charged for railroad travel.

8046

GERMAN PAPER-PULP MILL FIRST IN ARGENTINA

Initial ventures are not always a success, but the first step in the introduction of paper-pulp making in Argentina, seems to be progressing favorably. German interests are responsible for the undertaking, which is located in the Gran Chaco territory, near the Parana River, and 600 miles from Buenos Aires. A single mill has been erected, that produces five tons of paper pulp per day, for which a ready market is found in the above-named city, thus assuring the prosperity of the enterprise,

and illustrating the pioneering efforts of the Germans in South America.

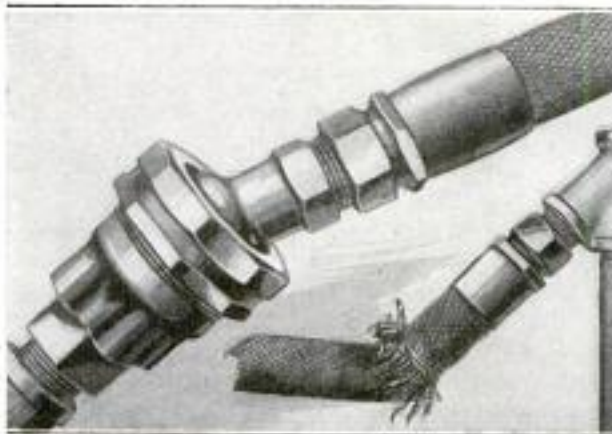


German Paper-Pulp Mill Recently Built in the Gran Chaco Territory of Argentina, near the Parana River, and 600 Miles above Buenos Aires, Where the Entire Output is Sold

7919

SWIVEL JOINT FOR HOSE AT GASOLINE STATIONS

Bending, cracking, and wearing out of hose at the curb connections of automo-



Swivel Joint for Use in Connection with Pumps at Gasoline Stations

bile gasoline stations can be avoided by the use of a new swivel joint for the hose that allows it to be turned or twirled in any direction without injury. It is a common ball-and-socket joint, with a specially designed seat that is kept pressed against the ball by four springs. These are adjustable, and sufficient pressure can be maintained to prevent any leakage at the joint, without interfering with its flexibility. The swivel joint is attached to the pump, and its socket slopes downward so as to act as a spout.

Electrical exports, which now aggregate an approximate monthly total of \$5,000,000.00, are largely composed of orders from the Orient, thus illustrating the steadily growing importance of that part of the world as a market for American-made electrical equipment.

Morrison Bros., Lubuque, Iowa.

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BUILDING SAFETY-DEPOSIT VAULTS

BY T. BENJAMIN FAUCETT

*402 B'klyn. Ave
Brooklyn, N.Y.*

THE safe-keeping of Liberty bonds has made almost everybody familiar with the general plan of safety-deposit boxes

laid across them to reinforce the concrete. This makes a construction that is not only fireproof

but practically proof against burglary as well, because of the time necessary to drill through it.

But, even if the outer walls and the concrete floor were destroyed by design or accident, the valuables within the vaults would be found intact within the well-nigh heat-proof steel wall surrounding them on every side. The entrance to these vaults is guarded by a cylindrical steel door weighing several tons, though it is so accurately balanced that the push of a finger will swing it in either direction. Four

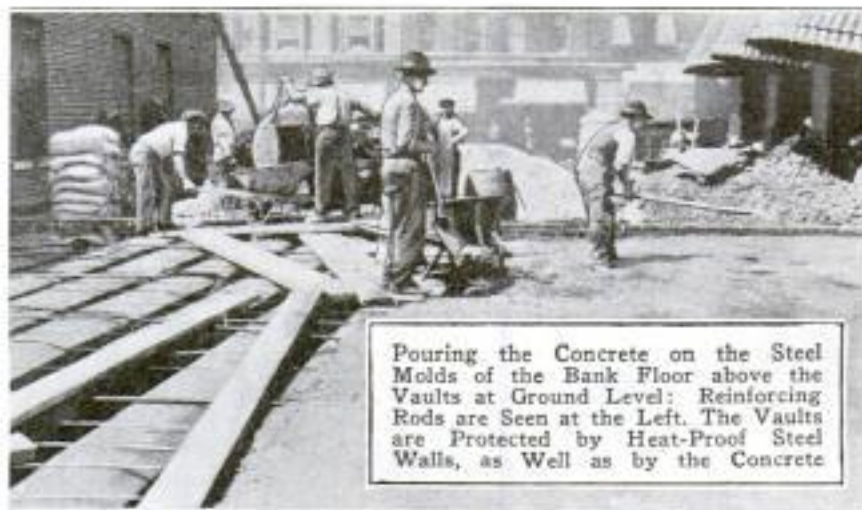


Sheet-Steel Forms for Pouring the Reinforced Concrete Floor on the Ground Level of an Addition to a New York City Bank Branch

and bank-storage vaults. A burglar and fireproof place is necessary for such a bank department, but few know the type of construction required to obtain these qualities. Neither do we realize the various additional precautions and safeguards thrown around even the smallest deposit boxes in order that they may be fully protected.

The building of an addition to a New York City bank branch in a near-residence district offered exceptional opportunity to observe the method of fireproofing the structure. No wood or other inflammable material was used, even the windows and doors being of thin metal, while the glass was of a special kind that will resist terrific heat. The making of the concrete section, serving as a ceiling for the basement vaults and as a floor for the ground-level safety-deposit department, was especially interesting. The metal molds, over which the concrete mixture is spread, are of thin sheet steel, strong enough to sustain the weight of the concrete until it has hardened, and are fitted together in 3-ft. sections, that enable running lengths of molds to be made for any size structure. Before the concrete mixture is poured over the molds, steel rods are

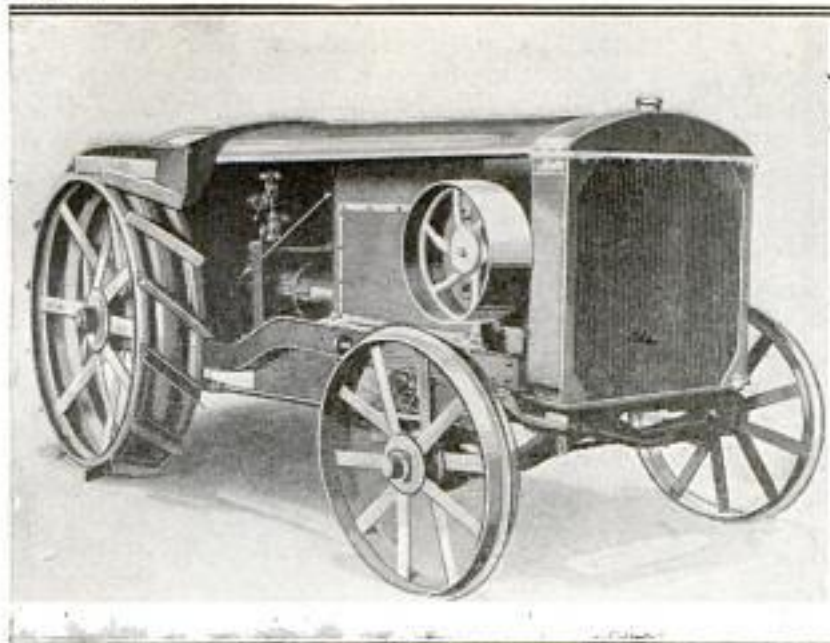
time clocks are on the outer side of it and control the many 3-in. steel bolts that project from its circumference into the proper openings of the heavy steel facing. At the close of business the big doors are shut, the clocks set for opening time the next morning, and when the designated hour is reached the bolts are withdrawn so that the vault can be entered. Four clocks are used, so that in the un-



Pouring the Concrete on the Steel Molds of the Bank Floor above the Vaults at Ground Level: Reinforcing Rods are Seen at the Left. The Vaults are Protected by Heat-Proof Steel Walls, as Well as by the Concrete

likely event that three of them should stop, the fourth would yet withdraw the bolts at the proper time. Electric burglar alarms, directly connected with police headquarters, give quick notice of any tampering with doors or fixtures, while watchmen on the premises are also on constant guard. Bankers believe that prevention is better than cure.

8114

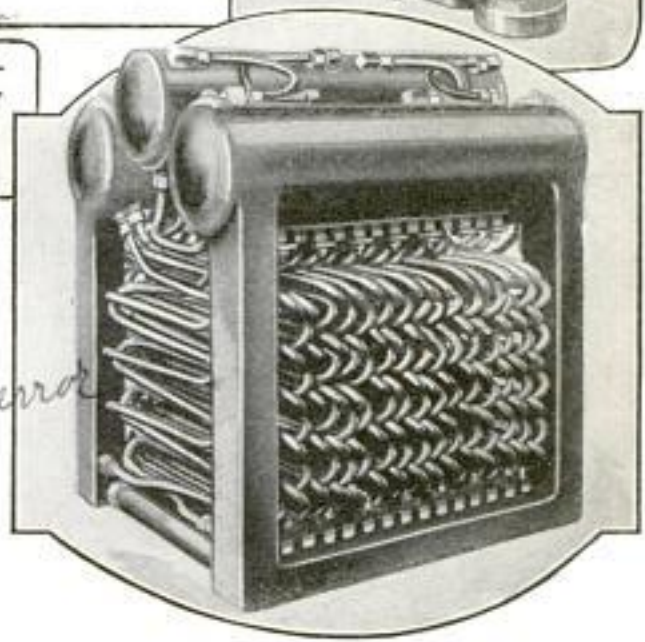


Left: Lightweight Steam Tractor Ready for Operation. The Cleats on the Wheels Are of Angle Iron, and the Removable Belt Pulley is Shown above the Front Wheel. Right: The Engine; All Its Shafts, Piston Rods, Main Rods, and Crossheads Are of Heat-Treated Chrome-Nickel Steel

8114

LIGHTWEIGHT TRACTOR OPERATES BY STEAM

Lightness and simplicity have been combined in a small steam tractor lately put on the market by a Cleveland, Ohio, concern. The machine weighs 5,500 lb., has a rating of 15 to 30 hp., and possesses a speed range of from five miles per hour down to creeping. The steam generator, of water tubing, is sectionally constructed so that any tube can be removed and replaced by a new one without disturbing the others. The firing system is of the vaporizing kind, having a positive automatic steam control which shuts off the fuel when 600-lb. pressure is obtained, and starts it again when the pressure falls below that point. A two-cylinder double-acting engine with piston valves is used, which has a 4-in. bore with a 5-in. stroke. Possessing no electrical parts, carburetor, clutch, or gear shift, this tractor should be popular for its apparent reliability and economy.



The Steam Generator to Which Water is Supplied by Plunger-Type Pumps, Driven from the Jackshaft: The Tanks Shown Have a Capacity of 60 Gallons, Enough to Operate the Machine for from Five to Ten Hours

8164

ITALY DEVELOPS SYNTHETIC INSULATING MATERIAL

As a result of the great activity in hydroelectric development in Italy, a new insulating material, made by chemical synthesis, has been developed. It is said to be ideal for insulating purposes.

BASCULE BRIDGE IN OPENING 191 ROLLS OVER BACKWARD

Recently, at Gray's Harbor, Wash., a bascule bridge of the rolling-lift type—which opens by rolling on a geared track, and to facilitate this is completely counterbalanced around each side of the center of rotation—when being opened experimentally by a newly installed gasoline engine, continued rolling until it fell over backward. In the usual design of these bridges there is a stop provided directly under the heavy concrete counterweight, but in this case this was absent, making the unprecedented accident possible. It was a single-leaf span of 110 ft., originally built for operation by hand.

Power 1/3/22
Sept. 4 Commerce Engineering News Record
12/16/21

Oxy. Acetylene Industries
Suite 1527, Carbide & Carbon Bldg.
New York City

80 378 47

POPULAR MECHANICS

METAL ROSE TREE PRODUCED WITH WELDING TORCH

Realistic in design and beautiful in appearance is a metal rose tree recently pro-



Ornamental Rose Tree Which Consists of Many Pieces of Metal Painstakingly Joined Together by an Oxyacetylene-Welding Mechanic

duced by a Philadelphia welding mechanic. The artisan, Steven Gavoorin, built the tree entirely of metal, except the "hearts" of the roses, which were represented by colored electric lights. Piece by piece the metallic sections were joined by the oxyacetylene torch, until when finished the whole presented a work that appeared almost genuine.

8/47

OLD JINRIKISHA MODERNIZED WITH PNEUMATIC TIRES

The most popular vehicle in the Far East is the jinrikisha. It is as popular there as the automobile is here, and it is apparently adopting some of the latter's refinements, for it is now being equipped with pneumatic tires. The ubiquitous Oriental "rikisha" is a two-wheeled ve-

hicle, built somewhat on the lines of the obsolete hansom cab, with a coolie between the shafts who combines the work of the cab's horse and its driver. The tires now used on the wheels are very like motorcycle tires, with similar inner tube and a flanged type of outer tire.

8202

REPORT SHOWS MINING TO BE HAZARDOUS OCCUPATION

The report of the Bureau of Mines shows that, during 1920, for every thousand persons employed in mines, quarries, and metallurgical plants, 3.19 were killed and 221.22 injured. These figures do not include those killed or injured in blast furnaces. With all our safety devices there seems to be still room for improvement.

New York Times 11/3/21 P. 4

COAL-DUST BRIQUETTES SOLVE FRENCH RAILWAY PROBLEM

8202

Since the destruction of the coal mines in northern France, the shortage of locomotive fuel has been a serious handicap to the railways. The imported coal contains much dust, making it unsatisfactory for use as locomotive fuel, but this dust is now utilized by making it into briquettes, weighing from 6 to 20 lb. and containing as much as 92 per cent coal.

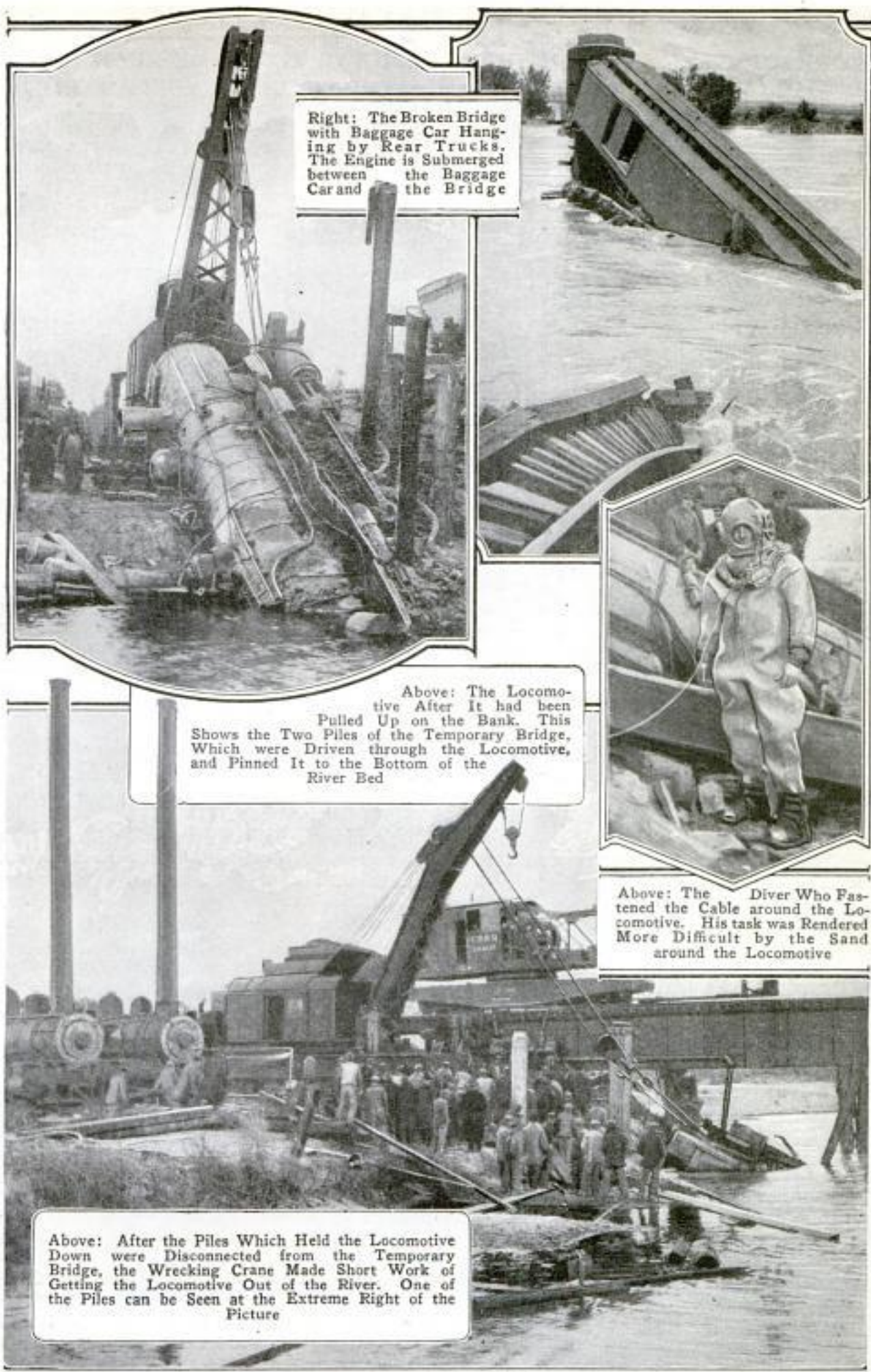
U.S. Dept of Commerce by Magazine SALVAGE LOCOMOTIVE PINNED TO RIVER BED BY PILING

8/86

At the time of the Colorado floods in the spring of 1921, a bridge on the Burlington Railroad near Brush, Colo., was washed out, and a locomotive and baggage car went into the river. In order that traffic might be quickly resumed, a temporary wooden bridge was put in on the site of the washed-out structure. Later in the year it was decided to attempt to salvage the sunken locomotive. Pumps were installed, and the sand which had accumulated over the engine was pumped away. A diver then fastened a cable about the engine, and a 150-ton wrecking crane attempted to pull it out of the river, but without success. Investigation showed that two of the piles which had been driven to support the temporary bridge had passed through the engine and into the bed of the river, one pile passing through one of the driving wheels and one through the fire box. When these piles were disconnected from the bridge, the wrecking crane lifted the locomotive without further trouble.

New York Times 1/8/22 Sec. 8, P. 12

A. D. Lerskov
Brush, Colo.
Copyrighted material



Right: The Broken Bridge with Baggage Car Hanging by Rear Trucks. The Engine is Submerged between the Baggage Car and the Bridge

Above: The Locomotive After It had been Pulled Up on the Bank. This Shows the Two Piles of the Temporary Bridge, Which were Driven through the Locomotive, and Pinned It to the Bottom of the River Bed

Above: The Diver Who Fastened the Cable around the Locomotive. His task was Rendered More Difficult by the Sand around the Locomotive

Above: After the Piles Which Held the Locomotive Down were Disconnected from the Temporary Bridge, the Wrecking Crane Made Short Work of Getting the Locomotive Out of the River. One of the Piles can be Seen at the Extreme Right of the Picture

7768

Isoldwyna Motion Picture Studios, Los Angeles, Calif.

380

POPULAR MECHANICS

8/46

WORK OF ELEMENTS ON HULK IMITATED WITH TORCH

When a motion-picture studio on the Pacific coast needed a weather-beaten old hulk of a wrecked ship for one of its pic-



Means Employed by a Motion-Picture Company to Counterfeit the Weather-Beaten Hulk of a Wrecked Ship: An Acetylene-Torch Outfit was Used to Burn Away and Char the New Lumber

tures, there was none of a suitable type to be found on the beach near by. So a resourceful carpenter conceived the idea of building a "wreck" out of new lumber and turning a man with an acetylene torch loose on it.

The torch worked perfectly, and in a short time as realistic a job was accomplished as wind and waves could have done in years.

AMERICA SETS WORLD RECORD FOR ENDURANCE FLIGHT

By remaining continuously in the air for 26 hr. 19 min. 35 sec., two American airmen have set a world's record for airplane flights. An all-metal monoplane of the JL-6 type was used. The flight took place Dec. 29-30, 1921, at Mineola, L. I., under very adverse weather conditions. The only difficulty encountered, which finally caused the airmen to descend while they still had sufficient fuel for more hours of flying, was the breaking of an oil pipe in the emergency oiling system.

The U. S. Forest Service and the California State Automobile Association have agreed to cooperate in preventing the mutilation of road signs. The signs of the automobile association will be protected by the forest rangers.

TONE OF NEW AMERICAN BELLS EQUALS OLD EUROPEAN ONES

Hitherto the cause of the superiority of the tone of European bells, as compared with American, has been attributed to their greater age. It has now been proved by an ingenious American bell maker that the only effect of their greater age was to wear away the inner surface of the lip of the bell, and the striking point of the clapper, until much greater areas come into contact when the bell is rung. Consequently, it has been a simple matter to cast the bell, and make the clapper, in forms which give this greater contact surface from the beginning, instead of waiting 100 years for time to produce the same condition. This American manufacturer has proved that bells made in this manner possess the desired tonal quality after only a month's ringing, instead of having to wait a century or two.

new York Times 1/8/22

THINNING OF CRANKCASE OIL SHOWN BY SIMPLE METER

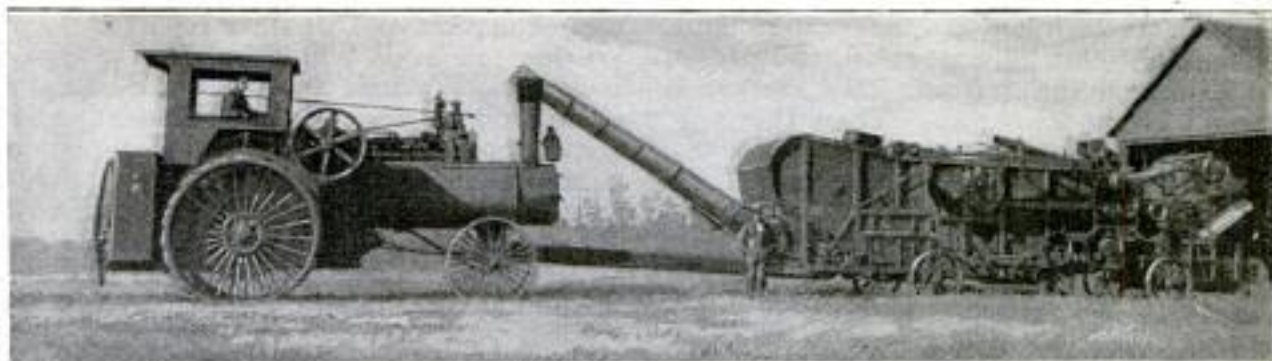
A meter which shows when the oil in the crankcase of an automobile has lost its viscosity, in other words, become too thin, is expected to prove valuable to automobile owners. Much serious damage is done by driving when the oil is in this state. Because of variations in driving conditions, weather, and oils, mileage is an unsatisfactory gauge by which to change oil. The meter has a continuous stream of oil flowing across the dial, behind which is a temperature gauge. As the oil becomes thinner it flows faster and rises on the temperature gauge. When it passes a certain mark, the driver knows that the oil must be changed.



William Ahers, Jr. Co., 10th & N. Street, Philadelphia

Chicago Herald-Examiner 12/31/21

8043



This Threshing Machine, Built from Parts of Seven Different Makes, Is Probably the Largest Ever Constructed. It is Used in the Wheat Fields in the Vicinity of Bottineau, North Dakota



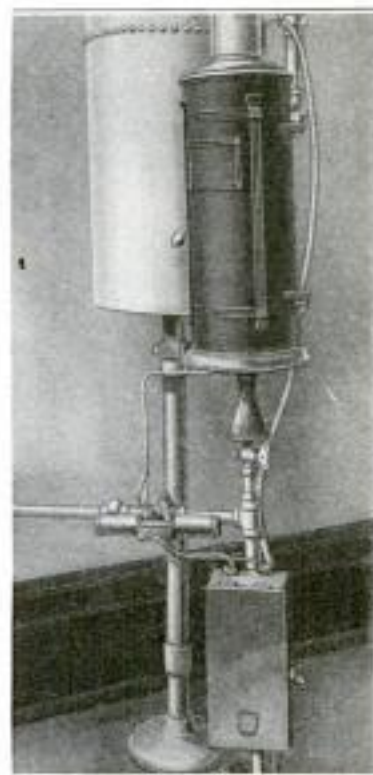
The Outfit, from Header to Blower, Measures 36 Feet in Length, and the Straw Travels over 60 Feet before being Discharged from the Blower. It is Operated by a Crew of 27 Men

GIANT THRESHING MACHINE BUILT FROM SEVEN OTHERS

ELECTRICAL CONTROL FOR GAS WATER-TANK HEATERS

Probably the largest threshing machine ever built is one constructed by J. J. Krogen, of Bottineau, N. D., from parts and attachments of seven different makes of separators. It is so constructed that the grain is separated twice, and it will do 100-per-cent work even when crowded. The length of the outfit, from the folded header to the blower, is 36 ft., and the straw travels over 60 ft. before it comes out of the latter. Its capacity is 4,000 bu. of wheat a day, or 700 bu. of oats an hour. A 110-hp. steam engine, with an 11-in. belt, is used for operating the machine. It requires a crew of 27 men, 21 being needed for pitching.

For lighting the gas under an ordinary tank water heater, an electric switch can be placed in the bathroom, kitchen, and laundry. This switch has "on" and "off" buttons and a pilot light. When the "on" button is pressed, a circuit is closed. This operates a solenoid or magnet which turns on the gas under the heater. A small pilot light, burning all the time, ignites the gas. The lever that opens the gas burner closes a switch on a circuit with the first pilot light, and a second switch in this circuit is closed by a small



WOODEN PICTURE PAINTED WITH NATURAL COLORS

A novel picture has recently been completed by a skilled woodworker in which all the coloring and variations of light and shade have been produced by the natural color of the various kinds of wood used. Thirty-seven different kinds of wood were employed, the completed picture being 22 by 24 in. in size. The scene represents a boy starting on a fishing expedition, accompanied by his dog, the background showing a landscape.

Maker. John S. Perkins, Wilmington, Del. American Forestry Magazine.

N.Y. Times 1/4/22 p. 8.

Brenco Corp 406 6th St. Minneapolis, Minn.

thermostat operated by the heater flame. When the pilot light goes on, the person who pressed the switch knows the gas is turned on and lighted. When the "off" button is pressed, the action is reversed. The thermostat can be set to shut off the heater automatically.

8029 GOVERNMENT INFORMATION BY RADIOTELEPHONE

Recent advances in the art of wireless telephony make it appear highly probable that the government will adopt this means of broadcasting information relating to market and weather conditions. Since April 15, 1921, this information has been furnished the agricultural interests by means of radiotelegraphy, but the simplicity of the radiotelephone, and its universal appeal, give it marked advantages over the older method.

Congress is being urged to establish a Bureau of Communication in the Post Office Department, and if this is done, radiotelephony will be the means adopted for broadcasting information of varying nature. The Post Office Department will draw upon the different government bureaus for information that will not only serve the interests of the farmer, but will be of benefit to the miner, rancher, fruit grower, forester, and lumberman. The service will also be enlarged so that isolated points of the United States may be reached. There are at present eight radio stations, originally established in conjunction with the transportation of mail by airplane, employed as distributing agen-

cies of market and weather reports. They are located in Washington, D. C., Ohio, Nebraska, Wyoming, and Nevada. In the event of the service being extended, new radiotelephone stations will be established in Georgia, Texas, California, Montana, Illinois, and at one point in the New England states.

Already, one specially designed radiotelephone transmitting outfit has been installed, and regular schedules of transmission will be effective early this year. The apparatus itself deserves mention. In transmitting messages a current having a strength of 14 amperes is produced in the aerial, the normal sending-wave length being 1,160 meters. The voice modulation is said to be nearly perfect. Preliminary tests have succeeded in transmitting the

voice in distinct tones, as great a distance as 1,200 miles. The transmitter has three control switches so arranged that low-power input may be used for local sending, or high-power for long-distance sending. Also, it is possible to use either straight continuous-wave system or interrupted continuous-wave system for sending radiotelegraph messages, as well as the continuous-wave system for sending radiotelephone messages, with an adjustment making possible the use of four different wave lengths varying from



Copyright, Harris & Ering
Specially Designed Radiotelephone Transmitting Outfit for Broadcasting Weather and Market Reports, Occupies Small Space, and is Arranged for Either Local or Remote Control

800 meters to 2,000 meters. Four 250-watt "power" tubes are employed in conjunction with a 50-watt amplifier. The transmitter is equipped with an operator's switch so constructed as to render possible the control of the transmitting outfit either locally or at a distance, with an

Director - J.C.
11th St. &

Edgerton U.S.P.O.
Pennsylvania Ave, Washington
D.C.

Emd. S. C. Winters, 702 Ulysses National Bank Bldg
Washington, D.C.

added interphone connection to remote control points. The transmitter is compactly built and may be incased behind a panel, the space requirements being only 7 by 3 by 2 ft. The motor generator is of the three-unit design. A direct-current motor drives a plate-voltage generator at one end, while a combined exciter and filament generator is located at the other end. The plate generator supplies 2,000 volts through the use of two 1,000-volt armatures.

Up-to-date market and weather developments have been transmitted by continuous-wave radiotelegraphy through the use of an arc transmitter. With the installation of a radiotelephone outfit in central headquarters at Washington, eventually telephone transmitters will be installed at all of the broadcasting stations under the supervision of the Post Office Department.

7995 —
SIMPLE FAIR-LEADER MADE FOR GUIDING CABLES

Problems arise in the logging industry, in the effort to wind and unwind steel cables without their becoming entangled,



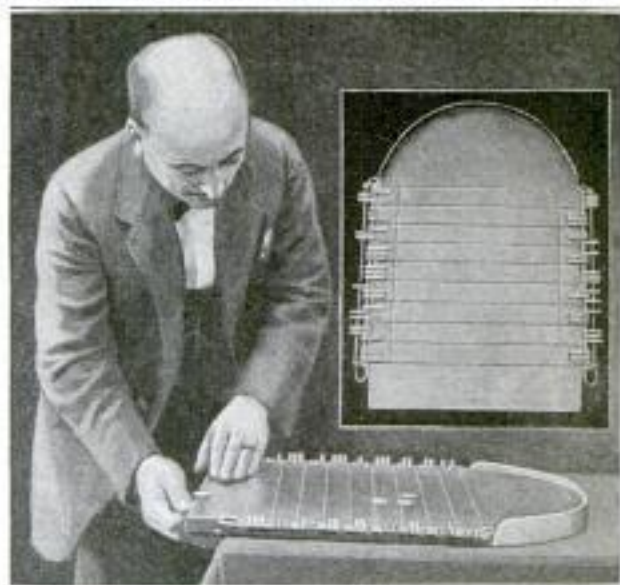
with consequent loss of much valuable time. As a remedy for this difficulty, an Oregon man has made a fair-leader of simple construction,

which consists of a pair of sheaves held in a disk that revolves in the direction of the strain placed upon it. The cable is inserted between the two pulleys, and they are always in line, regardless of what the angle of pull may be.

8095 —
"SHOVEHA'PENNY" BOARD MAKES GAME POPULAR

"Shoveha'penny" has, for many years, been intimately associated with taverns and similar places, in England, as "the poor man's billiards." Because it requires considerable skill, an attempt has been made recently to popularize the game. The method of scoring, with chalk, was very dirty, but a new board has been devised which eliminates this disadvantage. The game is played by shoving coins along a board, ruled off in sections, and the chalk was used to mark scores in the

proper sections. The new board has two rods along each side. Metal markers are attached to the inner rods, three to a sec-

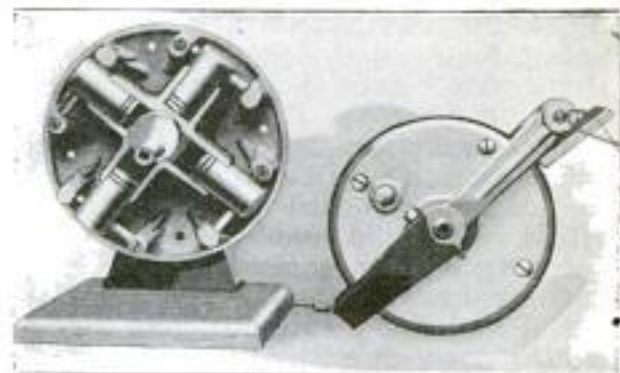


New "Shoveha'penny" Board in Use: In the Insert Is a Top View, Showing the Arrangement of the Rods and Markers

tion, on each side. When not in use these markers rest on the outer rods. To mark a score, a marker is swung over onto the board, in the proper section.

7914 —
MECHANICAL TIRE PUMP OF SIMPLE DESIGN

Patterned after the revolving-cylinder engine, a new tire pump has an eccentric shaft carried on a bracket hinged to the chassis. When the bracket is swung to bring the case into contact with the revolving flywheel, or other rotating part, air is drawn in through one end of the fixed eccentric shaft, and is distributed to the cylinders by air ports in the eccentric. The compressed air is delivered by other air ports to the opposite end of the shaft, to which the air hose may be attached. The pump is so constructed that the entire case may be packed with grease.



Revolving-Cylinder Tire Pump, Delivering Air through Fixed Eccentric Shaft to Which Air Hose may be Attached

*Chas. A. J. Johnson
 Oregon City, Ore.*

*Wm. A. Prichard
 4 Newbury Street
 Boston, Mass.*

*Edw. A. Smith
 c/o George Pringle
 1401 Bushfield Road*

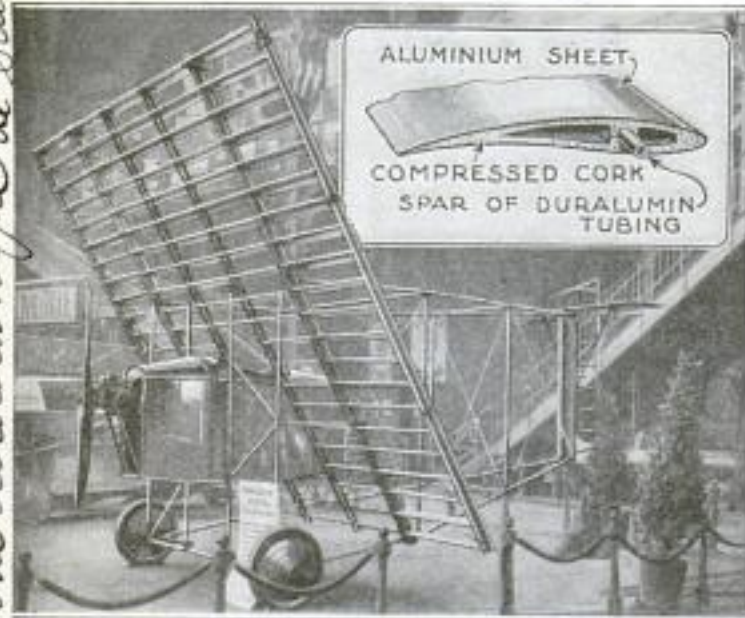
Chelmsford, England

384
8134
Paris France
Builder M. Sanchez
Besa, 2 Avenue
de Bellevue
Sures, Seine
France

POPULAR MECHANICS
FRENCH-DESIGNED MULTIPLANE
HAS STRANGE APPEARANCE

At first glance a new multiplane of French design seems like a step backward, as some of the very early exper-

imental machines were of similar type, but the advantages of the multiplane and the narrow wing have long been recognized. The machine has 21 planes, or aerofoils, of only 6-in. chord, the span being only 14 ft. 9 in. These narrow aerofoils permit a construction which would be impossible in wings of ordinary size, and under test, have proved very rigid and free from vibration, besides being fire-proof. Certain of the outer elements are free to rotate on their central spar, and, by proper connection to the pilot's control, can be made to act as do the ailerons of the standard airplane. Equipped with a 40-hp. motor, this multiplane has a maximum speed of 74 miles and a landing speed of only 25 miles an hour.



French-Designed Multiplane of Small Span, with 21 Narrow Wings, Which Has a Landing Speed of Only 25 Miles. The Insert Shows the Wing Construction in Detail

Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages, but this information is kept on file and will be furnished free by addressing our Bureau of Information.

Director M. Toussaint
Laboratoire Aerotechnique de Saint
Cy

HARNESSING A TREACHEROUS MEXICAN RIVER

Difficulties of railroading along the western coast of Mexico are strikingly shown by the experience of bridge engineers of the Southern Pacific Railroad Company of Mexico in trying to harness the Fuerte River. This is a treacherous stream in the state of Sinaloa, between Hermosillo and Culiacan. When it is on its good behavior, it is a peaceful waterway, but during the flood periods it rises with startling rapidity, sweeping everything before it.

steel girders. Although some of these girders weighed as much as 70,000 lb., they were carried downstream for a long distance by the resistless flood.

When the railroad was first built, the river was spanned by a so-called temporary structure. In addition to 750 ft. of pile and timber trestle, 12 steel deck-plate girders, 70 ft. long, were installed. These were placed on the south side of the river, over the deepest part of the channel where the current was strongest. This structure rose to an average height of 40 ft. above normal low water.

Thereupon it was decided to replace the part of the bridge thus destroyed, in the meantime operating the trains on a temporary track and depressed trestle on a "shoofly" alinement.

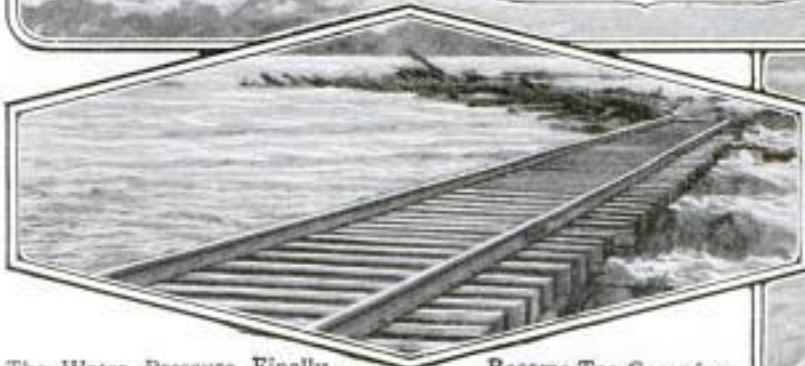
This bridge did good service for several years. Then came a period of excessively heavy rains. When the flood was at its peak, the tremendous current, rushing down at a height of nearly 35 ft. above normal low water, carried away four piers at the lower end of the bridge and dropped into the river five sets of

On the very day that the main bridge was put into service again, the river went on a rampage. Before sunset the raging flood had carried away three of the new piers and dropped four sets of girders. The shoofly trestle was also a sufferer in this flood as it had been in previous flood times.

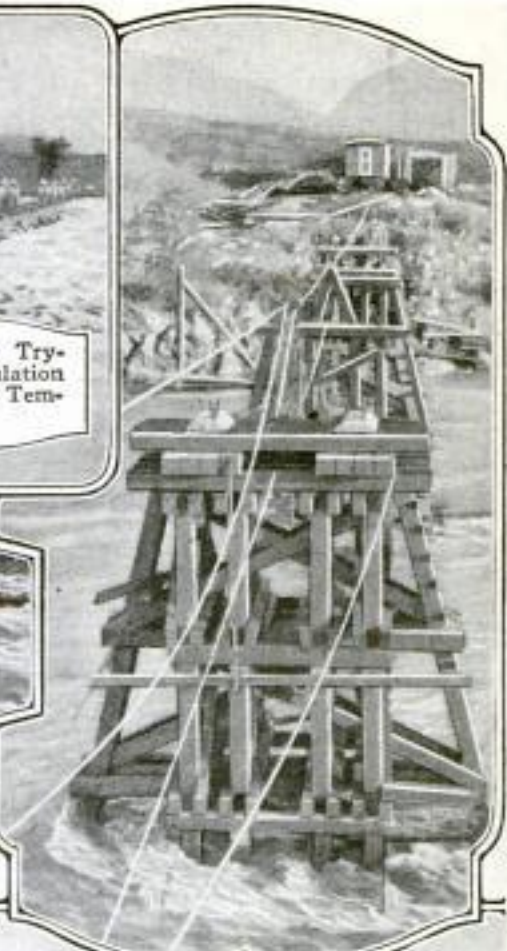
When to these adverse physical conditions is added the consideration that all common laborers, mechanics, clerks, foremen, and master mechanics were native Mexicans, it can readily be seen that the special engineer who was in charge of the bridge work had his hands full when it was decided to sink a pneumatic caisson. However, it was found the men were eager to master the principles and theory of what they were trying to do, and the experiment resulted in the work being completed in good shape.



Laborers were Kept Busy Trying to Prevent the Accumulation of Brush in Front of the Temporary Track



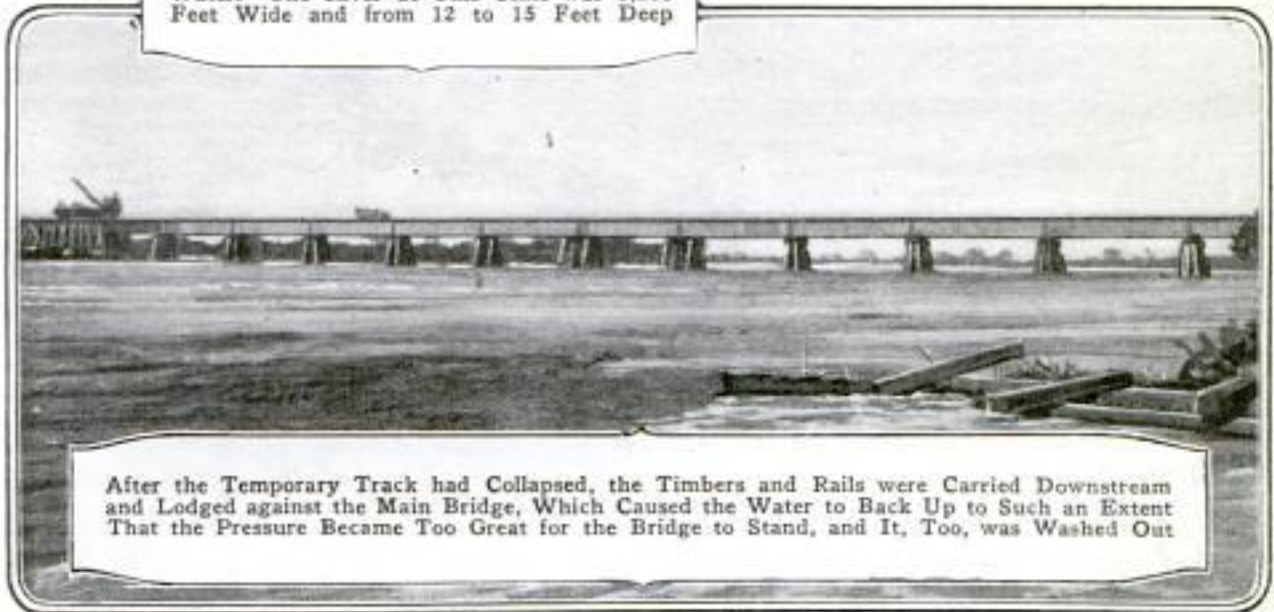
The Water Pressure Finally Became Too Great for the Temporary Structure to Resist, and It Gave Way in the Center, Timbers and Rails being Piled Up like Jackstraws



Above: High Water Delayed the Construction of the Main-Line Bridge. Strongly Anchored Foundations Were Necessary to Withstand the Rush of Water



The Engine is Crossing the River on the Temporary Track Which is Now under Water. The River at This Time was 1,200 Feet Wide and from 12 to 15 Feet Deep



After the Temporary Track had Collapsed, the Timbers and Rails were Carried Downstream and Lodged against the Main Bridge, Which Caused the Water to Back Up to Such an Extent That the Pressure Became Too Great for the Bridge to Stand, and It, Too, was Washed Out

Adel + Becher
153 & 42nd St.
New York City

Com. John W. Keane
Nav. Dept. Bureau of
Navigation, Washington
D.C.

386

POPULAR MECHANICS

FIGS ARE RAPIDLY PICKED
USING WHEELED PLATFORM

SUPERCHARGING COMPRESSOR
FOR AIRPLANE ENGINES

To use a three-wheeled platform for the purpose of picking figs, was the timely idea of a grower of that fruit, in order to

At high altitudes, where the atmospheric pressure is considerably reduced, it is important to be able to maintain the air pressure at the carburetor intake so that it will be equivalent to the pressure at ground level, for which the engine of an airplane is designed. This is done by means of a supercharger in connection with an air compressor. As the pressures required are comparatively low, it has been found possible to do this compression with a modified form of the well-known Root blower. This Root type of positive-displacement blower, used as a compressor for supercharging airplane engines, has been subjected to a great deal of study by the National Advisory Committee for Aeronautics at the research laboratory at Langley Field. Tests made there



Three-Wheeled Platform, Designed for the Purpose of Picking Figs, and with Which Four Pickers can Strip a Tree of Its Fruit in Much Less Time Than would Be Possible by Using Ladders

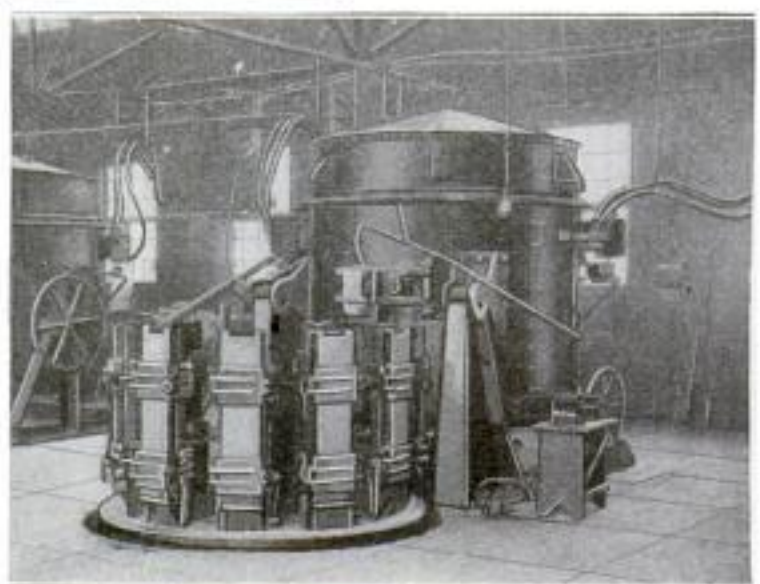
harvest his crop quickly. Bicycle-type wheels were fastened to a wooden platform, which was large enough to hold four pickers, and which was easily pushed around a tree or from tree to tree in much less time than four ladders could have been handled.

showed that, at normal engine speed and a pressure ratio equivalent to an altitude of 16,000 ft., the supercharged unit gave within 11 per cent of its ground-level power output. In nonsupercharged engines there is a 50 or 55-per-cent power loss at that altitude.

ELECTRIC BRASS FURNACE
HAS REVOLVING
MOLD TABLE

The advantages of pouring molten metal directly from the furnace into molds has led to the development of an electric furnace with a revolving table on which the molds are carried. An operator controls electrically the rotation of the mold table, and pours the molten metal as each mold is brought successively into position below the tapping spout.

Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.



The Molds on the Revolving Table Are of Sufficient Capacity to Take the Output of the Furnace

Com. E. J. Case, Wash. D.C.

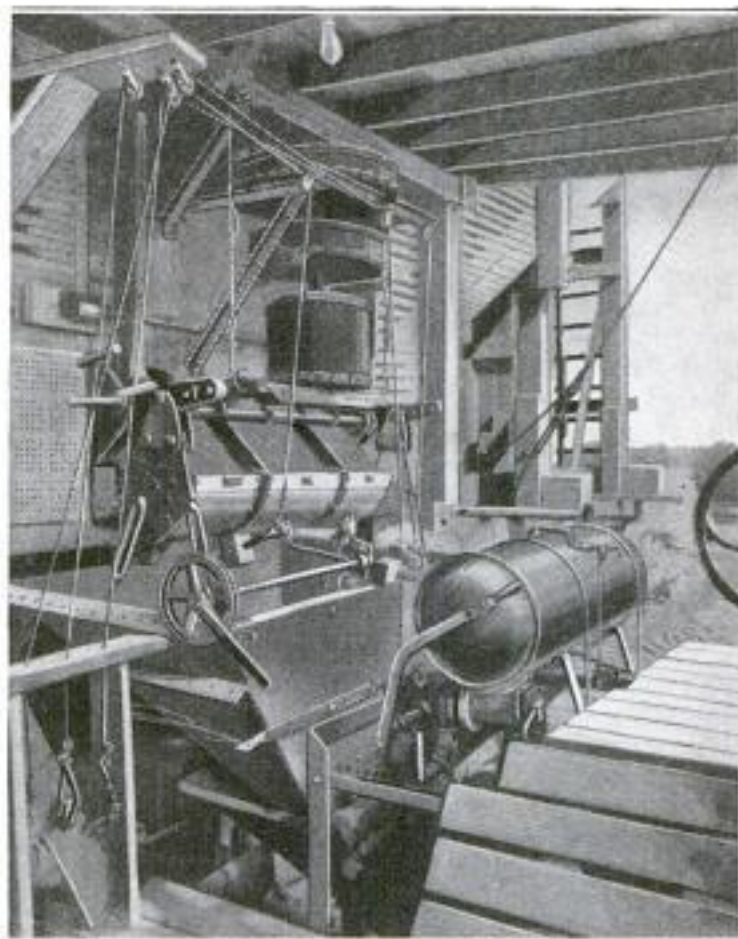
2060

8226

**CONCRETE IS AUTOMATICALLY
PROPORTIONED BY WEIGHT**

One of the latest developments in building equipment is a device that measures and proportions concrete aggregates with extreme accuracy, and with a saving in time and labor. This new proportioner measures the aggregates by weight instead of volume, and only one man is required to operate the mixer as well as the proportioner. Constructed so that it

can be framed into any standard bin is a steel panel having at its lower end three openings fitted with bin gates, the center one being for stone, and the two at the sides for sand and cement, respectively. The gates are operated by cams on a shaft above them that extends the full width of the panel. Bell cranks, keyed to each end of the shaft, have each a long vertical arm which is connected by a series of cables and pulleys to supports for three counterweights, one for each of the aggregates, proportioned suitably so that, when a weight of stone equal to its counterweight is discharged into an auxiliary hopper hung from the lower arm of the bell cranks, this counterweight rises, and through the movement of the horizontal shaft, automatically closes the gate on the stone bin, and opens the cement bin. The additional weight of the cement in the auxiliary hopper has a similar effect on the gate of the sand bin. The batch is then complete, and is dumped from the auxiliary hopper into the concrete mixer, returning every part to its original position, ready to proportion another batch.



Concrete Proportioner That, by Means of Three Counterweights, Discharges from Three Bin Gates below Them, Measured Quantities of Stone, Sand, and Cement into a Hopper, from Which They Pass to the Mixer; after the Discharge, All the Parts are Automatically Returned to Original Position

**PIGEONS AS SUBSTITUTES
FOR WIRELESS MESSAGES**

Innumerable have been the uses of homing pigeons, in both warlike and peaceful services, but it has remained for an ingenious resident of San Pedro, Calif., to make use of them as a substitute for wireless messages in connection with the fishing industry. The home loft for the pigeons is situated on shore at a point central with relation to the area,

extending 70 miles radially, over which the fishing boats operate. Each boat takes out a pigeon, and at the end of the day, before starting for the cannery, there is attached to the bird's leg a regulation army container, in which a slip of paper reports the day's catch. It takes each boat six hours to return to the cannery, and each pigeon not more than one to reach the homing loft, which is so constructed that as the intelligent little winged messenger pushes its way through the entrance door, an electrical connection rings a

bell that announces its arrival. The note is then taken off, and the information is telephoned to the cannery. The value of this advance information is obvious.

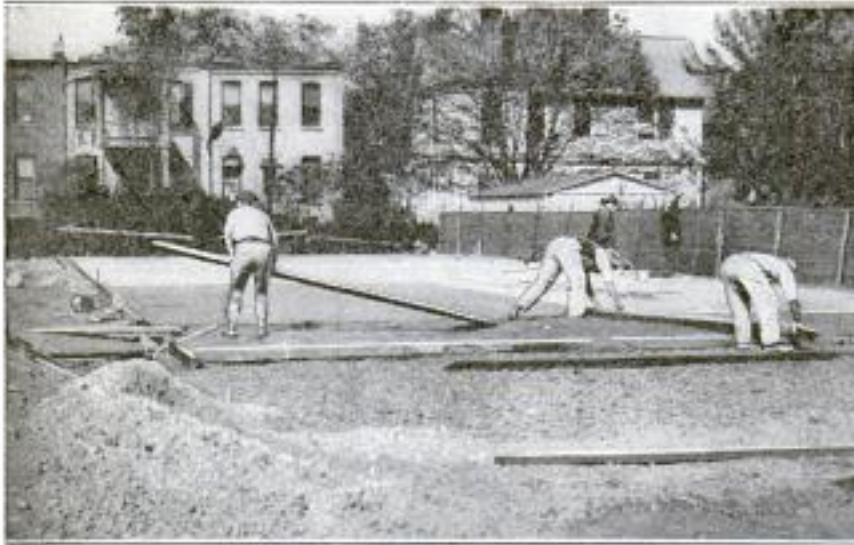
8232

¶The practice of crowding around an airplane when it is about to take off is a very dangerous one and resulted fatally at Red Bank, N. J., recently. An airman landed on the frozen river, and such a crowd collected that there was danger of the ice giving way. In attempting to leave the river, the airplane struck the crowd, killing one woman and injuring several people.

Chas. H. Hayward, San Pedro, Calif.

**CEMENT TENNIS COURTS LAID
 WITH PERMANENT LINES**

Tennis has been growing rapidly in popularity as a sport, throughout the country, and to increase the playing season, asphalt and cement are being adopted for surfacing tennis courts. Though the Pacific coast led in the use of this type of court, New York City, which has lately taken up the idea, has introduced a



Laying a Cement-Surface Tennis Court: The Initial Cost of Such Courts Is High, but There Is Practically No Expense for Upkeep, and They Permit a Much Longer Playing Season Than Grass or Clay Courts

new method of lining the courts. The lines were formerly painted on the surface of the cement. Now, while the cement is still soft, the lines are grooved out and the material removed. After the court, which is laid with cement colored with lampblack to relieve the glare, has hardened, the grooves are filled with white cement. The expansion joint, necessary for such a large surface of cement,



The Cement is Colored with Lampblack to Relieve the Glare, and the Lines are Made by Laying White Cement in Grooves in the Surface

is placed under the net, where it does not interfere with the playing. These courts can be used several weeks earlier in the

spring and later in the fall than clay or grass courts. After a rain, it is not necessary to wait for them to dry, and they do not require rolling and sprinkling to keep them in condition.

**BAGGING LAUNDRY ELIMINATES
 UNSIGHTLY MARKING**

Marking "flat-work" laundry with indelible hieroglyphics as a means of identifying it is no longer necessary under a system installed by a Massachusetts laundry. Under this system the housewife may send her best tablecloths, centerpieces, doilies, etc., to the laundry without fear of having them returned with their appearance marred by marks.

The goods are sent to the laundry in the usual way—with the name on the package. At the plant the soiled articles are put into an individual cloth container, in which they remain while going through the various processes of cleansing.

Marks on the container instead of on the articles permit quick identification after the laundering. Of course, if there is enough in one batch of laundry to fill more than one container, two or three are used.

The first week the no-mark system was in use, there was a reduction of 70 per cent in the number of articles reported missing. Through this process the company expects to lower the number of lost articles to an extremely small figure.

The chances of soiled articles, especially if they are worn thin, being torn or damaged in the washing processes, are also greatly reduced, as the containers afford the articles additional protection.

**RAILROAD IN ALASKA OPENED
 FROM SEWARD TO FAIRBANKS**

Formal opening, accompanied with elaborate ceremonies, of the government railroad in Alaska, between Seward and Fairbanks, took place early in February. Representatives of the chambers of commerce of several Pacific-coast cities were present, and the event was celebrated by an excursion over the entire system.

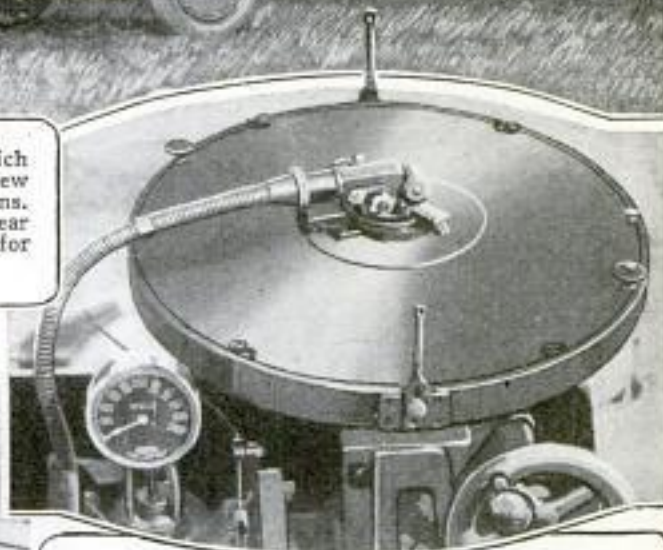
*Write Alaska
 Engineering Department
 of Seward Alaska
 R. C. 39*

*New York Times
 12/2 2/21 1911*

7920



Above: A Truck on Which is Mounted One of the New Centrifugal Machine Guns. The Motor on the Rear Supplies the Power for Operating the Gun



Above: The Drum Which Throws the Round Steel Bullets, and Which Incloses the Principal Mechanism of the Gun. Left: The Method of Mounting the New Gun, on the Dashboard of an Automobile, is Shown in This Picture, Taken during the Recent Tests at Sea Girt, New Jersey

PHOTOGRAPHED BY KEYSTONE VIEW CO.

TESTS MADE OF MACHINE GUN USING CENTRIFUGAL FORCE

Tests were made, not long ago, by the New York National Guard, at Sea Girt, N. J., of a new machine gun of the type in which centrifugal force instead of an explosive is employed to propel the bullets, which are of the ball-shot type and made of steel. They are thrown from a drumlike gun, mounted on the front of a motor truck, at the rate of 1,200 a minute. The power is furnished by a special gasoline motor mounted on the rear of the truck. It is possible to regulate the velocity of the bullets. At their greatest velocity they are capable of killing a man at 2,000 yd. This can be reduced so that, at extremely short ranges, they will merely wound without penetrating the body or causing a fatal injury. Because of this feature, it is hoped that this gun will prove useful in controlling riots without causing fatalities. It was with the idea of this use in mind that the tests were carried out, and the results proved most gratifying.

NEW CROSSING SIGNAL HELPS GUARD DEATH TRAPS

In a determined effort to cut down the tremendous loss of life, and the many injuries which are due to grade-crossing accidents, a large number of illuminated crossing signs of a new type are being installed. Between two bright-red lights is displayed the warning, "Stop." These signs are attached to the posts of the ordinary highway-crossing sign. The two oil lamps have large founts and long-time burners. Back of the letters is a trans-

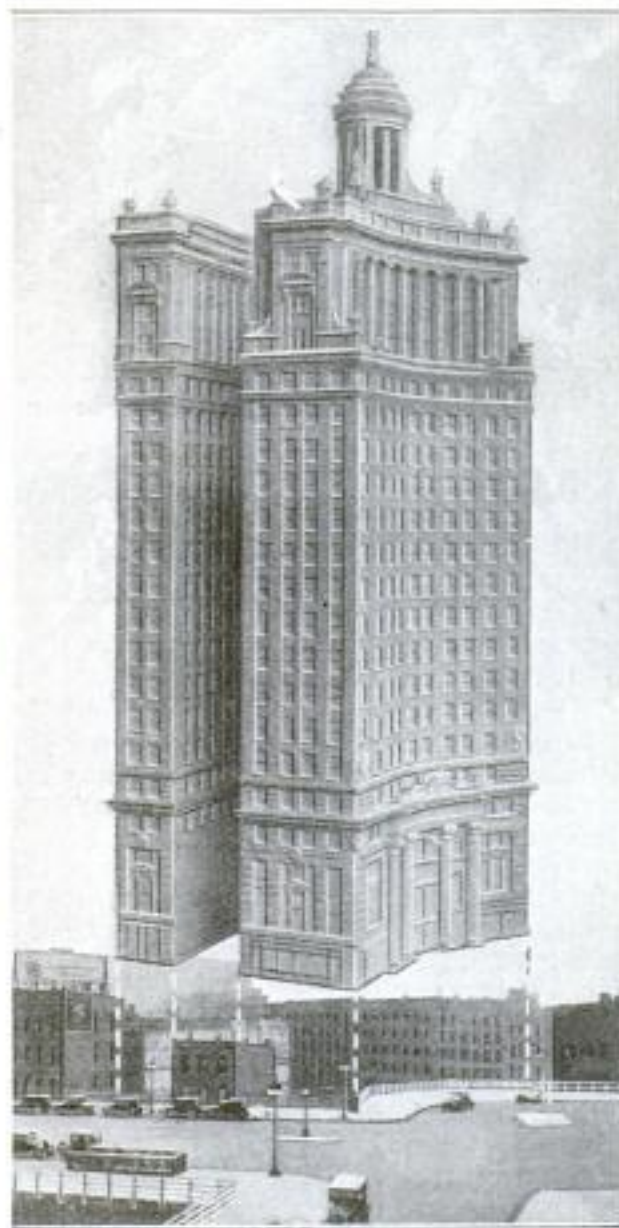


Adams & Westlake
 319 W. Ontario, Chicago

cent glass, on which light is thrown from the two lamps by mirrors set at an angle. By this means the light can be seen clearly for nearly 300 ft. Each container will hold a gallon of oil. The lamps will burn continuously for about a month with a long-time burning oil.

8000
**NEW GIANT OFFICE STRUCTURE
 AROUND OLD DWARF BUILDING**

The greater will include the less—very much greater, and very much less—and include it very completely in a new Chi-



Model, on a Scale of One-Eighth Inch to the Foot, of a 21-Story Chicago Office Building to be Erected around the Old Two-Story Brick Building Which the Owner Refused to Vacate

Chicago office building about to be erected, at a total cost of \$4,000,000, on the site of old Fort Dearborn, facing the new Michigan Avenue bridge. The area of the site

is 13,600 sq. ft., and of this only 1,200 sq. ft., less than one-tenth, is occupied by an old two-story brick building, the owner of which refused to sell out. Consequently, the new building will be built around it, leaving an air shaft above it. The new building will be a superlative contrast to the old one, in both size and finish, for it is to be 260 ft. high, surmounted by a 60-ft. tower, and will have an all-stone finish outside, with marble floors and corridors inside. It will have lights all around, and in every respect will be the last word in modern office buildings.

8135
**SELLING GAS BY HEAT VALUE
 AS WELL AS BY VOLUME**

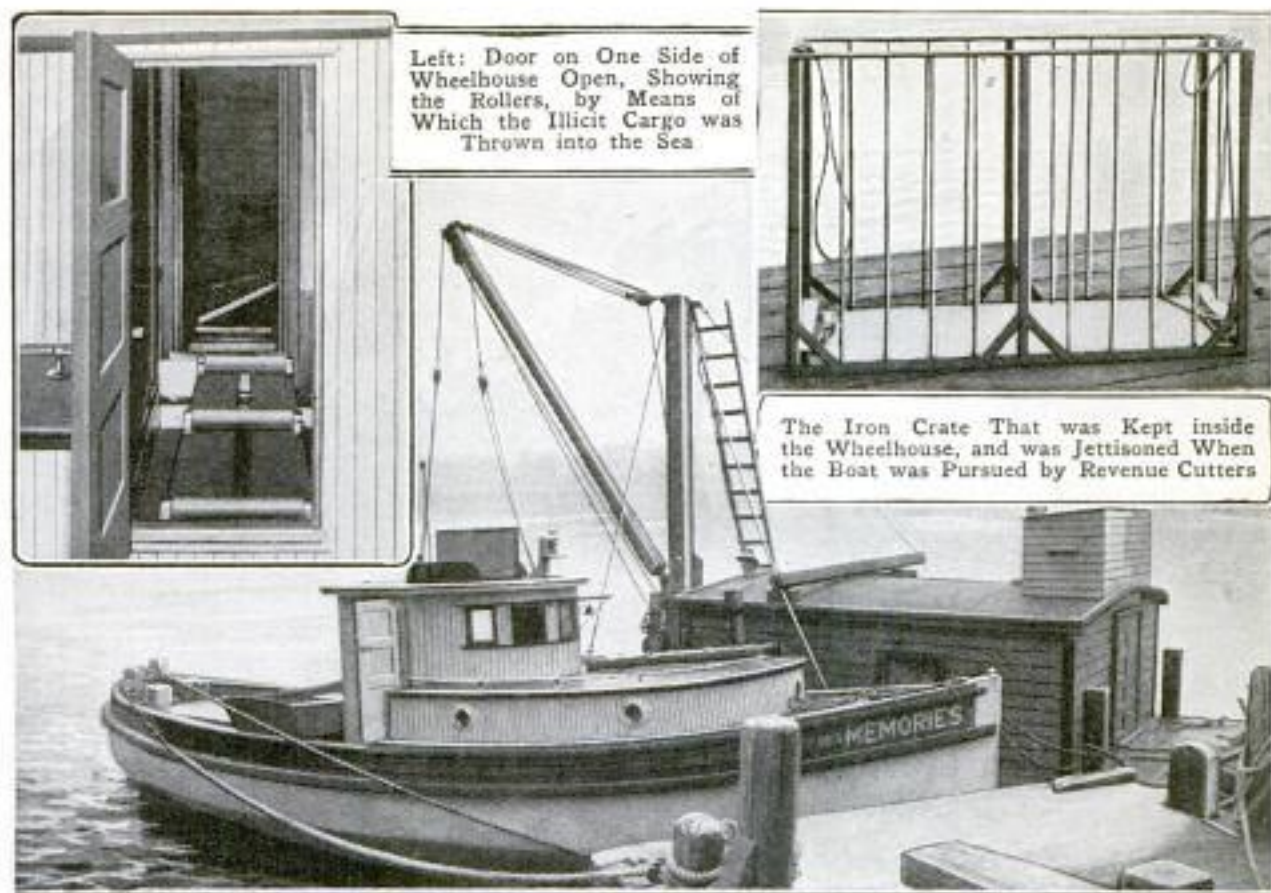
The difference of opinion, prevalent in every country, between the producer and the consumer regarding the quality of the gas furnished for heating and power purposes, was recently settled in the United Kingdom by measuring not only the volume of the gas consumed, but also the number of thermal units contained in the gas, which is paid for accordingly. Before reaching the ordinary volume meter, the gas passes through a heat-recording calorimeter at some point in the distributing mains of the gas company, and this instrument graphically records on paper tape the calorific value of the gas at all hours of the day. These records are periodically exposed in some public place for the inspection of the consumers.

800
**SNAP-ON RUBBER HEELS
 ATTACHED BY WEARER**

Applying the principle of the snap fastener, commonly used on gloves, to the attaching of rubber heels, is the idea of an eastern inventor. After first fitting the shoe with a metal plate containing 12 metal studs having enlarged heads, the rubber heels, which have corresponding cavities on the inner side, are pressed over the studs until they snap into place. Those who wear their heels down on one side can interchange them frequently, thus assuring a longer life and a neater appearance of the heel.



Chicago Tribune Architect-Architects
 E. W. L. Sarge & Chady
 Bridgeport, Conn.



Left: Door on One Side of Wheelhouse Open, Showing the Rollers, by Means of Which the Illicit Cargo was Thrown into the Sea

The Iron Crate That was Kept inside the Wheelhouse, and was Jettisoned When the Boat was Pursued by Revenue Cutters

Boat Used for Smuggling Contraband from Canada to the United States, That was Finally Captured in the Lake Washington Ship Canal at Seattle: The Goods were Left inside the Wheelhouse in a Large Iron Crate Which could be Pushed through the Door and Thrown Overboard

SMUGGLERS USE CLEVER DUMPING DEVICE

BY LAWRENCE WILLIAM PEDROSE

WHAT is said to be one of the cleverest devices ever developed for smuggling was uncovered on Puget Sound recently by Federal officers when a speedy power boat, believed for several months to be a successful smuggler of illicit goods from Canada into the United States, was captured in the Lake Washington Ship Canal at Seattle.

A feature of the boat's equipment was a mechanical device by which the illicit cargo could be temporarily jettisoned should it be overtaken by revenue cutters. Inside the wheelhouse was a specially built runway with smoothly working rollers, on which rested a large crate formed of iron grating, capable of holding several thousand dollars' worth of contraband. This runway connected with rollers on either side of the deck opposite the wheelhouse. The crate with its illicit cargo rested inside the wheelhouse with the doors closed. Should the boat be pursued and in danger of capture, either door of the wheelhouse could be opened and the crate noiselessly run over the side of the vessel.

When the cargo had to be jettisoned in deep water, the position of the crate was marked by a small floating buoy, attached to the sunken contraband with a line. The boat was also equipped with a complete deep-sea diver's outfit and a set of grappling hooks.

It had been known for some time, Federal officers state, that a dumping device was in use on some of the smuggling boats, but a complete outfit of this type had never before been captured. Along with the seizure, more than \$2,000 worth of contraband was taken, which made it possible for the government to confiscate the boat.

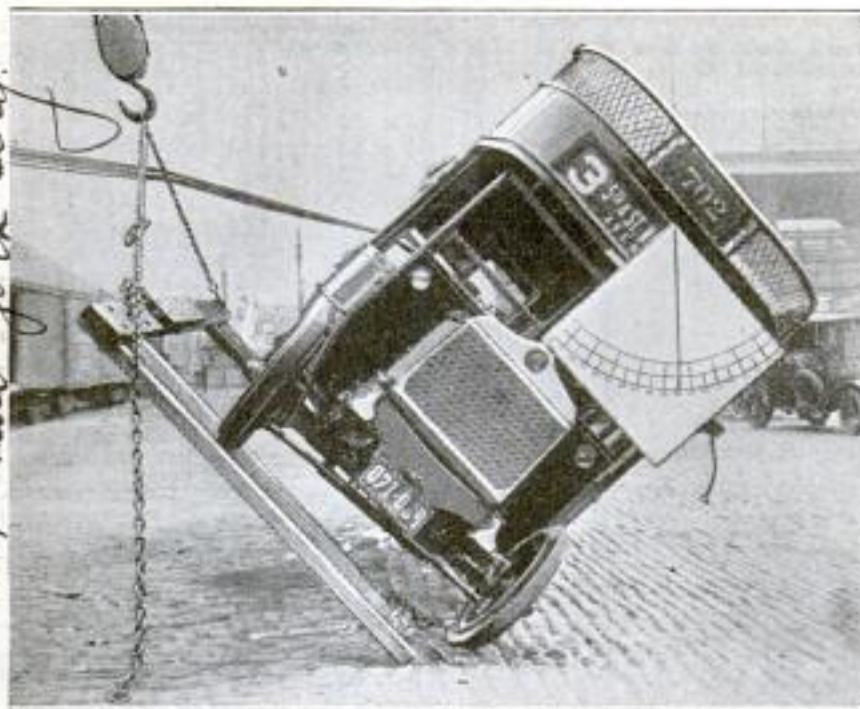
UNIFORM FIRE CALL ADOPTED BY CANADIAN COMMUNITIES

All the cities, towns, and municipalities of Canada have agreed to adopt the number "100" for telephone fire calls. Henceforth when the operator gets this number, no matter whether there are exchanges in the city or not, she will know immediately that a fire call is wanted.

