

X-Ray the Leak in a Pen

X-RAY a regular fountain pen sitting point up in a vest pocket. What will you see? At the top a feed tube full of ink; in the middle a space of air; and at the bottom a deep pool of ink.

X-ray what happens when the heat of the body warms the pen in your pocket and causes the air in the middle to expand like any heated gas. What will you see? The ink in the feed tube ascending to the pen point and oozing out, smearing the writing end of the pen, and the writer's fingers when he takes off the cap and commences to write.

X-ray a Parker Fountain Pen the instant it is turned point up. You see the ink in the feed tube running down instead of up—down into the pool of ink below. Why? Because the Parker feed tube is curved at the bottom end—curved over against the wall of the barrel. The end of this curved feed tube touches the wall, and that touching causes a suction that sucks all the ink out of the tube—sucks it out of the way before the warm air ascends.

What makes this suction? The same force of Nature that makes a dandelion stem suck water, or a lamp wick draw oil, *i.e.*, capillary attraction.

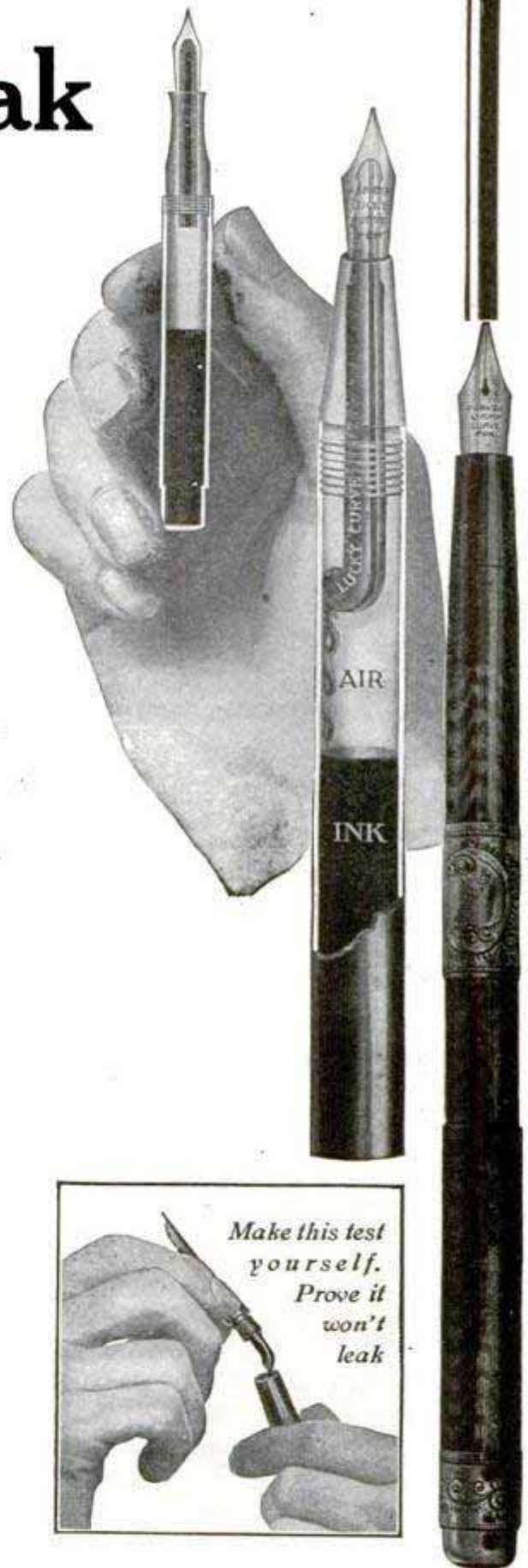
Fill Parker feed tube with ink, touch curved end to barrel wall, as in test picture, watch the ink scoot down, proving thereby that the Parker Pen will not leak.

Parker Pens flow any ink, with never a hitch or skip; all styles, self-filling, safety and standard; plain, gold or silver mounted, with 14-K gold pen, iridium point; prices \$1.50 to \$250. New disappearing clip is out of the way while you write.

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My system of teaching by mail is a New Idea—it's different from others. I will so thoroughly train you that you will not only be able to drive a car, but you can repair motors, overhaul cars, repair tires, repair launch engines, repair stationary gasoline engines—you could go into the repair business—and also sell cars and engines.



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—Ramsey Stewart, Jansen, Utah.

"I am working in a repair shop. Have increased my income \$20 more per month so far and expect to get as high as \$50 more per month."
—Jno. C. DeKoster, Lynden, Wash.

"I am now working in the American Auto Co., was formerly in the jewelry business."
—James Tronto, Providence, R. I.

"I am now driving a Packard 30. Your Course helped me wonderfully."
—Edw. Hauler, New Orleans, La.

"I am driving a 'Winton Six.' I do all my own repair work."
—Edw. Sawyer, Montclair, N. J.

"Your Course enabled me to get a good position which has increased my income."
—Geo. E. Davelarr, Prosser, Wash.

"I was formerly farming, but am now in the auto repair business."
—Geo. Millholke, Rheinbeck, Iowa.

SEE THIS WORKING MODEL

There are other models: one of a Magneto, Engine and Carburetor, Transmission, Clutch, Differential; also a Manikin of an automobile. The Manikin can be taken apart and the models actually work. All moving parts on the models made of real metal.

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You are safe in dealing with me. I allow you two days trial examination. If you are not satisfied, return the course and your money will be refunded promptly. Why Don't You Make Your Start—NOW?

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(A. L. Dyke is the man who originated the first Auto Supply Co. in America)

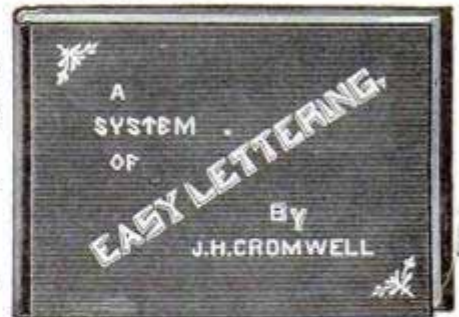
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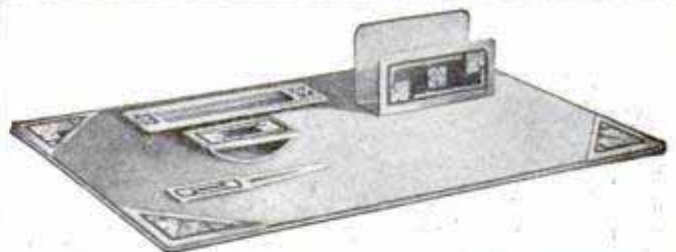
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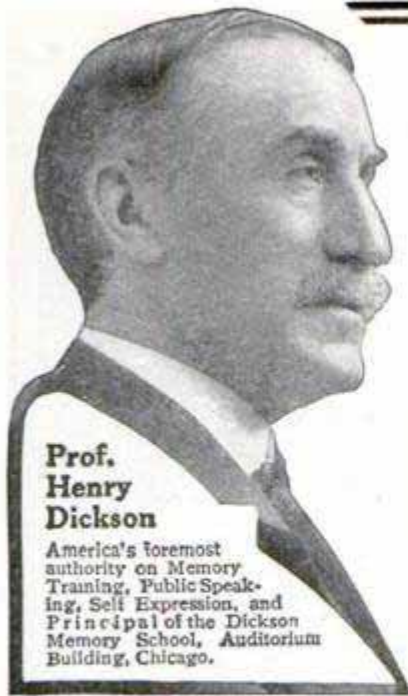
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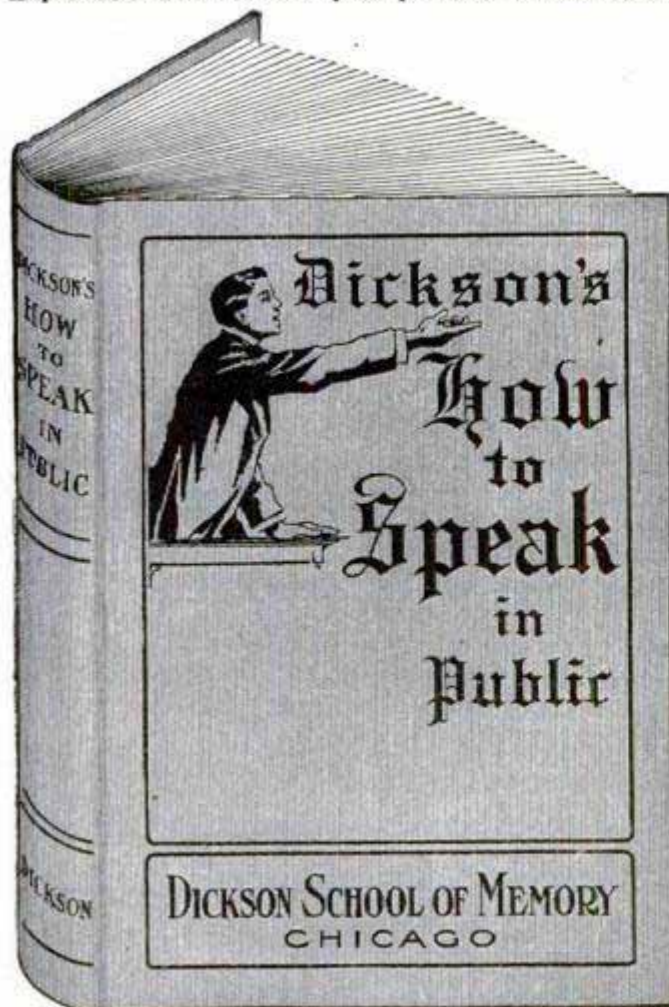
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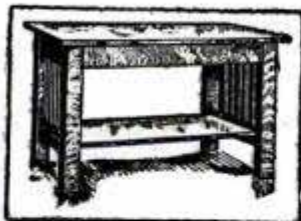
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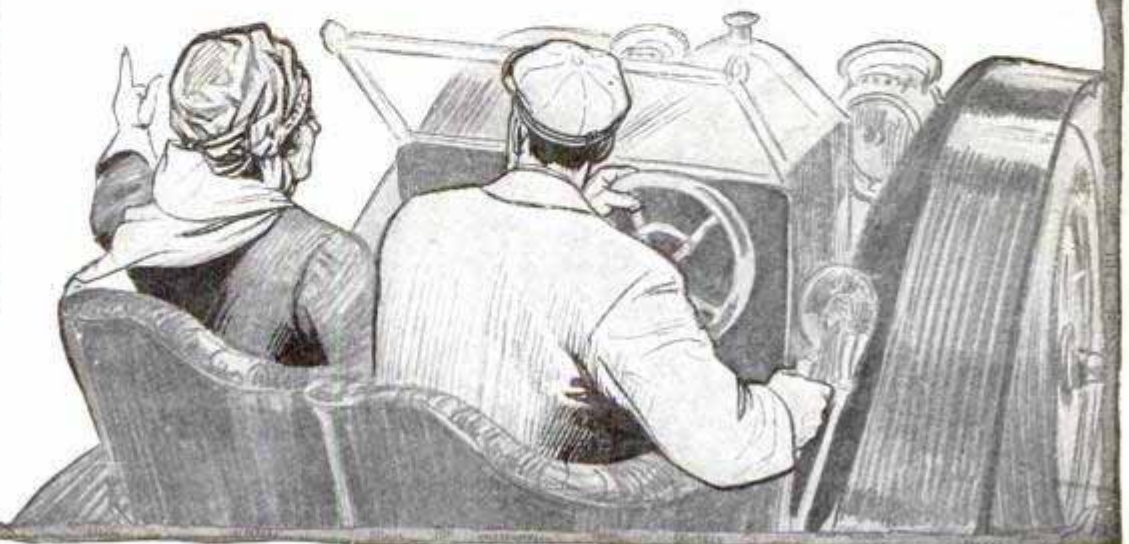
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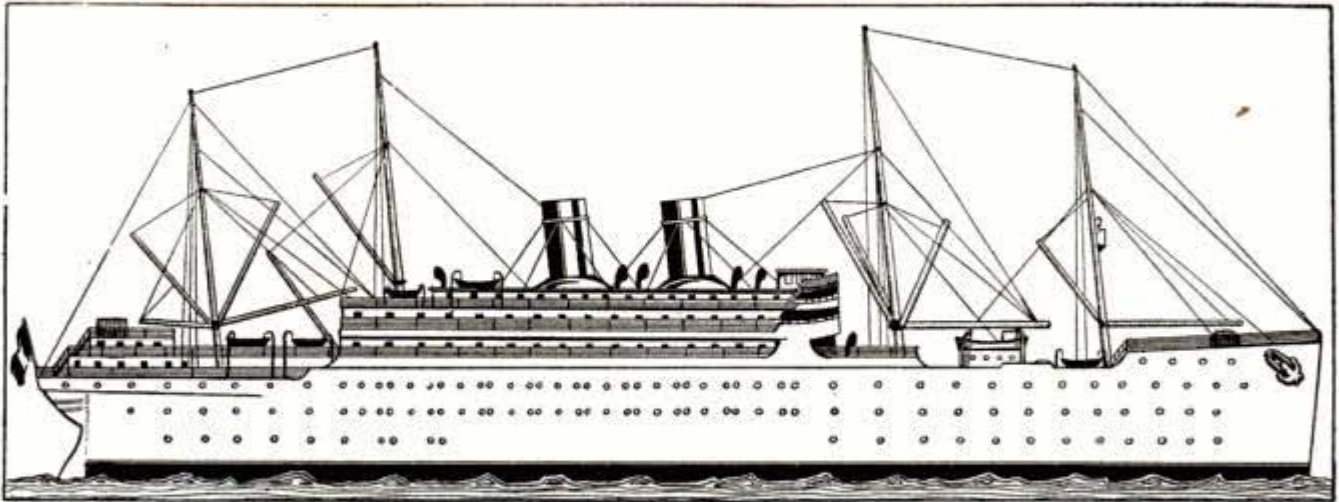


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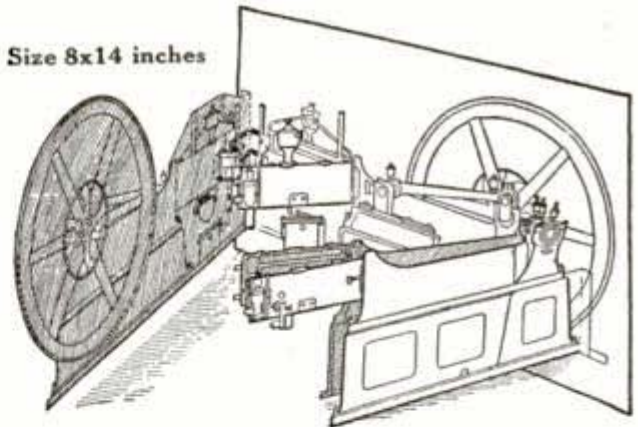
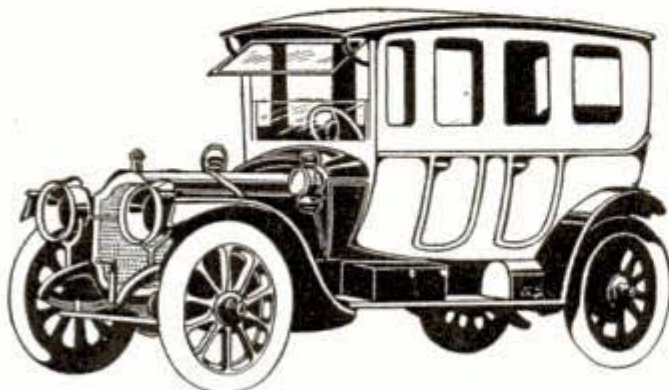


Illustration shows how parts separate



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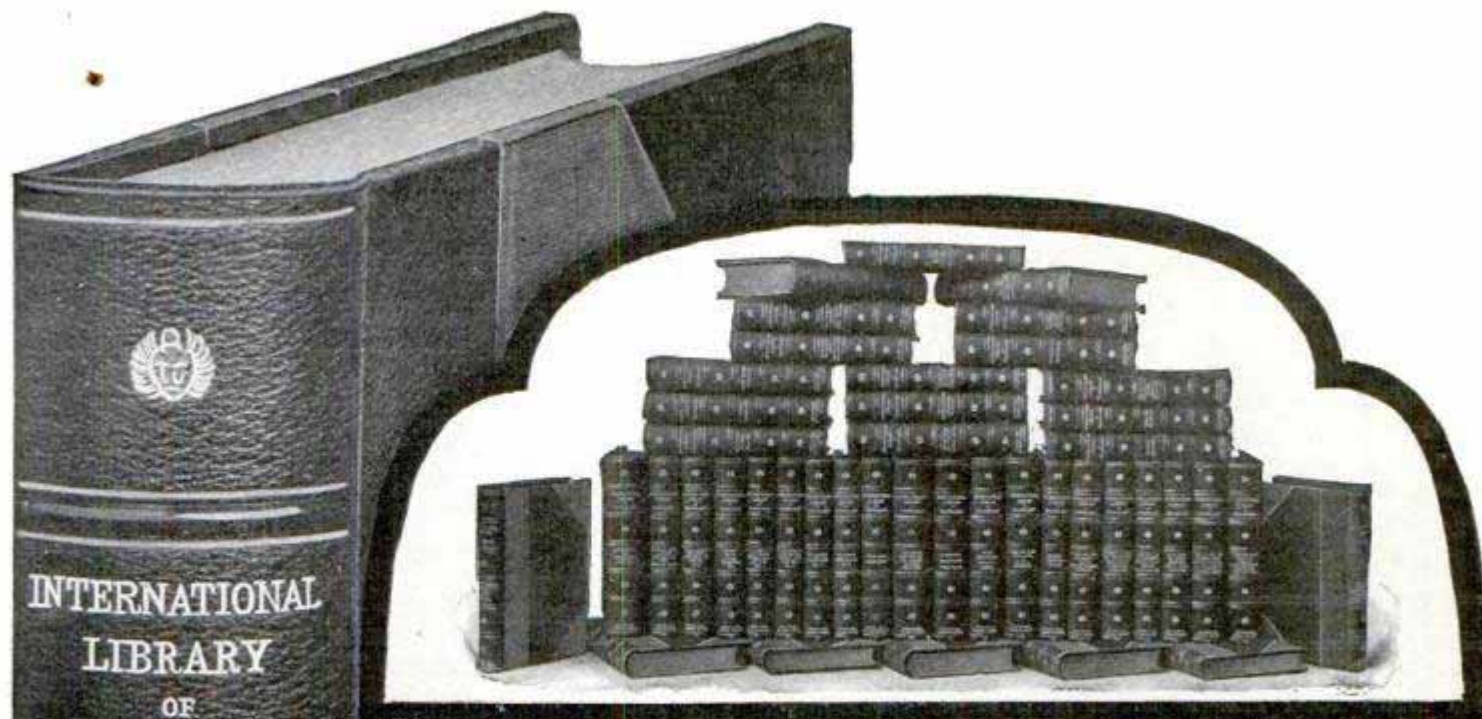
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I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Hancock, Lockport, N. Y.

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OUTFIT FOR BEGINNERS in profitable window sign letter business. Burkhard Co., Butler, Pa.

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ACCOUNTS COLLECTED EVERYWHERE. Legal opinions for business undertakings. Charles Fitzgerald, Lawyer, Reanoke Building, Chicago.

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GREAT SUIT OFFER! Just write us and we will send you absolutely Free, by return mail, postpaid, a large outfit containing a big variety of cloth samples, fashion figures, tape measure, order blanks, etc. Everything Free, and we will start you in a paying business. A most liberal offer on a suit for yourself that will make you wonder. Terms, conditions and privileges that will astonish you. We will name you so much lower prices on men's fine clothing that it will surprise you. We want a live agent in your town. You can make \$1,000 to \$2,000 per year. If you will write us before we get an agent in your town you will get a wonderful offer. As soon as we get an agent in your town he will get profits on every dollar we sell in his territory. We turn all our business over to him. That's why our agents make so much money. If you want a suit for yourself Answer Quick, before we get an agent in your town, you will then get all of our great inducements. Address Dept. 468, American Woolen Mills Co., Chicago, Ill.

AGENTS. DON'T BOTHER with cheap trashy jewelry and tableware—it injures your reputation. Sell at low prices dependable sterling and plated silverware, jewelry, leather goods, razors, toiletware, fountain pens and novelties. Watches and diamonds at cut prices. We prepay all express and mail charges—our line of 3,000 absolutely reliable and fully guaranteed quick-selling articles is the largest and best offered by any agency company in the world. Write today for free catalog of 750 pictures and particulars about agents' free sample outfit. A. W. Holmes & Co., Dept. B-10, Providence, R. I.

AGENTS: To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profit; sales driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 211 Opera Place, Cincinnati, Ohio.

AMAZING INVENTION—Entirely new lamp burner. Changes ordinary kerosene illumination into beautiful large white gas light. Guaranteed Smokeless. Odorless. Not a mantle. Can't break. Unlike others. Brings you quick sales, large profits. Show ten, sell nine. Only 35c retail. This territory just opened. Act now. "Radiolite," 364 Colonnade, Toledo, O.

AGENTS, VELOX RAPID POLISHING CLOTH cleans and polishes all silver and light metal instantly without the aid of polish. It does the work in half the time and outbids the best silver polish ever devised. Rapidity is its watchword! No dirty household with Velox in drawer. Indispensable to the masses. Full sample, particulars 10c. Velox N, 1019 Washington Ave., New York.

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WANTED: One live man in each town to take orders for men's made to measure clothes. No money required. Latest styles and lowest prices. You can build up a permanent business and make a splendid salary each day. We pay express, ship subject to examination and guarantee fit. Send your name quick for agency and free samples. We use the Union Label on all our garments. Regal Tailoring Co., 244 Regal Bldg., Chicago.

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GOOD LIVE AGENTS wanted everywhere to sell our new combination pencil holders for telephones. The most novel and useful article ever placed on the market. Remarkable seller. Large profits. Write at once for free particulars. Sample 25 cents. The Wm. W. Bythiner Mfg. Co., 308 Race St., Philadelphia, Pa.

EVERYBODY CAN SHINE THEIR SHOES with ease, convenience and economy by using the Kroll Patent Shoe Polisher. In tremendous demand. Agents making piles of money. Write today for exclusive territory. Adam J. Kroll, 600 Blue Island Ave., Chicago.

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GOVERNMENT RECOMMENDS use of our leader in every home. Other fast sellers. Big money quick. Samples and catalogue free. A. Kling and Brother, Mill St., North Brookfield, N. Y.

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AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

YOU CAN MAKE \$\$\$\$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, Newark, N. Y.

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WE MANUFACTURE an article indispensable to telephone users; sells on sight; send 25c in coin for sample, territory and particulars; sample money refunded on first order. Columbia Manufacturing Co., 212 King St., Alexandria, Va.

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I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306,

FREE GOLD SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice pleasant business. Write today. Metallic Mfg. Co., 460 N. Clark, Chicago.

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AGENTS. Sell every business man in your town an Adding machine for \$1.00. Big profits. Particulars Free. The Pen Cap Check protector, another lightning seller, sample 20c. Address L. Bassett, 5921 Indiana Ave., Chicago.

OVER 100% PROFIT. New Patented Article. Needed in every home. Big four in one cleaner. Has many uses. Easy to sell. Write today. Sterling Mfg. Co., 5th Ave., Racine, Wis.

AGENTS TO COVER EXCLUSIVE TERRITORY and sell physicians. Established line, liberal commission, weekly advance. Address Rehman Company, 1123 Broadway, New York.

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AGENTS—We manufacture specialty never placed on market before. Not for sale in stores. Household necessity. Sample and particulars 10c. LeRoy Specialty Co., 76 Park Place, Room 52, New York.

\$50.00 PER WEEK for the agent selling our new invention. Necessary article in every home. No competition. Territory exclusive. Write today for our proposition. National Stove Pipe Holder Company, Ottawa, Ohio.

GOVERNMENT RECOMMENDED specialty. Big seller. Big money. Sample and catalog free. Rehson Company, Elmira, New York.

PERFUME GLOSS IN STARCH makes clothes white as snow, and leaves lasting perfume of Fresh Azure Violets. Sample 4 cents. Agents wanted. Shipman Agency, Dept. D, Buffalo, N. Y.

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MATCH VENDING MACHINES Sell Easily Everywhere. Agents paid liberal commissions. Geo. A. Bayle, Second and Elm Sts., St. Louis, Mo.

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AGENTS WANTED—Rubber stamps and novelties. Send 4c for full particulars. A. S. Mankin & Co., Alexandria, Va.

THE NOEL KEROSENE MANTLE LAMP beats electricity, gas or gasoline. The most economical light to burn. A whirlwind seller. Customers delighted. Agents write for territory. John S. Noel Co., 10th St., Grand Rapids, Mich.

AGENTS TO SELL new Automatic device. Big profits. Unworked field. Write today for our profitable offer. Superior Wrench Co., Box 900, Marshalltown, Iowa.

BUILD UP A PERMANENT BUSINESS of your own. Represent us exclusively in your territory. No canvassing. Repeat orders. We, as manufacturers of patented specialties, want "live" men on our original selling system. Everything complete for you to start at once. Field unlimited. If you mean business write today. J. M. Pease Mfg. Co., 182 Pease Bldg., Michigan St., Buffalo, N. Y.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS DON'T HESITATE, write at once. Best proposition on the market. \$25 to \$50 weekly easy, \$100 to hustlers. Monroe Ownby, 226½ W. Texas St., DeWison, Texas.

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\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, M. O., Chicago, Ill.

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WANTED—AGENTS AND CANVASSERS everywhere to sell Kerolene Inhalers—newest and most scientific remedy for hay fever, catarrh and asthma which sells for \$1.00. Write at once for territory rights for sale to responsible parties. Kerolene Inhaler Breeze Co., Cupertino, Cal.

AGENTS—BOTH SEXES—We manufacture and control the fastest selling household specialty ever invented. P. M. Connelly, 123, Liberty, New York.

WANTED: High class, experienced agents. New subscription work. Leads furnished. Give references. Saalfeld Publishing Company, Akron, Ohio.

AS YOU CAN CLEAR \$30 weekly year round mailing music evenings, why look further? Send 10c for facts, proof and beautiful new sheet music to Weber Music Co., 3527, Boston, Mass.

FOR MEN'S TAILORING. Easy work. Big pay. Sample outfit free. Banner Tailoring Co., Dep. 135, Chicago.

READ THIS. \$5 daily with \$1 capital. Very new. Costs 10c or less. Sells for \$1. Weeks' supply carried in pocket. Sample, 5c stamps. A. M. Hayes, West Somerville, Mass.

AGENTS—Our household necessity sells for 50c, costs you little, enormous sales. Jersey Supply House, Washington, N. J.

FORMULAS, Orangeade Powders, Root Beer, Lemon Beer; three, 25c; one, 10c. Etter, Lake St., Cambridge, Mass.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R., Cincinnati, Ohio.

AGENTS—The Novelty Fish Pond and The County Fair are two of the most fascinating game boards ever invented, 100% profit. Orders bound to repeat. Nothing like them on the market. Slot machines beat. Both games and two other crackerjacks and full particulars on receipt of \$1.50. Money refunded after orders amount to \$10.00. Unique Novelty Co., Independence, Iowa.

COLLECT NAMES, information, etc., for business concerns. Steady profitable home business. Instructive booklet for stamp. Information System, 256, Marietta, Ohio.

WRITE FOR BEST money making proposition. Booklet free. Correspondents wanted everywhere. "Indicator," 931 Tribune Bldg., New York.

ONE MILLION AGENTS wanted to sell needle cases; send 7c for sample and particulars. J. V. Curin, 1807 Fisk St., Chicago.

SELF-THREADING NEEDLES, 10c a paper. Agent's samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

AGENTS! If you are after \$\$\$, better write us. Formosa Mfg. Co., Thibodaux, La.

BOYS AND GIRLS, wishing to earn \$3 to \$5 per week at home, write Esandbee, 109 Broad St., New York.

LADY AGENTS for one of the best and fastest selling articles ever put on the market; \$4 to \$5 made easy in a day. Address Box 104, Bucyrus, Ohio.

BUY SOMETHING you can sell! Famous physician's formula; removes superfluous hair; easily prepared. Guaranteed. \$1.00. Mystic Company, Washington, D. C.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., M. T., Chicago.

HANDY RAT TRAP. Great agents' seller. Terms free. Zerbe, Sacramento, Pa.

EARN MONEY selling Eye Glass Cleaners. Samples free. Address Magic Cleaner, No. 2, Camden, N. J.

AGENTS: A dollar bill puts you next to an advertising scheme that is good in any town for \$25 to \$75 a week. Clean work for ladies or gentlemen. Unique Novelty Co., Independence, Iowa.

SIGN LETTER AGENTS—PAINTERS. Something new and better. Attracto Gold or Silver Letters. Anyone can apply them. Big money lettering store windows—making glass signs. Write today for free sample. Attracto Sign Co., Kemper and Orchard, Chicago.

AGENTS AND MEN EMPLOYED in factories can make \$1500 to \$2500 per year easily selling new attractive patented article to friends and consumers at low cost. Necessary to every man and commends itself on first sight. If you want a winning proposition write us. Dept. B, Nelson-Harris Sales Co., 115 So. Dearborn St., Chicago.

THE FUNNIEST ILLUSTRATED PAPER on earth. The Mars Planet tells about unexplored lands on the planet of Mars and what this world will be two hundred years from now. Side-splitting throughout. Agents Wanted. Sample copy, 10 cents. Joseph Mathieu, 203 Court St., Brockton, Mass.

MAKE \$5 TO \$7 A DAY. Sell our new popular priced article. A specialty needed in every home. Excellent opportunity. Big money assured energetic, active men. Best article on the market. For free sample and illustrated booklet write. Nast Mfg. Co., Dept. A, Hornell, N. Y.

AGENTS—Handle our nameplates, signs, numbers, etc., and make \$5 profit daily, samples free. Brett Brothers, Boston, Mass.