Capt. W. E. Seymour,
301 Lister Chambers
Hamilton, Ontario, Canada

8039
 392

71st Avenue Coach Co., New York City.



WIDE WORLD PHOTOS
 The Tilting Test Which Showed the Center of Gravity of These Big Busses to Be Only 52 Inches from the Ground, an Assurance of Safety Which is Supported by the Record of 14 Years' Use in New York City

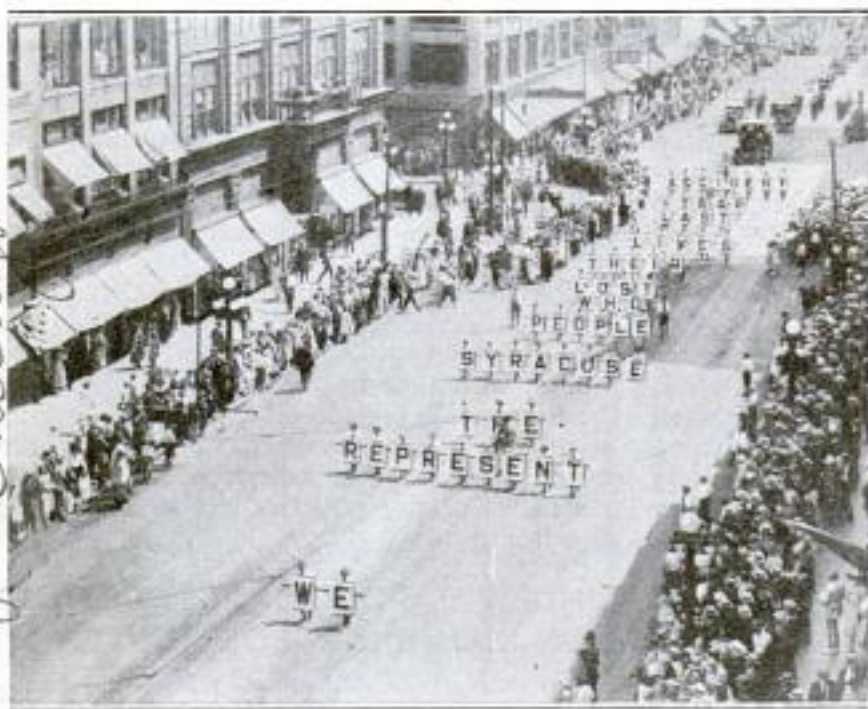
TILTING TESTS PROVE SAFETY OF BIG MOTOR BUSES

Tilting tests of motor busses, used in New York City, showed that their center of gravity is extremely low, only 52 in. from the ground. Their safety is further proved by the fact that, in the 14 years they have been used, they have safely carried 270,000,000 passengers and have had only two overturns. Both were due to an extraordinary combination of circumstances. The same type of bus is used in Chicago, Detroit, Toronto, Can., and other large cities, and in all these places with an equal degree of safety.

ANIMATED STATISTICS TELL ACCIDENT STORY

Walking letters that told their story in a most effective manner were the striking

the significant message: "We Represent the Syracuse People Who Lost Their Lives Last Year by Accident." Thousands of spectators watched the parade, and naturally they were deeply impressed by the message so vividly presented. Of the 63 who were killed by accident in 1920, 17 were boys and girls who lost their lives in accidents that could have been prevented.



A Striking Feature of a Safety-First Parade in Syracuse, New York, Which Speaks for Itself by a Graphical Representation of the Results of Accidents Which might have been Avoided

The marchers were preceded in the parade by a large truck, carrying an immense sign which read, "First Think of Your Safety," and an ambulance containing a sadly wrecked man and a nurse. At the head of the column of children a boy carried a placard—"63, Count Us." Following the sentence represented by the children was a truck load of children waving flags and bobbing balloons up and down, carrying out the spirit of the sign that they displayed.

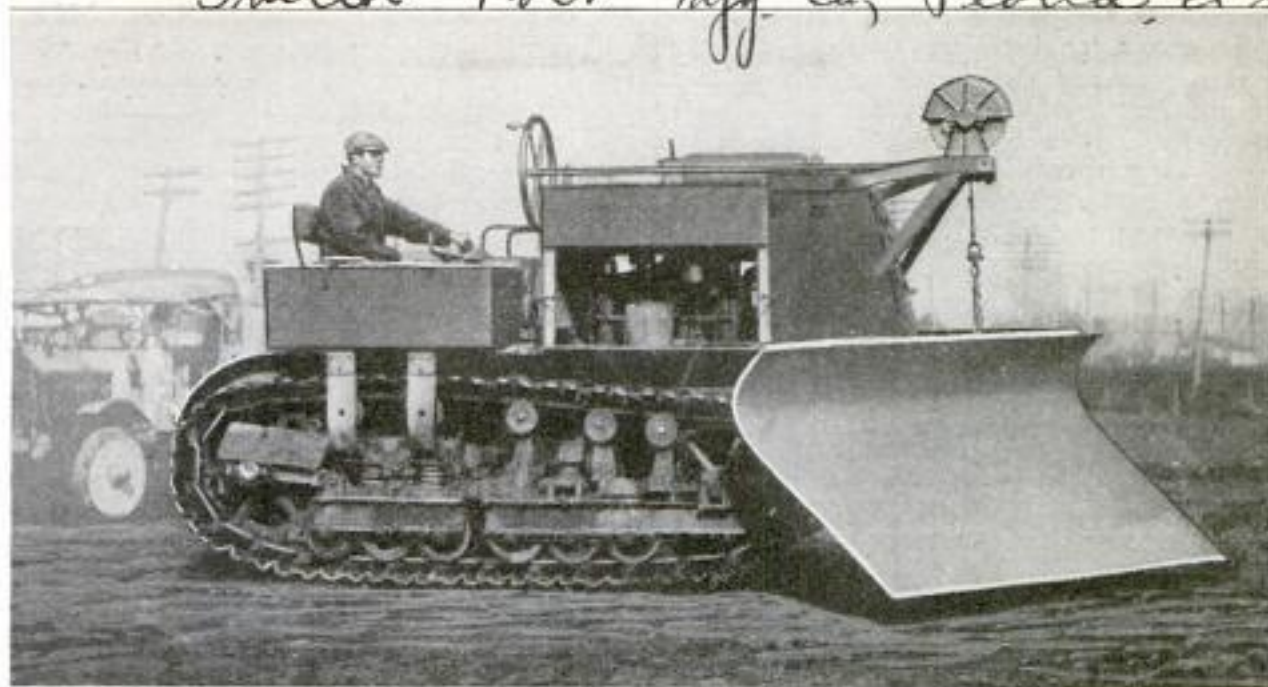
feature of a safety-first parade at Syracuse, N. Y. There were 63 children in the group, each child bearing one letter of

and which bore the words: "We Are Happy Because We Practice the A. B. C. of Safety—Always Be Careful."

George H. Paul, 900 Ellsworth Bldg Chicago

4992 American Road Machine Co.
 Kennett Square, Pa.

POPULAR MECHANICS 393
 Tractor Holt Mfg. Co., Peoria, Ill.



Endless-Tread Tractor, Showing the Method of Attaching a V-Shaped Plow for Scraping Snow from Roads: The Chain and Pulley Permit the Raising and Lowering of the Plow as may be Desired, the Lift being Operated from the Driver's Seat by a Hand Wheel.

7992
ENDLESS-TREAD TRACTOR MADE TO SERVE AS SNOWPLOW

Another adaptation of the endless-tread tractor, which gained wartime fame in the tank service, is seen in a snowplow being turned out by an eastern manufacturer of road machinery. This tractor is equipped with a large V-shaped plow. It is suspended, at the front, in such a way that it can be raised clear or lowered to scrape away snow which has drifted onto a roadway.

8707 Radio

WIRELESS MESSAGES IMMUNE FROM BEING "PICKED UP"

Privacy of wireless communications has been made possible, it is said, by a method which is the discovery of an electrical engineer in the employ of the Ukrainian Government. Utilizing his idea, messages may be sent to a definite receiving station, without danger of their being "picked up" by other operators. It is reported that the same man has also found a way to straighten out, and group, the "locked power lines" of the magnetic field into parallel rays, which can penetrate mountains, thus avoiding the necessity of high antennae.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

7924
CLEVER IDEA MAKES CONCRETE DAM A FOAMING WATERFALL

In the Cook County Forest Preserve, near Palatine, Ill., an ingenious idea has been used to give a small concrete dam the appearance of a foaming waterfall. The dam retains a small pond during normal weather. When it rains, the pond



The Face of the Dam, Showing How the Rocks are Imbedded in the Concrete to Procure the Effect of a Foaming Waterfall

Encl. Mrs. U. S. Vestal
 550 Courtland Ave.
 Park Ridge, Ill.

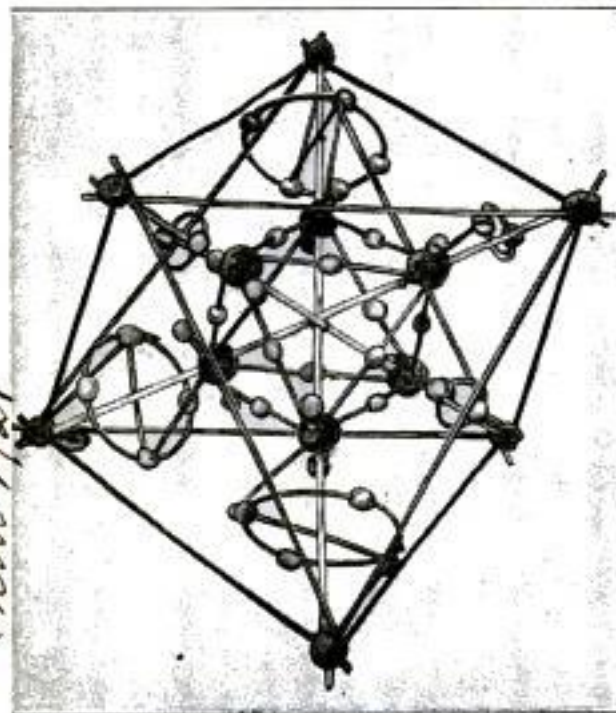
New York Times 12/18/21 p. 1

Chicago Tribune
12/29/21

overflows and the water must be carried off into a ravine. A shallow channel, passing under the roadway which runs along the top of the dam, carries the water over it. For a few feet the face of the dam is perpendicular and then merges into a more gentle slope. Small rocks have been imbedded in the concrete of this slope. When the sheet of water strikes them, it breaks into a splashing mass.

789 **MODEL OF ONE MOLECULE ENORMOUSLY MAGNIFIED**

The structure of a molecule which, before the discovery of radium, was considered by physicists to be the minutest par-



7933
COPYRIGHT, UNDERWOOD & UNDERWOOD
Model of a Molecule 250,000,000 Times Its Size, Being Nine Inches in Diameter: The Component Atoms are Shown by Putty Balls of Various Colors

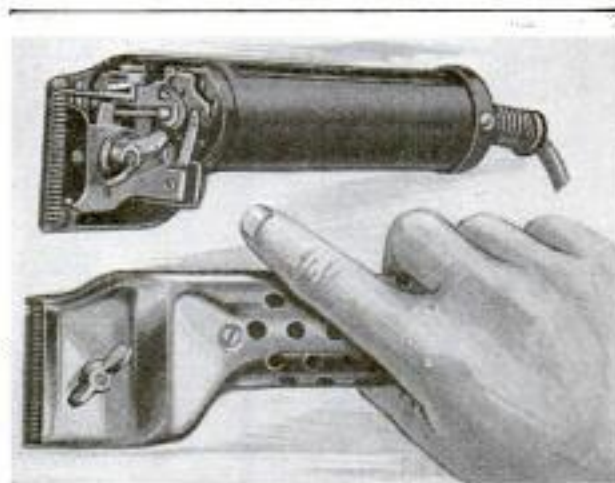
ticle of matter capable of separate existence, has been reproduced in a model shown recently at the 111th meeting of the American Physics Society. The model is in three dimensions, superficially of crystalline form, and with a diameter of 9 in. This makes it 250,000,000 times as large as an actual molecule, and therefore there is plenty of room to display its component atoms, which are represented by putty balls of various bright colors. These are all constructed in proper proportion and location, and show that the arrangement is similar to the solar system, and all other planetary systems of the universe, leading to the deduction that these atoms, like the planets, are revolving in orbits within the molecule.

CHICAGO'S POWER STATIONS HAVE ENORMOUS CAPACITY

"Cutting in" two 45,000-hp. units of the Calumet station, now under construction, brought the total generating capacity of the Chicago Commonwealth Edison Company up to the huge amount of 880,000 hp. When the Calumet station is completed, at a cost of \$20,000,000, its output will be 250,000 hp., thus taking rank as one of the largest electric-generating plants in the world. For the first time in a decade, and made possible by this latest addition, the company will have a supply of power available that exceeds the demand, and it is estimated that this condition will continue for two years. With its vast production of power, Chicago has become the hub of a gigantic network of interconnected electric-transmission lines in the upper Mississippi Valley, reaching from Minnesota to Kentucky.

RECIPROCATING MOTOR USED IN ELECTRIC HAIR CLIPPER

Hair clipping by electricity is no new idea, but the introduction of an appliance for this purpose that possesses a reciprocating motor, is a distinct departure from ordinary usage. Unlike other electric hair-cutting machines, the driving motor for the blades of this clipper is installed in the handle. The usual connection is made to a lighting outlet of 110-volt alternating current, and at .26-ampere flow the apparatus consumes from 18 to 25 watts. Because of the extreme flexibility obtained in the use of the instrument, its appearance will no doubt be welcomed by barbers in general, and should prove a great aid to the tonsorial trade.



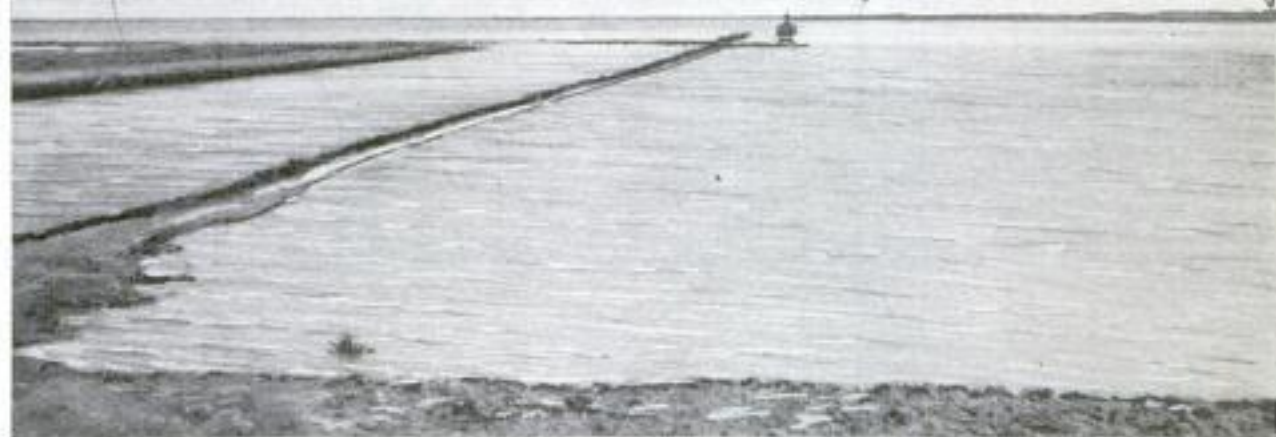
Top: Electric Hair Clipper with Outer Casing Removed, Showing Interior Mechanism. Bottom: Clipper as It Appears in Barber's Hands

7933
Mfr. Berry & Putts Co
201 Palace Bldg
Chicago, Ill.

Tribune 11/26/21
Journal of Franklin & Metcalf
Nov 1921

BORROWING A LAKE BOTTOM TO RAISE GRAIN

By Fred S. Walker, Tulare, Calif



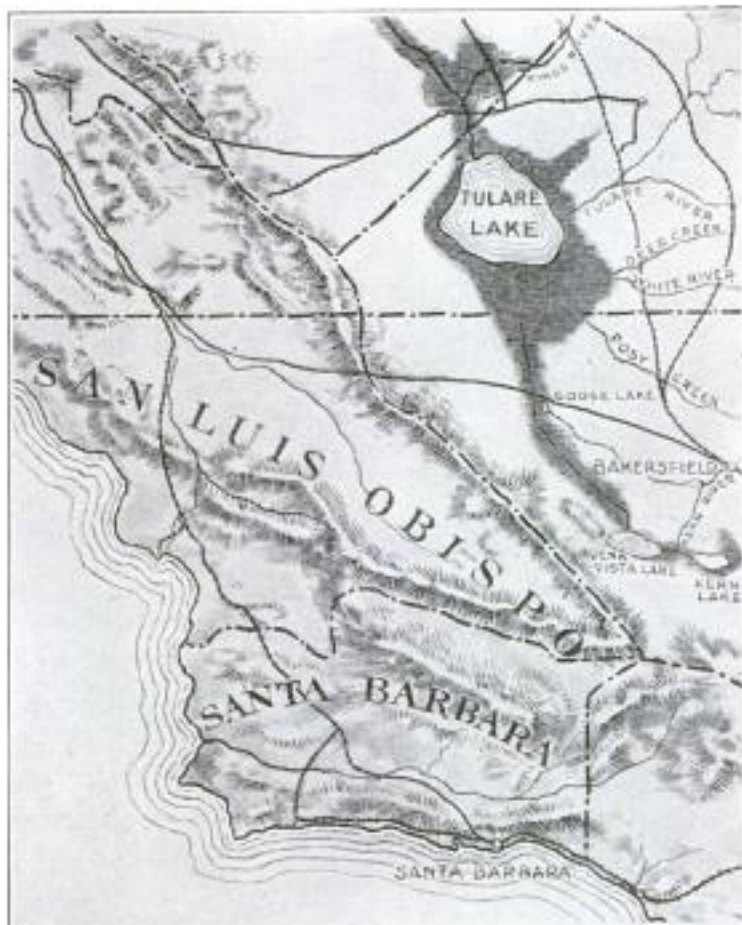
Dredger, Seen in the Distance, at Work Building a Levee, or Dike, across a Section of Tulare Lake, as the First Step in Reclamation of Lake Bottom for Farming Purposes: When the Levee is Completed the Water will be Pumped across It, Leaving One Portion of the Lake Bottom Dry

RAISING a grain crop, as a rule, requires a farmer rather than an engineer, yet during the past 30 years farming in the bottom of Tulare Lake in California has presented an engineering problem that has never been satisfactorily solved, even though, in 1920, a yield of wheat and barley aggregating in value more than \$5,000,000 was harvested and hauled to market from the last low reaches of what has been an inland fresh-water sea. Through it all the lake has only slowly yielded to the attempts to convert its ancient bed to the uses of agriculture. When it is realized that a watershed

more than 100 miles in length, from the highest mountains in the United States, has its natural flow into this lake;

that the laws of California recognize the lake bottom as the only outlet for a dozen streams on this watershed, and that the time of possible operations is limited, some conception of the difficulties of the development involved may be seen.

In 1892, the lake was described as "the largest body of fresh water west of the Mississippi River." Geologists claim that ages ago the drainage of this extreme upper section of the San Joaquin Valley was obstructed by the débris washed into



Map of the Watershed of Upper San Joaquin Valley and the Tulare Lake Basin, as It Was in 1890, Before the Reclamation Operations were Started



Hauling Five Four-Horse Scrapers by Means of One 45-Horsepower Tractor to Build a Levee to Protect Growing Grain from Threatened Floods: This Battery of Scrapers Makes It Possible to Build a Levee Three Feet High and One Mile Long in 12 Hours

the channel by Kings River, filling it to a depth of 40 ft., and thus forming a basin on the plain, catching the waters of all the streams south of the San Joaquin

River, the principal of which are Kings and Kern rivers, having their headwaters on the western slopes of Mt. Whitney—Kings River flowing north and Kern River south from that point and describing a great oval before again uniting in the waters of Tulare Lake.

In 1852, when Tulare Lake was first surveyed, it spread over 1,000 square miles of territory and broke over its northern rim into the San Joaquin River, but not in a suffi-



Above: Digging Machine Working on Levee to Protect the Enormous Wheat Field, Seen at Left, from Danger of Floods. Below: Looking from Lake toward a Section of the Levee That Bounds It. Two Rows of Willows on Lake Side are Planted to Protect the Soil from Waves



Part of a Battery of Tractors Hauling Rotary-Disk Plows over the Reclaimed Bed of Tulare Lake in the Fall, After the Season's Crop had been Harvested: Deep Plowing Is Not Necessary, and the Disks Turn Over the Top Crust, Providing a Satisfactory Seed Bed

ciently powerful stream to form a permanent channel. The lake abounded in fish of many kinds—mud cats, perch, and pike being the principal varieties—while receding waters left the shores white with the shells of fresh-water clams. In seasons of flood and heavy rainfall, when the lake was filled with water, it also became filled with rank wild grasses and tules, where the fish and clams multiplied. Then in seasons of drought the evaporation of the water was so great on the nearly flat surface as to leave millions of fish stranded on the mudflats of the plain. The shores of the lake became putrid with decaying fish and vegetable matter. This

process, repeated over and over through many decades, left the bottom lands incalculably rich in animal and vegetable deposits, and finally paved the way for gambling against the chance of flood seasons, and also to the more gradual work of permanent reclamation.

In the early efforts of reclamation a few furrows around large tracts by individual growers were often sufficient to hold the water from flooding the land; but as the



Above: One Tractor Pulling 125 Feet of Rollers over the Growing Grain to Pack the Soil about the Roots and Prevent Evaporation. Below: Hauling the Grain to Market with Teams of 10 Horses or Mules, Handled by a Single Driver, Who Usually Rides the Near Wheel Horse

area of the lake was decreased by this method, higher and stronger levees became necessary. A break in the levees of one grower often caused heavy loss to scores of others. Concerted effort became urgent, and led to the formation of recla-



Dense Growth of Grain on Part of a 5,000-Acre Field, Taken Just Before the Heads Filled and Weighted Them Down Till They Touched the Ground. The Yield Was 70 Bushels an Acre

mation districts and systematization of the construction of greater bulwarks against flood.

Unquestionably helping to reclaim the lake to agriculture are irrigation projects on the higher plain around the lake, where intensive farming is profitable. Alfalfa fields early took the place of the old stock ranges, while horticulture and viticulture have proved less insecure than dry farming of grain on the arid plain. These industries have required vast quantities of mountain water in addition to the local rains. Then, a score of years ago, the foothill section of the Sierras developed one of the most famous citrus belts in the annals of industrial enterprise, and in a decade the towns of Lindsay and Portersville have become commercial centers for the orange, the grapefruit, and the lemon. With the rise of the citrus culture, the water from the normal rainfall and the slowly melting snow of the high mountain region went into use for irrigation long before it reached the lake in dry and normal years. Each irrigation district, however, takes care of its own affairs, will take only such water as it needs from day to day, and turns back into the rivers any surplus of the snow waters of the high mountains which fill every stream during a few sudden warm days in May and June. These freshets, which come three months after grain must be seeded in the lake bottom, form the basis of the hazard under which the lake farmer must work.

This, then, is the situation today. The Tulare Lake now covers only 42 square

miles of territory, around which an immense levee, more than 20 ft. high and 100 ft. broad, cuts this final remnant of lake bottom from the other 958 square miles of fertile valley land which it once held.

In dry seasons, outside the levee, are farm lands under irrigation stretching for 50 miles across the plain to the foothills; inside the levee are 42 sections of bottomless mud, level as a floor, yet covered in a great part by a few inches of tepid water. It is miles away from rodent pests, is free from stones, roots, and weeds of any kind, and seemingly invites the farmer to drain and plant in its matchless fertility. Yet every grower who engages in the enterprise does so with the knowledge that this muddy pond is the legally allotted catch basin for more than 7,000 square miles of mountain watershed, and now 20 times smaller than it once was.

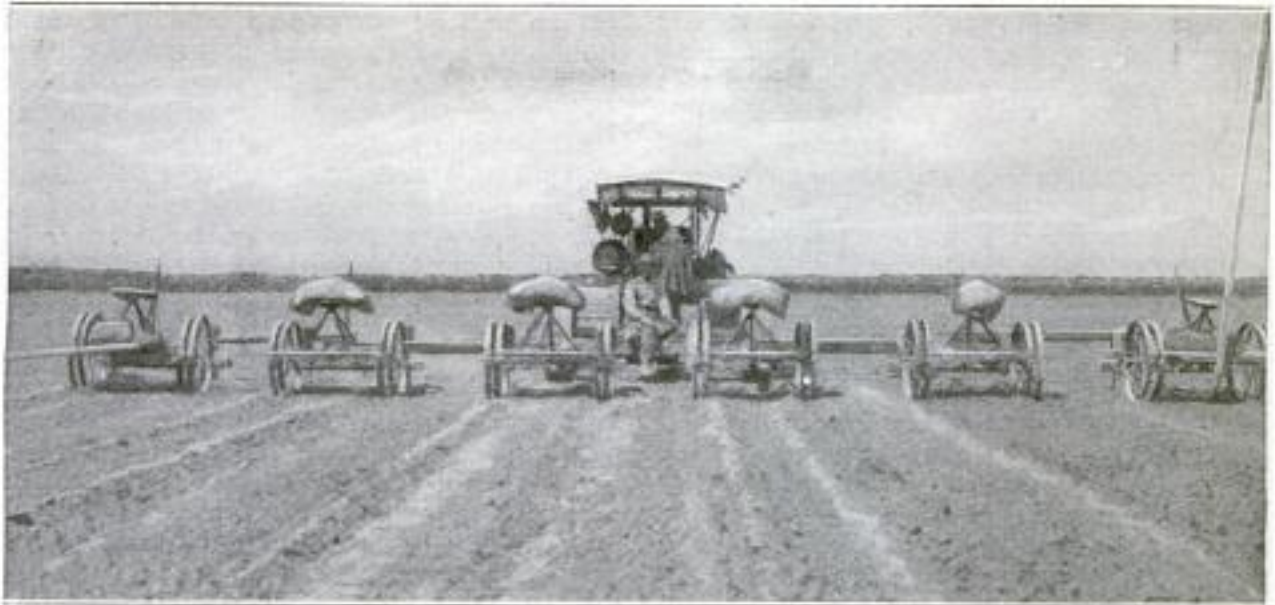
Tractor power has proved to be the key to success in farming the bottom of Tulare Lake. Without the facility to perform large operations under limited-time pressure, every attempt of the growers would have been doomed to failure.

With two feet of water in the lake bottom at the deepest point, spreading over an area of more than 14,000 acres, the first step toward the production of a grain crop is a battery of dredgers, which run levees, or dikes, through the lake from end to end. Then, with large motor-driven centrifugal pumps, the water is drawn out of one section into another, to



Timbering the Levee to Prevent It from being Washed Away by the Waves: The Water Here Stood 17 Feet Deep against the Levee

facilitate the drying of each tract to be farmed. Finally, it is pumped across the large levee, protecting the reclamation



Battery of Six Corn Planters Operating on the Reclaimed Bed of Tulare Lake: They are All Hauled by One Tractor, Making It Possible to Plant 12 Rows Simultaneously with the Labor of Only Two Men, One on the Tractor, and the Other on the Planters

districts outside, and is used for the irrigation of the higher ground.

Removal of the water leaves a sea of bottomless mud, picturesquely described as "not bearing the weight of a mosquito." A sheep or an ox venturing into it is helpless and soon sinks from sight. Warm dry winds and spring sunshine, however, dry the surface within a short time so it will bear the weight of tractors of the track-layer type, though it shakes under a man's foot, and for months will not bear the pulling weight of horses. During the entire course of the work of plowing, seeding, and caring for the crop, no domestic animal is permitted to enter the district. Naturally, for 20 miles across this expanse, no permanent house, no tree or fence may be seen. For temporary use by tractor operators and helpers, mosquito-screened camps are set up for instant removal in case of heavy rains or mountain floods.

As soon as the drying soil permits, tractors, pulling rotary plows and working in batteries, turn under the top crust and provide a seed bed for the coming crop. This is followed by seeding and harrowing on a gigantic scale. After the grain is a few inches in height the soil must be treated to prevent too great evaporation. As the drying process goes on after the planting is complete, the soil cracks and crumbles into a myriad of tiny fissures. This is overcome, in part, by pulverizing the soil with rollers which packs the soil and keeps the moisture about the roots of the plants. Working day and night, a tractor, pulling 125 ft. of rollers, rolls and packs 280 acres of land in 24 hours.

The grain sown, sprouted, and rolled, there is left for the operator only the work of strengthening and repairing the levees. The weather of the high Sierras has much to do with successful crop conditions in the lake bottom. A mild spring brings about a gradual melting of the banked-up snow in the mountains, but with a backward spring, followed by warm rains and sunshine during May and early June, every stream out of the snows becomes a tumbling cataract of potential flood waters. Then every grower in the wheat pit of the lake bottom is transformed from a placid farmer into a dynamic force for concentration and coöperation. Barometer changes are reported hourly from forester stations and electric power plants in the mountains, and the rise of a fraction of an inch in every stream is reported 24 to 36 hours before it can reach the valley. Specialists employed by the lake farmers know the capacity of every irrigating stream out of the rivers, and the probable demand for every foot of water. What they do not know, and what they must gamble on, is the probable duration of a flood.

This happened on one occasion last year and it was only met by prompt and decisive action on the part of the growers. One grower in the irrigation district outside the big lake levee held 5,000 acres of grain that would average in the neighborhood of 25 bushels to the acre, as it stood on the ground late in May. Acting for the lake-bottom growers, a committee waited upon this grower and quickly closed a deal for his entire holdings in growing grain at a price of \$70,000. Then, as the flood waters swept down the sandy

bottom of the Kings River, a dam was thrown across the stream and the cutting of the river levee sent the flood into this new 5,000-acre reservoir. Again the operators gambled on the chance that this area would suffice to hold the waters until the hot spell ceased. Hundreds of men armed with shovels and empty sacks patrolled the levees ceaselessly, while steam dredges operated day and night, raising and strengthening the embankments. Still the hot wave in the hills filled the streams, and hour by hour the battle went on to keep the levee from breaking and flooding the country, which would have involved heavy damage suits for loss of crops. But the flood subsided and the levee held, and for the first time in history a full harvest was taken from the lake bottom.

Yet, though the flood condition had been met, the great problem of lake-bottom farming was but half solved. One inch of rain might again render it a slimy mass of mud, so slippery and sticky that nothing could be hauled away until it dried. An inch of early-fall rain, too, would wet the sacks of grain in the wake of the harvesters, and these, drying in the blistering sun, would rot like paper. If harvesting was done, it would be necessary to remove the grain before the fall rains, which sometimes fall in September.

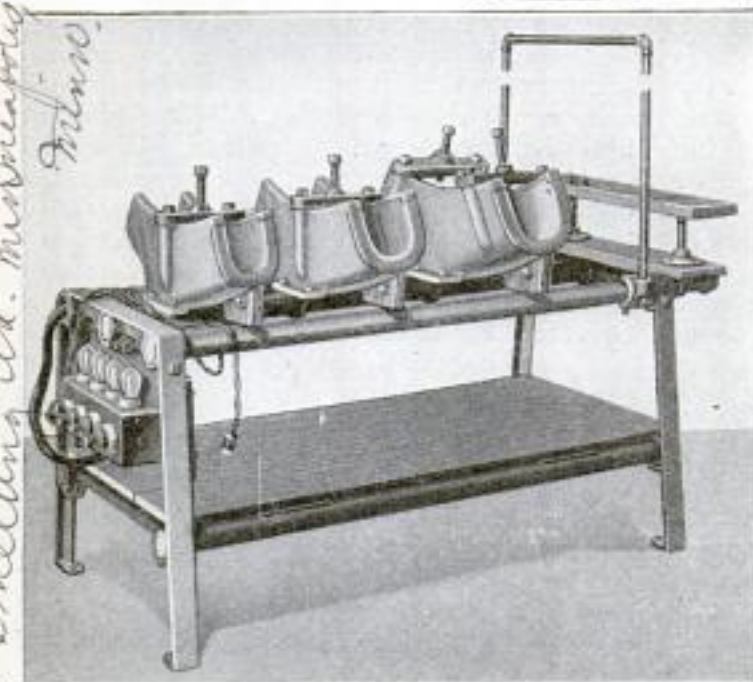
The harvest began during the third week of June. The lake bed was a sea of standing grain, relieved only by tall stakes

set on section corners to mark individual holdings, and to guide the work of the harvester. Grain "buck" wagons followed close upon the harvester, and every effort was made to haul the grain from the field and place it near the roadways as rapidly as the filled sacks fell from the machine. With every facility for transportation in use, moving 700 tons of grain daily, it would require 100 days to get the crop out of the lake, even after it was harvested. To speed the work, one firm, having 5,000 acres of wheat, employed eight large tractors in the harvest field cutting and harvesting the grain, while smaller tractors, pulling trains of five low-wheeled farm wagons, followed the harvesters, gathering the filled sacks and hauling them to roadways previously rolled and packed, where heavy motor trucks and freight teams hauled them to warehouses and depots.

It is claimed that every straw in the immense crop was utilized, for following close upon the removal of the grain from the field, sheep were turned into the stubble in droves of 2,000 to 5,000 each. Small camps, embracing a sleeping tent for the herder and troughs for watering the animals, were established and moved from place to place as the need arose. Specially equipped supply wagons visited these camps daily. By November 1 the lake bed was again seemingly as bare as before the farming operations began.

Tire

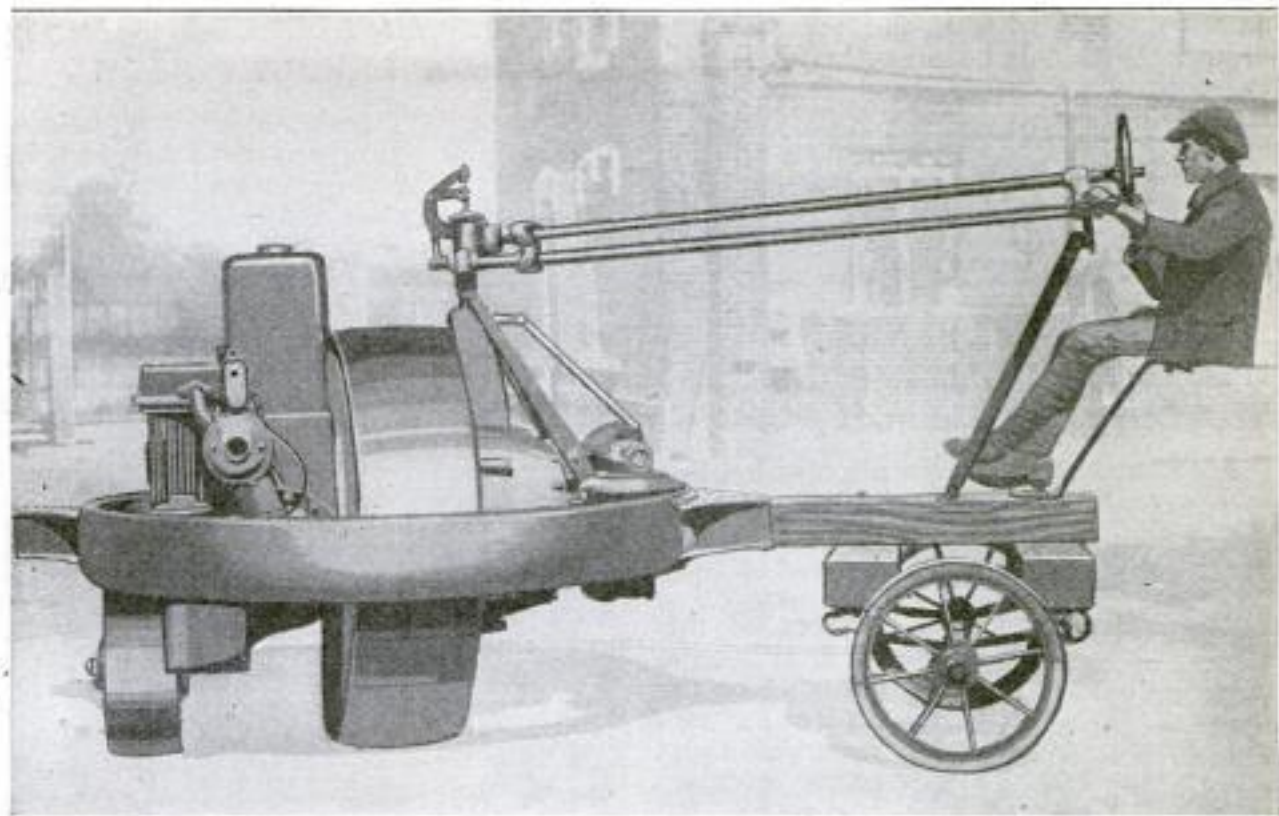
ELECTRIC VULCANIZER HAS MANY MERITS



Electric Vulcanizer, Showing Molds, Tube Rack, and Hot Table on Top, with Switches and Pilot Lamps at End

Efficient electrical vulcanizing, excluding all steam apparatus and the consequent danger of explosion, is performed with an appliance developed by a Minneapolis firm. Three molds are provided for holding the tires, in sizes of 3 to 3½ in., 4 to 4½ in., and 5 to 5½ in., together with extra bead molds for accommodating both the clincher and ordinary-type casings. Each mold can be operated independently, has individual pilot lamps, and the whole receives power from a cord attachment to any light socket. In addition are supplied a hot table for vulcanizing inner tubes, and a bracket upon which these can be hung while the work is being done. As many of the units as desired may be joined, so that tire repairs in any size shop can be effectually executed.

5946
Progressive Shoe Machinery Co.
112 Snelling Ave. Minneapolis
Minn.



Novel Farm Tractor Making an Abrupt Turn: The Large Traction Wheel has been Turned at Right Angles to the Direction in Which the Tractor was Traveling, and will Thus Follow a Curve around a Stationary Center

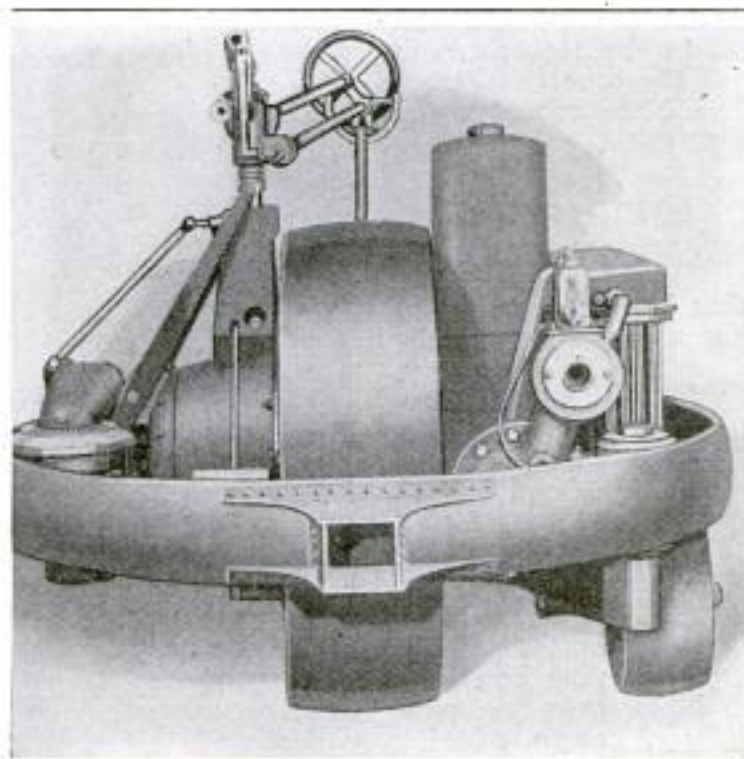
FRENCH TRACTOR—SIMPLE AND ORIGINAL IN DESIGN

7460

To all intents and purposes the ordinary farm tractor is a more or less skillful adaptation of the principles of operation embodied in the automobile. More-

over, these tractors, as a rule, are adapted for hauling the same kind of farm implements as are used with horses. A novel type of tractor has been constructed in France that has little more in common with the ordinary motor car than the fact that it is driven by an internal-combustion engine. Even at that, its motor, which consists of two opposed cylinders, is valveless, depending for its

gas distribution upon one rotary device, and bears no resemblance whatever to any automobile motor. This new tractor consists of one large traction wheel some-



Front View of Tractor, Showing Large Traction Wheel in Center: To the Right of It Are the Motor and Radiator. To the Left Are Steering Devices That Turn These Parts as a Unit

what in the nature of a wide disk wheel, which contains in its interior a complete system of transmission and speed gears. The motor and its adjuncts, as well as the wheel and its supports and the water-cooling radiator, form a unit that is pivoted in a horizontal circular frame, to which can be attached any suitable means for hauling the implements, as well as a trailer which supports,

on two small wheels, the seat for the driver. With this construction, it is easy to make very abrupt changes of direction. Beside the driver's seat is a lever by which the speed is controlled and the tractor driven forward or reversed. The models that have been built up to the present have proved to be very efficient in doing the work for which they were designed.

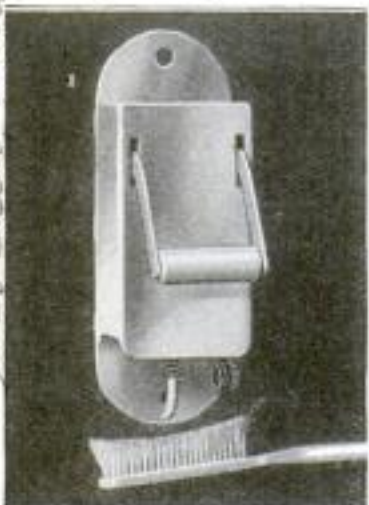
DENATURED ALCOHOL ALWAYS 808 2A DANGEROUS POISON

Reports of denatured-alcohol poisoning, since the adoption of prohibition, indicate a failure fully to understand what denatured alcohol really is. Denatured alcohol is alcohol to which some poisonous substance has been added to make it unfit for internal use, and is always sold with a poison label on the container. Some of the mixtures are: carbolic acid 1 part, alcohol 99 parts; formaldehyde 1 part, alcohol 99 parts; corrosive sublimate 1 part, alcohol 2,000 parts; corrosive sublimate 1½ gr., hydrochloric acid 2 dr., alcohol 4 oz.; formaldehyde 2 parts, glycerine 2 parts, alcohol 96 parts; carbolic acid 1 dr., tannic acid 1 dr., alcohol 1 pt., water 1 pt.; alum ½ oz., formaldehyde 2 dr., camphor 1 oz., alcohol 1 pt., water 1 pt.; lysol 1 part, alcohol 99 parts. All these are violent poisons, astringents, or corrosives, strong enough to cause intense suffering and lingering physical decay. The proportions of denaturing substances are in some cases so small that they cannot readily be detected by smell, and in others entirely imperceptible.

7985

IMPROVED HOLDER SQUEEZES TOOTHPASTE FROM TUBE

A recently invented fixture, for holding and squeezing a tube of toothpaste, is said to have a definite advantage over other devices of this kind. When the pressure on the tube is released, no more paste escapes from it. It consists of a boxlike case containing a movable plate, which is pressed back by bearing down on a handle protruding from the front of the box. The tube is held upside down in the box by means of a slot in the top, through which the bottom of the tube is inserted and bent over. The plate squeezes the tube with a flattening effect.



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STRAINER OF STEEL WOOL KEEPS PIPE STEM OPEN

Clogged stems, that bane of pipe users, can be averted by the use of a new smokers' accessory, which consists of a small, loosely wound ball of fine steel wool. This, pressed down against the bottom of the pipe bowl, allows free passage of the smoke, but prevents tiny particles of tobacco from entering the stem.



which consists of a small, loosely wound ball of fine steel wool. This, pressed down against the bottom of the pipe bowl, allows free passage of the smoke, but prevents tiny particles of tobacco from entering the stem.

OLD SWEDISH COIN TEN INCHES SQUARE IS LARGEST KNOWN

Probably the largest coin in the world is one belonging to Farron Zerbe, internationally famous expert on rare coins.



It is a piece of stamped copper plate 10 in. square, and weighs 6½ lb. It has a value of "4 Daler" (the daler was a coin of varying value) stamped on it, and the date 1730. Such coins were commonly

used in Sweden for some time during and after the wars of Charles XII. It is part of a collection of more than 30,000 specimens, representing mediums of exchange of all countries and periods from the earliest times to the present day. The total face, or original exchange, value of the collection is counted in millions, but no present value has ever been placed on it. Many of the coins are, of course, rare, and of much greater value than their face.

German makes unknown to C.W. Frankly Electric company

Com. Mortimer J. Tessier
24 Mills St. Nyack, N.Y.

Com. J. P. Lynch
3557 St. Charles

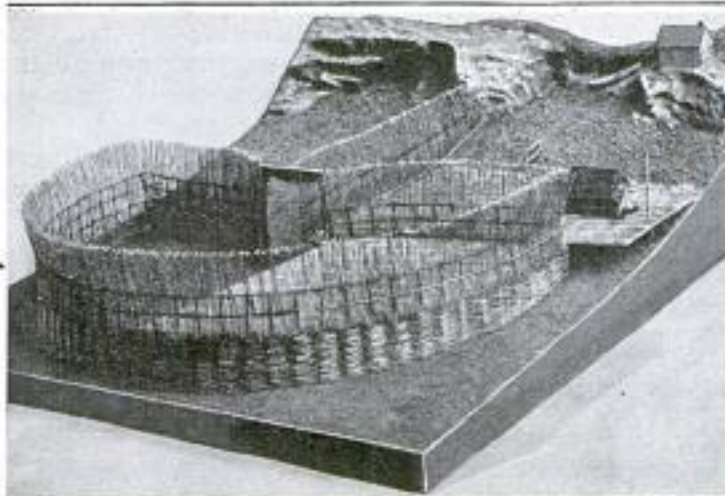
7812

SPECIAL RACING MOTOR-CYCLE DESIGNED BY ENGLISH RIDER

A 20-hp. motorcycle of novel design has been constructed by G. W. Baker, a well-known English motorcycle racer. The machine is especially designed for the cycling pacing track, for the purpose of breaking the present world's record of 63 miles in an hour, held by Paul Guinard, of Paris, France. It is the highest-powered machine of its kind in Great Britain, and is equipped with a two-cylinder V-type motor, with a belt drive. The unusual arrangement of the steering mechanism is particularly conspicuous. The speed attained will depend as much upon the driver's skill as upon the machine.



The New 20-Horsepower Motorcycle Built by an English Motorcycle Racer for the Purpose of Breaking the World-Cycle Pacing-Track Record



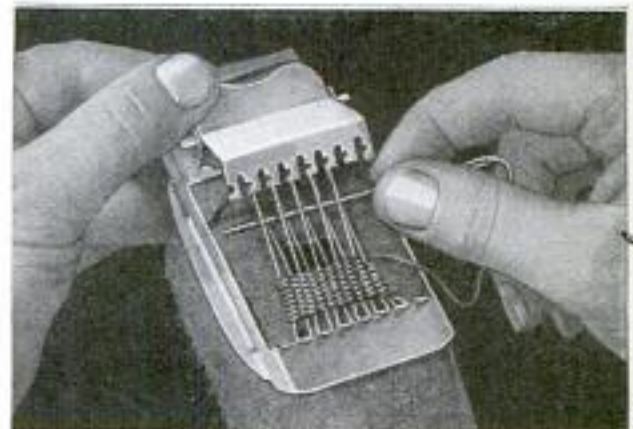
A Perfect Reproduction of a Typical Maine-Coast Herring Weir, the Product of Four Months of Patient Work on the Part of an Old New England Fisherman

MODEL HERRING WEIR BUILT BY MAINE FISHERMAN

Through four long winter months Capt. John A. Anderton worked patiently building a model herring weir. The result is a perfect reproduction, in miniature, of the type of weir commonly used along the Maine coast. It is 3 ft. long and 4 ft. wide, one-fiftieth the size of the original. The brush work was reproduced by the use of straws from a broom and small twigs. The beach and rocks were modeled in clay and sand. A fisherman's cottage is on the rocks.

HAND-DARNING MACHINE WORKS LIKE A LOOM

Darning is made into a pleasant occupation, it is claimed, when done with a device recently introduced in England. The little darning machine consists of a flat stretcher which is placed behind the hole in the stocking, and over which is slipped a saddle that holds the stocking in place. The thread is wound back and forth over the hole on hooks on this saddle. A third piece, hinged on the saddle, hooks under every other thread and raises or depresses them alternately while a threaded needle is passed back and forth between them, as in weaving.



Darning Machine: With the Left-Hand Thumb the Saddle is Raised and Depressed, While with the Right Hand the Needle is Passed between the Threads

~~E. J. A. Co., 656 Holloway Road, N. 19, London, England.~~
Wm Penn.

Emb. Cecil Lereau, Maine
168 Water St. Eastport.

7837

7941

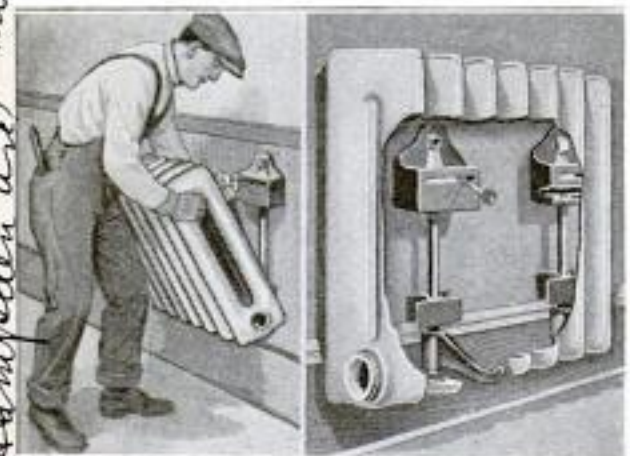
No representations in U.S.
\$6.00 per dozen

Wm. H. L. Healy
c/o Arthur Hallam,

404
 7954 317 Cedar St. **POPULAR MECHANICS**
Minneapolis, Minn.

**NEW ADJUSTABLE HANGER
 FOR WALL RADIATORS**

The growing popularity of hanging heating radiators against the wall calls attention to a new adjustable hanging



Left: Hanging a Radiator on the New Adjustable Support. Right: Radiator Cut Away to Show How the Support is Adjusted

device. It consists of a boxlike bracket, fastened to the wall by a single bolt. A bolt, through a slot in the front of the bracket, is passed between two sections of the radiator and screwed tight with the washer against the inner columns of the two sections. Two brackets are used for each radiator, and the slots make it pos-

sible to bolt them to the wall studs, yet permit the radiator bolts, by moving them laterally, to come between the sections of the radiator. A 1/2-in. pipe extends down from a slot in the bottom of the bracket. It can also be adjusted laterally. Near the lower end is a brace which holds the radiator 2 1/2 in. from the wall. At the end is a bracket on which the radiator rests.

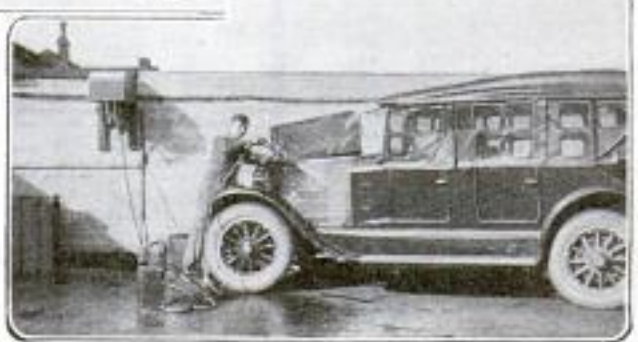
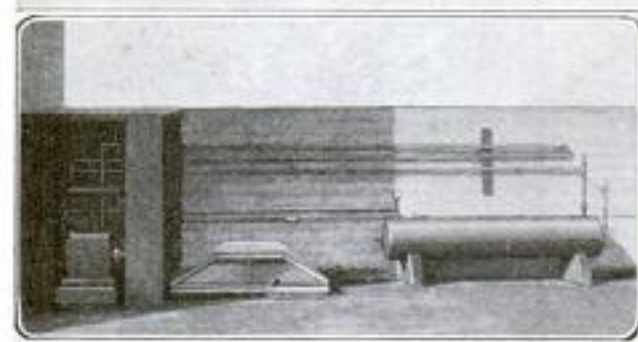
**USE OF THE ROOF FOR SHOPS
 IS LATEST GARAGE ECONOMY**

One western garage owner believes in using all the space possible around his garage, for on the roof of his service station is located sheet-metal, blacksmith, and paint shops, and also an apparatus for cleaning engines with a distillate spray. This apparatus consists of an air compressor and a spraying rig. The distillate is blown from a reeled hose by the compressed air, and the reel for the hose is fitted with a spring which rewinds it when not in use. A large drain is conveniently located to dispose of the residue from cleaning the engines, and all the dirty or greasy work around the garage is assigned to the lofty workshops. The interior of the garage is thus kept entirely free from all smoke, gas, and grease, resulting from this work.

Below: Under This Shed on Top of Garage Roof are Installed, at Extreme Left, a Sheet-Metal Shop; to the Right of That, a Blacksmith Shop, and Farther to the Right, a Paint Shop



Above: Part of the Garage Roof. On the Parapet Wall at the Extreme Right Are the Pipe Coils That Cool the Air While Passing from the Compressor at Their Left to the Air Tank beneath Them



Left: Air Compressor, with Its Cooling Pipes on Wall Leading to Receiver Tank beneath Them, Which Furnishes Supply of Compressed Air to the Spraying Device Seen at Right, being Used for Cleaning the Engine of an Automobile. The Sprayer is Connected by a Hose to a Five-Gallon Can of Distillate

Carl Chas W. Iseliger, Press Club,
Powell & Sutter, San Francisco, Calif.

mfr - Healy - Ruff Co / St. Paul
795 Hampden Ave / Minn

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7871
 mfr. *Thos W. Bland & Co.*
 2 King William St, Strand
 W.C. 2, London, England
A TWENTY-GAUGE SHOT PISTOL

BY CAPT. EDWARD C. CROSSMAN

3416 Helen Allyn Drive, Los Angeles Calif

SINCE the earliest days of their colonial empire, the British have almost continuously found themselves engaged in various arguments with primitive peoples, widely separated in location, but having the same failing of refusing to consider themselves dead when duly shot with the British-army firearms provided for the purpose.

It proved of no comfort to the relatives of an officer who had "gone west" from an assegai stab or the slash of a long knife, to know that the Zulu or Pathan had first been neatly shot by the officer, and had eventually passed on to a heathen paradise. The missiles from the British service rifles and pistols took too long to work, and in the meantime the heathen often proceeded to carve the soldier to suit his taste.

Wherefore appeared both the British dum dum, or mushrooming, bullet for the service .303, and the shotgun pistol which was intended to knock the festive native right out from under his hat. The pistol was evolved by British gunmakers for the use of officers of the army having to do with natives. It is literally a 20-gauge shotgun—about .67-caliber if measured in rifle terms—fitted with two short barrels and a pistol handle, especially shaped to permit control of the gun and its rather heavy recoil. It has the locks, the frame, the top lever, and even the ejector of the

is a practical and most powerful double-barreled hammerless pistol, which will deliver a frightful shock with either its



The 20-Gauge Double-Barreled Shot Pistol, the Missile of Which Is More Deadly Than Even a Dumdum Bullet, in Position for Firing: With a Smaller Bore, It Resembles in Effect the Sawed-Off Shotgun

buckshot loads, or ordinary loads of duckshot, such as "6'es" or larger. The pistol is made with single trigger for firing the two barrels, for the officer willing to sink the additional money in the gun.

My wife and I tried the British gun, for the first time, in fear and trembling. All we could buy for it in the sporting-goods store was a good stiff 20-bore load of $\frac{7}{8}$ -oz. duckshot, in front of $2\frac{1}{2}$ dr. of powder, which is the heaviest combination



Close-Up of the 20-Gauge Double-Barreled Shot Pistol

put up for the 20-gauge shotgun. Memory of the good stiff jolt of the 6-lb. 20-gauge shotgun when fired at the shoulder, made firing this gun, held in the grip of one lone hand, seem a sure way to depart this sad vale of tears. However, firing it with two hands didn't develop anything very fearful in the way of kick; the hands and arms, springing under the thrust, seemed to cushion the kick, and it was felt less than with a gun held against a comparatively unyielding shoulder.

Our courage restored, we tried a shot with one hand, pistol-fashion, arm extended, everything according to Hoyle. The pistol rose into the air a little, and came back into the crotch of the hand with a good firm jolt, but the hand remained intact, and there was no tendency, as we feared, to tear out of the grip.

The handle, or grip, is made with an overhang, coming just above the junction of thumb and hand, and this aided in the control of the up-



Photo Snapped at the Instant That the 20-Gauge Shot Pistol was Fired, Showing the Effect of Recoil: It Is Double-Barreled, Hammerless, and Resembles an Ordinary Shotgun on a Very Small Scale

ordinary shotgun, and the fine workmanship of the British arm of this class, yet

ward thrust of the gun with its load of $\frac{7}{8}$ oz. of shot, three or four wads, and $2\frac{1}{2}$ dr. of smokeless powder, a combination about twice as weighty as the most powerful of ordinary revolvers. We shot up the box of shells without untoward results to our right hands. The gun is not a desirable weapon for a woman for target practice, but the lady of the family shot this one single-handed several times to prove that a woman had no trouble controlling it.

At the receiving end of the fire, the gun patterned like any other cylinder-bored shotgun of this gauge, and with buckshot at 20 yd., was a far more formidable weapon than any revolver or automatic pistol. A buckshot of a quarter-inch or larger diameter, with its velocity of not far from 1,200 ft. per second, has a more vigorous wallop at short ranges than the bullet from the ordinary type of .32 pocket revolver or automatic pistol, and in a gun of this 20-bore persuasion one fires from each barrel from eight to fifteen of the round leaden pellets, depending on the size.

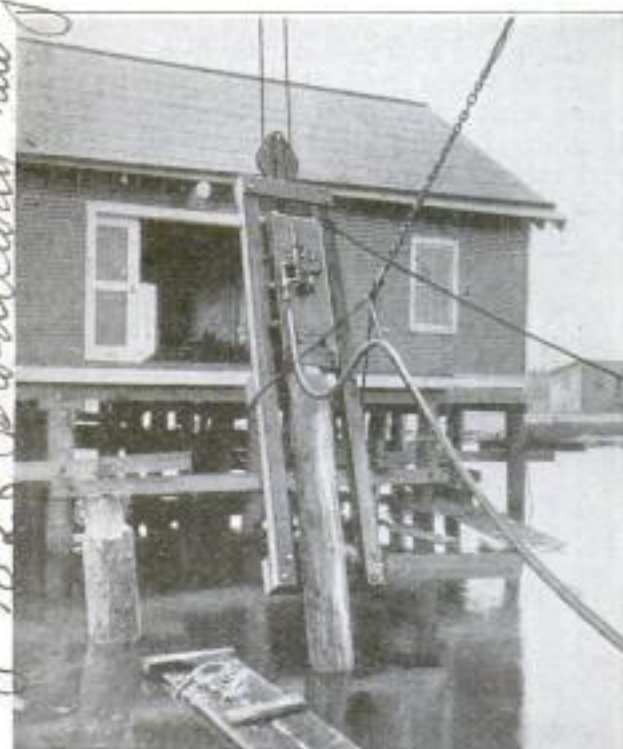
The two barrels can be fired, of course, as fast as the hand is recovered from the upward throw of the first shot, and the finger is shifted to the rear trigger. At a dozen feet, or so, the load from one barrel would inflict a knockdown shock, even if only duckshot were used.

For stopping a rush or discouraging one that is ready to start, the gun would be much superior to any pistol firing only one ball. And if the shooter fancies hitting his quarry with just one round and weighty pellet, the gun will fire 20-gauge round balls, of nearly .67-caliber, and weighing nearly an ounce—but the shooter will know that he's pulled trigger on something when he fires it.

For a half century the most effective weapon of American firearms for close-range fighting has been the sawed-off shotgun, but it remained for the British gunmakers to put out the shotgun idea in the form of a pistol, easily carried in a holster, and yet as sure death as the old express messenger's pet, which took up room and advertised its presence by its length.

7964
**PILES DRIVEN WITH SWINGING
 LEAD TO PREVENT BREAKING**

To do away with the breaking of piles under the weight of the hammer, which caused much trouble in the construction

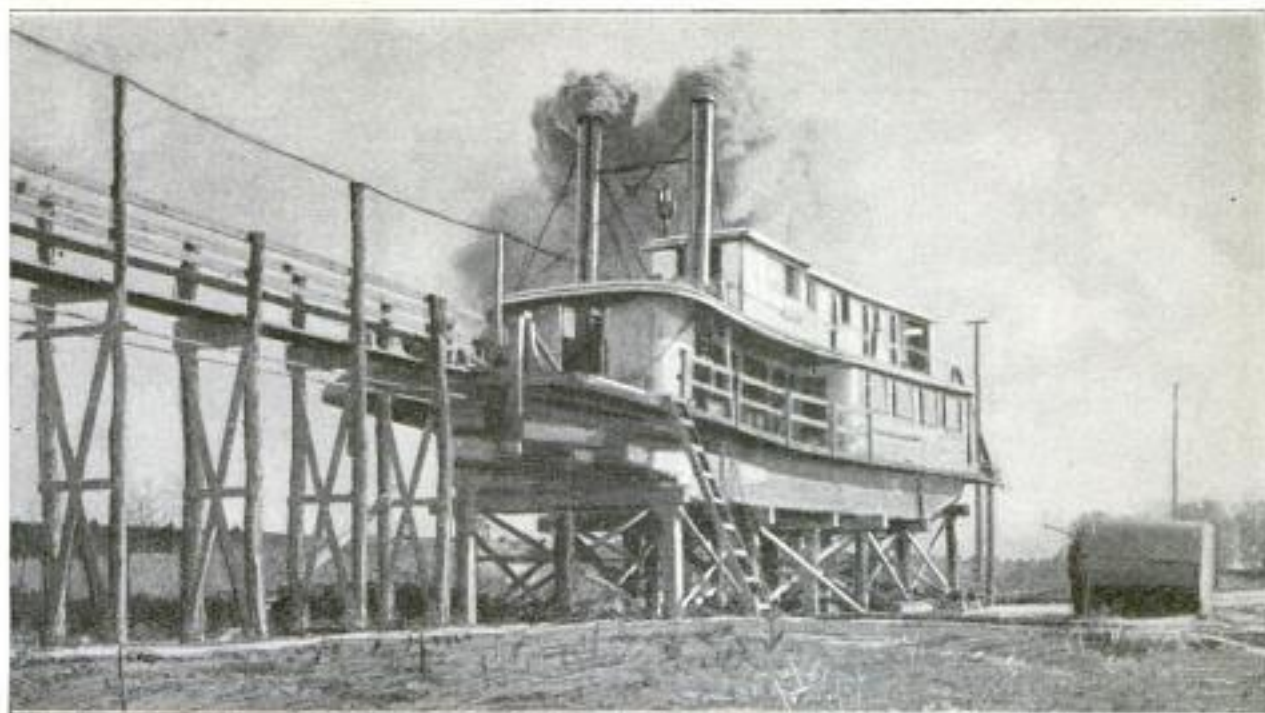


Swinging Lead Used in Place of the Ordinary Type for Driving Piles at an Angle: By This Means the Piles were Prevented from Bending and Breaking

of a sea wall at New York City, the contractors devised a swinging lead. A floating derrick was used, and the weight of the piles caused them to penetrate the mud several feet, when placed. By means of guys they were pulled to the right angle and held while being driven. The hammer operated between two 6 by 6-in. timber leads, extending 8 ft. below the butt of the pile, and handled by a hoisting tackle and derrick boom.

8053
**OLD MISSISSIPPI CRAFT USED
 AS POWER PLANT**

One of the survivors of the days made famous by Mark Twain's "Life on the Mississippi," the steamboat "Andrew Paddock," is now serving as a power plant at New Orleans, La. Perched high in the air on stilts, smoke still belches forth in black masses from its tall stacks, but the sternwheel that once churned the murky waters of the river is motionless. The captain and crew of the "Andy," as it was affectionately termed by the negro roustabouts, were transferred to other boats, and the crew now consists of two firemen, each of whom is addressed jocularly as "captain." The numerous passing craft invariably blow their sirens in salute, and old "Andy" always replies vigorously from its position just beyond the water's edge. The boat is owned by an oil com-



This Is How the Old Mississippi River Steamboat Now Appears as It Rests High upon Stilts at the Water's Edge and is Used as a Power Plant. The Elevated Sidewalk Leads from the Former Craft to the Bunkering Offices of the Company, for Which It Furnishes Light, Heat, and Power

pany, and furnishes power for its bunkering offices on the Mississippi River. The rooms in the rear of the offices are occupied by employes of the company, and are also heated by the steam from the boat. Very little ceremony attended the lifting of the "Andrew Paddock" from the water, and elevating it to the present position. After the stilts were driven in place, it was raised by jacks to its final resting place, thus ending an active river career which extended over a period of 25 years.

9909
BUFFALO FUR TO BE SHEARED AND USED LIKE SHEEP'S WOOL

There are 8,000 American bisons, commonly known as buffalo, in captivity, and it is calculated that, if sheared, the fur of these animals would furnish 160,000 lb. of raw material that could be used as a substitute for wool in the manufacture of blankets, sweaters, socks, or other products. That buffalo skin is a greater warmth retainer than any other hide was well known to northern pioneers, and it has now been demonstrated in a practical way, in Canada as well as in this country, that the hair or wool when sheared from the pelt has real commercial value. Unfortunately, buffalo cannot be sheared as sheep are, because of their great strength and pugnacity. It will therefore be necessary to handle them in some manner similar to the way unbroken horses are held when being

branded. Held without danger to themselves or the shearers, the loose wool could be pulled off, and what remains



Photo of Buffalo, Taken While in Captivity in Canada Where Arrangements are being Made for Utilizing the Fur of These Animals as a Substitute for Wool

could be sheared. Arrangements are now being made in Canada to shear 5,000 head of buffalo at Wainwright, Alberta.

For quick transportation, the company owning the diamond mines in the Province of Kasai, in the Congo State, Africa, sends diamonds to the town of Kinshassa, their nearest destination, by airplane.

W. inc. V. Fair Vancouver, B. C., Canada
 Col. Chas. Goodnight Goodnight, Texas

6,000 buffaloes at Wainwright, Alberta, Canada.

Bill Cochran, Buffalo Park, Wainwright, Alberta, Canada.

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Louis B. Mayer Studios
 Los Angeles, Calif.

POPULAR MECHANICS

8064

IMITATION CONCRETE BLOCKS
 ARE MADE OF SANDPAPER

Counterfeit concrete blocks for motion-picture photography, when made of sandpaper, have been found to yield a more



This Imitation Stone Doorway of a Motion-Picture Set is Made by Tacking Sheets of Sandpaper on Wood to Represent Concrete Blocks

natural appearance than the genuine product. The stone borders on doorways have always proved to be a source of annoyance to moving-picture producers, because of the unnatural aspect they present in the finished photograph. By accident, the usefulness of sandpaper in this connection was discovered, and due to the minimum of expense involved, it is thought that the future "stone" of the movies will consist of a sandpaper imitation.

VALUABLE DIATOMITE MINE
 IS OPERATED IN OREGON

Diatomite, or infusorial earth, composed of the remains of myriad microscopic underwater organisms, or diatoms, of past ages, is now being mined near Redmond, Ore. A company has acquired nearly 1,000 acres of land, under which is a deposit of this product, 35 ft. in thickness and claimed to be 100-per-cent pure.

Western Diatomite Corp.
 Redmond, Ore.

This commodity is used for numerous purposes; for example, as an ingredient in tooth paste, nail polish, in vulcanized rubber, in sirup and sugar filters, as an insulation material, in dynamite, and in cement mixtures for the plastering of marble or other hard substances.

PECULIAR MACHINE BUILT
 FOR EMPTYING CANALS

On Belle Isle, the municipal playground of Detroit, Mich., there is a peculiar pumping machine which was improvised for the purpose of draining the water from the canals on the island. These canals are drained and cleared of refuse each year in preparation for the skating season. The machine is a box, 3 ft. wide and 20 ft. long, open at the ends and mounted on two wagon wheels at the center. At each end are two sprocket wheels. Endless chains pass over these sprockets and through the box. On the chains, at intervals of 14 in., paddles are attached. One end of the box is lowered into the canal and the paddles carry the water up through the box to a sluice, which drains into the river. The machine is operated by either a tractor or a steam engine, according to the amount of power which happens to be required.



The End of This Peculiar Pump is Lowered into Canals Which are to be Emptied of Water for Cleaning. The Outside Box is Here Removed

Emb. W. K. Croason, 414 29 Townsend Ave
 Detroit Mich.

Standard Oil
 Bulletin Sept 1911

ARTIFICIAL CRANBERRY BOGS IN THE NORTHWEST



Typical Artificial Cranberry Bog in the Pacific Northwest: The Bog has been Drained, Cleared, and then "Scalped" of Vegetation. Through Soil Made of White Sand the Cranberry Shoots are Thrust and Take Root in the Peat below It. This Work Costs \$1,000 an Acre

SHORTAGE in the cranberry crop in other parts of the United States last year has focused attention upon this new industry of the Pacific Northwest, which promises to furnish strong competition for the product of the eastern part of the American continent. After years of experimentation and selection and the development of artificial growing areas, the states of Washington and Oregon have come to the front as producers of cranberries in large commercial quantities.

Lewis and Clark, in the log of their trip across the continent in the early part of the 19th century, mention the fine flavor of the wild cranberries purchased from the Indians

along the Columbia River. Cultivation of the wild cranberry bogs was not attempted until about 35 years ago, and continued in a desultory manner until recently, when a successful means of preparing growing ground was developed.

Preparation of cranberry ground in the Pacific Northwest is an expensive under-

taking, the cost being around \$1,000 an acre. A wild marsh is selected, drained by ditches, cleared of trees and brush, then the turf is removed by what is called the "scalping" process, leaving bare the peat of the bog. Over the peat is spread a 4-in. layer of clean white sand. Planting is the next proceeding. Vine cuttings are used for this purpose, and are pressed through the sand into the peat with a dibble or planting tool. The vines are

planted 10 in. apart, which makes about 60,000 to the acre.

During the first year the plants send out runners, which in the second year form a vine growth, 6 to 10 in. in height. Every two or three years the

ground must be carefully weeded by hand. Flooding the ground in winter has proved effective in keeping down the weeds.

For the first year or two after the productive stage has been reached, the cranberries must be picked by hand, because the vines are tender. Thereafter a long-toothed wood comb is used, and is about



After the Bog has been Drained and Cleared Down to the Peat Bottom, Four Inches of Clean White Sand is Spread on Top of the Peat

8021

ten times faster than hand picking. The field is marked off in 4-ft. avenues with white twine, and a picker is delegated to each avenue. The ground is dry and clean, and the pickers work sitting or

carefully picked over by hand. Care in picking over the berries is necessary, as one decayed berry will spoil a whole crate. The floor of the warehouse is thoroughly ventilated, and the berries are stored in their crates until time to send them to market, whereupon they are again examined and packed in barrels for shipment.



The Cranberry Warehouse: The Berries Brought In from the Field are Mechanically Separated from the Chaff, Then Carefully Sorted by Hand, after Which They are Stored in the Warehouse until Marketing Time

kneeling, gathering the fruit into shallow dishes, which are emptied from time to time into crates at the end of the avenues.

The crates, which have slatted bottoms to provide ventilation for the berries, are transported to the warehouse as rapidly as they are filled. A machine separates the chaff from the berries, which are then

minute drop of oil so strongly flavored that in comparatively small numbers these organisms impart to the whole water supply a disagreeable taste. The affected reservoir, the Kensico basin at Valhalla, has been cut out from the water-supply system by a by-pass. Thus isolated, the water will be treated with a sulphate-of-copper solution that will kill the Synura.

8130
HARMLESS ORGANISM MAKES WATER DISTASTEFUL
Brown

N. J. James 7/6/22 Q. 1



Pickers at Work on an Artificial Cranberry Bog: The Plantation is Marked Off with White Twine into Avenues Four Feet Wide, to Each of Which a Picker is Assigned. They Work Sitting or Kneeling



CIRCULAR SAW MOUNTED ON AUTO CUTS COMMUNITY'S CORDWOOD

WHEN this young man, who lives up in northern Wisconsin, needed to cut cordwood for his furnace, he made his inventive mind save him from the back-breaking labor of the handsaw. Removing the body from his automobile, he mounted a circular saw on the chassis, with a belt from the rear wheels to drive it, and went into the business of cutting wood for the whole community. It proved so profitable that he was soon able to buy a new car.

8008 apparatus _____ *Accessories*

**RADIO CHANGE-OVER SWITCH
 OF SIMPLE CONSTRUCTION**

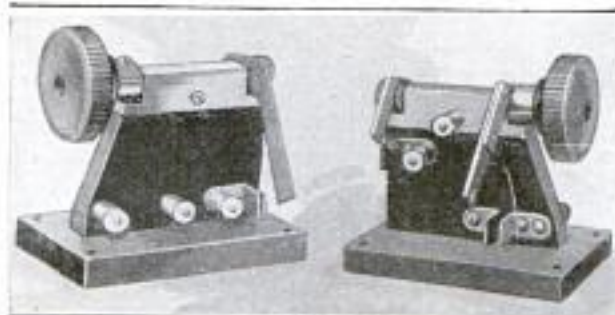
**8044 AUTO BABY BED USABLE
 ALSO IN THE HOUSE**

Simplicity of design and operation, in addition to the elimination of all "kick" in the phone receiver, are the chief features of a new radio change-over switch. When changing from sending to receiving, the turning of a knob causes three knife-blade contacts, first, to cut off the power, then ground the aerial for a moment to drain away any accumulated charges, and finally connect the aerial to the receiving circuit. Being small, compact, and possessing a high insulation factor, the switch should be welcomed by all who look for simplicity in radio apparatus.

A bed, designed to carry babies in automobiles, is equally suitable for use in the



A Baby Bed, Which can be Used Either in an Automobile or in the House, should Prove to Be a Great Convenience



Left: Radio Change-Over Switch as It Appears from the Receiving Side. Right: Sending Side of Switch

*Signal Electric Co.
 Menominee Wis.*

home. It is made of heavy steel-gray covert cloth, strongly reinforced and mounted on a folding frame. The frame is of black-enameled steel and is supported by legs. The bed is intended to be placed back of the front seat of the machine. It is 18 in. high, 14½ in. wide, and 33 in. long.

*Perfection Mfg. Co.,
 2701 N. Central Ave.
 St. Louis, Mo.*

Cml. M. H. Allen,
283 1/2 Regent St.

412

POPULAR MECHANICS

8035

Berkeley, Calif.
JAPANESE WOOD CARVING
INCREDIBLY LIFELIKE

San Franciscans are paying homage to one of the most remarkable wooden statues ever conceived. It is the work of



Life-Size Statue of the Japanese Artist Hananuma Masakichi, Carved in Wood by Himself: Two Thousand Pieces were Separately Fashioned and Put Together with Pegs to Complete the Figure

Hananuma Masakichi, greatest Japanese artist in wood or ivory, who posed for

himself by the aid of adjustable mirrors, and carved his own life-size image from wood. More than 2,000 separate pieces of wood were used, each member of the anatomy having been carved separately before putting the whole together. The joints were perfectly made, dovetailed and glued together, only wooden pegs being used for fastening. With the woodwork completed, the artist applied lacquer to the statue, giving it the appearance of flesh and blood. Skin blemishes, blue veins, discolorations—everything is reproduced faithfully.

The hair on the figure is the artist's own. He used the clippings from his head and beard, boring tiny holes for the hairs and setting them in place one by one. The body hairs were all pulled from his own body and put in exactly the same position on the figure as they occupied on himself. The teeth are visible through slightly parted lips, and the eyes, made of glass by the artist, have the appearance of real eyes.

The figure is in every particular, even the most minute, an exact counterpart of the artist. The carving required three years, even to so adroit and masterly a workman as Masakichi.

7998

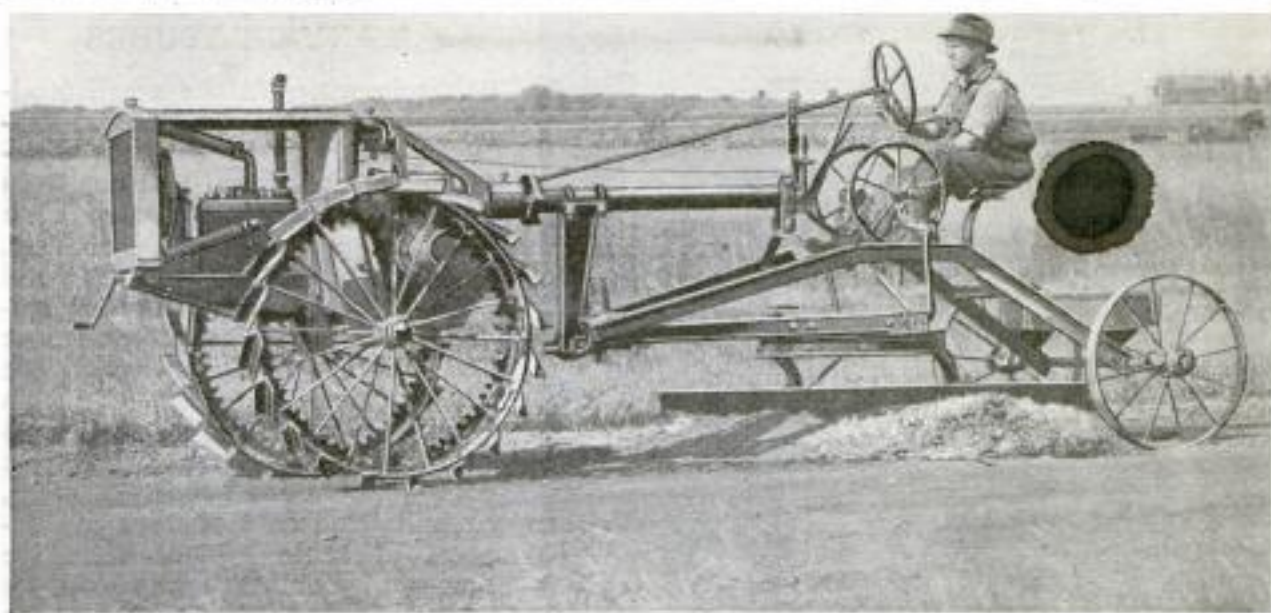
ROLLER AND ICE SKATING ON RESERVOIR COVER

On the large, specially designed concrete cover of a fire reservoir in Dubuque, Ia., can be seen crowds of youngsters enjoying the unusual roller-skating facilities offered there. A small store and many other conveniences are installed for the benefit of the youthful merrymakers who daily throng the smooth surface during the summer months. In cold weather, the cover is flooded with a foot of water, the freezing of which provides an excellent ice-skating rink.



Showing the Large, Specially Designed Concrete Cover of a Fire Reservoir as It Appears during the Summer Months When Children are Permitted to Use It as a Roller-Skating Rink

Cml. S. J. Jellison, 2506 Windsor Ave.
Dubuque, Ia.



The New Road-Grading Tractor, Showing the Novel Design Which is Said to Permit Easy Operation by One Man, and Results in More Economical Work Than can be Done with Horse-Drawn Graders: The Entire Front Part is Pivoted for Steering

7973
**NEW TRACTOR ROAD GRADER
SIMPLE AND ECONOMICAL**

A company, which has been producing road-building machinery for some time, is now turning out a tractor grader of novel design, for which it claims great ease and economy of operation. Only one man is required to operate it, both the tractor and grader controls being easily handled from the driver's seat. The front, or tractor, part turns on a vertical pivot, and is steered by means of a segmental gear and pinion operated by the steering wheel, so that the whole machine can be turned in about the same space required by an automobile. The 6-12-hp. motor operates on gasoline, and low-grade fuel can be used effectively. It will grade from 1½ to 3 miles of road an hour, about the amount of work done by three teams, at about half the expense of horse grading.

7997
**BRITISH COLUMBIA ADOPTS
AMERICAN TRAFFIC SYSTEM**

On January 1, this year, the province of British Columbia abandoned the English custom of driving on the left side of the road and adopted the American "keep to the right" system. With this change, all of Canada, except Nova Scotia, New Brunswick, and one or two other small eastern territories, have come under the American plan. The change was made necessary because of the increasing traffic across the international border and the many accidents resulting from the conflicting systems. Though the change involves heavy expense in altering the entire traffic system of the provinces concerned, it is expected to prove profitable.

8179
**COINS COATED WITH POWDER
AID IN TRAPPING THIEF**

In solving a mystery of petty thievery, an English detective coated several coins with a chemical known to produce a stain on the hands, and placed them in the purse of the complainant. Later, upon being informed that some of the money had been stolen, he commanded certain suspects to expose their hands, thereby revealing the telltale stains and obtaining a complete confession and the conviction of the guilty person.



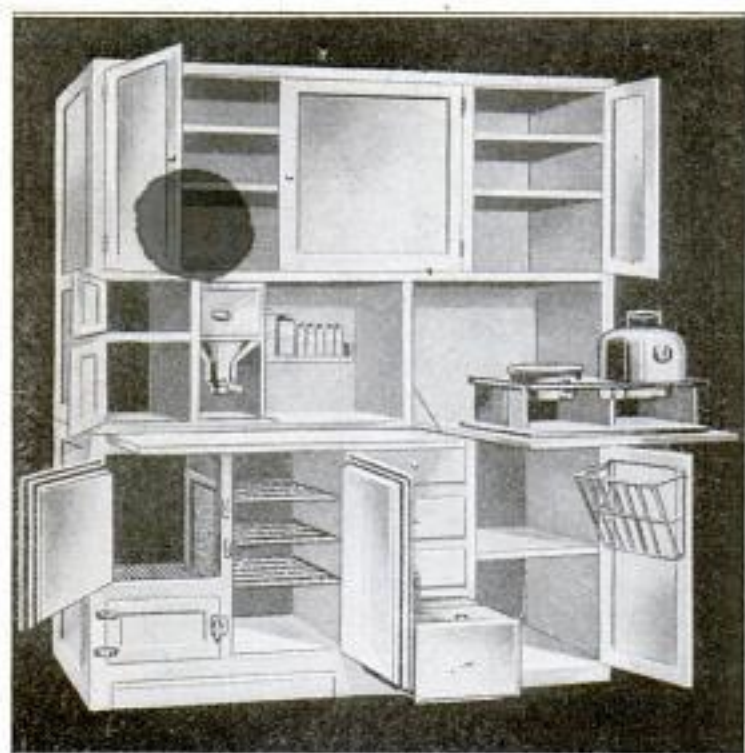
One of the Many Signs in British Columbia Affected by the Changed Traffic Regulations

London Times Weekly
12/23/21

Copyrighted Material
416
12/23/21

7921

Electric Kitchenette Co.,
Hort Wayne, Ind.



Kitchenette, Showing the Three Compartments at the Left Which Have Front and Rear Doors, and the Folding Electric Range at the Right

**KITCHENETTE CONTAINS
MANY FEATURES**

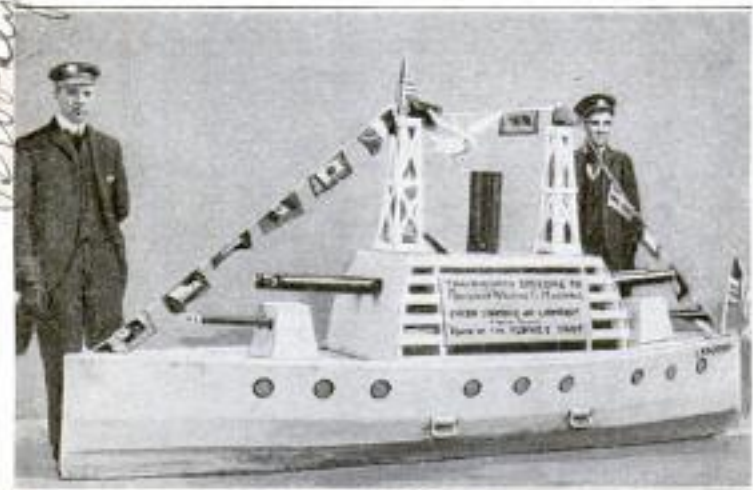
Kitchenettes in the small modern apartment must possess features that will save work, eliminate useless steps, and assist in the general saving of space. One of this type, now on the market, has incorporated in it many good points in this connection. In addition to the usual complement of shelves and drawers, the kitchenette in question includes a folding electric range with two burners, a built-in refrigerator, a compartment for groceries, meat, or milk, and also one for the deposit of table refuse. The ice box and compartments can be opened from the rear, so that ice and food can be put in, and garbage removed, without entering the kitchen, thus solving one of the housewife's vexatious problems—the safe deposition of the ice or food delivery.

8041

End. Stanley W. Todd, 327 Mc Donough St. Albany, N.Y. 8071

**PRESIDENT'S TURKEY SHIPPED
IN BATTLESHIP CRATE**

A Thanksgiving turkey, presented to President Harding by the Chamber of Commerce of Cuero, Tex., made the trip



Novel Battleship Crate, in Which a Thanksgiving Turkey was Shipped to President Harding, from Cuero, Texas

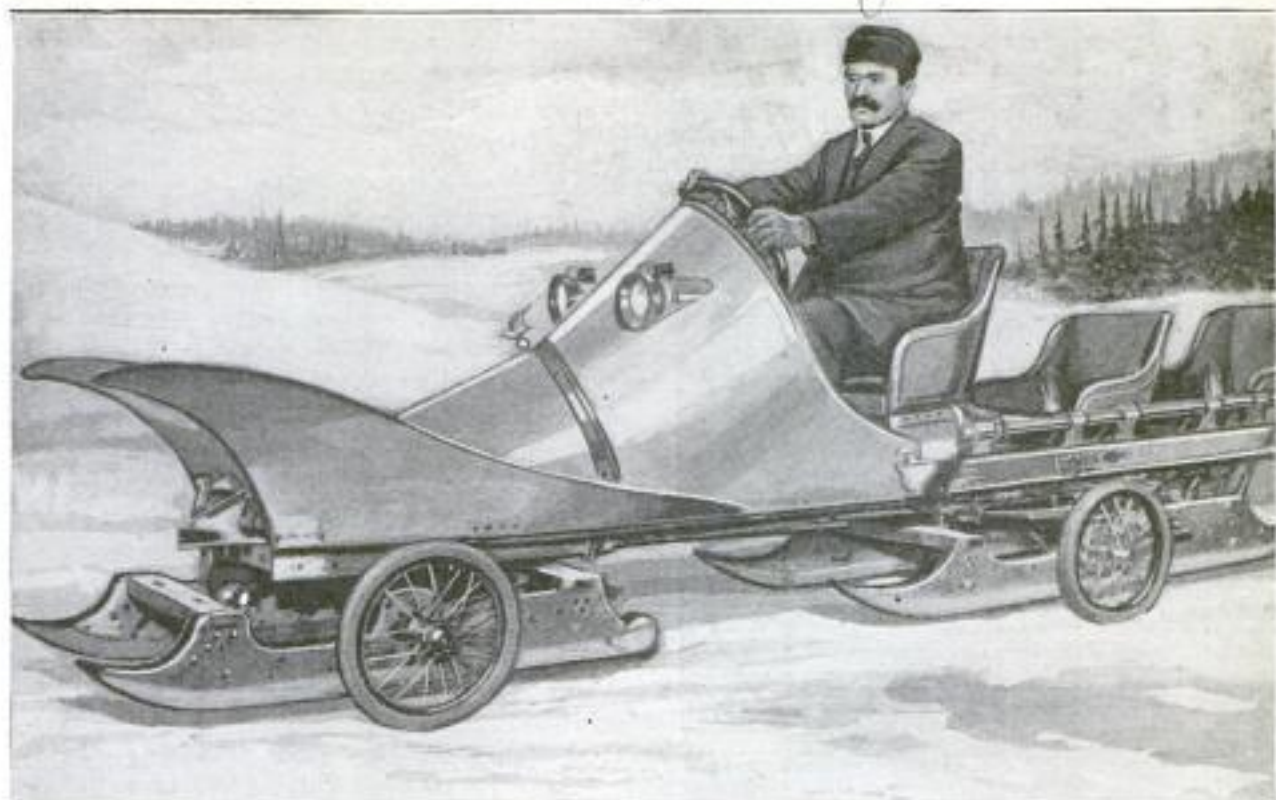
to Washington in a novel sort of crate. It was built to represent a battleship, with turrets and guns, and decorated with flags and pennants. The idea was suggested by the fact that the Conference for the Limitation of Armaments was in session in Washington at the time, with the question of scrapping battleships occupying a conspicuous position.

**SUNSPOTS CONSIST OF GASES
COOLED BY EXPANSION**

The sun's spots are cooler than the surrounding portions of the surface of the sun, and the dark patches thus formed make them visible. Recently an American astronomer has made several interesting deductions concerning them. It is well known that gases are cooled by expansion, and in the sunspots there is an upward movement of gas, producing an expansion and corresponding drop in temperature. It is thought that the increase in volume of the gas is 30 times or more. By making allowance for the effect of heat being radiated into the sunspots and for an increase of temperature with depth, as would be established by the radiation of the sun's heat, it is estimated that the lower part of the vortex of the

sunspots must be in a region of extremely high temperature, probably over 20,000°C. (36,000°F.). The temperature of the sunspots is lower than the adjacent luminous-gas envelope by 2,000 to 2,500°C., so that on account of the tremendous drop in temperature produced, the sunspots may be regarded as the most powerful refrigerating engine known to science.

C.A. Briggs, 1524 Cal St Hall Washington, D.C.



Motor Coasting Sled Which Climbs the Hills under Its Own Power: For Coasting, It Rests on the Runners; for Climbing, the Wheels are Lowered to Support It, and the Engine is Started

8073 MOTOR SLED SAVES CLIMBING —FOR COASTING PARTIES

Coasting would be much more enjoyable if it were not for the work of dragging the sled back uphill after the downhill slide. With a new motor sled the climb is no longer necessary. This sled is equipped with a gas engine and wheels. For coasting downhill, the wheels are raised, and the sled rests on the runners. At the bottom of the hill the wheels are lowered, the engine started, and the sled climbs back under its own power.

834 HOLDER FOR TRANSPLANTING SAPLING TREES SAFELY

The difficulty of transplanting young trees may be overcome by a recently invented transplanting receptacle. The chief reason for failure is that the nourishment stored in the soil about the roots is needed by the transplanted sapling to continue its growth. The receptacle is designed to transfer this soil with the tree. It consists of two curved pieces of sheet iron hinged together and fastened with straps to form a bucket-shaped container. Two pins and four slides pass through slots, near the lower edge, to form a bottom. A circle is cut about the tree, and the surrounding soil dug out, so that the receptacle can be fastened about

the column of earth and the pins and slides inserted. The tree is placed in a hole prepared to receive it, the slides and pins are removed, and earth is



Left: How the Soil about a Tree is Removed for Transplanting. Right: Method of Attaching the Receptacle

tamped in to the level of the first buckle, which is then unfastened. This is repeated until the hole is filled, when the receptacle is withdrawn from the ground and the soil packed firmly about the roots.

¶ The U. S. Bureau of Mines is experimenting in the Nevada gold mines in an attempt to prevent or minimize the danger of rock bursts in deep metal mines, by the use of the cement spray gun.

cl. w. Lionel Neil
Esoldsbors, N. C.

7913 no record of address - Inquire
Oakland Garages.



A Street in the "Bungalow" Village Which will Accommodate 500 Motorists When Completed: At the Extreme End of the Street, on the Right, can be Seen a Store Which was Erected Expressly for the Convenience of the Villagers. When Finished, This Street will be Paved with Crushed Stone

"BUNGALETTE" CAMP FOR MOTOR TOURISTS

By JOHN ANSON FORD

HERE is the latest idea in camps for motorists. An Oakland, Calif., concern is spending no less than \$80,000 in erecting "bungalettes" on an eight-acre tract, to be let to motoring tourists by the night or for any longer period "up to fifteen years" (as the management jokingly announces), which is the length of the lease on the land. These simple resi-

is commonly offered by an ordinary tent. These bungalettes are of two types, some with one room and some with two rooms. They are built entirely of wood, and are equipped with sinks, running water, electric lights, two-burner gas plates, etc. They rent for \$20 to \$35 per month, and at corresponding rates for shorter periods. A third type of structure is designated as a "shelter house," and consists of a shed, about 9 ft. square, open on two sides, furnished with a combination table and benches for four persons, and a two-burner gas plate. These shelter houses rent for 75 cents per day or \$4.50 per week.



The Building on the Left Is One of the Sanitary Toilet Houses of the Village, While the One on the Right Is a Laundry. Both Structures Possess Modern Plumbing

dences are designed to take the place of tents, and while their furnishings are meager compared with regular houses, they offer considerably more in the way of conveniences than



Another View of the Village Street, Showing Some of the Houses Which Contain Electric Lights, Running Water, and Two-Burner Gas Plates

2913

All rates quoted include gas for cooking, as well as the use of community laundries, which are equipped with sanitary tubs with running hot and cold water.

The bathhouse, which occupies a central location on the grounds, is equipped with enameled tubs and is piped for hot and cold water. Sanitary toilets are also conveniently located. Construction of the bungalows and shelters began in the late summer last year, and the demand for them proved so great that the owners decided to double the number of structures to be erected. As soon as they have erected enough shelters and houses to accommodate the steady stream of incoming tourists, they propose to erect a dance pavilion where entertainment will be provided evenings and on rainy afternoons.

It has been found that a surprising demand for accommodations of the kind provided here, exists among traveling salesmen, who evidently consider it more economical to motor to this camp with their wives than to put up at hotels. Here they can set up housekeeping at very little cost, and in the week or two consumed in "doing" the Bay District, the salesmen's wives enjoy sight-seeing, shopping, etc. Another class of patrons are members of theatrical troupes. Already a considerable number who are on the Pacific-coast circuit have found it more enjoyable and economical

to travel by automobile and stop in auto camps.

When all the structures in the Oakland

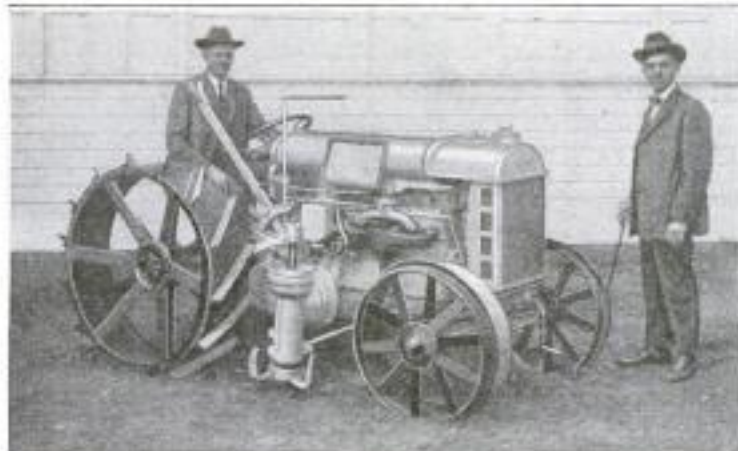


One of the "Shelter Houses" of the Village, Which Is Open on Two Sides: It Has a Combination Table and Benches Accommodating Four Persons, and Also a Two-Burner Gas Plate

camp have been completed, it is expected that between 400 and 500 cars will be parked there nightly. In view of the shortage of houses, many new arrivals in the vicinity of Oakland have turned to these structures as temporary homes, parking their automobiles close by their bungalows, and preparing to stay for several weeks or months. The camp is located close to a public school, and several "tenants" have already enrolled their children there.

1748
SMALL TRACTOR ATTACHMENT IS PLOW AND WEED KILLER

Originally designed as a weed killer, but also adapted to the work of plowing,



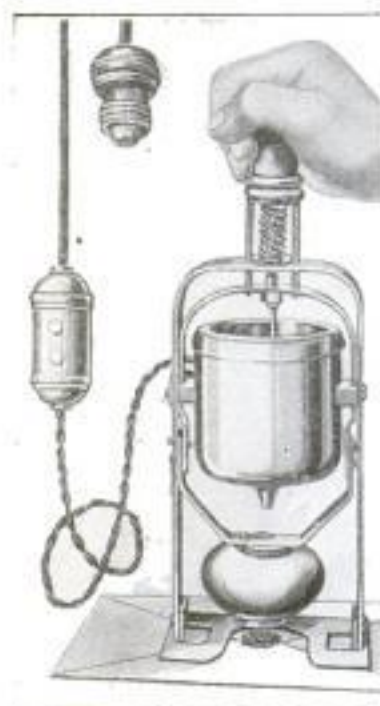
Attachment for Weed Killing and Plowing, Designed to Fit a Small, Widely Used Tractor

disking, cultivating, and dragging, there is now being manufactured an attachment for a standard small tractor, of which there are a large number now in use. The tractor has a belt pulley, which is removed, and on its shaft the attachment is mounted vertically, so that through gears, as in an ordinary drill press, its cutting knives at the bottom of its spindle can be rotated at 500 r.p.m., through a 2-to-1 gear reduction to the motor of the tractor. While the ordinary plow merely buries the weeds, without destroying them, the whirling knives of this attachment cut the weeds to pieces. It is specially effective on wild, rank grass, which on the northern prairies is so prevalent and harmful. It quickly improves any weedy soil.

A. M. L. L. Burr Pine & Land Machine

418
7932
**ELECTRIC SEALING MACHINE
IS SAFE AND ECONOMICAL**

A sealing machine, in which the wax is electrically melted, and which is intended to meet the requirements of bankers, brokers, jewelers, and large commercial institutions in the sealing of valuables, has made its appearance. The machine can be attached by a cord to any light socket, and operated at a cost of one-half cent an hour. In operating, a spring holds the seal to one side, and the wax is released by a



small lever, after which a downward pressure on the apparatus brings the seal into position for making the impression. The use of the appliance gives protection against the fire hazard, to say nothing of the avoidance of burnt fingers and "mussy" seals.

Because of the scarcity of timber for use as props, a South African coal-mining company, which produces nearly 40,000 tons a year, has planted 250 acres to trees, and another equal amount of land is now under preparation for the same purpose.

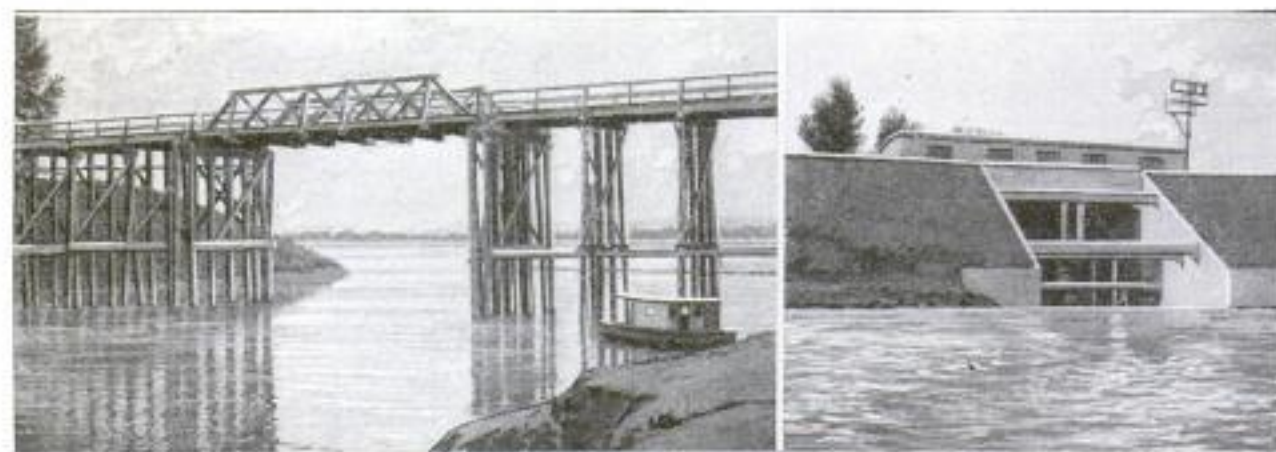
4862
**SLOUGH BECOMES SEWAGE
CHANNEL IN BIG SYSTEM**

By creating an inlet to a slough, and excavating a uniform channel throughout its length, the city of Portland, Ore., has furnished an outlet for sewage for a large residential district including 40,000 city lots. The successful completion of the new channel at a total cost of \$350,000 also makes unnecessary the construction of a trunk-sewer system that would have cost 3,500,000 dollars.

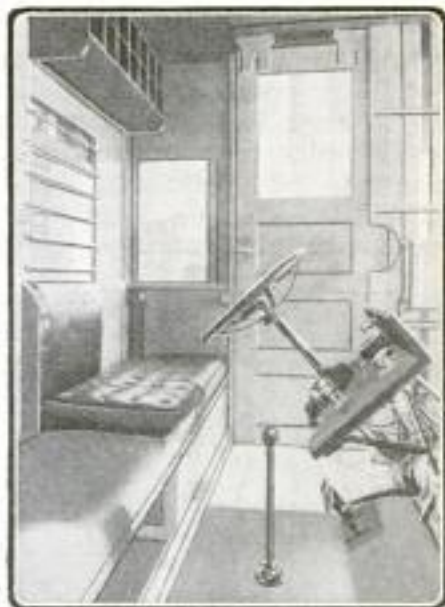
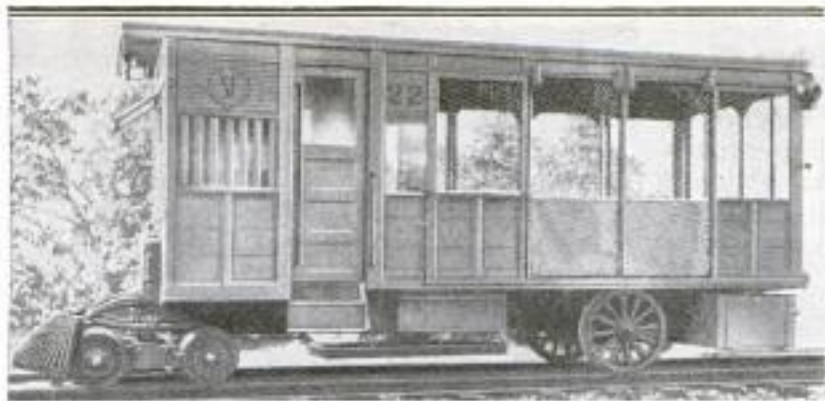
The slough that was thus utilized branches off from the Columbia River on the northern boundary of Portland. At low water it had no inlet, and consequently there was no current, so that it could not be used to carry off sewage. Both the Columbia and Willamette rivers are several miles distant, and it was first planned to build a trunk sewer to empty into one of them. Then engineers hit upon the idea of transforming the slough into a branch of the Columbia.

Six large dredging machines were employed, nearly 1,500,000 cu. yd. of earth were excavated, and 25,000 yd. of rip-rap placed. A uniform channel, 150 ft. wide at the bottom, was dug for a distance of 2 1/4 miles, and dikes were placed along it to protect the adjacent drainage districts.

When the project was first proposed there was much opposition to it on the ground that there would be too much current during high water and not sufficient current to carry off the sewage during low water. Tests of the velocity of the water, as the project was nearing completion, proved that these fears were groundless, and that the channel is a practical solution of the sewage problem in the district that it serves.



Left: The Mouth of the Drainage Canal in the Foreground Emptying into the Columbia River, Which is Seen in the Background. Right: A Section of a Dike with Water Gate, Built along the Drainage Canal to Protect the Adjacent Farm Lands during High-Water Periods



Above: One of the Truck Cars Used for Carrying Mail and Express in the Hetch Hetchy Valley. Left: Interior of the Combination Mail and Express Car. Right: The Dashboard is Raised to Accommodate a Brake Ratchet

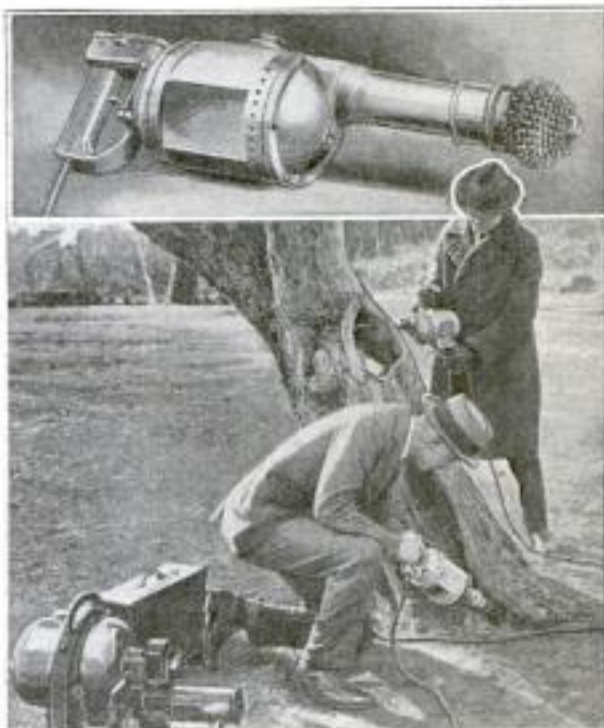
operated in a portable electric drill, which is driven by a gasoline engine and 1/2-hp. generator. As the total weight of the ap-

**RAILROAD USES MOTOR TRUCKS
 ON HETCH HETCHY LINE**

The Hetch Hetchy Valley reservoir, in Yosemite National Park, which is to supply water to San Francisco, is reached by a short railroad, circling up through the mountains, over which automobile trucks of a novel type are operated. They are equipped with flanged wheels, to fit the rails, and special bodies. For handling mail and express, the bodies are inclosed partly with solid sides and partly with heavy wire net. Two sliding doors in the sides are used in loading, and another door gives access to the driver's compartment. There the dashboard is raised and placed at right angles, part way up the steering post, to support a brake ratchet. The steering wheel, being useless for its ordinary purpose, operates one of the three brakes made necessary by the many steep grades along the line. One truck is equipped as an ambulance, with a stretcher hung under the top. Others are arranged for handling tourist traffic.

**"TREE SURGEONS" AIDED
 BY PORTABLE OUTFIT**

"Surgical instruments" consisting of a cutter, or reamer, having 11 small circular saw blades, and ordinary steel bits, have been introduced as an aid in removing the dead and diseased wood from trees undergoing treatment. These tools are



Above: Portable Electric Drill Showing Special Reamer. Below: Treating a Diseased Tree with the Portable Electric Outfit

paratus is only about 120 lb., it can readily be transported to any tree requiring attention.

¶ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

*C. W. H. A. Bartlett
 Stamford, Conn.*

4996

Universal Motion Picture Corp., Los Angeles
Calif. 'Koolish Wives'

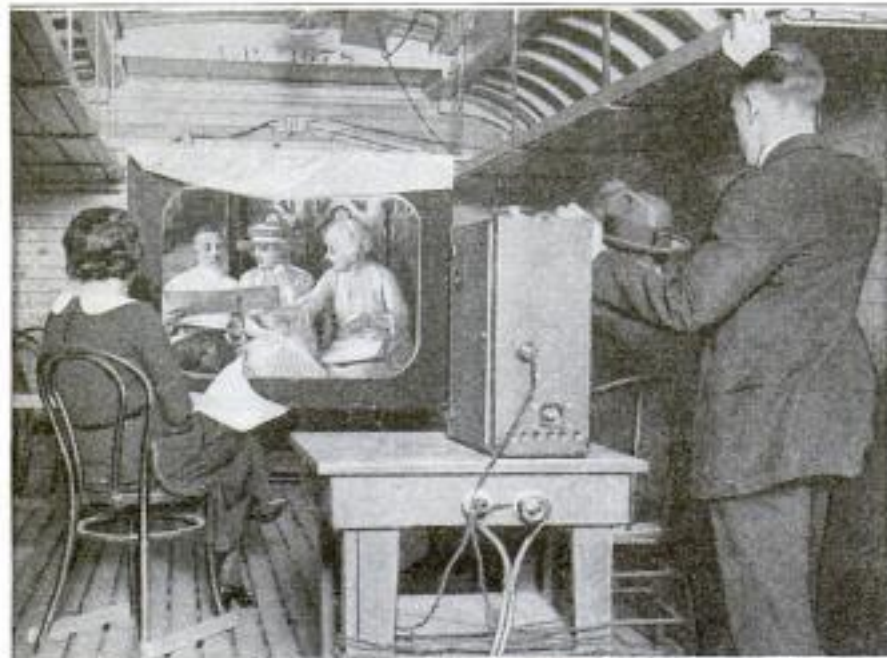
MOVING-PICTURE FILM PREPARED ON RUNNING TRAIN

By JACK A. BRISTOL, Cheyenne, Wyo.

CAUGHT short on time with a New York opening date booked, and facing a huge loss for each day's delay, a moving-picture producer made arrangements to edit, title, and cut the play en route between Los Angeles and the eastern metropolis recently. With a special

and utilizing high-pressure steam from the locomotive for its operation. A steady supply of current was available at all times, regardless of train speed or whether the train was in motion or not, thus enabling the projector to function without interruption, a feat impossible with the ordinary belt-driven equipment.

Twenty-eight heavy steel containers carried the original film, which remained in the "cans" all the time it was not actually in use. Editors and cutters worked continuously, stopping only for meals and for a few hours' sleep at night, and on these occasions every scrap of film was returned to its proper container. The work was entirely successful; and by the time the train arrived in



Projection of Movies aboard a Train in a Specially Equipped Car: The Projector on the Table, and the Silver Screen, were Rigidly Built In to Eliminate Flicker

car equipped as a laboratory and attached to a limited train, the work was found entirely practical even while speeding eastward at a mile a minute or more.

The equipment in the special car consisted of all the cutting apparatus ordinarily used in a laboratory, in one end, a silver screen rigged across the other, and a projecting machine about "amidships" of the car. Both screen and projector were rigidly fastened to the car, and thus, while there was the same motion and vibration attendant upon all moving trains, it was apparently so synchronized that the projected pictures were sharp and clear at all times. With this arrangement, more than 100,000 ft. of film were run off to enable the film editor and his assistants to select the 12,000 ft. needed.

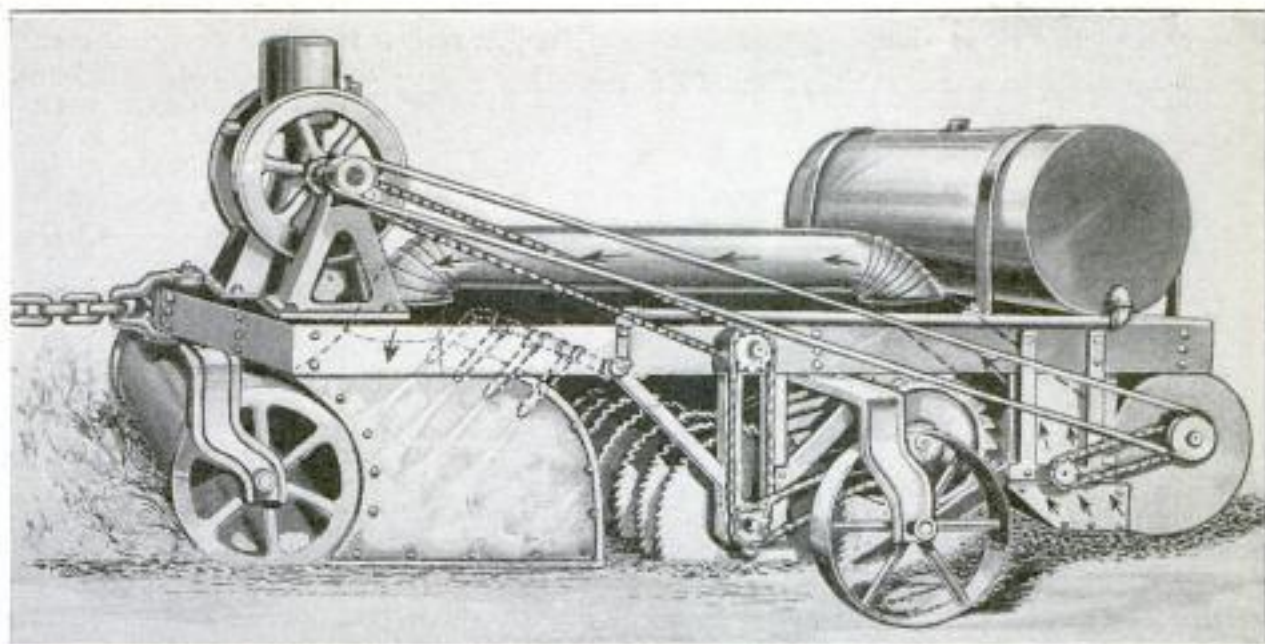
Electricity for the heavy arc lights in the projector was furnished by a dynamo car running ahead of the laboratory car,



Cutting End of Car, Where Film Editor and His Assistants Trimmed 100,000 Feet of Film to 12,000 Feet While Traveling from Los Angeles to New York

New York the film was finished and ready for delivery.

Ⓒ Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages, but this information is kept on file and will be furnished free by addressing our Bureau of Information.



The New Weed and Insect-Exterminating Machine, Showing the Combination of Roller, Hood-Inclosed Burners, and Saws, behind Which are Placed the Cremating Furnace and Distributor: This Machine is Said to Be One of the Most Important Developments in Agricultural-Implement History

7942

NEW MACHINE EXTERMINATES WEEDS AND INSECT LIFE

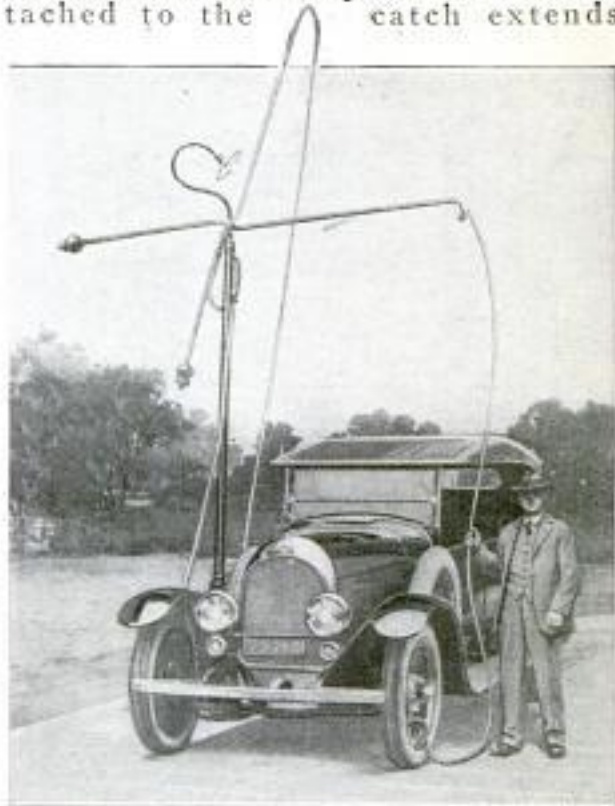
If a recently developed farm machine fulfills expectations, a large part of the loss to farmers from weeds and insect pests can be eliminated. The processes used are not new, in themselves, but their practical combination has been described as one of the most important developments in the history of agriculture. The entire mechanism is operated by a small gasoline engine, mounted on the frame. A front roller crushes all vegetable matter and is followed by a hood, which controls the flames from a row of oil burners, so that the fire cannot spread. This cremates all vegetable and insect life, and prevents germination. Next, close-set saws cut the soil and roots, which are then carried up an incline to a spiral cutter, where the roots are further cut. They are then carried to a set of sieves which separate roots and soil by pressure from an air fan. Refuse is blown back into a furnace and consumed. The soil is distributed in the field absolutely free of vegetable and insect life. The machine works a strip 40 in. wide and easily covers eight acres a day.

758

COIN-OPERATED AIR-HOSE SUPPORT FOR GARAGES

A coin-operated air-hose support, for garages and filling stations, has recently been invented. It consists of a hollow pipe standard with a tilting arm at the top. The air hose extends through the arm and will not reach a machine unless

the arm is brought to a horizontal position. Normally, the arm is held nearly vertical by a counterweight and by a catch at the fulcrum point. A rod, attached to the catch extends



This Coin-Operated Support Keeps the Garage Air Hose Up off the Sidewalk When Not in Use. Its Construction Is Simple and Strong

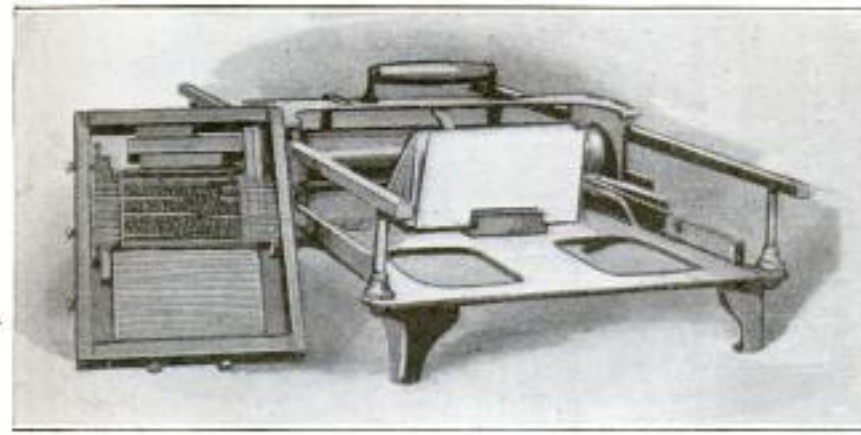
down through the standard and ends in a coin receiver. When a coin is inserted in a slot in the standard, a lever can be pressed against it to release the catch.

d.w. & C. Arguth
811 N. Andrews Blvd.
Los Angeles, Calif.

1999 d.w. Michael Kenna,
 1/0 L. J. Jellison, 2506 Windsor Ave.,
 Dubuque, Iowa

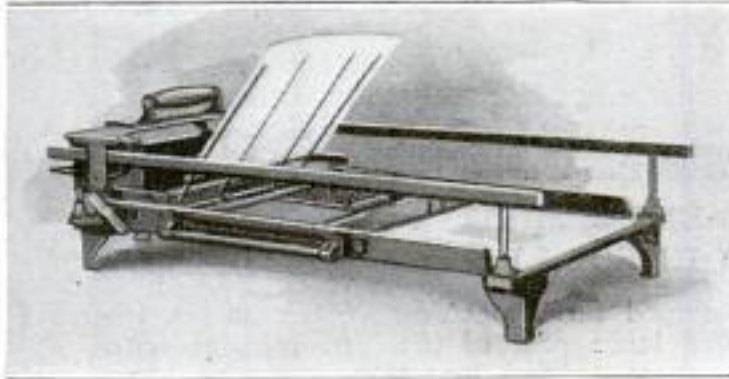
NEW PRINTING OUTFIT USES TYPE STRUNG ON WIRES

SINCE the time of Benjamin Franklin and the laborious hand press, the considerable quantities of office stationery, might find it a profitable investment.



Ordinary Printers' Job Form Set Up in the New Manner: The Printing Press Has a Stack of Envelopes in It

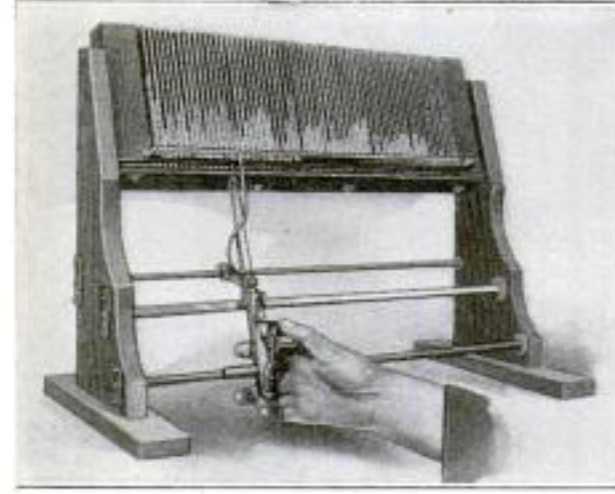
printing industry has evolved but slowly. The present day has seen the development of the type-setting



Form on the Press Which is Equipped, in This Case, with Automatic Paper Feed of Flat-Bed Type

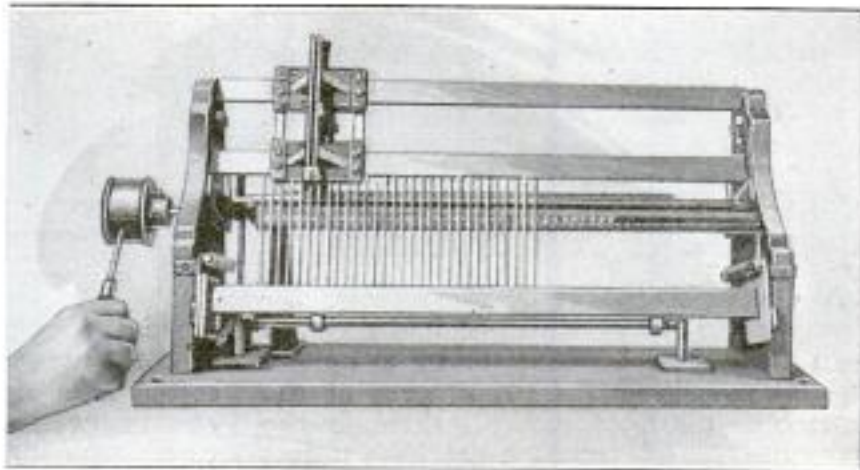
The press and paper feed are an adaptation of the old flat-bed-press idea, and the work turned out cannot be distinguished from regular printing. The type-setter is the most interesting part of the invention. A touch of the operator's thumb releases a metal type slug and strings it on a wire. A little practice gives the right spacing. When a line is strung, it is removed from the setter and placed in the form. The distributor, also, is an interesting bit of mechanism, which allows rapid distribution of the type after using it.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

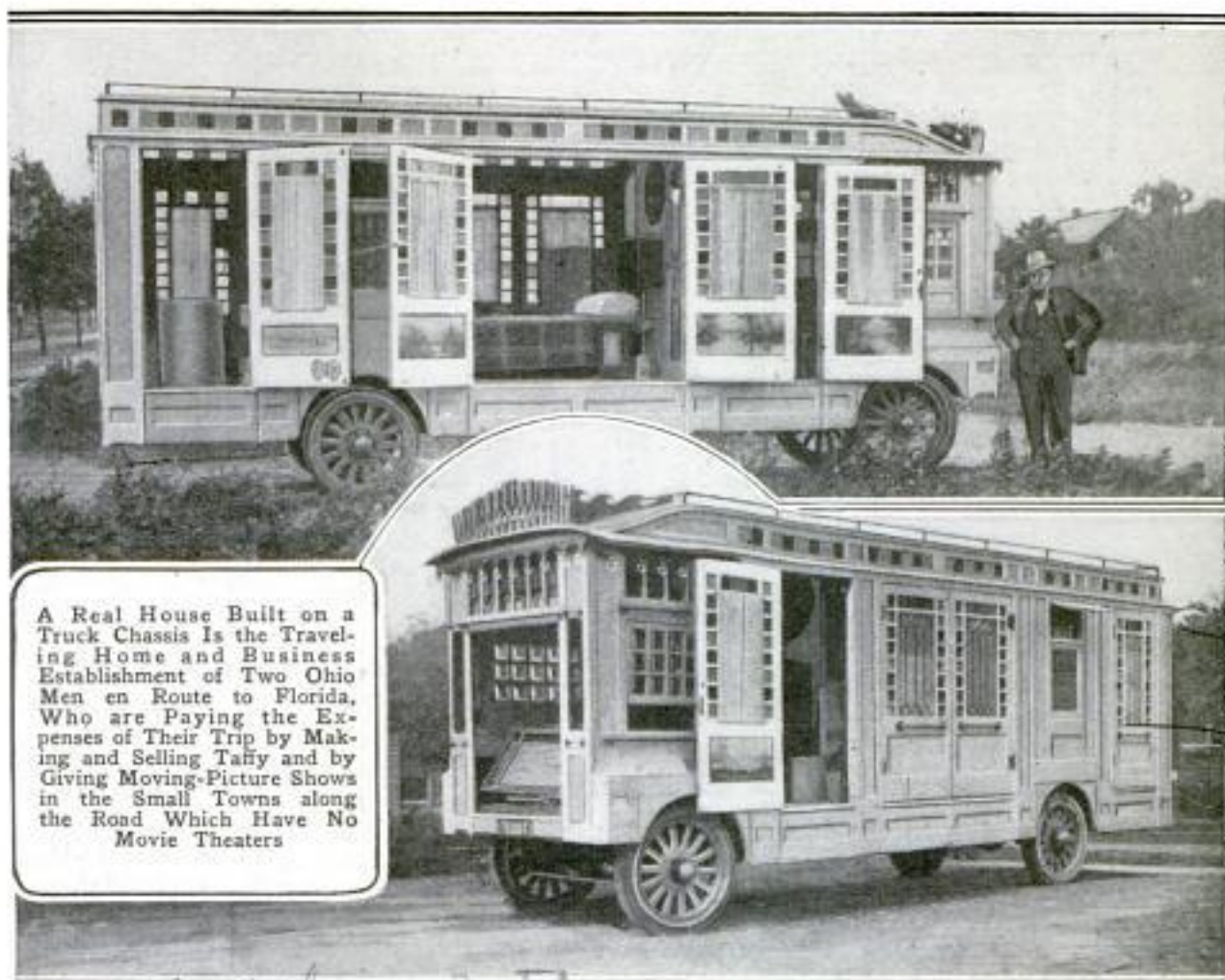


Above: The Type Rack, Showing the Method of Stringing Type from the Rack onto Form Wires by a Simple Pressure of the Thumb. Right: Type Distribution, with Type Pinion Ready to Receive and Distribute Type from Forms After It has been Used

machine which produces type in uniform slugs, but the individual type remains the same. Now a Dubuque, Ia., inventor has built a printing plant so simple in operation that any firm, using any



*Owner - Frank Griswold
 Willoughby Ohio*

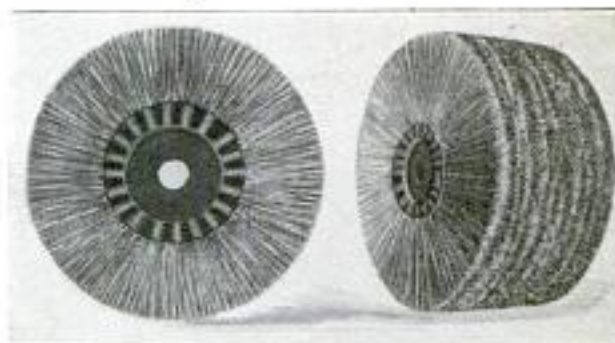


A Real House Built on a Truck Chassis Is the Traveling Home and Business Establishment of Two Ohio Men en Route to Florida, Who are Paying the Expenses of Their Trip by Making and Selling Taffy and by Giving Moving-Picture Shows in the Small Towns along the Road Which Have No Movie Theaters

Traveling
COMBINED HOME AND BUSINESS ESTABLISHMENT ON WHEELS

7991 Recent years have produced many motor vans for touring, but the one in which Frank Griswold, of Willoughby, Ohio, is traveling to Florida is distinctly novel. The body, built on a truck chassis, has the appearance of a real house and is elaborately decorated, with stained glass and painted scenic panels in the doors. The interior is well furnished for comfortable living, and in addition is equipped with a stove, for making candy, a moving-picture machine, and a small pipe organ. Accompanying the owner is D. Roberts, an expert taffy maker. The two men are paying the expenses of their trip by selling taffy and giving picture shows in towns which have no regular movie theaters.

the brush is an interlocking arrangement, achieved by having the faceplates constructed with corrugated surfaces. When two sections are properly placed together, these corrugations intermesh, thus precluding any possibility of slipping. The sections are made in half-inch widths, and with any diameter of shaft hole de-



At the Left is Shown a Single Section of the Interlocking Wheel, While at the Right are Seen Numerous Similar Sections Joined to Make a Large Wheel

1928 6
SECTIONAL BUFFING BRUSHES HAVE INTERLOCKING PLATES

An eastern firm has placed on the market a sectional buffing-wheel brush, which is made in three materials—wire, horse-hair, or fiber. The outstanding feature of

sired, so that buffing wheels of various sizes can be built up to fit different classes of work. The wheel was specially designed for tire and rubber manufacturers, and is said to be efficient and economical for tire-repair work of all kinds.

*North Eastern Mfg. Co.
 New Haven, Conn.*

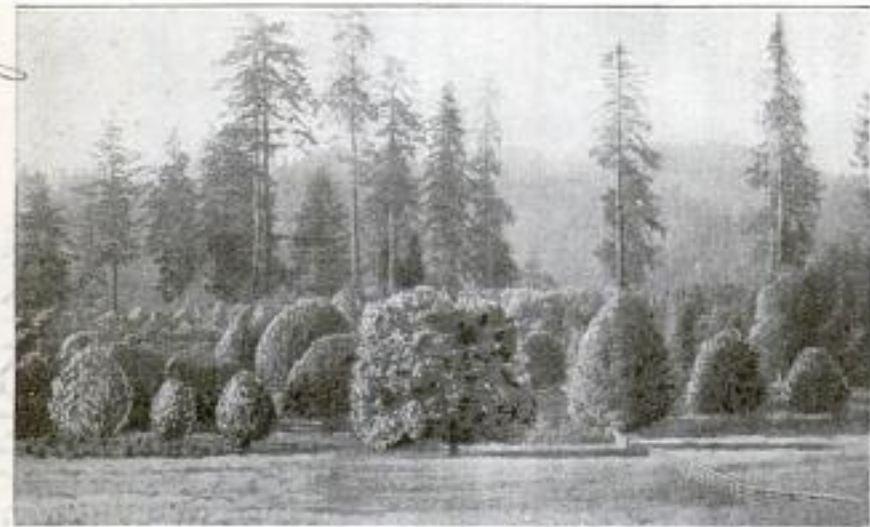
Capt. Alfred Powers,
1065 Alder St.
Eugene, Oregon

Capt. C. A. Briggs,
1521 Oak St. N.W.
Washington,
D.C.

426
893

POPULARITY OF MYRTLE WOOD REDUCES LIMITED SUPPLY

The growing popularity of myrtle, as a wood for the manufacture of novelties, special furniture pieces, and interior panel



Grove of Myrtle Trees in Coos County, Oregon, the Only Place in the United States Where They are Found in Quantities Sufficient for Cutting on a Commercial Scale

work, calls attention to the fact that it is found, in commercial quantities, in only one place in this country. It is estimated that about 687,000 ft. are available in Coos County, in southwestern Oregon, and that the demand will soon require a cutting in excess of the production. Myrtle grows very slowly, a tree of the greatest size, about 12 ft. in diameter and 100 ft. high, requiring about 300 years to develop. Most of the trees in Oregon are from 18 to 48 in. in diameter. The wood is greatly prized because of its beautiful graining. No two pieces are ever exactly alike, and matching is impossible, which adds to the manufacturing cost. Its cost is also increased by the fact that it will not float in water. Because of this, trucks



Bowls Turned from Myrtle Wood: This Wood has Become Popular for Such Purposes Because of Its Beautiful Graining

or trains must be used to transport the logs to the mills. This is, of course, a much more expensive method of handling than floating them down the rivers, as is commonly done with other kinds of timber.

INTERESTING DEMONSTRATION OF RADIO-WAVE VELOCITY

The tremendous speed with which electricity travels was demonstrated in an interesting way at a recent gathering in Washington, D. C. The evening had been spent in listening to a radio concert coming over the Allegheny Mountains from the station of an electrical company in Pittsburgh. Just before 10 o'clock, the time signals sent out by Arlington, just across the Potomac from Washington, were picked up on the long wave by Pittsburgh and retransmitted on the short wave used for broadcasting music. Washington is almost in the shadow of the great steel towers of the Arlington station, and

the direct signals were so strong that they forced themselves on the receiving set tuned for Pittsburgh. Both the original and the retransmitted signals were therefore heard at the same time and identified by a slight manipulation of the tuning knob. At the receiving station at Washington, a telephone receiver was attached to a phonograph horn, permitting all present to listen at the same time. The signal returned from Pittsburgh seemed to come in just at the same time as the one received direct from near-by Arlington. It was then figured that, if there were no perceptible delay at Pittsburgh, the signal took only .002 of a second for the round trip. The direct signal was just coming out of the large end of the horn at the moment the signal relayed back from Pittsburgh was starting in at the small end. It was also computed that, if the telephone receiver at Pittsburgh were connected to the transmitter through a tube carrying the sound by air through a distance of seven inches, the signals reaching Washington from Pittsburgh would be such that the vibrations of the musical notes would be exactly out of step, and the two signals would tend to weaken each other.

☐ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

UTAH MINE GIVES PROMISE OF U. S. JET INDUSTRY

By FREDERIC KINNEY

Tribune, Salt Lake City

Right: Outcrop of Vein of Jet in Wayne County, Utah, the First Deposit of This Mineral Discovered in the United States. It is Now being Mined as Shown Below. Where the Vein is Stripped and a Miner Is at Work in It



Below: Auto Truck Full of Jet Slabs from the Utah Mine, Accompanied by a Number of the Men Interested in Its Development



Above: Two of the Miners at the Jet Vein with Some of the Jet Slabs in Sacks Ready for Shipment

WHAT is believed to be the first jet deposit to be developed in the United States is now being successfully mined in Wayne County, Utah, where recently mineralogists discovered the largest commercial body of the mineral known to exist in the world. Singularly, discovery of the jet was accidentally made by a party of miners engaged in assessment work for a copper company. The work of mining the jet began late in the summer of last year, and with financial backing assured is expected to develop into great proportions.

For ages jet has been prized by barbaric and semicivilized peoples for use in ornamentation, and the taste has survived. The possibility of carving the mineral into ornaments of rare beauty and delicate workmanship and of giving the black mineral a beautiful velvety polish,

has made deposits of jet widely sought for. Proof of its age-long use is given by the discovery in barrows of the Bronze Age of beads, buttons, rings, and other personal ornaments made from the mineral. Its occurrence in Britain is mentioned by a Roman writer, and it is certain that it was used in pre-Roman times. The early supply was probably obtained from the Yorkshire coast, near Whitby, from mines which still supply the world's markets with the much-prized mineral. Spanish jet is said to be deficient in luster and hardness. Cannel coal from Scotland is occasionally used as a substitute for jet.

While the origin and nature of the jet deposits in Utah are, of course, a matter of conjecture, there is good reason to believe that during the geologic age, when the Henry Mountain Range was thrust

above the surrounding territory, a great forest was covered with hundreds and perhaps thousands of feet of overburden. The pressure of this overburden flattened out trees that were probably a foot or more in diameter to a thickness of from 4 to 6 in. Squeezing out of the sap, the closing of the pores of the wood, and the tremendous heat and pressure, fossilized the vegetable matter and converted it into the mineral known as jet. That the deposit was once a forest is apparently proved by the fact that, in the large slabs of the mineral exhibited in the office of the state mineralogist, is easily detected the fibrous character of the material.

The Utah deposit is overlaid by a tough

fireclay substance about 6 in. thick. The remainder of the overburden is soft and is readily slushed off the mineral by the use of water. Despite the tough and firm character of the jet, it is easily mined with pick and trowel-like blades, the mineral being cut out in slabs of varying length and thickness, averaging, however, 12 to 14 in. in length and 4 to 6 in. in width.

At the present time, the work of mining the mineral is more or less crudely done, but it is the intention of the owners of the decidedly valuable deposits soon to install modern machinery and develop the industry into the largest of its kind in the world.

FUR DURABILITY MEASURED BY NEW DEVICE

IN order that a standard test of fur durability may be had, and that various furs, or the same furs differently treated, may be rated or standardized on the basis of their wearing qualities, there has been recently devised at Cornell University the apparatus shown in Fig. 1. It consists of a hammer, and a slide, which can be operated upon a fur sample placed in the position indicated by B. The weight of the slide is known, as is also the force of the impact of the hammer. When the motor is set in motion, the fur sample at B is alternately rubbed and beaten. The force of the hammer stroke and the weight of the slide can be varied

at will. In this way the fur samples are subjected to the same tests, and their durability definitely recorded.

From time to time the block containing the sample, Fig. 2, is removed and the fur examined under the microscope, to note the first signs of breakdown of the individual hairs. When these indications of disintegration are noted, the sample is removed, recorded, and a second sample introduced. Or the sample may be left in the testing device until the individual fur hairs break off. Various tests can thus be applied.

By means of these tests it is also possible to distinguish between the wearing qualities of the same kind of fur which has been subjected to different treatments, such as plucking—that is, picking out the long coarse overhairs—dyeing, clipping, and so forth.

Tests in this so-called "attritiometer" have also been found useful for rating the wearing qualities of clothing fabrics. In such cases the material to be tested is stretched over the blocks which are used for fur samples, or the fabric may be fastened in a small crumpled mass to the block, or arranged in any way which the test may call for.

Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

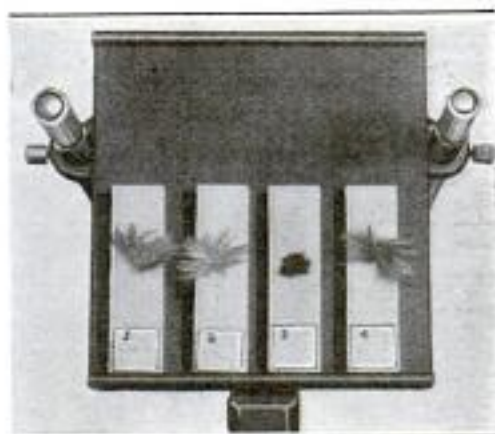


Fig. 2—Four Blocks of Fur Samples Which have been Removed from the Testing Machine for Microscopic Examination to Note Breakdown of Hairs

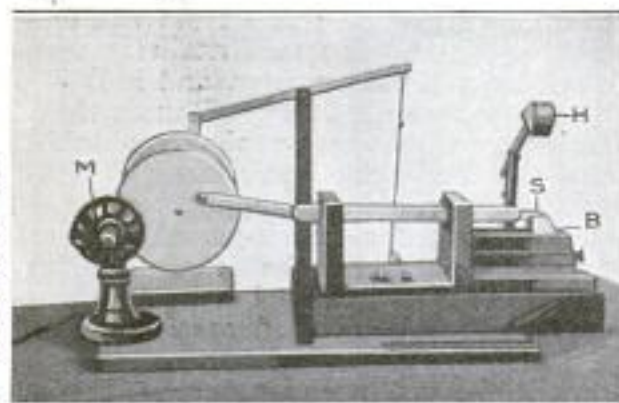


Fig. 1—The "Attritiometer" Which Tests the Durability of Furs for Standardization Purposes Consists of the Following Parts: M, Motor; H, Hammer; B, Block, upon Which the Fur Sample is Placed, and S, Slide That Rubs against the Sample

8120
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POPULAR
 AERONAUTICAL CHAMBER OF
 COMMERCE ORGANIZED

The organization of the air-craft industry into a national body, recently effected, is a step which, it is believed, will greatly hasten the development of American aviation. The organization, composed of approximately 100 charter members, representing practically every element of the industry, such as designing, constructing, operating, etc., has for its objects the development of the market for airplanes and the increase of their use by individuals and corporations. It will act as a credit bureau for its members, and as a board of arbitration in case of disputes; assist in mapping of air lanes, and in all ways help to promote the industry.

7866

HANDY LUBRICATING DEVICE
 WORKS WITH AIR PRESSURE

A portable pressure-lubricating device has been designed specially for dispensing grease accurately by measure with the least possible effort, and with the elimination of waste from leakage. It is particularly adapted for use in garages, and greasing-service stations, where air pressure is available. It consists of a tank, with a capacity of 70 lb. of grease, which is placed under air pressure that forces the grease



through a hose to a double-acting weighing nozzle, which delivers 1/2 lb. to the stroke.