AGENTS—SAMPLE FREE. Stamp names and addresses on key checks, name plates, watch fobs, etc. We supply blank stock and stamping outfits. Hart Manufacturing Co., 200 Eckford St., Brooklyn, N. Y.

AGENTS—SELF-WRINGING MOPS; six styles for all purposes. New inexperienced men make \$9.00 per day. No investment. Send for exclusive territory proposition that will make you independent. Edward Hilker Mop Co., 1195 Grand Ave., Chicago, Illinois.

BOKARA DIAMONDS—Agents, everyone to wear and sell our famous Bokara diamonds. Write for sample offer and catalogue free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

WE HAVE SOMETHING NEW for salesmen making small towns. A neat, clean, quick selling pocket sideline. If interested write for order book today. Burd Mfg. Co., 231 No. 5th Ave., Chicago.

YOUR NAME AND ADDRESS on an aircushion rubber stamp, 20c. Including pad, 30c. Smith Supply, Waukegan, Ill.

AGENTS. \$10 DAY selling Air Brush Show Cards. 2 color, catalogue free. Popular Show Card Co., Desk S, 1235 Michigan Ave., Chicago.

AGENTS make \$25 daily selling minute tire repair kit. Florence Novelty Co., Box 1 4505, Philadelphia, Pa.

100 GOLDEN EYED NEEDLES. Handsome bargain wallet, something different. Sample, 8c. Barstow Company, 514-23rd St., Oakland, Cal.

MEN OF IDEAS or inventive ability. Address Greeley & McIntire, Patent Attorneys, Washington, D. C.

AGENTS—Over 500% profit. Gold sign letters; sell everywhere; sample free. Johnston Co., Quincy, Ill.

AGENTS WANTED. Something new and profitable. Box 431, Starke, Fla.

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- First Prize—**GEO. M. HARRIER, Lockport, N. Y.**..... \$10
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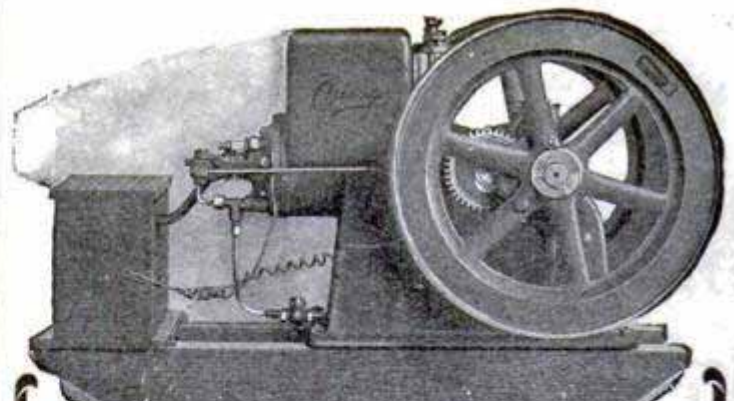
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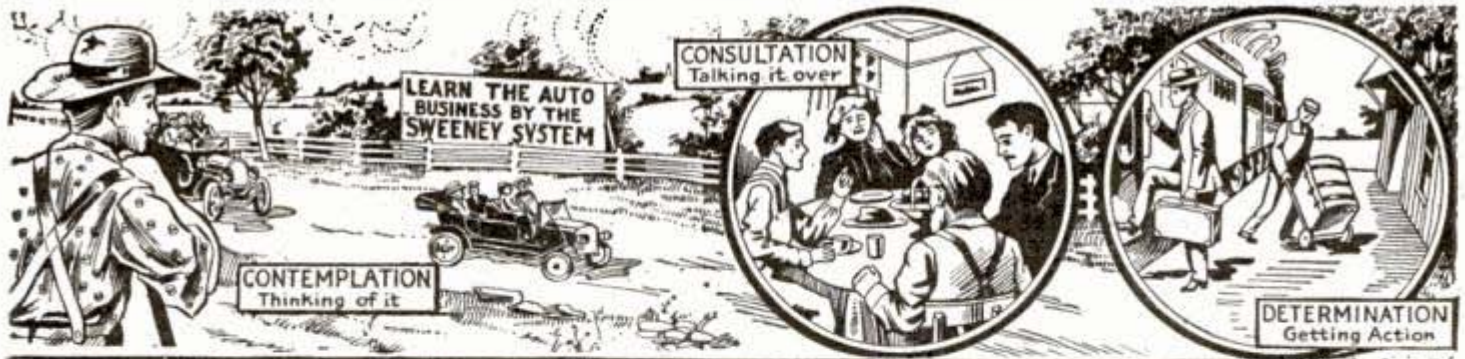
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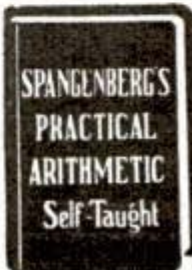
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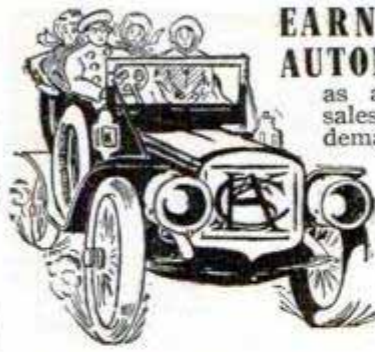
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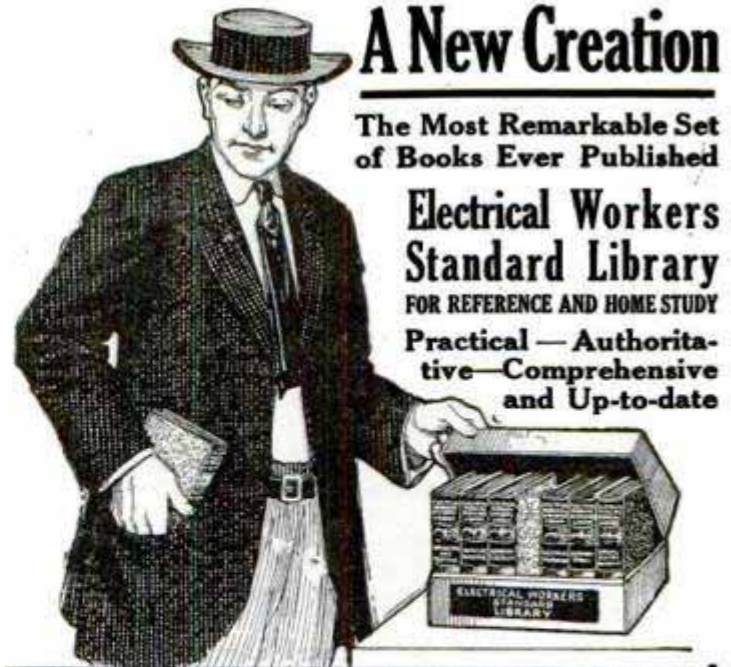
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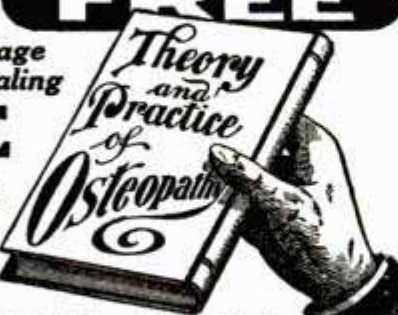
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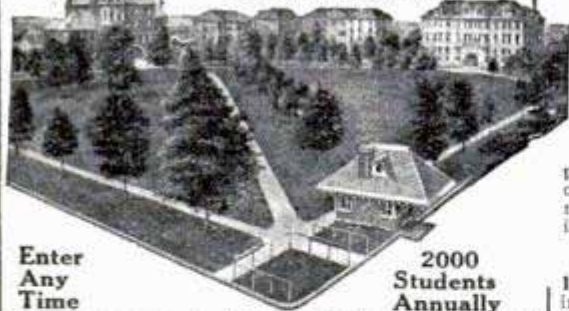
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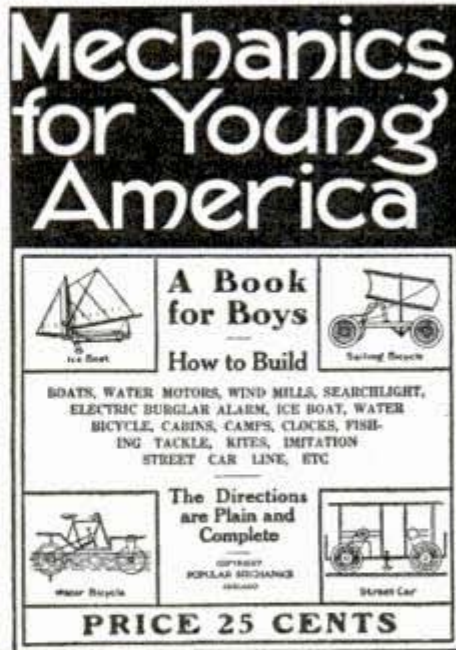
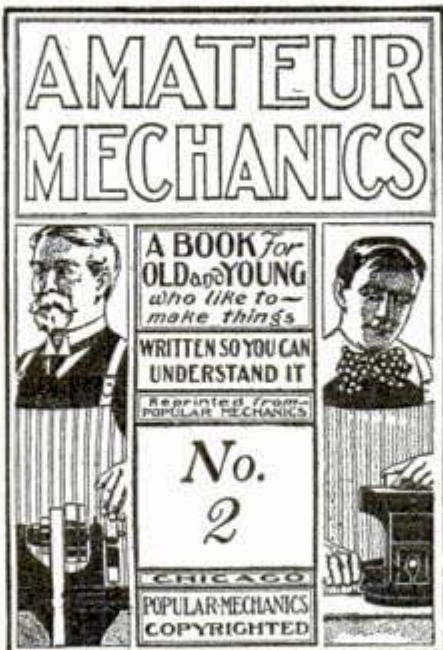
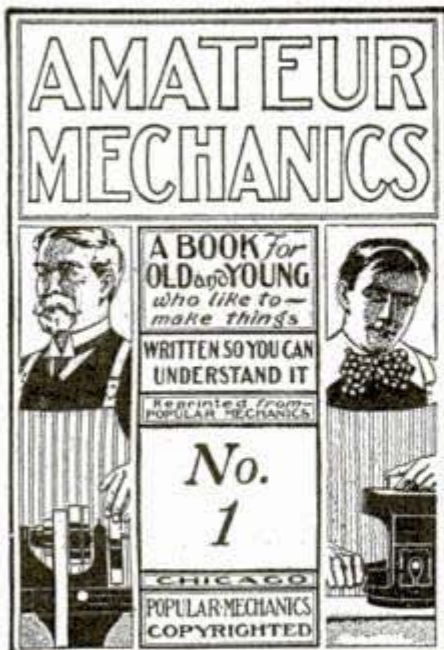
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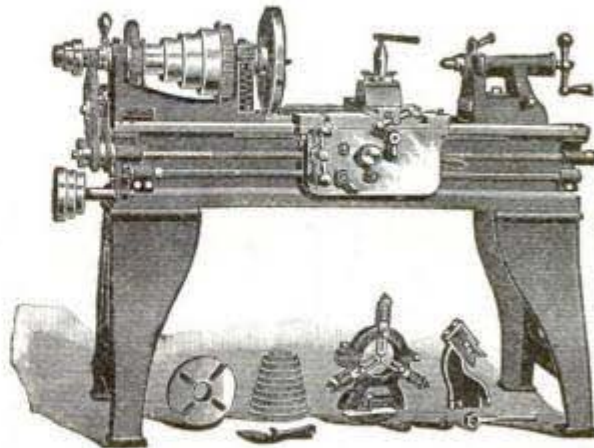
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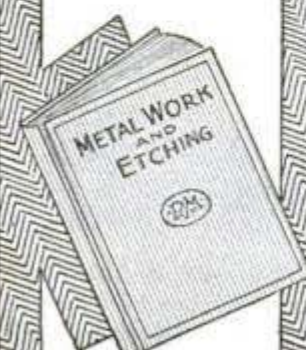
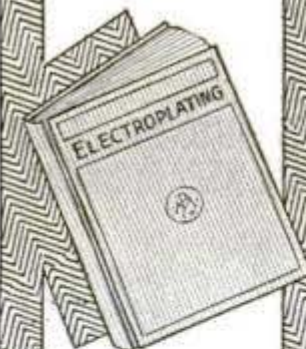
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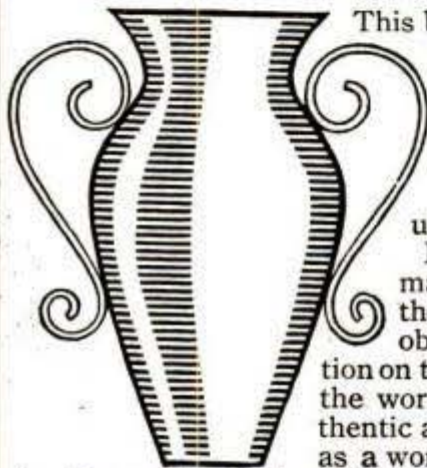
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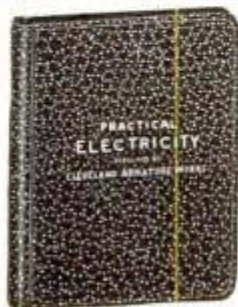
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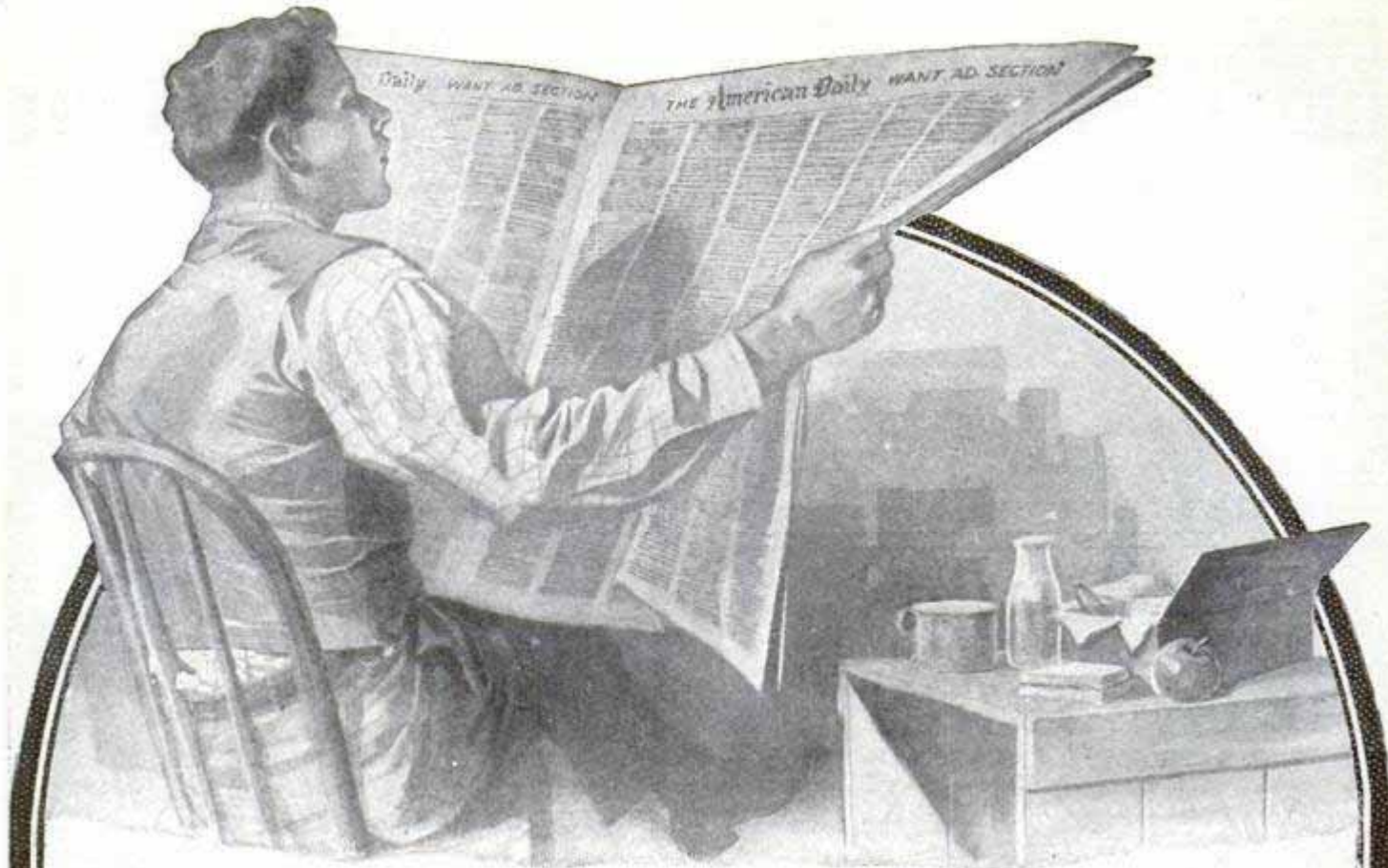
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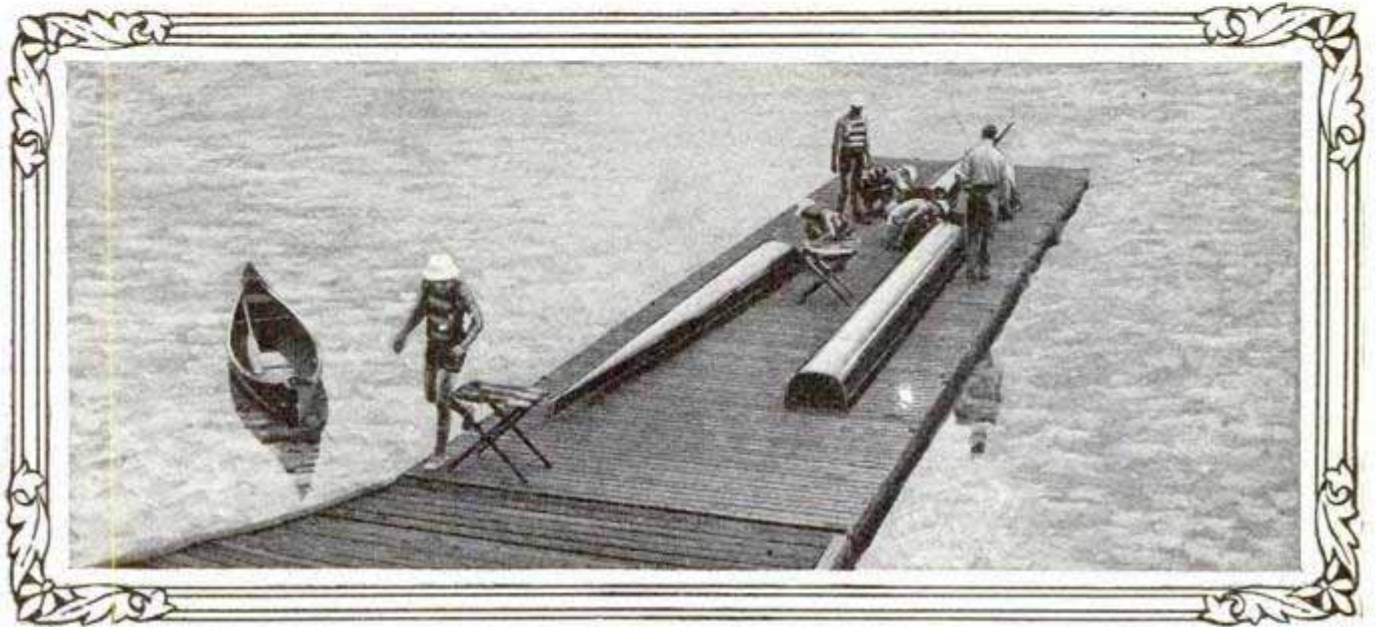
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SEPTEMBER, 1911

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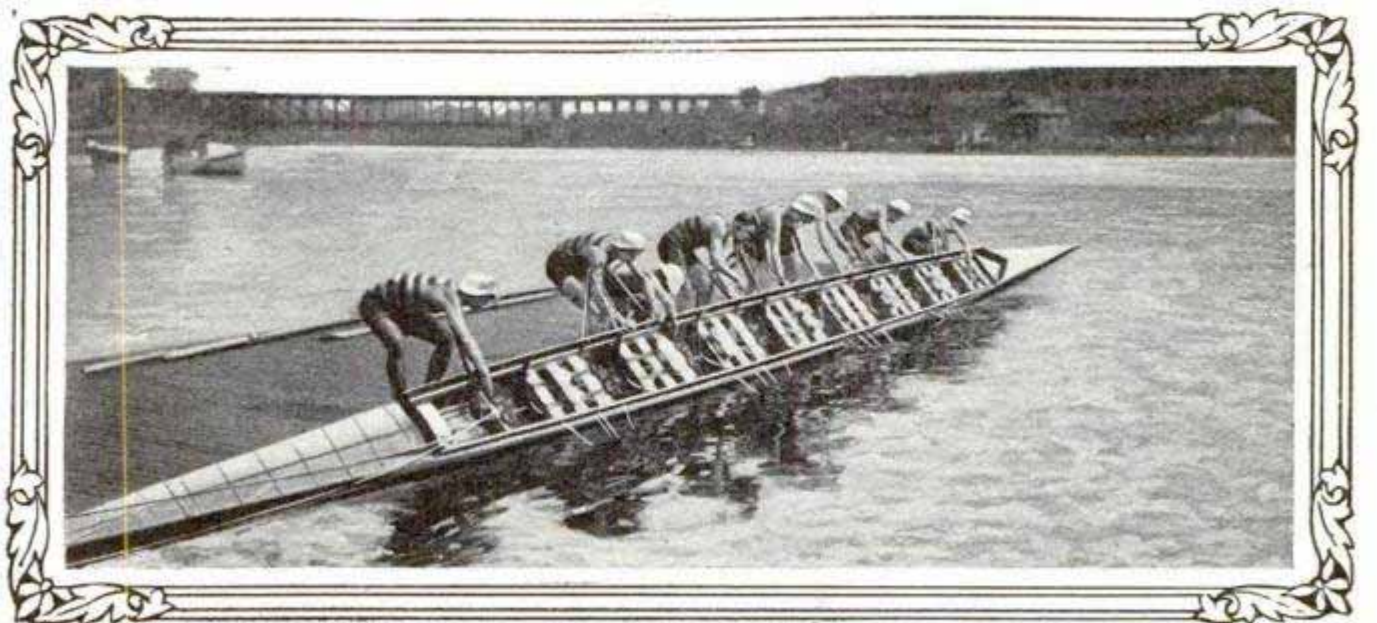
"KNOCK-DOWN" EIGHT-OARED RACING SHELL



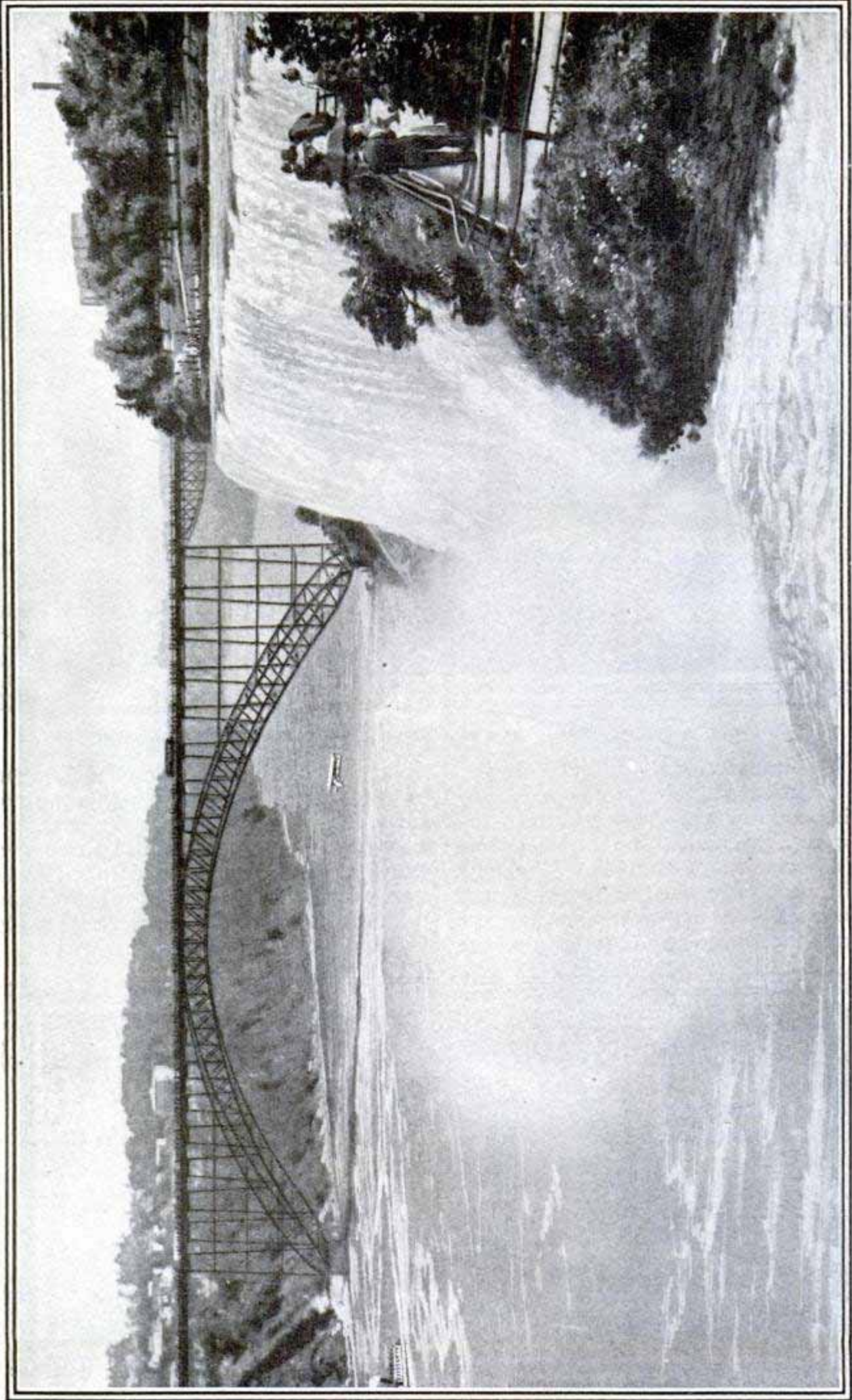
Preparing to Put the Three Sections of a Knock-Down Eight-Oared Shell Together

THE first sectional or "knock-down" eight-oared racing shells to be used in this country are the property of the Toronto Argonauts, the famous rowing association of Canada. The new shells were purchased in England, and were used for the first time at the recent international regatta on the

Schuylkill River, Philadelphia. Instead of the long wagons being required for transporting eight-oared shells, the new shell, knocked down in three sections, may be transported in an ordinary wagon. The putting together and taking apart of the sections is easily accomplished in an hour or two.



The Shell Put Together and Being Launched



LINCOLN BEACHEY MAKING HIS FLIGHT UNDER THE BRIDGE AT NIAGARA

SEARCHING FOR THE ELECTRIC ATOM

By DAVID A. KEYS

THE so-called atom of electricity is the smallest charge of electricity that has yet been detected and is equal to that carried by a single negative ion. The value of this constant electric atom has been calculated by many prominent physicists using various methods. It was an American, however—Prof. R. A. Millikan, of the University of Chicago—who first succeeded in separating it and keeping it under observation in the microscope.

The chemical atom has not yet been seen, although Professor Rutherford has been able to count charged atoms of helium expelled by ra-

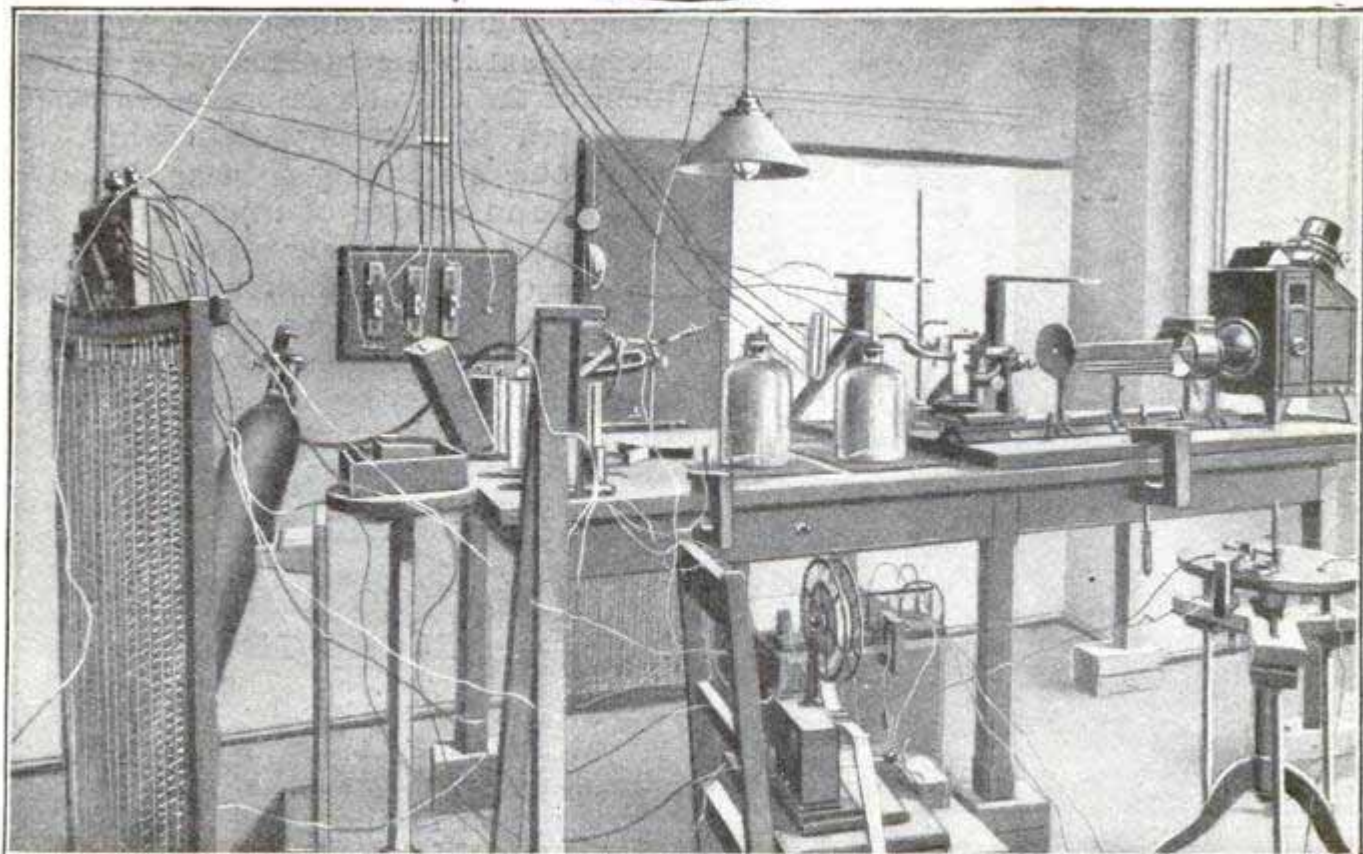
dium and caught in a receptacle. Helium, one of several radium products, is an inert gas occurring in air. This is a distinct advance on the way to the isolation (or separation) of the chemical atom, a problem which men of science are now endeavoring to solve, as Professor Millikan solved the problem of isolating and observing what is said to be the atom of electricity.