At Montgomery, Ill., the Burlington railroad has completed a sheep shelter, said to be the largest in the world, consisting of seven barns, each 450 ft. by 130 ft.; a 1,000-acre pasture; hay, grain, and feed barns, and a 100,000-bu. elevator. The plant accommodates 70,000 sheep.

Levee & Co. Chicago

Hamilin, Hygrostat
 corp., 438 W. 125th St
 MECHANICS
 7970
 new York City
 429
 DEVICE TO PREVENT DAMAGE
 OF OBJECTS BY MOISTURE

For the purpose of preventing the presence of moisture in sufficient quantities to do harm to works of art, musical instruments, or perishable foodstuffs, a simple little device has been placed upon the market. It is in the form of a perforated cylindrical container for a chemical that is harmless, odorless, and noninflammable, and which when placed in a piano, or a case containing any instrument, or in a wall case, protects these objects from excessive moisture. It acts in a similar manner on brass and silver articles, preserving them from tarnish and corrosion. The device is made in a number of sizes for the various purposes.



7688
 KEY ATTACHMENT SAFEGUARDS
 LOCKS FROM BEING PICKED

To make the picking of a lock impossible, an attachment that holds a key securely in a key-hole after the lock is turned, has been designed. A small clamp, adjustably secured to the stem of the key, in cooperation with a plate that is inserted in the keyhole, after moving the bolt so as to lock the door, makes it impossible to turn the key from the outside, or to force it out of the lock. Thus it is not only practically impossible to pick the lock, but no counterfeit key can be used to open it.



Edw. Edward Tiller
 Racine, Wis.

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430

Compression Loss Leage Co.
2926 Telegraph Ave.
Berkeley, Calif.

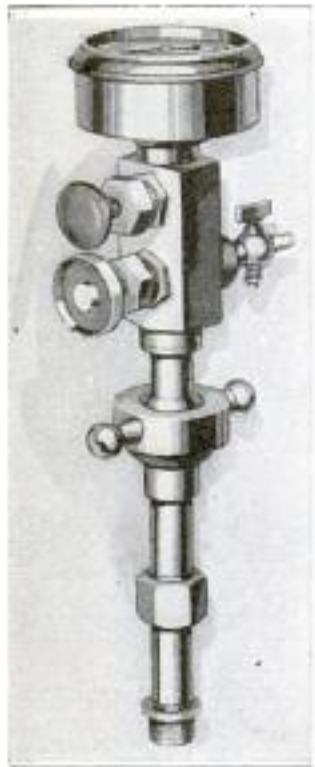
London Times Week
12/23/21

POPULAR MECHANICS

South Pole

GAUGE TESTS COMPRESSION LOSS IN MOTOR CYLINDERS

Any means of determining by test, not only the amount of the loss of compression in the cylinder of a gasoline engine, but also the cause of that loss, whether past the piston or the valves, will be of valuable assistance in directing the work of the repair man. A recently patented compression-loss test gauge makes this possible. It does more than that, for it shows what percentage of the theoretical compression is lost by leakage past the piston, and what percentage is lost by leakage past the valves. The dial of the gauge is graduated to give readings as close as a



fraction of one per cent. The instrument is small, weighing only a few pounds, and the time required for testing a motor is approximately five minutes for each cylinder.

of that loss, whether past the piston or the valves, will be of valuable assistance in directing the work of the repair man. A recently patented compression-loss test gauge makes this possible. It does more than that, for it shows what percentage of the theoretical compression is lost by leakage past the piston, and what percentage is lost by leakage past the valves. The dial of the gauge is graduated to give readings as close as a

8148 POLAR SHIP "QUEST" SAILS FROM RIO DE JANEIRO

After a series of tests that proved that all the machinery and equipment were in perfect order, the "Quest," with the polar expedition in command of Sir Ernest Shackleton, sailed Dec. 17, 1921, from Rio de Janeiro, bidding farewell to about its last contact with civilization before it reaches the southern polar region. On the 19th, Sir Ernest telegraphed London, "Our engines are running perfectly. There is a fair wind. All well and looking forward." The added weight of stores taken aboard at Rio caused the ship to ride low in the water.

806.2 ROADS SPRINKLED IN WINTER TO MAKE AN ICE SURFACE

Street sprinklers are a familiar sight to the city dweller in summer, but up in the northern lumber camps the roads are sprinkled in winter. Logging roads are usually temporary affairs, slashed through the woods and swamps, with no attempt at surfacing or anything more than clearing the right of way. But, as the logging is done in winter, it is a simple matter to maintain a smooth surface of packed snow and ice. A large tank, mounted on a sled, is driven over the roads. From it streams of water fall into the tracks and quickly freeze. This makes a smooth ice surface, over which the big bobsleds, loaded with five tons or more of logs, are easily hauled by two horses.



One of the Bobsled Road Sprinklers Used in the Northern Lumber Regions during the Winter Months, to Keep the Surface of Logging Roads Ice-Coated, So That Huge Sled Loads of Logs may be More Easily Hauled

Cont. Area O. Mulliken, Eastport, Maine

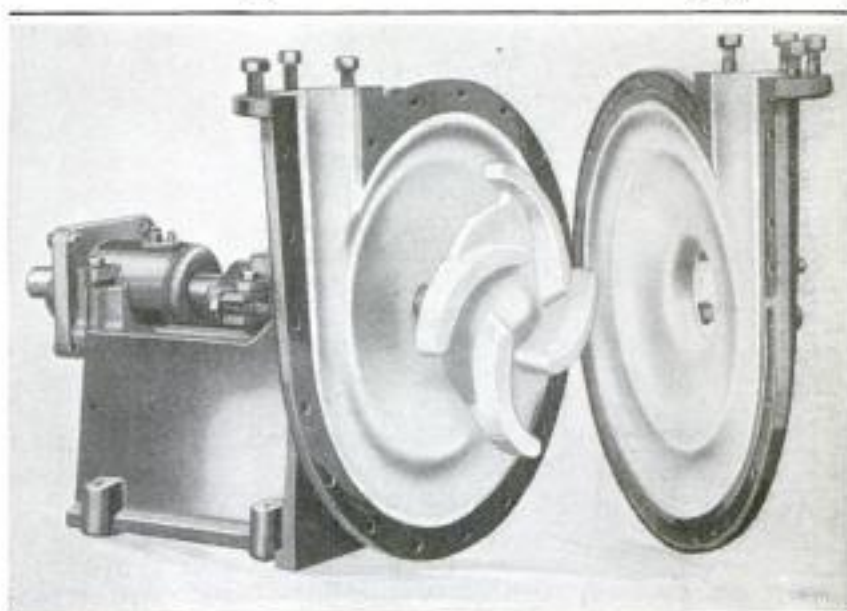
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7788 Byron Jackson Iron Works,
 410 Sharon Bldg.
POPULAR MECHANICS
 San Francisco, Calif. 431

PUMP LINED WITH RUBBER HAS GREAT DURABILITY

Soft resilient rubber has been successfully used to line pumps, because acid corrosion, or abrasion from rough substances passing through the pump, is practically eliminated by the rubber lining. The pump is designed for operation with either a belt drive or by direct connection to an electric motor. Both bearings are mounted outside the pump case and are of the ring-oiling reservoir type. It is said, that the mechanical and hydraulic efficiency of the rubber-lined pump is equal to that of the old-style metal-lined pump of corresponding size. Although a new pump, there are many of this type that have been in

operation for a sufficient length of time fully to demonstrate their wearing qualities.



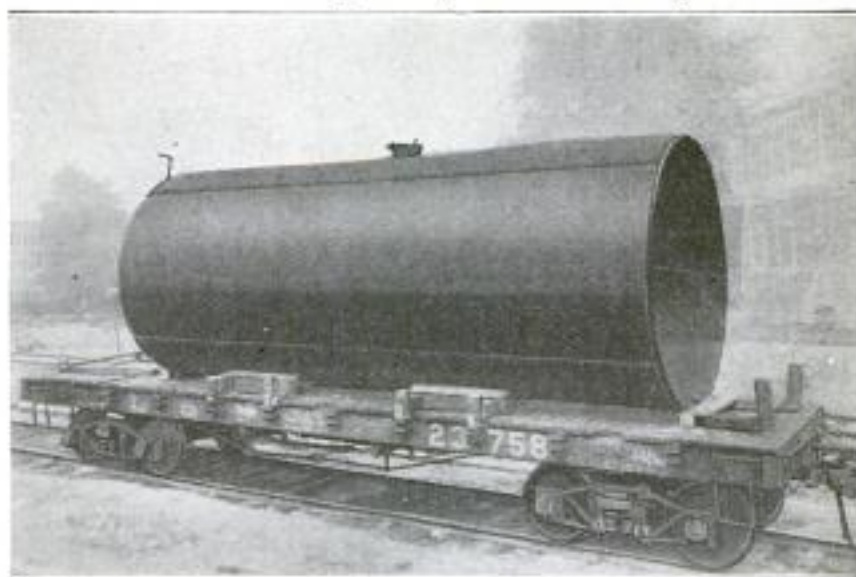
Rubber-Lined Pump Opened, Showing the Resilient Interior: In Pumps of Four-Inch Size, and Smaller, the Lining is Attached to the Pump Casing; in Larger Sizes the Lining is Removable

8/25
ALL NEW YORK CITY TRAFFIC GUIDED FROM ONE CENTER

In all large cities the problem of traffic control is becoming constantly more difficult of solution, but nowhere so much so as in New York City. Plans, such as the control towers on Fifth Avenue, described in Popular Mechanics for May, 1920, have been more or less successful, but as yet nothing has been attempted of such wide scope as the present plan to control all traffic from one central station in Times Square. It is planned to install red, green, and yellow search-lights conspicuously, that will control simultaneously all the traffic north and south, as well as the cross-town traffic, east and west, all operated by a single switch in Times Square. A traffic director, seated in the center of the city, by the pressure of a button will cause a number of red lights to flash that will stop all traffic moving in one direction, while green lights will govern the traffic in the other direction.

Control 8086
STEEL TANKS MORE DURABLE IF FEWER PLATES ARE USED

Building steel tanks with only four longitudinal plates has been found to increase the strength of the container, as well as reduce the liability of leakage. According to engineers, these tanks are 50 per cent stronger than the ordinary type with 10 to 14 plates, and cost much less, as there is a great decrease in the amount of riveting necessary and a corresponding increase in production.



Steel Tank Having Only Four Longitudinal Plates Which has Proved More Efficient for the Storage of Oil Than Those of Ordinary Make

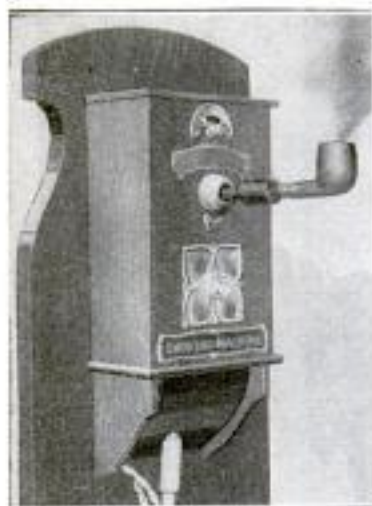
R. U. Grimes
 1/5/22

Standard Tank Car
 Sharon, Pa.

Alfred Lunhill 137 High St
 Nottingham Esate W. 18, London, England.
 432 POPULAR MECHANICS

8069 **AUTOMATIC PIPE SMOKER
 FOR TESTING TOBACCO-**

Testing the cool-smoking properties of tobacco blends, and "breaking in" new pipes, are now performed with the aid of a smoking machine lately developed in London, Eng.



The apparatus is operated by electricity, and has adjustments with which it can be regulated to "puff fast" or to consume the contents of a pipe as

slowly as desired, thus providing any manner of smoking experiment.

steel supports and connections for a light latticed girder, supporting on its top a movable carrier to which is slung the block and tackle that does the lifting. The tripods are placed on either side of the load to be lifted, and are first spread so that the girder can be clamped in position by hand. The legs can then be arranged and braced with their chains, to suit any conditions of the work to be done. This apparatus complete, with a lifting capacity of 2,200 lb., weighs only 92 lb., and one with a capacity of 3,300 lb. weighs 115 pounds.

8129 **CULTIVATION MADE DIFFICULT
 BY HARDENING OF FARM SOIL**

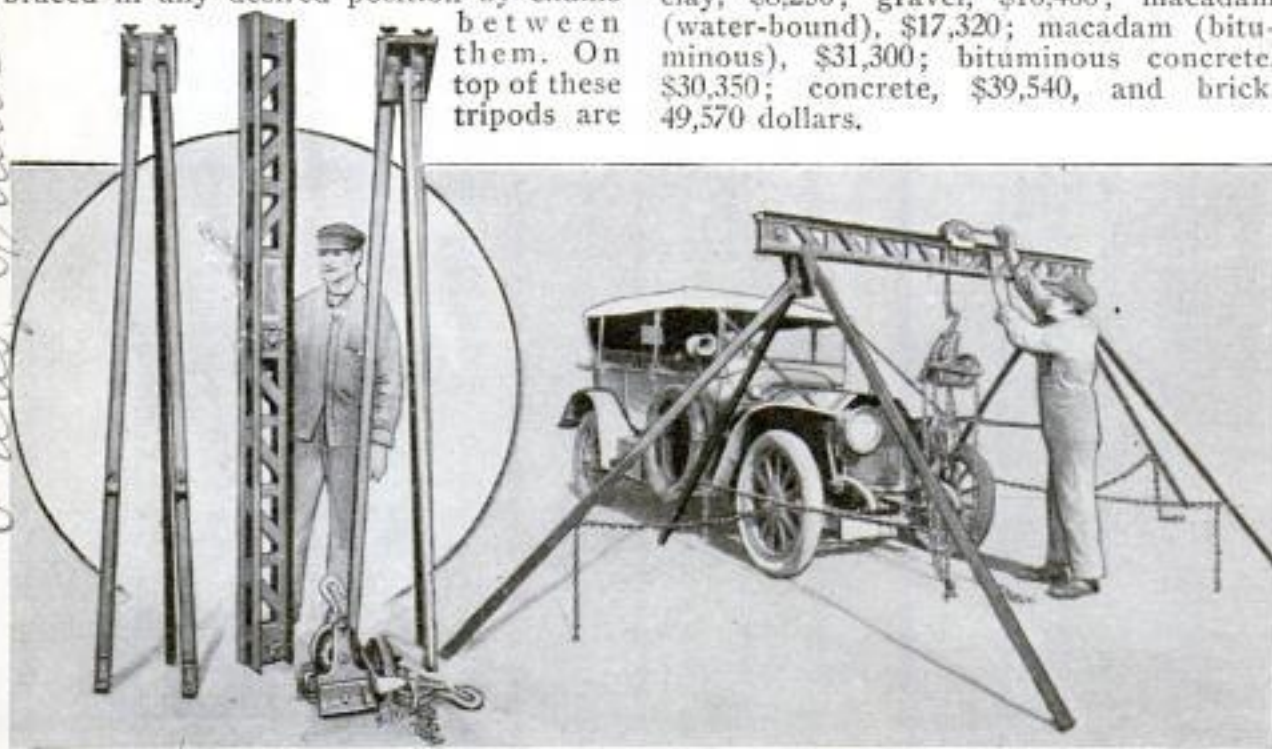
The annual report of the Bureau of Plant Industry reveals the fact that some of the most fertile irrigated land in the West has become unproductive by reason of the hardening of the soil to such an extent as to make cultivation exceedingly difficult. It is believed that this hardening is due primarily to the sodium salts carried in the irrigation water, and experiments with corrective applications of calcium, iron, or other salts are now being undertaken.

U. S. Times 4/22-08
 Road construction, with Federal aid, throughout the country for the past four years, has averaged in cost per mile: graded and drained roads, \$8,115; sand clay, \$8,250; gravel, \$10,400; macadam (water-bound), \$17,320; macadam (bituminous), \$31,300; bituminous concrete, \$30,350; concrete, \$39,540, and brick, 49,570 dollars.

797 **LIGHTWEIGHT PORTABLE CRANE
 LIFTS 30 TIMES ITS WEIGHT**

For lifting weights of any kind, wherever they may happen to be deposited, a very light and easily transported hoist that acts as a crane is in use in France. It is composed of two similar tripods, with strong steel legs, which when opened out are braced in any desired position by chains

between them. On top of these tripods are



Light, Portable Lifting Crane, in Use in France: It Is All Steel; the Tripods are Braced by the Chains between Them, and Held in Any Position. The Girder Clamped to the Tops of the Tripods Supports the Block and Tackle for Lifting Loads About 30 Times the Weight of the Complete Crane

Em. E. Weiss 80 Boul. Jourdan
 Paris, France

PEPPERMINT ROOTS PLANTED BY AUTOMATIC MACHINE

Planting the roots of the fragrant peppermint crop has heretofore been accomplished by hand, but a lately designed machine is available, which takes the place of 16 men. The mint planter has an endless-belt arrangement driven by the front wheels of the machine, which feeds the roots to a hopper. From the hopper, the roots fall into a furrow, which is dug and then covered by the planter. The inventor manages a 10,000-acre mint farm in Michigan, from which state, together with Indiana,

comes three-quarters of the entire world's peppermint and spearmint-oil production.



Machine for Planting Peppermint, Showing the Endless Belt Leading into the Hoppers, below Which can be Seen the Tool That Makes the Furrow

7980 *Chicago*

AUTO-RADIATOR TRUSS AFFORDS QUICK AND CHEAP REPAIR

A simple, quick, and inexpensive repair for broken or leaky automobile radiators is now available. It consists of a long bolt which is attached in front of the radiator by means of hooks, at each end, which fasten over the front-fender brackets. Tightening the nuts pulls the ends of the frame toward the center and relieves all strain. The result is that cross members are kept from breaking, or if already broken, are pulled together and need not be replaced. It also prevents the breaking of ears, and leaking. The truss can

be attached to a machine in a few minutes, using only a pair of pliers or a wrench, and can easily be removed.



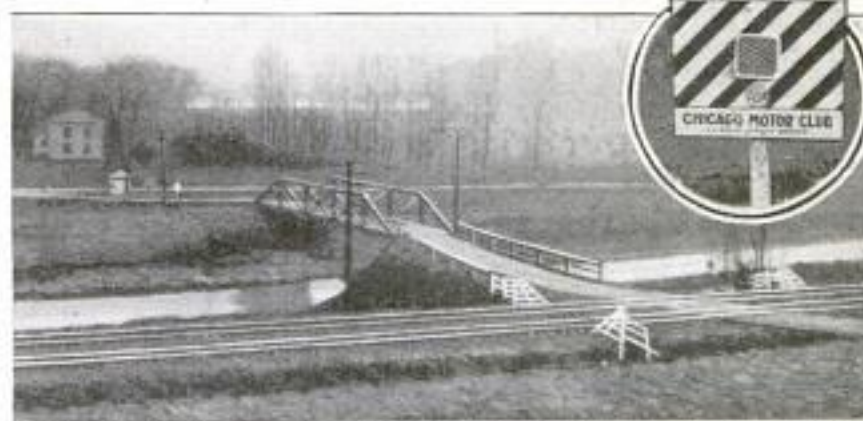
The Radiator-Repair Bolt, and, Above, the Method of Attaching It to a Broken or Leaky Radiator

7829 *Railroad*

"DEATH-CROSSING" HAZARD CONTAINS TRIPLE RISK

Dangerous crossings are numerous, but one of the worst is to be found near Ottawa, Ill. The crossing possesses an almost fiendish design, there being three risks for the driver, which are greatly magnified should he prove to be careless or incompetent. These three are a railroad crossing, a high and narrow canal bridge, and an interurban right of way. A steep hill, the descent of which is a task in itself, precedes the railroad hazard, and if the railway is

safely passed, the autoist finds a sharp incline directly ahead, leading to the bridge. Coming down from the other end of the bridge, there loom in his path the interurban tracks.



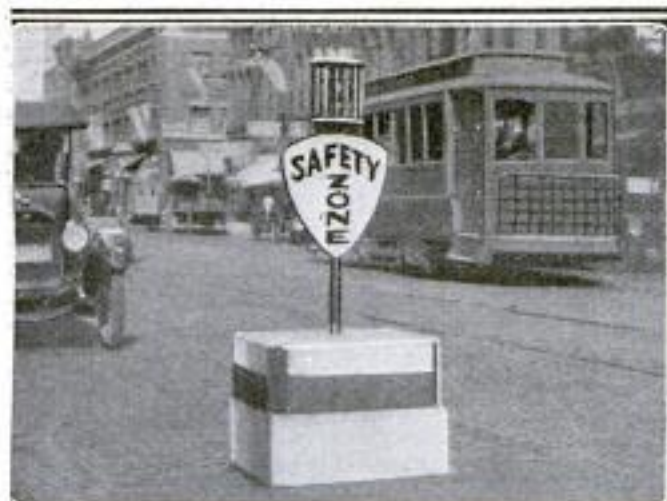
Triple-Hazard Crossing with Railroad Tracks in Foreground: Insert Shows Metal Sign with Red-Glass Center Erected to Warn Motorists

*Con. William L. Crover, 819 Canal St
 Ottawa, Illinois.*

*Steam Tractor Auto St.
 + mfg. Co. 219 W. 7th St.
 Chicago, Ill.*

Copyrighted material

AND ENJOYMENT OF VISITORS AND RESIDENTS

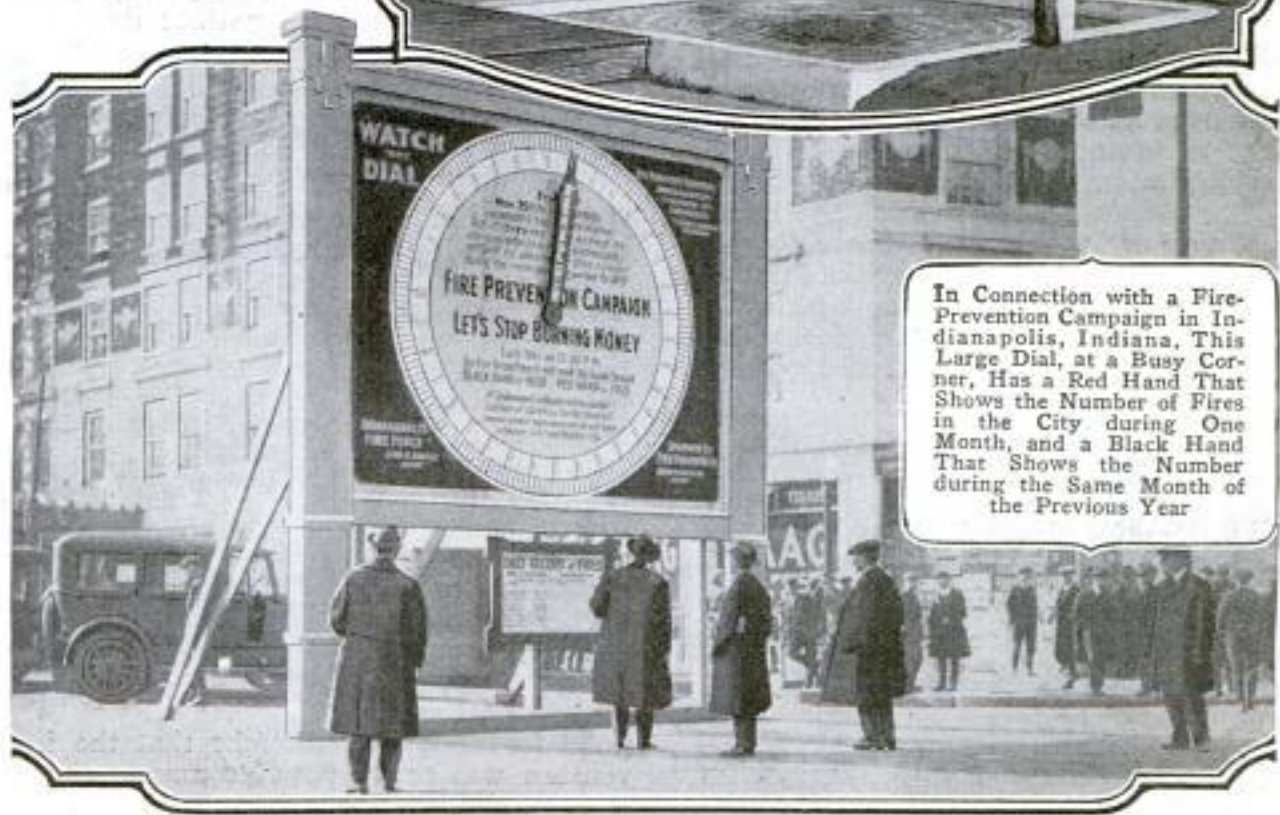
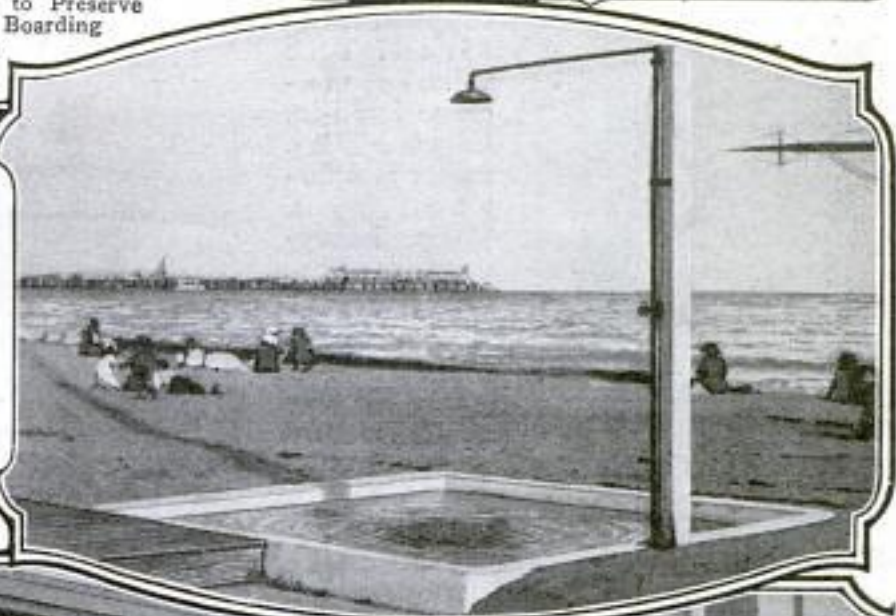


The Solid Concrete Base on Which This Sign is Mounted will be Avoided by Motorists Who Have Any Respect for Their Cars. It is Used in the Streets of Springfield, Illinois, to Preserve a Safety Zone for Passengers Boarding and Alighting from Street Cars. Above the Sign is a Red Lantern.



Rounded Block of Concrete, Built against an Unusually High Curb, That Makes It Easy for Pedestrians to Mount to the Sidewalk, and at the Same Time Forms No Obstacle to Wheeled Traffic: It Is of Such Shape That Automobiles can Pass over It without a Jolt.

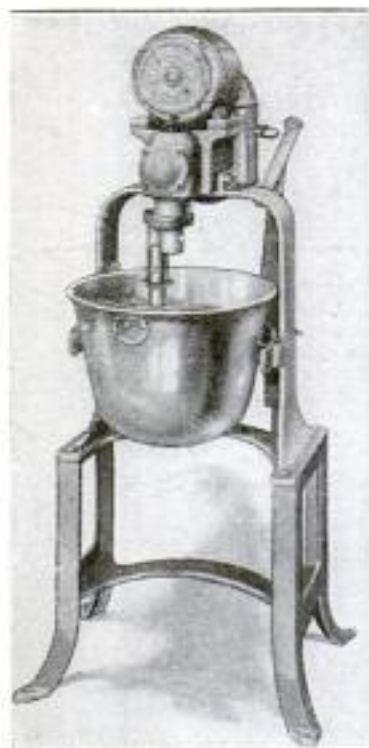
Inside the Concrete Curb, Located Right on the Sands, at the Beach of Santa Barbara, California, Bathers can Stand under an Ordinary Overhead Shower Sprinkler, Supplied with Fresh Water, and Wash Off the Sand and Ocean Brine, without Having to Wait Till They Get Back to Their Dressing Rooms, as Is Usual at Most Beaches. This Is a Very Popular Convenience.



In Connection with a Fire-Prevention Campaign in Indianapolis, Indiana, This Large Dial, at a Busy Corner, Has a Red Hand That Shows the Number of Fires in the City during One Month, and a Black Hand That Shows the Number during the Same Month of the Previous Year.

8081 **ELECTRIC FOOD MIXER BUILT FOR MEDIUM-SIZED KITCHENS**

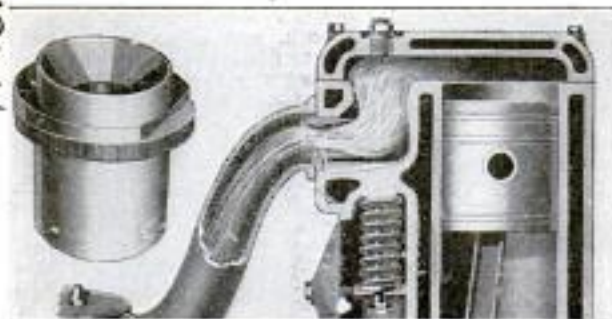
A new electric food mixer is designed especially for the kitchens of hotels, restaurants, clubs, bakeries, and ice-cream parlors. It has a 24-qt. mixing bowl, supported by a stand which occupies a 24 by 23-in. floor space. It is also furnished without the stand. A food chopper is supplied if desired. The whole machine is 55 in. high. The mixer is operated by a 1/4-hp. heavy-duty motor, mounted at the top of the



frame, and a gear shift provides two speeds. It is finished in light-gray enamel.

7981 **FUEL IN GASOLINE ENGINES COMPLETELY ATOMIZED**

Improvement of the carburation of the charge in the internal-combustion engine has been effected by the application of heat to promote vaporization, or of violent agitation to increase atomization. In a new device, that is now on the market, agitation of the mixture is caused by placing in the inlet manifold, at the inlet port of the cylinder, a short tube with a Venturi orifice, which has the property, as is well known, of greatly increasing the ve-



Atomization of Charge in Gasoline Engines Increased by Tube with Venturi Orifice in Inlet Port of Cylinder, and Jets for Atomizing Liquid Deposits below Tube

locity of the flow of a fluid from the outlet side of the Venturi throat, and of causing suction on the inlet side. Below the tube is a small sump, into which any unatomized units of the mixture drop by gravity, and the suction has the effect of lifting these units through a jet in the tube which atomizes them when they reach the main body of the inflowing charge. Thus no liquid fuel reaches the inside of the cylinder, with resulting advantages that every motorist will appreciate.

7923 **NEW CONVENIENCES FOR INVALID'S WHEEL CHAIR**

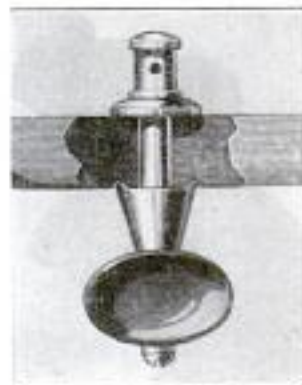
Wheel chairs are now being made with accessories, for the convenience of the invalids who must depend upon them. One of these is a luggage carrier which provides a place for books, magazines, and wraps. Cane and crutch carriers are attached to



the back of the chair, where they are out of the way but always within easy reach. Brakes, similar to those used on baby carriages, are also provided. These hold the chair steady when the patient does not wish to move about.

7994 **METAL UKULELE PEG FITS ALL TYPES**

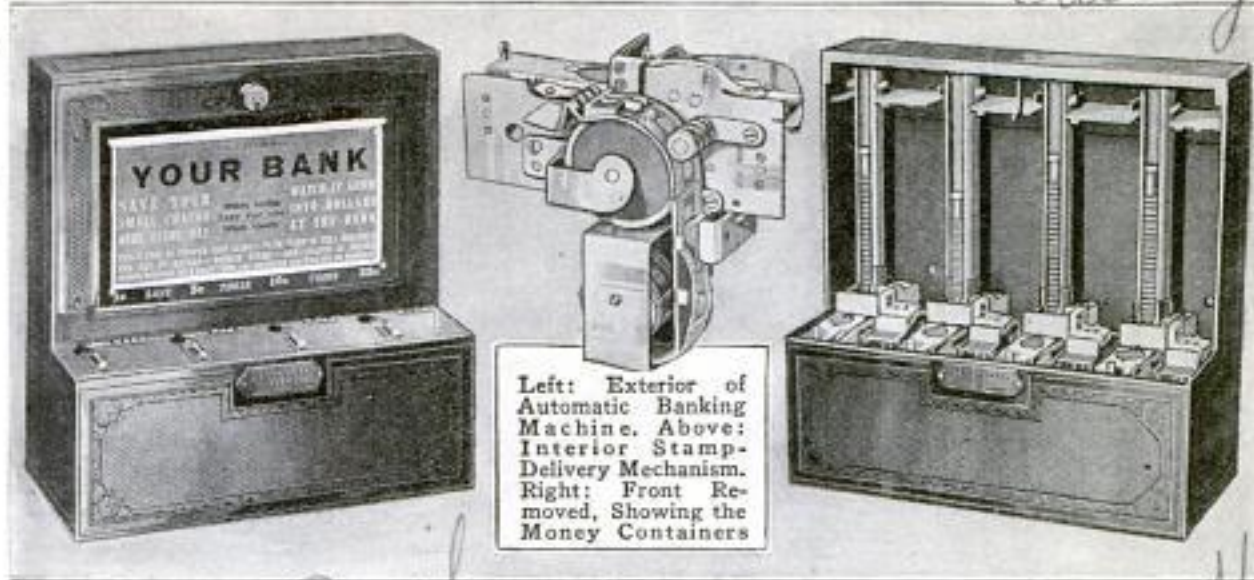
Any size or shape of ukulele shaft can be fitted with a universal metal peg lately patented by a New York inventor. The peg, which has a celluloid button, will hold a string at a heavy tension without slipping, because of its construction, and may be manufactured to sell at a very low price, according to the inventor. Because of its many good features, it is thought that the invention will prove popular among those who play this instrument.



Chas. G. K. Trout
 Waverly Novelty Co. 200 Fifth St. New York

Turbulator Corp. 2635 S. Michigan Chicago

Walter Robertson 158 E 23rd St. New York



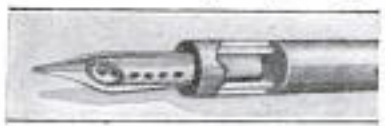
Left: Exterior of Automatic Banking Machine. Above: Interior Stamp-Delivery Mechanism. Right: Front Removed, Showing the Money Containers

Bank
 789.6 THRIFT EFFECTUALLY TAUGHT BY NEW SAVINGS SYSTEM 7982

Thrift is being effectually taught to school children by the installation of automatic banking machines, which are located in the school buildings. The machines are operated after the fashion of the familiar candy or gum-vending appliances, in so far as pertains to inserting money. The child may put in a cent, nickel, dime, or quarter, and receives in return a stamp marked with the respective amount of his insertion. These stamps are pasted in a previously distributed folder, and when the amount on the stamps totals one dollar, the child takes the folder to a savings bank, and opens an account. Although primarily designed for the efficient handling of school savings, this system has been installed in numerous factories, business houses, and public buildings.

7939
 PEN WITH AN INK RESERVOIR AVOIDS CONSTANT REDIPPING

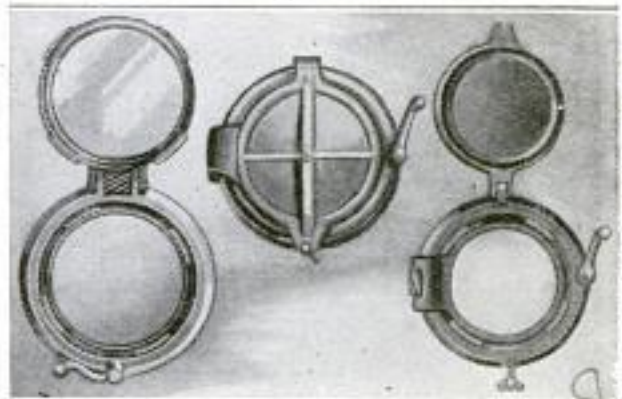
Writing pens that will take up, when dipped in the ink, a much larger supply than the common pen point are the simplest form of fountain pen. One that is now on the market consists of a perforated piece of rubber tubing that is inserted into the hollow shank of the pen point, and that fills up with ink, holding, it is claimed, enough to write 1,000 words without redipping. The ink is fed gradually through holes in the rubber tube to the writing point of the pen, and does not blot the paper.



consists of a perforated piece of rubber tubing that is inserted into the hollow shank of the pen point, and that fills up with ink, holding, it is claimed, enough to write 1,000 words without redipping. The ink is fed gradually through holes in the rubber tube to the writing point of the pen, and does not blot the paper.

7982 SIMPLIFIED AIR PORT HAS NO TUMBLE BOLTS

Many of the troubles, well known to seafarers, of the ordinary air port are avoided in a patented port that is being manufactured in New York. Instead of the dogs for tumble bolts, as in the conventional port, the glass frame has four fixed curved lugs on its outer circumference. Snugly fitted to the inside of the fixed frame of the port is a ring with four



Left: Air Port, without Deadlight, Completely Open. Center: Air Port with Deadlight Closed. Right: Air Port Closed and Locked, with Deadlight Up

similar lugs on its outer circumference, which engage the lugs on the glass frame when the port is closed. In the fixed frame is a crank handle, which, when turned, revolves the ring until the lugs become disengaged, and then by means of spiral gearing on the hinge of the glass frame opens the light, the operation being so timed that as it opens, the light clears the crank handle. By reversing the handle, the light is closed and latched. A deadlight, similar to those in common use, may be attached to this port. This requires the conventional swivel closing bolt.

Ship Equip
 Steward
 Larvik + Equipment Corp
 19 Battery Place, New York

Ad no. Peter J. Pappas. Data missing

8017

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



Left: This Salt or Pepper Shaker Opens When the Top is Pressed. Below: By Merely Pressing the Sides, the Top is Again Closed

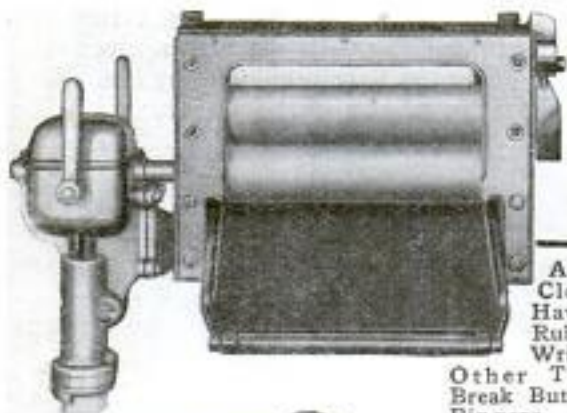
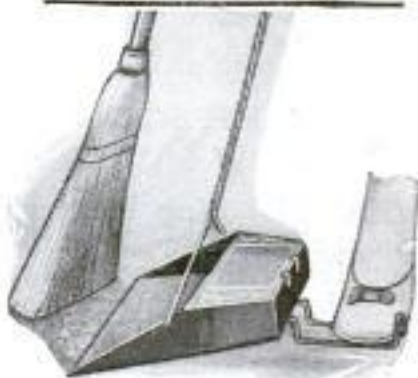


With This Shellfish Scraper, the Meat can be Removed from the Inside of Shells and Claws



A Counterbalanced Electric Lamp Which can be Hung Quickly over the Back of a Chair, Bed, or Dressing Table: The Fixture Has an Ordinary Cord Attachment

A Dustpan Which is Held in Position by the Foot, So That the Housewife can Use Both Hands in Taking Up Sweepings, without Stooping



An Electric Clothes Wringer Having Large Soft-Rubber Rolls, Which Wring Drier Than Other Types, do Not Break Buttons, Nor Injure Fingers, and Are Self-Cleansing



This Fruit-Jar Sealer and Opener, Made of Unbreakable Malleable Iron and Steel Wire, Opens and Tightens Any Jar, and Smooths Out the Edges of the Covers



Top: The Combined Crib and Wardrobe Showing the Drawers Built under the Mattress. Right: One of the Drawers Pulled Out for Use as a Table. One Side of the Crib can Also be Lowered

INTENDED FOR THE HOME AND ITS MEMBERS



This Brush, Made for Cleaning the Drain Pipe of Refrigerators, Has a Long Flexible Wire Handle, and Its Use will Prevent the Pipe from Clogging and Overflowing

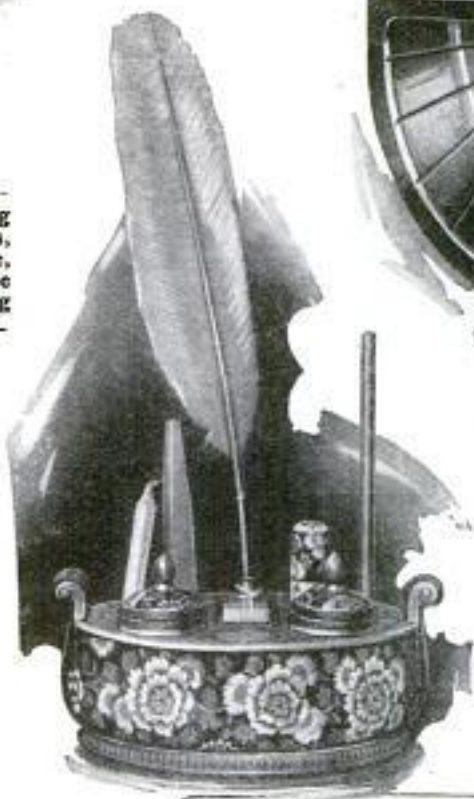


Tube Support Which Prolongs the Life of the Tubing by Preventing It from becoming Kinked and Consequently Broken, as Is Often the Case When a Tube is Hung from a Nail

Dripless Broiler Which Retains All the Juice of the Food and Thus Prevents the Stove from being Soiled and Causing Smoke

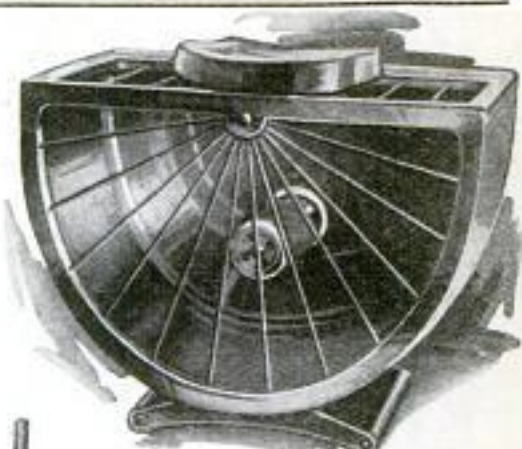


A Jelly Tumbler Which is Sealed by Simply Pressing the Sides of the Cover, and, Opened by Pressing the Center



A Paper Weight, Which Also Serves as a Writing-Desk Set, Has Compartments in Which can be Placed Pens, Ink, Stamps, and Sealing Wax. There is Also a Space for the Owner's Monogram

A Combined Electric Toaster and Heater, Making Possible the Use of These Two Appliances at the Cost of Only One



Left: Folding Table Ready to be Used as Breakfast Table. Right: The Table with the Sides Down and Ironing Leaf in Position for Use. Below: The Table Knocked Down and in Readiness for Moving

The Markham Co.
1410 Wrightwood Ave

440
7478

POPULAR MECHANICS
Chicago

**SIMPLE PRINTING TELEGRAPH
COVERS NEW FIELD OF USE**

A simplified printing telegraph suitable for inter-department communication in large plants, as well as main-line traf-



Combined Receiving and Sending Unit: The Receiving Tape Protrudes from the Left Side. A Full-Size Section of Tape is Shown Above

fic, is now on the market. The simplicity is obtained by printing on a tape in place of a sheet, so that much complicated mechanism is done away with. A transmitter, with a keyboard similar to that of a typewriter, is mounted with a printer to form a single unit. This unit is operated on either direct or alternating current, of 110 volts, by a 1/40-hp. motor. The keys control a camshaft, which revolves, opening and closing the line. The maximum speed is 45 words a minute, a safety device preventing too rapid operation.

**NEW TOOTHBRUSH STERILIZER
KEEPS BRUSH SANITARY**

Because of the opinion, generally held by doctors and dentists, that an unsterile toothbrush may be a greater hindrance than benefit to health, the claims made for a new toothbrush sterilizer are interesting and important. It is stated



Toothbrush Case Open, Showing the Pad Container and a Bottle of the Sterilizing Solution

795
Dental Hygiene Laboratory
La Crosse, Wis.

that by using this simple container the brush is kept perfectly sterile. It consists of a two-piece case, of aluminum, just large enough to hold a toothbrush. In one half a small metal box, containing a pad, is held on the inside by ridges in the case. At regular intervals the pad is moistened with a special sterilizing solution, and the brush is kept in the case at all times when not in use.

8048
**NEW CARDS MAKE BRIDGE GAME
OF SKILL ONLY, NOT LUCK**

Cards for playing bridge, in any of its forms, have been produced which remove all of the element of luck from the game, and make it purely a game of skill. The backs of the cards are marked with numbers and indicators and the cards are dealt according to the indicators, instead of in the usual way, by rotation. The result is that four absolutely equal combinations of cards are obtained by the four players. There are 12 sets of indicators on each pack of cards, making possible 12 entirely different hands or sets of combinations. After the cards have been dealt, the game is played in any of the ordinary ways.

Milton Bradley Co., Springfield Mass

778
**NEW APPLIANCES MADE
TO AID BATTERY MEN**

Two new tools for the use of the battery man have lately been produced and placed on the market. One is a small hoe-shaped tool for the disagreeable task of removing the compound from the bottom of old battery cases. The other is a knife-shaped blade with teeth on one



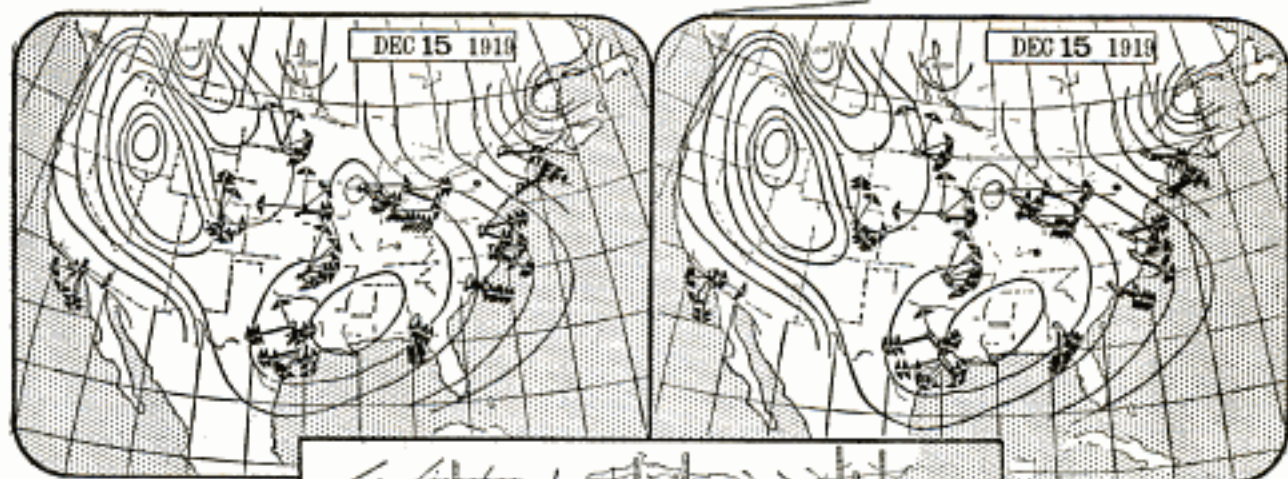
Top: Scraper for Removing Old-Battery Compound. Below: Knife for Separating Battery Elements

side, to be used in removing the separators between the elements of the batteries.

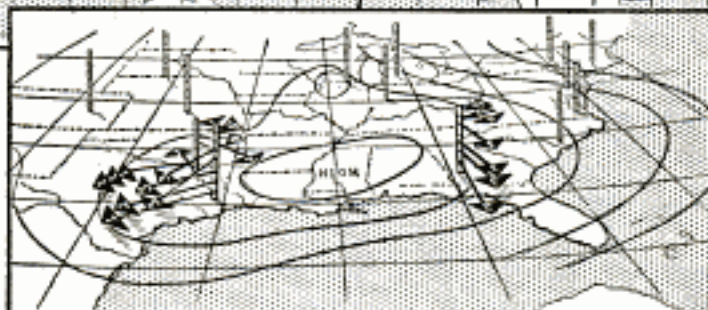
As a means of combating counterfeits of her creations hereafter, each garment of a celebrated French modiste will bear a special serial number, a notice of license, an autographic signature, and the thumb print of the designer.

American Bureau of Modistes
Chicago

THREE-DIMENSION WEATHER MAPS MADE FOR AIRMEN



The Maps are Photographed from Two Different Angles, and the Two Photographs are Mounted Side by Side



When the Two Maps, Shown Above, are Viewed through a Stereoscope, They Blend and Appear, as Seen Here, with the Posts and Arrows in Strong Relief

Upper-Air Stations are Marked by Posts and Arrows, Indicating the Wind Direction and Velocity at Different Levels

Three - dimension maps are being made by the United States Weather Bureau as a result of the development of flying. It was found necessary to chart wind directions at different levels for the airmen. At first, separate maps for each level were made, but these proved awkward. Now an ordinary weather map is drawn and at the location of each upper-air station a little metal

post, supporting a series of arrows, is set up. Each arrow is a little shorter than the one below. They are set to indicate the wind direction at the levels they represent. Numbers on the arrowheads show the wind velocity. The map is photographed from two angles, and when the two pictures are seen through a stereoscope, they blend, bringing the posts and arrows into strong relief.

7450

INGENIOUS SYSTEM SOLVES DOUBLE-CARFARE PROBLEM

Street-car passengers between St. Paul and Minneapolis must pay two full fares. Formerly the conductor collected in the car and repeated the collection after passing Snelling Avenue, going east, and Bedford Street, going west. Snelling Avenue is east of Bedford Street and the space between the two forms a neutral zone from which a person may ride in either

direction for one fare. This year the company adopted "pay-as-you-enter" cars with rear entrance and front and rear exit. A system of collection had to be worked out so that the conductor would not have to leave his money box to collect. When a passenger boards the car before passing the neutral zone, he pays at the rear on entering and can get off at either end before passing the neutral zone. After passing that zone all passengers must get off at the rear and pay

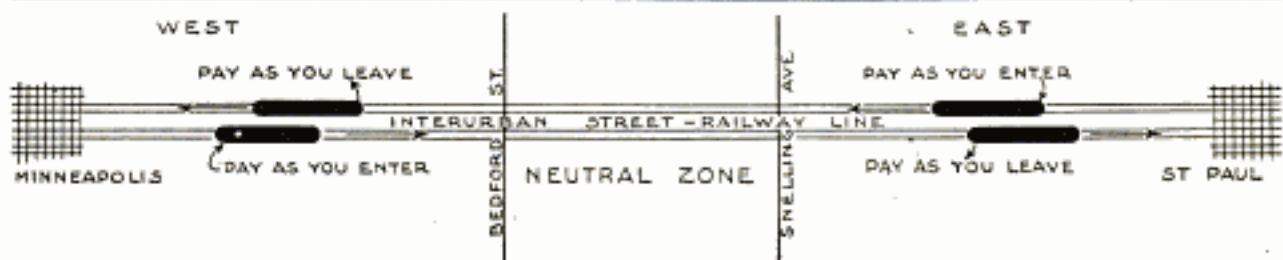


Diagram Showing How the Interurban Street Railway, between Minneapolis and St. Paul, Handles the Collection of Double Fares on Pay-as-You-Enter Cars, and the Neutral Zone in Which Only One Fare is Required

Capt. Arthur Hallaw,
 317 Cedar Av., Minneapolis, Minn

Western Electricity News, 195 Broadway New York

on leaving. Passengers boarding the car in the neutral zone are given blue identification slips which they give the conductor on getting off, in place of the second fare, which they are not required to pay.

CHINESE GREATLY MYSTIFIED BY WIRELESS TELEPHONE

Mystification of the usually placid Chinese was accomplished by a noted American professor, who has been lecturing on, and demonstrating, the latest developments of electricity throughout the Orient during the past six months. Placing a wireless-telephone station on a wheelbarrow, the professor had the outfit trundled through the streets, stopping every little while to converse with associates, who had set up similar stations in their living quarters. The carrying on of conversations from the interiors of thick stone walls, and receiving responses from several different directions at once, particularly impressed the Orientals, and added to their bewilderment.

4830 **ELECTRIC HAND DRIER BUILT INTO WALL TO SAVE SPACE**

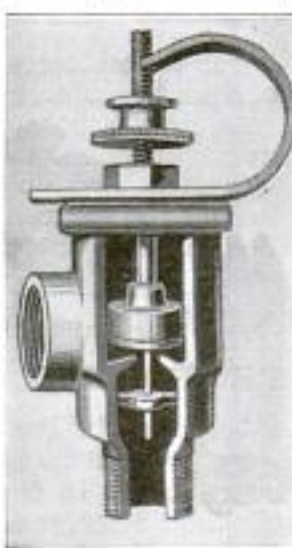


Space, so valuable in modern city apartments and buildings, is now being economized by recessing the ordinary electric hand drier into the wall of the bathroom. The movable blower is set in a plate at the correct height, and below it, the operating pedal is set in a second plate,

just above the floor. This eliminates the awkward pedestal which was formerly used.

7570 **NEW SAFETY RELIEF VALVE OF IMPROVED DESIGN**

A plumbing specialty in the form of a safety relief valve of improved design, is now on the market. Integral with the valve body is the valve seat, which is made small in order to prevent it from damaging the valve disk when under pressure. On top of the body is a removable cap, upon the outside of which is bolted a C-shaped spring that never comes in contact with the water, an undesirable condition that is common in other relief valves.



Above the bolted end of this spring, a small adjusting wheel is threaded on the plunger that is connected with the valve disk. When this is set for any desired pressure, it is retained in its position by means of a loose lead-tipped wire on the upper end of the spring. A side outlet on the body provides means for taking care of the drip by piping it to any open-plumbing fixture.

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

Widely incorporated Laboratory, Ill.

4806 **DISPENSING MACHINE DELIVERS WELL-MIXED PEANUT BUTTER**

Properly mixed peanut butter can be dispensed in small quantities from 60 or 80-lb. cans by means of a new dispensing machine. It is placed on top of an open can, clamped on with three rods, and the whole then inverted. Two paddles, revolved by the dispensing handle, extend into the butter. The handle is turned a few times before opening the dispensing valve, to mix the light and heavy oils and butter thoroughly.



Each time it is turned to dispense butter it again revolves the mixing paddles.

Wm. C. S. Emright 612 N. 6th Tacoma Wash.

Donnelly 10 High St. Boston? has

POPULAR MECHANICS

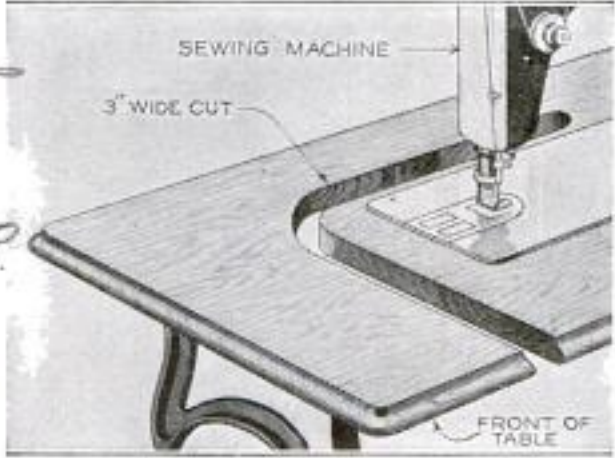
CHARACTERISTIC SOFT X-RAYS
FROM ARCS IN GAS VAPORS

The outstanding characteristic of the X-rays which were first discovered was that they would pass through solid bodies which were opaque to ordinary light. Experiments have recently been conducted in which soft X-rays from arcs in gas vapors have been produced inside vacuum tubes. All known substances, including ordinary air, are opaque to these soft X-rays, which can only be detected by their effect on objects inside the vacuum tube. These soft X-rays have wave lengths greater than those previously known. The shortest wave lengths of light, at the violet end of the visible spectrum, are much longer than the longest previously known X-rays, and measurements of the wave lengths of these soft X-rays have shown that they partially close the gap between the ultra-violet radiations and the ordinary X-rays.

7783

SLOT IN TABLE FACILITATES
WORK ON SEWING MACHINE

Sewing-machine tables are now being provided with an L-shaped slot, 3 in. wide, that enables an operator to feed material more conveniently to the needle. A piece of material requiring a continuous band



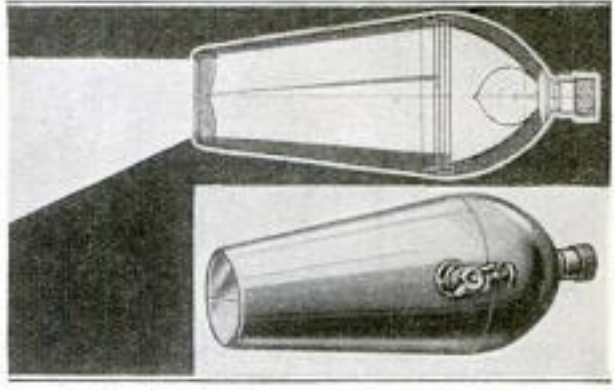
Slot in Sewing-Machine Table through Which Material Hangs So That It can be Fed without Difficulty under the Presser Foot at the Needle

can be sewn by letting it hang through the slot while it is fed under the presser foot at the needle.

¶An engine on the Canadian Pacific Railway recently demonstrated its hauling possibilities by pulling 112 cars, including the usual tender, and caboose. The train was nine-tenths of a mile long, and was loaded with 165,000 bu. of grain.

PERFECT LIGHT BUT NO DAZZLE
FROM ENGLISH AUTO LAMP

An automobile lamp, being marketed in England, is said to control the light rays in such a way that while an approaching



The Nondazzle Auto Lamp: The Diagram Above Shows Arrangement of Diaphragm and Lenses, and the Outline of the Stream of Projected Light

pedestrian suffers no blinding effect, at a distance less than 200 ft., yet it lights the road perfectly for that distance. The body of this lamp is a tapered tube, 10 in. long, with two D-shaped lenses in the front and a horizontal diaphragm dividing its whole length. The two streams of light mingle, giving a single horizontal and downward stream. The width of the stream, at any point, is about one-half the distance of the point from the lamp, but the construction can be varied to give a narrower and more intense or wider and less intense stream.

BURGLAR-PROOF WINDOW CATCH
LOCKS SASH AT ANY POINT

Windows are made completely burglar-proof by a new catch, which the makers claim cannot be jimmied, and will lock the window in any position. From the inside, the window may be opened to any desired height, but cannot be opened any farther from the outside. The catch is set flush in the frame, so that it does not catch and tear the curtains.



¶Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

John H. Stewart
Poughkeepsie, N.Y.

C. M.

Ray - Lynch Co. Ohio
Toledo, Ohio

Cont. P. I. Connelly
20 Eagle St. Schenectady
N.Y.



A Group of Native Girls from India Arriving in London, England: These Girls were Given the Trip as Guests of the Salvation Army, as a Means of Furthering and Broadening Their Education by First-Hand Contact with the Western World. Dressed All Alike, in Their "Little Red Riding Hood" Cloaks, the Youthful Visitors from the Far East Attracted Much Attention Wherever They Appeared and, Needless to Say, They were Delighted with the Many Strange Sights, Experiences and Entertainments Encountered on Their Trip, Which had Taken Them So Far from Home and Familiar Surroundings

Small Visitors at the New York Zoölogical Gardens can Now See All the Sights without Becoming Tired. Their Mothers may Hire One of These "Prams," Furnished by the Zoo, and Also an Attendant to Push It, for a Small Price

COPYRIGHT, KEYSTONE VIEW CO.



"Jimmie" Uses the Phonograph as a Merry-Go-Round. He Presses the Starting Lever and Jumps on for a Ride. This Is One of Many Tricks of This Pet Squirrel, Belonging to Miss Manilla Martan, of New York City

COPYRIGHT, RADEL & HERBERT

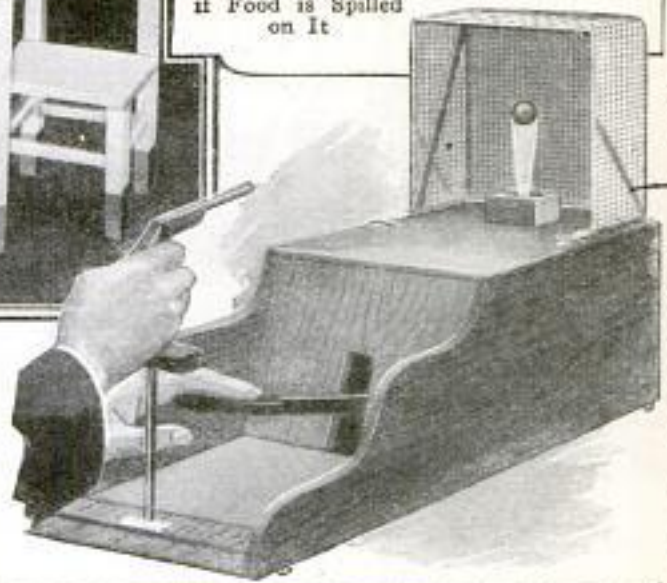


Benjamin Eldredge Co., 8916
 207 S. Green St. Chicago
 OF MODERN ACTIVITIES AND INTERESTS



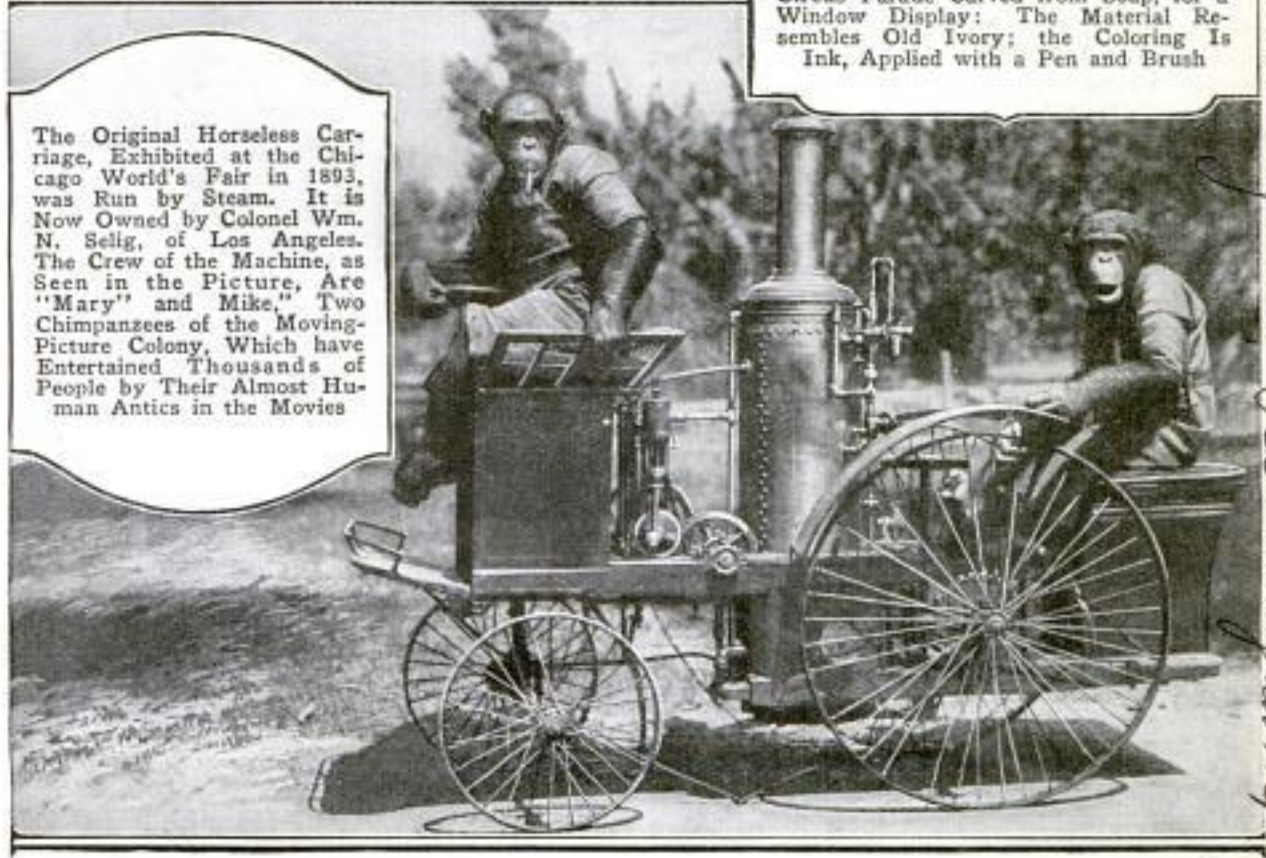
A White-Enameled Table and Chairs, for the Children, are Shown at the Left. The Table Top Is of White Porcelain and may be Washed Easily if Food is Spilled on It

The Shooting Gallery, at the Right, Has a Ball for a Target. Air Pressure, Obtained by Pressing the Lever, Supports the Ball, or a Model Operated by Current from an Electric-Light Socket may be Had



Circus Parade Carved from Soap, for a Window Display: The Material Resembles Old Ivory; the Coloring Is Ink, Applied with a Pen and Brush

The Original Horseless Carriage, Exhibited at the Chicago World's Fair in 1893, was Run by Steam. It is Now Owned by Colonel Wm. N. Selig, of Los Angeles. The Crew of the Machine, as Seen in the Picture, Are "Mary" and Mike," Two Chimpanzees of the Moving-Picture Colony, Which have Entertained Thousands of People by Their Almost Human Antics in the Movies



Glass Vacuum Cleaner Co. Ltd. Leverette Hotel Birmingham England

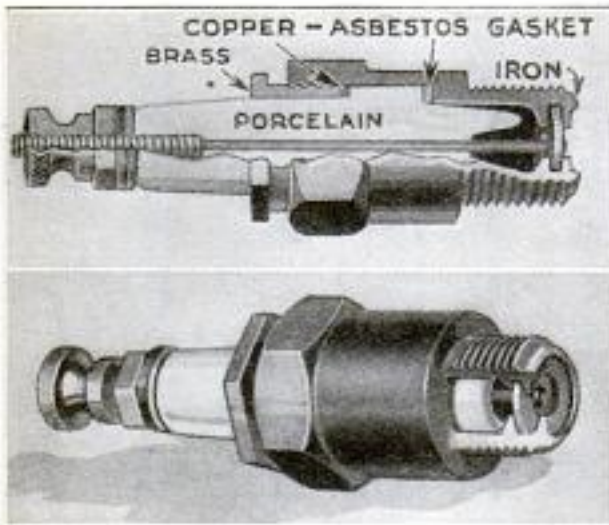
*Mrs. E. Jermoine
Chauvont. France.*

416
7962

POPULAR MECHANICS

CARBON-PROOF SPARK PLUG
MANUFACTURED IN FRANCE

A carbon-proof spark plug, similar to any ordinary plug, except that, in place of a side electrode at the sparking point, it

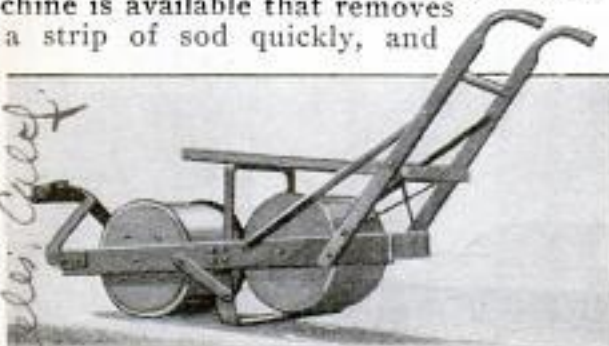


Below: Carbon-Proof Spark Plug with the End Milled Out to Show Disk in Its Circular Slot. Above: Sectional View Notated Fully to Explain the Construction

has a loose movable metal disk that is retained in a circular slot made by spinning over the end of the plug, has been patented, and is now being sold in France. In the center of the disk is a hole, which surrounds the end of the central electrode, and the space between this and the inner circumference of the hole forms the spark gap. With this construction it is impossible for carbon or oil to pass the metal disk and reach the porcelain inside the plug, one of the commonest causes of short-circuiting. As the disk is constantly vibrating and rotating in its slot, it is unlikely that oil or carbon will lodge in the spark gap.

SOD-CUTTING MACHINE AIDS
IN PRESERVATION OF LAWN

For the laying of pipe, or similar purposes, where the turf must be cut, a machine is available that removes a strip of sod quickly, and



Sod Cutter with Sharp-Flanged Front Roller, Lifting Tool, and Rear Roller with Cutting Knives Affixed

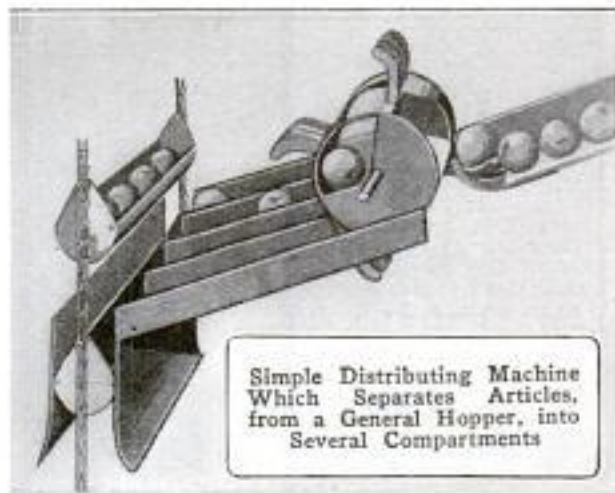
without damage to it. The appliance has two handles like a plow, two heavy rollers, and a tool for lifting the cut turf. The front roller has sharp flanges on either side which cut through the sod, and the lifting tool is adjusted so as to raise the turf as the roller cuts it into strips. The rear roller has knifelike projections on it to cut the sod in regular lengths, after which it is piled up and relaid when the work is completed.

8070
SHELLS HUNG IN CHURCH TOWER
REPLACE CONFISCATED BELLS

Church bells throughout Germany were confiscated during the war to be melted up and used in the manufacture of munitions. One of the most novel and ingenious substitutes which has been reported was used in the town of Marhorst. Two large shells were suspended in the church tower and a pendulum swung between them. When the pendulum struck the shells it produced a pleasing tone with surprising carrying power.

Musik Industrie
SIMPLE MACHINE DISTRIBUTES
ARTICLES INTO COMPARTMENTS

7846
For distributing articles, such as fruit, into several compartments, a newly invented machine is quite simple. The end



of a chute, down which the articles pass from a hopper, is provided with upward curving teeth. A revolving cylinder below has rows of teeth, which pass between those on the chute, and pick up the articles. From the teeth they fall into an opening in the cylinder and a small chute carries them to one of the compartments below.

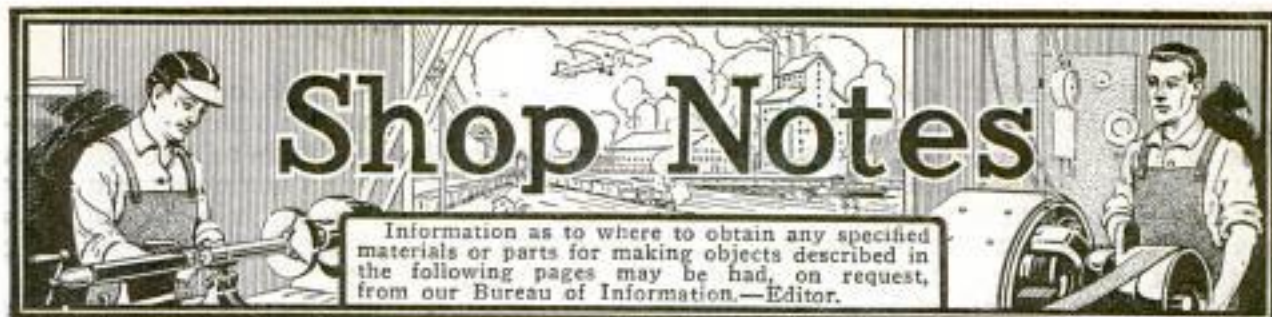
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*Chas. E. & J. Kohr,
North York, Pa.*

*Grand O. Home, 412 Mason Opera House Bldg
Soan Peoples, Calif.*

*G. Klein, 807 Broadway Place,
Chicago*

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Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

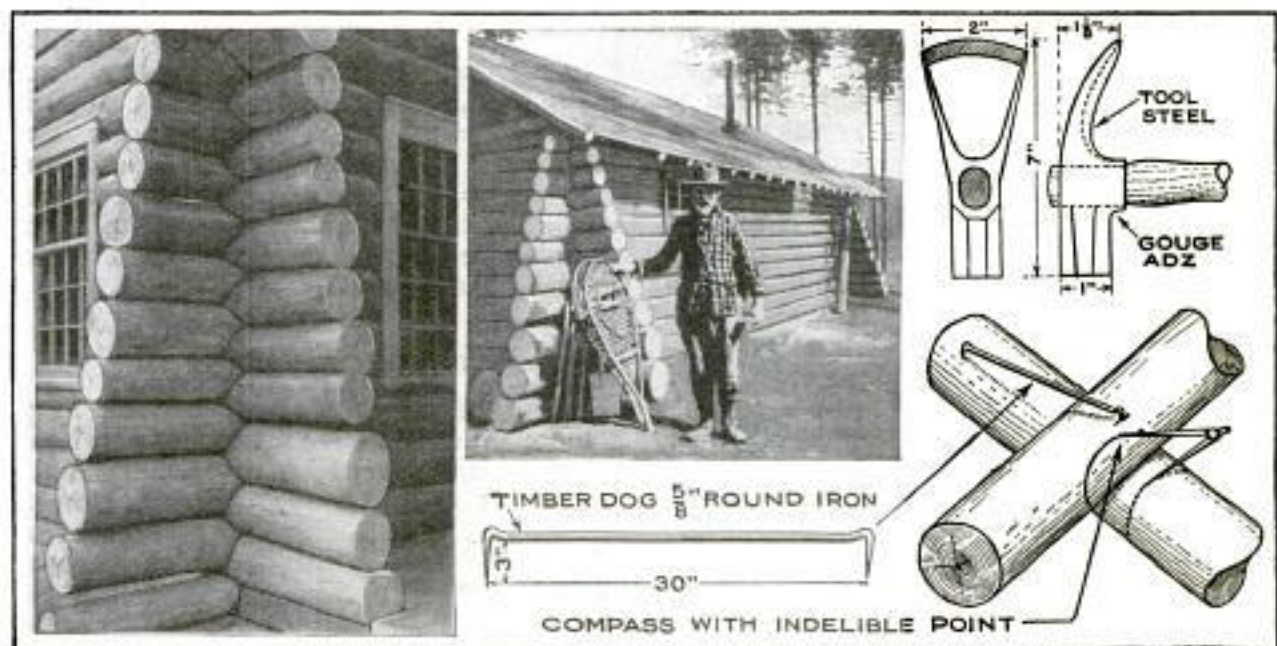
Corners for Log Cabins

BY A. NEUMAN

IN building log cabins, the parts that cause the most trouble are the corners, where the logs cross each other at right angles. To get the best and most attractive effect, and to retain the "pioneer" look, the logs should project beyond the corners, but, unless properly done, the effect will not be pleasing. The pictures show how accurately and neatly the logs can be joined at the corners. To make

although, if necessary, it can be done. The logs should be cut about 6 ft. longer than the inside dimensions of the building, and good straight ones should be selected; they should also hold their size well, that is, they should not taper very much.

The notches are marked with a compass with an indelible-lead point, if green timber is used, as an ordinary pencil or



If a Neat and Finished Job is Desired in a Log Building, Particular Pains must be Taken to Fit the Logs Accurately at the Corners. By Marking the Notches According to the Method Described, a Very Neat Corner Is the Result. The Drawings Show the Tools Used and the Method of Marking Off the Logs

this type of corner it is necessary to have made at a blacksmith shop a gouge adz along the lines of the one shown. The cutting edge is ground with an inside bevel and sharpened with a slip stone. The hammer head is to give it the right "heft" and balance, and is useful to drive the timber dogs into the logs to hold the latter while they are being notched. Two of these timber dogs are needed, and they are made and used as shown in the drawing. Peeled logs are best to use, as it is quite difficult to get a distinct pencil mark on the bark of a rough log,

lead will not make a good mark on the surface of freshly peeled logs. Two logs are dogged together at right angles, as shown; the compass is set to a radius of a little less than half the diameter of the log to be cut, then, with the steel point against the lower log and the pencil point against the upper one, it is drawn over the surface of the logs as shown, marking, on the upper log, an accurate representation of the contour of the lower one.

A similar mark is made in the same manner on the opposite side of the upper log, which is then rolled over, dogged

again, and the notch cut. It should be noted that the notches are cut in only one side of each log—the underside.

As the logs taper somewhat, the diameter of the notch at the small end must be a trifle smaller than the diameter of the notch at the larger end. If the joints do not fit exactly when first cut, the compass should be set with its points $\frac{1}{4}$ to $\frac{1}{2}$ in. apart, new marks made, and the notches cut down to these marks. If the work has been carefully done, extra fitting is usually unnecessary; after the first few experiments with the method, neat and accurately fitting notches can be cut, and, where the work is exceptionally well done, it is hard to tell which log is cut.

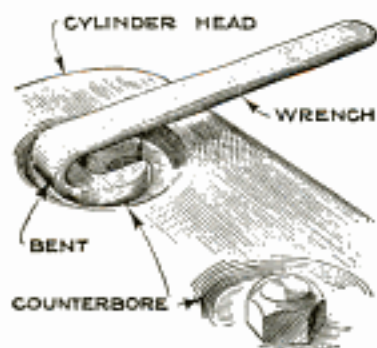
About an inch of space is left between the logs, and this space is "stuccoed" ac-

ording to the methods commonly used. Straight logs should be selected for building purposes, but if there should be a slight bend or bow in some of them, they should be placed in the building with the bow up, so that, in time, they will sag and straighten out.

The logs settle a great deal more than is generally thought after being put in place, and it is advisable to allow the building to settle for two or three months before furring in the doors and windows, or trying to stucco the chinks between the logs. If the building is allowed to settle for a while, nails driven close up into the cracks, about 2 or 3 in. apart, and the chinks then filled, the stucco will stay tight for years, as the heads of the nails will be imbedded in it and hold it tightly.

Wrench for Cylinder-Head Bolts

It is difficult to place a straight open-end wrench on the cylinder-head bolts of certain makes of automobile engines, as the nuts are set below the surface in such a manner that a good grip cannot be taken. In such cases a wrench of the type shown in the drawing can be used to considerable advantage. It is only necessary to bend over the open end of the wrench, so that the jaws will fit into the counter-bore or depression in the casting.



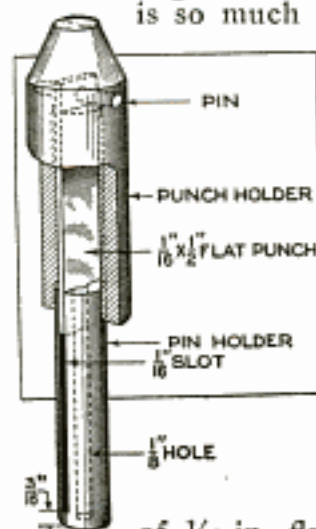
Cleaning Silver Cathodes

Silver cathodes for use in the electro-deposition of copper are cleaned by placing them in contact with pure tinfoil in a boiling 10-per-cent solution of sodium hydroxide until bright. They are then washed successively with dilute hydrochloric acid, dilute ammonia, and distilled water, rinsed with alcohol, burning off any adhering alcohol by igniting it. The electrolysis is carried out as usual, except that the electrode is not immersed in the solution until the current has been switched on. To remove the copper deposit, after the final weighing, the cathode is placed in a wide-mouthed stoppered bottle, filled with a 10-per-cent solution of trichloroacetic acid in aqueous ammo-

nia (.90 specific gravity), to which an equal volume of water has been added. The copper is removed in about ten minutes and the silver electrode is not attacked. Chloroform or carbon tetrachloride may be substituted for trichloroacetic acid, but in this case the ammonia solution should be made from one part ammonia (.90 specific gravity), and one part alcohol. The reaction is slower, and care must be taken that no sulphur compounds are present in the carbon tetrachloride that is used.

Driving Long, Slender Pins

A very efficient tool for driving long, slender pins that have a tendency to bend when being driven, because their length is so much out of proportion to



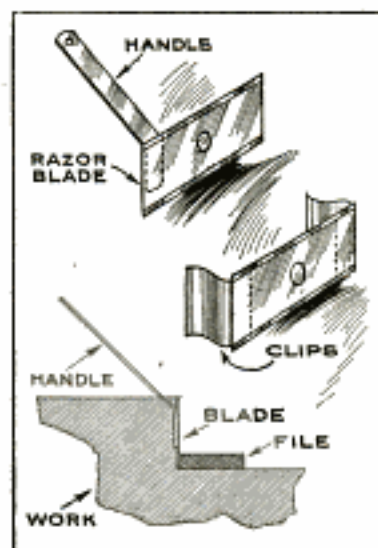
their diameter, and also because they are not always set squarely, is shown in the drawing. The part that holds the pin is made from $\frac{1}{2}$ -in. steel, drilled through to accommodate the pins, and a slot is cut through to within $\frac{3}{16}$ in. of the end. The punch, or driver, is a piece of $\frac{1}{16}$ -in. flat steel, $\frac{1}{2}$ in. wide, held by means of a pin in the sliding punch holder, which is drilled out, $\frac{1}{2}$ in. in diameter, to within a short distance of the top. Care should be taken in making this tool to see that the flat piece fits

the hole in the punch holder neatly, as this supports the driver lengthwise. When the two parts are assembled, the flat punch should slide nicely in the slot of the pin holder.

When driving the pins, they are first placed in the hole and the driver slipped over them; then, taps on the top of the punch holder will drive them home to within $\frac{3}{16}$ in., a final tap being sufficient to bring the pin flush with the face of the work. It will be seen that the pin is supported at all times by the holder, and that the punch holder pilots the punch down centrally, thus overcoming the two main difficulties mentioned. — Harry Moore, Montreal, Can.

Shop Uses for Old Razor Blades

Old safety-razor blades can be put to good use on the bench by soldering on



sheet-metal handles, and then using the blade as a guard in filing the corners of dies and castings. Even a safe-edge file will sometimes cut up a finished metal surface badly, and the blade will form a good protection when any file, even a three-cornered one,

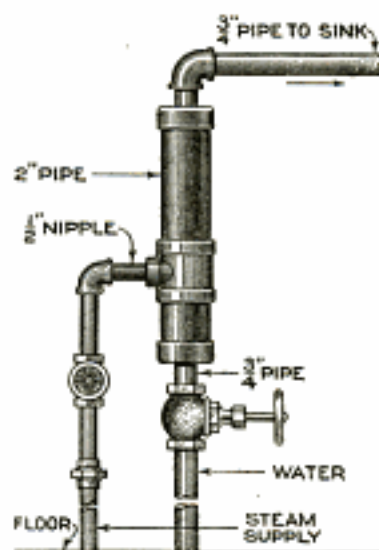
is used. Instead of a single handle, especially on repetition work, a metal clip can be soldered to each side of a blade to hold it up against the work, so that both hands will be free to use the file.

Sticker Identifies Rush Orders

Small gummed-paper stickers, such as can be bought at any stationery store, are used on the order cards of a large concern to indicate rush orders. A red seal is stuck in the upper left-hand corner of the card, and everyone who gets the shop ticket knows instantly that the order is to be handled with speed. A variation of the same idea makes use of a blue seal, which enjoins everyone to take particular pains in filling the order, or in working to dimensions.

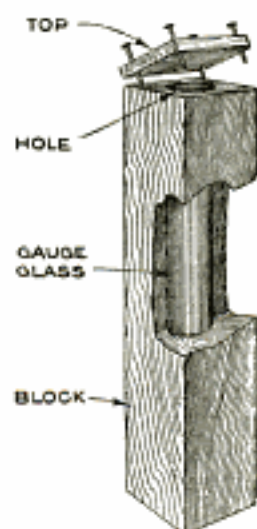
Heating Water with Steam

Heating cold water by steam is accomplished in various ways, the most common method being to insert the end of a steam pipe into a tank of water and turn on the steam. This method, besides being wasteful of steam, produces disagreeable noises. The drawing shows a simple fitting in which the steam is mixed with the cold water, so that this is heated and passes on to an outlet without any fuss. The water and steam-supply pipes are controlled by separate valves, making it possible to regulate the temperature of the heated water very closely. — Earl Stevens, Niagara Falls, N. Y.



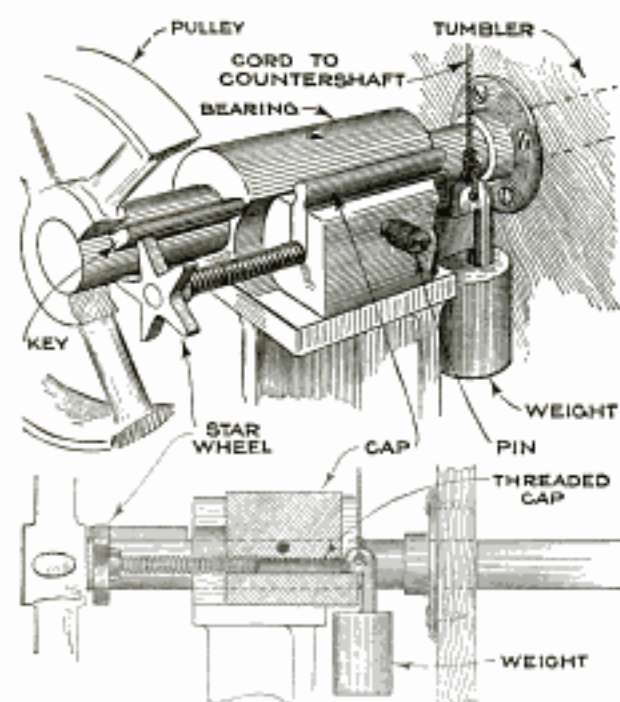
Safety Container for Gauge Glasses

In dismantling large ammonia compressors for shipment, most of the small parts are easily disposed of by packing them in a box fastened to the skids. There is one piece, however, that does not mix well with the rest, no matter how carefully it is wrapped in burlap or corrugated cardboard, as it invariably works its way under a heavier piece and is crushed. This is the gauge glass. The difficulty of transporting such glasses, and for that matter all kinds of glass tubing in short lengths, can be solved by using a block of wood in which a hole, 1 in. longer and about $\frac{1}{32}$ in. larger than the glass, is drilled. The tube is inserted in the hole, and a small block, fastened over the opening with four brads, makes it possible for the gauge glass to ride safely along with valves, oil cups, and other small parts.



Automatic Stop for Tumbling Barrel

When tumbling some small castings, to remove the sand and burrs, trouble was experienced when the pieces were tumbled



An Automatic Stop for a Tumbling Machine Prevents Injury to Castings by being Tumbled Too Long

too long, the result being that the corners were worn round. The trouble occurred mainly because the operator forgot to stop the tumbler when the work was done.

The result of this experience was that the automatic stop illustrated was devised; this required a new bearing at one end of the machine. The cast-iron bearing supports the tumbler shaft and the threaded stem of the star wheel, a hole being first drilled for the stem, then the hole slotted out on top, and a machine-steel cap fitted. The bearing for the star-wheel stem is tapped to fit the thread on the stem when the cap is in place, as shown. Afterward the thread in the bearing is removed so that the only part having a thread is the movable cap, which is held in place by a pin. A key is driven into the tumbler shaft to operate the star wheel. The end of the star-wheel bearing nearest the tumbler has a weight hooked over it to operate the countershaft, which is not shown.

When the tumbler is ready to start, the attendant takes out the pin, lifts the cap and slides the star wheel out to the position shown; then the cap is secured in place again, the countershaft cord pulled to start the machine, and the weight hooked over the bearing; the tumbler can

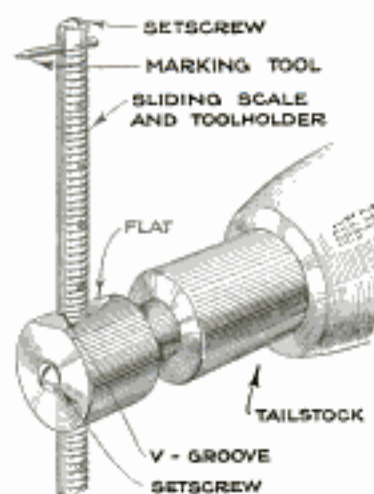
then be left to stop itself. As the threaded stem of the star wheel is 3 in. long and makes only one-fifth turn for each revolution of the tumbler, and the stem has a 20-pitch thread, it takes 300 revolutions of the tumbler before the star wheel is fed through enough to push the weight off its bearing, and stop the machine.—S. A. McDonald, Brooklyn, N. Y.

Stencils Made from Old Films

I find that the best material from which to make air-brush stencils is old photographic film, such as can be obtained from any professional negative finisher or photographer, many of whom have discontinued the use of glass plates. Such celluloid masks are much more durable than those of paper, and the alcohol in the colors cannot strike through and stain the work underneath. The designs may be drawn on the rough surface of the stencil directly, then cut out with an old razor blade.—R. E. Deering, Clements, Kan.

Marking Bolt Circles

When turning a cover, flange, gland, or other work that will afterward require a circle of bolt holes drilled in it, it is the usual practice to mark or "strike" the bolt circle, that is, cut a fine tool mark in the face of the work at the required diameter, while the work is held in the chuck or faceplate. This is generally accomplished with a V-shaped tool, held in the toolholder, and the proper radius is obtained by adjusting the



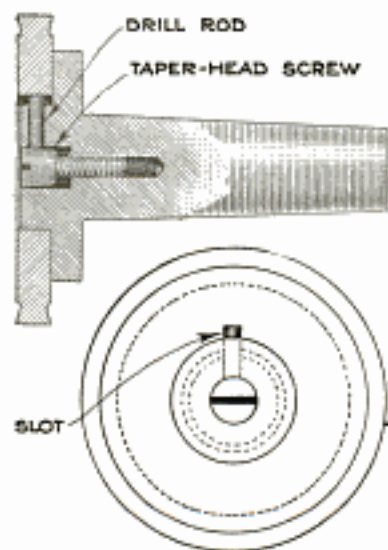
obtained by adjusting the tool to a scale held against the lathe center. The drawing shows a special tool for this work, which is simple to make and easily adjusted to the correct radius.

The body is turned on the shank to fit into the tailstock spindle, the front end having a $\frac{3}{8}$ -in. hole drilled through it at right angles to its center, and a small hole at the center, tapped for a setscrew. A piece of $\frac{3}{8}$ -in. cold-rolled steel, of suitable

length, is centered and placed in the lathe, where a 16-pitch thread is "scratched" on it. The thread is not actually cut, but a fine helical line is made on the rod, which is then grooved on one side to fit the point of the setscrew, and fitted at one end with the marking tool and setscrew. The diameter of the body of the tool should be large enough to permit a flat to be filed on one side, the flat being filed at an angle corresponding with the angle of the thread, and so that when the marking tool is snugly against the flat, the distance from the center of the tool to the center of the body is exactly one inch. When setting the tool, pull out the bar until the measurement of half the diameter of the required circle is obtained, and then tighten the screw. The tool is held in a vertical position so as to clear the toolholder of the lathe, and is fed in by means of the tailstock until a fine line is marked on the work.

Face Milling with Side Mills

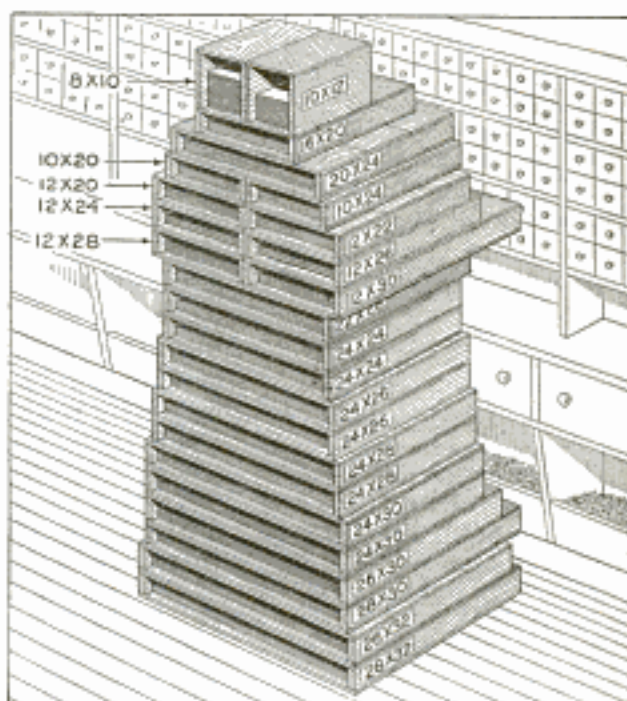
A good deal of quick face milling can be done with the ordinary face and side-milling cutter when held in the simple holder illustrated. This is turned, on the shank, to fit the spindle, and on the front



to a snug fit in the bore of the cutter. A shoulder, to take the end thrust of the cut, is left on the holder. The center of the holder is next drilled, tapped, and counterbored for the special screw indicated. This is an ordinary filister-head screw with the head turned to a slight taper. At right angles to this hole is another, drilled to a diameter the same as the width of the keyway in the cutter. A piece of drill rod is inserted in this hole, and the tool is ready for use. It will be seen that when the screw is tightened, the drill-rod pin will be forced out against the cutter and act as a driving key. With a cutter held as shown, and close to the spindle of the machine, face-milling operations can be successfully accomplished.

Rack for Storing Sheet Glass

So-called "country" hardware and paint stores, that carry an extensive assortment of sizes in sheet window glass, realize



Correct Design of Movement for Intermittent Motion

Most machine designers and draftsmen have occasion to make use of cams and Geneva movements in their work, and these certainly form two of the principal elements in the study of machine design. Results are obtained by using them which would otherwise be impossible, and upon whether they are correctly or incorrectly used depends the success of the machine in a great many cases. High-speed production is a

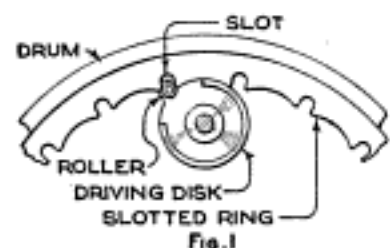


Fig. 1

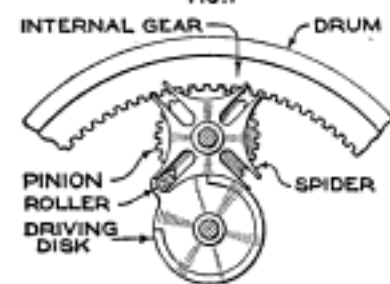


Fig. 2

used whenever possible. When a uniform or constant motion is required for the cam roller, the entire movement cannot, of course, be harmonic, but an effort should be made gradually to accelerate the roller at the start and gradually retard it at the end of its movement; in most cases this can be done, though often neglected.

In the present example a machine was to be redesigned. The highest possible speed was 15 cycles per minute; it would have broken down at a higher speed, and to make it a commercial success more speed was absolutely necessary. Its various moving elements consisted mainly of abrupt-movement cams and Geneva movements. A close examination revealed the fact that the design of these parts was not based upon the principle of gradual acceleration and retardation. The cams and Geneva parts were redesigned, and in so doing it was found that most of them could be given true harmonic forms, and, in consequence, the machine was operated up to a speed of 90 cycles per minute, without undue vibration, and without exceeding safe stresses.

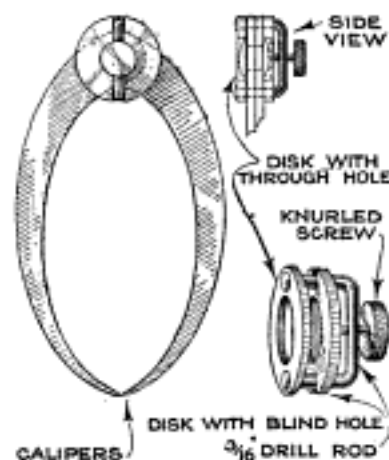
One of the several sources of trouble in the original design was the Geneva action

illustrated in Fig. 1. The drum was driven with an intermittent motion and had a diameter of about 24 in. Attached to it was a slotted ring engaging the driving disk. The drum remained stationary while the disk revolved, excepting when the roller was in engagement with the slot, as shown, when the drum started to revolve at nearly the full speed of the disk. As the parts driving the disk had considerable weight, as had also the drum, their opposing inertia forces caused a shock each time the roller struck the side of the slot. This condition was entirely overcome in the redesigned movement, shown in Fig. 2, in which the slotted ring was replaced by an internal gear, engaging a pinion which was secured to a slotted spider. A driving disk was located so that its roller engaged in the radial slots of the spider, care being taken to have the roller begin to enter the slot in a direction parallel to the slot, or radial to the center of the spider. This arrangement insured the starting of the spider and drum at zero speed, accelerating to full speed, and retarding to zero again. The engaging curved surfaces of the spider and disk were slightly tapered on their faces so that, by axially adjusting the disk, lost motion was easily taken up.—

R. E. Bates, Dorchester, Mass.

Lock for Firm-Joint Calipers

Anyone who has used calipers of the firm-jointed type knows how easily the setting may be altered when this kind of



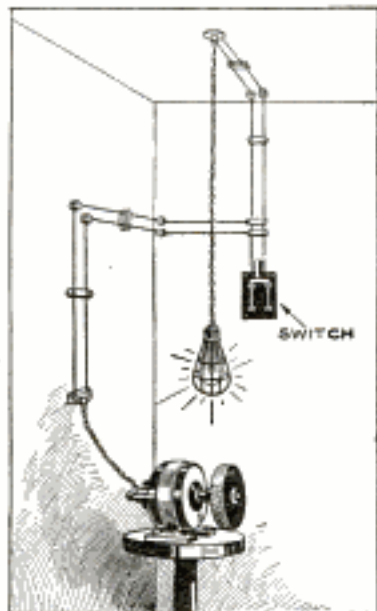
tool is being tried on the work. The knowledge of this causes the user to be continually testing the setting with a scale, which, of course, takes much time. The drawing shows a simple lock that will give the user of firm-jointed calipers confidence that the setting will not be disturbed by any ordinary usage. Two disks are bored out, one with a clear hole and the other with a blind one, the diameter of the holes being a snug fit over the joint washers. A piece of drill rod or cold-rolled stock is bent as shown, the two

ends entering holes in the through-drilled disk, while the disk with the blind hole has slots cut in the edge to fit the rod. A tapped hole in the center of the bent rod receives a small knurled-head screw for tightening after adjustment. When the attachment is made as described, it is placed on the caliper and the ends of the drill rod riveted over, thus making it a fixture, with no possibility of loss.

It will immediately be apparent that the lock is out of the way and will not interfere with the full capacity of the instrument. When the calipers are set to the required dimensions, a slight turn of the screw tightens the two legs firmly together. The depth of the blind hole should be such that its bottom will not touch the face of the washer, in order that the pressure may fall on the caliper legs only.

Combining Grinder Light and Switch

The usual practice of placing a separately controlled light over the tool grinder results in considerable wasted current, because the person using the machine generally forgets to turn off the light when finished with the grinder. A simpler method, and one which makes it impossible to start or stop the grinder without turning the light on and off, is shown in the drawing. The switch that controls the grinding-wheel motor also controls the lamp, as the light circuit is tapped into the one supplying current to the motor. When the user throws the switch to stop the grinding wheel, the light is extinguished.—G. A. Luers, Washington, D. C.

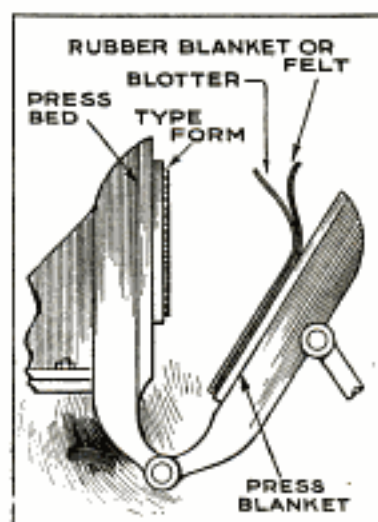


Ⓒ No plates or bars of steel or iron should be worked at a blue or black heat; the material will stand far more strain worked either red-hot or cold. At an intermediate point, great risk is run, as strains will probably be induced that will produce rupture later on.

Making Stereotype Matrices from Type Forms

Country newspapers equipped with plate-casting boxes can make their own stereotype matrices by a simple method that has been worked out with satisfactory results in the composing room of a Minnesota paper.

Lock up the type in any job or cylinder-press form. Cut a piece of medium-weight blotting paper to the exact size of the casting box.



Place the blotting paper on a felt or rubber blanket, blotter on top. Take an impression and the type form will be pressed into the blotter in the form of a matrix.

Too much pressure will crack the blotter and spoil it, and too light an impression will leave the matrix too shallow for the casting of a good plate. Strips of strawboard, pasted behind the places on the matrix that correspond to white portions in print, will keep the open parts of the plate from being too shallow and smudging up on the impressions made from the plate.

Composing-room foremen will find it possible and profitable to set up in this way business cards, small advertisements, and similar matter that run for considerable periods without change.—J. Harold Curtis, Columbia, Mo.

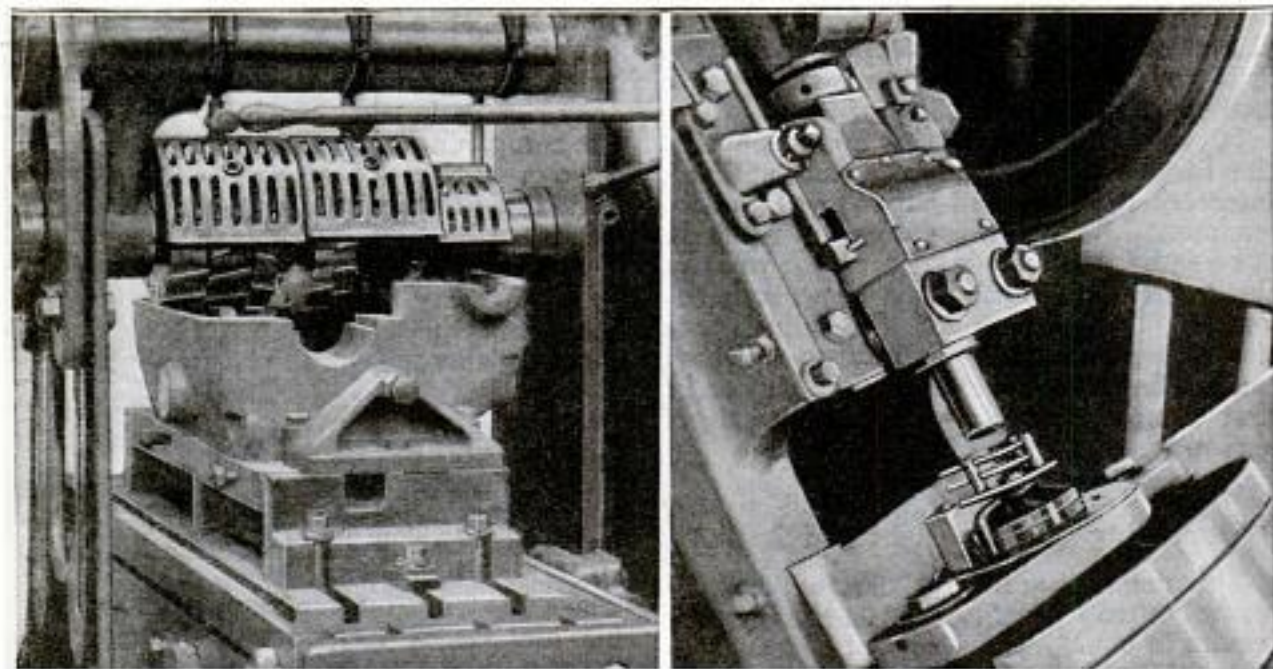
Cutting Glass with a Soldering Bit

For cutting glass when there is no glass cutter at hand, a heated soldering bit or any other piece of heated brass or copper can be used. The edge of the glass to be cut is nicked, and the soldering copper, very hot, is passed above the section of the glass to be cut. Then, starting at the notch, the bit should be drawn slowly across, keeping just ahead of the crack that will follow the hot iron. With practice, fairly accurate cuts can be made, but it is advisable to practice the method on a worthless piece of glass before undertaking to cut an expensive sheet.

Two Simple Machine Guards

Anything that protects the operator of a machine from injury without interfering with production is well worth while, and

flying into the operator's face, but the hands are kept from contact with the revolving cutters. The other picture shows a small wire guard which is so placed around the die of a punch press that the



Left, Guard for a Milling Machine That Prevents Chips from being Projected into the Operator's Face and Keeps His Hands from Contact with the Cutters; Right, a Safety Guard for Punch Presses That Prevents the Operator from Getting His Fingers under the Descending Ram

the photographs illustrate two such safety devices that have been found quite efficient.

The first picture shows how the cutters on a milling machine have been covered so that not only are chips prevented from

operator cannot possibly get his hand underneath, and, of course, he would never want to put it over the top. This particular type of guard saved so many fingers that it was installed on all the punch presses of the firm using it.

Sponging Wood before Staining

There are a number of advantages to be claimed for sponging wood before it is stained. First, the action of the water, which should preferably be cold, raises the grain of the wood, so that after subsequent drying, this raised grain may be leveled off with sandpaper, thus doing away with its recurrence upon application of the stain. Hot water should not be used on veneer work, since it may strike through and loosen the glue on the cross-banding. With any work, it is best to play safe and use cold water. The second advantage in sponging lies in the fact that the water opens the pores of the wood, relieving them of the clogged condition resulting from previous sandings, and so enables the staining material to be drawn deeply into the wood, thereby producing a very even color, which is capable of withstanding light sanding

with fine sandpaper, if such should be necessary to produce that perfect smoothness of surface upon which the subsequent varnish coats depend for their beauty.

The last big advantage is also the result of opening the pores, and this has to do with the use of a filler previous to varnishing. If the wood is filled without sponging and sandpapering previous to staining, the old sandpaper dust and other material which clog the pores will absorb water from the stain and remain in a condition considerably more damp than that portion of the wood in direct contact with the air. When filling is now attempted upon such a foundation, this material in the pores dries out through the absorption of the water by the surrounding wood, with the result that shrinkage and settling develop, causing the varnish coat to be pulled down into the pores.

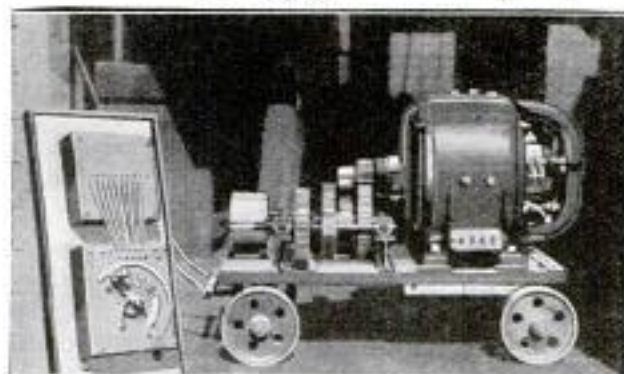
On the other hand, the same moist condition in the pores of the wood may result, in some cases, in the varnish being forced out in small spots, due to expansion of the moisture if the varnish work is done in an excessively warm room.

Why Pumps Become Air-Bound

Under atmospheric conditions water contains about two per cent of air. When subject to a lower pressure than that of the atmosphere, the air expands, and when given sufficient time, as while the water is flowing through a long suction pipe, the air will escape from the water in small bubbles. These bubbles will stick to the pipe or pump surfaces, or the air will gather in the pockets of the pump spaces. The trouble can largely be prevented by increasing the head of the suction supply and by operating the pump more slowly, so that the pressure of the suction water in the pump cylinder will be higher.

Driving Unit for Banding Motor Generators

Having experienced a great deal of difficulty in turning over large motor-generator armatures for banding, a western electric railway built the device shown in the photograph. The driving unit, a 600-volt variable-speed motor, is controlled by a portable rheostat. Connected to the motor is a three-speed



A Western Electric Railway Uses the Portable Arrangement Illustrated to Turn Motor-Generator Armatures for Banding. It Consists of a 600-Volt Motor Connected to a Three-Speed Transmission

transmission, the lowest ratio being slow enough to turn the heaviest armature over for banding. The entire arrangement is mounted on a wheeled truck so that it can easily be pulled to any part of the shop where its services may be needed.—Hyman M. Fink, Los Angeles, California.

Safety Attachment for Printing Press

A common accident in printing shops where platen job presses are used is the crushing of a feeder's fingers between



A Safety Device for Platen Printing Presses That Forces Out the Pressman's Hand Before It is Caught between the Platen and Type Form

the chase and platen, because he did not withdraw his hand fast enough. A Pennsylvania concern has equipped a press with a safety device that prevents accidents of this character.

A wooden bar is mounted outside the upper platen band, on adjustable metal strips. These strips are attached to rods at the side and are adjustable vertically. The side rods are provided with cam rollers, and attached to the sides of the press in such a manner that, just before the platen closes on the type form, the connecting rods between the platen and gears that operate it, strike the cams and elevate the wooden bar. The pressman's arm and hand, if not previously removed, will be forced out of the press before they can be caught between the form and platen.—Armstrong Perry, New York City.

Carburetor Leakage

That dirt and grease on the outside of some types of automobile carburetors may cause leakage and dripping is rarely suspected. However, this is possible, and occurs in numerous cases. At the top of the float chamber of the carburetor is a small vent that must be kept open in order to permit the escape of air, and so allow the incoming gasoline to raise the float. When this vent is closed, the air is trapped in the upper part of the chamber, and as the air pressure will not allow the float to rise and shut the needle valve, the gasoline will continue to flow. When the carburetor develops flooding, before replacing or overhauling, inspect this vent for dirt, as, in many cases, nothing more than this is wrong.



TESTING MOTORS, GENERATORS, and TRANSFORMERS

By KENNETH C. COGGESHALL

Part II—Generators and Transformers

TO determine what is known as the external characteristics of a generator, that is, the variation in terminal voltage with an increase or decrease in load, connections are made as in Fig. 8, which shows a shunt-wound dynamo under test. The generator must be driven at constant speed during the test, and this should be the speed shown on the nameplate. The field rheostat, once adjusted, should not be touched again during the test. A water rheostat, lamp bank, or other device capable of being adjusted, should be used to vary the load by steps, from 0 to 150-per-cent load. At each step, readings of the meters should be made, recorded, and plotted graphically, as shown in Fig. 9. The line drawn through the points representing the readings indicates the trend of the terminal voltage under varying loads. The characteristic curve of a series-wound or over-compounded dynamo will rise above that of a shunt-wound dynamo.

The power necessary to drive the generator is:

$$H_p = \frac{E \times I}{746 \times \text{Efficiency}}$$

If the efficiency is not known, but the power necessary to drive the dynamo is, then

$$\text{Efficiency} = \frac{E \times I}{746 \times H_p}$$

Figure 10 shows the connections for testing the output of a three-phase a-c. generator. Only one set of instruments need be used, if a switching system is used to connect the meters in the various phases in quick rotation. During the test the field current should be kept constant. An external characteristic curve should be plotted, as in Fig. 9, from the data recorded during the test. The load, if the test is conducted in the laboratory, may be a water rheostat or lamp bank; if the regular commercial load is used, the test may be of longer duration. The average current flowing in each phase is:

$$I = \frac{I_1 + I_2 + I_3}{3}$$

that is, the average value, I , is obtained by adding the readings of the three am-

meters and dividing by 3. Similarly, for the average value of E ,

$$E = \frac{E_1 + E_2 + E_3}{3}$$

The power output is:

$$P = E \times I \times 1.73 \times \text{Pf.}$$

The horsepower required to drive the generator, when the efficiency of the machine is known, is:

$$H_p = \frac{E \times I \times 1.73 \times \text{Pf.}}{746 \times \text{Efficiency}}$$

and, consequently,

$$\text{Pf.} = \frac{H_p \times \text{Efficiency} \times 746}{E \times I \times 1.73}, \text{ or, } \frac{P}{E \times I \times 1.73};$$

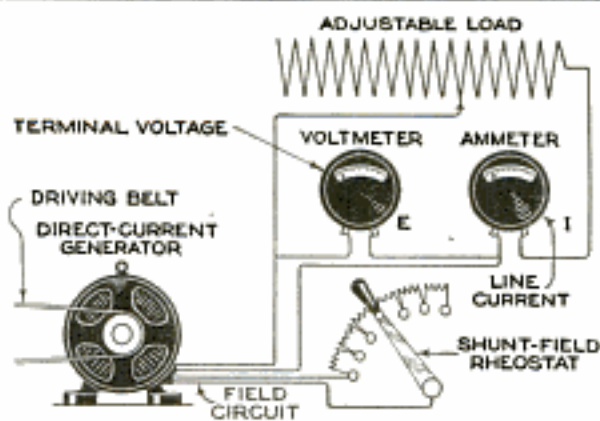
and

$$\text{Efficiency} = \frac{E \times I \times 1.73 \times \text{Pf.}}{746 \times H_p} = \frac{P}{746 \times H_p}$$

It is a good plan to measure the operating temperature of a motor or generator, to make sure that the insulation is not in danger of injury by heat. Place the bulb of a thermometer in the hottest available spot on the machine, and take temperature readings while the machine is running. Continue the test until the thermometer indicates no further increase in temperature. Compare the reading with the room temperature; the difference, or temperature rise, should not exceed 50° C. (90° F.). In no case, regardless of surrounding conditions, should the thermometer show a temperature of more than 90° C. (194° F.).

As intimated in the preceding paragraph, the capacity of a machine depends, to a large extent, upon the temperature at which it operates. This is especially true of transformers. Insulation breaks down very rapidly at high temperatures, and weakened insulation materially shortens the life of a transformer.

To test the capacity of a transformer, suspend a thermometer in the oil in the case, placing the bulb as near to the coils as possible. An ammeter connected in the low-tension side indicates the load current, while a voltmeter shows the line voltage, as shown in Fig. 11. If the load consists only of lamps, as is preferable, then the product of the volts and amperes approximates the output. Temperature readings of the surrounding air should



CONNECTIONS FOR OBTAINING TERMINAL VOLTAGE AND LINE CURRENT FOR VARIOUS OUTPUTS

Fig. 8

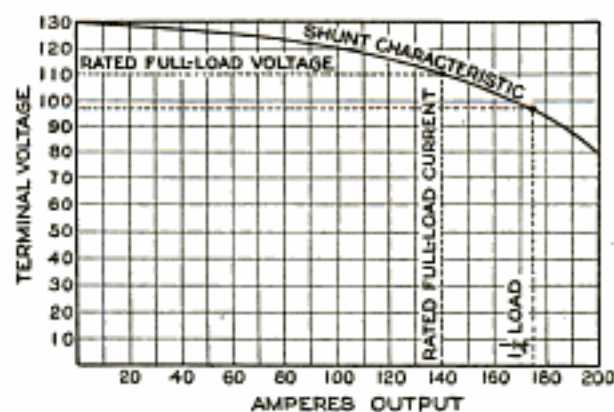
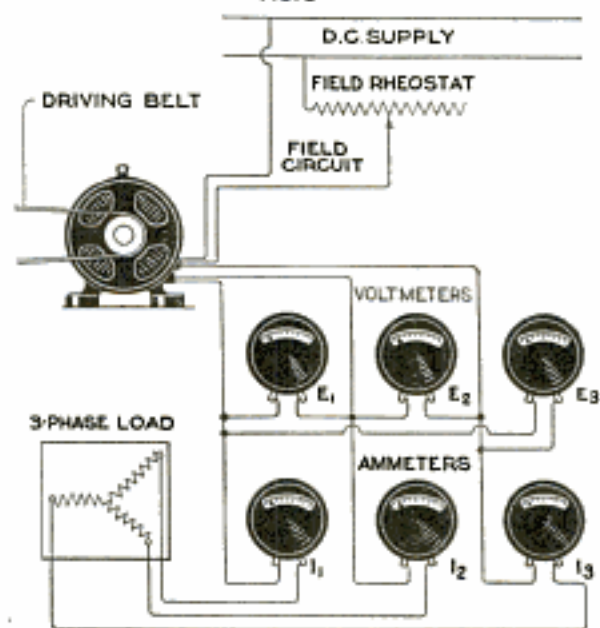


Fig. 9



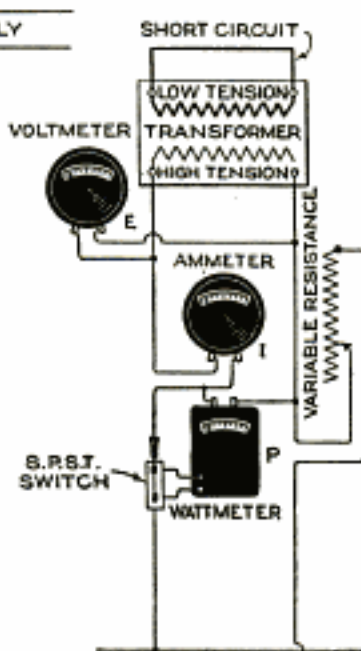
CONNECTIONS FOR TESTING 3-PHASE GENERATOR

Fig. 10



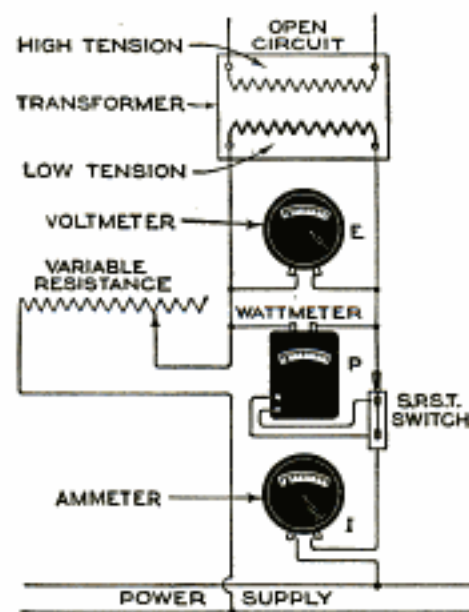
TEST FOR TEMPERATURE RISE

Fig. 11



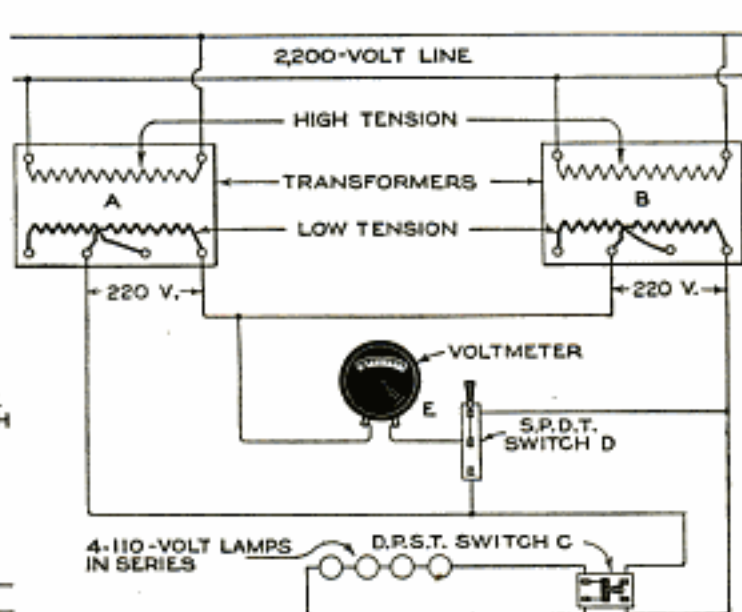
TEST FOR COPPER LOSS

Fig. 12



TEST FOR CORE-IRON LOSS

Fig. 13



TEST FOR POLARITY AND WINDING RATIOS

Fig. 14

Connections for Making Most Usual Tests on Direct-Current and Alternating-Current Generators and Transformers: Figure 8 Shows Connections for Direct-Current Generators; Figure 9, External-Characteristic Graph for a Direct-Current Shunt-Wound Generator; Figure 10, Connections for Testing Alternating-Current Dynamos, and Figures 11 to 14, Connections for Various Tests on Transformers

also be taken so that the temperature rise may be determined. This difference should not exceed 50° C. (90° F.) nor should the temperature of the oil rise above 90° C. (194° F.).

It is both difficult and dangerous to obtain the current and voltage values of the high-tension circuit without special testing apparatus. The efficiency of a transformer is, therefore, determined by finding the copper and iron losses; the input is, then, the output plus the iron or core loss plus the copper loss.

To make the copper-loss test, short-circuit the low-voltage windings and place a voltmeter, an ammeter, and a wattmeter in the high-tension circuit, as in Fig. 12. Connections are made through a rheostat to a low-voltage power supply. Manipulate the rheostat until the full-load current, the value of which will be found on the nameplate, flows in the windings. The wattmeter will then indicate the copper loss of the transformer—since the transformer is doing no outside work and the power consumed is that due to the heat loss in the windings. Take other readings at various loads, and record the readings graphically.

The test for iron loss is somewhat similar to the copper-loss test, as indicated in Fig. 13. In this instance, the high-voltage winding is left open-circuited, and the instruments are connected in the low-tension side. Since no current flows in the high-voltage winding, the wattmeter shows the power consumed in exciting the iron. The wattmeter reading also includes the potential coil losses in both voltmeter and wattmeter, but unless very accurate tests are being made, these losses can be disregarded.

If possible, an auto transformer should be used instead of the rheostat for varying the testing voltage.

Using Drawing Pencils

Always sharpen a drawing pencil at both ends; the ordinary round point at one end and a knife-edge at the other. Use the knife-edge whenever a long line is to be drawn, as it will do much more work than the round point before re-sharpening is necessary.

In forming a knife-edge on a drawing pencil, always hold the pencil so that the edge will be made parallel with one of the six flats on the hexagon pencil—preferably the one on which the name and grade of the pencil are stamped. This makes it easy to form the second side of the edge,

Knowing, now, the copper and iron losses, the efficiency of the transformer under test is:

$$\text{Efficiency} = \frac{P}{P + \text{copper loss} + \text{iron loss}}$$

Should it be necessary to change the transformer leads, or should there be any question as to whether the connections are correct, a polarity test is advisable. Such a test requires a transformer of equal rating for comparison. Make the connections as indicated in Fig. 14, which shows a relative-polarity test on a 2,200 to 220-440-volt transformer. The high-tension windings of both A and B are connected to a 2,200-volt power-supply circuit. Four 110-volt lamps are connected in series through a double-pole single-throw switch, C, with leads from the low-tension side of both A and B. A voltmeter is connected through a single-pole double-throw switch, D, in such manner that the voltage of either transformer may be read as desired.

When all is ready for the test, throw switch C and note if the lamps light brightly. If they do, the leads are brought out correctly; if not, the leads are reversed. The latter case indicates that the transformers are opposing each other. Repeat this test on all leads until every connection is known to be correct.

The ratio between the windings of a transformer may be found by making the same connections as for the polarity test. Transformer B must, however, be of a known ratio. Leaving switch C open, quickly throw switch D from one contact to the other. If the transformers have similar windings, and similar ratios, the two readings should be identical.

In making transformer tests, high voltages are sometimes encountered and great care must therefore be exercised to insure personal safety.

for it is simply made parallel with the opposite flat of the "hex," and the edge thus comes out straight, instead of on a slant. Thus, when the pencil is gripped by the fingers, the edge will always have the proper angular relation to the hexagon, bringing it instantly parallel with the edge of the T-square.

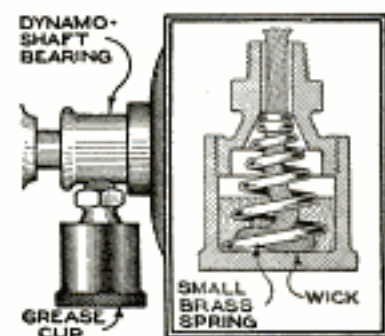
Since sharpening a pencil in this way soon removes the maker's mark, it is necessary to mark the pencil near the middle; this is done by cutting the required number of notches near the center of the flat; that is, two notches for a 2H pencil, three for a 3H, and so forth.—Curtis Ralston, Chicago, Ill.

Lubricating Broaches

Square broaches should be pulled with a corner upward. The cutting lubricant then flows down around both sides, and does not spatter off, as would be the case were a flat surface used upward. Spline broaches should be so slotted that a channel between two of the splines will be on top; the channel then serves to conduct the lubricant into the hole.

Wick-Feed Oiler Made from Grease Cup

A satisfactory homemade wick-feed oiler can be applied to the bearings of a dynamo or similar mechanism, so that

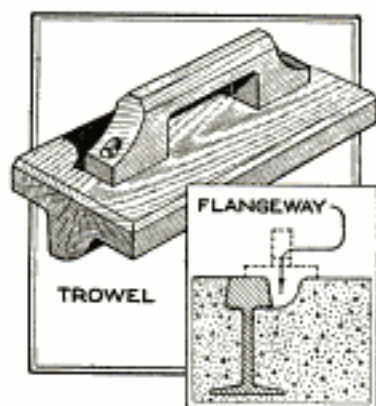


the necessity of constant hand oiling, with the attendant possibility of flooding, are eliminated. A large grease cup is screwed to the underside of the bearing, with a

piece of wicking extending through it and touching the revolving shaft. The cap of the grease cup serves as a reservoir for a liberal supply of oil. This is a simple method, for use where small quantities of oil are required, and where excess oiling is to be avoided.

Special Trowel for Concrete-Road Work

Concrete workers on road-paving contracts are familiar with those jobs in which a groove, or flangeway, must be molded on the inside of street-car or railway tracks, in order to provide clearance for the flanges on the car wheels. The drawing shows a type of trowel used on one such contract, for forming the flangeways. A single block of wood is used for the trowel, which can be cut out on a bandsaw or formed in a pattern shop on a shaper.



Lifting Check-Valve Balls

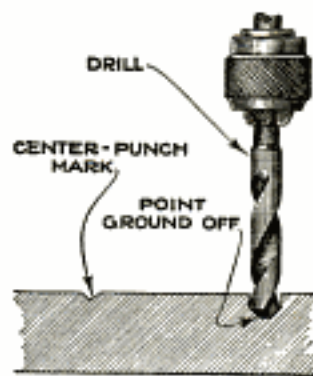
The drawing shows clearly how a small metal ball can be removed from its position in a ball-check valve, or other position where it is inaccessible to the fingers or ordinary tools. Nothing more than a piece of rubber tubing, such as can be bought at any drug store, is needed. The rubber tube can be used alone or it



can be fitted with a small piece of metal tubing in each end, as shown in the drawing, for handling balls smaller than the diameter of the rubber tube. In use, the operator places one end of the tube in his mouth, the other end being in firm contact against the surface of the ball, which is drawn up and held tightly against the tube by suction.—C. A. Clark, Miyazaki, Japan.

Drilling Tempered Springs

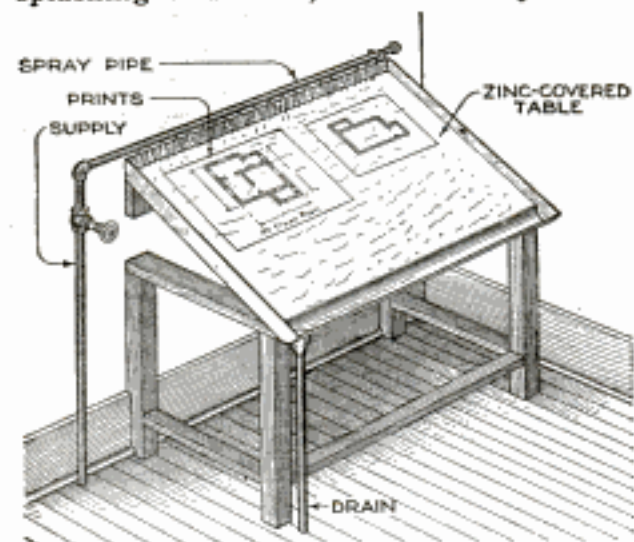
After attempting to drill a $\frac{3}{8}$ -in. hole through a number of tempered springs with no better success than a number of broken drills, an observant mechanic noticed that the lips of the drill would still cut, even when the center was dulled, and an idea being suggested by this, he proceeded to put it into execution, with satisfactory results. In order



to bring the lips of the drill into contact with the metal, the point of the drill was ground off square so that when set into the punch mark the drill immediately began to cut. The drill was run at slow speed, and, when it stopped cutting, was raised from the work, a heavy center punch used to make another depression in the center of the hole, and the drill fed down again. By alternately punching and drilling in this manner, the steel was finally drilled through.—E. K. Wehry, Cedar Rapids, Ia.

An Improved Blueprint Washer

The washing of large blueprints is always an awkward job because of the splashing and mess, which is impossible



A Blueprint Washer That Uses Nothing but Clean Water to Develop the Exposed Prints, and Eliminates the Need of Using Trays and Sinks

to avoid when large trays are used. Also, owing to the size of some of the trays and the inconvenience of emptying them, they are not uncommonly left for a long time full of dirty greenish-yellow water.

The washing device illustrated does away with the tray or sink, as the washing is done entirely by a flow of clean water over the print. An inclined table, which is built in any convenient location, is provided with raised sides and a trough at the bottom for carrying off the excess water, the whole being covered with sheet zinc or lead. A water pipe, which is drilled with a series of small holes, is arranged parallel with the top of the table so that there will be a uniform flow of water over the surface of the prints.—B. Francis Dashiell, Dunkirk, Md.

Testing for Vibration in Buildings

In a western city, a reinforced-concrete building had but recently been completed when the plastering began to fall from the ceilings. The owner claimed that work was not according to specifications, and the contractor asserted that the trouble was the result of vibrations, which were caused by trolley cars crossing a frog in the street just in front of the building. As none of the vibrations were heavy enough to be seen or felt in the four-story building, an engineer solved the problem and traced down the trouble in a novel manner. A shallow bowl of me-

tallic mercury was placed on the floor of the top story, in such a manner that the mercury would be in direct sunlight. Those interested in the result of the test stationed themselves at a window and watched. A reflection from the sun was thrown onto the ceiling by the mercury and as the street cars passed, it was noticed that the reflection on the ceiling moved several inches, thus greatly magnifying the movement of the building and vindicating the contractor.—J. R. Linton, Sioux City, Ia.

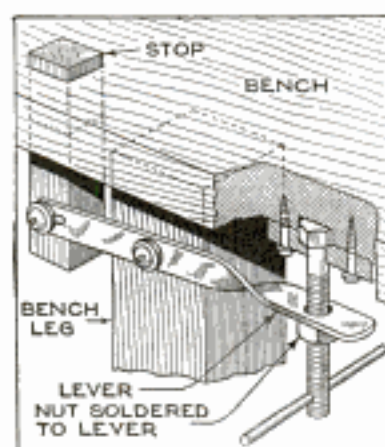
Curing Slapping Exhaust Valves

Sometimes, when a Corliss engine is running under a light load, a slapping noise will be heard from the exhaust valves. Examination of the indicator diagrams will usually show that, under light load, the cut-off is very short, and expansion is carried to a pressure below that of the atmosphere. The exhaust valves are then forced from their seats, causing the slapping or chattering noise.

The steam should be throttled, or the boiler pressure lowered, and the cut-off made later in the stroke, so that the steam will not be expanded below atmospheric pressure.

An Adjustable Bench Stop

A bench stop, which can be adjusted to any height, or lowered so as to be flush with the top of the bench, is quite easily installed on any bench in the manner illustrated.



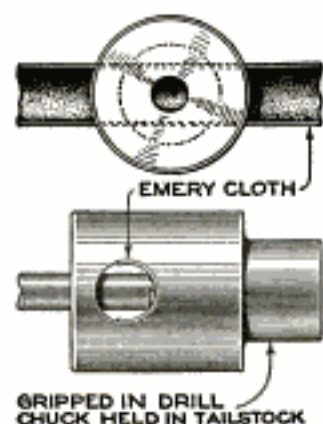
installed on any bench in the manner illustrated. A square hole is cut through the bench, in line with one of the legs; this hole is for the piece of oak that forms the stop proper. A flat-iron lever is next made;

twist one end of this to lie flat, drill a hole for a capscrew, and solder or braze a nut underneath. Drill two other holes in the lever—one to pivot it to the bench leg and the other to fasten it to the lower end of the stop. This latter hole should be slotted, so that the stop will be moved upward in a straight line. Fit a bolt into the nut on the lever, then bore a blind

hole in the underside of the bench, to receive the capscrew head, and screw a wooden block, with a hole for the screw shank, below it. Drill a small hole through the bottom end of the bolt for a turning lever, which may be a piece of stiff wire or a nail. To raise or lower the stop, it is only necessary to turn the screw either to the right or left.—L. B. Robbins, Harwich, Mass.

Polishing the Ends of Pins

The appearance of pins with round or spherical ends will be greatly improved if the ends are well polished. It is a difficult matter to get a good polish by holding the emery cloth with the fingers while the work is revolved, because it is impossible to hold the cloth perfectly steady, with the result that fine grains of the abrasive cross and recross the surface, producing a scratchy appearance. To



GRIPPED IN DRILL CHUCK HELD IN TAILSTOCK

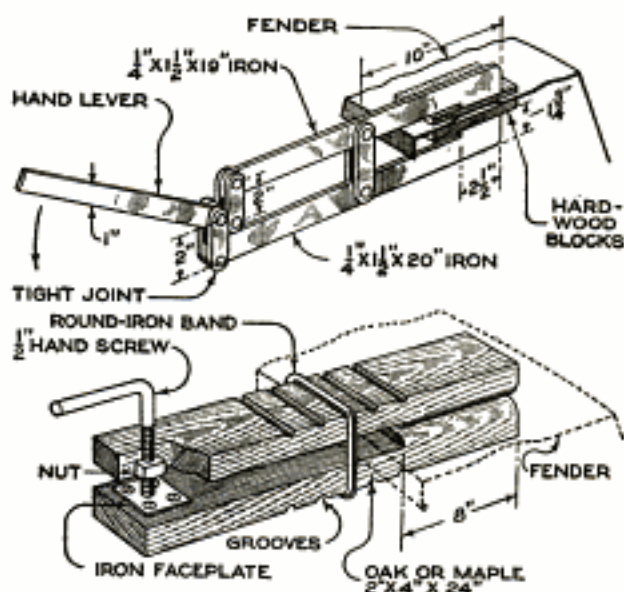
obtain the best results when using emery cloth, it should be held, if at all possible, in some kind of rigid holder of the type illustrated. A holder of this kind is merely a piece of cold-rolled steel which is turned down to a handy diameter to fit into a drill chuck. A hole of the same diameter as the work is drilled in the center, and another hole, of a diameter that will conform to the radius of the end of the pin, is drilled at right angles to and intersecting the first hole, as shown. A strip of emery cloth is inserted into the side hole and moved along as it becomes worn. This method gives a very high polish quickly and easily, and is well worth the trouble when a quantity of work is to be finished.

Presses for Straightening Bent Fenders

The drawing shows two devices that can be used to advantage for the quick and easy removal of dents from fenders, or any other sheet-metal work to which they can be applied.

The upper tool is made entirely of $\frac{1}{4}$ -in. flat iron to the dimensions shown. The tight joint indicated should be very solid and should be riveted, although a nut

and bolt will hold it sufficiently tight. Downward pressure on the hand lever gives a powerful compression at the ends of the jaws. Any width of fender or any curve can be restored to its original shape



Two Convenient and Simple Tools for Pressing Out Bumps and Dents in the Fenders and Bodies of Automobiles and Similar Sheet-Metal Work

by inserting hardwood blocks of the proper size and shape between the jaws and the work.

The lower tool is made from hardwood, with a handscrew at one end which serves to press the outer ends of the members together with sufficient force to flatten out practically any dent. Notches are cut in both members, to permit changing the position of the round iron band holding them together, so that the tool can be adjusted to fenders of different widths. The thrust of the screw is taken by an iron plate, screwed to the lower member.

Size for Porous Walls

A good size for preparing walls for papering or calcimining may be made by dissolving 1 lb. of glue in 1 gal. of boiling water, as in making ordinary size; dissolve also 1 lb. resin soap (yellow laundry soap), cut in thin slices, in 1 gal. of boiling water; then 2 lb. of alum in 2 qt. water. Thoroughly stir together the glue and soap solutions, then add the dissolved alum. This makes about 3 gal., which will require 2 gal. of water to thin to the proper consistency for a porous wall, and still more water for a hard surface. One or more applications should be put on, as hot as possible. This size is more resistant to moisture than ordinary size.—A. MacCullough, Chicago, Ill.

Adjustable Planer Vises

Many jobs that are machined on the planer could be done better, and in less

upon the thickness and length of the work; they can be bolted anywhere on the table so as to hold odd-shaped work at any angle. The length of these vises

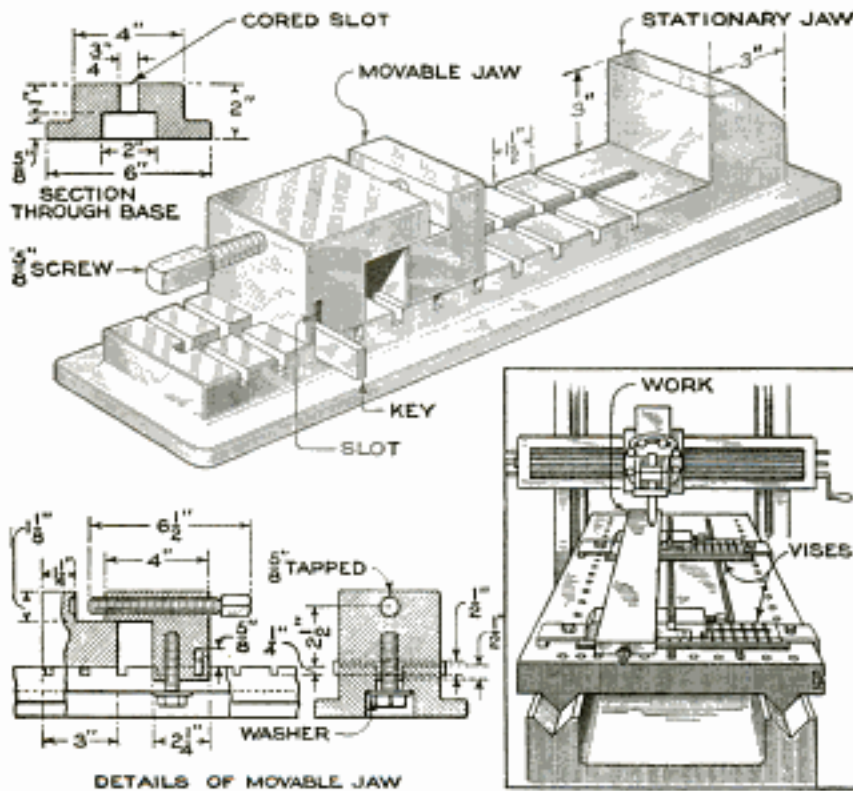
is left entirely to the requirements of the user; some will prefer them made to the width of the table, and others will not want them quite so long.

The body and stationary jaw are cast in one piece from a simple pattern, the resulting casting being machined on the top, bottom, and face of the jaw. On the top face of the jaw slide, a number of key slots, $\frac{1}{4}$ by $\frac{1}{4}$ in., are cut, $1\frac{1}{2}$ in. apart.

The sliding, or movable, jaw is built up in two parts, the front member being the real jaw, while the rear piece serves as a buttress, and as a nut for the clamping screws. The rear block is shaped so as to overhang and slide on the tongue of the front member, and serves to hold the latter down to the slide. The

countersunk screw seat is the only means used to hold this loose jaw centrally, which is free to float, to adjust itself to the face of the work. The rear part of the sliding jaw has a tongue that fits into the slot in the base, to which it is loosely clamped by a screw or bolt, as shown.

The key, which fits loosely, is used to form an absolute buttress and prevents the jaw from sliding backward while the clamping screw is tightened.—J. V. Romig, Allentown, Pa.



Adjustable Vises for the Planer. That Make It Possible to Set Up and Remove the Work Quickly with a Considerable Saving in Time, Particularly on Repetition Work

time, if the work were held in vises instead of being bolted to the planer table. The work is generally bolted to the table because suitable vises are lacking, the only ones available being generally of too limited capacity for wide work.