Now Dr. Felix Ehrenhaft, of Vienna, a recent investigator of the electric atom, has obtained, on microscopic particles of precious metals, still smaller separate charges than those obtained by Professor Millikan.



Dr. Felix Ehrenhaft

at His Microscope



Dr. Ehrenhaft's Laboratory and Complete Research Apparatus

Dr. Ehrenhaft obtained small charged dust particles of the metals by striking an arc between pencils of the required metal in the glass flask shown immediately to the left of the microscope in the illustration of his laboratory on the preceding page. These charged particles are then drawn into the field of vision of the microscope and their charges determined by observing their fall in an electric field and under gravity. In the eyepiece of the microscope are three or four horizontal lines at equal distances apart. Whenever the charged particle under observation passes a line, the time is recorded on a moving strip of paper by means of the apparatus shown on the chair. With the aid of this instrument the time taken by the charged particle to traverse the known distance between two lines may be accurately determined. The electric field, of

known strength, is produced between two horizontal plates, one placed above and the other below the field of vision of the microscope. These plates are so connected by a commutator switch, shown on the little table to the right, that the plates may both be connected with the ground, or charged, the upper one positively and the lower one negatively, or vice versa, by merely turning the handle.

The values for the atom of electricity obtained in this way have been very small. In these experiments, Dr. Ehrenhaft's particles appear to carry charges whose value is one-tenth that obtained by other investigators.

As an acknowledgment of his merit and in order that he may continue his experiments, Dr. Ehrenhaft has been granted a substantial subvention by the Imperial Academy of Science, of Vienna.

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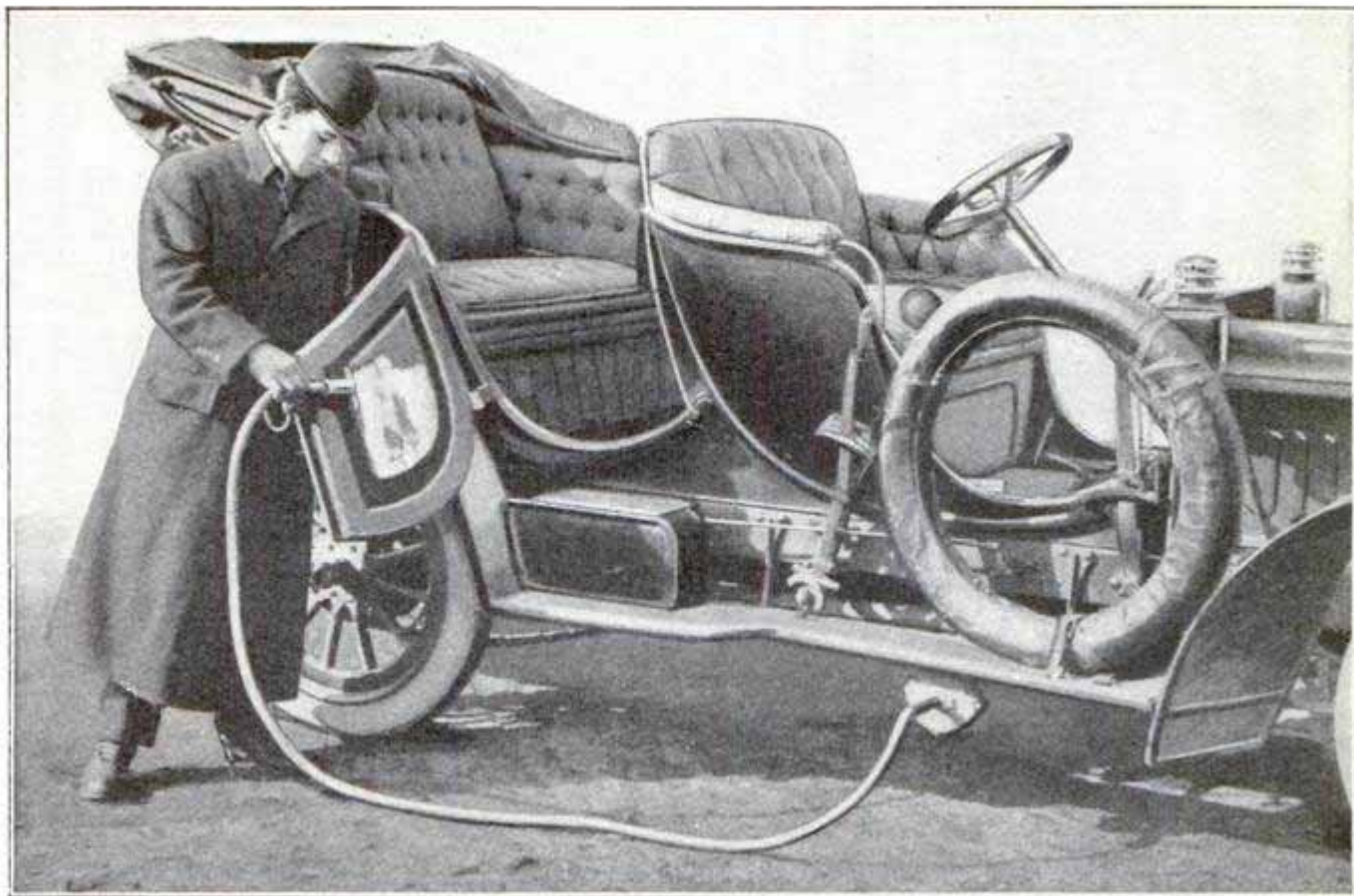


Yielding Section in Floor of Elevator Prevents Movement Up or Down When a Passenger is Standing Upon It

ger elevators is being placed on the market by a Baltimore, Md., concern. By means of a hinged yielding section in the floor of the elevator at the entrance, and electrically connected with mechanism in the basement, the movement of the elevator is prevented when a person is entering or leaving, or when one is standing so near the door as to be in danger of injury from the movement of the elevator. Another feature of the installation is a device in the roof of the car over the door. This consists of a yielding section, contact with which, by the head or body of a person about to be caught and crushed, instantly stops the car.

WHEAT TO BISCUIT IN RECORD TIME

The record time in transforming wheat standing in the field to biscuit steaming on the table is still held by Jim Lawton of the Wild Moss Mills, Carrollton, Mo., and will continue to stand until someone succeeds in get-



A Vacuum Cleaner is the Latest Accessory for Automobiles

ting wheat out of the field, into the mill, into the kitchen, and onto the table as biscuit in less than 11 minutes.

But a record that is notable because no record was contemplated was made in Kentucky, in June. A farmer near Owensboro went into his field at 9 o'clock in the morning and cut a quantity of wheat. At 11 o'clock he threshed it, and at 3 o'clock in the afternoon delivered it to an Owensboro mill. At 5 o'clock he received his flour, and at 6 o'clock sat down to supper with biscuits served from the wheat that had been standing in the field nine hours before. Nothing in this record was premeditated or hurried, the farmer having simply been reminded that the household was short of flour.

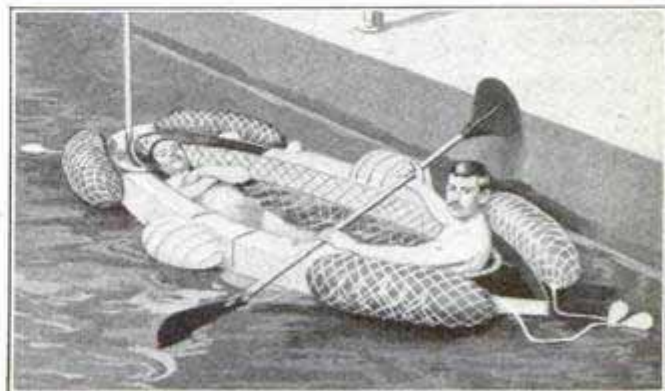
VACUUM CLEANER FOR AUTOMOBILES

A new and ingenious accessory for automobiles, in the form of a vacuum cleaner, is shown attached and in operation on this car. Such a machine, which is soon to be marketed extensively, may be attached to any car, it

being operated by the exhaust gases. It is found useful not only for cleaning the car, especially the upholstery, but also for removing the dust from the clothing of the passengers after a long run.

LIFE BUOY AS A WATER HAMMOCK

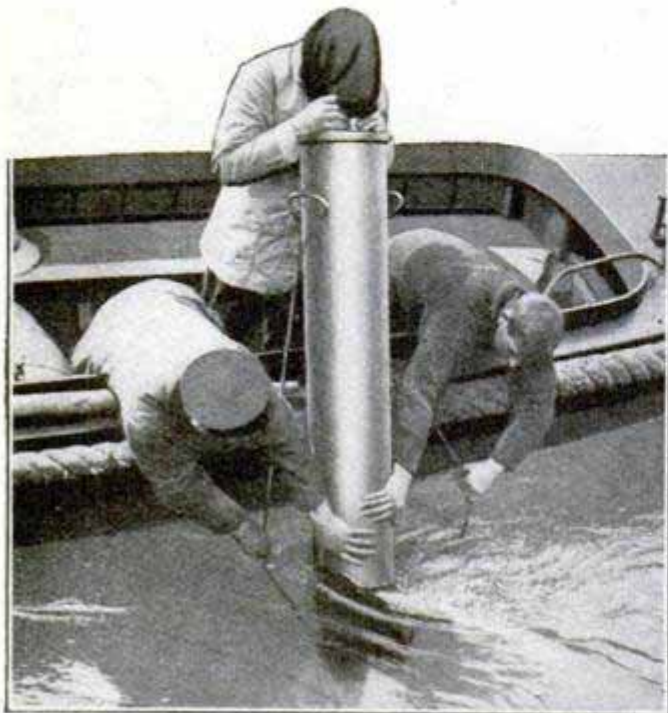
One of the new types of life-saving buoys used at a watering place in Germany also serves very well as a water hammock. The bathers, lying on the netting and partially submerged, may float upon the surface of the water in solid comfort, or paddle slowly about.



Enjoying the Comforts of a New Form of Life-Saving Buoy

WATCHING DIVER THROUGH MARINE TELESCOPE

The marine telescope, which is a long tube with a glass window in its bottom and eyepieces at the top, is here



Watching the Operations of a Diver with a Marine Telescope

being used to watch the operations of a diver. The watcher has a cloth similar to that used by a photographer placed over his head and around the eyepieces to exclude the light. The movement of the water was so rapid that two men were required to keep the telescope upright.

A SCIENTIFICALLY BUILT BONFIRE

The building of a huge bonfire for celebrating purposes must, if it is to be a great success, be done scientifically. Several stages in the building of such a bonfire are shown in the drawings. The bonfire stack is begun as shown in the first, then faggots about 3 ft. long

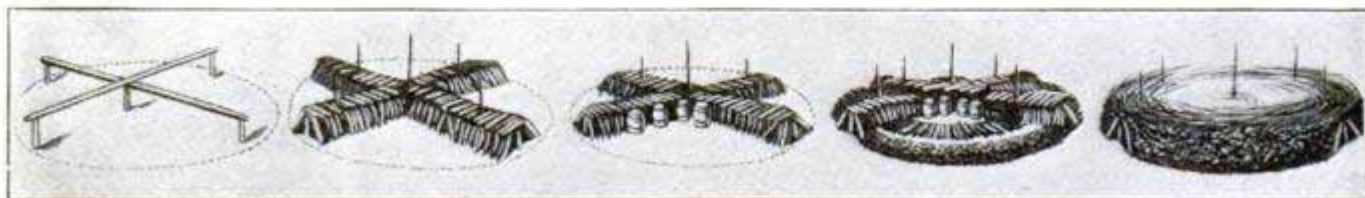
and 6 in. in diameter are inclined against the diagonal poles, as shown in the second drawing, which is an arrangement allowing for draft. On these lie horizontal faggots. The next stage, shown in the third drawing, is to place old tar barrels in the angles, and then the rest of the segment is filled up with faggots laid with their ends to center, as shown in the fourth drawing. This promotes ignition, and the next tier consists of long faggots placed across the stack from side to side to a height of about 3 ft., topped by a layer of faggots, the ends of which all point to center, and so on, until the pile is complete.

LADDER TRUCK USED AS FOREST FIRE-FIGHTER

One of the old ladder trucks of the Natick, Mass., fire department has been converted into a forest fire-fighting truck in a rather novel manner. Seats that will accommodate 10 fire-fighters have been installed lengthwise of the truck, and underneath have been placed large tanks holding about 300 gal. of water each. The back of each tank protrudes slightly from the rear of the truck and is provided with a faucet attachment for drawing the water into the hand sprinklers. Between the seats is ample room for brooms, hand sprinklers, etc.

It is believed the converted truck will enable the firemen to fight wood fires much more effectively than heretofore.

ⒸAn Illinois traction system is equipping its cars with air signal whistles in place of bell signals for the use of the conductors in signaling the motormen.



The Diagonal Poles in Place

Faggots Inclined against the Poles

Old Tar Barrels Placed in the Angles

Rest of Segment Filled with Faggots

Faggots Placed across Stack, from Side to Side



THE PIN POINT OF SUCCESS

WHEN I was a boy in Titusville,
My father led me over the hill
To a big, wide street where he pointed with pride
To the finest house in the countryside;
High iron fence and a lawn of green,
Marble steps of a snowy sheen.
"That," said Dad, "is the house of Blynn,
Who invented a patent safety-pin.

"And that there house just goes to show
How mighty oaks from acorns grow.
For Lucifer Blynn never took no prize
A-buildin' ships of a lofty size,
Nor bridges long, nor buildin's grand,
Nor railroad lines across the land;
But he stuck to his task, did Mister Blynn,
Inventin' a tiny safety-pin."

Now and then as I crossed the street
I saw old Blynn in his carriage neat,
Lofty of forehead, round of chest,
With a huge gold chain on his brocade vest.
I looked up—but he never looked down—
And I thought with the rest of my old home town,
"Newton was smart—but I tell you, Blynn
Got *his* by inventin' a safety-pin."

Some years passed. I started away
To be an Inventor myself one day.
Father said: "Don't try first trip
To think up a cannon or battleship,
Or a telescope that will reach to Mars,
Or a bran' new species of trolley cars;
But keep yer eye on the life o' Blynn,
Who made his pile on a safety-pin."

I harked to the words that my father spoke.
I have worked for years, and I'm now dead broke,
Though I can't see why. For I've spent no time
On bridges tall or on ships sublime.
I've loitered not with the super-men,
Dreaming of forces beyond my ken;
But the deuce of it is—O Ghost of Blynn!—
I haven't invented a safety-pin!

WALLACE IRWIN.





Night Photography in the Illumination Furnished by the Headlights of an Automobile

AUTO LAMP ILLUMINATION FOR NIGHT PHOTOGRAPHY

The photograph of this dangerous double railroad crossing was taken by means of the illumination furnished by the electric headlights on an automobile, and is claimed to be one of the most successful night photographs ever taken in this manner. The camera was set up in the tonneau of the car and the plate exposed for about three hours. The picture is remarkable because made with only the regular lighting equipment of the car, without extra lamps, batteries, or contrivances of any kind to strengthen the light.

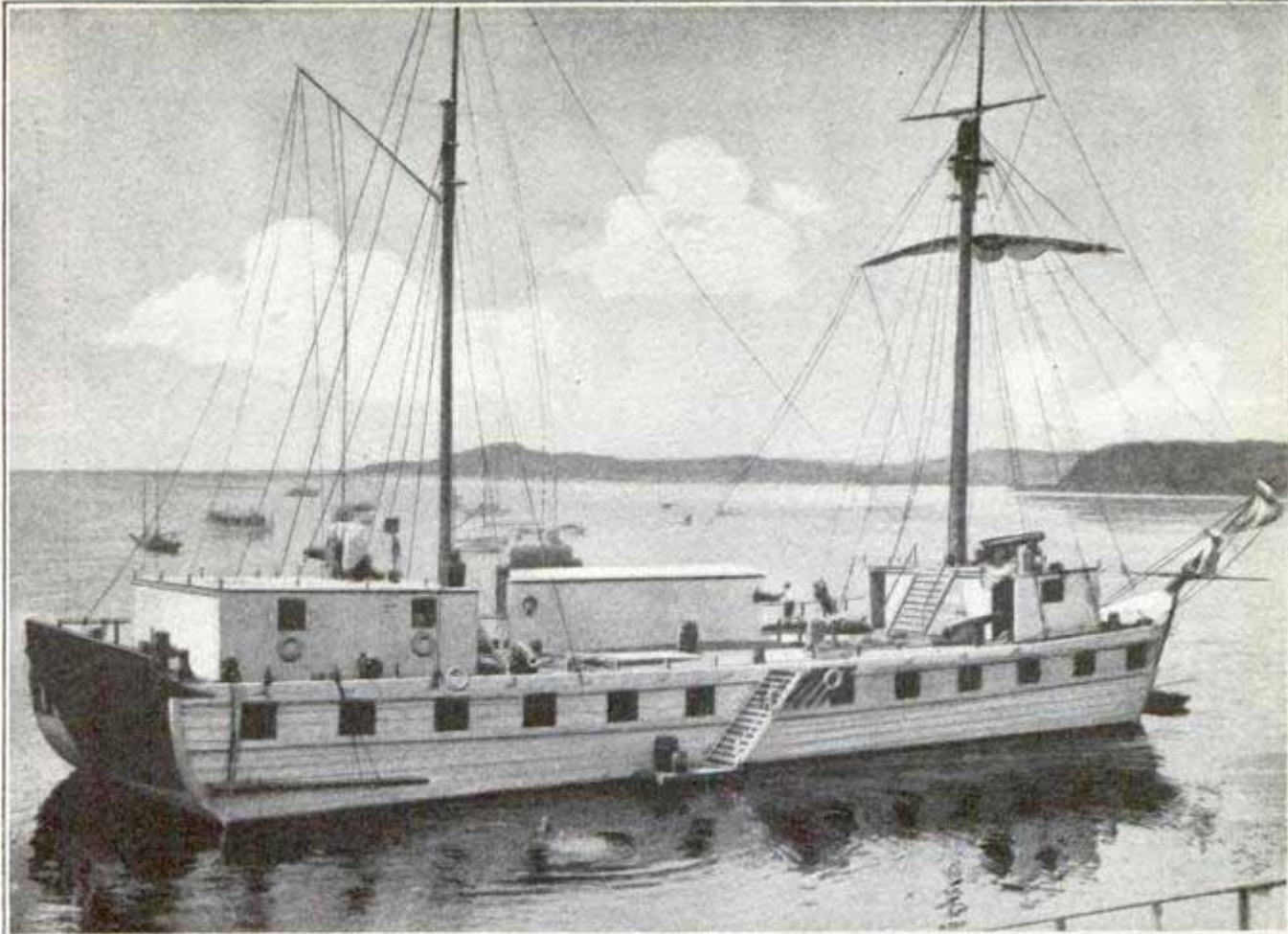
FIRE HORSES ANSWER LIGHTNING ALARM

Lightning recently set off the alarm at one of the engine houses in Louisville, Ky., and opened the automatically operated doors of the stalls. The horses leaped out, brushed down the rope across the doorway and galloped off into the night as if to an-

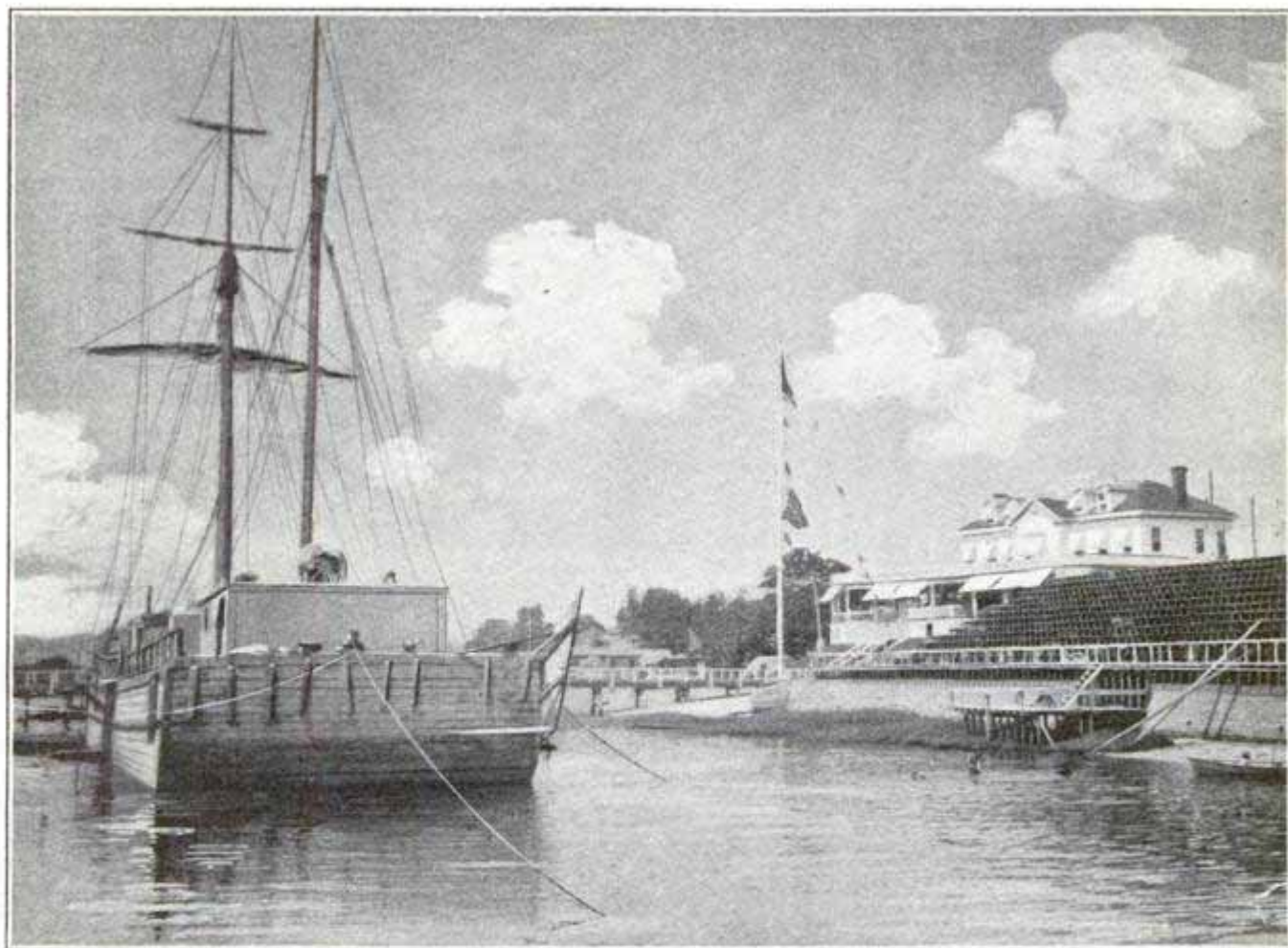
swer an alarm, before the men in the station could stop them. They were found an hour later about three miles from the engine house, covered with foam and practically exhausted.

REAL NAUTICAL SCENE IN OPERA PERFORMANCE

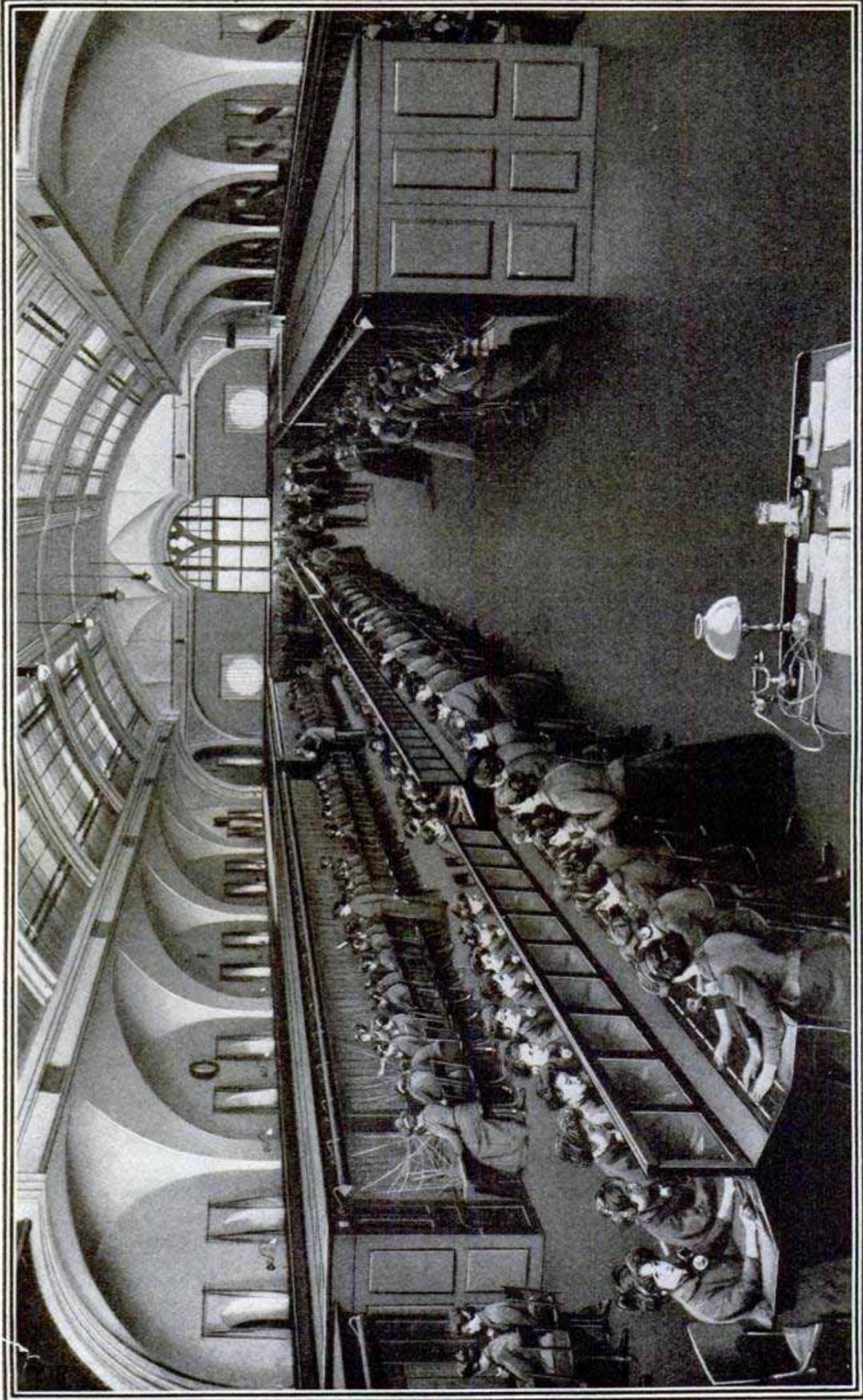
His Majesty's Ship "Pinafore" cast anchor in the harbor of one of the Long Island summer colonies recently, both literally and figuratively. The famous Gilbert and Sullivan opera was produced on a ship especially constructed for the purpose and moored a sufficient distance from the shore to permit the actors and actresses to make their entrance and exits by boat, as many of the entrances and exits in the opera as produced in a theater are supposed to be made. Every feature of the warship so humorously presented by the English composer and librettist, was faithfully reproduced. The spectators were seated on shore in a large stand provided for the purpose, and performances were given both afternoon and evening.



H. M. S. "Pinafore" as It Looked to the Audience Seated on Shore, during the Recent Performance of the Opera at Long Island, N. Y.



"Behind the Scenes," or the "Auditorium" as It Appeared from the "Wings" in the Aquatic Production of "H. M. S. Pinafore"



Courtesy Telephony

TELEPHONE SWITCHBOARD FOR 80,000 LINES

A series of telephone switchboards in one great room, capable of giving service to 80,000 subscribers, has recently been placed in operation in Hamburg. At present there are but 40,000 lines running into the operators' room, but the equipment that has been installed is made to handle double that number, allowing for increases for a number of years. It is claimed to be the largest exchange in the world.

TO MAKE MOTION PICTURES OF ITS PASSENGERS

A steamship company operating a line between New York and Bermuda is to include motion-picture exhibitions, in which returning passengers may see themselves, as one of the diversions of the voyage. A practical motion-picture photographer accompanies the ship outward bound and takes a series of scenes which are developed during the vessel's brief stay in Bermuda. The passengers who book a return passage on the same steamer will thus be privileged to see themselves in lifelike action upon the screen.