The drawing shows a type of planer vise that permits rapid set-up, which is an advantage when several pieces of the same kind are to be worked. For a planer having an 8-ft. stroke, three or more of these vises should be used, depending

Testing New Refrigerating System

When testing a new installation of coils in a refrigerating system, a small, portable, air-cooled, motor-driven air compressor is used to provide the necessary test pressure, which, depending upon the contract specifications, runs up to 200 lb. and over. A suitable connection is made between the coils and pump for the insertion of a high-pressure gauge, and also an ammonia-charging valve. Pressure is pumped into the coils, using fresh air, for the first test. If there are any serious leaks, they will be detected immediately

by the hissing of escaping air. Should there be no such leaks, watch the pressure gauge and see whether the pressure falls very much, remembering, however, that a slight fall in pressure will accompany the cooling of the highly compressed air. After this slight drop, which should take place within a half hour, the pressure should remain constant. If this test is satisfactory and the pressure stands up well, discharge the air, and connect a drum of ammonia to the ammonia valve between the air pump and the coils, and allow a small amount of the ammonia to escape into the closed-up system, enough

to raise the pressure to about 10 lb. This amount of ammonia will be sufficient to make the detection of any leaks, no matter how small, possible. Now, pump the system to 200-lb. pressure again and go over all the joints, smelling for the sharp ammonia odor, which will escape through any porous or leaky spots.

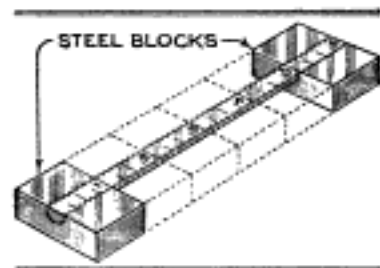
Leaks come from badly cut pipe threads, poorly cemented joints, bad seams in the piping, porous and honeycombed spots in the fittings, and from cracked fittings.

If the second test is successful, discharge the ammonia-laden air into the open, and pump a vacuum in the coils, before filling the system with the full ammonia charge.

Small leaks are sometimes closed by peening the metal with small punches and ball-peen hammers. Another way consists in pumping a strong vacuum and smearing the leaky spots with a thin mixture of glycerin and litharge, which has a tendency to be sucked into the holes and porous parts, closing them when the litharge sets. Soldering may also be resorted to, but never with the system under pressure.

A Novel Scale for Machinists

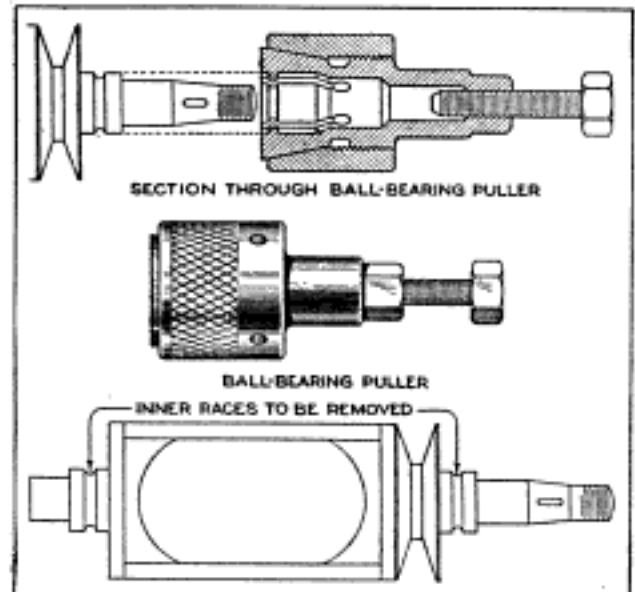
A new die, having 16 threads per inch, was being tested out on some $\frac{1}{4}$ -in. drill rod, the result being an exceptionally fine-cut thread. A few of these threaded rods were made into 6-in. scales by one of the



machinists in the shop in the following manner: Two steel blocks were drilled and tapped for a $\frac{1}{4}$ -16 screw and then cut down at the ends, as shown in the drawing, to about half the diameter of the rod. The threaded rod, resting on the steel half-blocks, was placed on the magnetic chuck of a surface grinder, and faced down flat. After grinding, the rod was removed from the grinder, graduated with a very sharp chisel, and marked with small figures. The half-blocks were moved along, as indicated by the dotted lines, to serve as anvils for the rod during the graduating. The threads, being 16 to the inch, take the place of $\frac{1}{16}$ -in. graduations, and the chisel marks are $\frac{1}{4}$ -in. apart.—M. E. Duggan, Kenosha, Wis.

Ball-Bearing Puller

A puller for inner races of ball bearings, that is different from the usual device, is built on about the same principle



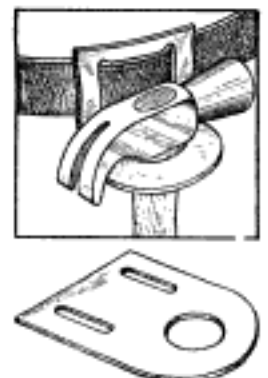
A Ball-Bearing Puller That Embodies the Principle of a Lathe Collet, Holding the Inner Race While the Screw is Turned, to Force the Shaft Out

as a lathe collet. As the puller can be made for use on bearings of different sizes, no dimensions are given in the drawing, which clearly shows the constructional details.

The inner part is machined, as shown, with split jaws. The largest diameter of this part is tapered so that the similarly tapered and threaded sleeve can be screwed down to tighten the jaws of the puller on the bearing race. A long screw at one end of the puller bears against the end of the shaft; when this is tightened the race is pulled off.—J. Magis-Frankart, Ouffet, Belgium.

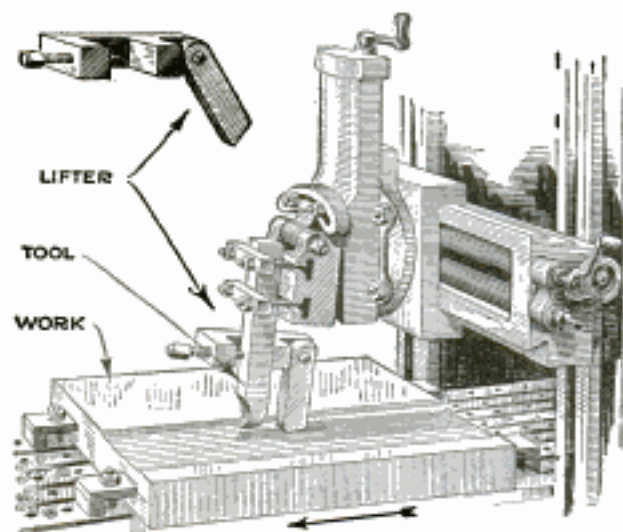
Belt-Loop Hammer Holder

Carpenters, and others who must always have their hammers within easy reach, or those who work with two styles of hammers, will find the hanger shown in the drawing to be of great utility. All that is required to make such a holder is a piece of leather, about 3 by 4 in., which is pierced with a hole for the hammer handle and slitted to fit over the belt.—A. C. Cole, Chicago, Ill.



Planer-Tool Lifter

When a machinist is working at piece rates on duplicate production work, every little trick to preserve the cutting edge



A Lifter for Planer Tools That Prevents the Tool from Rubbing on the Work on the Backstroke, Thus Preserving the Cutting Edge of the Tool

of his tools helps to put money in his pocket. As everyone knows who is familiar with planer tools, the rubbing of the cutting edge on the return stroke soon makes resharpening necessary, and many operators lift their tools on the backstroke by hand, just to eliminate this dulling action.

While there are many devices for the automatic elevation of the tool above the surface of the work, the one shown in the drawing is among the simplest and most effective, as it is easily made and quickly clamped to any cutting tool. The body is made from a piece of flat steel; it is fitted with a latch, which has a form somewhat similar to that of the cutting tool and is held to the body by a bolt or rivet. By rounding off the top corner, this latch will drag behind the tool on the forward or cutting stroke, but will fall in a vertical position on the return stroke. When the lifter has been adjusted to the proper height, it will cause the tool to rise on the return stroke, as shown.

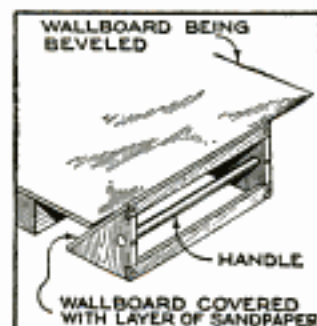
Making Good Brazed Joints

A method which adds strength to a brazed joint, in either tubular or plate work, consists in drilling one of the parts with a series of holes, at the point where the braze is to be made. Ordinarily the practice is to apply the spelter and flux to the pieces and then heat until the spelter flows and runs into the joint. Lack of heat, or dirt in the joint, will cause an

imperfect union, that cannot be detected from the outside. Drilling the holes, as suggested, and applying the spelter to this portion of the joint, causes the melted brass to enter between the surfaces where it is desired. The size of the holes depends, of course, upon the size of the job, but ordinarily holes not larger than $\frac{1}{4}$ in. should be used; these can be filled with spelter and finished to present a smooth job. This method has been satisfactorily used in brazing automobile-axle housings.

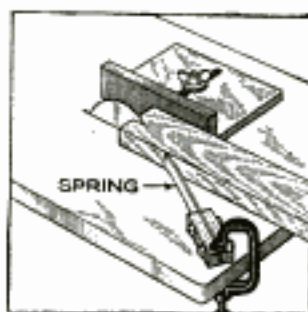
Beveling Edges of Wallboard

In working with wallboard, it is sometimes desirable to bevel the edges to form a neat joint; this can be done without sawing, which generally leaves ragged edges, by means of a simple device that uses sandpaper for forming the bevel. A piece of wood, about 6 in. square, is cut diagonally to make two 45° triangles, and these are fastened together by two braces, as shown, a handle also being provided. A piece of wallboard is nailed to the hypotenuses of the triangles, and the sandpaper is fastened to this with thumbtacks. In use, the sanding device is moved back and forth across the edge of the panel, and, by raising or lowering the panel, the whole surface of the sandpaper can be used.—Karl L. Martin, Cleveland, Ohio.



Spring Circular-Saw Guide

When the circular saw is used to split narrow stock, the simple spring holder shown in the drawing will enable the operator to do his work faster and without danger of having a finger cut off. Such a holder is made by bolting a piece of $\frac{1}{8}$ by $\frac{5}{8}$ -in. spring steel between blocks of hardwood. The length of the spring will vary with different saw tables, but 12 in. is about the average.



A piece of stock is set against the saw guide, and the spring holder is clamped in

place on the saw table with a C-clamp, in such a manner that the spring presses firmly against the stock. Make certain that the extreme point of the spring cannot come into contact with the saw itself. A similar spring can be used to press downward on the stock, in which case the holder would be clamped to the saw guide, and the steel spring would be adjusted to press on the wood between guide and saw. With two such guides in position, the stock can be sent through the saw from one end to the other without carrying the hands beyond a safe distance from the saw. Once started, the man "taking away" can pull the stock toward him and at the same time be certain that the wood is bearing hard against the saw guide.—E. L. Bragdon, New York City.

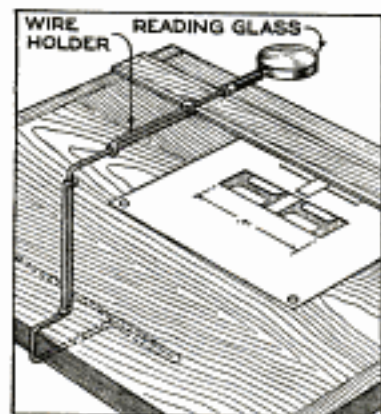
Rustproofing Iron

A new method of rustproofing, which has been applied especially to small automobile parts, consists in boiling the articles in a solution of hydrophosphate of iron. An attractive dark-gray finish is produced, and this is practically proof against all attacks of rust. The process is more rapid than others, and there is no effect upon the strength or temper of the metal.

The Engineer
Sept. 9, 1921

Artist's Magnifying-Glass Holder

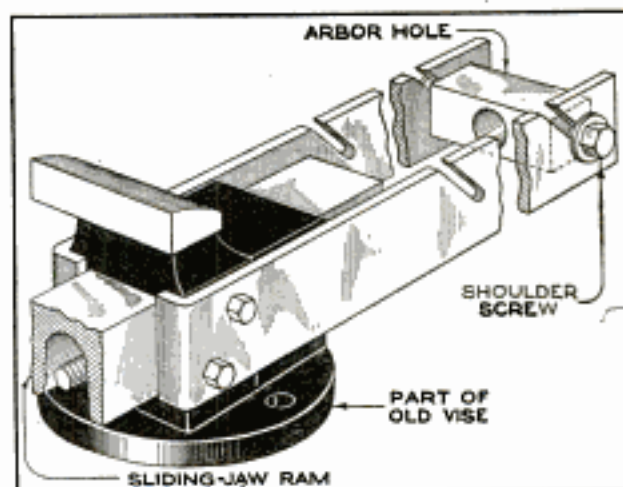
An artist's ability to do fine work on a drawing, such as producing a fine stipple with pen or pencil, can be greatly increased by using a 3-in. reading glass.



Besides, the eyes are relieved of a great deal of strain, and the pen can be more accurately guided. The drawing shows a wire support for the magnifying glass, which is slipped underneath the edge of the drawing board and can be instantly removed. The support can be made to any suitable measurements from stiff wire, and is adjustable horizontally and vertically. The magnifying glass has a hole drilled in its handle to make a tight fit over the wire, as shown in the drawing.

Discarded Vise Makes Arbor Press

Scrapped on account of a broken jaw, an old vise was made to serve in the capacity of an arbor press, the device



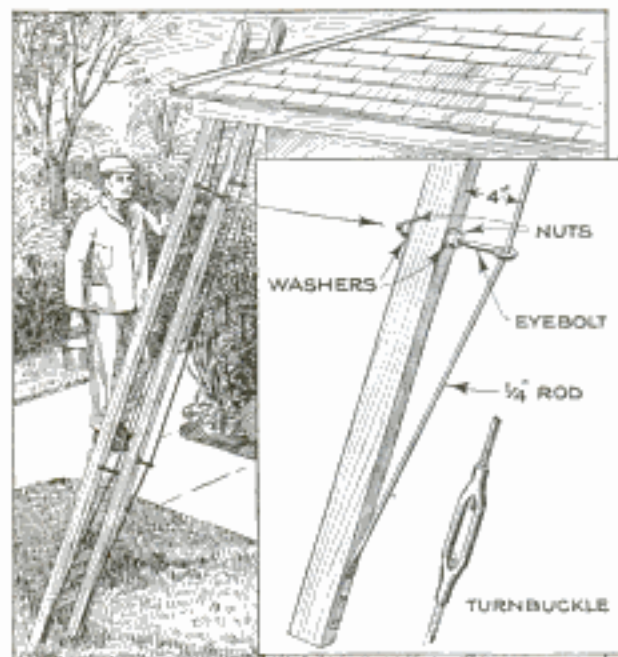
Discarded Because of a Broken Jaw, This Vise was Made into a Substantial and Quick-Acting Arbor Press for Work within Its Capacity

proving very quick and solid. Two pieces of $\frac{3}{4}$ by $2\frac{1}{2}$ -in. flat steel are used for the sidepieces, which are fastened to the fixed part of the vise by screws. One end of each piece is bent at right angles and fits around the vise, to give extra strength and rigidity. Next, a piece is made that serves as the arbor plate of the fixture; this is a 3 by 3-in. piece of machine steel, the length of which is such as to fit easily between the sidepieces. It is bored in the center for the arbors to slip through, and each end is drilled and tapped for $\frac{3}{4}$ -in. bolts. To make the press quick-acting, holes are drilled in the sidepieces at intervals of about 2 in., and slots are cut at an angle, as shown. From the drawing it will be seen that the part bored to take the arbors is free to revolve, and that, consequently, the arbor can be inserted in the hole while in an upright position, thus lessening the distance necessary between this part and the end of the vise ram. This feature, in conjunction with the freedom with which the piece can be dropped into any convenient slot that the length of the arbor may call for, makes this press quite rapid. For small arbors, a bushing is made to fit the hole. When the whole fixture is assembled, it should be bolted securely to a bench, preferably one mounted on wheels, so that it can be moved around the shop.

☛ Nails and screws dipped in grease, wax, or soap will drive more easily, particularly in hardwood.

Truss Stiffens a Long Ladder

The use of long ladders, such as fire ladders, is only made possible because of a system of trussing, which can be



Trusses on the Underside of a Long Ladder Prevent It from Swaying and Swinging and Give a Sense of Safety to the Worker

adopted, in a modified form, for stiffening other long ladders and preventing them from swaying. Four eyebolts are made, large enough to permit a $\frac{1}{4}$ -in. rod to be inserted through the eye, which should be about 4 in. away from the underside of the ladder. Four pieces of $\frac{1}{4}$ -in. mild steel are used for the trusses, and each of these is about half the length of the ladder itself; one end of each is flattened and drilled for heavy screws, the other ends of two lengths are threaded with left-hand threads, the other two being threaded right-hand. Turnbuckles are fitted to each truss after the ends have been passed through the eyebolts. With each side of a long ladder braced as shown, practically all spring will be eliminated, and it will be sufficiently strong to be used in many places where otherwise it could not be considered.—Lowell R. Butcher, Ames, Ia.

A Cheap Board for Large Drawings

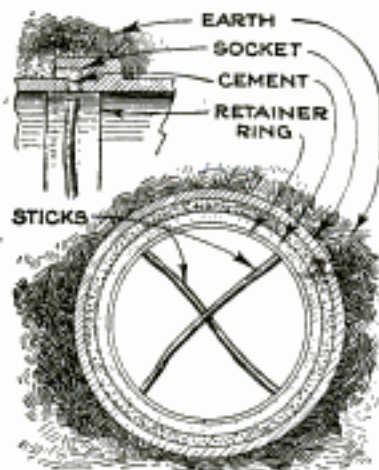
The high price of a large drawing board and the still higher price demanded for a large-size drawing table are items that must be seriously considered when the board is required only for some special piece of work. An idea that represents an economical and practical solution makes use of a variety of wallboard that can be

obtained in panels of almost any dimensions up to 4 by 12 ft. The type of wallboard best suited for the purpose is that which is built up of wooden strips, cemented together to make a continuous board, with a smooth surface of tough brown paper. The cost of this material is but a few cents per square foot. Wallboard of this kind is made $\frac{1}{4}$ in. thick, and the large panels are therefore flexible and should be well supported when used horizontally; when used vertically, this is unnecessary. A standard $\frac{1}{4}$ -in. metal channel, fitted to the edges of the board, makes a fine sliding edge for the T-square.—C. Nye, New York City.

Making Smooth Joints in Large Tile

Where firmly cemented joints are required in lines of large sewer tile, several difficulties are encountered unless an unnecessarily large quantity of cement mixture is used. If a dry, coarse mixture is used, it will

be hard to make an absolutely tight joint, and if a thin, rich mixture is used it will flow through the joints. The latter is, of course, the better mixture, as it will flow and fill in below the tile without



tamping or the use of a great amount of the cement mixture, and will make a good joint if some means of confining it is used. This is easily done. Having placed a new section of tile in position and centered it by means of small bits of stone or like objects, placed between the socket of one pipe and the end of the other, take a narrow strip of some thin springy material—wallboard is excellent—and shape it to the inner curve of the joint to be cemented. The ends of the strip should butt closely together; if this retainer ring is correctly made, it will hold itself in place, but light sticks, a trifle longer than the diameter of the pipe can be sprung into place to help retain it. With the aid of this device, a very thin cement mixture can be poured about the joint, into which it will flow, filling it completely and showing a smooth inner bore when set.—Louis Schneider, Clinton, Mo.



Amateur Mechanics

Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

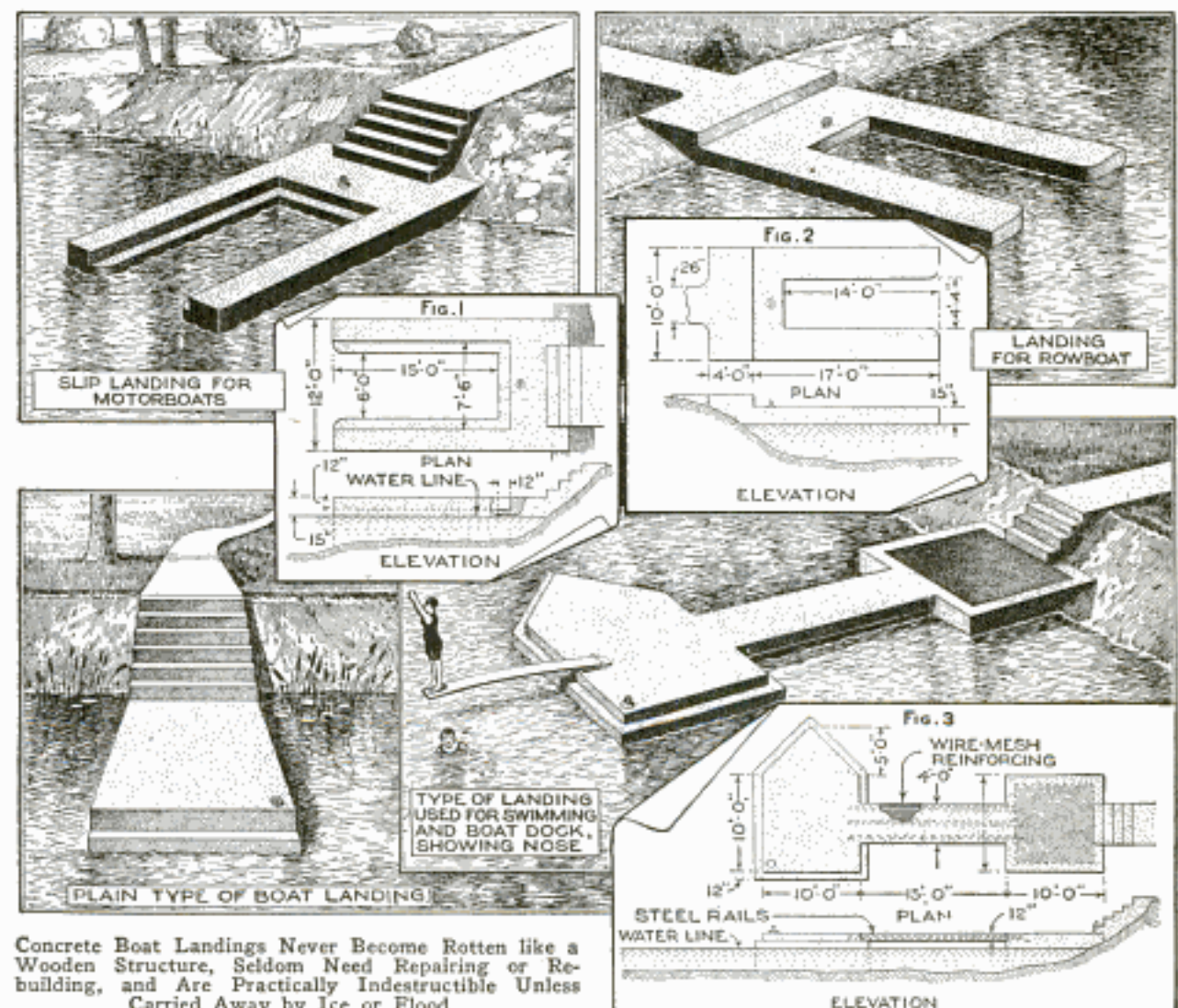
Concrete Boat Landings and Docks

By A. C. COLE

A BOAT landing at the summer home, or resort, is something that is frequently lacking, and in most cases where one exists, it is, as likely as not, a rickety structure supported on a few half-rotted posts. Such a landing is not only unsafe but unsightly, requires frequent repairs,

will be required to build the necessary wooden forms, but once constructed, the job is practically everlasting, and repairs are seldom if ever necessary.

The drawing shows four types of landings and docks; dimensions are given for three, and all are suitable for the accom-



Concrete Boat Landings Never Become Rotten like a Wooden Structure, Seldom Need Repairing or Rebuilding, and Are Practically Indestructible Unless Carried Away by Ice or Flood

and, from time to time, rebuilding. The disadvantages of wooden structures cannot, however, apply to a boat landing made of concrete. A little more work

moderation of the average small boat. Neither the style nor dimensions given need be adhered to, of course, but can be altered in any way desired.

In the construction of a boat landing, as well as in the building of any other monolithic structure, a form is required to contain the concrete mixture until it sets. A form for the construction of work of this character is made by driving boards or sheet piling into the bed of the stream, to form a hollow, into which the concrete mixture is poured and tamped. In making the form, care should be taken to have it well braced, so that the weight of the concrete will not force it apart. Also, the boards forming the sides of the form should be close enough together to prevent a free flow of water through the form, as this would have a tendency to wash away the cement binder, leaving an imperfectly bonded mass consisting largely of broken stone. It does not make any particular difference whether or not there is water inside the form; if it can be pumped dry, all the better, but this is not necessary. The concrete will harden under water, although at a slower rate than when exposed to the air.

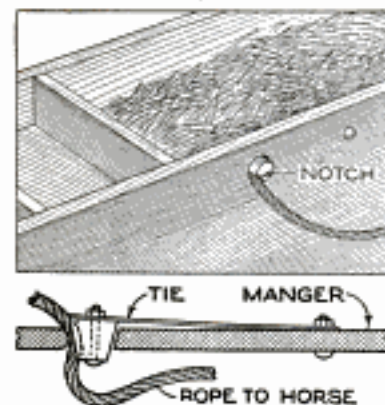
The mixture for work of this kind should consist of at least 1 part cement, $2\frac{1}{2}$ parts sand, and 5 parts of crushed stone or screened gravel. A little more cement than the above quantity will not hurt, however. All the ingredients should

be thoroughly mixed before adding water, and when the water is added, the mass must be mixed again until every stone and grain of sand has its coating of cement. In this manner the strongest possible mass will be obtained once the cement has set or hardened.

The estimated materials required for landings of the style and dimensions shown are: for Fig. 1, cement 38 bbl., sand $14\frac{3}{4}$ cu. yd., and stone 29 cu. yd.; and for Fig. 2, $33\frac{1}{2}$ bbl. cement, 12.8 cu. yd. sand, and $25\frac{1}{2}$ cu. yd. of broken stone. The plain type of landing shown in the lower left-hand corner is built to meet individual requirements, and no dimensions or estimate of materials are given. The rather elaborate style of Fig. 3 is built in two parts, which are connected by means of a reinforced runway above the water line. The nose of the outer pier is pointed upstream to break up floating blocks of ice, and the inner pier is cast hollow, being afterward filled in with well-packed earth. The materials required for this landing, built to the dimensions given, are cement $46\frac{1}{2}$ bbl., sand 18 cu. yd., crushed stone 35 cu. yd., woven-wire mesh, 3 sq. yd., and old steel rails, 60 ft. Eye-bolts and rings, for tying the boats to, are imbedded in the concrete as shown.

Automatic Stock Tie

Although the knotted rope is the oldest tie for stock at the manger, it is not always the most convenient, for, with mittened hands, it is difficult to tie the clumsy rope into a knot that will hold. Again, as the rope becomes worn at the knot, it breaks at that point before the



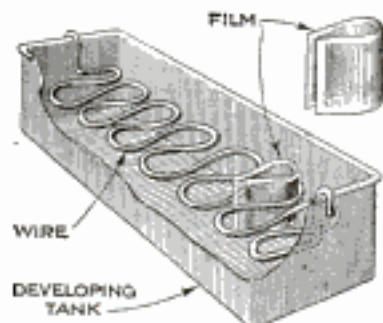
remainder of the rope shows appreciable wear. To save the rope and make the tying and untying practically automatic, the device shown in the drawing can be made and attached to the manger. A hole is drilled in the front of the manger and a plug is made, so tapered that its larger diameter will just fit into the hole. A notch is cut in one side of the plug to hold the rope, and a strip of ash, or some other springy wood, is used

to attach the plug to the manger by means of a bolt, as indicated. To make the rope fast, it is simply passed through the hole by pushing in on the outer end of the plug. The animal is released by pushing the plug the same way and pulling out the rope.—Geo. G. McVicker, North Bend, Neb.

Developing Holder for Cut Films

The drawing shows a film-holding device used when developing the individual

films of a film pack. The holder is made from a single strip of brass, aluminum, or galvanized wire, formed into a number of loops into which the



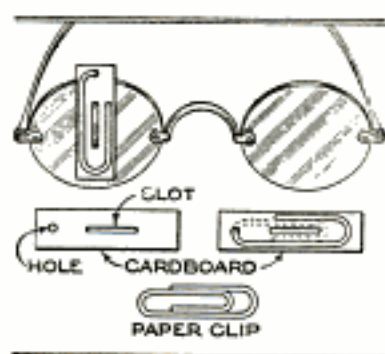
films are inserted in the manner indicated. The ends of the holder are bent upward, and a hook is formed in the extremity for suspending it from the edges of the tank containing the developing solution.

Removing Tight Screw Caps

When the screw cap of a fruit jar, or similar container, refuses to move, the following plan is frequently successful in getting it started: Get a strip of sandpaper, twice as wide as the screw top and long enough to reach entirely around it. The sandpaper is folded lengthwise of its center, with the abrasive side out, placed around the outside of the cap, and tied in place with a stout string. Pass the cord around several times, drawing it as tightly as possible, and end it in a loop. Into this loop a stick, or similar lever is inserted, the end of which, pressed against the top, provides sufficient leverage to loosen it.

Attachment for Glasses Aids Marksman

The elderly marksman, on account of changing eyesight, often finds himself handicapped by the limitations of focus.



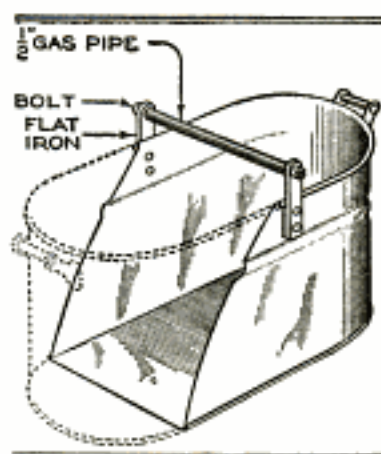
If he uses glasses to overcome a tendency to farsightedness, the target and front sight are clear, but the rear sight is more or less indistinct, and if "nearsighted" glasses are used, the target and front sight are blurred while the rear sight is clear and sharp. The little device shown in the drawing, which one sharpshooter has found eliminates these troubles, is made from a narrow piece of cardboard having a narrow slot cut in the center; it is held to the lens of the "sighting" eye by a wire paper clip.—J. G. Brown, Evanston, Illinois.

A Water Popgun

The only thing needed to make a safe and sane popgun is a cork large enough to fit tightly into the end of a length of garden hose after the nozzle has been removed. The hose is connected to the faucet and, aiming the cork as desired, the water is turned on; this compresses any air that may be inside the hose and causes the cork to be expelled violently, with a considerable "pop."—Everett Gordnier, Denver, Colo.

Grain Scoop Made from Washboiler

There are many times during the year when a scoop such as that illustrated will be found very useful around the farm. For filling grain sacks it is faster than the scoop shovel, there is less danger of spilling, and it is also used with good effect in handling grain in other ways. The dotted lines show the part of the boiler which is to be cut away; the cutting should be done carefully, and, if desired, the edges may be beaded over a piece of stiff wire, which will make the scoop stronger and eliminate sharp edges. Two pieces of flat iron are riveted to opposite sides of the boiler, just back of the cut, and a piece of pipe is fitted between them to form a handle, a long bolt being used to hold it in place. When partly filled, the scoop can be carried by the pipe handle like a pail.

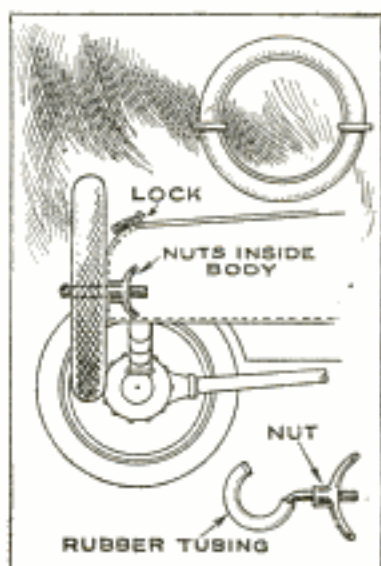


is to be cut away; the cutting should be done carefully, and, if desired, the edges may be beaded over a piece of stiff wire, which will make the scoop stronger and eliminate sharp edges. Two pieces of flat iron are riveted to opposite sides of the boiler, just back of the cut, and a piece of pipe is fitted between them to form a handle, a long bolt being used to hold it in place. When partly filled, the scoop can be carried by the pipe handle like a pail.

Brackets for Spare Tire

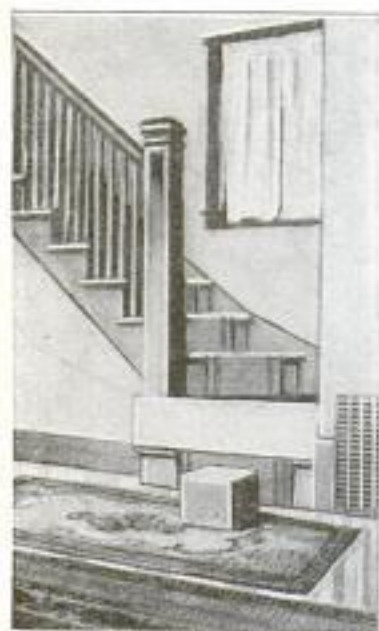
The form of tire bracket shown in the drawing is made from short lengths of iron or steel rods, bent into shape, and threaded at one end to take a suitable wingnut.

The clamps are covered with rubber tubing to prevent chafing. When attached to the back of the deck of a roadster, and the cover locked down, the tire is practically secure against theft. To remove the tire it is only necessary to loosen the nuts and turn the clamps to one side.



Making the Stairs Safe for Baby

To keep the baby from climbing the stairs until he can do it safely and without the usual danger of falling back, to



the consternation of the household and possible injury to himself, the false step shown in the photograph provides an effective barrier to the infant's progress.

The step is built to conform as closely as possible in appearance to the rest of the woodwork, and when placed on the

lowest step, leaves no foothold for the baby. When in position, the barrier is held in place by screen-door hooks, and when the child is large enough to climb over the obstruction, he can be safely trusted to go the rest of the way upstairs. The small box in the foreground of the picture is for the other members of the family, and is so small that the baby cannot get on top of it.—Uri V. Averitt, Gary, Ind.

Using Cheap Flashlight Batteries

Among the small types of pocket flashlights, the most popular is the 1½ by 3-in. two-cell flat case, in which both cells are side by side. Both cases and batteries of this size are sold in large numbers through novelty and five and ten-cent stores. By knowing how to fit the cheap batteries into the case properly, they may be used with results comparable with those obtained with the higher-priced ones. The cheap batteries are sold at a low price largely because they are not so accurately made. It will usually be found that, when inserted in the case, the cheap battery will rattle loosely, and this frequently results in short-circuiting the contact springs of the battery, either directly to the case, or through the lamp. When this happens, the battery rapidly discharges, and the owner may never know why his battery suddenly goes dead.

After some experiences of this char-

acter, the idea of wrapping the new battery with strips of gummed tape to make a fairly tight fit in the case occurred to me. Since that time my cheap batteries have had a long life. It is, of course, also necessary to bend the battery springs so as to get the right tension and contact with the switch, but this bending does not insure satisfaction unless the battery is "padded out" to fit the case properly. Where this fitting is properly done and the usual attention given to tensioning the springs, most of the ten-cent batteries will give satisfactory service.—Curtis Ralston, Chicago, Ill.

Preventing Theft of New Tires

The general custom of carrying new automobile tires in the tire rack of the car as "spares," instead of mounting them upon the wheels and getting mileage out of them, is responsible for many tire thefts. Even when they are protected by a chain and lock, an enterprising thief can find ways and means to open the lock or cut the chain; the best way to foil him is to put the new tires on the wheels and carry the old ones as "spares." A new tire is much more easily disposed of by the thief than an old one, and as the thief reasons that the old one is probably of little value, he passes on to find a car attractively baited with new tires.

Chemical Crusher Made from Spoon

Photographers who mix their own chemicals frequently find it necessary to crush some of the crystals in order to



make them dissolve rapidly, and the same is true of amateur chemical experimenters. The photograph shows how an ordinary ice-cream-soda spoon, one of the long-handled variety, can be made into a very effective

crusher, which, unlike glass crushers, is unbreakable. It is only necessary to bend the spoon bowl at right angles to the handle so that the bottom of the bowl is downward.

Bottle Caps Make Good "Metal Lath"

The proprietor of an amusement resort makes it a point to gather all the soda-water bottle caps which are left scattered around by picnickers. There are several reasons for this, the main one being that the caps, concealed in the grass, dull the edge of the scythes. The second reason for gathering the caps is that they may be nailed to the sides of small buildings, serrated edge out, with a shingle nail through the center, and form a good foundation for a coat of cement stucco. From 12 to 24 of the caps are needed to cover a square foot of surface.—John Mignone, Spring Valley, Ill.

Agitating Negatives during Development

Tray development of photographic negatives has one advantage over the method of developing the plates in a tank, as the



tray can be rocked and the developing solution agitated. However, time is often limited, and it is desirable to develop the negatives in a tank. The photograph shows a method of developing the plates in a hard-rubber or vulcanite tank in which the developing solution is agitated by a massage vibrator, which is clamped to the side of the tank with an ordinary C-clamp. Care should be used that the clamp is not screwed up so tightly as to break the tank.—Thomas Allen, Flushing, N. Y.

"Art" Glass as Showcards

Squares of so-called "art" glass, opal, ruby, or other color, can be used as showcards in stores and display windows. They are lettered in the usual manner with water colors or showcard colors; then, when a new card is needed, the paint can be washed off and the new lettering applied. Green or brown art glass, which is also called "cathedral" glass, "pot metal," and other names, held in a harmonizing frame, makes a very attractive sign which will save the continual expense of Bristol-board cards.

Heater Made from Auto Headlamp

The photograph shows an electric heater that was made from a discarded automobile headlamp. The heating element from a standard heater was bought from an electrical-supply store, inserted in the position occupied by the bulb, and the electric wires led out through a porcelain tube placed in the hole previously occupied by the lamp receptacle. A



circular piece of copper screen in place of the headlamp lens prevents anything from coming into contact with the red-hot heating coil. The base of the heater is made from an old automobile-hub flange to which flat-iron supports are fastened, the latter being attached to the heater so that it can be tilted at practically any angle.—A. F. Willey, Jr., Grand Rapids, Mich.

Forcing Obstruction from Drain Pipes

Bathtub and similar drain pipes will become clogged at times, and it is frequently found that the ordinary suction cup will not dislodge the obstruction. The photograph shows a device which has been successfully used for opening up drain pipes with water pressure, and that, unless the stoppage is caused by a hairpin or similar article, usually clears the pipe.

An ordinary rubber bathtub stopper has a hole cut through its center, into which a piece of $\frac{1}{2}$ -in. pipe is inserted and held by a nut on each side of the stopper.



A suitable length of garden hose is slipped over the end of the pipe and fastened securely with wire, or with a regular hose clamp. In use, the rubber stopper is placed in the drain pipe, the hose is then attached to a faucet and the water turned on, forcing the obstructing matter through the pipe.—W. S. Standiford, Youngstown, Ohio.

Milk Cart Made from Buggy Shafts

Having a few cans of milk to take from the barn to the highway each day, a Michigan farmer devised a means of wheeling

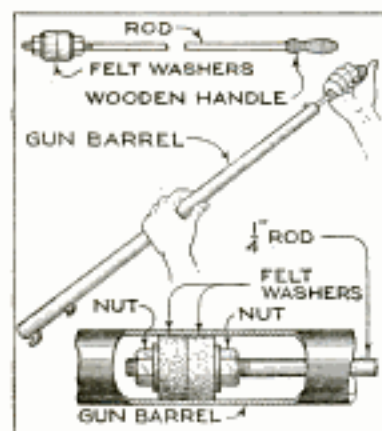


The Front Wheels and Shafts of an Old Buggy Made into a Truck for the Convenient Transportation of Milk from the Dairy to the Roadside

them without spending any money. He simply took the front wheels of an old buggy, turned the shafts upside down and rested the cans on the crossbar, as the picture shows. Three milk cans can be carried at one time, and by placing a loose board or two across the shafts, other articles can be carried as well.

Polishing Bore of Gun Barrel

When a shotgun or rifle has been neglected and allowed to go for some time without cleaning or oiling, the bore becomes rusted, due to the action of atmospheric moisture and chemicals in the powder. Although a good cleaning with kerosene will partly remove the worst of the incrustation, if the original high polish, which is conducive to good shooting, is desired, it may be obtained without much



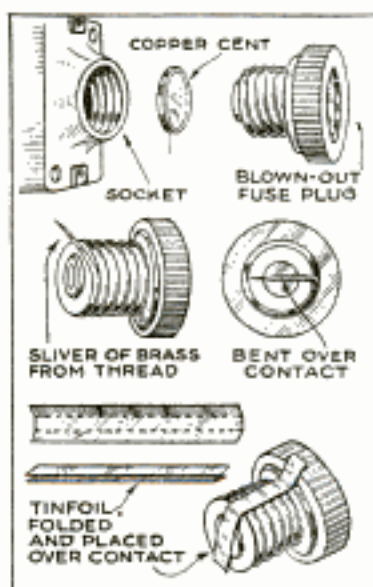
difficulty. Make an emery lap of the type shown in the drawing. A $\frac{1}{4}$ -in. steel rod is threaded at one end and fitted with two nuts, two hard-felt washers, and two smaller metal washers, while a handle is fitted to the opposite end. With the lap assembled as shown, use fine emery flour mixed with vaseline smeared on the felt washers, and clean out the spots with a

reciprocating movement of the rod. "Fine" valve-grinding compound will also answer. If the felt washers are too loose-fitting, expand them slightly by screwing down the nuts until they fit rather snugly into the bore. After polishing off the spots, clean out the barrel and grease well.

When the Light Fuse "Blows" Out

When the fuse plug of the house-lighting circuit "blows" out, there is usually an anxious wait until another is obtained.

Any of the following suggestions will permit the use of an old plug during the interval. While effective, none of the methods are recommended or advised for other than temporary use, as the regular fuse is designed to blow when the circuit becomes overloaded, while the makeshifts are not.



Should the wires become short-circuited the fuse will burn out, and unless the cause is found and removed, the new fuses will burn out as fast as they are put in.

The first method consists in placing an ordinary copper cent in the socket and screwing in the old plug on top of it. The cent will fit the socket of either a fuse or a lamp, and is ever handy to complete a circuit. The second method is to split a thin rim or edge from the threaded brass rim on the fuse, with the blade of a knife, and bend this rim over the center contact, as shown. This is a practice often resorted to by electricians. The third method consists in folding a piece of tinfoil, placing it over the fuse plug across the center contact, and screwing the plug into the socket.

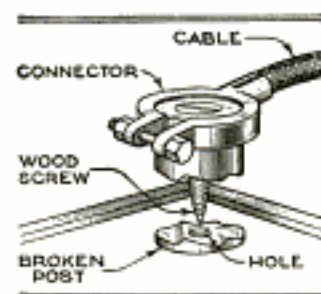
Adjustable Front for Brood Coop

The proper housing of a hen and chicks is always a problem to the back-yard poultryman, who must avoid letting the youngsters out in the early morning before any of the family are astir, in order

that a stray cat or dog may not get them. By using two strips of an old inner tube and the usual vertical slats, the openings in the front of the coop can be regulated to allow the chicks to pass through or restrain them within. An old inner tube is cut lengthwise into strips about 1 in. wide. Two of these rubber strips are spaced to come at the top and bottom of the coop opening, and to them a row of slats or lath is tacked. The projecting ends of the rubber strips are permanently fastened to one side of the coop, and the ends on the opposite side are held by projecting nails. By stretching or releasing the rubber, the width of the openings between the slats can be regulated to confine or liberate the chicks as desired.—G. E. Hendrickson, Argyle, Wis.

Repair for Broken Battery Post

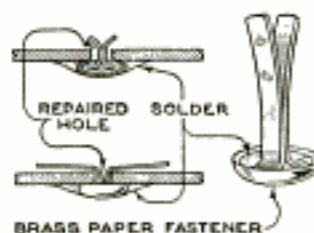
Owing to the vibration, a post was broken from an automobile storage battery; this resulted in starting troubles, burnt-out lights, and other evils, until a temporary repair was effected in the manner shown. The halves of the post were



scraped bright, and a $\frac{1}{10}$ -in. hole was drilled into each; some lead filings were then placed between the rough faces, and a woodscrew was turned down through the sections until they were brought together solidly.

Soldering Holes in Tanks

When a hole in a tank, can, or sheet-iron pipe is to be plugged by soldering, it will frequently be found difficult to make the solder bridge the opening. In an instance like this, an ordinary brass paper fastener may be pressed into service with satisfactory results. The prongs are pushed through the opening, cut to a suitable length, if necessary, and pressed down on each side. The hole is then soldered over, the fastener providing at once a means of bridging the space and strengthening the repair.



A Sailor Wind Vane

A wooden sailor, who waves his arms and indicates the quarter of the wind, is something a little different from the



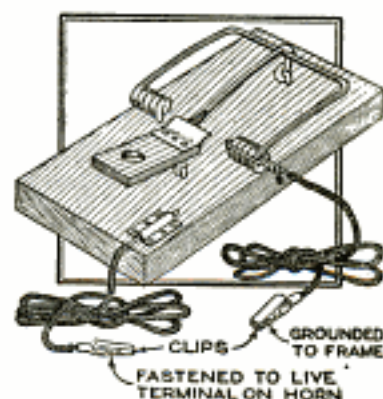
conventional weather vane, or revolving wind wheel. The wooden figure is cut from $\frac{1}{2}$ -in. white pine, or other soft wood, the arms being made separately and attached to the body by means of light iron wire passing through

screweyes on the back of the body. The figure is supported on a pole by an iron rod driven into the latter. After a large-diameter iron washer has been dropped over the vertical iron rod, it is inserted into screweyes on the back and leg of the sailor, so that the figure can revolve freely with each change of the wind.—Duncan M. Halliday, Chesley, Can.

Mousetrap Prevents Theft of Auto

An ordinary spring mousetrap, of the type that can be bought for a few cents, can be converted into an effective burglar alarm for preventing the theft of an automobile.

Two wires, with spring clips attached to their outer ends, are attached to the trap in the manner illustrated, and the trap is set in the usual manner. One of the clips is attached to the live terminal of the horn and the other is grounded to the frame to complete the circuit. The front wheels of the car are turned at an angle and the mousetrap is set in the mud pan so that the steering arm will touch the trigger when the steering wheel is turned. When the trap is sprung the horn circuit is closed, and the horn sounds until the trap is removed.

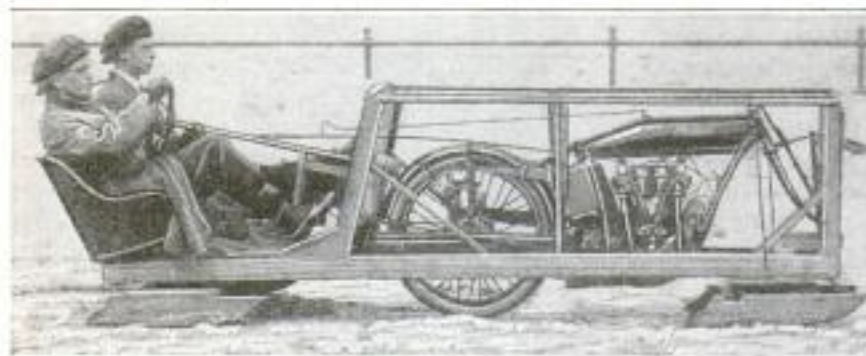


A Motorcycle Bobsled

Most motorcycle owners put their machines away when the snow begins to

sled that uses the motorcycle power plant to drive it along the frozen surface.

The front wheel and handlebars are removed from the machine, which is held upright in a wooden framework built as part of the sled body. The front fork is firmly fastened, and the rear wheel is placed between two guideboards, so arranged as to prevent the walls of the tire from rubbing against the sides. An old tire was used on the single wheel, and additional traction obtained by the use of a tire chain. The sled is steered by means of a steering wheel operating the front set of runners, which swivels on a pin at the center.—S. E. Gibbs, Colfax, Ia.

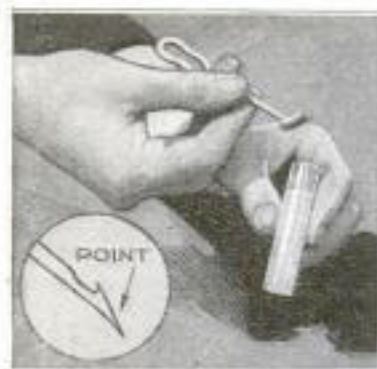


Instead of Storing the Motorcycle during the Cold Winter Months, It is Used, in This Case, to Drive a Bobsled: the Front Wheel and Handlebars are Removed, and the Machine is Held Upright in a Wooden Framework

fly, and forgo their use during the winter months. However, the photograph shows how one enthusiast constructed a bob-

Cork Extractor Made from Buttonhook

An ordinary buttonhook, such as can be obtained from any shoe dealer, is easily converted into an effective imple-



ment for removing thin corks and cardboard caps from bottles and tubes. In making the extractor, the hooked end of the buttonhook may be either cut off or straightened out. A

barbed point is then formed on the end, either by filing or grinding.—John H. Schalek, Pittsburgh, Pa.

Safety in the Use of Electric Lamps for Heating

It is a quite common practice to use electric lamps for heating purposes, but the misuse of them is also very common, and may lead to serious consequences. It should be remembered that if conditions are such that the heat cannot be dissipated, a fire may be started.

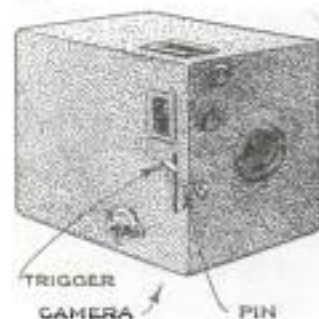
An ordinary 25-watt electric lamp, burning under normal conditions, is entirely too hot to be put, with safety, into a rubber boot to dry it. If such a lamp at the end of an extension cord is placed in a bed to keep a person's feet warm,

and bedding is piled over it, there will be little chance for the heat to escape, and it will almost certainly char the bedding within a few hours—possibly set it on fire.

When lamps are used for these or similar purposes, although such a misapplication is not recommended, the best and safest way is to employ bulbs of twice the voltage of the service current, for instance, a 220-volt lamp on a 110-volt circuit. These "oversize" lamps will generally give sufficient heat without becoming dangerously hot. Another way to accomplish the same result is to use two lamps in series, as by connecting two 110-volt lamps in series on a 110-volt circuit.

Safety Catch for Box Camera

Everyone who has carried a camera of the fixed-focus box type in a crowd, has been afraid that some one might accidentally rub against the trigger and expose the film so that the next picture taken on the same film would be worthless. By drilling a $\frac{1}{16}$ -in. hole in the position indicated by the dotted lines and inserting a wire pin or small nail back of the trigger, the trigger cannot be moved and the lens uncovered until the pin is withdrawn.—Chas. N. Shaw, Jr., Oxford, Ga.



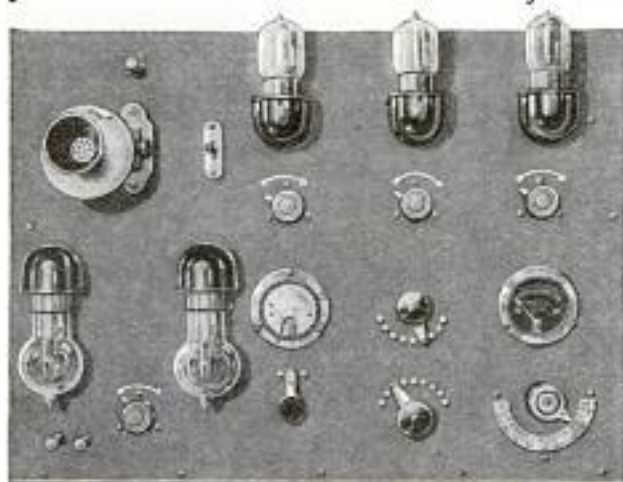


An Efficient Wireless Telephone

By FRANK L. BRITTIN

MANY amateur radio operators throughout the country are building radiophones, and more would doubtless do so, were it not for the fact that, while many articles have been written on the subject, in nearly all definite constructional detail is conspicuous by its absence, and, unless the amateur is thoroughly grounded in radio theory, he meets with little success. The telephone described in this article is simple and practical; the construction cost, which varies, of course, with locality, is about \$125, which is not much more than the cost of many good receiving sets. The range will vary with local conditions; with a good aerial and ground system, music and the voice have been transmitted from 100 to 200 miles, while under specially good conditions, an extreme range of 500 miles has been recorded with this instrument.

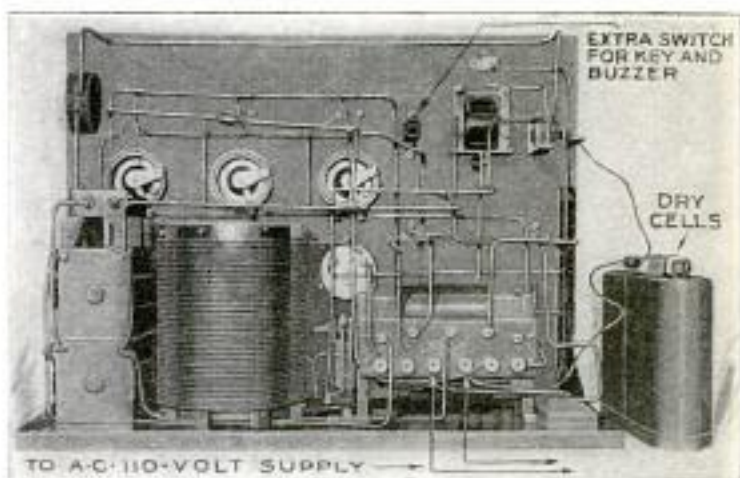
The greatest hindrance to the development of amateur radio-telephones has been that the builder was compelled to use a motor generator, an expensive unit, in order to get the necessary high-potential direct current. This objection



Front View of Instrument Panel: The Tubes at the Top Are the Transmitting Tubes, Those at the Lower Left-Hand Side the Rectifying Tubes

does not apply to the instrument herein described, however, as a new type of transformer is employed, being connected to a 110-volt alternating current source of supply as simply as screwing in a light-

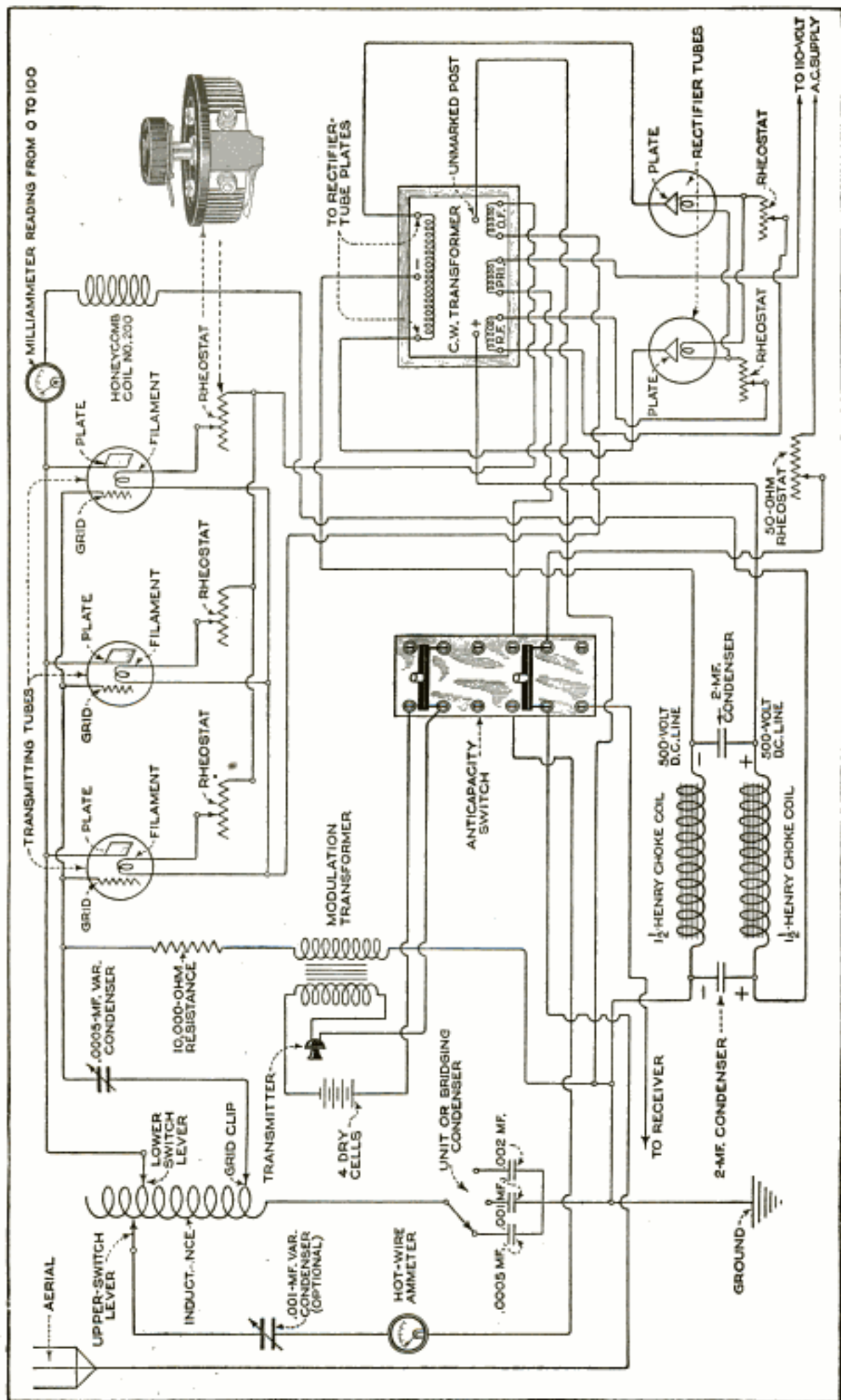
ing bulb or plugging in an electric iron. The rectifier tubes, shown in the upper right-hand corner of the full-page illustration, may be any of the various types on the market, but the transmitting tubes should be UV-202 tubes, the correct filament voltage for which is $7\frac{1}{2}$ volts. The current for the transmitting-tube filaments is taken from the posts on the



Back View of Panel: The Inductance and Choke Coils are Seen at the Left, the 200-Watt Continuous-Wave Transformer at the Right. The Dry Cells Are a Standard Four-Cell Unit

transformer, marked "O.F." (oscillation filaments), and the voltage is regulated by means of the heavy-duty rheostats, shown between the tubes. The rheostats are necessary because this winding of the transformer furnishes a potential of 12 volts instead of $7\frac{1}{2}$. An a-c. voltmeter can be used to advantage in this circuit, and adds to the ease of adjustment, although it is not absolutely necessary.

The rectifier-tube filaments are lighted from the posts marked "R.F." (rectifier filaments), and heavy-duty rheostats, as shown in the winding diagram, are recommended for this circuit also (only one rheostat is shown in photo, as the instrument was originally built with but one). The posts marked "PRI." are for the 110-volt a-c. supply, and in this line, a 50-ohm rheostat, such as a 10-hp.-motor field rheostat, which can often be picked up cheaply, is of great benefit in tuning the entire circuit to best advantage. It is a good idea to have every part of the circuit variable, as far as possible. The post above and between the posts R.F. is



Complete Wiring Diagram for the Telephone: The Various Circuits should be Thoroughly Studied and Understood Before Connections are Made, and the Connections Checked against the Diagram Before Soldering. A Little Care in This Respect will Save Much Trouble Later. The Continuous-Wave Transformer Is of a Standard Make, as Are Most of the Other Instruments, with the Exception of the Unit Condenser and the 50-Ohm Rheostat; the Latter may Be One Taken from a 10-Horsepower Motor

marked +, this is for the positive lead of the d.-c. potential; the post for the negative lead, marked -, is found at the top, in the center of the transformer panel. This d.-c. current, which goes to the transmitting-tube plates, first passes through two $1\frac{1}{2}$ -henry choke coils as shown, which serve to "smooth out" the current; a 2-mf. condenser is bridged across the line on each side of the choke coils. Each choke coil may be made by winding, on a soft-iron core $\frac{5}{8}$ in. in diameter by $3\frac{1}{2}$ in. long, 1 lb. of No. 26 double cotton-covered magnet wire, or they may be purchased at a reasonable price. The 2-mf. condensers must be able to stand the high voltage; condensers specially built for this purpose are now generally available. The plates of the rectifying tubes are connected to the posts marked "P." (plates), and when the unmarked post is connected to the ground circuit, the transformer wiring is complete.

Following the 500-volt d.-c. line through the choke coils, the negative lead is connected to the ground; the positive lead goes to a No. 200 honeycomb coil, which prevents the high-frequency oscillations in the transmitting tubes from backing up into the transformer. From this coil the lead goes to a milliammeter, to the tube plates, then to the lower-switch lever on the inductance. The inductance consists of 40 turns of No. 12 hard-drawn copper wire, wound on a threaded bakelite tube, 6 in. in diameter and 8 in. long; this tube can be obtained threaded, ready to wind.

The connections of the inductance taps to the upper and lower switches are shown clearly in the detail drawing; helix clips, instead of the switches, can be used here to advantage. The upper switch is connected to the aerial circuit, and in this circuit a condenser of .001-mf. capacity is recommended; it should be able to stand a heavy voltage, and, while not absolutely necessary, is of great advantage in tuning. The hot-wire ammeter should read, by fractions, to one ampere, and be as sensitive as possible. The lead from the lower end of the inductance is taken to the lever of the three-point switch controlling the unit or bridging condenser. This may be homemade, and the units are of .0005, .001, and .002-mf. capacity, respectively. The dielectric in each unit is the best grade of India mica, 2-in. by $1\frac{3}{4}$ -in. pieces being used, and copper-foil sheets, $1\frac{3}{4}$ in. by $1\frac{1}{2}$ in., are used between the mica sheets; the tabs on alternate sheets of foil are brought out at top and bottom, on the same side, being soldered together and connected as shown

in the detail drawing, when the units are assembled. Bakelite panels, $\frac{3}{16}$ by $1\frac{3}{4}$ by $3\frac{1}{2}$ in., are used to separate the units, and the assembly is supported by a metal strip, as shown. The .0005-mf. unit has five sheets of foil, the .001-mf. unit seven sheets, and the .002-mf. unit 11 sheets. A bridging condenser, with a fan switch, can be used at this point if the builder does not wish to make his own.

The grids of the transmitting tubes are connected in parallel; the variable condenser in this circuit is of .0005-mf. capacity, and should also be able to stand a high voltage; the lead from this condenser goes to a helix clip on the inductance, to facilitate close tuning. The 10,000-ohm resistance, shown in the grid circuit, which is used to hold the grid negative, is connected to one secondary terminal of the modulation transformer, the other secondary terminal being connected to the ground. The modulation transformer and microphone transmitter are of standard make, and the primary is connected in series with a four-cell battery; this circuit, as well as the others, is operated through the anticapacity switch, which, when thrown up, cuts in the transmitter, and when down, puts the receiver into operation. A key and buzzer can be used in this circuit instead of the transmitter, for c.-w. telegraphy. This completes the circuit.

The instrument panel is of bakelite, $\frac{5}{8}$ by 18 by 24 in., mounted on a $\frac{3}{4}$ by 8 by 24-in. wood base by means of metal shelf brackets, the panel being drilled for the instruments before screwing to the base. A shelf can be placed at the rear of the panel to hold the choke coils and condensers, if desired. The entire "works" can be inclosed in a cabinet, but this makes it harder to get at if any adjustments are necessary. The wire used for the circuit may be No. 18 insulated fixture wire, wire smaller than this should not be used; a tinned-copper wire, now on the market, which can be covered, as the winding proceeds, by the so-called "spaghetti" tubing, is better still, as it makes a neater job and saves time. All connections should be soldered but the circuit should be carefully studied before the connections are made permanent, and carefully checked before turning on the power.

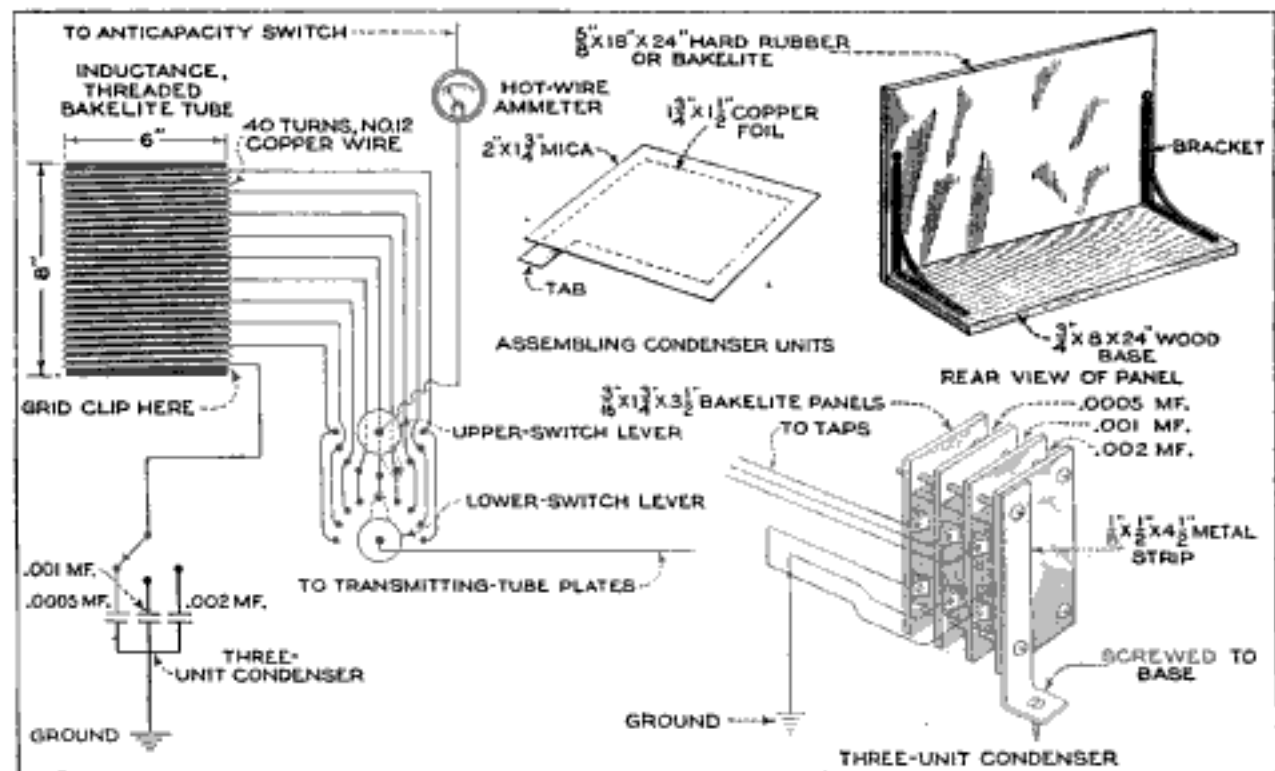
Put all the resistance in the circuit, then turn on the power. First regulate the rectifier-tube rheostats; the current flow from these tubes can be regulated much more easily if a d.-c. voltmeter, reading to 500 volts, is connected to the d.-c. out-

put. By means of this the rheostat scale on the panel can be graduated for the various voltages desired.

Calibrate the rheostat and graduate the

be adjusted to find the oscillation point, no exact directions can be given for this.

The unit-condenser switch is then adjusted, and the circuit tuned to the maxi-



Details of Connections for Upper and Lower Switches of the Inductance; Method of Fastening Panel to Base, and Details of Construction of the Unit Condenser

scales to, say, 250, 300, 400, and 500 volts; then the voltmeter may be discarded. Now adjust the rheostats of the transmitting tubes to the proper positions for regulating the filament voltage ($7\frac{1}{2}$ volts), by means of an a.-c. voltmeter, graduating these scales also. In tuning, after these adjustments are made, it will be found easier to adjust the entire circuit by means of the 50-ohm rheostat in the 110-volt a.-c. line.

Next, place the upper and lower-switch levers of the inductance at about the position indicated by the dotted lines in the detail drawing, and place the grid clip in position. As these points must, of course,

be adjusted to find the oscillation point, no exact directions can be given for this. The reading on the milliammeter should be low.

The circuit is tuned by adjusting the variable grid condenser and the variable condenser in the aerial line, and also by changing the position of the switch lever on the unit condenser; by moving the switch on the 50-ohm rheostat carefully, the change of potential will often start the circuit oscillating. There is no specific method of reaching the point of oscillation, as every instrument requires individual treatment.

MATERIAL LIST

- | | |
|---|--|
| 1 bakelite panel, $\frac{5}{8}$ by 18 by 24 in. | 21 switch points. |
| 4 pieces bakelite, $\frac{3}{16}$ by $1\frac{3}{4}$ by $3\frac{1}{4}$ in. | 1 .001-mf. variable condenser (optional). |
| 23 sheets copper foil, $1\frac{3}{4}$ by $1\frac{1}{2}$ in. | 1 .0005-mf. variable condenser. |
| 26 sheets mica, $1\frac{3}{4}$ by 2 in. | 1 milliammeter, reading 0 to 100. |
| 1 hardwood base, $\frac{3}{4}$ by 8 by 24 in. | 1 hot-wire ammeter, reading by fractions to 1 or 2 amp. |
| 2 shelf brackets. | 1 threaded bakelite tube, 6 in. in diameter, 8 in. long. |
| 3 switch levers. | 2 2-mf. fixed condensers for 1,000 volts d. c. |
| 1 standard 10,000-ohm resistance. | 2 $1\frac{1}{2}$ -henry choke coils. |
| 5 heavy 7-ohm rheostats. | 1 No. 200 honeycomb coil. |
| 1 50-ohm rheostat. | 1 200-watt e.-w. transformer. |
| 5 gooseneck tube sockets. | 1 standard modulation transformer. |
| 3 UV-202 transmitting tubes. | 10 binding posts. |
| 2 standard rectifier tubes. | 4 nickelplated wood screws, $1\frac{1}{2}$ in. long. |
| 1 anticapacity switch. | 8 nickelplated wood screws, 1 in. long. |
| 1 radiotelephone hand or panel transmitter. | |
| 4 dry cells. | |

Emergency Oilstove Wicks

During the war, the owner of an odd make of oilstove was unable to obtain wicks, as the manufacturers had closed their factories. In the emergency, a stove dealer suggested that heavy outing flannel might be used to advantage for making wicks. The strips of flannel were cut to the exact size of the original wicks, and the edges were brought together and sewed by "overhanding," so that there would be no lap at the joint. Although these wicks did not last as long as the regular ones, it was at least possible to keep the stove in use.—Mrs. James Doremus, Passaic, N. J.