FATAL BUILDING COLLAPSE

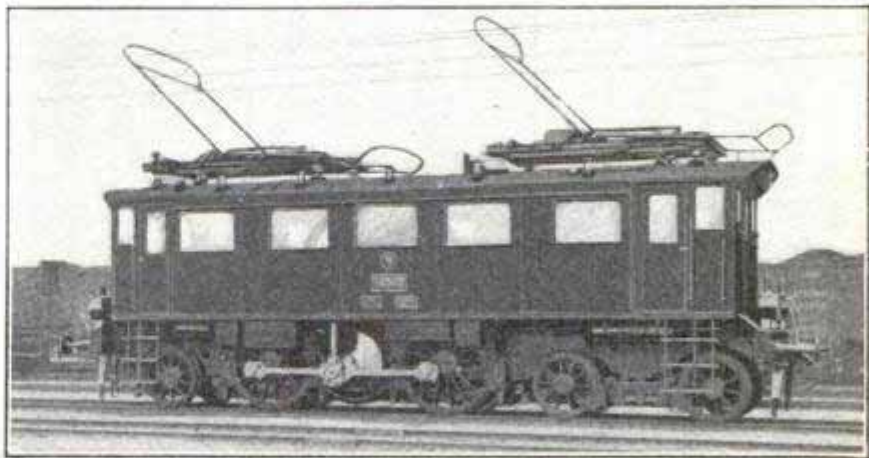
In this illustration is shown the extent of the collapse of a partially completed pump house in Buffalo, N. Y., in which 15 men were killed and many others injured. The loss to the city was estimated at \$200,000. The collapse occurred while the roof was being placed in position. The central truss buckled, it is thought, letting the entire mass of steel down into a pit, and leaving a gap 300 ft. wide.



The New Buffalo Pumping House which Collapsed, Killing 15 Men and Injuring Many Others

ELECTRIFYING THE STEAM ROADS IN GERMANY

The first German electric locomotive built for passenger service made its initial run recently over the Dessau-

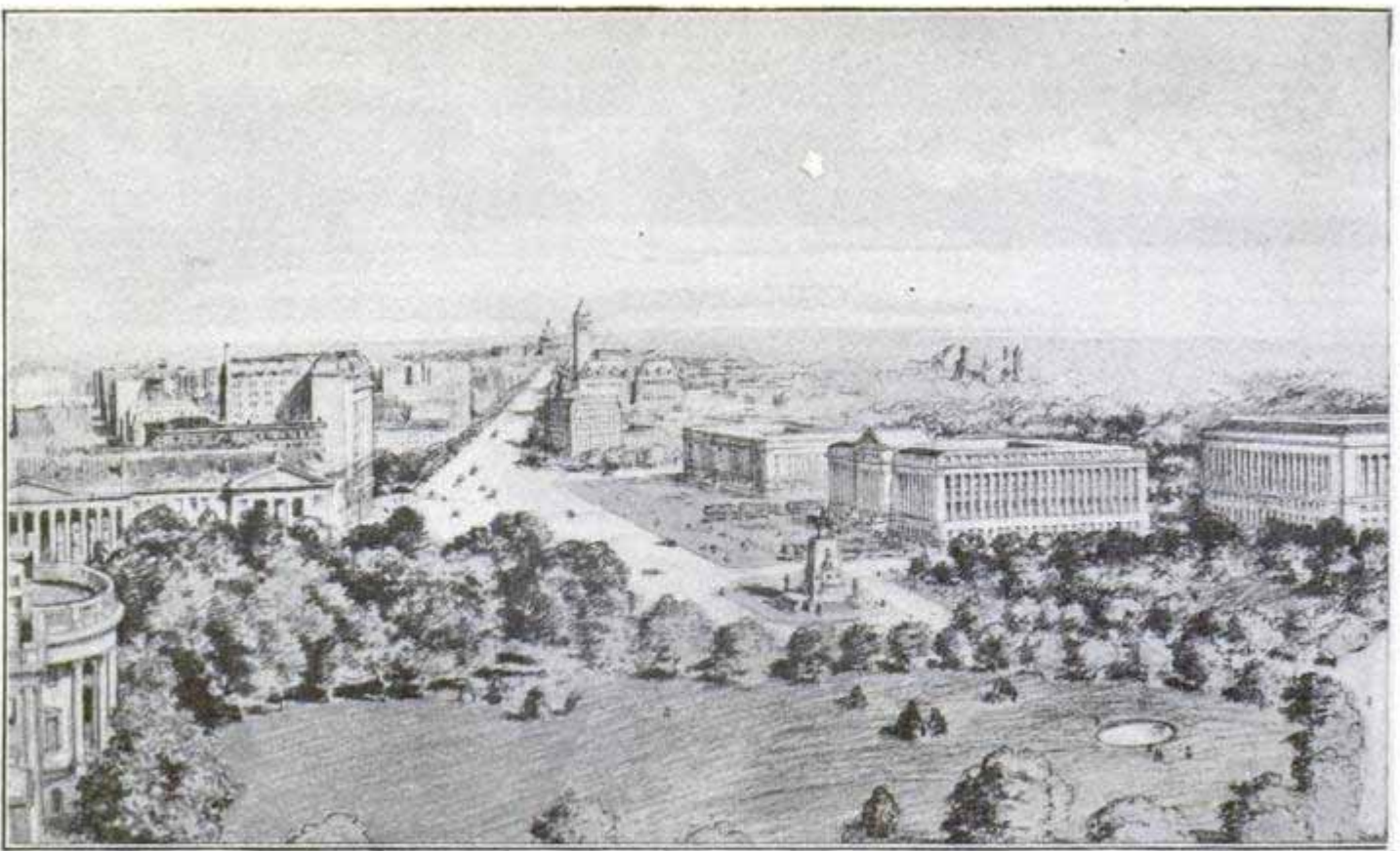


First Electric Passenger Locomotive for German Trunk Lines

Bitterfeld section of the Magdeburg-Leipzig-Halle road, which is being electrified for its entire length of about 100 miles. It is said to be only a question of time before all the government-owned roads will be electrified, as Germany is rich in water power, and in peat, lignite and the inferior grades of coal, all of which lend themselves readily to the production of electric power.

FARMERS PLANT DYNAMITE TO FRIGHTEN WORKMEN

Farmers in a certain section of Kansas have taken a novel means of discouraging the work of grading for a new railroad, the right of way of which was disputed by them. The graders found in this particular section a perfect forest of signs reading "DYNAMITE BURIED HERE" as a warning against digging up the ground promiscuously in that vicinity. Whether the people who objected to the railroad's route had buried dynamite mines which they proposed to fire with electricity or had simply placed the explosive underground to await the point of a grader's pick to explode it, is not known. Just how the railroad men managed to pacify the farmers is not of record.



White
House

Treasury

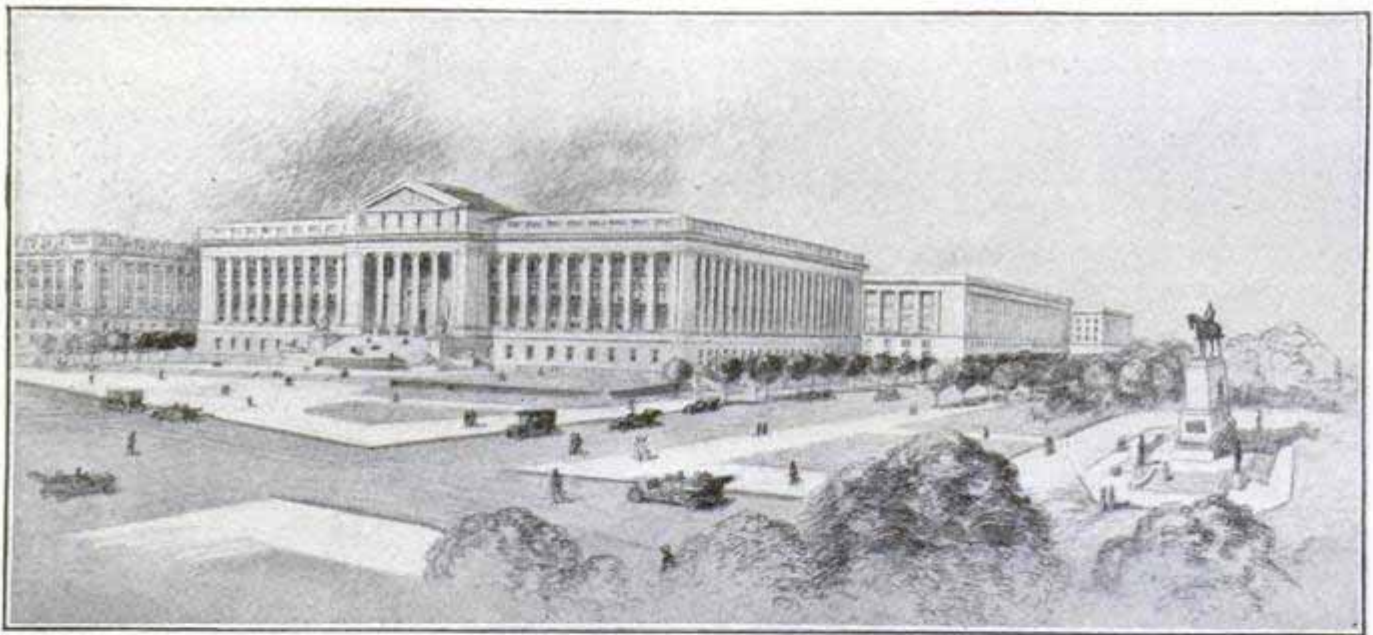
Capitol
P. O. Dept.

Municipal
Bldg.

Dept. of
Justice

Dept. of
and

Panoramic View of Proposed New Buildings for State Department,



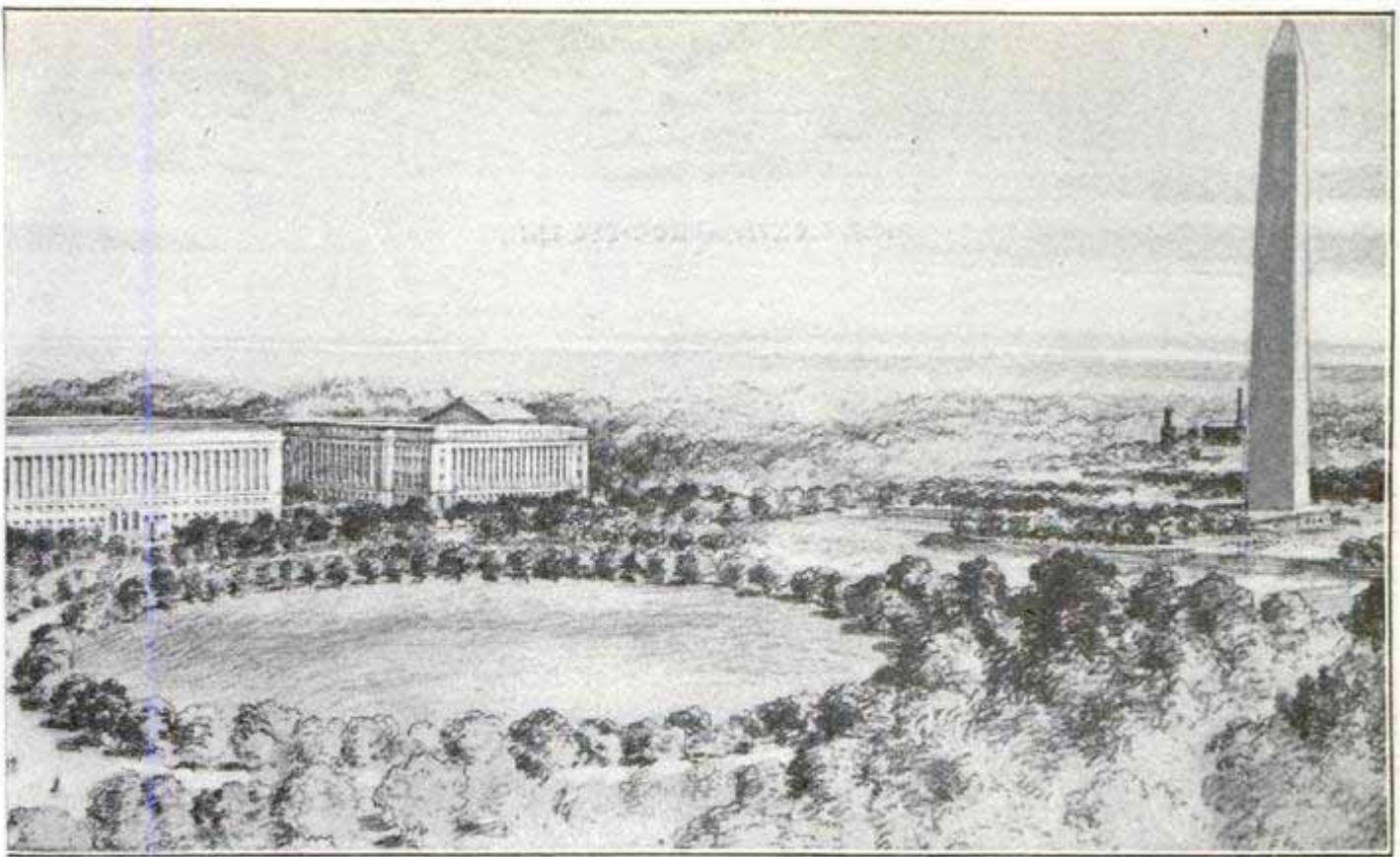
Proposed Structures for Dept. of Justice, Dept. of Commerce and Labor, and State Dept.

HARMONIOUS GROUPING AND DESIGN FOR NEW FEDERAL BUILDINGS AT WASHINGTON

By F. J. LEWIS

The United States government has just entered upon one of the greatest building projects of its career. The President, the Secretary of the Treasury, the National Fine Arts Commission, and the heads of the departments involved, have approved the designs for

the new buildings of the departments of State, Justice, and Commerce and Labor. These buildings are to occupy the site recently purchased by Congress, at a cost of \$3,000,000. It lies between 14th and 15th streets and extends from Pennsylvania Avenue south



Commerce
Labor

State
Dept.

Bureau of
Printing and
Engraving

Washington
Monument

Department of Commerce and Labor, and Department of Justice



Corner of State Department Building, Looking North toward Treasury

to the Mall, the government reservation extending from the Capitol to the Washington Monument. The buildings are to cost \$8,000,000.

This is one of the few times in the history of the world when a group of such importance has been conceived and studied as a whole, each individual building subordinating itself to the group. It is this, rather than the expenditure of the \$8,000,000 (a cost not infrequently exceeded by single state

or federal buildings) which makes the project remarkable. The administration has had but one end in view, namely the best results obtainable—a group composed of whole units, harmonious in itself, supplementing the existing architecture of Washington.

The grouping of the new buildings provides that the Department of Justice shall occupy the north end of the site, its principal front on Pennsylvania Avenue opposite the south front of the

Treasury. The Department of Commerce and Labor, with a building of the same width but of much greater length north and south, comes next, extending nearly to the Mall. The Department of State, flanking the group on the other end, will face south on the Mall, its front on a line with the south front of the National Museum, a line corresponding with that upon which the new Department of Agriculture faces on the south side of the Mall opposite.

The competition among the architects of the country as to whose designs should be accepted, was spirited. Sixty of the leading architects were invited to submit plans, 20 for each building, three separate competitions being inaugurated by the Treasury Department for this purpose, and held simultaneously. Probably the 20 best sets of the 57 sets of six or seven drawings each that were submitted cost their authors more than \$1,000 a piece, and the rest an average of \$500. The drawings themselves, therefore, represent an expenditure of nearly \$40,000, which was borne by the architects and not by the government.

Three separate juries of architects were chosen to pass upon the plans. After an immense amount of labor, awards were made as follows: The design for the building of the Department of Justice to Donn Barber, the Department of Commerce and Labor to York & Sawyer, and the Department of State to Arnold W. Brunner, all of New York.

After the awards were announced, the successful architects were called together and the group was drawn for the first time, in which the three buildings were placed side by side upon their relative grades, their relation to the Treasury, the Monument, the Municipal Building and their surroundings studied, and the buildings themselves modified to conform closely to each other.

In exterior design, the three buildings are similar in character, each employing columns three stories in height, set upon a windowed wall, an architectural "basement." This wall is one story high in the case of the end buildings, and two stories high in the central one, thus correcting the dip of the ground and raising the three colonnades to the same level. While ornamental in appearance, the buildings are of the utmost simplicity and no fancied needs of "architectural expression" have been allowed to interfere with the practical requirements of lighting and arrangement.

The buildings have been planned to meet the needs of the departments for the next 10 years and every provision has been made for the health and comfort of the employes. The completion of these new departments will result in great economies to the government in the matter of rentals; also the departments will be for the first time properly arranged and adequately housed. While the question of materials is not decided as yet, it is likely that white marble will be used.

ROUND THE WORLD IN A 37-FOOT SAIL BOAT

The "Pandora," a staunch little yawl-rigged sail boat, 37 ft. long, arrived in New York Harbor recently after a 22,000-mile trip through the roughest kind of seas, tarried there for a short period, and then started out again in the attempt to encircle the globe. The little ship left Bunbury, Australia, May 30, 1910, touched at Melbourne and Sydney, and arrived at Auckland, New Zealand, Sept. 4,

1910. She journeyed to Pitcairn Island, 2,750 miles east of New Zealand, by Nov. 18; touched at Easter Island, 1,100 miles further east, Dec. 12, and rounded Cape Horn on Jan. 16, 1911. On May 3, one year after setting forth on the globe-circling voyage, the "Pandora" reached Ascension Island, and the run from there to New York took 46 days.

The crew of the "Pandora" consists

The effect was so surprising that the students forwarded the card as it was to their friend, together with three others made in a similar fashion. Within a very short time an art dealer in the same city published a series of cards with pen and ink sketches of the city. It was not until 1880, however, that an effort was made to place the sale of the cards on a large commercial basis, and now picture postcards have become so important an article of commerce as to mount into the millions annually.

THIS CLOCK CASE TOOK SIX YEARS TO BUILD

This clock case, of cathedral design, with its ingenious mechanism, took six years of a Skowhegan, Maine, woodworker's spare time to construct. It stands 7 ft. 10 in. high, and is made of 20,000 pieces of wood of various kinds, finished in their natural color. In the upper story, six folding doors open every 10 minutes and a number of the apostles appear, marching in time to music played by a musical box governed by the clock. Each apostle bows before the Savior as he passes, with the exception of Peter, who turns his back. At this moment the devil appears at the top of the clock and blows a trumpet.

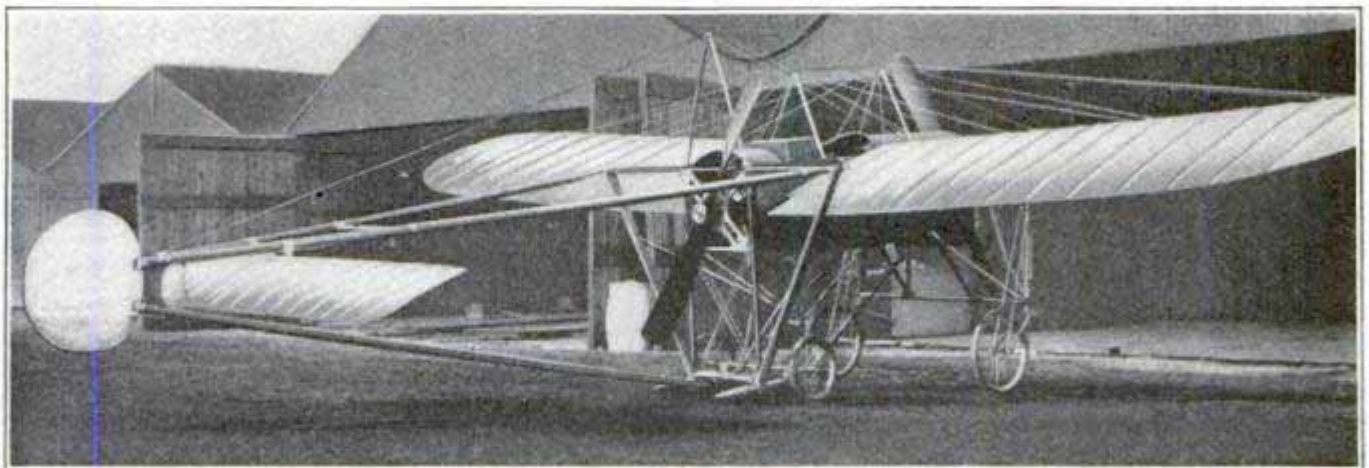
The second story of the clock case

is supposed to represent a mansion, and its double doors also open every 10 minutes. Lazarus appears at the



A Novel Clock Case, Constructed of 20,000 Pieces of Wood, which Took Six Years of a Woodworker's Spare Time to Construct

rich man's door and on bended knees asks for charity. The dogs lick his sores, and the rich man stands in the door swinging his arm as if throwing crumbs from his table.

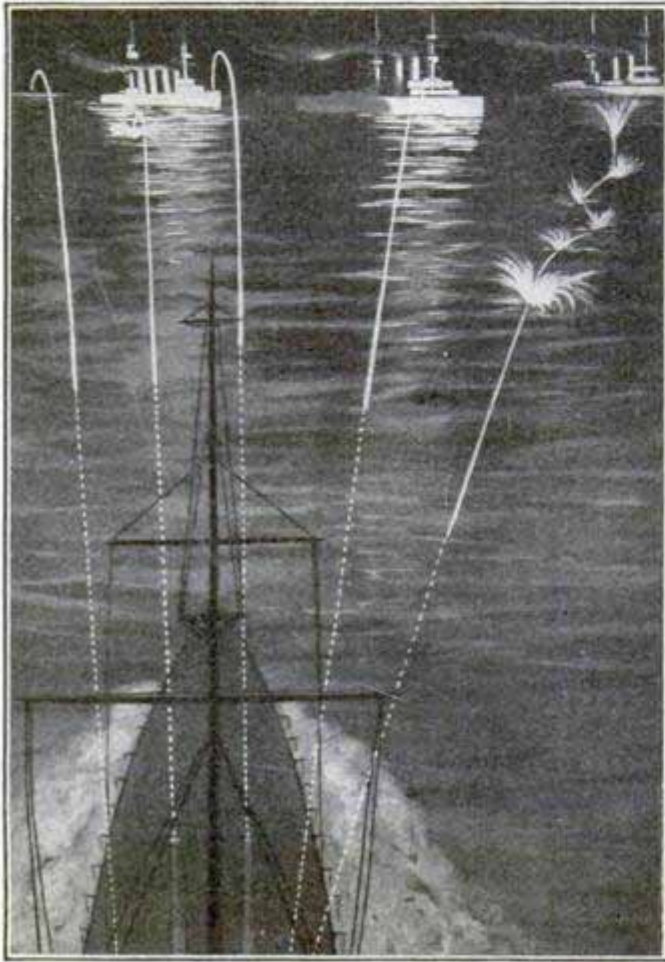


FIRST MONOPLANE WITH TWO PROPELLERS AND TWO MOTORS

This machine, a "racing monoplane," equipped with two 50-hp. Gnome rotary motors and two propellers, revolving in opposite directions, on the theory that the gyroscopic action of a single rotary motor would thus be overcome, failed to realize the expectations of its builders when tried out at New York recently. It proved unmanageable on turns.

ILLUMINATING THE TRACK OF PROJECTILES

A novel invention for illuminating the track of projectiles for night firing was recently tested successfully by



Courtesy The Graphic, London
Firing Illuminated Shells from Five Big Guns. The Dotted Lines Denote the Course of the Projectiles before the Illuminating Mechanism Attached to Each Became Operative

British battleships and with coast-defense guns. A metal cylinder containing the necessary illuminant and operating mechanism is attached by means of a screw to the base of the projectile. This mechanism, which may be timed to cause the illuminant to burst into flame at a predetermined moment in the course of the projectile's flight, is set in operation by the act of firing the gun. Thus the projectile may travel a third or a half of its course dark, so that the exact location of the ship firing it will not be disclosed to the enemy, then the illuminant will burst into flame, leaving a train by means of which the gunners may determine the accuracy of the aim.

REAL TEST OF AUTOMATIC TRAIN-STOP DEVICE

A fatal accident on the New York subway recently demonstrated in convincing fashion the reliability of the automatic train-stop device which was invented for use on the Interborough trains and which has also been adopted on the Hudson tunnel trains. It appears that in some way the motorman fell or was knocked out of his cab, probably in looking out of the side of the train to observe the signals, and when his grip on the controller handle was thus removed, the brakes were automatically set and the train was brought to a stop within a short distance. On top of the handle of the controller there is a small electric push-button which is normally pressed down when the motorman is operating the train, but when the grip on the handle is released, as in case of a fainting spell or sudden death of the motorman, an electric circuit is made which immediately operates the automatic mechanism to set the brakes and stop the train.

JEWEL FOUND IN BRAZIL WEIGHS 243 POUNDS

Jewel experts throughout the world have been thrown into a state of excitement by the appearance of a beryl that weighs 243.1 lb. and is 18.9 in. high and from 15.75 in. to 16.5 in. in width. This is the largest beryl ever found and is reported to have been sold by its finder for \$25,000. The beryl was picked up by a Turk in the state of Minas Geraes, Brazil. Its color is a greenish blue and it is absolutely free from impurities. It is estimated that this one crystal will furnish at least 200,000 carats of jewels of various sizes.

ⒸThe total cost of a round-trip voyage of the "Olympic" from Liverpool to New York and back, is \$175,000, and on her first voyage the receipts from passenger tickets alone aggregated \$250,000.

COMMENT AND REVIEW

Why Theories Fail

THE combining of theory and practice is one of the fine arts, requiring that deft touch which famous cooks possess, who, taking the same ingredients, have a knack of putting them together after a fashion impossible to describe accurately, but producing a rare delicacy where others miserably fail. The Railroad Gazette Age has published a series of notable articles entitled "The Mistakes of the Efficiency Men." While acknowledging the theory of their theory, it shows by citing actual experiences that a large number of failures, costly in time, effort and money, are caused by trying to enforce a system, or theory—which figures declare highly economical—while losing sight of the human equation. One of the expert efficiency men goes into a plant, spends several months studying the capacities of the machines, and comes out with an array of figures proving that a great saving of—in one instance 30 per cent—can be made. He is told to install the new system, but in doing so he ignores the human element, the esprit de corps; and the shop men to whom his mystifying calculations are Greek, resent the innovation and withhold their support. In some places reductions in cost appear but prove to be offset by increases elsewhere, and after two years the scheme is declared a failure. Then a practical man is called in. He mixes with his men, gains their confidence, explains how the new system benefits them quite as much as the employer, and in six months has accomplished what the purely theoretical man failed to do in two years.

The practical man will always accomplish more than the mere theorist. Theory without practice is futile. Theory and practice can do great things: The cook with the deft touch.



Need of More Cities Beautiful

HE is a wise man who learns from experience, but he who learns from the experiences of others is wiser than the one who learns only from his own. If only our American cities would learn from the experience of cities on the other side, there would be, in years to come, avenues and parks of striking beauty which otherwise will be impossible, or attained only at enormous cost. London has already widened a few of its densest thoroughfares at a cost of millions, and now plans to spend a million dollars in the removal of two comparatively small buildings which, being on corners, destroy the beauty of the Admiralty arches at Charing Cross. The removal contemplated would provide the finest spectacular street in all the city.

London, of course, has been centuries in growing, and even 100 years ago its citizens did not dream of its present greatness. Our own American cities, many of which will not reach their century mark for years to come, will some day wake up to a realization of what urban beauties they could easily have had if only the present generation had been less absorbed in temporary

utility and more thoughtful of the future. As a rule we all build too small, and frequently before a structure is completed the owner regrets he did not plan more liberally. Nor is it necessary to plunge into needless and useless waste of money; the simple spending of money lavishly is not art, but it is possible to plan ahead and to inaugurate public improvements the expense of which should be spread over such a period of time as will put upon a coming generation its fair share of the burden, either of continuation or completion of the work, or retirement of bonds on which money was raised to do it. We need a great awakening here to a loyal pride each in his own city, for no town is so small, nor any city so large, that it cannot do something to give the place a distinction that its own people will enjoy forever, and visitors remark when they are within its borders. Paris, Berlin, Brussels, Vienna have each spent millions in this way, and the results will justify the act for all time. There is no need for us to wait until our cities are moss-grown with age; we can commence right now to make a beginning.

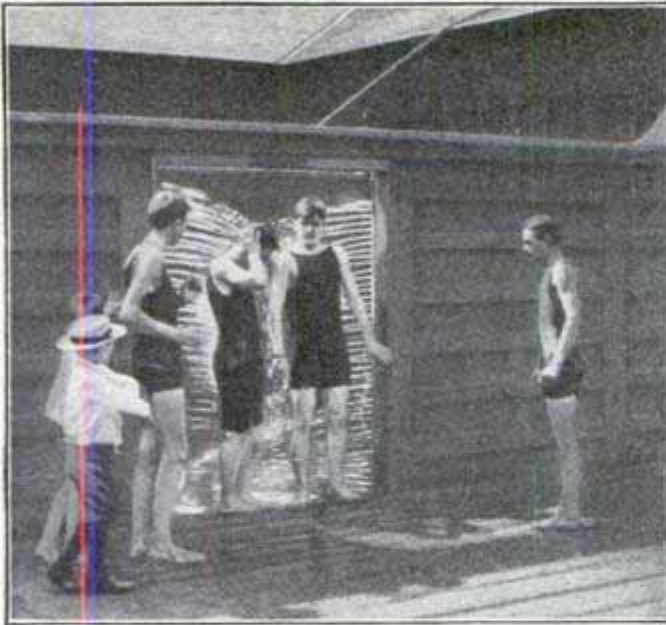


THE street car has reached its maturity; whereas the motor omnibus is in its infancy." This is the verdict of the Board of Trade, London, regarding surface transportation in a city having the largest street traffic in the world. As our own American cities are rapidly congesting in their business districts, much faster in proportion, in fact, than London on account of our numerous skyscrapers which are unknown there—the reasons for this decision are of interest to our city dwellers. It is pointed out that the new motor busses operate with scarcely any noise, are light, and possibly even less expensive to run than trolley cars. That they land their passengers at the curb instead of in the middle of the street; they do not impede traffic following, and require no widening of the street, as they follow the flow of other vehicles, turning out for obstructions, which the street car cannot. The development of the motor busses has very seriously reduced the revenue of the street car lines which practically do not enter the heart of the city at all.