Releasing Hook from Fish's Mouth

It is often quite difficult to take the hook from a fish's mouth, because the teeth or scales of the fish make the undertaking disagreeable, if not one of possible injury. In such cases a simple tool like the one shown in the drawing will be of great assistance. Obtain a piece of corset steel, or clock spring, about 8 in. long, and grind the ends round. Soften the ends in a flame, and bend them back so as to form hooks, then reharden the steel by dipping it, still heated, in water. Bend the steel into the shape shown, so that the ends will be about 4 in. apart.



When a hook is caught in the fish's mouth, insert the ends of the tool in the mouth by pressing the ends together, then release them, and the tension of the steel spring will force the jaws apart so that the fisherman can get at the hook with both fingers.—L. B. Robbins, Harwich, Massachusetts.

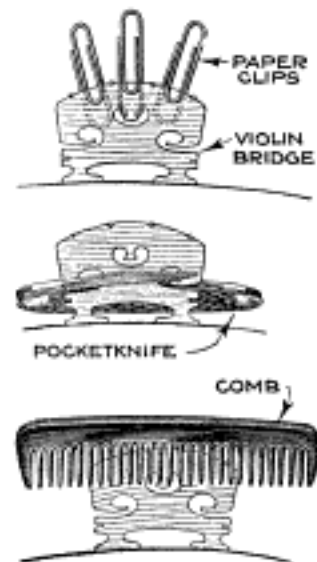
Old Propeller Used as Anchor

Not having a regular anchor at hand, a motorboat owner picked up an old propeller, put a long bolt through the shaft hole, and tied it to the boat by a length of rope. By dropping this overboard, it is easy to anchor the boat, as the propeller blades catch in the bottom of the stream or lake as readily as the flukes of an anchor.—John Y. Beaty, Chicago, Ill.

Muting the Violin

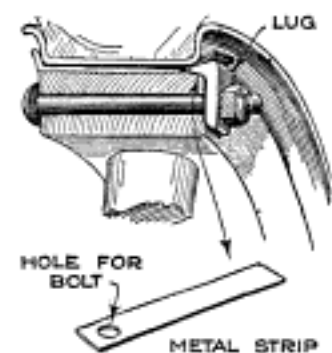
Three original ideas for muting a violin in the absence of a mute of the ordinary type, are shown in the drawing.

Three ordinary wire paper clips, slipped over the upper edge of the bridge between the strings, are quite effective in softening the instrument's tone. They cost next to nothing and can be carried tucked away in the pocket. A pocketknife may be used as shown, one of the blades being opened and the knife then closed around the lower part of the bridge in such a manner that the weight of the knife is supported entirely by the bridge. The third example shows the application of an ordinary comb, which is slipped over the strings, and thus reduces the volume of sound.—Henry O'Connell, New Haven, Conn.



Stopping Noise in Demountable Rims

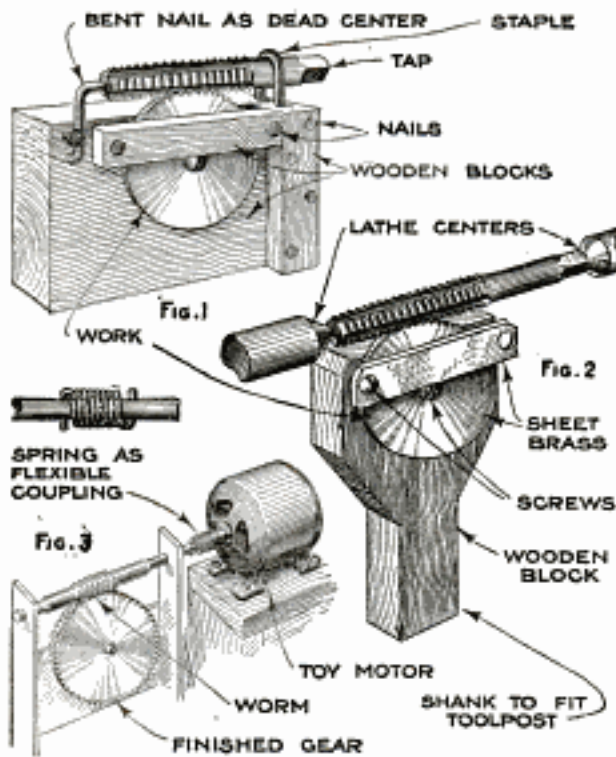
Demountable rims often squeak in an annoying manner, in spite of efforts to tighten them by various means or to remedy the trouble by the application of oil. This noise often arises from the fact that the bolt heads pull into the rim of the wheel so that the lug fails to grip the steel rim tightly. An effective method of ending the trouble



is to take some pieces of rather heavy sheet metal, about the same width as the lug, and bend them as shown in the drawing. A hole large enough to allow the strip to slip over the bolt is drilled or punched at one end. The strips are then placed over the offending lugs, which are screwed down in the usual manner with the metal strip projecting between the lug and rim. This will take up the play and usually eliminate the noise.—G. W. Greene, Madison, Wis.

Worm Gears for Toy Machinery

Every youngster who owns a small battery motor delights in rigging up hoists, mills, and all manner of "machinery" for



Two Fixtures are Shown for Cutting Small Worm Wheels; the First Is for Use by Hand and the Second with a Lathe. The Last Picture Shows How the Worm Drive is Connected

the motor to drive. As these motors necessarily run at high speed, and have only a very small torque, or turning force, it is always necessary to have some sort of speed-reduction gear, usually a system of large and small pulleys carrying strings as belts. A better arrangement is to use worm gearing, and the fine thing about this is the fact that a speed reduction of 100 to 1 is just as easy to obtain or perhaps easier than a 10-to-1 reduction. And as the speed is much reduced, the turning force is greatly increased, so that a very small motor will, when provided with a worm-gear drive, operate mechanism it could not even turn by means of the strings running over small V-pulleys.

In worm gearing the driving member or "worm" is nothing but a screw; a special kind of thread is used on large screws made for the purpose, but this is not at all necessary for small worms to drive toys—any bolt or machine screw that has a good, full thread will do for the driving worm, provided that the proper gear, or worm wheel, to serve as the driven member can be obtained. The worm wheel must have a number of teeth equal to the

desired speed ratio, one with 50 teeth giving a reduction of 50 to 1, when used with an ordinary single-thread screw.

The only special tool needed for cutting worm wheels is an ordinary machinists' tap. It should be of some common size, such as $\frac{1}{4}$ -20, and the worm or screw must, of course, be of the same pitch, in this case, 20 threads to the inch.

Two methods of cutting the worm wheel are illustrated. Fig. 1 shows a fixture that can be made of three wooden blocks nailed together. A screw for holding the gear blank, a wire nail, and a large wire staple are the only other materials needed. Fig. 2 shows how the work is done in a lathe; any lathe having a cross-feed can be used. It may be remarked that although the shank of the wooden block may be held quite rigidly in the toolpost, some kind of bracing block will have to be wedged under the forward end of the block to prevent chattering.

The blank for the worm wheel is merely a disk of sheet brass or soft iron, with a hole in the center. It can be turned out of the sheet, or filed, if no lathe is handy. The diameter need not be determined accurately, unless the speed reduction must be exactly as it is desired. The rule for determining the diameter of the worm wheel is to multiply the pitch (distance between teeth) by the number of teeth wanted, and take $\frac{7}{22}$ of the result. Thus, for a 100-tooth wheel to fit a $\frac{1}{4}$ -20 worm, the diameter would be $100 \times \frac{1}{20} \times \frac{7}{22}$, or $1\frac{13}{22}$ in. In practice, the diameter should be somewhere near $1\frac{5}{8}$ in., the main thing being to get the disk as nearly round as possible. In the hand fixture, shown in Fig. 1, the feed is obtained by striking light blows on the heavy staple. The staple should at first be driven in just so far that the teeth of the tap scratch the edge of the blank. The tap is then revolved with a bit brace or wrench; when it has made 100 revolutions the blank will be scratched clear around. As the turning is continued, notice whether the tap teeth have worked into the scratches previously made, or are cutting new ones. If the latter is the case, apply a little pressure with the hand, backward or forward, on the blank, as the turning is continued and the tap is fed in with an occasional blow on the staple, so that the teeth will revolve in the grooves previously cut, and not cut double-pitch.

Figure 3 gives an idea as to how the motor is connected to drive the slow-speed shaft by means of the worm and wheel. There must be plenty of play between the worm and gear, as the simple

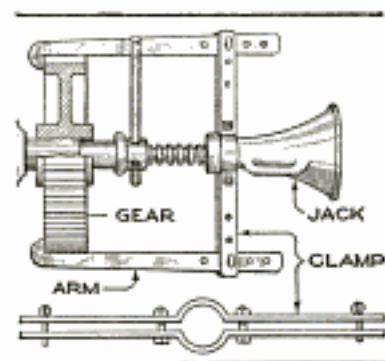
teeth of this type will not work well if pressed tightly together. The worm in Fig. 3 is made by turning, or filing down, a screw or bolt having the proper thread, so that journals are formed on the ends; the thread is also filed off for the sake of appearance, except at the center, where it meshes with the gear.

To Prevent Funnel from Tipping

A simple method of preventing a funnel from tipping to one side and spilling the liquid being poured, consists in slipping an iron washer over the stem; if desired, the washer can be permanently attached by soldering. This arrangement will be found particularly useful when both hands are required for pouring, as, for example, when filling the fuel tank of an automobile.

A Screwjack Gear Puller

Wherever gears or wheels are to be removed from their shafts, considerable damage may be done if the work is not properly performed, and, as gear pullers are not always available, or have not a



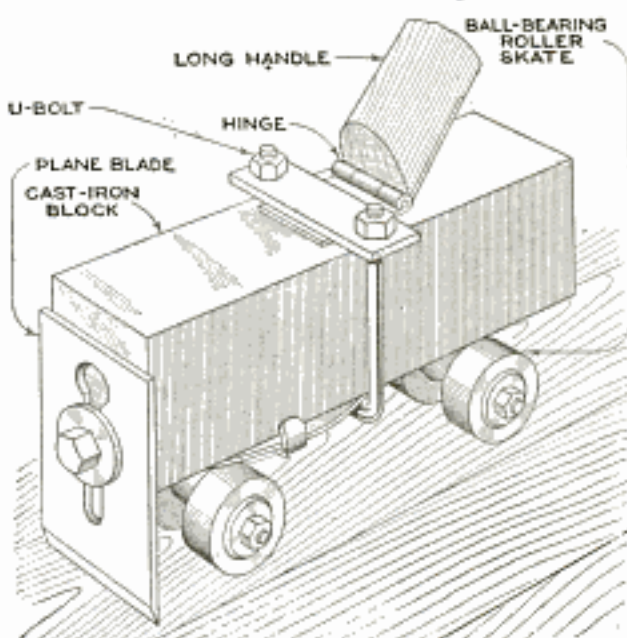
large enough range for the work to be done, the repairman is often tempted to resort to drastic methods to remove an obstinate gear. If a screwjack and a few pieces of flat iron are

at hand, they can be made into a powerful puller, thus removing the necessity of hammering the gear, with the attendant possibility of damage.

Two bars are shaped to fit around the top part of the jack standard, and drilled for clamping bolts; these bars should not be made from material lighter than $\frac{1}{2}$ by 2-in. steel. Holes are also drilled through each end of the crossarm thus formed, to take the pins which hold the pulling hooks. The hooks are cut from $\frac{1}{2}$ by $1\frac{1}{2}$ -in. stock, and are also drilled for the adjusting pins. With the hooks holding the wheel to be removed, and the head of the jack against the shaft, it is only necessary to turn the screw to exert pressure sufficient to pull off the wheel. Where possible, the hooks should pull against the gear hub.

Improvised Scraper for Hardwood Floors

A combination of a roller skate, plane blade, and a heavy block of iron makes a serviceable and efficient scraper for re-



A Scraper for Refinishing Hardwood Floors can be Made from a Roller Skate, an Iron Block, and a Plane Blade

finishing hardwood floors. This improvised scraper was made by an amateur workman simply by clamping the cast-iron block to the top of the roller skate. The plane blade was fastened to the forward end of the block by a screw and washer, for which a hole was drilled and tapped in the block.

A hinged handle was attached to the device by bolting one leaf of the hinge under the U-shaped clamp, which also serves to hold the iron block to the roller skate.

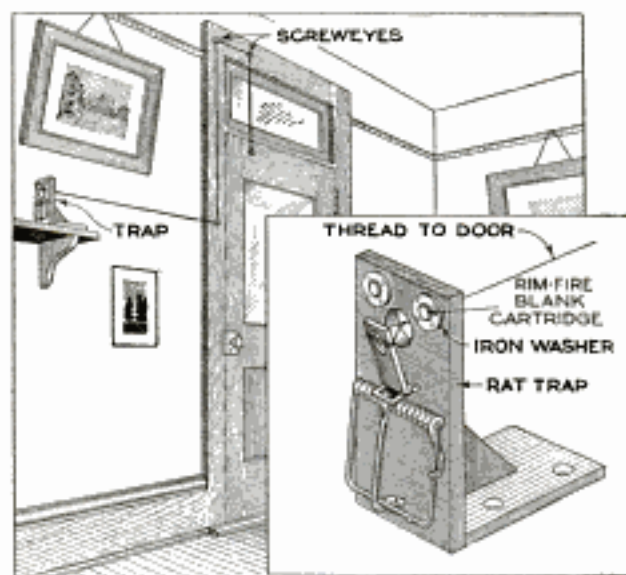
With the scraper shown, all the floors of a six-room house were resurfaced, the work being done with much more rapidity and ease than would have been possible by the hand-scraping method. The edge of the scraper blade should be beveled at an angle of about 30° , and the iron block should weigh about 30 or 40 lb. to get the best results.

Cure for Slipping Fan Belts

An automobile fan belt that is inclined to slip on the pulley, either because it is too loose or because the pulley is worn too smooth, can quickly be made to run true and take hold by lining it with adhesive tape the width of the belt. The adhesive tape is that used for bandages, and can be bought at any drug store.

A Burglar Alarm That Shoots

A burglar alarm that will fire blank cartridges, when operated by the entrance of an intruder, can easily be made at a



An Ordinary Spring Rat Trap, Converted into a Burglar Alarm, Shoots Blank Cartridges When the Door or Window to Which It is Connected is Opened

cost of but a few cents, from an ordinary spring rat trap. To convert the trap into a burglar alarm, it is only necessary to drill one or two holes in the base, into which .22-caliber blank cartridges are inserted, in such a manner that the spring of the trap will strike the rim of the cartridges and fire them. A hole is drilled underneath the trigger arm, and a thread or wire attached to the arm for releasing the trap. The burglar alarm is mounted on a base in the manner shown, the base being screwed down to the floor or shelf. The alarm is connected to the door or window by means of a stout thread or string, so that the door or window cannot be opened without giving an alarm.—Van Allen Lyman, Aromas, Calif.

Test for Water in Gasoline

The low specific gravity of most of the gasoline on the market makes it imperative that some caution be observed to prevent water from entering the supply tank. Chamois skin is frequently used, but this is too expensive to permit its common employment and is seldom at hand in emergencies. Cotton cloth will serve the same purpose if several layers are placed within the funnel to act as a strainer when the tank is being filled. Cotton is a powerful absorbent of moisture, and will remove all the water from the gasoline up to its point of saturation.

Care must be taken to see that nothing but cotton material is used.

A good test for determining the presence of water in gasoline is made by dipping a cotton cloth into a pan of the liquid. If the cotton remains damp after the gasoline has evaporated, there is water present in sufficient quantity to cause trouble in operating a gas engine or stove.

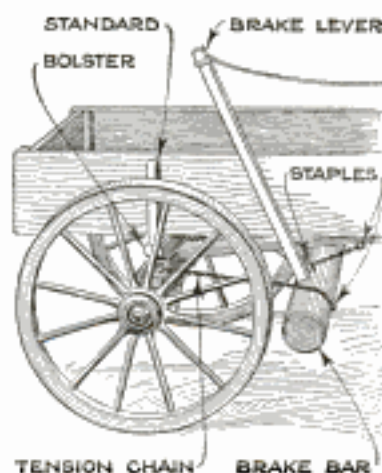
Preventing Wear on Copper Kettle

Having had considerable trouble in soldering a copper teakettle, that was worn through in several places around the bottom edge, means were sought to prevent this wear. This object was accomplished by soldering a ring of $\frac{1}{8}$ -in. copper wire around the bottom edge, thus preventing the bottom of the kettle from coming into actual contact with the stove, and preventing further wear.—Chas. G. England, Washington, Pa.

Mountain-Type Wagon Brake

A form of wagon brake which is more or less familiar in mountainous parts of the country produces a powerful pressure against the circumference of the wheels, and the speed of a wagon descending any grade which can be safely traveled is very nicely regulated.

A cylindrical brake bar is suspended, parallel with the axles, from the underside of the wagon gear by short chains, as in the drawing. The ends of the brake bar, which is made from part of the trunk of a small tree, should project 6 to 8 in. beyond the wheels on each side. A lever is inserted into the brake bar at one end so that the brake can be operated by the driver. When braking the vehicle, a forward pull on the lever brings the bar back against the wheels, and the amount of friction is controlled by the pressure exerted on the lever. When not in use, the brake hangs from the wagon gear out of contact with the wheels.—Louis Schneider, Clinton, Mo.



How to Make an Inlaid Checkerboard

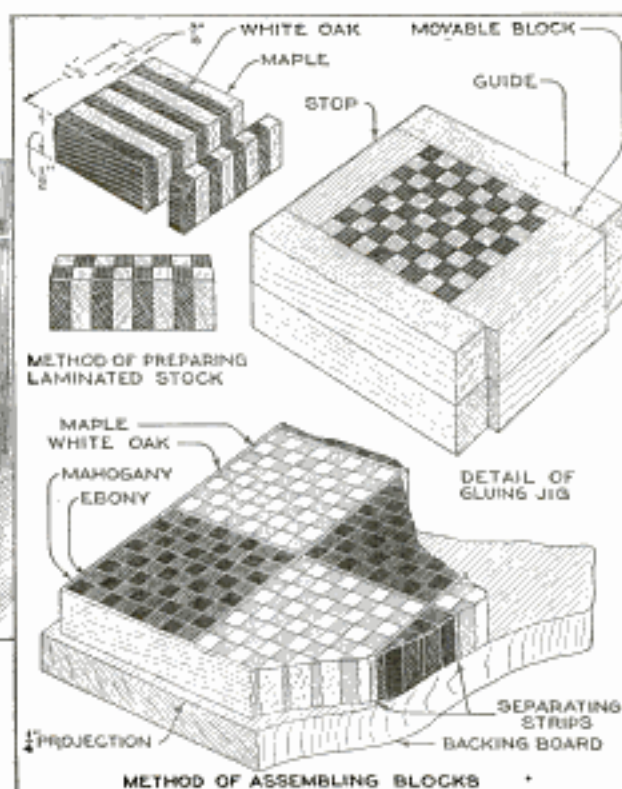
By EDWIN M. LOVE

IN the checkerboard design illustrated, each square is a miniature checkerboard in itself, composed of 64 light and dark squares.

For the dark squares, 16 strips each of ebony and mahogany, $\frac{3}{16}$ by $\frac{1}{2}$ by 17 in., are needed, and as many strips of maple and oak of the same size will be needed for the white squares, a total of 64 strips. Using alternate strips of light and dark-colored wood, eight strips are glued together to make a laminated piece, $1\frac{1}{2}$ in. wide. From this piece, after it has been glued and both faces sanded, $\frac{3}{16}$ -in. sections are

seven strips of red oak, $\frac{1}{16}$ by $\frac{1}{2}$ by $12\frac{1}{2}$ in., and 56 similar strips, $1\frac{1}{2}$ in. long. Paint the face of the board with glue and place in the angle formed by the strips at the edge, which should be at the lower left corner, one of the dark squares, with an ebony square in the corner, and the grain running parallel with the left edge of the board.

Glue one of the short separator strips to the upper edge, and then place a light block in position, with the grain at right angles to that of the dark, and with the light maple square in the lower left corner.



An Inlaid Checkerboard, the Squares of Which Are Miniature Checkerboards Themselves, being Built Up of Light and Dark-Colored Woods



cut transversely, and eight such sections glued together to form a square of the board, using the gluing jig illustrated for the purpose. The sections are cut $\frac{3}{16}$ in. wide in a miter box. The strips are glued together so that light squares will come next to dark ones, the mahogany and ebony being used for the "black" squares, and the oak and maple for the "white" ones.

All of the gluing operations should be done in a warm room and the stock should also be warmed. The wooden gluing jig should be made long enough to accommodate about eight squares at a time, each being separated from the other by a strip of paper. By rubbing the edges of the jig with paraffin, the glue will be prevented from sticking, and the blocks can easily be removed.

For a backing board use a $\frac{1}{2}$ -in. pine board, $14\frac{1}{2}$ in. square. Nail and glue two $\frac{1}{16}$ by $\frac{1}{2}$ -in. red-oak strips near two edges, to form a right angle, and also prepare

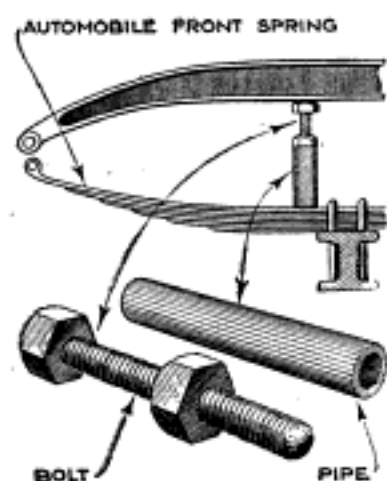
the row and start building up the next row. When all the blocks are assembled, inclose the two open sides with strips, and clamp them tightly until the glue sets. When the glue has dried thoroughly, trim the ends of the separator strips flush, and glue $\frac{1}{16}$ -in. strips around the remaining two sides. Cut off the edges of the backing board to leave a $\frac{1}{4}$ -in. projection, and scrape and sand the surface smooth; wax it, or, if a higher gloss is desired, fill with a light paste filler and give three coats of varnish.

When the row of eight squares has been placed against the pine strip at the left, glue one of the long separator strips to the inner edge of the row and start building up the next row. When all the blocks are assembled, inclose the two open sides with strips, and clamp them tightly until the glue sets.

Before using raveled-out wool for knitting, wind it in hanks, and place it in a steamer until thoroughly moistened. Then let it dry and wind into balls. The yarn will be straightened out and the color freshened.

Safety Spring-Hanger Bolts

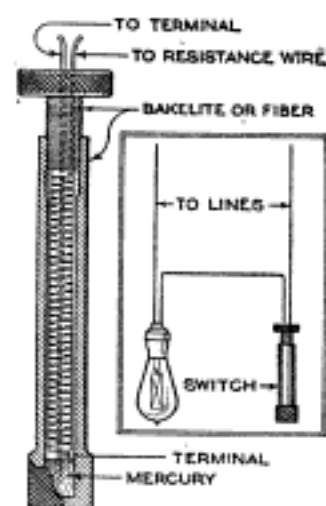
One job that will try the patience of the automobile repairman consists of lining up the eye of a spring with the spring hanger in the chassis. The stiff springs are difficult to handle unless some means is provided for aligning the two eyes. A simple jack for flexing the spring and lifting the weight of the car can be improvised from a bolt and a short piece of pipe or tubing, as indicated in the drawing. These materials are usually easily obtainable, and with a few of these jacks, much time can be saved in working the eye of the spring into the proper position for the insertion of the shackle bolt.—G. A. Luers, Washington, D. C.



a bolt and a short piece of pipe or tubing, as indicated in the drawing. These materials are usually easily obtainable, and with a few of these jacks, much time can be saved in working the eye of the spring into the proper position for the insertion of the shackle bolt.—G. A. Luers, Washington, D. C.

A Simple Dimming Switch

The drawing shows a very sensitive and simple dimming switch for use with an electric incandescent lamp, in locations where a dim light must be kept burning constantly. A hard-fiber, or bakelite, rod is turned down, as shown, to form a plunger, leaving enough of the original diameter to form a head, which is then knurled. A portion of the length of this rod, at the upper end, is threaded to fit the tapped hole in the mercury container. The latter consists of another piece of rod which is bored and tapped, the diameter of the hole below the thread



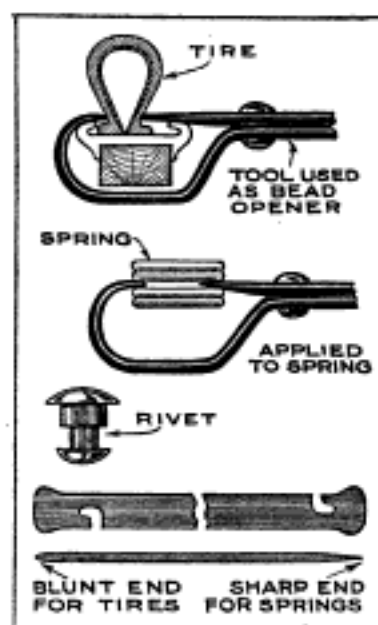
being slightly larger than the plunger. The plunger is drilled, along the vertical axis, with a $\frac{1}{16}$ -in. drill, a copper wire being run through the hole, and projecting through the bottom of the plunger.

Resistance wire is then wound around

the outside of the plunger, being firmly fastened at the bottom and led ir at the top through another $\frac{1}{16}$ -in. hole paralleling the center one. At the bottom of the container, a small quantity of mercury is placed; as the container is screwed upward, the mercury rises in the annular space between plunger and container, so that the current flows through less of the resistance wire, thus increasing the current strength until full light is obtained. Screwing the container downward, of course, reverses this process. This type of switch has been successfully used on small motors and baking ovens, in addition to lamps.—W. Burr Bennett, Honesdale, Pennsylvania.

Combined Spring Spreader and Tire Remover

A tool that serves equally well for spreading the leaves of automobile springs for the application of lubricant, or for removing a tire when the beads have rusted to the rim, is shown in the drawing. The tool can be forged on the anvil, from parts of old wagon tires, in less than an hour.



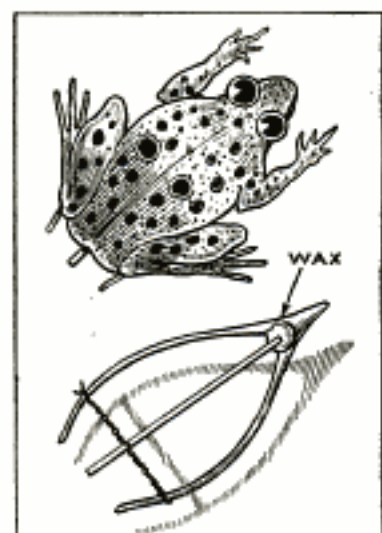
A shouldered rivet is permanently fastened to the curved part, as illustrated, and curved slots that fit around the shoulder of the rivet are provided in each end of the lever handle, but on opposite sides. The span of the tool is somewhat different for the two uses, and for that reason the blade ends are not quite duplicates, the difference being in the distance from the pivot hole to the end of the blade. The hook portion of the tool is simple enough to understand without explanation, while the only detail of the handle that need be further explained is that the end used for tires should be blunt, the opposite end being sharpened for easy insertion between the spring leaves. The blade can be removed from the device and used as an ordinary tire tool for pulling the bead over the rim.

Spring Prevents Breaking of Fishline

"The big one that got away" would, perhaps, have been landed, had the strain on the line been applied more easily when the fish struck the bait. However, as fish are not particularly considerate, the angler must provide a means for preventing his line from breaking, and one that will materially assist in landing his game. This may be done by merely interposing a short length of small-diameter spiral spring of the proper tension between line and hook. The spring will absorb a considerable portion of the strain on the line caused by the vicious lunging of certain varieties of game fish.—O. S. Billings, Ruskin, Fla.

A Jumping-Frog Toy

An entertaining little toy can be made from the wishbone of a fowl after it has been well cleaned and freed from flesh.



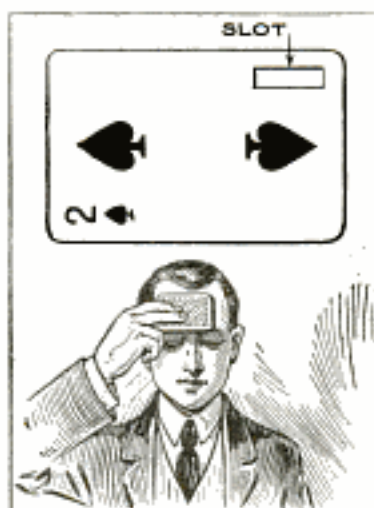
Take a piece of strong, thin string and double it, tying it securely to opposite sides of the wishbone about 1 in. from the ends, as in the drawing. Cut a strip of wood a little shorter than the bone, and make a circular notch about $\frac{1}{2}$ in. from one end.

Push the stick through the doubled string for about half its length, twist the string tightly by means of the stick, then pull the stick through until the notch is reached. From a piece of paper or thin cardboard cut out the outline of a frog, paint it to resemble the animal as nearly as possible, and paste this to one side of the wishbone. The only thing now required is a piece of shoemaker's wax, which is placed on the underside of the bone, just where the free end of the stick will rest. When it is desired to make the frog jump, push the stick down and press the end into the wax. Place the frog on the table, and after a short while the toy will, all of a sudden, make a very lifelike leap as the end of the stick pulls away from the wax.—S. Leonard Bastin, Bourne-mouth, Eng.

The "X-Ray" Pack of Cards

This trick is a "mind-reading" stunt which is worked on a new principle, and is very puzzling. A full pack of cards is

shown and half of them are handed out, the other half being kept by the performer. A spectator is asked to select any card from those he holds, and insert it in the pack held by the performer, while the latter's eyes are closed or his head is turned.



Without manipulating the pack in any way, the performer places it against his forehead and instantly names the card chosen by the spectator.

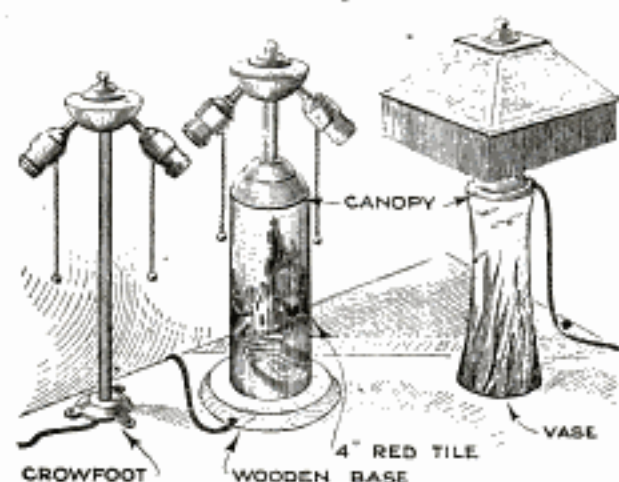
The cards held by the performer are prepared for the trick by cutting a slot $\frac{1}{8}$ in. wide and 1 in. long in one corner of 25 cards, with the sharp point of a penknife, in such a manner that all the slots coincide. In presenting the trick the performer keeps all the prepared cards, and also one card which has no slot, the latter being kept on top of the pack so that the slots cannot be seen by the spectators. The performer's thumb is held over the slots when the bottom of the pack is shown. A spectator is asked to insert a card face down into the cards the performer holds in his hand. When this is done the thumb is lifted from the slot as the cards are raised to the forehead, when the performer can look through the pack and see the index on the card the spectator has selected. After the forehead "stall," the performer announces the card selected. The trick is repeated by "fanning" out the cards and extracting the card named.

Corked Bottle Used as Float

A simple and effective substitute for a wooden float, which becomes waterlogged after continued use, for water tanks and similar purposes, can be made from old bottles. The bottle is stoppered with a tight-fitting cork, which is made leak-proof with sealing wax. The bottle can be fastened to the end of a float arm by means of metal clamps.

Artistic Lamps Made from Vases and Drain Tile

There are few household furnishings that create an atmosphere of hominess



Attractive Table Lamps That can be Made from Such a Humble Article as the Ordinary Brick-Red Farm Drain Tile, or from Vases of Any Size and Form

and furnish cheerfulness to the whole family more completely than lamps which harmonize with their surroundings.

The common brick-red drain tile can be elevated to a position of beauty by using it as a part of a lamp of the type shown in the drawing. The tile itself can be decorated in any desired manner, as by painting some simple scene in oils against an enameled ground. The wooden base should have a diameter large enough to prevent the completed lamp from being easily upset. The electrical fittings, shown at the left, can be obtained from any dealer in such articles. The crow-foot should be screwed to the center of the wooden base in such a manner that the upright pipe will be in the exact center of the tile. When all parts have been assembled the space inside the tile is filled with cement. The vase lamp is practically the same in construction, but because the value of the vase is to be retained, no hole is drilled in its base, which makes it necessary to run the cord in over the edge, and down to the crowfoot. In order to make a lamp of this type stable, the vase is partly filled with dry sand.—Truman R. Hart, Ashtabula, Ohio.

Soil Crusher Made from Mower Wheels

A very useful implement for the farm, for breaking up hard lumps or clods on the surface, is a soil crusher made from old mowing-machine wheels, or wheels from a similar implement. If the maker of such a device does not possess a sufficient number of wheels, a few visits

among his neighbors, or to the nearest junk man, will provide plentiful material.

The construction of such a roller is quite simple and is done by merely mounting the wheels on a shaft of the proper length and diameter, with a thin washer between each pair of wheels. This shaft is mounted on a strong wooden framework of 4 by 4-in. lumber. A tongue is attached to the implement for hitching to the horses or tractor. The wheels revolve freely on their stationary axle and consequently the proper differential effect is obtained so that corners can be turned without skidding. The wheels should be kept well lubricated to prevent undue wear on the shaft.

Hook Pulls Straw from Stack

Looking somewhat like the harpoon of the old-time whalers, the wooden hook shown in the drawing is used for pulling hay or straw from a stack, without wasting a considerable amount of it.

The hook can be made from either wood or metal, so that it can be thrust easily into the stack. The barb is formed about 3 in. from the end; this



catches the straw, and, when the hook is pulled out, a quantity of straw comes along with it. By using this method it is unnecessary to disturb the top that has been arranged to shed the rain. In case a metal hook is used, it can be fastened to a wooden handle, but a straight sapling will answer just as well, especially if there is a conveniently formed crotch near one end that can be utilized in forming the barb.

Flexible Liquid Court-Plaster

A formula for making a flexible liquid court-plaster that can be painted over small bruises, cuts, and other unimportant wounds to keep them free of dirt, is made in the proportion of 10 oz. of flexible colloidion, which can be obtained at any drug store, 20 gr. of Canada balsam, and 10 drops of castor oil.

PRIZE OFFERS

8023
**EXAMINATIONS FOR INSTRUMENT MAKERS
 BY U. S. CIVIL SERVICE COMMISSION**

The U. S. Civil Service Commission announces an open competitive examination for instrument makers. From this examination vacancies will be filled under the following bureaus and departments, at the yearly salaries indicated: Coast and Geodetic Survey, \$1,400; office of the Secretary of Agriculture, \$1,200; Bureau of Standards and Department of Commerce, \$900 to \$1,800; Weather Bureau, \$1,300 and \$1,440; supervising instrument maker, \$1,620; and Naval Observatory, at \$6.88 a day. Appointees whose services are satisfactory may be allowed the bonus granted by Congress of \$20 a month. The examinations are open to all U. S. citizens who have reached their 20th, but not their 65th birthday. Applications will be received by the commission at Washington, D. C., until the business-closing hour on March 31, 1922. Competitors will not be required to report for examination at any place, but will be rated upon sworn statements of their education and experience. Applicants must show that they have completed the eighth grade of common school. Particulars of the experience required for each position can be obtained from Washington.

All desirous of competing should at once apply for form 1312, stating title of examination, to the Civil Service Commission, Washington, D. C., or to the Secretary of the U. S. Civil Service Board in the applicant's locality.

8026
**WORKMAN HONORED FOR WAR INVENTION
 BY THE AWARD OF A GOLD MEDAL**

"In recognition of an extraordinary engineering achievement with great public service," was the unanimous expression of 2,000 members of the American Society of Mechanical Engineers, when at their annual meeting, Dec. 8, 1921, they awarded the gold medal of the society to Hjalmar C. Carlson, a sheet-metal worker of Worcester, Mass. The engineering achievement that won the award was described by the society as "his invention making possible the production of 30,000,000 drawn-steel booster casings; used principally as a component of 75-millimeter high-explosive shells, and also extensively in gas shells and bombs, as an aid to victory in the World War." These shells, which were used by the American army, were of French origin, and they had a peculiar "booster casing" which gave trouble in American plants. Carlson's invention more than removed this trouble, for it made possible the manufacture of the shells at a speed, and with an economy, that surpassed anything done in France. For the benefit of the layman, it may be stated that a booster casing is a casing for the primary detonating charge in a shell. This is in direct connection with the fuse.

8027
**PRIZES FOR AMERICAN-HISTORY ESSAYS
 OFFERED BY KNIGHTS OF COLUMBUS**

Fuller particulars are now available regarding the prizes for American-history essays offered by the Knights of Columbus, as announced in our issue of November, 1921. The five prizes offered for the best studies, based on research in primary sources, are as follows: a prize of \$3,000 for professors or instructors in history, and other social sciences, in the colleges in the United States; a prize of \$2,000 for specialists, not college teachers, on the same subjects; a prize of \$1,000 for school superintendents and teachers in the United States, and another of the same amount for scholars and graduate students who have access to material in the universities, libraries, and archives of Mexico, Central and South America, and the Caribbean Republics, dealing with the international relations of the Americas; and a prize of \$500 for undergraduates in United States colleges. Manuscripts must be in triplicate typewritten form, fully annotated as regards the authority for statements made, and must include a complete bibliography. Studies submitted in competition for prizes must have been prepared especially for this purpose, and must be mailed on or before May 31, 1922. Other particulars, including a

synopsis of the topics, and the periods, suggested to be taken as themes for special investigation, may be obtained from the Knights of Columbus Historical Commission, K. of C. Bldg., 199 Massachusetts Ave., Boston.

7999 — Prize
**AUTOMOBILE CLUB OF MINNEAPOLIS
 AWARDS GOOD-ROADS TROPHY**

Each year the official pathfinder of the Automobile Club of Minneapolis makes a tour in his car to some distant point in the state of Minnesota. The counties through which he passes are then notified. Thirty days later a party of about 75 cars belonging to the club takes the same tour, led by the pathfinder, who keeps about an hour ahead of the party, and leaves behind him a trail of confetti to show the route. Then comes another car, the pacemaker, which sets the speed at which the party shall travel. With the party is a pilot car, whose duty it is to guide them on the trail. The object is to decide which of the counties traversed has made most improvements on its roads in the interval of 30 days between the notification of the pathfinder and the tour of the party. This is judged by the pathfinder, the pacemaker, and the pilot, and to the county they select is awarded a handsome trophy, consisting of a winged bronze figure, bearing in one hand a scepter, and beckoning with the other hand to the auto tourist. This figure stands upon a marble pedestal, making the trophy altogether 7 ft. high. Its cost was 1,200 dollars.



8028
**BLIND WORLD-WAR
 VETERAN WRITES
 PRIZE-WINNING
 BOOK**

The prize offered by a New York publisher for the book of highest literary value written, during 1921, by a student of Columbia University, was won by David P. Sentner, a blind veteran of the World War. The winner is studying journalism at the university, under the auspices of the U. S. Veterans' Bureau. The book, entitled "Cobblestones," is a collection of poems and essays. The blind veteran wrote all the manuscripts on a typewriter.

8029
**GOOD EXAMPLE OF THE KIND OF CONTEST
 THAT BENEFITS A WHOLE COMMUNITY**

A contest of the kind that benefits all members of a community, whether contestants or not, is one that was recently conducted by the Fort Wayne, Ind., Chamber of Commerce, called "Better Yards Contest." As its name implies, the object was to stimulate interest in beautifying the yards of the community's homes. Prizes were given for excellence in the care of lawns and sidewalks, in the growth of flowers, shrubs, trees, and in the general outside appearance of the house. The purpose of the contest was further promoted by the nature of the prizes, which were shrubs of a dis-

W. S. U. S. Civil Service Examination

Cont. Arthur Hallam 317 Cedar Ave. Minneapolis, Minn.

newark Ohio Advocate
 12/16/21
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tinctive variety. These added to the beauty of the yard and at the same time conferred distinction upon the winner, to whom probably the former benefit was as gratifying as the latter.

BIG REWARDS OFFERED IN AUSTRALIA FOR DISCOVERIES OF PETROLEUM

Up to the present very little oil has been discovered in Australia. In order to stimulate prospectors to greater activity in boring for oil, the government of the Commonwealth of Australia has offered a cash reward, equivalent to \$243,000, for the discovery of petroleum oil in commercial quantities anywhere in Australia. This is defined as production, to the extent of 50,000 gal., with the oil still flowing freely. A similar, separate reward of \$48,600 has been offered by the state of New South Wales to the person or company who first produces 100,000 gal. of petroleum within that state. It is now more than a year since these rewards were first offered.

ROOSEVELT JUNIOR MEMBERSHIPS OFFERED BY WOMAN'S MEMORIAL ASSOCIATION

Theodore Roosevelt's birthplace in New York City is being restored by the Woman's Roosevelt Memorial Association, who, when the work is completed, propose to conduct therefrom a national educational movement. In this connection they contemplate the foundation of a scholarship with annual prizes for the best essays on the life of Roosevelt. In the meantime, the association will present a copy of that famous book, "Theodore Roosevelt's Letters to His Children," to each junior who obtains 25 junior memberships for the association. For the sum of only 25 cents, a junior receives full membership, and as a token thereof, a bronze medallion of Theodore Roosevelt mounted to be worn as a pin. This work is being carried out by the formation in schools of Roosevelt clubs. For particulars address: Woman's Roosevelt Memorial Association, 1 East 57th St., New York City.

In answering prize offers please mention Popular Mechanics Magazine

CONTESTS PREVIOUSLY ANNOUNCED

Essays on Economics: Prizes, \$1,000 and \$500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize \$10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lillian Welsh, Goucher College, Baltimore, Md.

Model in Clay by Students of Chicago Art Institute: Prizes, \$1,000, \$100, and \$50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

Best Slogan Describing Razor: Prize \$500; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

Hunting Stories, True or Fiction: Prizes, \$1,000, \$600, \$400, \$300, \$250, \$200, \$150, and \$100; announced February issue, 1922; closes March 1; address: Contest Editor, Outers'-Recreation, 9 S. Clinton St., Chicago, Ill.

Essays on Life of Roosevelt: On page 159 of our January, 1922, issue, and for some time previously, we have announced scholarship prizes offered by the Woman's Roosevelt Memorial Association, with the addition that the contest closed Dec. 31. This statement was premature, as a new announcement in this month's Prize Offers makes clear.

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

SATURN'S RINGS WILL BE DISPERSED BY ITS SATELLITES

The rings of Saturn are unique in the sky and have always commanded the interest of the astronomer. The first question they raised was, "What are they?" The first mathematical investigation showed that they could not be solid but must consist of small particles. This was later verified by examining, through sensitive spectroscopes, the sunlight reflected from them, and determining that the inner edges moved faster than the outer, which could not be true if the rings were solid. The next question was, "How did they originate?" In attempting to get an idea of their source, astronomers and mathematicians have for years been trying to answer the preliminary question as to why the rings persist and why they are not broken up by the action of the moons of Saturn, and why they consist of a series. Furthermore, it has been determined recently that fine lines appear on some of the rings, suggesting subdivisions.

A complicated mathematical study just concluded has developed some very curious facts about the matter. It appears that if the particles in any ring were all of equal size they would, under certain circumstances, tend to leave that ring and mingle with those of the other rings, and the well-defined boundaries would tend to disappear. If there were a large number of particles of all sizes ranging from very small ones up to a certain maximum value in the rings, the divisions of the ring would tend to become more extended and therefore more readily visible.

It has also been discovered that the spacing of the rings is determined by the satellites, or moons, which revolve about the planet. Moreover, it is predicted that in the course of time one of the satellites will cause the disappearance of the crêpe, or innermost dusky, ring, and another moon will cause the other rings to be dispersed.

SOUNDS MEASURE FEEBLE ELECTRIC CURRENTS

As science makes progress, there are many reversals of practice, and what yesterday was used to obtain the best results is done differently today. For instance, the character and magnitude of sounds and musical notes have been determined by converting the sound waves into alternating currents and then measuring them by electrical instruments; but recently the tables have been turned, and very feeble alternating currents have been measured by converting them into corresponding sound waves which are measured on an acoustic device.

The instrument developed for this work is somewhat similar to previous ones, but this particular arrangement is one in which remarkable sensitiveness is achieved. It is a well-known fact that a flat object, as a disk, tends to set itself at right angles to a stream of air or water in which it is held, and in the new device this is used as the actuating principle by suspending from a slender filament of quartz a very light mirror, which forms a disk in the neck connecting two resonating chambers. The feeble alternating currents to be measured are passed through a telephone receiver in the base of one of the resonators. The resulting sound sets up a minute pulsating draft of air in the connecting throat which causes the mirror to rotate to a degree that is a measure of the sound intensity and the current which produces it, and which is read by a suitably arranged telescope and scale, or by the movement of a spot of light.

Such an instrument will probably have many uses in scientific investigations, as, for instance, in telephone research, where it will serve to some extent as an artificial ear, and in making psychological tests for measuring the sensitiveness of hearing of different persons under various circumstances.



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In endorsing the work of the Architects' Small House Service Bureau of the United States, Inc., Mr. Herbert Hoover, Secretary of the Department of Commerce, says:

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The book and plans may be obtained direct from either the Architects' Small House Service Bureau, Northwestern Division, Inc., or the Southern Pine Association. The book is sold for \$2.50 prepaid. The service includes complete working drawings, details, specifications, quantity surveys, forms of agreement, ready to use, at prices ranging from \$17.50 to \$32.50, depending upon the size of the house.

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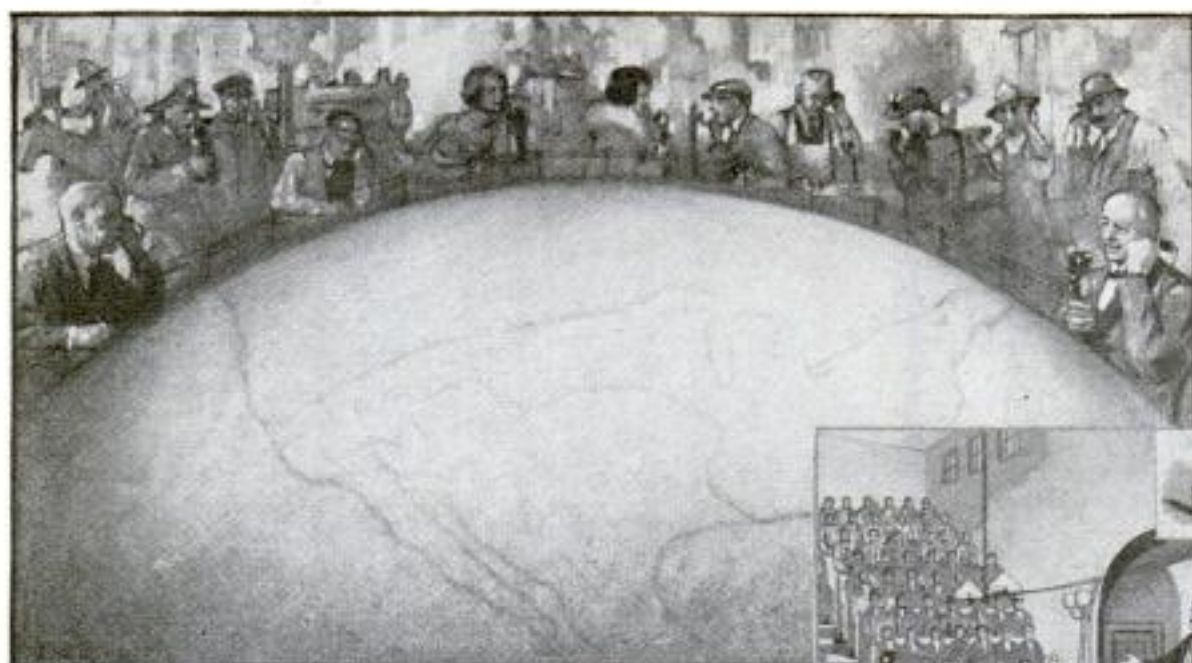
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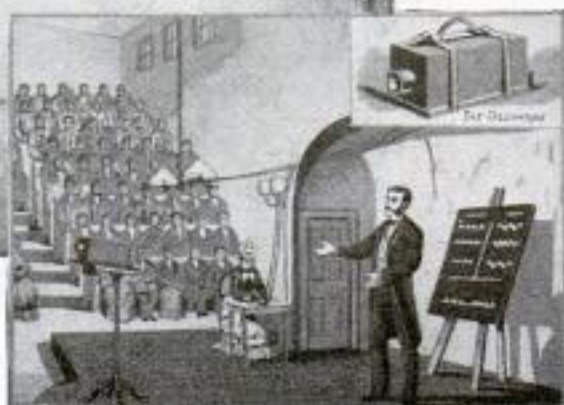
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FORTY-THREE years ago Alexander Graham Bell, the inventor of the telephone, wrote this inspired forecast: "It is conceivable that cables of telephone wires could be laid underground or suspended overhead, communicating by branch wires with private dwellings, country houses, shops, manufacturers, etc., and a man in one part of the country may communicate by word of mouth with another in a distant place."

At the right, an old print of Bell lecturing on telephony, 1877.



Foresight

More than forty years ago, when the telephone was still in its experimental stage, with but a few wires strung around Boston, the men back of the undertaking foresaw a universal system of communication that would have its influence upon all phases of our social and commercial life.

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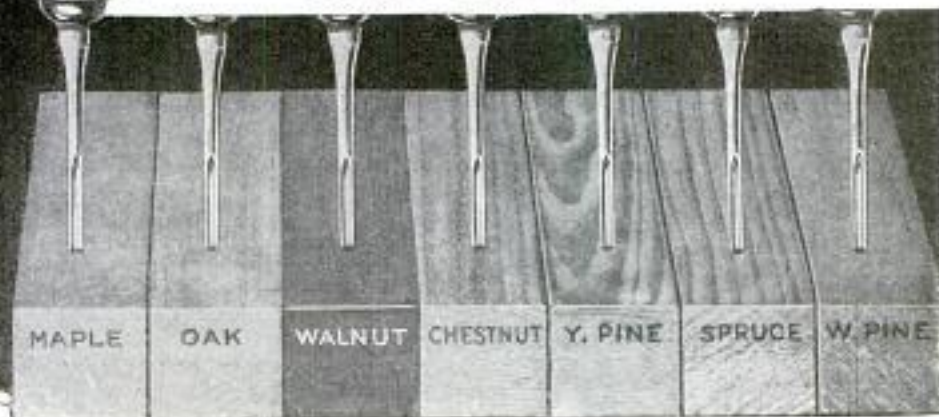


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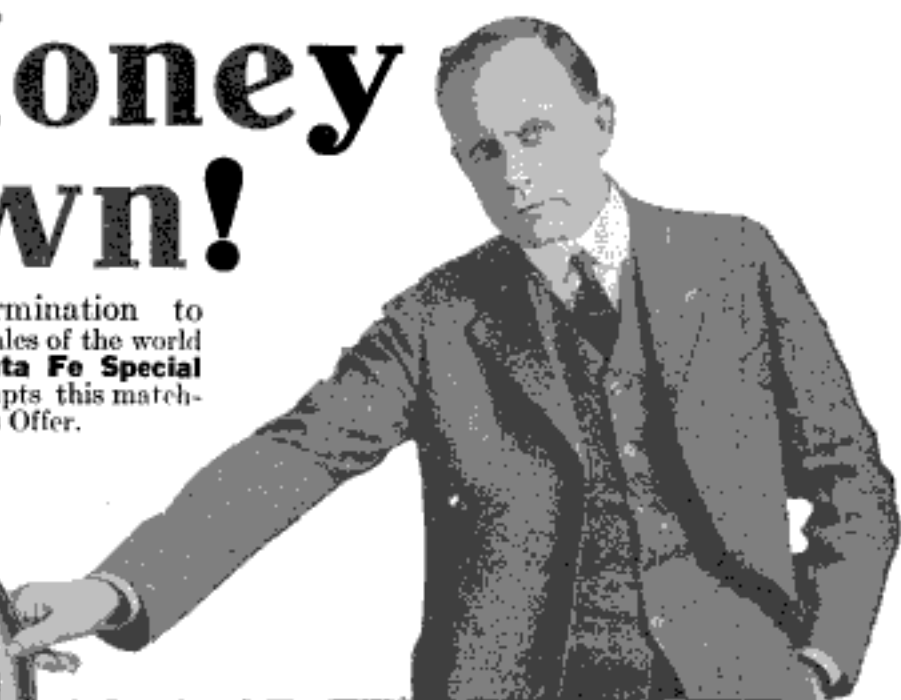
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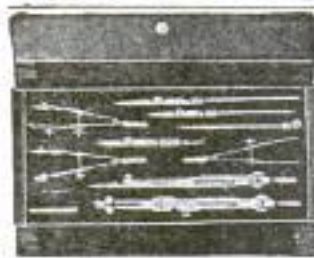
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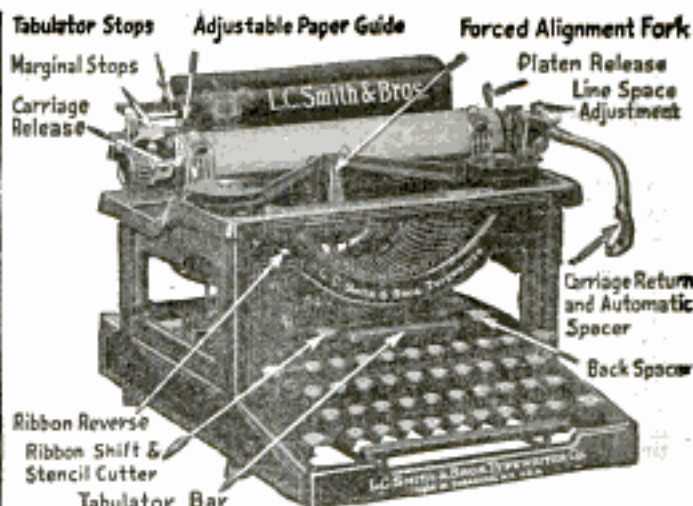
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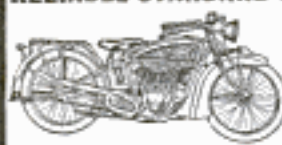


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32x3 1/2	9.00	15.45	34x4 1/2	14.45	23.90
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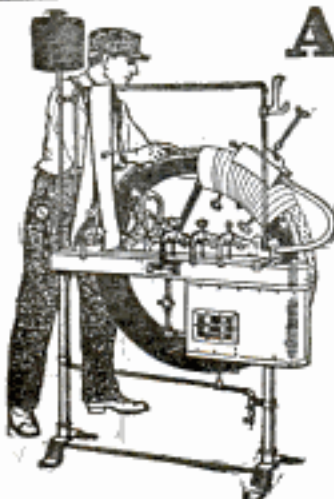
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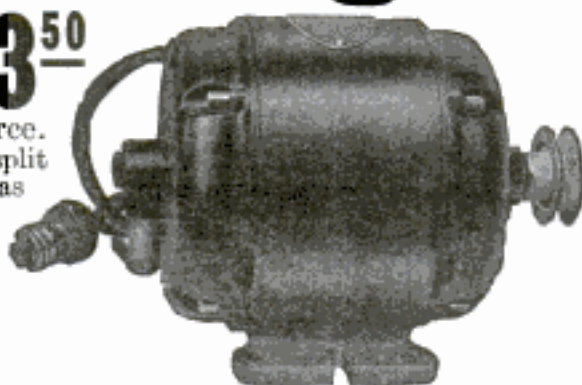
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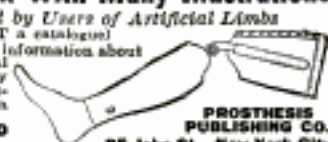
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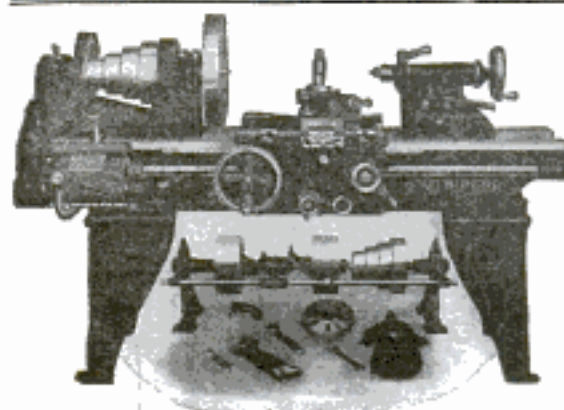
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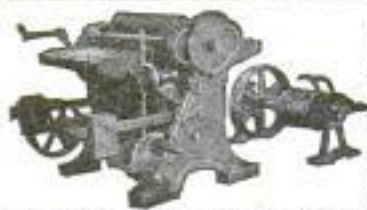
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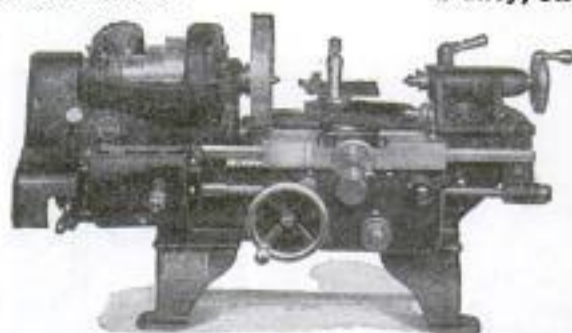
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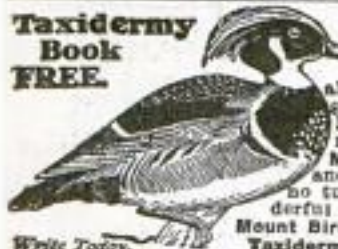
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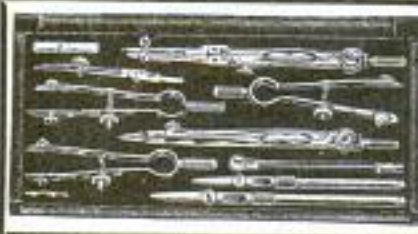
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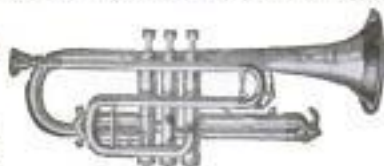
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\$375.75 One Day!

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—making and selling **Popcorn Crispettes** with this machine. He says in letter dated March 1, 1921: "I started out with nothing, now have \$12,000.00 all made from **Crispettes**." Others have amazing records: Gibbs says: "Sold \$50.00 first night!" Erwin's little boy makes \$35.00 to \$50.00 every Saturday afternoon. Melxner reports \$600.00 business in one day. Kellogg writes: "\$700.00 ahead first two weeks." Master's letter says: "—sold \$40.00 in four hours." During March, 1921, Turner was offered \$700.00 clear profit above cost of his investment to sell. **There is money—lots of money—in Crispettes.**



Times make no difference for most of these records were made in 1921—were made while people are crying hard times and are looking for jobs! Location makes no difference. It's common for Crispette machines to make \$10.00 to \$25.00 profit daily in small towns!

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Write me—get my help. Begin now. Others are making money selling **Crispettes**. You can, too! You don't need much capital. Experience not necessary. I furnish everything—secret formulas, equipment for shop or store, full directions, raw materials, wrappers, etc. Splendid chances galore everywhere! Crowded streets, amusement parks, concessions, wholesaling and stores!

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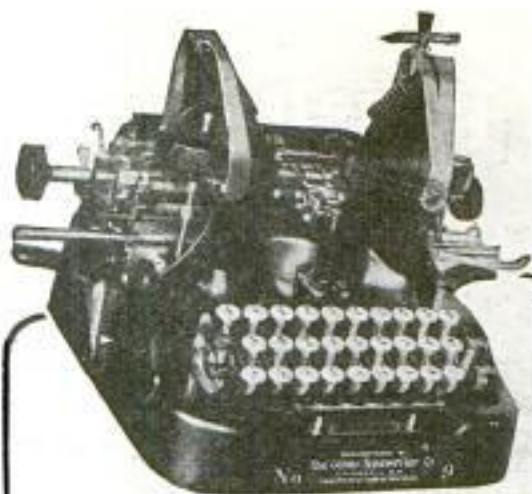
1915, three speed twin electric \$125; 1916, \$135; 1917, \$150; 1918, \$165; 1919, \$180; 1920, \$200. Shipped on approval. Catalog A free, describing Harley-Davidson's, Excelsiors, Indians, Smith Motors at \$40 and upwards. Liberty Bonds taken at full face value. Letters of recommendation from hundreds of satisfied customers. Heds.: Buick and Harley-Davidson Motor Co. Rapid service on 1902 to 1922 Harley-Davidson parts. 100 page PARTS catalog B, 25 cents. Stamp or coin.

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Watch a few moves of Puzzle Peg and you will get a set of your own. It is simply irresistible—the most baffling, mysterious puzzle game ever invented. You are sure you can solve it easily. It looks so simple you expect to solve it in 5 minutes. When the 5 minutes are up you ask for 15. When the 15 are up you declare you can solve it in half an hour. But the cleverest puzzle workers often spend hours before they find one solution, and remember already there are

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If your dealer does not have it send only 50 cents and we will mail you a complete set by return mail postpaid, together with booklet showing thirty problems—every one a fun maker for all the family.

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ACT NOW! Sells like hot cakes year 'round. A baby could sell Lucky 11. Don't delay a minute. Save time. Send \$1.75 for complete outfit including display case. At least write for circulars explaining our unique plans, including 50 other packages. **ACT NOW.**
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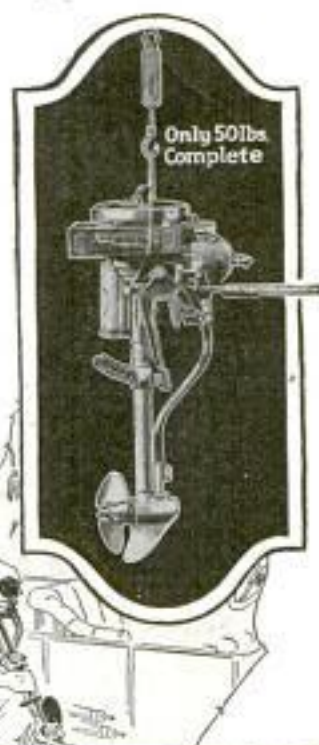
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Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness, ruptures, constipation, after effects of Flu. Comfortable and easy to wear.

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Power Plant—2½ H. P. SHAW Super Motor, 4-cycle type. Bore 2¼ inches. Stroke 3 inches.

Transmission—Two roller chains with countershaft clutch on crank hanger shaft, giving free engine.

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90 to 125 Miles per Gallon!

That's what the SHAW gives! 1,200 to 1,800 miles per gallon of lubricating oil; speed 4 to 40 miles an hour. Easily controlled; always dependable.

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Fits double or single bar frame. Just use a common screw driver and a monkey wrench. No expert required. No drilling; no tapping; no welding. You can attach it in about 30 minutes' time.

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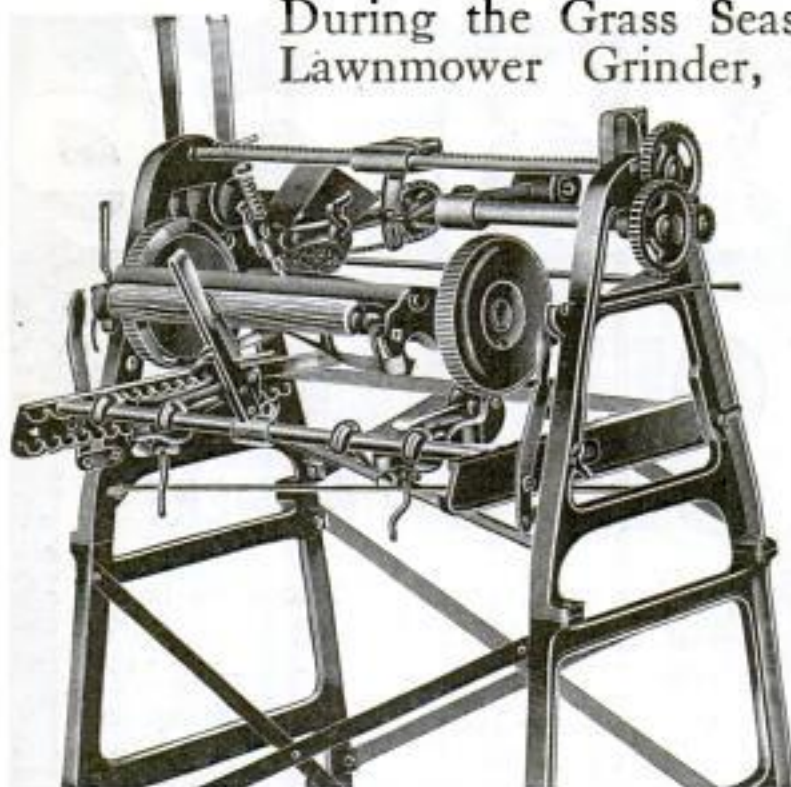
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It cuts new seats on household hydrants, faucets, bibbs, etc., and saves buying new faucets and does away with annoyance and waste of dripping water.

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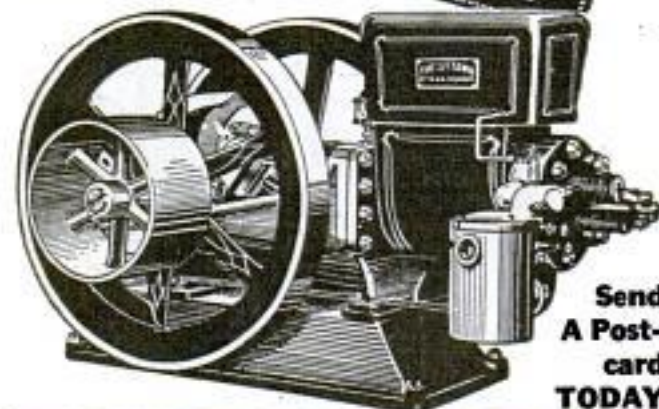
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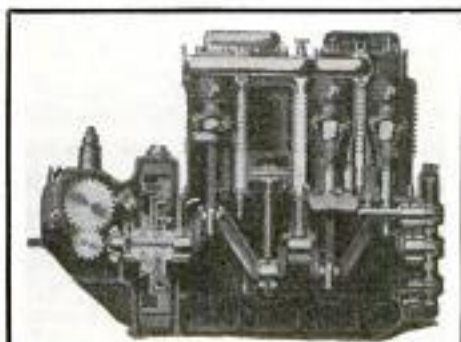
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The Duncan will cure two or three times as many tires a day as any other mould. It is the only mould made that will operate with sand bags equally as well as with air bags.

\$50 a Week EASY AGENTS

Free Sample Offer



You can start a big paying business at once. Don't wait. Get big money. We tell you how—selling the famous E-Z Self-Heating Solder Iron. No experience necessary. Easy to sell. Possibilities great. Every home a prospect. Satisfaction guaranteed. Absolutely safe. Thousands in use.

Write today for proposition.

Enterprise Tool & Metal Works, Dept. 33, 129 So. Clinton St., Chicago

SPRINGFIELD CARBINE

\$3.50

45 Caliber



Made by U. S. Gov't
Breech Loading

First Class Condition. 41 inches long, weight 7 lbs., \$3.50. Then for \$3 more, you may have a smooth bore barrel to shoot shot. This makes a wonderful combination. The smooth barrel can be interchanged by anyone in 5 minutes. Millions of Bird or Ball Shot cartidges, 3 cents each. Send for Catalogue.

W. STOKES KIRK, 1627 N. 10th STREET
Dept. P. M., Philadelphia, Pa.

WHEEL-O-TIME Auto, Motorcycle or Bicycle WATCH HOLDER



for any watch. No more fumbling in your pocket. Watch instantly released. Handsomely made, heavily nickel-plated. \$1.00. With genuine Ingraham watch \$2.25. Radium

50c extra prepaid. Money order or C. O. D.

Money-back Guarantee

WHEEL-O-TIME CO. 186 East Avenue
Rochester, N. Y.



SOMETHING NEW, CATALOG No. 22



New goods, new ideas, small boilers, engines, steam and gasoline, 1-8 H. P. up, pumps, castings, blue prints, gears, pulleys, electrical goods, model makers' supplies, accessories, 2-4 H. P. Motor engines, 2 1/2 inch ga. model locomotive, etc. Catalog postpaid 20 cents stamps (2 dimes preferred). Refunded first order.

Modern Engine and Supply Co.
53 W. Jackson Blvd. CHICAGO



Send for Your Free Copy of the
NEMCO AUTOMOBILE CATALOG
3000 BIG BARGAINS
in Automobile Accessories
NEMCO BARGAIN SUPPLY HOUSE
1017 Jackson Boulevard, Chicago, U. S. A.

Make \$200. to \$1000. Profit Monthly

With Balba Perfume Sales Machines

There were \$700,000,000.00 worth of perfumes and toilet preparations sold in one year in the U. S. Approximately one-third of this, or \$250,000,000.00 was spent for perfume. Humanity has always wanted to radiate fragrance and today the demand for perfume is greater than ever. Men, women and children love to use it. They spend a dime for it, when they can't spend more. Dimes fairly flow into the Balba Sales Machines. The average machine will make about 80% profit per month on the first investment and repeat the earnings monthly. Just think what this means—one machine containing 100 bottles in an average location will empty every 30 days and the profit is \$4.00. That means only 3 1-3 people use the machine daily. Assuming a man owns 100 machines, he will average \$400 profit a month. It's the greatest opportunity ever offered to people with a little money. It is a clean, legitimate, safe, permanent, big profit business. It earns day and night. Can easily be handled in spare time. You own machine and business. Machines Fully Guaranteed.

Balba Bouquet Perfume Exquisite in Fragrance and Quality

Balba is a lasting perfume of rare and wonderful quality—it radiates a fragrance of elegance and refinement about the wearer. Where Balba machines are in use, hundreds are regular customers and buy from 5 to 12 bottles at one time, because of the convenience in size—they are easily carried in vanity case, hand-bag, coat or vest pocket.