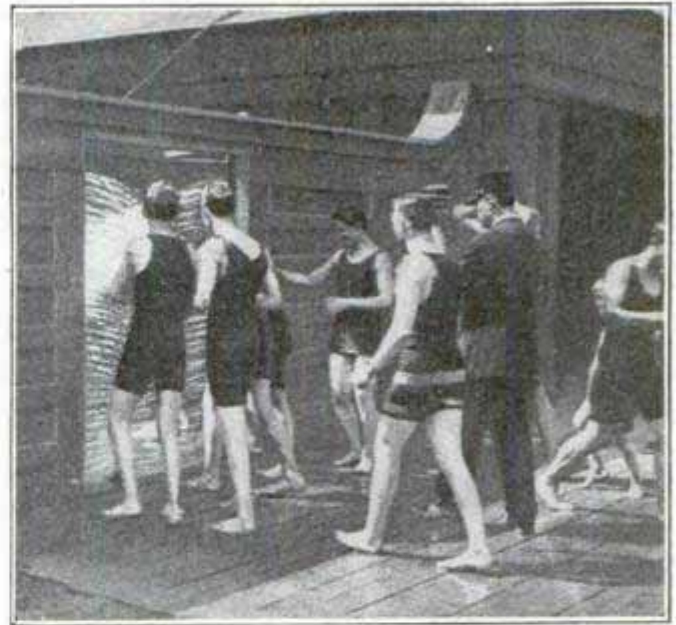
If the experience of London can be applied to large American cities of the future, it would seem to indicate that eventually subways and motor busses may drive street cars from our downtown districts. There was a time, not so many years ago, when the substitution of the trolley for cable cars seemed more unlikely.

*Motor Bus
Supplants
Street Car*

H. H. WINDSOR



No Person Can Enter Chicago Bathing-Beach Dressing Rooms without a Shower Bath



Beach Policeman Driving a Group of Bathers through Shower to Clean Bathing Suits

A SHOWER BATH THAT IS ALSO A POLICEMAN

An ingenious method of utilizing a shower bath to prevent bathers from stealing suits and towels has recently been put into effect at the Lincoln Park public bathing beach, on Chicago's north lake shore.

"When we first opened the beach," said President Francis T. Simmons, of the Lincoln Park board, "many of the bathers attempted to steal the suits and towels provided for them. They would skip by the small shower then used, dress, and then duck out past the shower with one of our suits and our towels under their arms. We also had trouble with persons who tried to enter the lockers by way of the bathers' gate. That is the reason for the new shower. No one goes through this gate without getting thoroughly drenched. There is only one other way of leaving the bath house and that requires you to turn in your suit and towel."

The shower also requires each bather and every "sand fly" to wash the suit before returning it. The "great unwashed" who don a suit and then merely loll on the beach are forced to get a good washing before they go home. As a matter of fact there is little chance for lying on the beach at Lincoln Park. The demand for

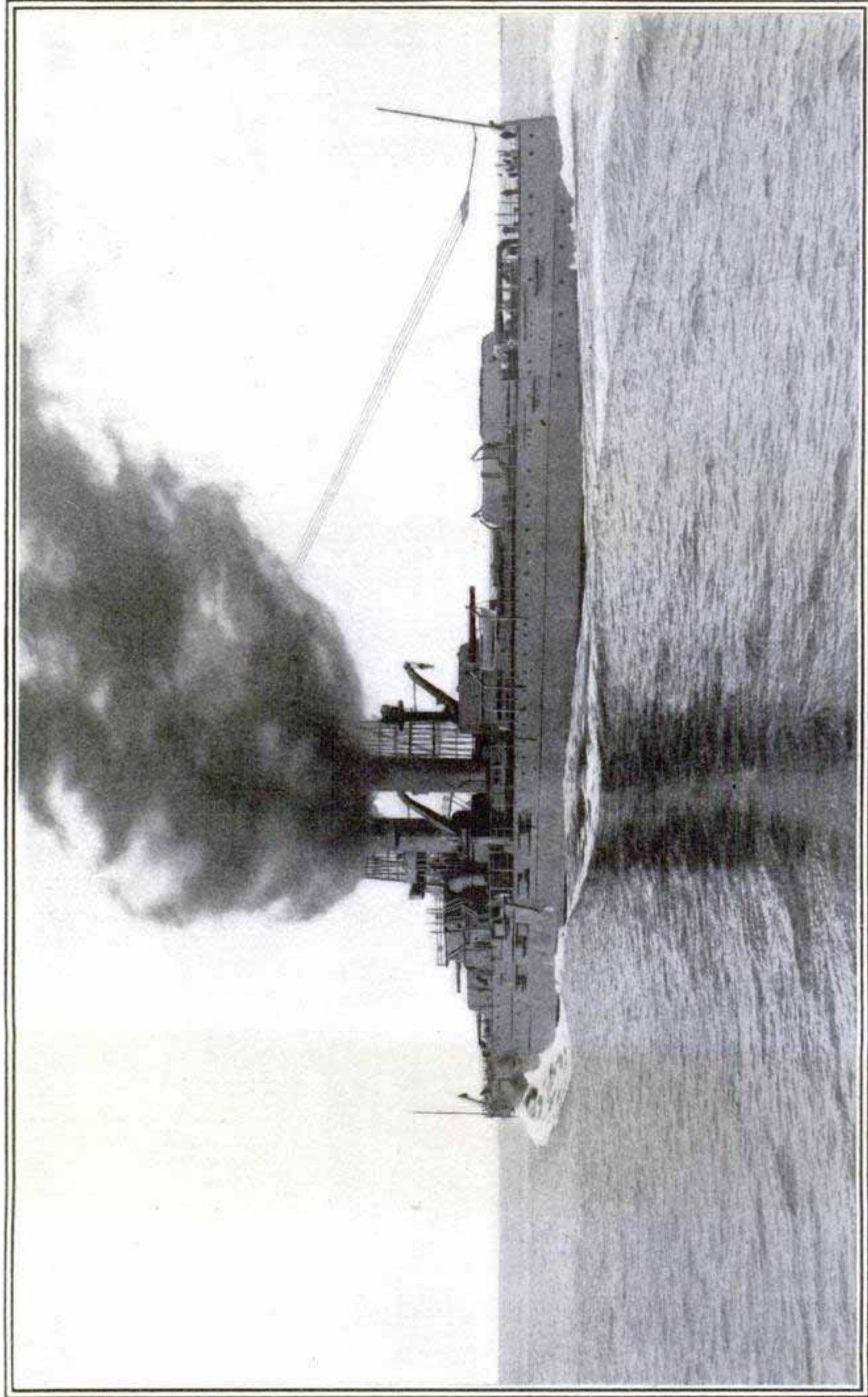
lockers is so great that the park police refuse to allow a bather to idle while others are waiting to get a swim. One of the pictures shows a policeman escorting a group of bathers, who wouldn't bathe, back to their dressing rooms through the cold shower.

"ACT OF GOD" NO PLEA IN FRENCH DECISION

A firm in Havre, France, sued one of the state railroads for \$80,000 damages because the road did not deliver sundry carloads of freight until after the period prescribed by law. The state pleaded "force majeure," which includes what American law calls "Act of God." The railroad was handicapped by a strike on the road and on the docks, there was an inundation which made matters worse, and there was more freight than could be handled anyway.

The court held that all this did not excuse the railway, and an arbitrator was called in to estimate damages.

☞ Cork board is being tested as the insulation in a reinforced concrete ice-house recently erected, 3-in. board being used for the ceilings and two layers of 2-in. board for the walls.



"Utah"—The U. S. Navy's Newest, Fastest and Biggest Battleship, during a Speed Trial

U. S. S. "UTAH" EXCEEDS SPEED REQUIREMENTS

The super-dreadnought "Utah," which went into commission in August, and becomes the biggest and fastest battleship in the American navy, exceeded her speed requirements by more than a mile an hour in the standardization trials. Her maximum speed was close to 25 miles an hour. Aside from the gratification of the builders in the successful accomplishment of the speed test, the interest of not only the naval engineers of this country but of other nations as well, centered in the work of the "Utah's" turbines, as the efficiency of the turbines over former equipment rested upon the vessel's behavior in this trial. The turbines, of which there are 10, developed 28,477 hp.

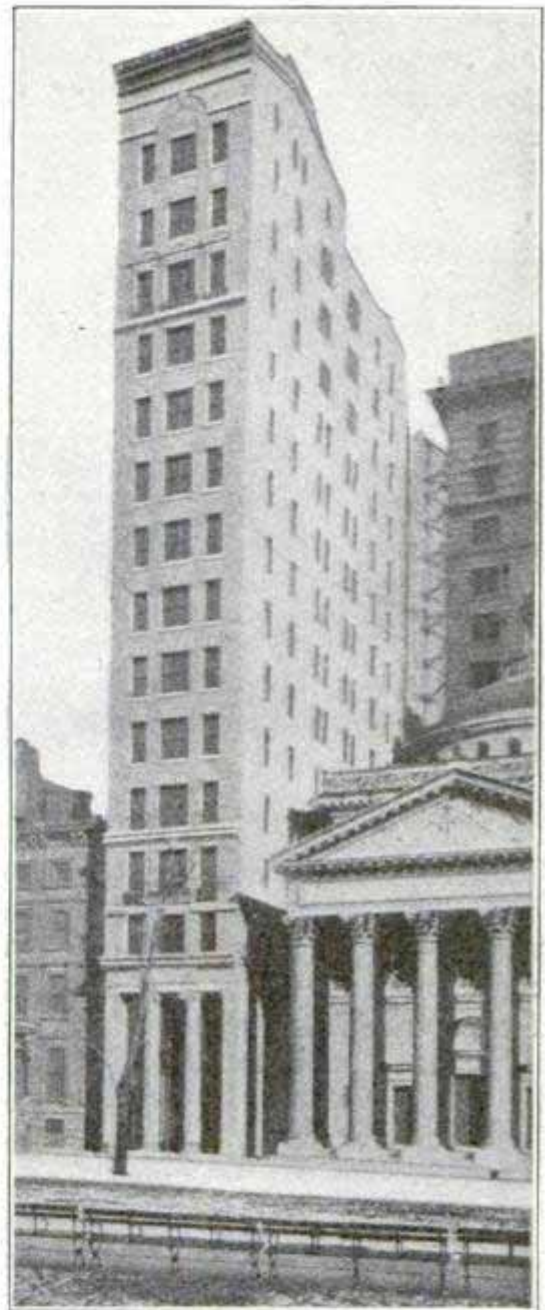
The displacement of the "Utah" is 21,247 tons, her length 518 ft., breadth 85 ft., and she carries ten 12-in. guns.

WATER WIRELESS TELEGRAPHY

Habibur Rahman Khan, an Indian deputy-superintendent of telegraphs, located at Allahabad, India, has invented a system of water wireless telegraphy which he is said to have used successfully during interruptions to the land lines in his jurisdiction. He established steady wireless communication by means of the river between Chitral and Drosh, a distance of 25 miles, and even as far as Mastuj, which is 67 miles from Chitral. His success is said to be due to the use of the surface of the water as a substitute for the wire line.

SIXTEEN-STORY BUILDING ON 24-FT. LOT

The Pullman building, Madison street, New York, has the unique distinction of being the narrowest office building of its height in the world. It stands on a plot of ground only 24 $\frac{3}{4}$ ft. wide, yet is 16 stories high. The ex-



Claimed to be Narrowest Office Building of
Its Height in the World

treme narrowness for such height is said to have presented rather difficult problems in structural wind bracing, which were successfully solved.

⌈The Russian airman, Lebedeff, has installed a taximeter on his aeroplane, charging 25 rubles (about \$12.50) for the first five minutes of flight, and 10 rubles (\$5.00) for each additional five minutes. He is doing a rushing business, says L'Aéro, and intends launching an aero-taxi company.

AN AUTOMOBILE MISSION CHAPEL

This remarkable automobile, recently consecrated by the Archbishop of Westminster, is a chapel



A Catholic Automobile Chapel in England

on wheels built for mission work in England. The interior has a miniature altar for the celebration of mass, and is provided with prie-dieu kneelers for 12 worshipers. When not in use for divine service, the

benches are stowed away, the altar cleared of its ornaments, and the chapel converted into an ordinary auto traveling van, with cot beds for the two priests.

JEWEL BOX HAS ELECTRIC ALARM MECHANISM

A jewel box provided with an electric alarm has been patented in European and American countries and has already been placed on the market in Paris. In the bottom of the box is a dry battery, a magnet, and a system of levers, the whole forming a device not unlike a telegraph instrument in appearance. In the center of the bottom of the box is a small opening in which a pendulum is suspended. As long as the box is stationary this pendulum hangs perpendicular and does not close the electric circuit, but the slightest movement of the box causes it to close the circuit and sound the alarm. The sound is made by means of a bell and clapper. Once the pendulum drops down, the alarm cannot be silenced except by opening the lid of the box and shifting a lever.

MECHANICAL PROGRESS IN 35 YEARS

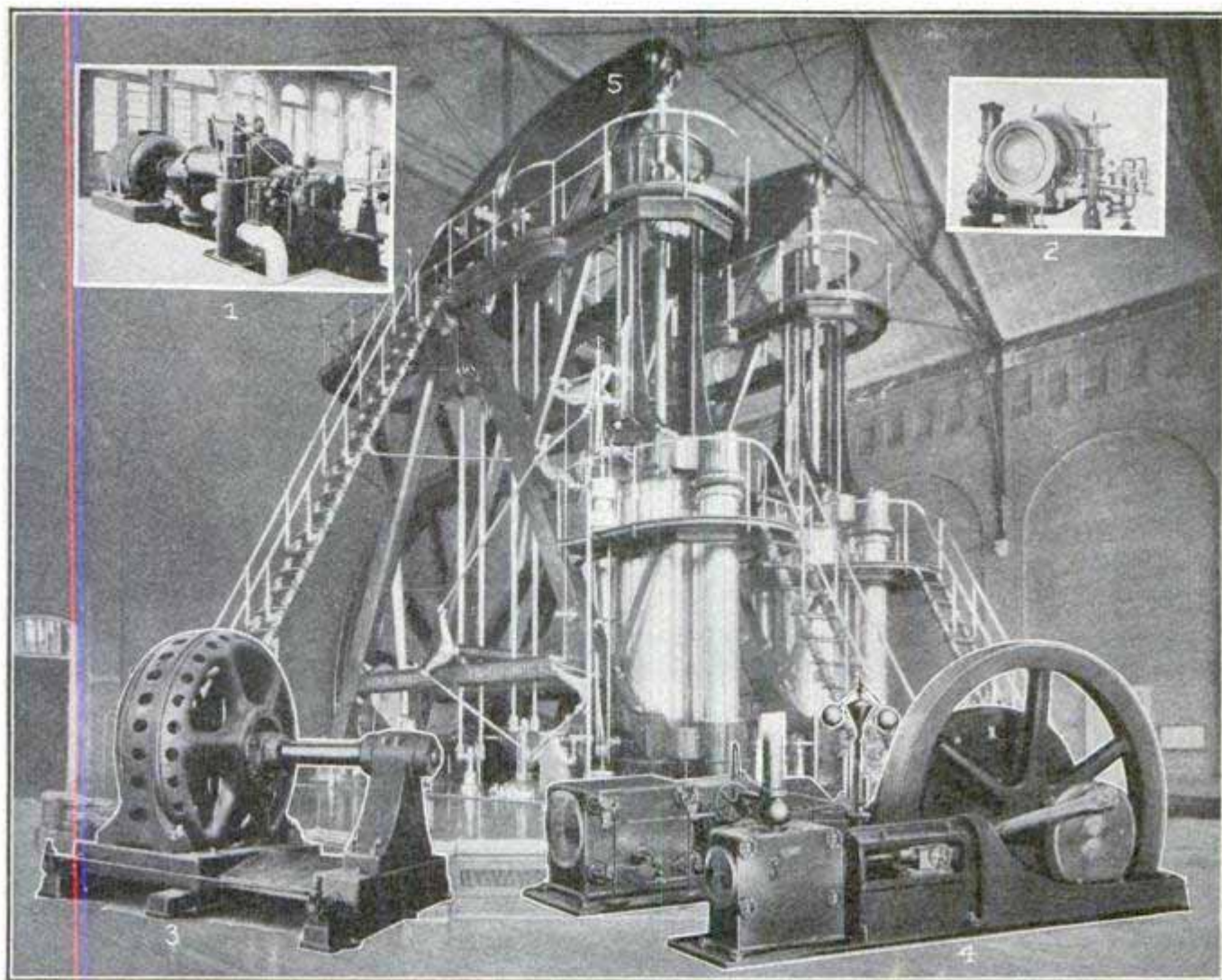
The accompanying picture shows, in correct relative sizes, five different types of prime movers which develop approximately the same horsepower under their normal conditions of operating, and affords a striking illustration of the wonderful progress in mechanical engineering made during 35 years of evolution and discovery.

This interesting comparison was suggested by the passing away of the famous old Centennial Corliss engine from the car shops at West Pullman, Chicago, Ill., where, after being in continuous service for nearly 30 years, it has just been superseded by a modern electrical equipment.

The Centennial engine was built at Providence, R. I., for exhibition at the Philadelphia Exposition of 1876. At that time it was considered the last

word in engineering design. It is of the walking-beam type, with two vertical cylinders, each 40-in. in diameter by 10-ft. stroke. The rated horsepower for each cylinder at a normal speed of 36 revolutions a minute and a steam pressure of 80 lb., is 700, giving a total of 1,400 hp. The height from the floor to the top of the walking beam is 39 ft., and the engine weighs complete over 1,600,000 lb. The fly-wheel is 30 ft. in diameter with a rim 2 ft. wide, and weighs 112,000 lb. The engine has air pumps and condensers, and may be operated either condensing or noncondensing.

Contrasting with this old type of engine is the modern Corliss engine shown in front of it to the right. This is a cross-compound condensing engine of 1,400 hp., and weighs 360,000



These Five Machines, Shown in Correct Relative Sizes, Develop Approximately the Same Power. 1—Steam Turbine. 2—Francis Water Turbine. 3—Electric Induction Motor. 4—Modern Corliss Engine. 5—The Famous Centennial Corliss Engine of 1876

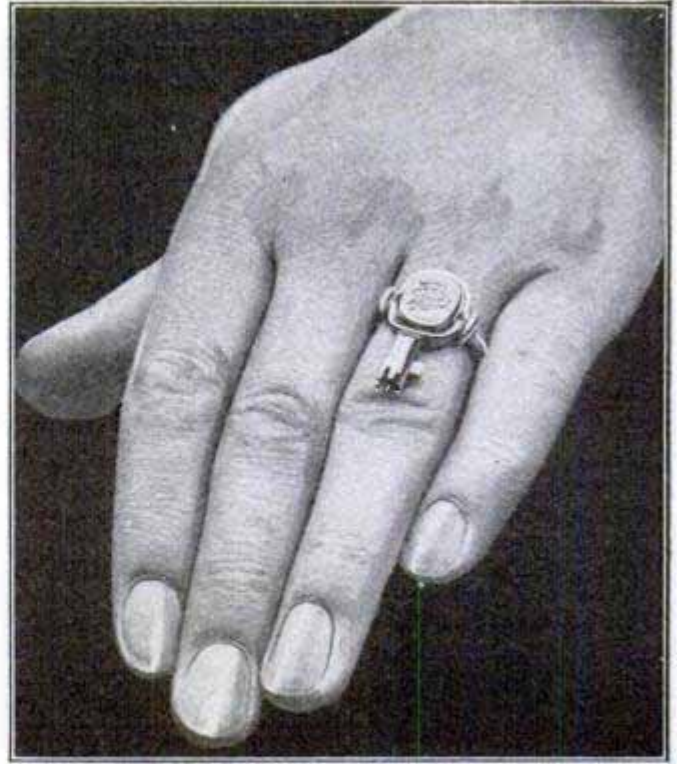
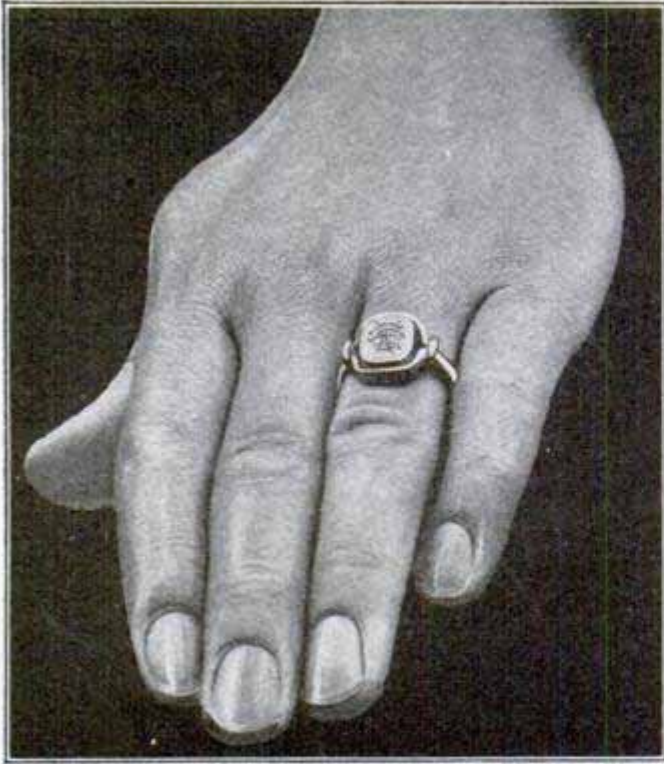
lb., or about two-ninths of the weight of the other. Its height from the floor to the top of the flywheel is 14 ft.

A modern steam turbine is shown in the top left-hand corner of the picture. This high-speed machine runs at 3,600 revolutions a minute and develops 1,350 hp. Its height is 6 ft. 5 in. The electric motor in the bottom left-hand corner develops 1,200 hp. under normal conditions and much more than that under an overload. Its running speed is 360 revolutions a minute, its height 12 ft., and its total weight, including pulley and base, approximately 75,000 lb., or less than one-twentieth of the weight of the Centennial Corliss engine.

The most striking picture, as regards size and low weight per horsepower, is the little machine in the top right-hand corner. This is a high-pressure Francis water turbine, which develops 1,180

hp. under a head of 350 ft. and a speed of 600 revolutions per minute. It weighs about 14,000 lb.; that is to say, it would take a fraction over 114 of these little motors to weigh as much as the mechanical wonder of 1876, and each of them would develop nearly as much power as the old Corliss engine. In height it is but 5 ft. 9 in. above the floor line, as against 39 ft. for the Centennial engine. A modern freight car could carry several such machines with ease, whereas, when the old Corliss engine was moved from Philadelphia to Chicago, it took 35 cars to transport it.

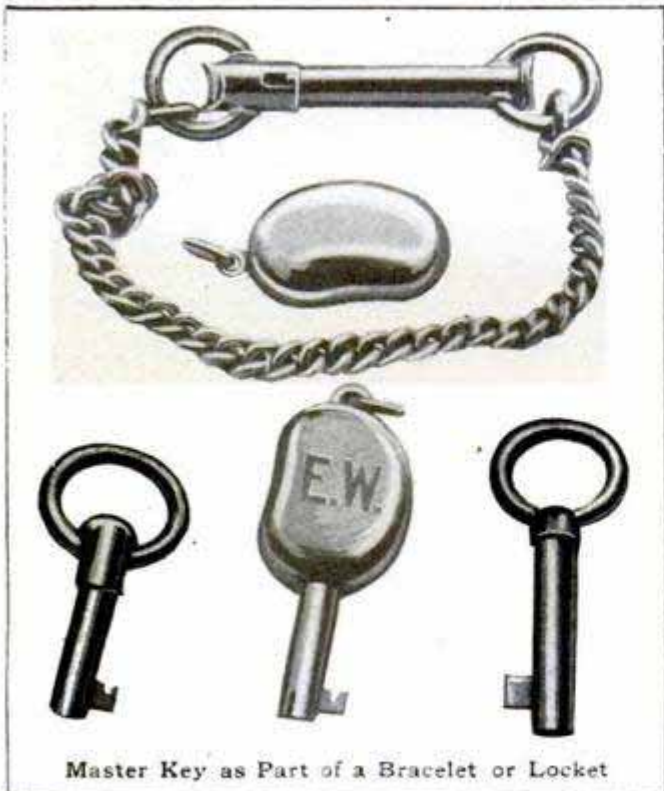
Besides the refinements in modern design and machine-shop methods, the chief cause of the striking development shown by the picture is the use of greater operating pressures and much higher speeds. Startling advances are not looked for in the future.



Master Key as Part of a Man's Signet Ring

MASTER KEY CARRIED IN RING OR LOCKET

Ingenious means of carrying a master key in jewelry are shown in the accompanying illustrations. One of these depicts a master key carried as part of a bracelet or a locket. The other illustrations show a master key as part of a man's ring, one showing the key exposed and the other hidden.



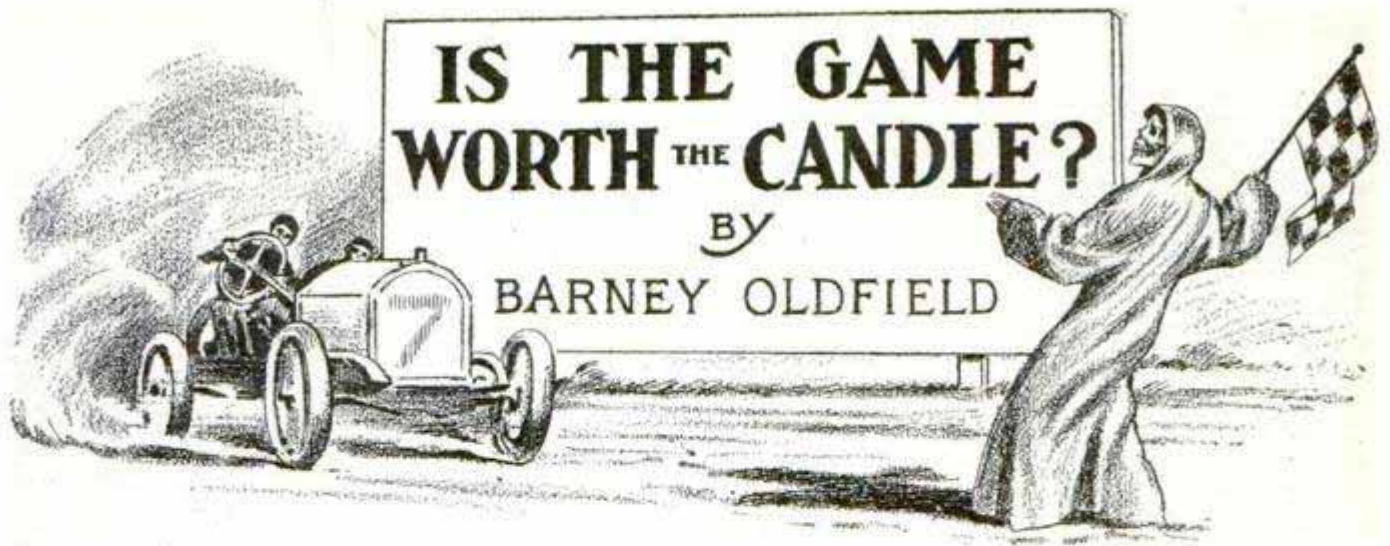
Master Key as Part of a Bracelet or Locket

A master key is a key designed to open all the locks used to safeguard one's possessions.

FORCING METALS INTO GLASS

Lead, tin, copper, iron, cobalt and silver have been introduced into glass by means of an electrical process developed by two German scientists. In this process a small tube of soda-glass or potash-glass, closed at the bottom, is filled with a fused mixture of sodium and potassium nitrates, and then immersed in a fused salt of the heavy metal. Electric current is applied through platinum wires, the mixture within the tube forming the negative pole, and the metallic salt outside serving as the positive pole. The metals penetrate the glass in a jelly-like form, giving colors varying with conditions, and on heating change to the metallic state, or to oxides.

A telephone company in Iowa claims that many of its subscribers owning automobiles take the batteries off the telephones for use on their machines, replace them with old worn-out ones, then complain to the company that the phones are out of order.



The question which Barney Oldfield answers in this article is one which has been confronting automobile manufacturers for several years. Many of the men engaged in the building of high-class cars have given their answer by refusing to take part in speed contests, not only because they do not consider the transitory glory and slight advertising sufficient reward for the cost of maintaining expensive racing teams, but because they do not consider it worth the cost in human life. Oldfield is probably the most experienced driver of fast cars in the world. He is now out of the game and is merely a spectator. He considers himself lucky to be alive.



Barney Oldfield

IT was in Birmingham, Ala. George DeWitt, who, on the Florida beach, in the flush of his first race after a record, had done 100 miles in 90 minutes, dropped swiftly down past the grandstand into the short turn. It had been a dry summer, and the dust of three parched weeks drove itself across his vision. He checked his throttle, put on his brakes, and then, to the astonishment of everyone, came to a dead stop, while the other racers rushed past him.

"What's the matter?" I asked, as he withdrew from the track, "Smash something?"

George lifted his goggles, blinked his eyes, and gazed back into the seething hurricane of dust and machines.

"Not yet," he answered, with his eyes still fixed on the track; "but that dust doesn't look good to me. There's death in tracks like that, and, take my word, I'd rather live to hear one man talk about my eightieth birthday than to have the whole world cheer me as a dead hero."

I knew he was right at the time, and since then a thousand developments in the racing game have gone to prove him right. The dirt track has been the death, not only of many brave men and good drivers, but, to a certain extent, of automobile racing itself. There are still lunatics who will risk its dangers, but the manufacturers themselves have become weary of its endless death-roll. Good drivers fight shy of it. *The game is not worth the candle.*

It has taken 10 years to prove this, 10 years of driving death, of incessant slaughter, of many broken machines and a few broken records. It has been a decade replete with black headlines and black mourning. Much money has been made by promoters and the sport-governing association; a little has been made by drivers.



Bulletins Posted During Los Angeles Race. Told of Accidents — not Standing of Contestants

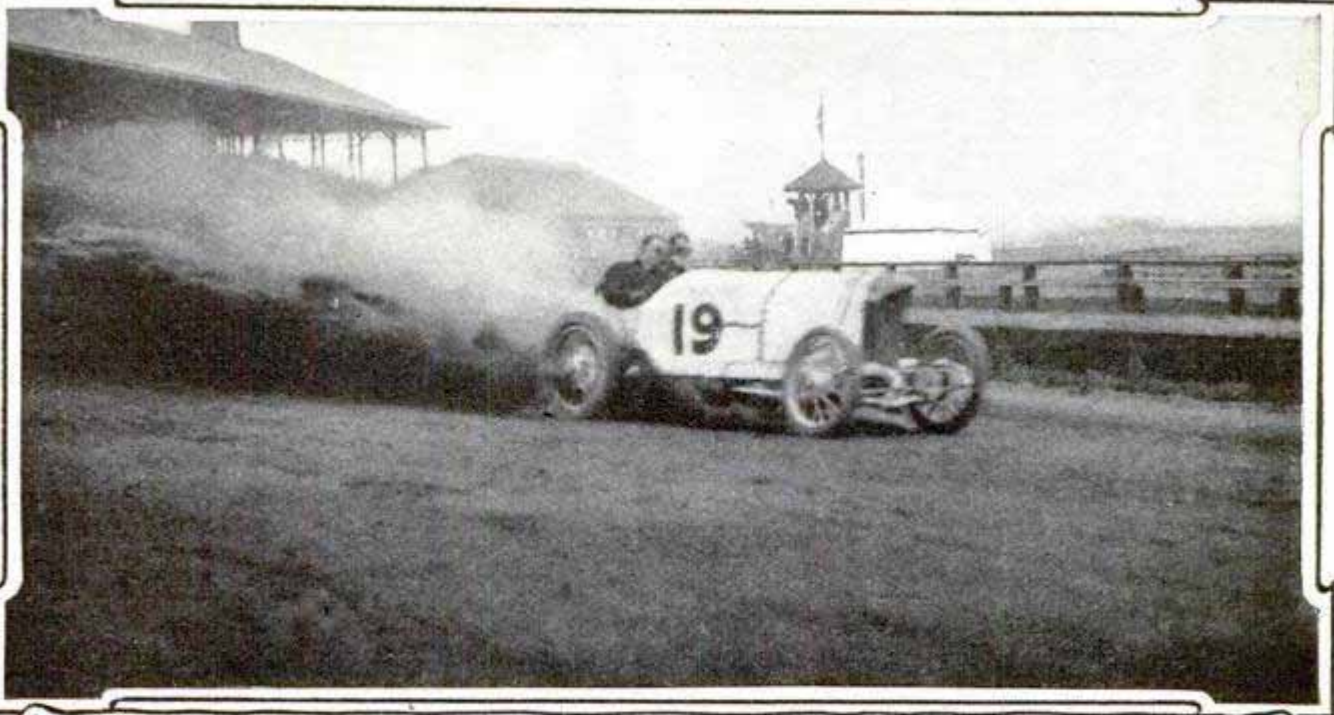
It has also been a source of considerable profit to hospitals, undertakers, and cemetery societies. It has had one excuse—the development of the motor car. This, though, was nothing more than an excuse—the real reason for its existence was the blood-hunger of the spectator. Everybody knows this, manufacturer, promoter, driver, mechanic. I was never famous until I went through the fence at St. Louis and killed two spectators. Promoters fell over one another to sign me up. Few of your average automobile-race fans know or care anything about the finer points of the machines or the race. They watch without interest or perception the most skillful and delicate driving, but let a tire burst, a wheel skid, a car break for the fence, and they are out of their seats in a flash, with the blood-cry in their throats and the lust of death in their eyes. It is the call of the Roman arena, of the Spanish bull ring. It is no more a sport than a hanging is sport. It used to be called “instructive,” “developing,” “useful,” but that day is long past.

The racing game, in fact, has outlived its usefulness. The science of speed has reached a point where any manufacturer can produce a car which will satisfy any sane buyer. There is no demand and little need for a further development along speed lines. Fast racing has ceased to be even a proof of perfect cars. The same car seldom wins twice in succession. It is a contest now of drivers, tires, and luck, rather than of machines. The manufacturer has found that he no sooner wins a record than some other manufacturer takes it away from him. A two-dollar-a-day workman's carelessness in the manufacture of a tire will lose a speed event as surely as a faulty axle or poor engine. All the skill in the world will not save a good driver when some dub who has crept into the race by virtue of a weak head and a two-dollar license card from the sanction-governing body, shoves a machine across his road. A soft spot in the track, a piece of broken metal, an infinitesimal speck of dirt in an oil-feed—these things, and not engines, experience, determination, or skill, are the things that win motor races now.

In the recent race at Indianapolis, where the crowd's lust was satisfied by a black tangle of shattered men and machines, nine-tenths of the entries were made against the desires of the manufacturers. It was a drivers' race. Few of the participants received a cent from the makers of their cars. The most of them had cajoled their employers into allowing them to enter. When it was over Harroun had won, mainly by the wonderful manner in which he handled his tires. He changed only one tire during the 500 miles. His car was built with one object—the preservation of tires. It was hung low and perfectly balanced. He designed it himself.

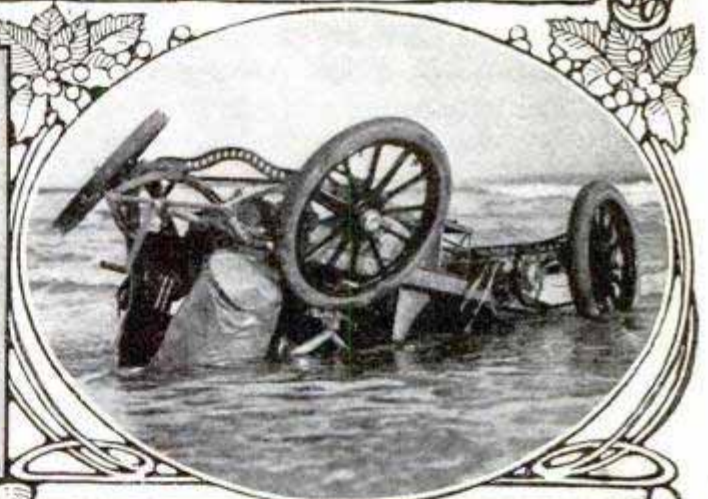
For the manufacturers who trusted to superior power and speed to win the race, it was a fizzle. I know of three whom it cost \$25,000 apiece. If they had won, the victory would have been good for a three-months' advertising spree, nothing more. The race proved absolutely *nothing*, except the paramount importance of tires and luck. Soon, it will be forgotten; its records will be eclipsed by other records, as all records are; it will pass into unstable and worthless history. It attested no advance in mechanics; no superiority of workmanship. How many of my readers know at this moment the name of the winning car? If anything be remembered, it will be that mad mesh of machinery at the lower turn; that Dickson was killed and the lives of a dozen others put in danger, just as the memory sticks of that opening meet at the same track, when seven died for entertainment's sake. It is the horrible that remains; not the expenditure of money, and science, and careful industry. It is one case at least where the living are forgotten for the dead.

The manufacturer is nowhere. The past winnings of his car are forgotten in the present winnings of somebody else. He has gambled, deliberately



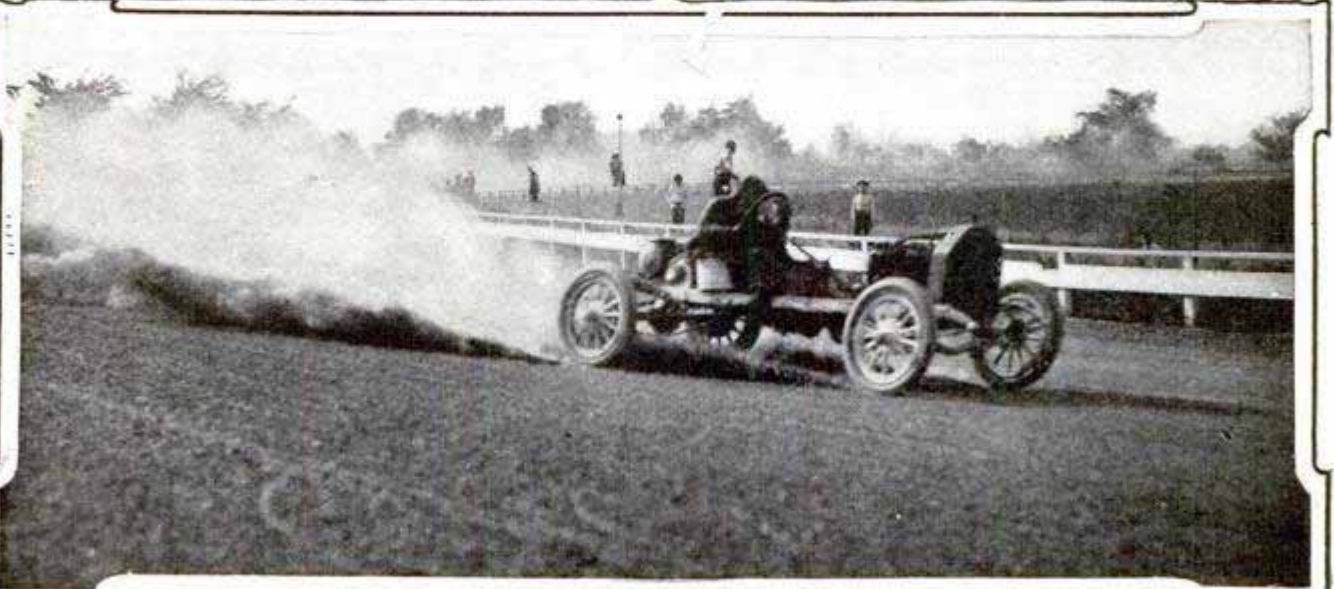
Most Persons Believe Dirt Tracks can be Made Safe by Oiling. This Photograph Shows Barney Oldfield Going into a Turn on the Hawthorne Track, in Chicago, after the Track had been Flooded with Oil and the Surface Put in the Best Condition Possible with a Dirt Track. What Might Happen to a Driver Who was Forced to Follow into Such a Hurricane of Greasy Dirt?

SHAKING DICE WITH DEATH!
20 DARE DEVIL DRIVERS
 IN THRILLING SPEED DUELS
 THE FIELD vs. DEATH—WHICH WILL WIN?
FAIR GROUNDS, AUGUST 8-9
 SPECIAL CAR SERVICE!
 ADMISSION 50¢ GRAND STAND 50¢ EXTRA



Not Burman vs. DePalma or Aitken vs. Robertson, but the Field vs. Death

The \$20,000 Car Which Killed Frank Croker on the Beach at Daytona, Fla.



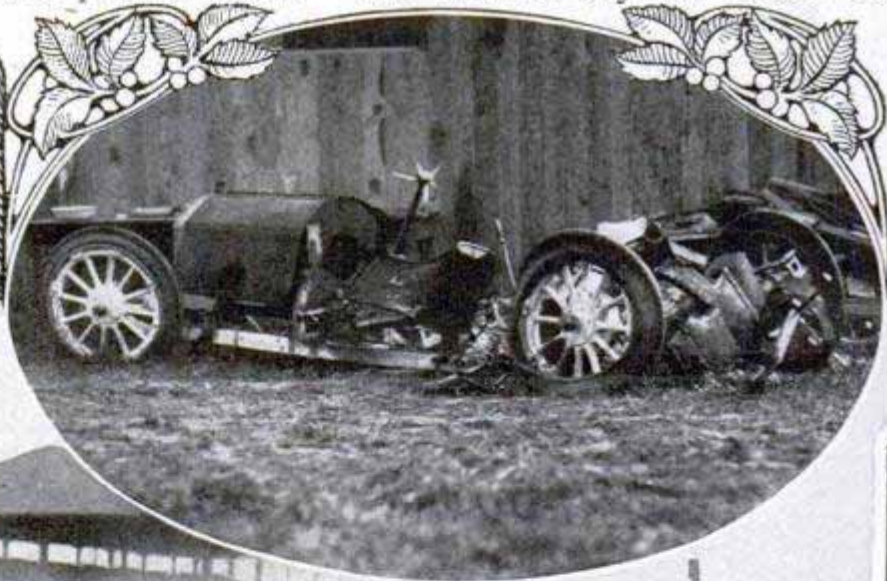
The Late Lewis Strang Breaking a Dirt-Track Record. Four Cars are in Strang's Wake, but Cannot See or be Seen for the Dust

gambled away thousands of dollars—and manufacturers are not fond of gambling. The simple fact is that automobile racing has ceased to have a business end, and has become a mere game, an entertainment in which business has little part. The manufacturers are beginning to perceive it. They no longer bid against each other for famous drivers. They no longer throw expensive machinery into the profitless mill. Even the Glidden tour has been called off, and an attempt to draw manufacturers into the recent national-circuit scheme met with a north pole reception that effectively indicated the general direction of the wind. In short, the racing game is becoming less and less profitable to manufacturers, and the moment anything becomes unprofitable, good business men drop it.

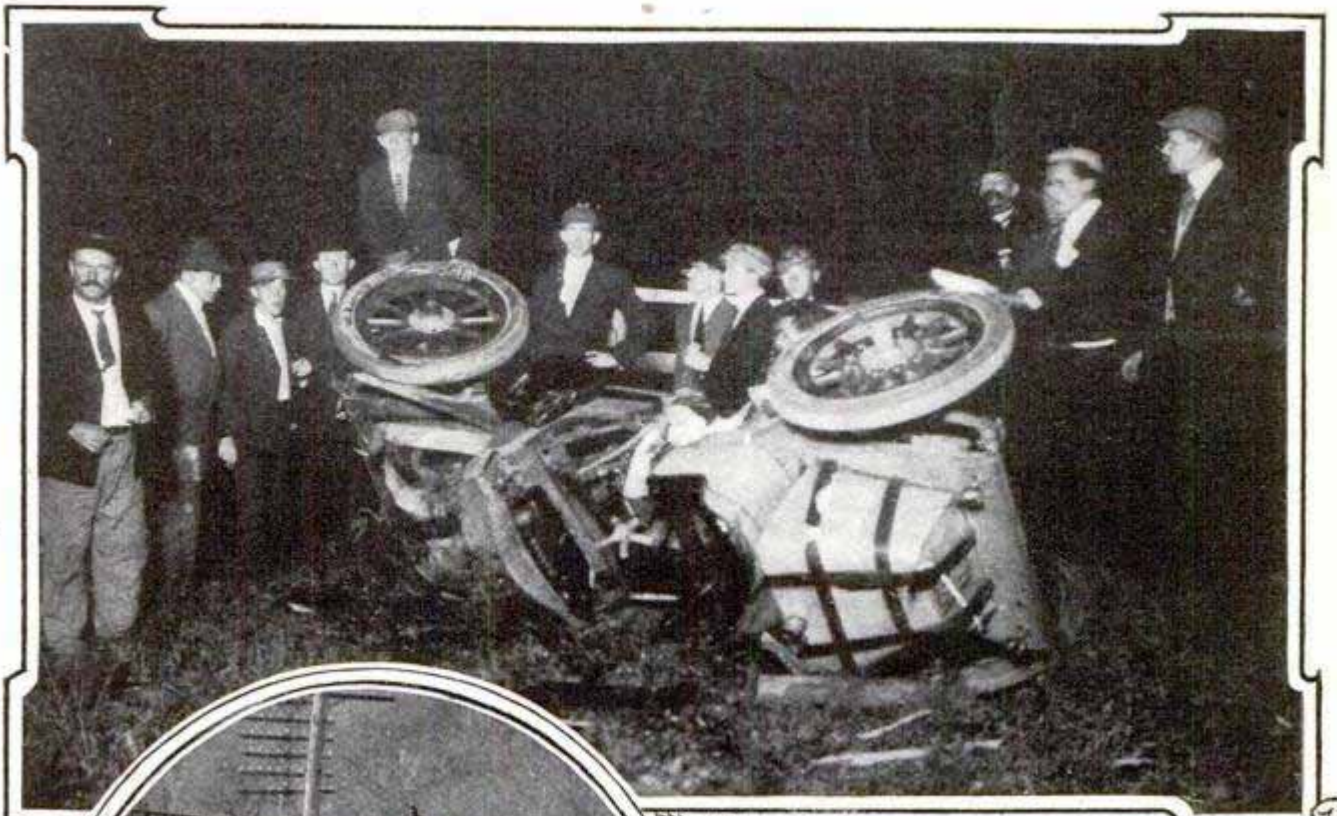
It happens also, that the increasing importance of tires has brought no balm to the tire maker. Even if the industry were of sufficient proportions to support the racing game unassisted, there is not enough in it for the cost. Nine-tenths of the press reports after the average race accident attribute it to "a burst tire." A wheel collapses, a steering knuckle breaks, and in the ensuing accident, the tires are torn away. That is enough to start the "burst-tire" story.

No, if automobile racing is to be perpetuated, it must be through the interest of the public. How large is this interest? Immense; but so was the interest in cock-fighting, in bull-baiting, in prize-fights, in gladiatorial contests. So is it yet in the Mexican bull fight, where in sport's name they kill cattle instead of human beings. All of these have passed or are passing. Modern humanity will not permit them. The morbid cry for blood still

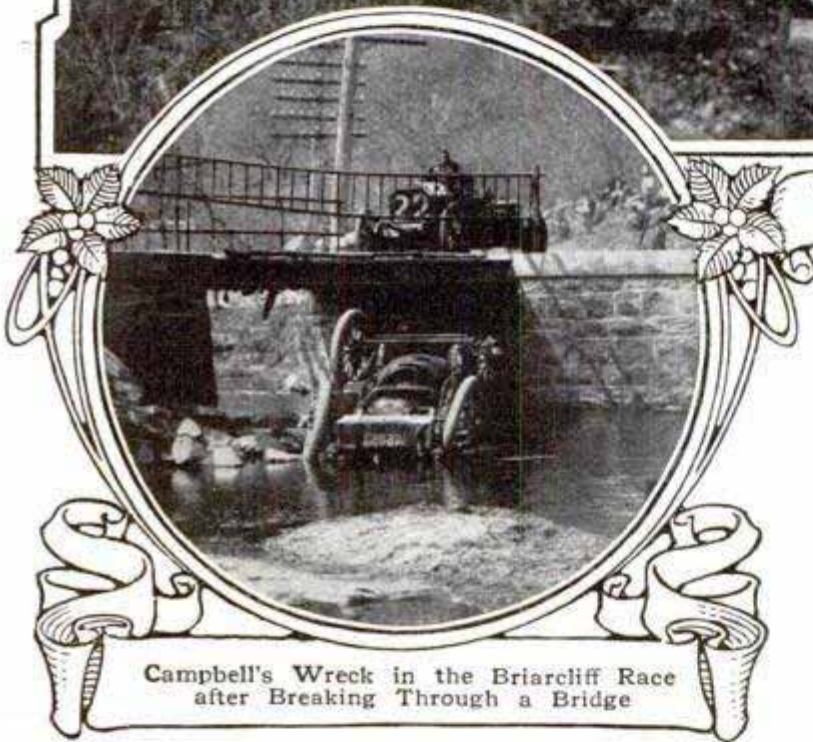
Remains of "Wild Bob" Burman's Car after a Smash in Practice on the Savannah Road Course. Said to be the Most Smashed-Up Car Ever Seen



George Robertson Leading a Field of Seven Cars on the Brighton Beach Motordrome. Only One Other Car can be Seen on Account of the Blinding Dust. This Track is Supposed to be Dustless



Wreck of No. 5 at the 24-Hour Race at Brighton Beach in 1908



Campbell's Wreck in the Briarcliff Race after Breaking Through a Bridge

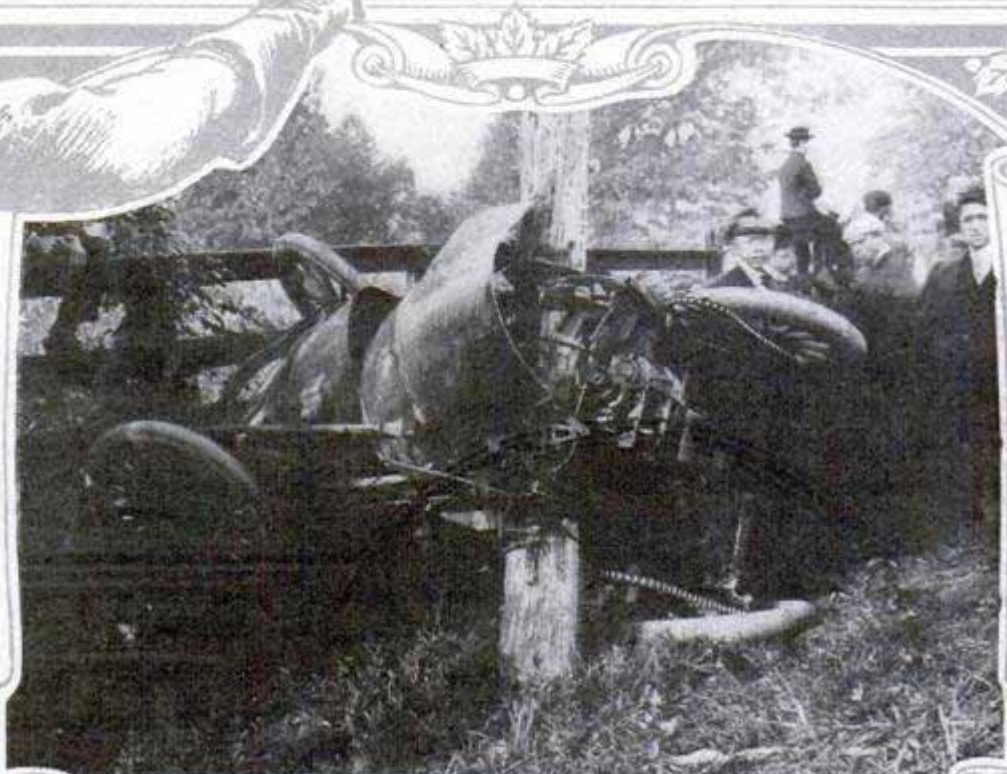
lives in a few, but the many cry for mercy. The moment that the disguise of mechanical advancement is stripped from the racing game, humanity will refuse to permit it also. The mere sacrifice of life for amusement will not be tolerated a moment. The American public is peculiarly prone to condone its faults so long as it can hide them under a pretense of virtue, or "progress," but so soon as

these veils are torn away, condonement and toleration cease. For years, horse racing survived on the strength of its contributions to pedigree, but this could not save it from the storm of protest which finally drove it from almost every state in the country. Yet the worst that could be said of horse racing was that it was a gambling game. Fewer lives were lost in it than in football. Its victims, if it had any, were the spectators, not the participants. They came to win or lose money, not to watch men die.

People say that "speed madness" is the thing which draws great crowds to motor races. I don't think so. Speed madness is one thing; blood madness is another. For speed there is nothing more wonderful than the wireless telegraph; yet it is unlikely that the 77,000 persons who attended the recent race at Indianapolis would find much interest in a wireless telegraph contest. It is not sufficiently spectacular. The element of human danger is not present. If motor racing could be developed to a point of perfect safety, how much of a crowd do you think a race so arranged would attract, even though the cars made 500, or, for that matter, 5,000 miles an hour?

Americans will not tolerate bull-fighting because it is considered inhumane and unsportsmanlike. It is certain that the Mexicans would not

THE PRICE IS HEAVY

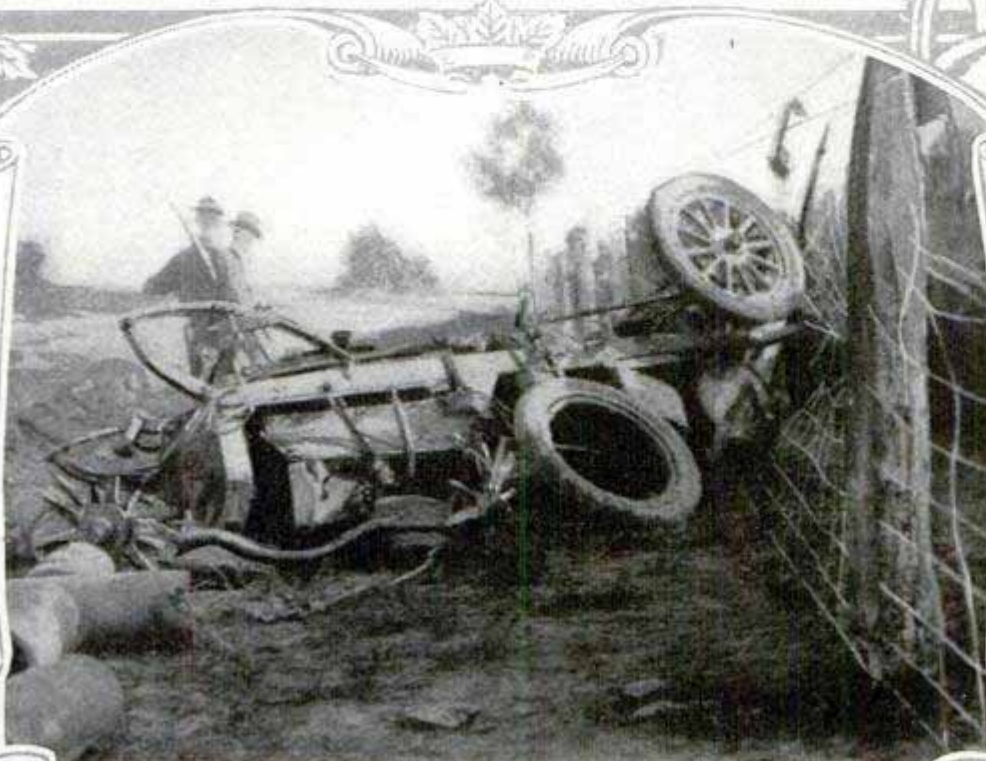


This Remarkable Accident Made George Robertson, Vanderbilt Cup Winner, a Careful Driver, and Influenced Him to Quit Driving

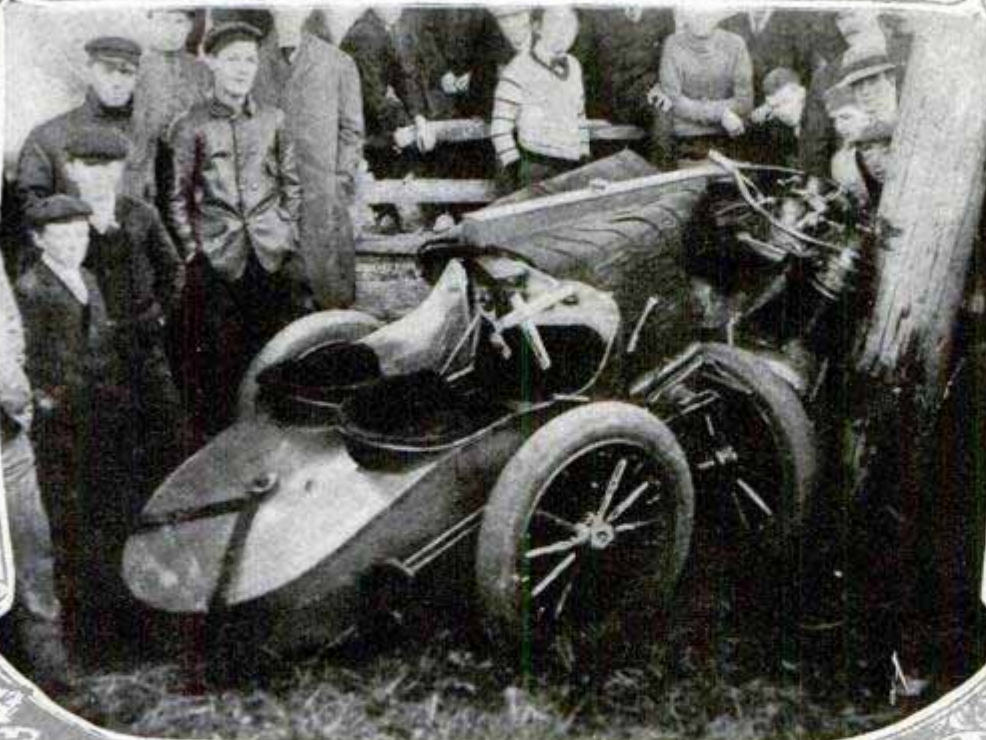


When Charlie Merz Went through the Fence at the Indianapolis Speedway—Four were Killed

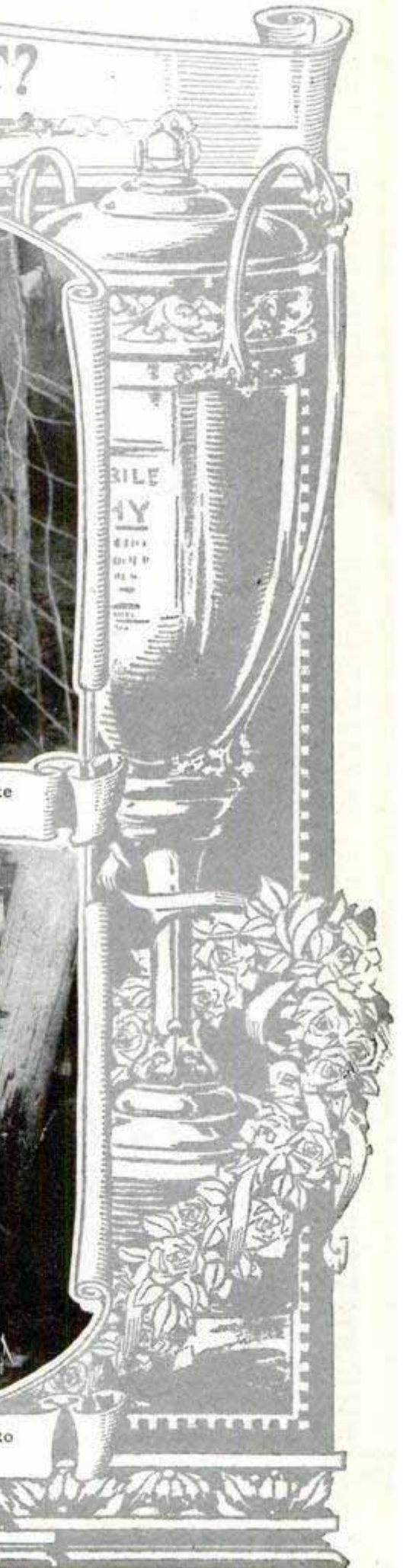
THE REWARD IS - WHAT?