25c to 35c Value—Price 10c a Bottle

Balba is a high quality, exquisite perfume. We manufacture it in large quantities and sell it only through Balba Sales Machines in plain, inexpensive bottles, thus reducing the cost and leaving out all middle men's profits for we sell direct.

Sold Only Through Balba Sales Machines

Balba Sales Machines are always ready to wait on customers—never high-priced nor wasteful—have no overhead expense—are attractively nickel-plated—give out a fragrance that attracts the customer—practically thief-proof—easy to fill—simple to operate—nothing to break or get out of order—weather proof, can be placed out of doors in any climate—occupy small space on wall or counter—get and hold customers because it's the lowest priced way to sell perfume and give the highest quality and largest quantity.

We Want Balba Sales Machines in Every City, Town and Recreation Resort

We have thoroughly proven that Balba Bouquet Perfume is a good seller—it repeats—it makes new users. Balba machines in good locations show an increasing business, which proves we have hit the safe, sane, logical way to sell Quality perfume. Think of this small investment as compared with the 5c and 10c stores and yet they make millions yearly. We are now going to offer a tested, proven, big profit, permanent business to a live person, (man or woman) in each territory. We do not sell territory rights—we sell an allotment of Balba machines in proportion to population, large cities may be subdivided, and then give the purchaser exclusive rights to sell Balba perfume in that territory. There is no other perfume sold like this, and as quickly as we get general sales distribution, we are going to advertise Balba nationally.

FREE Newspaper Advertising in Your Territory

When our representatives have bought and placed a full allotment of Balba Sales Machines we will then run advertising in his local newspaper, giving the locations of all the Balba Sales Machines. This makes every one start buying Balba, and the Balba quality makes them buy again. We tell you how to place machines and handle them. In a short time, when we have general distribution of Balba, we will advertise in the National weeklies and Women's magazines and make Balba popular every place.

Guaranteed 100% Earnings or Money Refunded

We guarantee that Balba Sales Machines will earn at least 100% on their original investment the first year, provided the machines are all placed in use and kept filled, or we will refund the original price of the machines and perfume then on hand and take them back.

Write NOW for complete information, literature and sample of Balba. Territory given to first to qualify. A telegram holds territory until you get our proposition. Act quickly if you want choice locations. Remember Fortunes are made in Dimes.

References: Northern National Bank, Toledo, Ohio, or R. G. Dun & Co.

THE BALBA CORPORATION of AMERICA
Dept. 43 1306-1308 Jackson St. Toledo, Ohio, U. S. A.



WHERE BALBA MACHINES CAN BE PLACED		
Theaters	Moving Picture Houses	Waiting Rooms
Pool Halls	Billiard Parlors	Drug Stores
Depots	Apartment Houses	Cigar Stores
Clubs	Public Buildings	Hotel Routes
Restaurants	Bowling Alleys	Hotel Lobbies
Cafeterias	Ticket Offices	Dance Halls
Elevators	Street Car Shelters	Lodge Rooms
Trains	Ice Cream Parlors	Fruit Stands
Parks	Office Building Lobbies	Candy Shops
Bath Houses	Passenger Boats	Lunch Counters
Factories	Recreation Buildings	Skating Rinks
Rest Rooms	Interurban Cars	Street Cars
Boats	Shoe Shine Parlors	Barber Shops

Send 10c Coin or Stamps
—with name and address for full size bottle of Balba Bouquet Perfume. This offer is open to any one.

WE GUARANTEE OUR AGENTS \$60 A WEEK FOR ONLY FOUR \$5 ORDERS A DAY

No Delivering—Commissions Same Day You Take Orders

READ WHAT NEW AGENTS SAY:

S. B. KURTZ, of Hartsville, Ohio, writes: "I sold eight FUGOS in my first three evening's work."

HENRY TUP, of Green Bay, Wis., writes: "The FUGO is a superior extinguisher and by far the best seller."

WALTER S. NYE, of Oneonta, N. Y., writes: "Ship twenty-four FUGOS immediately. Check enclosed. Have fifty additional orders for later delivery."

FUGO AUTOMATIC Fire Extinguisher A Simple Practical Dependable Fire Extinguisher For Only \$5



Millions of people want a handy, reliable, fire extinguisher for their homes, offices, factories and garages, but they've held off paying \$15.00 or \$20.00. The FUGO Automatic costs but \$5.00 and is just as efficient and dependable as the highest priced.

Everyone can afford to have FUGOS in the home, office, and garage. Agents take orders on every call. There is nothing equal to it for the price—A FIVE MINUTE DEMONSTRATION SELLS IT—no talking, no price arguments. An inexperienced agent can take four orders a day—others take ten orders, easily. No competition, the field is unlimited. Customers are so pleased they tell others. Sales multiply fast.

NO EXPERIENCE NEEDED

Our proved instructions guide you—you cannot go wrong—a five minute demonstration and it's sold. Your neighborhood fire department will recommend it. Boost it—push it.

Exclusive Territory

Become our licensed agent, control your own exclusive territory and employ sub-agents. You take no risk—you don't invest a penny. We deliver—you receive commission same day you take orders. Trained agents are accepting this opportunity without hesitation.

Write now for full particulars, showing the real possibilities that you have with the FUGO.

Sample FUGO Automatic free to every active agent.

THE OHIO INSTRUMENT COMPANY,

9412 St. Catherine Avenue,

CLEVELAND, OHIO.

NEW IDEA TURNS OLD CLOSET INTO GENTLEMAN'S WARDROBE



THE OLD WAY—
Wrinkled, tummy and shapeless
clothes



THE RITE-WAY—Snappy, well-pressed suits

Clothes make the man. When hung on hooks and nails, they tear, wrinkle and lose their shape. You make a bad appearance.

Only \$1⁵⁰ EACH

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LAWSON
RITE-WAY
Hangers sell on sight to everyone. Our agents earn \$20.00 to \$30.00 a day. Easy work—large profits. Write NOW for discounts and start at once to make big money.

Keep your clothes as neat, snappy and well pressed as a millionaire's by making your old closet into a gentleman's wardrobe with the LAWSON RITE-WAY Sliding Hanger.

Put up in a minute with a screw-driver. Doubles your closet room. Just pull and the whole rod slides out—every well-kept suit and coat is easy to see and remove.

Send \$1.50 for one RITE-WAY. Save their cost first month in pressing and repair bills. You look RIGHT all the time.

Send today to

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Dept. 23

230 W. Superior St. CHICAGO

Marvelous New Improved Oil-Gas Burner Makes Red Hot Fire in Two Minutes



Make your wood or coal stove a gas stove instantly with a Marvel Burner. Marvelous new device makes gas from Kerosene,

cheapest fuel known! Twice the heat at half the cost. Great for cooking, baking, heating. No fuss! No dirt! No kitchen drudgery! Saves time, labor, money! ABSOLUTELY SAFE!

No Coal—No Ashes—No Smoke Save Half Your Fuel Bill

Most modern, improved burner made, yet is lowest in price. You can install it easily in a few minutes. Full directions. Marvel Burner gives strong, hot flame instantly! Fits any stove. Lasts a lifetime!

30 Days' Free Trial Write Quick!

For details of our amazing 30-day trial and Special Introductory Price Offer. Don't delay; this offer might be withdrawn any day. Write right now.

AGENTS! This wonder burner sells like wildfire. Ask quick for our "Special Proposition."

MARVEL HEAT & LIGHT CO.
Dept. 123, 609 Fulton St., Chicago



Save Time and Money

Prices \$20 to \$400 Less

Eventually you will want some kind of power you can depend on. Perhaps you could use a 16, 22 or 30 H-P.—or you might want a 2, 3, 4, 6, 8 or 12. Whatever your needs—Kerosene or Gasoline—why not

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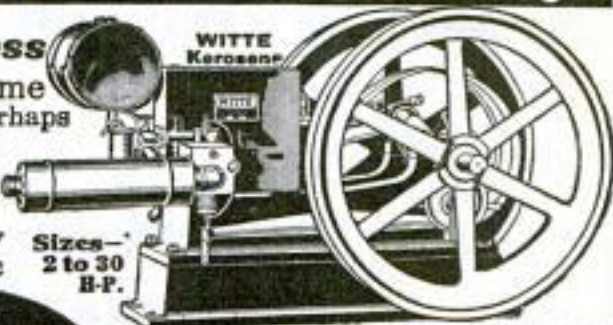
You can have a Stationary Engine up to 30 Horse; a Portable Engine, 2 to 16 Horse; a Portable Sawing Outfit to operate on kerosene or gasoline, 4 to 12 Horse; a Combined Log and Tree Saw; a Stationary Buzz Saw Outfit, 2, 3 or 4 H-P.; or the new WITTE Portable One-Man Stump Borer used in preparing stumps for burning and blasting. Anything you want at a money-saving price—

Cash or Easy Payments

Built in Sizes 2 to 30 H-P.

Stationary or Portable

Sizes—
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H-P.



**Made
By the Man
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'em**

Direct From Factory

When you buy a WITTE, you come direct to the man who makes your engine or other power outfit. You get your rig all complete ready to install and start using. You pay only the factory price from Kansas City, plus my one small profit—carload freight added from Pittsburgh. Whatever you select, I give you a straight

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This guarantee covers any and all defects of material or workmanship on any WITTE Engine or outfit you get for the entire life of the rig. 90-Day Test proves Quality and Service. My prices are now \$20 to \$400 less than a year ago, according to size, and style. Tell me what kind of power outfit you need, and I'll send you catalog and lowest price for Immediate Shipment.—ED. H. WITTE, President,

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WITTE
Gasoline

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Cuts $\frac{1}{3}$
Faster Than
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Make
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Just The Log-Saw Outfit You Have Been Looking For—Latest Log Saw Improvements. Surplus power engine, with two fly-wheels for belt work. Friction Clutch, Lever Controlled, for starting, stopping or slowing down saw. Reversible wheels. Rugged construction. Natural feed when sawing logs makes saw cut fast. Adjustable force feed when sawing trees.

Special Points of Merit Saw finishes cut parallel with ground. No sawing dirt or rocks, no jacking up logs. Only interchangeable Log and Tree Outfit of the kind sold direct. Tree Saw parts make Log Saw a complete Tree Saw. Rig anchors to stump below saw—cuts tree clear down. Saws uphill or downhill, anywhere. Log Saw Outfit sold on our regular

90-Day Test—Lifetime Guarantee

Buy for cash, or, on easy payments, as you wish. Separate Branch Saw Outfit, only \$19.90. Write for the Log and Tree Catalog. It tells all about sawing. We also build stationary engines, all sizes, up to 30 H-P. If interested, ask for Stationary Engine Catalog, and state size. Sent Free on request.

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1747 Oakland Avenue, - Kansas City, Mo.
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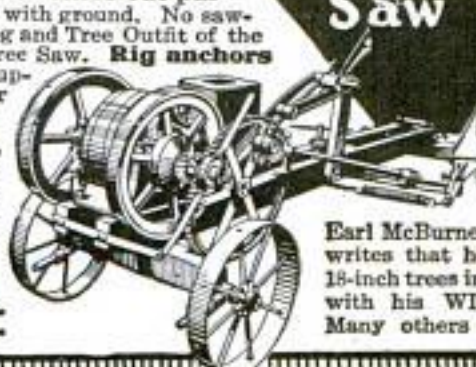
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Now \$75⁰⁰
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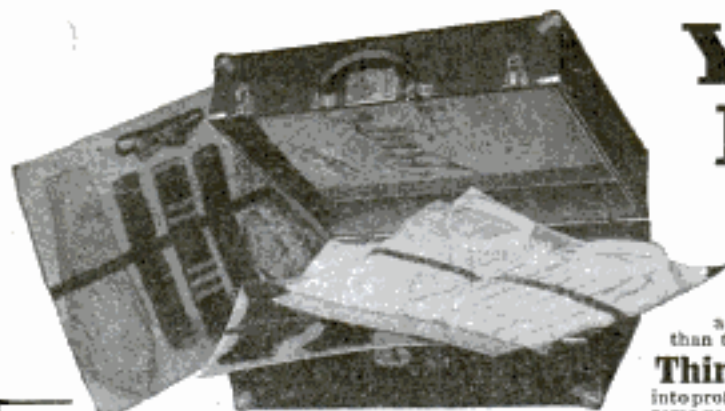
From Pittsburgh \$80

Tree Saw Equipment at Small Cost Additional, Giving You Two Rigs in One, Operated by Same Engine

**Quick
Change
From Log
To Tree
Saw**



Earl McBurney, of Iowa, writes that he cut fifty 18-inch trees in five hours with his WITTE Rig. Many others delighted.



You do not invest one penny. We furnish you with complete when you make the sale. We insure your success by giving you now making \$5,000.00 to \$7,000 a year. **WRITE FOR FULL PARTICULARS AND OUR FREE COURSE IN SALESMANSHIP.**
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Make Your Spare Time Pay You a Profit!

The Wright Line is the most complete line of its kind in the world. Everything that men wear—made-to-measure suits—shirts—hats—shoes—underwear—work clothing—and a full showing of boys' suits. A complete retail clothing store in a sample case. Prices that are 25 per cent to 30 per cent less than the same quality can be bought for elsewhere.

Think What This Means to You! Turn your spare time into profit—add \$25 a week to your income. Every man you know needs some goods in our line. Easy to sell. Profits large. No capital is required. outfit—we carry the stock—we deliver and collect. You get your profit complete Training Course FREE. You follow the methods of men.

Interlox

Always Ready to make instantly accurate

inside or outside measurements. Slides in and out. No slow folding;



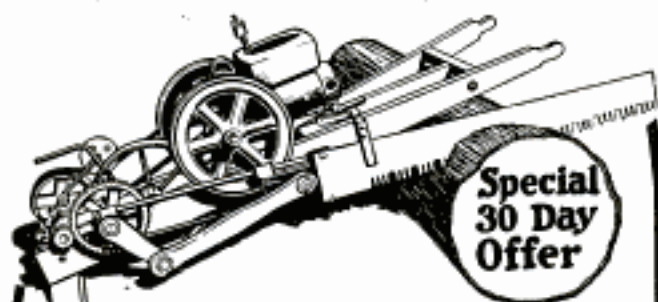
Strong brass-trimmed boxwood. Any length, 2 to 8 ft. If not at your dealer's, sent postpaid.
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 Dealers and agents: Request attractive proposition.

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Wonderful instrument. Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a Pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail, with 300 page Novelty Catalog, ONLY 50¢ or 3 for \$1.25

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Lower factory costs, and closer buying enables us to build this new improved Log Saw and sell it for a lower price. Ottawa's Newest Log Saw saws 8" logs as easily as 5 ft. logs; lighter in weight; easier to move; new non-skidding base; many other wonderful improvements; has genuine Ottawa quality. Write today for Big Free Book and complete information about this new saw.

FREE BOOK

Send Today—a postal will do, and get the Big new book on wood cutting. Valuable and interesting. Get it Now!

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FREE
 Greatest Wood-Sawing BOOK

Protect Yourself!

The bravest man UN ARMED GUN-MAN. Crime is increasing everywhere. Marbe you, your home are next. Be Prepared.



38 CALIBER DOUBLE ACTION AMERICAN MADE



REAL PROTECTION for Life, Home, Money and Your Dear Ones

Heavy Nickel Plated

This genuine H. and R. revolver has safety trigger and every other feature of famous American made guns. Hexagonal barrel. Central fire, double action, 38 caliber, uses S & W Cartridges obtainable everywhere. Five shots, removable cylinder, accurate, fine and ABSOLUTELY SAFE! In fact at only \$5.85 you get everything you need in a revolver, so why pay more!

SEND NO MONEY!

Nowhere else can you get this bargain today! Simply send name and address. Pay postman \$5.85 and a few pennies postage when package is delivered. Wrapped in plain paper. Hurry while this low price remains in effect! Money back if you want it.
LINCOLN NOVELTY CO. Ravenswood Sta. Dept. 50 Chicago



A Five-Thousand Dollar Job Goes Hunting!

An army of men out of work, an army of men feverishly scanning the want-ads in search of a chance to make perhaps twenty or thirty dollars a week—

—While a prominent Chicago business house finds it necessary to invest over \$100 in a single advertisement in a daily newspaper, just to find *one man*—an expert accountant—who will best fill the \$5,000 job which it has to offer!

A serious indictment, this, of the average office man in America, for failing to be *ready!*

Also, a wonderful *tip*—for YOU—if you are willing to devote a few spare hours of your time each week to the mastery of Higher Accountancy!

Make no mistake about the *need* for trained accountants—it has never been so great as today.

Make no mistake about the *opportunities* in this profitable profession—thousands of LaSalle-trained men are today earning from \$3,000 to \$10,000 a year by reason of their expert knowledge in this field. A smaller but very considerable group of LaSalle-trained accountants report even higher incomes.

A. J. Hatton, for example, was promoted from Junior Accountant to Senior Accountant within eight months from the time he commenced the LaSalle course of Higher Accountancy. He writes: "I am at present holding a position as manager of the Fiscal Department of a large financial corporation, with a salary of \$15,000 a year."

Rodney B. Horton, of Savannah, Ga., writes: "At the time I took up the study of Higher Accountancy, I accepted a position at \$75 a month which required only a few hours a day keeping a set of books. Because of making this sacrifice in salary in order to have time for study, I am today a full partner in the above firm (Clayton, Eaton, Horton & Saussy) with offices located at Atlanta and Savannah, and with a net income of \$20,000 per annum. My previous training was very limited, as I was raised in West Texas, where our school terms are from 6 to 9 months, and include only the studies that our present grammarschools give."

Make the Bigger Job Hunt You

Why let next year find you still at the same old desk, performing the same petty tasks and drawing the same inadequate pay, when so simple a thing as marking, signing and mailing the coupon will set you squarely on your path to a bigger job?

Stop losing, start winning—begin this very week to schedule some of your evening hours for advancement!

Under the LaSalle Problem Method, your progress will be *rapid*, for by this remarkable plan you do not merely *read* how to do a thing, you pit your strength against *actual problems*, under the direction of some of the ablest business minds in America.

As a result, you step into that better job *assured* of success—first, because you have already met and mastered the problems of your new position, and second, because you know that LaSalle stands absolutely back of you, ready at a moment's notice to give you authoritative counsel regarding any problem whatsoever that may arise in your daily work. LaSalle not only helps you *land* the better position, it helps you *make good*, every step of the way.

Mail the Coupon

The coupon below will bring complete information regarding the business training that you need for real achievement, together with a wealth of evidence from men still in their twenties and early thirties who have won high-salaried positions by the Problem Method. With this information we will send you details of our *convenient-payment plan*, also your free copy of that inspiring book, "Ten Years' Promotion in One." Get away with a "flying start"—by mailing the coupon NOW.

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The Largest Business Training Institution in the World

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Chicago, Illinois

Please send me catalog and full information regarding the course and service I have marked with an X below. Also a copy of your book, "Ten Years' Promotion in One," all without obligation to me.

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Training for positions as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.

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Name.....

Present Position

Address

Club Feet

Ruby Booth was born with Club Feet. At ten months she was brought to McLain Sanitarium. Photos show result of treatment. Parents' letter tells everything.

When Ruby was 8 months old, a doctor put her feet in plaster paris casts. After 3 months they were no better than when he started. We had given up all hope of a cure, when we heard of McLain Sanitarium and took her there. Her feet are now perfectly straight. I shall never cease to be thankful. Refer anyone to me. MR. and MRS. GEORGE BOOTH, Carbon, Iowa.

FOR CRIPPLED CHILDREN

The McLain Sanitarium is a thoroughly equipped private institution devoted exclusively to the treatment of Club Feet, Infantile Paralysis, Spinal Disease and Deformities, Wry Neck, Hip Disease, Diseases of the Joints, especially as found in children and young adults. Our book, "Deformities and Paralysis," also, "Book of References" sent free.

L. C. McLain
Orthopedic Sanitarium

902 Aubert Ave.,
St. Louis, Mo.
E349



has enabled John G. Anderson, Aurora, Ill., to keep on the payroll since his right arm was amputated some years ago. The reproduction (from an actual photograph) shows Mr. Anderson at work on an intricate machine using his Carnes Artificial Arm.

INCONSPICUOUS - SERVICEABLE

The Best Substitute for the Natural Arm.

To see him on the street you would not realize that his right arm was artificial. Wearers of this wonderful arm find that it practically takes the place of the natural arm. With it you can dress yourself, use knife and fork, carry grips, write, pick up large and small objects—in fact, do practically everything that was possible before. Even though the amputation be at the shoulder, the CARNES ARTIFICIAL ARM bends at the elbow and wrist, and the fingers open and close as desired.

WONDERFUL BOOK SENT FREE Every armless man or woman should write today for the wonderful illustrated 110 page book showing with actual photographs what can be done with this invention. Write today to
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Moles (Also BIG Growths) Dry Up.

Ask for Free Booklet of Full Particulars

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Rheumatic Aches



Use **Sloan's**

Have a bottle of Sloan's Liniment handy in case of sudden attacks of rheumatism, neuralgia, sciatica or lumbago. Also good for lame back, sprains and strains, over-worked and sore muscles.

Penetrates without rubbing. Sold by dealers you know and can trust, 35c., 70c., \$1.40.

Keep it handy

Sloan's
Liniment (Pain's enemy)

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ONE YEAR TO PAY

Know the joy of owning—for business or pleasure—a HARLEY-DAVIDSON, EXCELSIOR, HENDERSON, INDIAN, CLEVELAND, or any other standard make; thoroughly rebuilt in our own factory.

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America's Largest Cycle House
Established 26 years
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Resist the elements of weakness and ill-health that are dragging you down and sapping your very life forces. Get rid of the nagging complaints that make your life a wretched failure. Shake off Catarrh, Constipation, Indigestion, Dyspepsia, Biliousness, Headache, Nervousness, Rheumatism, Asthma, Weak Lungs, Weak Heart, Rupture, and the numerous other results of neglect and abuse. Don't put it off until you are down and out. Get busy NOW.

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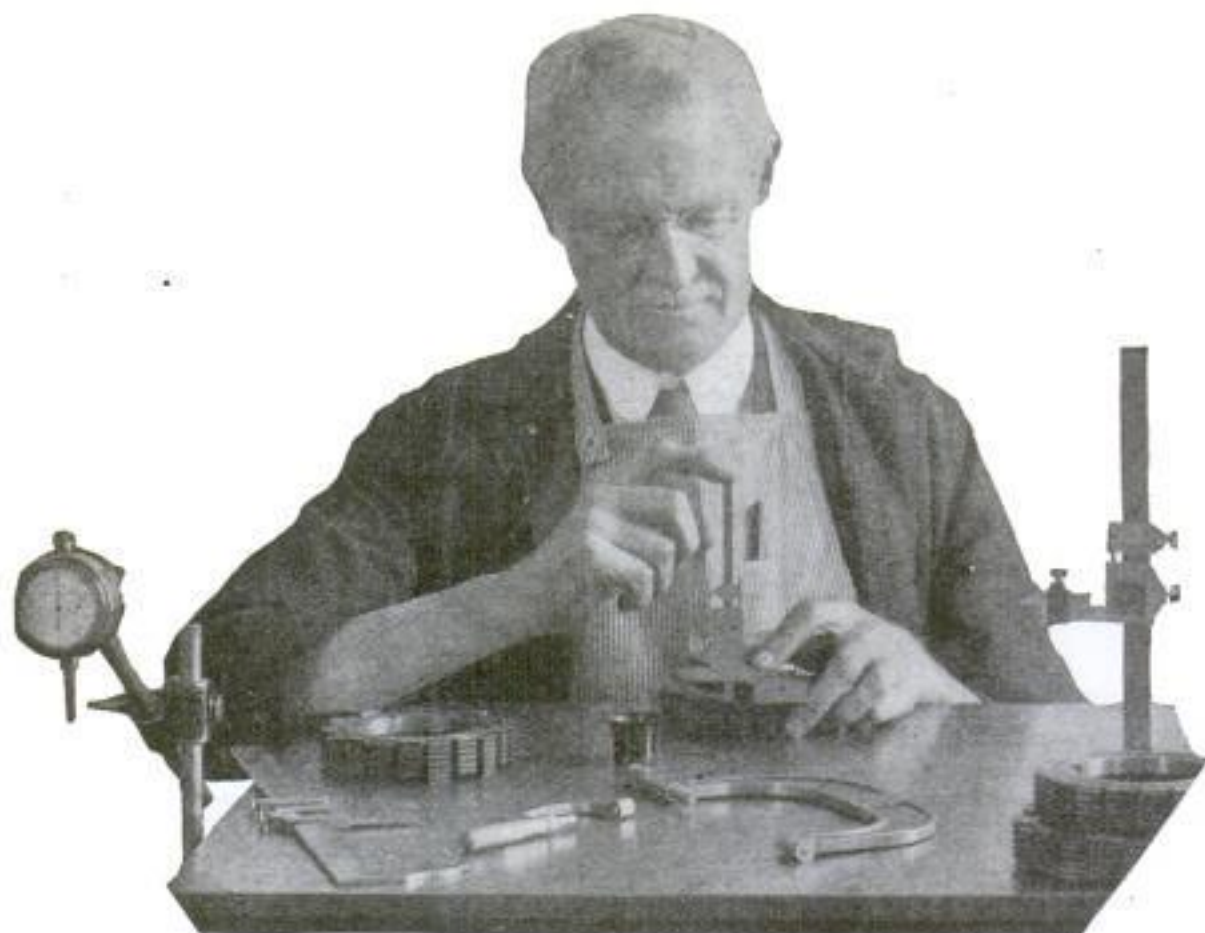
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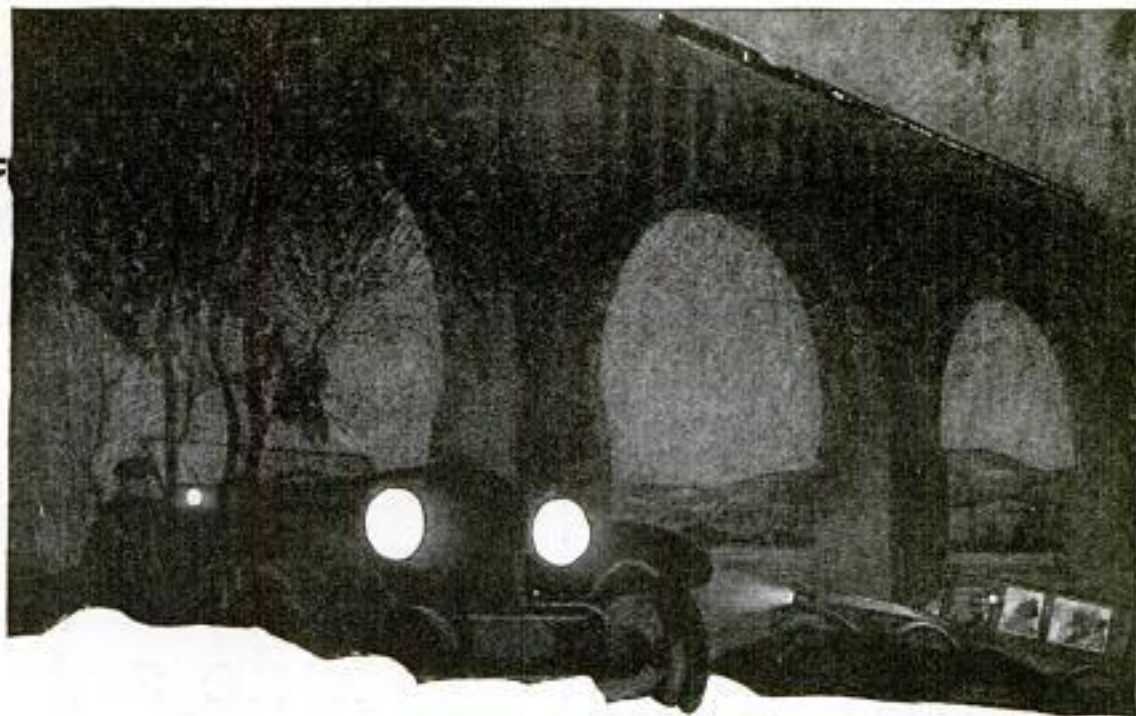
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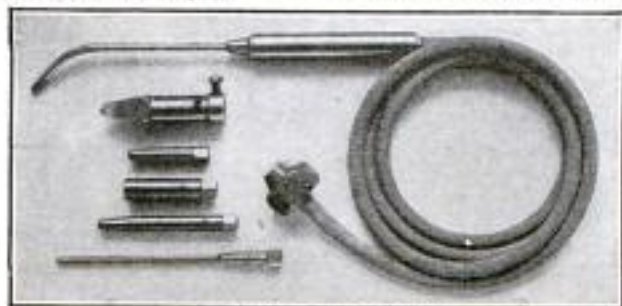
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USES ACETYLENE GAS ONLY

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Handles 4" and 5" grinding wheels, 6" saws, 6" and 8" sand discs and 3/4" chuck. Saws 1 1/2" wood. Mountable on separate base with motor. Height 10". Weight 31 lbs. Top 10" x 12" easily removed. All metal construction. Easily driven by 1/4 HP. motor. Especially suited for Private Shops, Laboratories, Manual Training Schools, Shipping Depots, Printers, Builders, Cabinet and Pattern Makers, Furniture Repairmen, etc. Machine sold with a Money-Back Guarantee.

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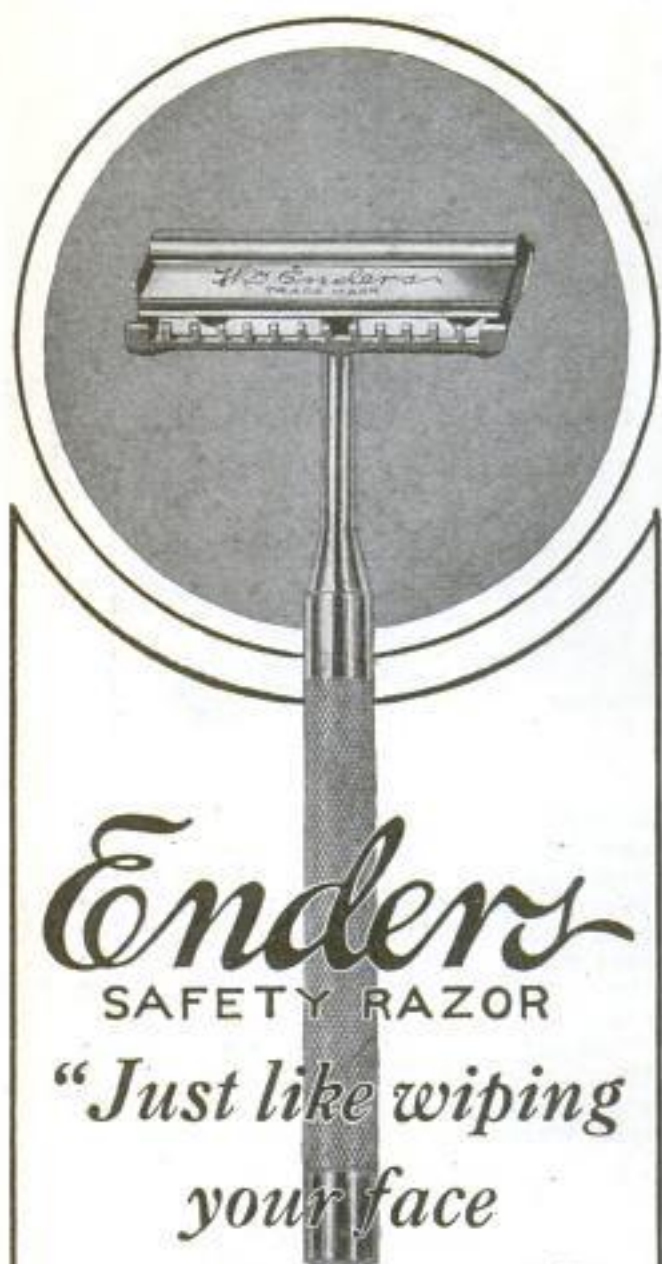
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SAFETY RAZOR


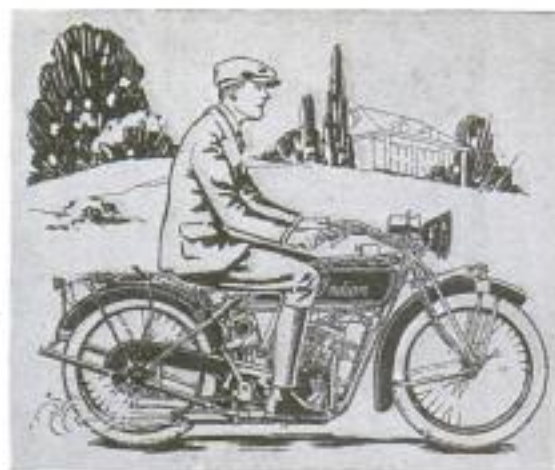
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When you need shoes look for a W. L. Douglas store. We own 107 stores located in the principal cities. You will find in our stores many kinds and styles of high class, fine shoes that we believe are better shoe values for the money than you can buy elsewhere.

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\$7.00
SHOE

THE STAMPED PRICE
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AGAINST
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Pay the
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and postage when the revolver is delivered. We guarantee full satisfaction or money back after examination.

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Guaranteed One Year—Price 75¢

Always insist on NU-WAY or EXCELLO Guaranteed Suspenders, Garters and Hose Supporters.



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Thermometers for inside and outside temperatures

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There's a Tycos Thermometer for every purpose.

"Sugar-Coated" Electricity

Absolutely shockless and painless, overcomes nervousness, banishes aches and pains, renews the vigor of youth and builds healthy, well-developed bodies

THOUSANDS of volts of stimulating, up-building, high frequency electricity—as painless and pleasant as a ray of sunshine—can be sprayed into any weak, diseased or under-developed part of your body. Instantly you will feel its healing, strengthening, tonic effect. You will feel the warm, fresh blood surge to the treated part, bringing with it the tissue-building and disease-fighting forces that Nature provides. Poisons and diseased tissues will be washed away, pains and inflammations relieved and the part treated will be nourished and strengthened. It literally helps Nature **build new bodies.**

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Renulife Treatment is a household remedy in 50,000 homes. We have thousands of testimonials telling of benefits derived in cases where all other treatments have failed.

To get equal satisfaction, be sure that the generator you buy is a genuine RENULIFE. There are many imitators but the genuine RENULIFE Generator is supreme in its field. It is made by a fully responsible company under guarantee of satisfaction or money back. Get the genuine and be sure of maximum benefits.



Starrett Thickness Gage No. 71

Made especially for the Automobile Mechanic

Contains six leaves particularly adapted for adjusting motor tappets. Also useful for gaging slots. The six leaves have, respectively, thicknesses of .0015, .002, .003, .004, .006, and .015. Auto drivers and mechanics have been looking for this tool.

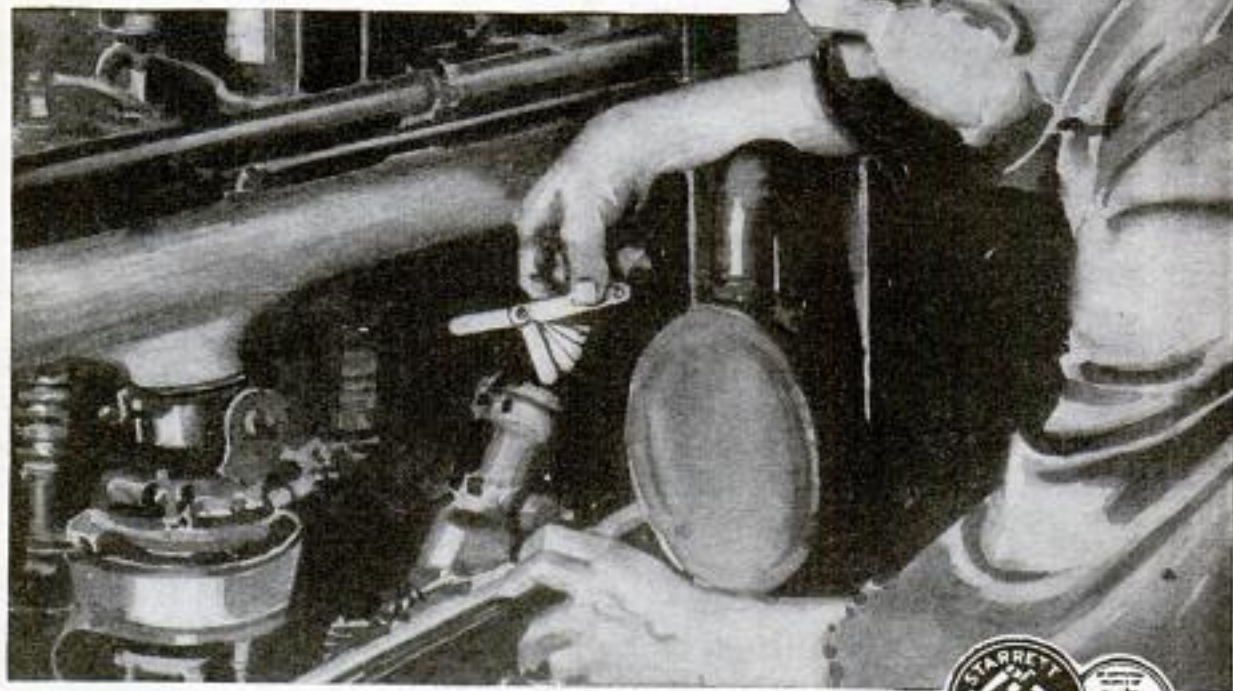
The combination affords scope for gaging dimensions ranging from .0015 to .031. A neat metal case protects the leaves from kinks, and any leaf may be easily replaced by removing the screw stud on which it is pivoted. An eyelet in the case permits the gage to be carried on a ring or hung from a hook. Extra leaves supplied on order.



Full details of this new Starrett No. 71 Thickness Gage and other new Starrett Tools are given in Supplement to Starrett Catalog No. 22 "AP" completely illustrated. Write for copy.

THE L. S. STARRETT COMPANY

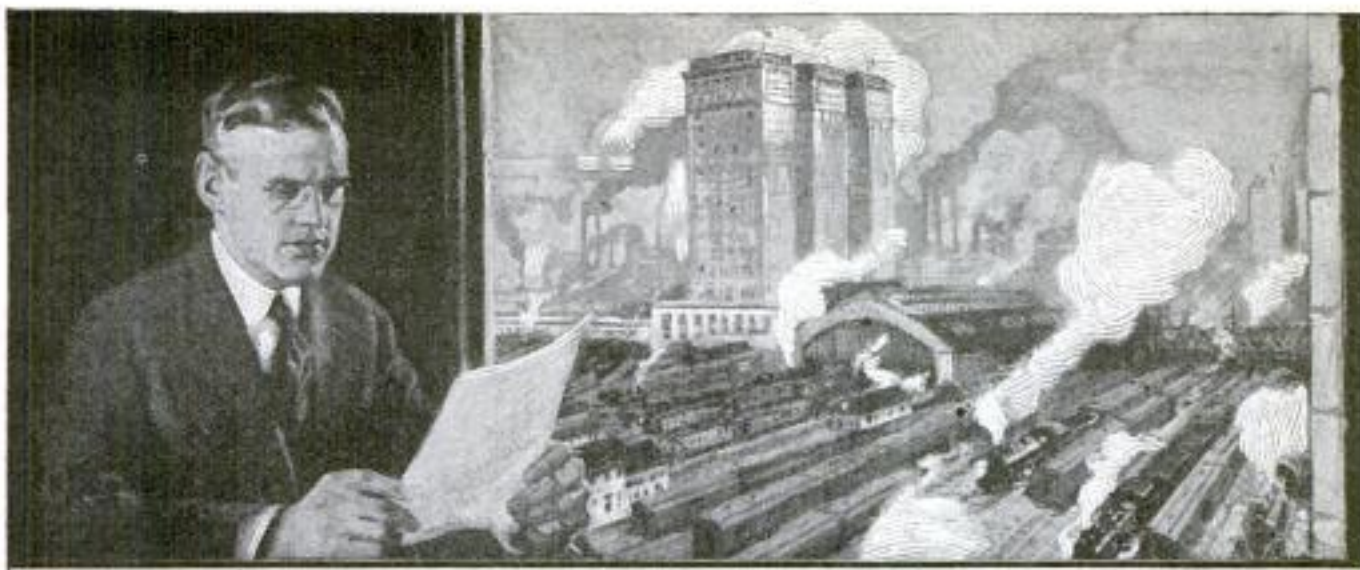
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Manufacturers of Hack Saws Uneexcelled
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43-271



Starrett Tools



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Competent Traffic Managers Earning \$100 to \$200 a Week

Five hundred thousand business firms in the United States are paying freight charges annually totaling billions of dollars. Fifty thousand concerns pay a freight bill of \$5,000 and over every month.

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TODAY—in this era of intense competition upon which Business is entering—

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Here's the way promotions are won in this field of Traffic Management:

A trained traffic man recently pointed the way for a large concern making woodworking machinery to save \$6,000 a month on freight charges simply by making a few changes in construction to permit its bandsaws to be shipped in box cars instead of on flat cars. Result—a salary of \$6,000 a year.

Another LaSalle man—at that time only a rate clerk for one of the big packing companies—discovered by investigation and study that his firm was paying a rate of \$1.60 a hundredweight on certain shipments, as against a rate of \$1.53 to which it was entitled. He recommended the filing of claims with the Interstate Commerce Commission and recovered for his company \$200,000 in cash—\$80,000 of which was refunded by a single railroad company. He is now Traffic Manager for the largest cement company in the world.

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Swift Advancement by the Problem Method

Here, then, is a field in which the *demand* for competent men vastly exceeds the *supply*—a field that affords every opportunity to *show results*—a field in which you are offered every opportunity to qualify—swiftly, surely—right in your own home—under the direction of a Traffic Advisory Council of 150 nationally-known traffic men, who will train you in the practical traffic methods utilized by the most efficient organizations in America.

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The coupon below will bring you complete information regarding the training you are interested in, together with details of our *convenient-payment plan*. With this information we will send you your free copy of "Ten Years' Promotion in One," a book that has inspired thousands of ambitious men to greater achievement.

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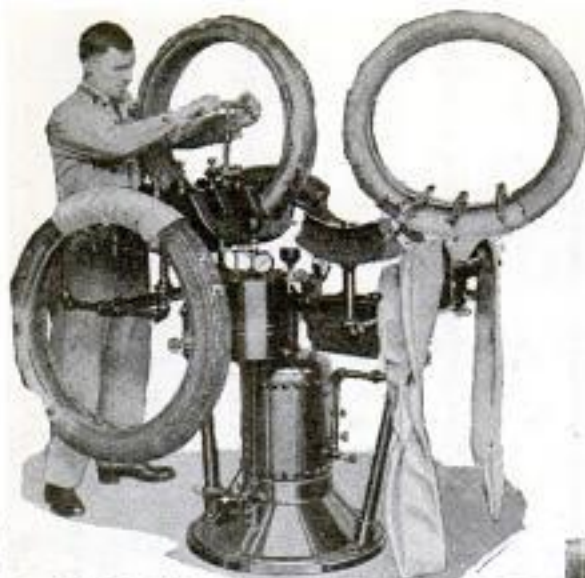
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\$6000.00 YEAR WITH THIS MACHINE

WHAT others have done, YOU CAN DO! \$6,000.00 year is low estimate. Many make more. This new machine and Haywood's Tire Surgery method marvelous. Starts you in paying business quickly. No experience needed. Taught at my school or by mail within two weeks. Very little capital required. It's a bonanza for ambitious men.

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Are you one of the crowd drifting back to 1914 wage scales? Protect yourself! Join the ranks of those who have forsaken jobs, time clocks and bosses! Be among these money makers! Hargan, of Ill., did \$20,000.00 last year. Fetzner Bros., Pa., made clear net profit of \$3,500.00 during first year. Spring City Tire Co., Wis., did about \$26,000.00 to date, and expect year's total to reach \$50,000.00. Ramsay, S. D., working alone, cleared \$441.56 in one month. Wendt, Ind., approximates \$500.00 month. Tucker, Ill., runs high as \$127.00 weekly single handed. Mitchell, Ill., says, "Record day was \$360.00—last month did \$2,600.00." And so on!

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Above successes were made within past eighteen months. These men took advantage of splendid conditions. Right now car owners are economizing. Not buying new tires. Making old ones do. This work Booming Tire Surgery stations with cash business.

Get My Big Proposition

Start like others have done. Get the facts. There's nothing to stop you. I'll help you to the limit. My proposition is highly interesting. My machine is marvelous. Its compact design and size make small, handy shop possible. Its big capacity earns money fast. Send this coupon or postal to me, personally. Write me tonight.

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ONE-HAND-Y



Weight
3 lbs.

Capacity
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The ONE-HAND-Y Electric Drill Rapid, Economical, Indispensable

Application

The ease with which holes may be drilled in metal or wood with the ONE-HAND-Y makes it one of the most desirable tools in existence.

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Its light weight—3 pounds—insures rapid, economical and accurate work, as it can be moved about easily, and can be used constantly without tiring the operator.

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The ONE-HAND-Y is the lowest priced, most economical electric drill on the market.

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Westinghouse, Universal Type, 110, 220, and 32 volt AC and DC. Air cooled. Ample power controlled by switch always under thumb.

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The ONE-HAND-Y—the lightest electric drill on the market—is guaranteed against defective workmanship and material.

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Richly Upholstered
7-Piece Suite

Quarter-Sawed and Solid Oak
Send only \$1 for this complete suite of library, parlor, or living room furniture. Use it 30 days on Free Trial.

If you don't say that it is even more than you expected, ship it back and we return your \$1 and pay transportation charges both ways.

A Full Year to Pay

Only by seeing this splendid quarter-sawed and solid oak suite can you realize how it will add to the appearance of your home. Only by examining it can you appreciate what a record-breaking bargain it is at our smashed price. Furniture like this can be bought nowhere else at near our price. **Handsome Fumed Finish!** TABLE, solid oak with top 24x36 in. ARM ROCKER, solid oak with quarter-sawed top panel and rounded arm rests; seat 18x19 in. SIDE ROCKER, solid oak with quarter-sawed oak top rail, seat 18x14 in. ARM CHAIR, 37 in. high and SIDE CHAIR, 36 in. high, with seat 16x14 in. Table and chairs stand on noiseless glides. Ornamented backs and seats upholstered in durable, imitation Spanish brown leather. Comfortable spring seats. TABOURETTE, 16 1/2 in. high with 10 in. top, is solid oak. BOOK BLOCKS, heavy enough to support a liberal number of volumes. Shipped (fully boxed, "knocked down" to lessen freight charges) from factory in Central Indiana, Western N. Y. State or Chicago warehouse.

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Street Address.....
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Town.....State.....
State Your Occupation.....Color.....

Let Me Pay You \$12 for 15 Minutes of Your Time

\$215 in One Day

"Ye gods—some seller! I made \$215 today!"

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Buys Car With Profits

"Have earned enough in one month to buy me a new auto."

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\$7 Profit per Hour

"I started out and made \$21.50 in about 3 hours. The Oliver does the work. It certainly is the real thing."

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"Sells Like Beer in a Dry Town."

"Am sending today for 7 Oliver's. This is one day's orders (\$85 profit). Selling like beer in a dry town."

W. H. Drew, Mich.

Mr. T's 28th Order in Six Months.

"Ship 52 Oliver's: 10 No. 30; 6 No. 1; 12 No. 2; 24 No. 4." (Mr T's profit on this order alone is \$711).

G. T., Ottawa, Ont.

Russel Earned \$3,300 in Five Months

"Have averaged \$660 profit a month for last six months."

A. M. Russel, Conn.

Carnegie—\$1000 a Month.

"Am making \$1000 per month. I have made big money before, but did not expect so much. Your Burner is just the thing."

J. Carnegie, S. D.

Berger—\$258.50 per Week.

"Send following weekly hereafter: 10 No. 1; 8 No. 2; 4 No. 5."

R. Berger, Ont.

\$11.75 in Ten Minutes.

"I took order for a neighbor. \$11.75 profit in ten minutes."

Mrs. N. B., Hattiesburg, Miss.

\$43 in One Evening.

"I made \$43 last night selling Oliver Burners."

N. B. Chelan, Wash.



B. M. OLIVER

The man who built the **Oliver and Largest Manufacturing Concern for Oil-Gas Burners in the World.** Now he wants to show you how to make \$12 for 15 minutes of your time! Read what he has done for others right on this page.

New Invention Is Sweeping Salesmen Into Big Profits

AGENTS find it no work at all to sell this amazing invention—the Oliver new improved Oil-Gas Burner. They just show it—taking only one minute to connect it—then light it. And the sale is made! This new invention is its own salesman. It sells itself! About 15 minutes does it. The Oliver Oil-Gas Burner is the most timely thing that could be put out. It dispenses entirely with coal and wood when both are now high-priced. It burns the cheapest fuel—oil. It saves a woman work now in times when she is looking for just such things. Just as much or as little heat as wanted, off and on instantly by simply turning a valve. It makes an immediate hit with her. Because in the winter it gives her 3 times the heat of any other method. And in the summer she has heat for her cook stove or range whenever she wants it—but does not have to have a hot, roasting kitchen.

The Secret of Big Money—Any Season of the Year

Of course, now that you know the facts you yourself can understand why this new invention is going over like wildfire! And you can understand why F. W. Bentley made \$215 in one day. Why J. Carnegie made \$1,000 in one month and why hundreds of other agents are cleaning up big too.

These men know the secret of big money. They know a good thing when they see it and they know that the time is ripe for this new Oliver Improved Oil-Gas Burner. They know that this age of high-priced coal and wood makes it necessary for some substitute. They see ships and locomotives being run by oil and big buildings being heated by

YES, \$12 for 15 minutes of your time. This wonderful invention practically sells itself. Just this little short-time demonstration puts the sale over for you. And you pocket the big profit. Read how easily others are drawing down enormous earnings.

No wonder this amazing new invention is bringing fortunes to agents. All over the whole country this new device is doing away with old-fashioned methods of heating with coal stoves, ranges and furnaces. Already over \$1,000,000 worth have been sold. You can readily understand why this new invention—the Oliver Perfected Oil-Gas Burner—is sweeping over the country like wildfire. It does away with all the expense of coal—making every stove a modern oil-gas burner. Saves money, time and drudgery. Three times the best of any other method—right on tap when the housewife wants it. No hot kitchen for housewives in the summer when they don't want it. No wonder agents are riding in on the tide of big Oliver profits.

it. And they know that an invention that makes use of this cheap fuel for every home—and yet does it so as to give more heat than coal or wood—is the thing they want to tie up to.

Big Profits Quickly Made

You too can use this secret of big money. You do not need to be a high-powered salesman. The Oliver's amazing features sell it for you. When people see it they know at once that it is the thing they want. You will realize that this is a proposition that will pay you as big money as it does others. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight but when you have sold one this one will sell several others as soon as your customer's friends and neighbors see it. And thru our special plan you get credit and commissions for every sale in your territory.

You can also make big money just by using your spare time. Note how N. B. Chelan made \$43 in one evening.

Coupon Brings Full Offer

If you want to make at least \$5,000 a year easily, mail this coupon now for our offer. We are not making any extravagant claims about this. We do not have to. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory with private selling rights. The coupon will bring you the facts and will save you writing a letter. But mail the coupon at once.

OLIVER OIL-GAS BURNER AND MACHINE CO.

2014-O Pine Street, St. Louis, Mo.

Oliver Oil-Gas Burner and Machine Co.

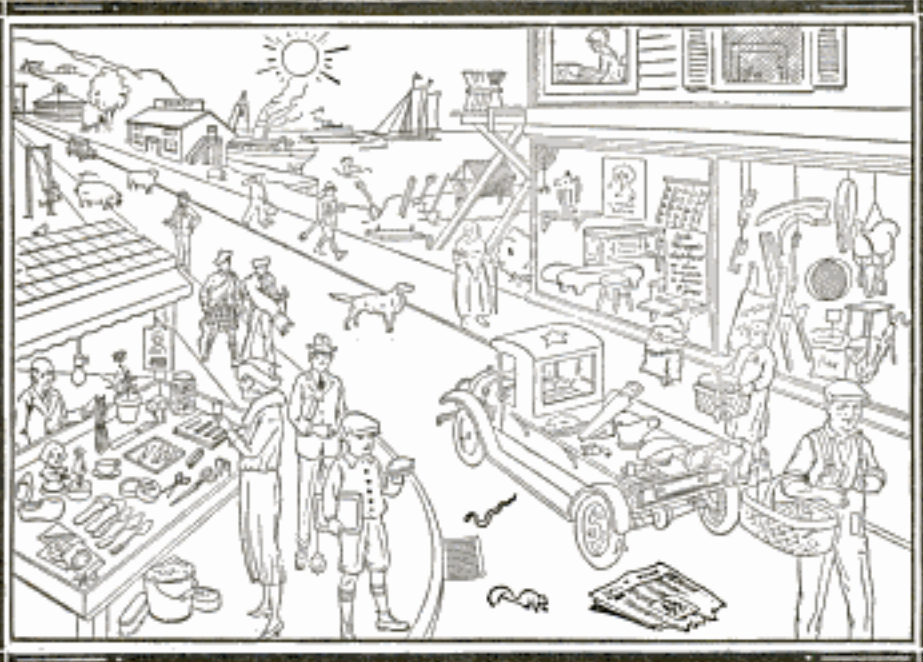
2014-O Pine Street, St. Louis, Mo.

Please send me full facts about how I can make at least \$5,000 a year representing you in my territory. Also your plan if I just wish to make big money in my spare time.

Name.....

Address.....

Win \$5000



Bank Guarantee

State Bank of Philadelphia PHILADELPHIA PA

E. J. REEFER

This will acknowledge your deposit of \$50,000 with this bank which we will hold as a guarantee that the prizes awarded by the judges to the winners of your puzzle contest will be paid.

It is understood that the Cashier of this bank will serve as one of the judges of this puzzle contest as a guarantee that E. J. Reefeer will award these prizes.

Yours very truly,

E. C. KRAUSOFF
PRESIDENT

*How many objects
in this picture
Begin with "S"?*

A Great Big Puzzle Picture Free

Join in this fascinating puzzle game. Work from this picture or send for large size puzzle picture.

Costs Nothing to Try List all the objects you find in picture beginning with "S." You need not buy any Reefeer's Yeast Tablets to win a prize. Open to everybody. Largest and nearest correct list wins first prize of \$50 even if you buy nothing. But look to right! See how you can win \$5000, \$2500, or one of the other 103 biggest cash prizes. \$50 or \$5000, which do you want? Start now. Contest is for the purpose of introducing the latest scientific aid to —

BEAUTY—Health—Vim—Vigor

The world has waked up to Nature's own beauty and health secret. Vitamins!

Reefeer's Yeast Tablets

—embody all 3 necessary vitamins. Help to build up vitality, strength, endurance, induce youthful natural complexion. A food. Has all the elements your body needs to derive the proper nourishment from the food you eat. Send for some today.



E. J. Reefeer, Dept. A-1773. 9th and Spruce Sts., Philadelphia, Pa.

Win the \$5000 Prize

A one package order for Reefeer's Yeast Tablets qualifies your list for first prize of \$750. A two package order qualifies you for \$1500. But if you have ordered five \$1.00 packages and your list is largest and nearest correct, you win \$5000. Study the Prize List.

105 Prizes

Winning answers will receive prizes as follows:

	If no Reefeer's Yeast Tablets are ordered	If one \$1 pkg. Reefeer's Yeast Tablets are ordered	If two, \$1 pkgs. Reefeer's Yeast Tablets are ordered	If five \$1 pkgs. Reefeer's Yeast Tablets are ordered
1st prize	\$50	\$750	\$1500	\$5000
2nd prize	35	375	750	2500
3rd prize	25	200	400	1250
4th prize	25	125	250	600
5th prize	25	75	150	400
6th to 55th prizes, each	2	4	8	25
56th to 105th prizes, each	1	2	4	10

Observe These Rules:

1. The contest is open to every man, woman, girl or boy living in America, except employees or relatives of employees of E. J. Reefeer, 9th and Spruce Sts. There is no entrance fee of any kind.
2. You must use only one side of paper. You must number your list of objects in regular order—1, 2, 3, etc. Your full name and address must be written on each page in the upper right hand corner. Use a separate sheet for anything you may wish to write outside of your list of names and your name and address.
3. English words only will be accepted as they appear in the English dictionary. Obscure words will not be counted. Both the singular and the plural of a word will not count; either one of them may be used.
4. Compounds or words which are made up of two or more complete English words cannot be used.
5. The same spelling of a word will be counted only once even though it is used for different articles or objects, or parts of them. Each article or object can be given only under one name.
6. Two or more people may co-operate in answering the puzzle. However only one prize will be given to anyone household. No prizes will be awarded to more than one of any combination outside of the family where a number—two or more—have worked together.
7. If a contestant sends more than one list under the same name, an assumed name, or a pre-married name, then all lists of such contestant will be

- disqualified. If more than one list is sent by any group or by any members of the same group who have co-operated in the preparation of such lists, then all lists of such contestants will be disqualified.
8. All answers must be received through the mail by E. J. Reefeer, 9th and Spruce Streets, Philadelphia, Pa., and must be post-marked by Post Office closing time, April 10th, 1922.
9. The first prize will be awarded for the answer containing the largest and most nearly correct list of the names of visible objects and articles beginning with "S" shown in the picture. No other consideration, such as neatness, style or handwriting will have any bearing in making the decision.
10. The full amount of any of the prizes will be awarded to each contestant in the event of a tie.
11. The decision will be made by three judges entirely independent of and having no connection with E. J. Reefeer. They will judge the answers submitted and award the prizes at the end of the contest. Participation in the contest carries with it the acceptance of the decision of the judges as final and conclusive.
12. All answers will receive full consideration whether or not "Reefeer's Yeast Tablets" is purchased. At the close of the contest, when all lists have been graded, the names of the prize winners will be announced and the list of words will be sent upon request to any participant who sends us a stamped, addressed envelope.

Copyright 1922, by E. J. Reefeer

JOHNSON'S WOOD DYE



How to Finish Woodwork

The finishing of woodwork—old or new, is just a matter of using the proper materials. The Johnson Line of Artistic Wood Finishes is complete—it includes Johnson's Wood Dye, Perfectone Enamel and Undercoat, Varnishes, Prepared Wax, Paste Wood Filler, Crack Filler and everything necessary for woodwork, floors and furniture.

Johnson's Wood Dye is the proper material to use for staining wood—old or new—soft or hard. For the popular enamel finish on either new or old work use Johnson's Perfectone Undercoat and Enamel. Made in White, Ivory and French Gray.

For refinishing old woodwork, floors and furniture in color where you do not care to go to the trouble or expense of removing the old finish, apply one coat of Johnson's Sani-Spar Varnish Stain. Made in four beautiful shades.

This Book on
Home Beautifying

Free!

This book gives complete instructions for finishing all wood—hard or soft, old or new. Tells how inexpensive soft woods may be finished so they are as beautiful and artistic as hardwood. Explains just what materials to use and how to apply them. Includes color card—gives covering capacities, etc. Use coupon.

S. C. Johnson & Son, Dept. PA 3, Racine, Wis.

Please send me, free and postpaid, your Instruction Book on Wood Finishing and Home Beautifying.

NAME.....

ADDRESS.....

CITY & STATE.....

Dealer's Name.....

Are You Building?

If so, you will find our book particularly interesting and useful. It will tell you how to do the work yourself or enable you to talk intelligently on the subject to your architect and contractor. Our Individual Advice Department will give a prompt and expert answer to all questions on interior wood finishing—without cost or obligation.

S. C. JOHNSON & SON, Dept. PA 3, Racine, Wis.
"The Wood Finishing Authorities"
Canadian Factory—Brantford

FREE TRIAL

No Money Down

13c a day soon buys an Oliver Typewriter—latest model

Before you realize it you have this splendid Oliver paid for. And you get to use it right away — while you pay.

To begin with, you save \$50.50 on the price, for we now sell the standard \$100 Oliver for \$49.50 cash, or you can save \$45 if you pay the installment price of \$55. It is our latest and best model, the No. 9, brand new.

We are able to make these great savings for you through the economies we learned during the war. We found that it was unnecessary to have great numbers of traveling salesmen and numerous, expensive branch houses through the country.

We were also able to discontinue many other superfluous sales methods.

You may buy direct from us, via coupon. We even send the Oliver for five days free trial, so that you may act as your own salesman. You may use it as if it were your own. You can be the sole judge, with no one to influence you.

Used by U. S. Steel Corporation, New York Central Lines, National City Bank of New York, Encyclopedia Britannica, New York Edison Co., Otis Elevator Co., Boston Elevated Railways, and other big concerns.

Now \$49.50



\$100 Value

Let us send you the Oliver for Free Trial. The coupon brings it.

If you agree that it is the finest typewriter, regardless of price, pay \$49.50 cash for it, or \$55 in installments—\$3 after trial, then \$4 per month.

If, after trying it, you wish to return it, we even refund the out-going transportation charges. So the trial does not cost you a cent. Nor does it place you under obligations to buy.

Our new plan has been a tremendous success. We are selling more Olivers this way than ever before. Over 500,000 Olivers have been sold! Oliver popularity is increasing daily.

This, the Oliver 9, has all the latest improvements. It is noted for its sturdiness, speed and fine workmanship. It is handsomely finished in olive enamel and polished nickel. If any typewriter is worth \$100, it is this Oliver, for which we now ask only \$49.50, after its being priced for years at \$100.

Mail the coupon for EITHER a free trial Oliver or further information. Be your own salesman and save half. This is your great opportunity.

Canadian Price, \$79

The **OLIVER** Typewriter Company
1093 Oliver Typewriter Bldg., Chicago, Ill.

This coupon brings you a Free Trial Oliver without your paying in advance. Decide yourself. Save half. Or this coupon brings further information. Check which you wish.

THE OLIVER TYPEWRITER COMPANY,
1093 Oliver Typewriter Bldg., Chicago, Ill.

Ship me a new Oliver No. 9 Typewriter for five days' free inspection. If I keep it I will pay \$55 as follows: \$3 at the end of trial period and then at the rate of \$4 per month. The title to remain in you until fully paid for. If I make cash settlement at end of trial period I am to deduct ten per cent and remit to you \$49.50.

If I decide not to keep it, I will ship it back at your expense at the end of five days.

My shipping point is
 Do not send a machine until I order it. Mail me your book—"The High Cost of Typewriters—The Reason and the Remedy," your de luxe catalog and further information.

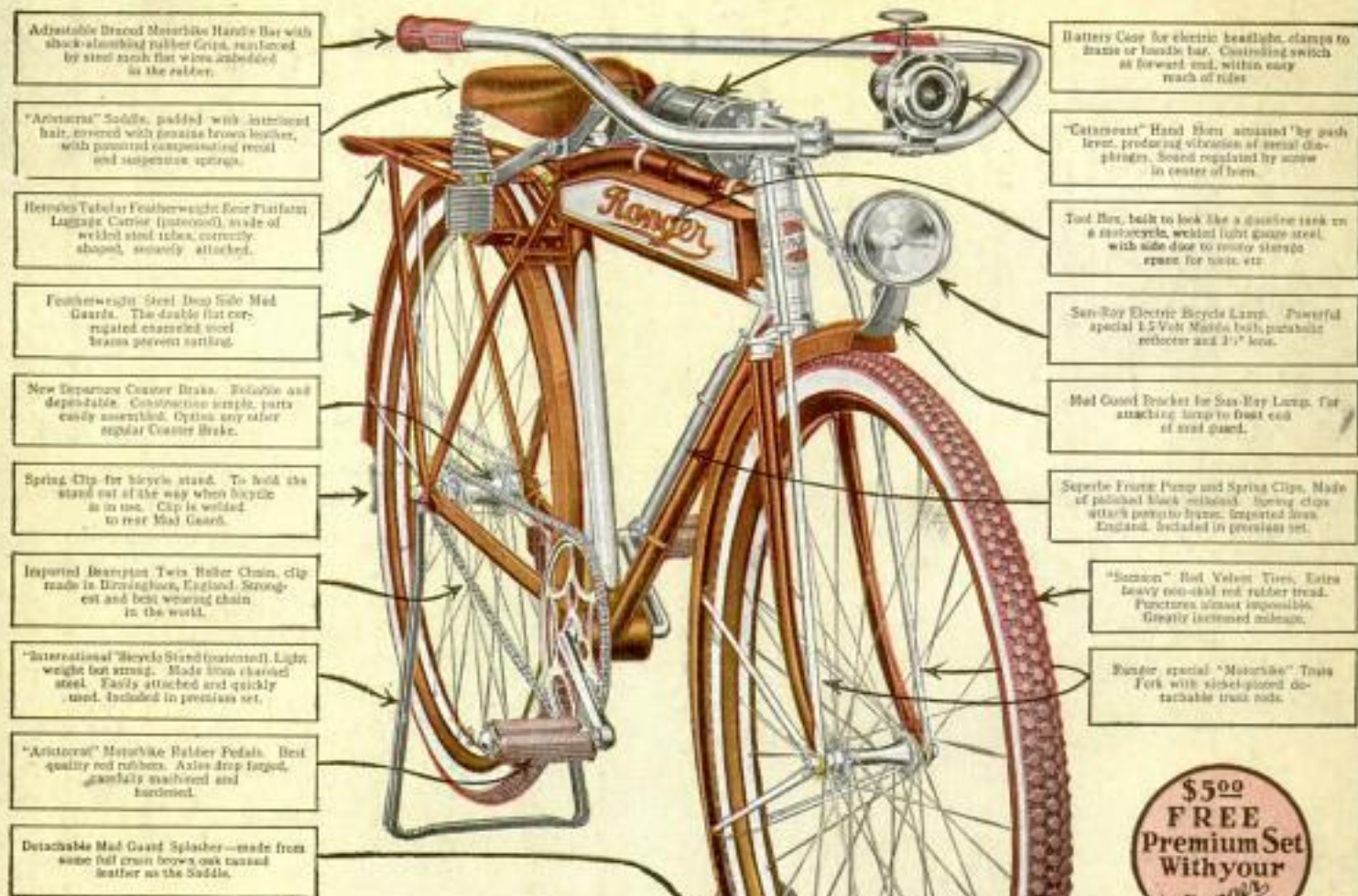
Name

Street Address

City State

Occupation or Business

1922 Ranger = 100% Equipped



Adjustable Braided Motorbike Handle Bar with shock-absorbing rubber Grip, reinforced by steel mesh flat wire imbedded in the rubber.

"Artists' Saddle, padded with imported hair, covered with genuine brown leather, with patented compressing recoil and suspension springs.

Removes Tubular Featherweight Rear Platform Luggage Carrier (patented), made of welded steel tubes, correctly shaped, securely attached.

Featherweight Steel Drop Side Mud Guards. The double flat corrugated channelled steel beams prevent rattling.

New Departure Center Brakes. Reliable and dependable. Construction simple, parts easily assembled. Option any other regular Center Brake.

Spring Clip for bicycle stand. To hold the stand out of the way when bicycle is in use. Clip is welded to rear Mud Guard.

Imported Besanton Twin Roller Chain. Clip made in Birmingham, England. Strongest and best wearing chain in the world.

"International" Bicycle Stand (patented). Light weight but strong. Made from channelled steel. Easily attached and quickly used. Included in previous set.

"Artists'" Motorbike Rubber Pedals. Best quality red rubbers. Axles drop forged, carefully machined and hardened.

Detachable Mud Guard Splasher—made from same full grain brown oak tanned leather as the Saddle.

Battery Case for electric headlight, clamps to frame or handle bar. Controlling switch at forward end, within easy reach of rider.

"Caterpillar" Hand Horn activated by push lever, producing vibration of metal diaphragms. Sound regulated by screw in center of horn.

Toot flux, built to look like a genuine tank on a motorcycle, welded light gauge steel, with side door to easily storage space for tools, etc.

Sea-Ray Electric Bicycle Lamp. Powerful special 1.5 Volt Mazda bulb, parabolic reflector and 1 1/2" lens.

Mud Guard Bracket for Sea-Ray Lamp. For attaching lamp to front end of mud guard.

Superbe Front Pump and Spring Clips. Made of polished black metal. Spring clips attach to pump to frame. Imported from England. Included in previous set.

"Samson" Red Velvet Tires. Extra heavy non-slip red rubber tread. Punctures almost impossible. Greatly increased mileage.

Ranger special "Motorbike" Tread Fork with side-mounted detachable tread rods.

\$5.00 FREE Premium Set With your Ranger

There are 44 styles, colors and sizes in the famous line of **RANGER Bicycles** a model to suit every taste and any pocket book.

30 Days Free Trial We want you to see for yourself what wonderful values are found in Ranger bicycles with their complete equipment of accessories and extras. Therefore, send today for the Ranger catalogue and select the model you prefer from 44 styles, colors and sizes. Ride it for thirty days, test its speed, sturdy qualities, deluxe equipment and many exclusive features. If at the end of thirty days you want to return it for any reason, send it back and you will not be out one cent. In addition to all the accessories usually found on bicycles, we give you with the Ranger Motorbike model, (as illustrated), over \$25.00 worth of extra equipment and a \$5.00 (extra) Premium Outfit. Where else can you get such value for your money?

Direct From Factory When you buy a Ranger you do business direct with the makers, at factory prices. For more than a generation Mead Ranger bicycles have been recognized everywhere as giving the most for the money in complete equipment, style, long life, finish and freedom from repairs. Every Ranger is backed by a factory guarantee for five years.



12 Months to Pay

To make it easy for you to own a Ranger of your choice, we will arrange with you to accept twelve small monthly payments, enabling you to take advantage of our rock bottom factory-to-rider cash prices—only a slight amount is added to the factory-to-rider price to cover cost of extra book-keeping. Pay while you ride and your Ranger will pay for itself with money that you save and earn.

WRITE TODAY Send no money. Just the coupon or a postcard. Get our big FREE catalogue. Select your Ranger and we will send it to you for thirty days free trial, express charges prepaid.

MEAD CYCLE COMPANY
 Dept. P-108, Chicago, U. S. A.

Send me the new Ranger Catalogue, factory-to-rider wholesale prices, 30-day Free Trial Offer and Easy Payment Terms.

Name.....
 R. F. D. or
 Street No.

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

FACTORY DISTRIBUTORS IN 264 CITIES

The nearest city (with a population of 25,000 or more) which I can conveniently visit to select a Mead Ranger is.....

If you have a Special Factory Distributor there, send me letter of introduction to him so I can inspect the Rangers and take delivery from there at Factory prices or on Easy Payment Plan if I prefer.

MEAD CYCLE COMPANY
 DEPT. P-108 CHICAGO U.S.A.