Wreck in Which Bourque and His Mechanic were Killed. Note Sewer Pipe and Ditch into Which Car Ran



Walter Christie's Famous Front-Drive Racer after Smashing into a Telegraph Pole on the Vanderbilt Cup Course



continue their national pastime if it involved so tremendous a sacrifice of human life as motor racing. With all the supposed danger of bull-fighting there have not been five deaths among the fighters in as many years. There were 29 fatal race accidents in the United States last year. This year, with the season less than half over, 18 lives have been sacrificed to the speed idol. Incidental to a "Speed Carnival" at Brighton, New York, July 3 and 4, three drivers were killed. The American grows sentimental about killing cattle; the Mexican prefers cattle to human beings. It is merely a matter of taste.

Since 1904 more than 200 drivers and mechanics have been killed in racing accidents. There are three favorite ways of killing motor racers—dives through fences, burst tires, and collisions. Burst tires are the most common; fences are the most to be feared. Collisions are infrequent; when they happen they are usually the result of the admission of inexperienced drivers. This is one of the charges to which the governing association is answerable, and only one of the many, for, as every driver knows, the association, which is supposed to do the most to protect the racer, ordinarily does the most to place him in unending danger.

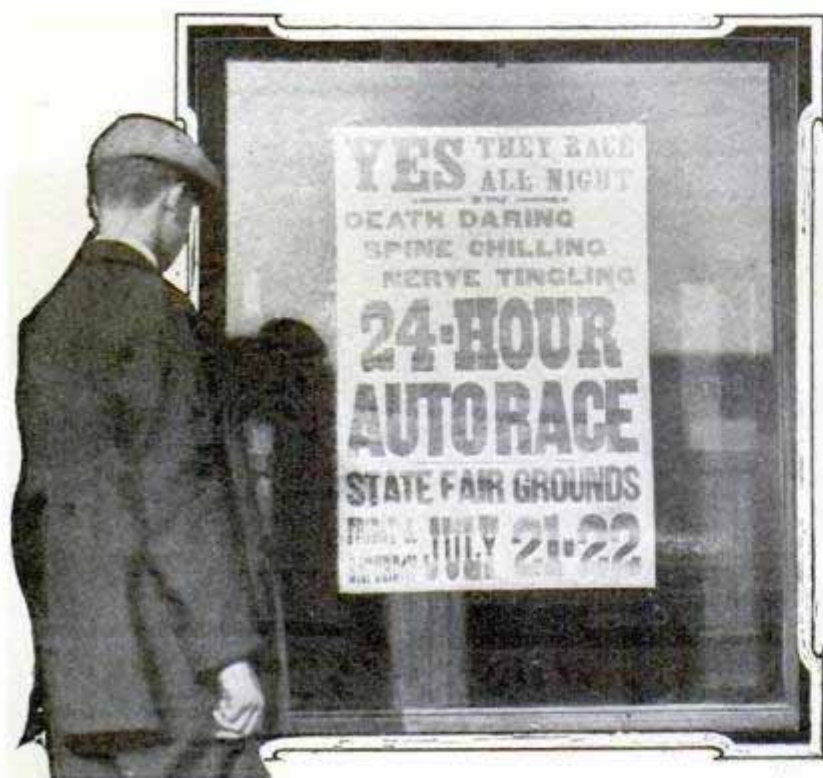
In the red dawn of amusement racing, Frank Day was the first to stimulate by death the imagination of the multitude. Frank was 20 years old. He had gone into the game over the wishes of his parents. He was young, but he had the careless indifference of youth to death, and a nerve which never wavered. During the state fair of 1903, he went through the fence at the deadly Milwaukee dirt track. Two months ago Walter Donnelly crashed through the fence not ten feet away. Day's old father and mother afterward moved to the remote country to avoid the sound of motor cars.

Many have forgotten the death of Frank Croker, son of the lucky boss and unhappy father, Richard Croker, at Daytona Beach, in 1905. Young Croker had all the daring in the world, but little knowledge of the awful capabilities of his record-breaking car. While he was making 100 miles on the beach, a motorcycle, through the carelessness of officials, was admitted to the track. It arose suddenly in Croker's path. Now, at 100 miles an hour, a broom-stick placed across the track, would throw a 2,000-lb car 50 ft. through the air. Turns are things to be contemplated in mile distances. Croker tried

to turn short. His car skidded and plunged into the Atlantic Ocean. Croker lay crushed, underneath.

A tire blow-out killed Emmanuel Cedrino, designer and driver of the Fiat "Cyclone," in Baltimore at the Pimlico track. All the science and skill he had spent in the building of the famous car went for nothing. As the tire popped, the car lunged about, whirled over, and killed one of the cleverest automobile designers the world has known.

On the same Birmingham track where DeWitt announced his decision to reach old age rather than young heroism, Emil Stricker, in



A Type of Poster Which Shows the Circus Manner in Which Motor Racing Appeals to the Public

1907, sacrificed his life to the 24-hour record. It was a day-and-night drive. Stricker had been making unparalleled time. Just as the twilight was advancing, and the shadow of the track rail was becoming long and vague, a rear wheel on the German's car collapsed. There was a sickening roar of disrupted machinery, and his body plunged out into the yellow splendor of the setting sun.

In the same fatal month of September, 1907, when seven drivers met death, young Smeltzer died through the carelessness of some one at Morris Park, New York. He was hugging a turn, when his car skidded and dived into the fence. Around the top of that fence there

was a 4-in. iron water pipe, a relic of the old days of horse racing. Smeltzer was all right until his head hit the water pipe; then his car leaped on, and the body of a record-holder toppled back upon the track.

The name of the Indianapolis speedway was made more effectively than it could have been in any other way, when Billy Bourque and his mechanic thundered from it into an open ditch on the opening day in 1909. The track was uncompleted; it should not have been given a permit. There was no protection for the drivers along the edge of the track. As he took the turn, Bourque's car refused to answer its head, and, screaming across 50 ft. of track, plunged into the ditch. Bourque and his mechanic were killed. Two days following, Charlie Merz drove his car into the fence—lined with spectators. Four were killed. The speedway leaped into instant fame.

It was only a year ago that Al Livingstone, the California marvel, was killed on the Atlanta speedway before the eyes of his wife and his father and mother; only a year ago that Laurent Grosso, a careful and conscientious driver, collided with an incompetent on Brighton Beach, and answered for the ignorance of another with his own life. Tom Kincaid, last September, met his death on the Indianapolis speedway. Kincaid was a careful driver. But caution could not govern the defects in his car.

Some of these fatalities were preventable; others were the result of things which could not be anticipated. If the track at Morris Park had not been lined with iron pipe, Smeltzer would be living today; if the surface around the Indianapolis speedway had been in proper shape, Billy Bourque, one of the best-liked men who ever entered the game, would have survived to enjoy his popularity. A proper supervision would have saved these and many more lives.

The death toll of the 1910 Vanderbilt cup race was seven dead and 16 injured. The authorities prevented the running of the grand prize race which was to be held a week later on the same course. Both these events are now contested near Savannah, Ga., where state troops patrol the course.

A list of the 200 who have died can give no idea of the hundreds who



A Cartoon by Ralph Wilder in the Chicago Record-Herald
It Hits the Nail on the Head

have suffered broken bones that the spectators might get an extra thrill. I've done it myself several times, not intentionally, you understand, but with the underlying idea of giving the audience just as good a run for its money as was in me. I never realized my foolishness on any of these occasions until I was in the hospital with the doctors standing around and the nurses looking serious.

Earl Kiser was just becoming a real champion when he went through the fence at Cleveland in 1905. His leg was squeezed off between the fence and his car. He never raced again. The same year, Webb Jay had a similar misfortune at Buffalo, when he, too, blinded by choking dust dashed his car into the boards. Jay spent a whole year in a hospital. He, too, never raced again.

No one knows where Walter Christie, designer and driver of what I consider the fastest car ever built, would have been today, if he had not skidded into the fence at Pittsburg in 1907. He was driving that strange, ungovernable wonder, the product of his weird mechanical genius which men used to call a cross between a devil and an angel. It was a nightmare of a car, with its shrieking drive on the front wheels, and its wild uncontrollable bursts of speed. In some ways it seemed human; in others, more than human. If there is a hell for motor racers—and I understand on good authority that there is one—I believe it will consist in driving Walter Christie's speed monstrosity around a one-mile dirt track. Christie was making the turn. He had shot down the stretch at a speed of 90 miles an hour, when suddenly the car jumped forward like a spurred horse, dug its nose into the track, and turned over and over and over. It was the most savage thing I ever saw in my life. Christie was flung far to one side. When they picked him up, it was discovered that he had an arm and a leg broken and he was crushed inside. It was his last record drive in the marvel. It is waiting now for some one else to try it. Christie has sworn that he will never race again. The poor fellow's courage was as badly crippled as his body.

The same Fiat "Cyclone" that killed Cedrino turned over with Ralph DePalma at Danbury, Conn., a couple of years ago. It broke his leg, and bruised him up pretty badly inside, but he is still racing. Not so with Jay and Kiser and Christie, and a good many others. They "quit the game cold," just as DeWitt did, just as I have done myself. All good motor racers are fatalists—they have to be—but the lips of death are cold, and there are occurrences which are horrible enough to shake the faith of any man in fate itself. The moment of suspense which follows an unexpected skid, the ripping of a burst tire, the grate of a lashing chain, the shock of an averted collision—these are everyday things in the life of the speed specialist; but the crunch of broken bones and the agony of battered nerves are things which cannot be forgotten. Think of Webb Jay with 27 bones broken, his body bruised to a pulp, and his face driven into the ground until the dust became a part of his skin. Is it remarkable that he races no more?

From an unprejudiced consideration of statistics, a champion racer who goes through 20 races unscratched, has passed the favorable balance. The percentage is against him. At any moment, he may expect the dice to turn—and they are dice which leave the loser no chance to recoup. The wise driver retires before that one last fatal race.

It was a strange freak of fate that Lewis Strang, who was killed on July 19th while piloting a touring car in a staid reliability run, should be killed while driving at a speed of 10 miles an hour. Only a few days before his death a newspaper report referred to him as a veteran driver, and he was only five years in the game. He ran his first important race in 1907. The fact is illuminative. On the track he was a spectacular but careful driver. He was



Wreck of Car at Morris Park Track, New York. A Woman was Killed in This Accident



Ralph DePalma Skidding into a Turn on the Point Breeze Track at Philadelphia. The Driver Following Him Ran into the Fence on Account of the Dust



Poole in Isotta Car Grinding up the Earth on a Turn in the Briarelliff Race



Webb Jay in the Lead at Morris Park Track. The Dust from Jay's Car is Blinding the Other Contestants

one of the few who mixed brains with gasoline. Had he lived another 30 days, he would have been the "speed king" of the world, for arrangements were being made to secure for him the 300-hp. Fiat which is now astonishing Europe.

Strang was a fatalist. One day I heard him tell "Bill" Pickens, my manager, and Strang's mentor for two years during the period that the youngster was becoming famous, that he was a big league fellow. He did not want to meet his fate while driving a touring car or in a stock chassis race. When it came his turn to bow to the scythe-swinger, Strang wanted to be gripping the wheel of the fastest racing car in the world, with his foot shoving the throttle wide open. He wanted the band to be playing the latest rag, and when the ambulance hauled him to the morgue he wanted the crowd to say as they filed out, "Well, he was certainly going some."

The way in which Strang received injuries when he went through a fence on a little dirt track at Kenosha, Wis., a few months before his death, is illustrative of the manner in which promoter and automobile association combine in shrugging their shoulders at the death thirst of the spectators. Ostensibly, the automobile association is supposed to protect the drivers and spectators alike from injury, to supervise tracks, entries and all the important features of the race with a thoroughness which will eliminate as much as possible the elements of slaughter.

The supervision has been a farce. Anyone with a \$100 sanction fee has been able to secure a permit for a race. The track at Kenosha is merely an example—a dirt affair no more fit for fast driving than the average country road. The June fiasco at the Hawthorne track in Chicago was another. The track, long known as one of the most dangerous of the circulars of the country, was granted a sanction, apparently for the sake of the daily \$100 fee. It was absolutely unfit for fast driving; the fences were contrary to the rules, the turns were soft and deeply rutted. Its backers were promoters who have raised "death-dealing" brand of advertising to a science—a work in which they have been assisted by most of the other good race promoters in the country. While under the ostensible auspices of a local motor club, the affair was really nothing more nor less than an amusement program, with all its actual lure resting in the possibility of danger.

On the first day, poor Marcel Basle blundered through the dust into the illegal fence, and died within the hour. He was followed by another racer who got off with better luck, and the management, becoming frightened, declared the races off for the day. The crowd, disappointed in its desire for more slaughter, cried "fake," and "robbery." While the body of Basle still lay beside his machine, women tried to cut off pieces of his clothing as a souvenir. Never was the spirit of the motor-race crowd exposed more plainly. The danger of the track was evident; the commercial character of the race was unquestionable; there was not one thing in the whole affair which corresponded with the theoretical standards of the sanction-granting association.

Did that association make any attempt to stop the races? The circumstances speak. On the day after Basle's death, 10,000 persons fought for front seats at the track. In the second race another car took the fence, and the officials, developing another case of cold feet, called off the program, but let all admission fees stand. Thereupon, the association, greatly incensed that such things should have been permitted, promised to allow no more dirt-track races in Chicago.

This ought to be pleasing news to Marcel Basle.

To show how much of a boost it was for the racing game, it may be added that, shortly after the coroner's inquest, two Illinois state senators announced that they would introduce an anti-racing bill in the legislature. If the sanction-

granting association will not use its powers of supervision the government will. That has been the history of every dangerous sport, and it looks as though the automobile men were going to find it out to their sorrow.

At the May Indianapolis race, the worst accident aside from those in which death resulted, was directly due to the admission of an inexperienced driver to the track. Lost in the hurricane of speed, he blundered into a collision which might have resulted in death to a dozen men. Of the 40 participants in the race, it may be safely said that not more than half possessed other qualifications for admittance than a two-dollar license from the association.

To show the immense difficulty which attends the acquisition of one of these licenses, a crowd of Los Angeles automobilists easily procured one for an armless cripple who didn't know a steering wheel from a carburetor. While they had no intention of entering him in a race, the fact remains that he would have been just as successful and a good deal less dangerous than many of the enthusiastic, though ignorant, entrants in the Indianapolis sweepstakes, and, for that matter, in nearly every other recent race. Some of these ambitious young license holders had never been in a track race before, which fact militated against them not in the least, as no examination whatever is required by the association.

They are the terror of the experienced drivers. There is never any telling what they will do. Many of them have the most reckless disregard for their lives—and the lives of others—coupled with a confidence as profound as their ignorance. They watch the big drivers for a while and conclude that all it takes is nerve. Fine. They have nerve to spare. The possibility that motor racing also requires at least a minimum quota of brains never occurs to them.

I never speak of these enthusiasts without thinking of a poor fellow named Ned Crane who was killed in Kansas City a few months ago. He had the most illimitable confidence I ever beheld in my life. He raced a hundred times and never won a race. One morning while he was practising out at Elm Ridge, his car turned turtle. When told that he only had a few minutes to live, he raised himself on an elbow, and summoning all the breath that was left in his body exclaimed with a conviction as impressive as it was pitiable:

"Tell them that the greatest racer of them all is dead!" They were the last words he spoke.

Crane expiated his mistaken confidence with his own life; many equally devoted optimists unfortunately have expiated it with the lives of others. Inexperience belongs no more on a racing track than it belongs in the cab of a fast passenger train or on the bridge of a transcontinental liner. It fills every foot of the track with the most ominous possibilities. With 10 or 12 cars massed together on a turn, a mistake by any one driver may mean the lives of a dozen others.

Like the other evidences of official and public indifference, it has aided in bringing about the end of motor racing. The good drivers are unwilling to take the chances. The Indianapolis sweepstakes was Harroun's last race. Fatalities are becoming too frequent. Harroun is going into the engineering business where he can make money with less danger. Other good drivers are retiring fast.

Many of the newspapers have even ceased to treat track racing as a sport. Reports of the big races are placed on the front page, under a "scare," with lists of the dead and injured for the year printed in heavy type at the head of the column. Other papers use both news and sport sections. The general run of readers, it is assumed, can get that in which they are interested from the double-leaded death and accident reports; those who are really concerned about the finer details can find them in equally fine type next to the golf news on the sport page.

As newspapers are proverbially representative of the public, it would hence appear that the public is a good deal more interested in the victories of death than the victories of drivers. The astute press agent recognized this long ago, and modeled his lines of attack accordingly. When I was racing in the West as early as 1903, my own P. A. kept the local sheets so full of the (mostly) imaginary exploits of the "Green Dragon" that I expected to find the radiator full of innocent gore every morning. The limit came when a couple of Reno cowpunchers suggested that the car ought to have a few notches filed in it—and the P. A. filed them.

In my press reports, I have been the "Speed Demon," "Dare-Devil Barney Oldfield," and I don't know what other incarnations of reckless lunacy. As a matter of fact, press agents notwithstanding, I was always a careful driver and never took any chances that I did not have to take. At present, I'm not taking any.

Every week I receive letters from chauffeurs who want a formula for becoming a record-breaking dare-devil. I've got one tip for them all. "Keep away from it. Many start but few finish." Fewer are going to finish in the next few years. The possibilities of the racing game for its big backers, the manufacturers, are exhausted. They are tired of the demand for slaughter; in a few years the people will be tired, too, and motor-racing will be a thing of the past. Manufacturers know that frequent death reports do not help their business. Likewise, there are a few manufacturers, who object to official mayhem on principles. Harry Ford, the noted automobile builder, two years ago constructed a 100-hp. racer. It turned over at the Detroit state fair grounds with Frank Kulick. It was thought at first that the driver was killed. Ford, in a sudden burst of remorse, ordered a grave dug beside the smashed-up machine. When it was 8 ft. deep, the workmen rolled the wrecked motor car into it, and covered it up with solid dirt. Kulick recovered and is back in the game. Alexander Winton withdrew forever when Earl Kiser went through the fence at Cleveland in 1905. He placed life far above commercial gain.

What is the exact future of the racing game if it is to continue at all? I don't know. I believe that in a few years, the men responsible for track deaths will be prosecuted for manslaughter, and whenever that becomes effective, speedways and dirt tracks will have to go. Whatever future there is apparently lies in the board track. Although many meets have been held on the one-mile circular board track built by Jack Prince, the old-time cyclist, in Los Angeles, there has not been a single accident, and many world's records have been made, too. It is the only sign of hope. There is an absolute anti-race bill pending in the Texas legislature now, and I would not be surprised to see Illinois come through with another this fall.

The fault is in one place. It lies with the sanction-granting association. An automobile touring organization in the United States has a large work cut out for it and is carrying on that work in a manner which calls for praise. It was possible for the big national organization to keep racing on a high level; instead they have allowed it to descend into a sort of sacrificial orgy, an open market for lives. For the sake of frequent sanction fees and exorbitant salaries for officials, they have allowed anyone and everyone to use their name, until it has been hopelessly cheapened. The officials' fees alone, if used rationally, would have been sufficient to repair a good many bad tracks, and thus save many good lives.

The dignity of motor racing is gone. It has been permitted to degenerate to the rank of prize fighting, without any of pugilism's redeeming virtues. It has ceased to be racing, and has become merely a morbid and unelevating spectacle. It is run for money alone. Its profits are blood money.

MONTH OF ACHIEVEMENT IN AVIATION



Charles T. Weymann, Winner of the International Speed Race

At no time since the Wrights first demonstrated a flying-machine has there been a period of a month or six weeks so filled with important achievement as that which has just gone down in history. The crowning of King George so filled the newspapers and illustrated weeklies that there was little attention paid to the remarkable things that were being done with the aeroplane and their importance as great events was thus minimized.

The international speed trophy which Claude Grahame-White won at Belmont Park, L. I., last October, returns to America through the effort of Charles T. Weymann, who won it at Eastchurch, Eng., July 1, by covering a course of 93.2 miles in 71 min. 36 $\frac{3}{5}$ sec. France shares part of the glory of this feat however, as Mr. Weymann piloted a Nieuport monoplane.

The German circuit contest, which was begun June 11, was finished just one month later. Herr Koenig won, having covered the greatest distance during the time allotted to the race.

Much interest was manifested on both sides of the Atlantic in the feats of Lieutenant André Conneau of the French navy, who flies under the name of "Beaumont." Beaumont, as he prefers to be known, won the two biggest events of the year, the French-Belgian-Dutch-English circuit and the London Daily Mail's race around England and Scotland. The international circuit was the first of the two races. Nine out of 50 airmen who entered the

race, completed the course which began and ended near Paris. Beaumont and Garros were the favorites throughout and they had a neck and neck finish. The race covered 1,000 miles and was started June 18. The final lap was completed July 7. The prizes

aggregated \$100,000. The winner's time of actual flight for the entire course was 58 hr. 36 min. 45 sec.

The British race covered 1,010 miles and Beaumont was forced to fight Védrières for the lead at every stage of the journey. The course in this event was laid around England and Scotland. Beaumont's flying time for the whole distance was 22 hr. 28 min., the finish being recorded July 26.

Something like an endurance run, rather long drawn out, occurred in the United States also, when Harry N. Atwood, in a Wright-Burgess machine, flew from Boston to Washington. This journey was commenced June 30 and finished July 13 after a series of mishaps.

Only one international record was broken during the month although several new American marks were set. At Bouy, France, on July 8, the world's altitude mark was set at 10,760 ft. by Loidan, a French airman, who used a Farman biplane. St. Croix Johnstone, a young Chicago flyer, broke the American endurance record by flying 4 hr. 1 min. 53 $\frac{3}{4}$ sec. at Mineola, L. I., July 27. Johnstone also made a speed record by flying 48 miles in 37 min. at Detroit earlier in the month.



Harry N. Atwood, the Airman Who Flew from Boston to Washington

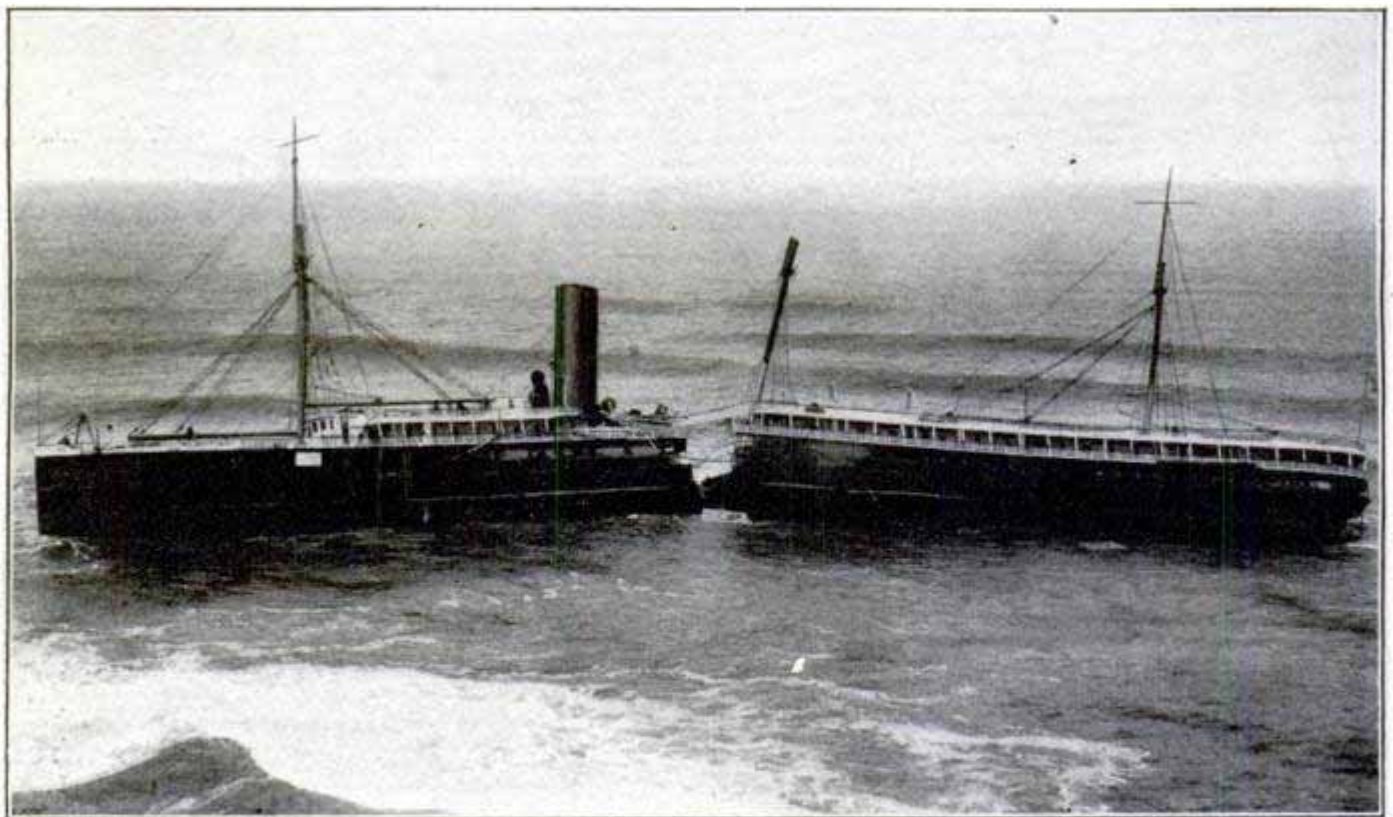
Six persons are reported to have been killed. Among the dead is the first woman flyer to receive fatal injuries. Mme. Deniz Moore fell 150 ft. when her aeroplane was capsized by a gust of wind at Etampes, France, July 21. D. A. Kraemer was killed at Chicago, July 13. Kraemer was trying to qualify for a pilot's license and was making a "figure 8" in compliance with the Aero Club's rules, when his machine, a Curtiss biplane, crashed to the ground from a height of 50 ft. The day following Kraemer's death, Edward Paillette fell 150 ft. at Algiers, Africa, and was killed. Lieutenant Trochon of the French army, fell at Chalons-Sur-Marne, France, June 29, and was fatally injured. On July 23, M. Jolly, fell 100 ft. and was fatally injured at Juvisy, France, and July 25, M. Shimansky, who flew as a passenger in an aeroplane driven by M. Slusarenkos at St. Petersburg, Russia, was killed in a fall. The pilot of this machine was badly injured.

CHICAGO'S MANUFACTURES

The total value of the manufactured products of the city of Chicago in 1909 is calculated by the U. S. Census Bureau to have reached the enormous sum of \$1,281,313,000, from materials valued at \$793,571,000 and on an invested capital of \$971,990,000. Some idea of the immensity of these figures can be gained from the fact that the total exports of the entire British Empire for the same year was but \$1,840,414,658.

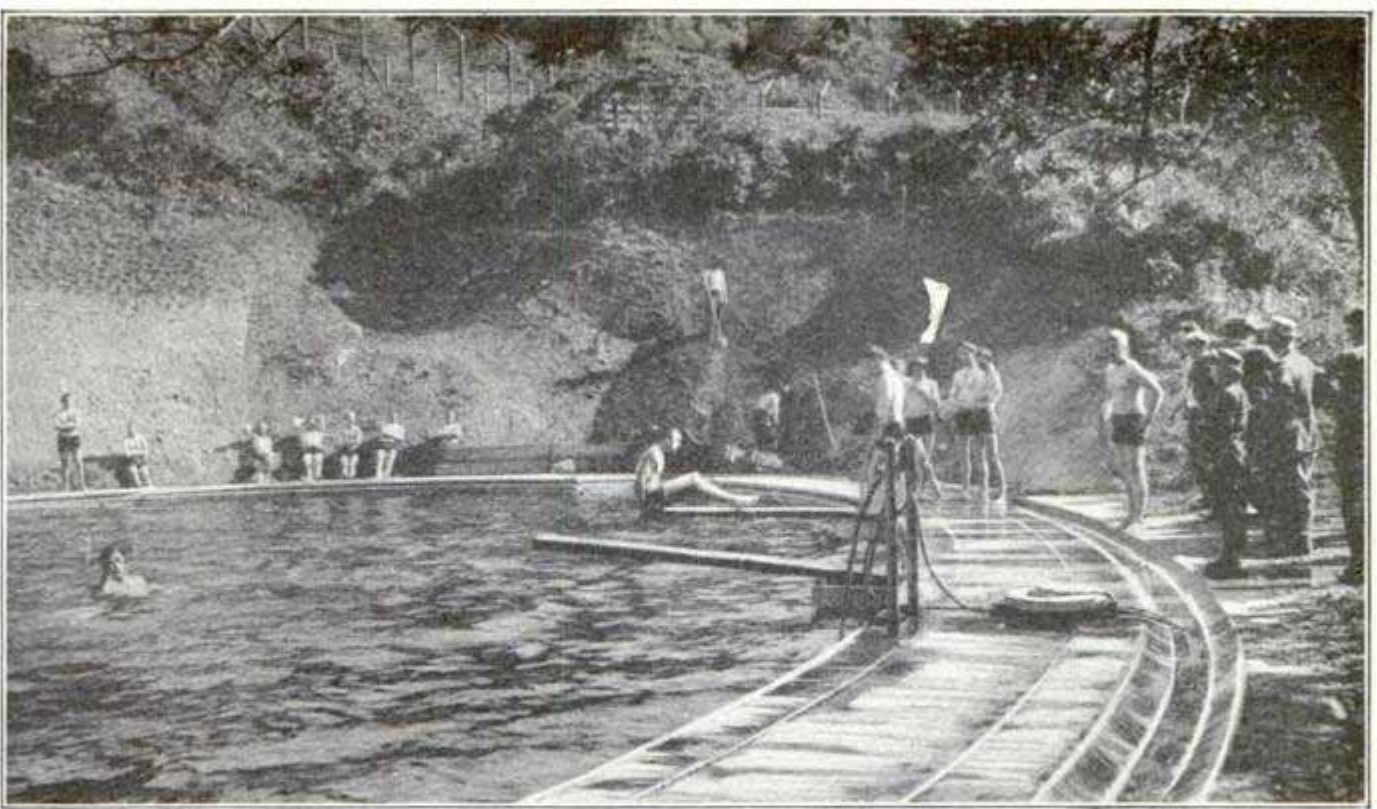
☪ Japan is to attempt the manufacture of nails and keep in the empire at least a part of the money paid out for the supply of more than 60,000,000 lb. of this product required annually by her industries.

☪ For the first time in history, athletes from the Chinese empire are to compete in the Olympic games, in Stockholm in 1912.



THE STEAMSHIP THAT BROKE IN HALVES

It is a common expression to refer to a wrecked boat as having "broken her back." The steamer "Santa Rosa" actually broke in halves when she ran on a rock at Point Arguelles, near Santa Barbara, California, during a storm on the morning of July 7. When the weather cleared the vessel looked just as she appears in the photograph. All of the 200 passengers on board at the time of the wreck and the members of the crew were saved.



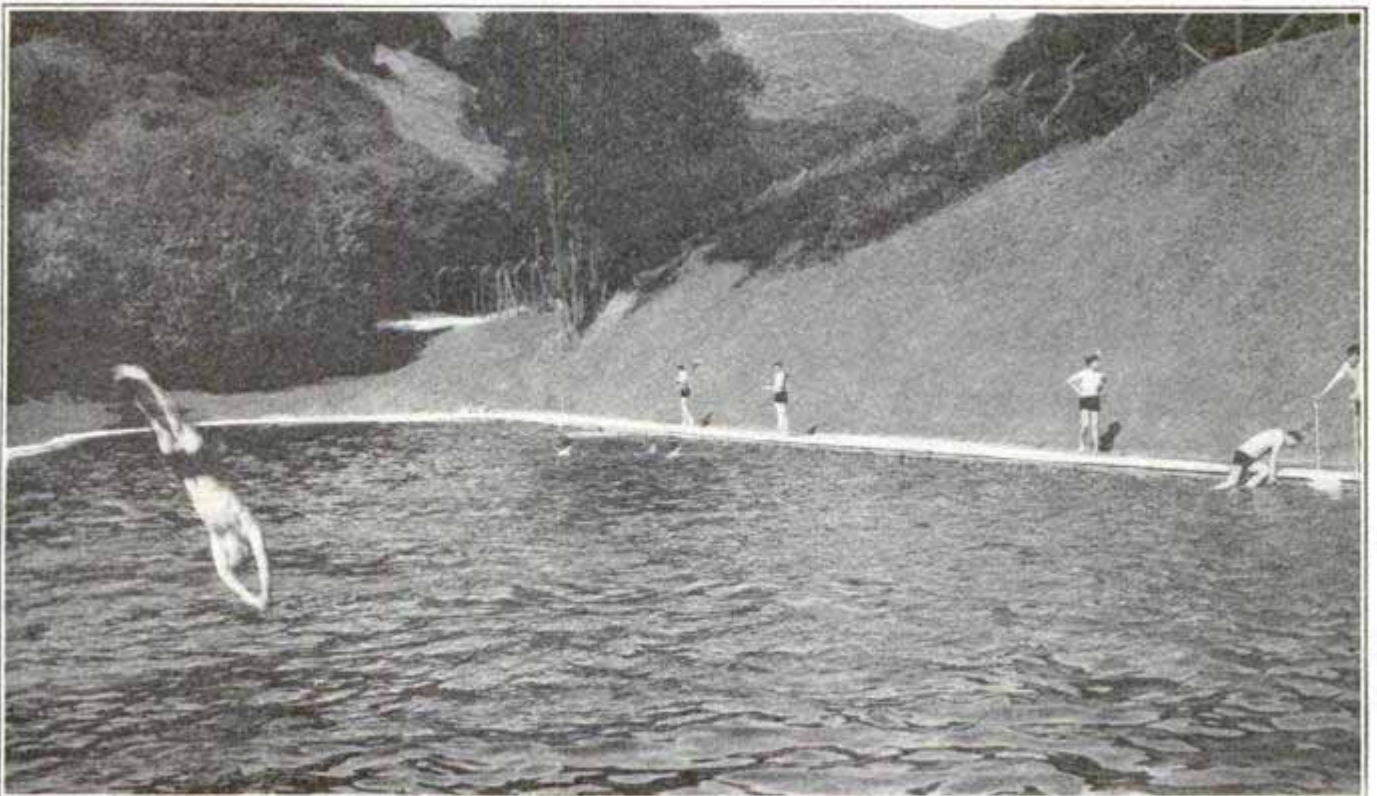
One End of the Swimming Pool, Showing the Springboards

OPEN-AIR CONCRETE SWIMMING POOL

An open-air concrete swimming pool has recently been constructed at the University of California, Berkeley. It is situated in a canyon at the back of the campus, is 210 ft. long by 76 ft. wide, with a depth varying from 4 to 10 ft., and cost \$12,500 to construct. A bathhouse is being built at a cost

of \$5,000. The pool is supplied with fresh water from a creek. Laurel and alder trees shade two sides of it.

CA drop hammer weighing 250,000 lb., and costing \$51,700, built for a locomotive company, is said to be the largest in the world.



One Side and End of the Pool, with Swimmer Diving

DOUBLE LOCOMOTIVE FOR BURMA RAILWAYS

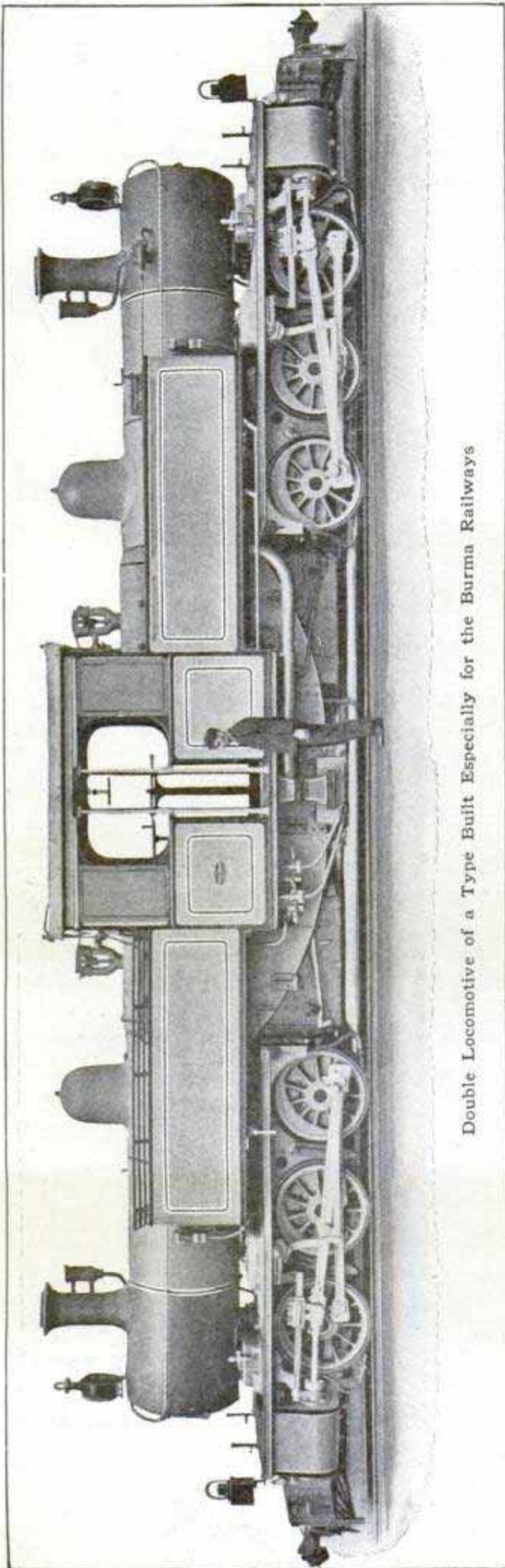
This curious double locomotive, a number of which have been built and are now in operation on the Burma Railways, is shown as a contrast to the huge locomotives built for the Atchison, Topeka & Santa Fe Railroad in this country by combining two smaller locomotives. The American method referred to consists of combining the boilers into one long boiler with a single firebox, while the English method, as here illustrated, consists of combining two apparently complete locomotives cab to cab, the two cabs forming one large cab. The firing is centralized, although there are two fireboxes, and the operating mechanism is so arranged that one movement governs both engines, or they can be worked separately if occasion demand. It is said that having separate boilers greatly facilitates repairs.

The double engines are particularly adapted for heavy mountain service and they negotiate successfully the many severe grades and sharp curves met with in the hill sections of Burma.

SPEEDIEST STEAM YACHT IN THE WORLD

The extraordinary speed of 35 miles an hour, guaranteed by her builders for the steam yacht "Sovereign," which was built to the order of M. C. D. Borden of New York, makes this vessel the fastest pleasure craft of her type afloat. Besides her extreme speed, the ship has a further claim to distinction by having four smokestacks, as well as other features which are unique in privately owned steamships.

The "Sovereign" is constructed mostly of steel, the keel and lower plating of the hull being of bronze, which is less affected by the action of sea water and is not so liable to become covered with barnacles. The overall length is 165 ft., reducing to 158 ft. at the water line. The beam



Double Locomotive of a Type Built Especially for the Burma Railways



Steam Yacht "Sovereign"—Claimed to be the Fastest Pleasure Craft in the World

measurement is 16 ft., and the draft, 4 ft. 6 in.

The propelling machinery comprises two triple-expansion steam engines, which are supplied with steam from a pair of water-tube boilers. Other machinery includes a steam steering gear and a complete electric lighting plant. The appointments throughout are excellent in their modern refinement, and altogether this vessel is bound to attract much attention.

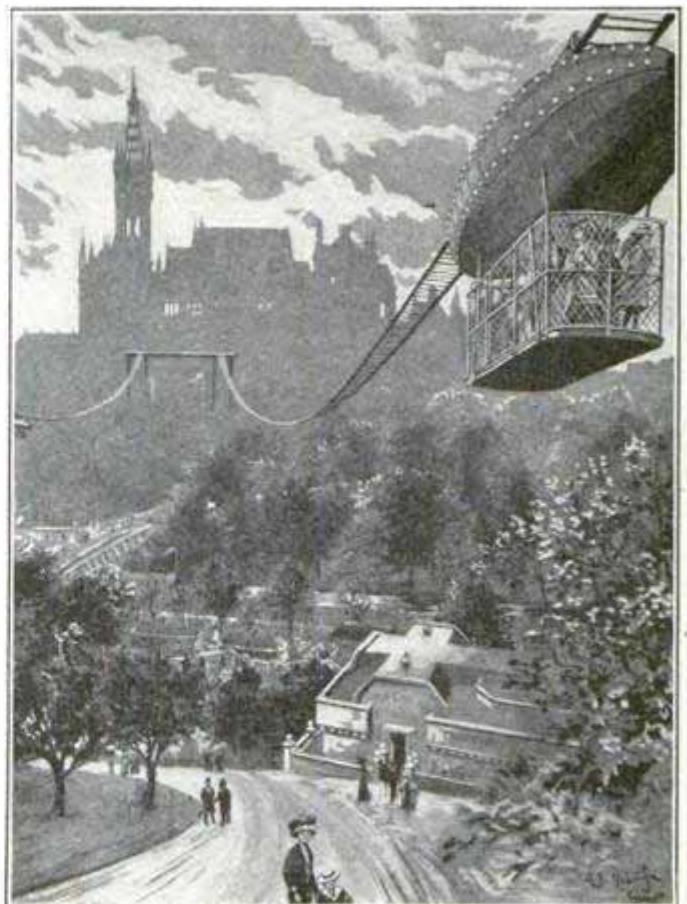
IMPROVED RASP-CUTTING MACHINE

A new machine of German make is now available for cutting rasps. It cuts every kind of rasp, including those which have hitherto been cut only by hand because of the difficulties in designing a practical machine to do this work. Among the automatic properties of the new machine is an arrangement whereby it reduces the number of teeth cut on the tapered part of the tool without the necessity of being stopped or otherwise interfered with. The output is consequently rapid, and little attention is required.

According to *La Nature*, Paris, there are now three places known in the Pacific Ocean, where its depth exceeds 29,500 ft., the deepest of these soundings having been found near Guam, one of the island possessions of the United States. It is a little over 31,600 ft. deep, almost six miles.

GLASGOW'S EXPOSITION HAS AIRSHIP WAY

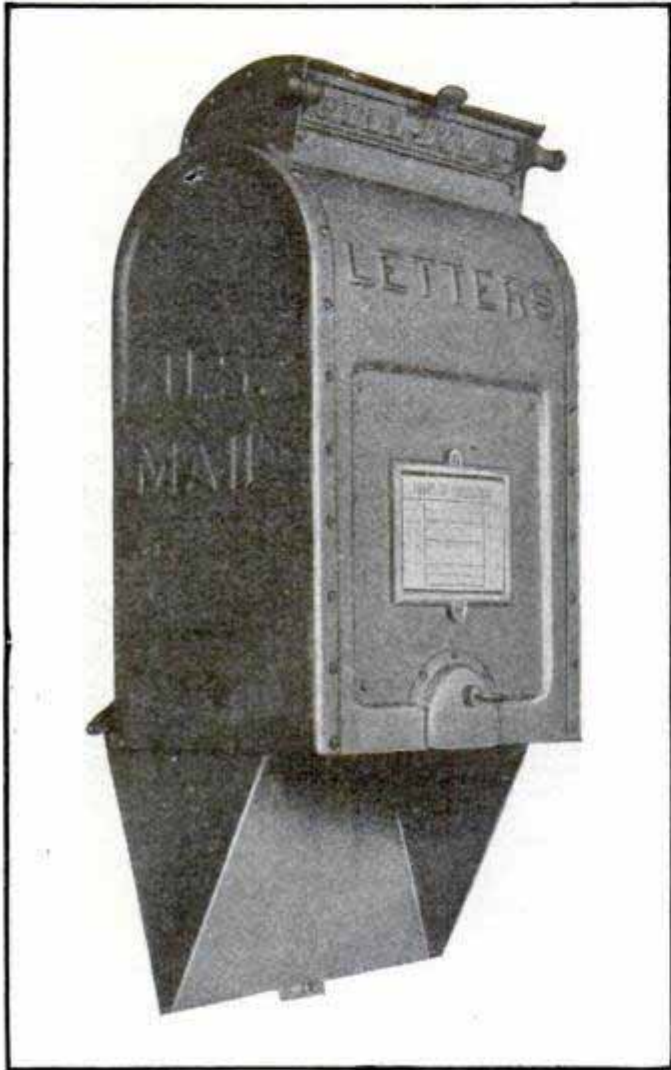
One of the many interesting amusement devices of the Scottish National Exhibition held in Glasgow was the aerial way, on which pleasure seekers were provided with many of the thrills of actual airship flight without its many dangers. Strung across the Kelvin valley were two sets of cables from which imitation dirigible balloons, provided with cages for the passengers, were suspended.



Courtesy Illus. London News
Flying across a Valley at the Glasgow Exposition in Imitation Airships Suspended from Cables

GOVERNMENT TESTS DROP-BOTTOM LETTER BOX

The federal government has begun a series of tests in various parts of the country of a drop-bottom letter box,



New Type of Drop-Bottom Letter Box, Showing Bottom Dropped to Facilitate Collection of Mail

which the inventor believes will not only greatly facilitate the collection of mail but will prevent letters being lost by sticking in the box. The box is of the same general style and appearance as that in use at present. It has an inner lining of very thin sheet steel which is absolutely smooth and without a crack or crevice.

After a letter passes through the slot in the top, air is the only thing which could keep it up. The collector's receptacle is swung under the bottom of the box and the bottom drops into it, thereby enabling the collector to get 500 or 1,000 letters as rapidly as one. With the old method of having the door on the side, it is

necessary for the collector to unload the box by pulling out a handful of mail at a time.

ELECTRO-REPRODUCTION OF SCULPTURE

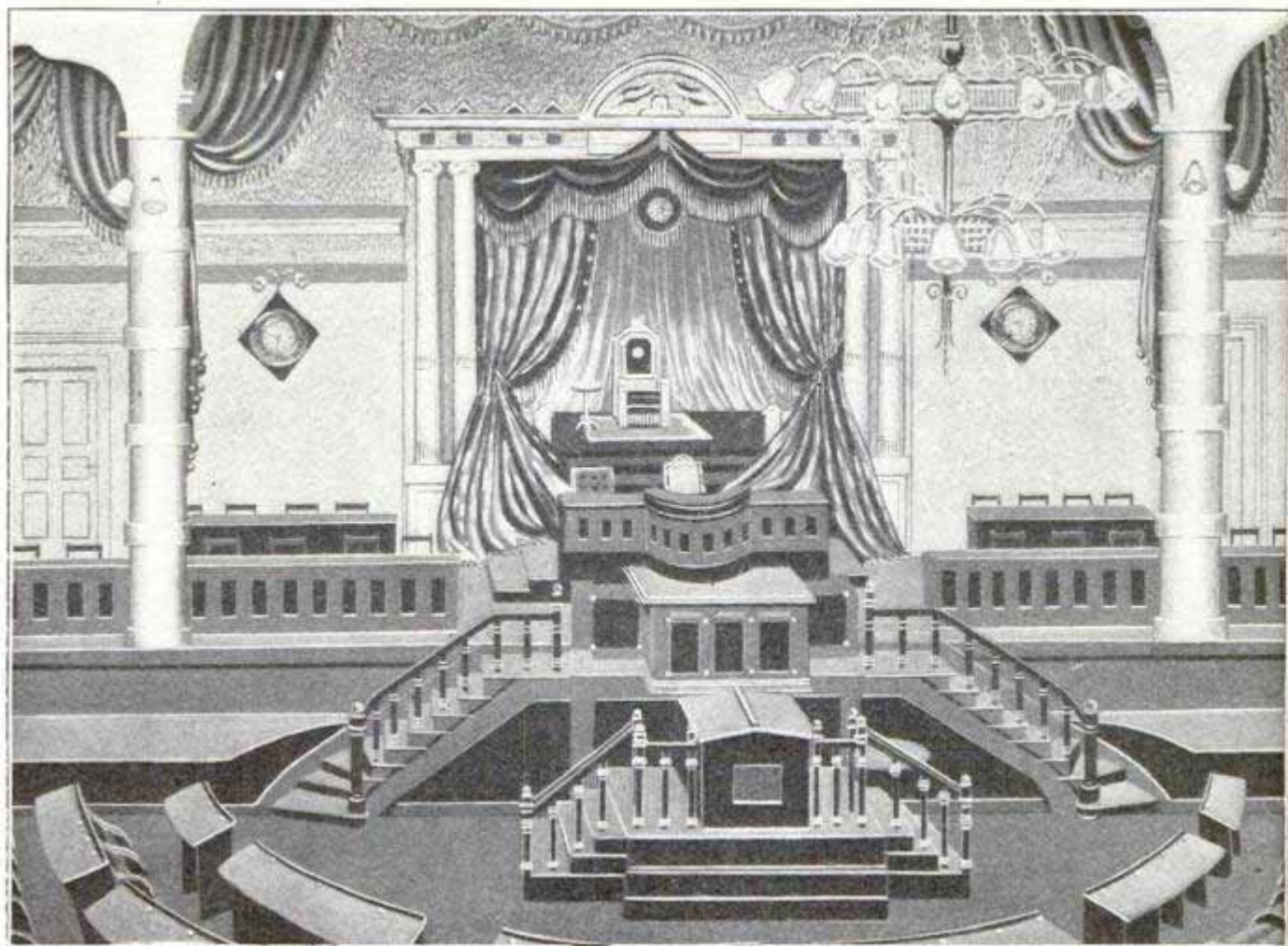
A satisfactory method of reproducing sculpture by means of electro-deposition has been perfected by Mr. Reynolds-Stephens, an English sculptor, who recently was enabled to exhibit a beautiful replica, made by the new process, of one of his best known groups.

In this process, there is first made a special plaster model constructed in carefully jointed sections, so that it may be easily taken apart. From the sections of this model, gutta-percha molds are made and bound with metal to keep them in place. When these are set, the plaster is carefully broken out of them to avoid stretching the gutta percha, and the molds are then fitted together. The reproduction is made in the usual way by an electrical deposit of copper, which forms an exact facsimile of the original piece of sculpture.

In Mr. Reynolds-Stephens' show piece, which was intended for exhibition at the Royal Academy, the sculptor has finished off the group by tinning the damask pattern of the dress of one of the characters, inserting mother-of-pearl in some of the costume trimmings, and enameling other parts. The result is said to be a perfect work of art.

THE JAPANESE HOUSE OF PEERS

The throne in the Japanese house of peers is shown in the accompanying illustration. It was not until 1889 that the people of Japan were thought ready for a voice in the government, and that the right to participate was granted them. The Imperial Diet consists of two branches, the house of peers, and the house of representatives. The former consists of members of the impe-



The Throne in the Japanese House of Peers

rial family; princes, marquises, counts, viscounts and barons; those especially appointed by the emperor for valuable service or distinguished learning, and members elected by vote among the highest tax payers. Members of the house of representatives are elected from districts over which governors of prefectures have superintendence.

BROAD SIDEWALK TAKES PLACE OF ROAD

One of the streets in a southern California town has no roadway, but consists of a wide concrete sidewalk extending down the center, with broad stretches of lawn on either side. Delivery wagons reach the rear of the houses through wide clean alleys, while automobiles and carriages make use of the intersecting streets, and can approach within a few rods of any house in the block.

The first consideration of this curious street plan was the elimination of

dust and street refuse. It also makes the street much quieter and more secluded than the ordinary residence



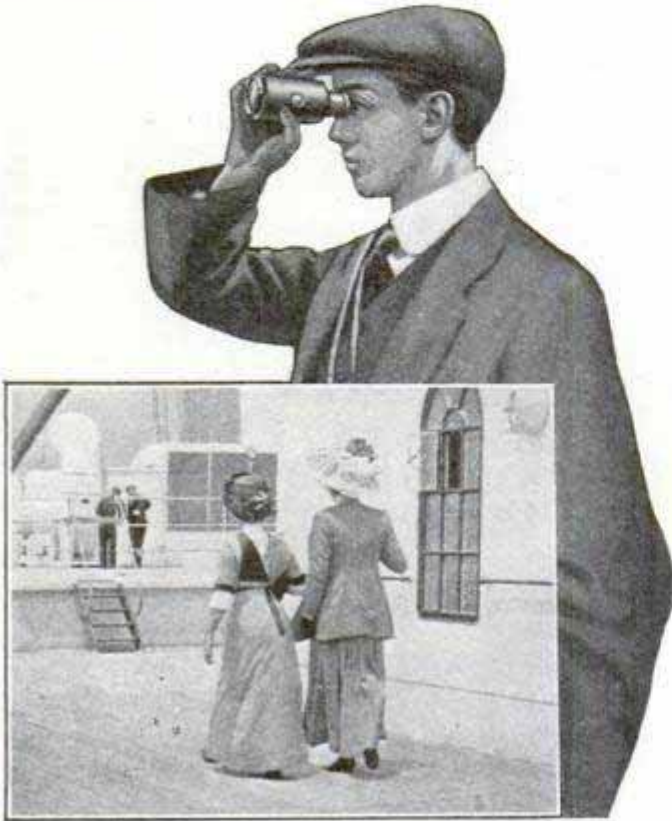
A California Street with a Broad Sidewalk down Its Center Instead of a Road

street, adds to its neat appearance, and provides safety for the children, as there is no danger from speeding automobiles.

It is estimated that the street railway companies of San Francisco will be compelled to spend almost a million in providing extra transportation facilities for visitors to the Panama exposition in 1915.

CAMERA DISGUISED AS FIELD GLASS

The desirability of obtaining snapshot photographs of people in an absolutely natural pose, which is difficult



Courtesy London Graphic

Taking a Photograph while Apparently Looking in Another Direction Through a Field Glass

when the persons being photographed are conscious of the fact, has resulted in a new type of camera disguised as a field glass. The imitation field glass is held to the eye while the photographs are being taken, the lens being at the side. Thus, while the user is apparently looking at some object straight ahead, he is in reality taking a photograph of some object at the side. The photographs so taken are of excellent quality.

CHINESE TELEGRAMS ARE IN NUMERALS

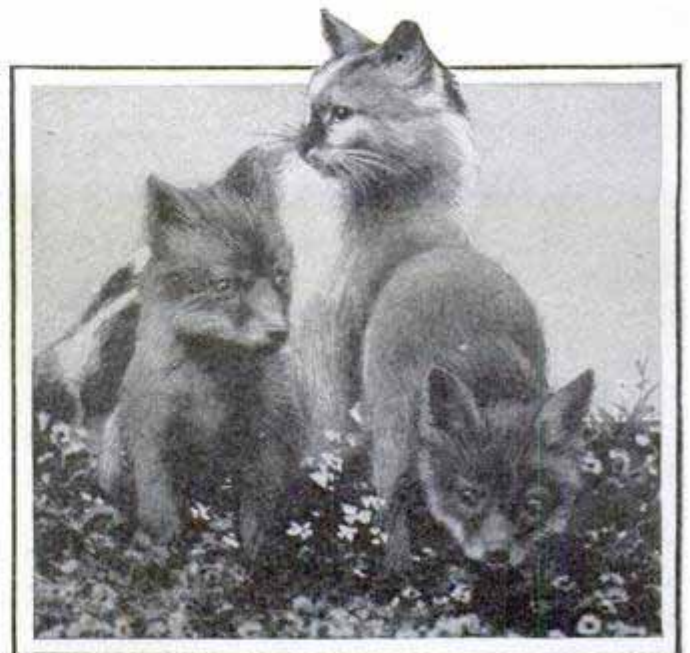
The transmission and receiving of telegrams in China is not so easy as in western countries, because the Chinese language, which has no alphabet, is made up of special characters representing the words. Consequently, for telegraphing purposes, it was necessary to compile a list of a sufficient

number of characters to enable ordinary correspondence to be carried on, and give each of these characters a separate number, which is transmitted by the Morse system. This numeral code of characters now numbers 9,800, listed in a 49-page book, each page containing 10 series of 20 characters each, with their corresponding numbers.

In receiving a telegram, the operator has to find in this book the character represented by the numbers transmitted over the wires, and thus transcribe the telegram into legible Chinese. The clerk at the sending station has, of course, to transcribe the Chinese characters into the numbers used to represent them.

CAT MOTHERS YOUNG FOXES

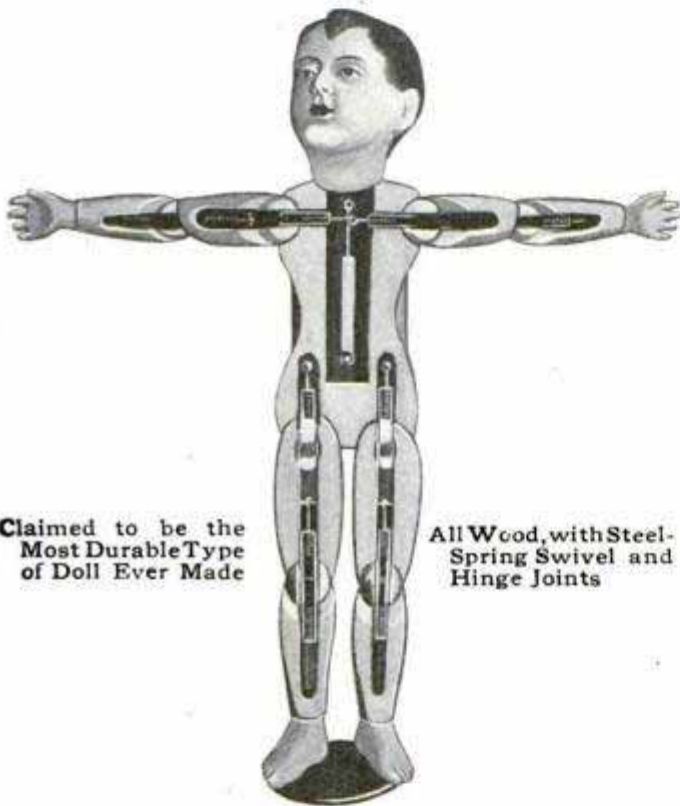
A cat as foster mother to two young foxes, which would have died were it not for the feline's generosity in taking the place of the mother fox, is here shown. Instances of domestic animals mothering wild animals born in captivity and repudiated by their natural mothers are far from scarce. There is hardly a zoological garden in the country that does not require the service of a dog or two every year to mother young lions, tigers, etc.



Young Foxes Content with a Cat as Foster Mother

ALL-WOOD STEEL-HINGED AMERICAN DOLL

Although Germany has for many years been credited with the newest and best ideas in children's toys, an American concern has designed and brought out a doll which is said to be a wonderful advance in doll construction. In the first place, the new type of doll is all wood, the head being solid. The head, arms and legs are joined to the trunk by means of steel-spring swivel and hinge joints, which completely eliminate the use of rubber cord. The face, being of solid wood



Claimed to be the
Most Durable Type
of Doll Ever Made

All Wood, with Steel-
Spring Swivel and
Hinge Joints

instead of composition, is artistically carved, and painted in oil colors so that it can be washed. The nicely shaped hands and feet are cut from solid hardwood. In the whole make-up of the new dolls there is nothing to easily wear or get out of order.

HARDWARE DISPLAYED IN MILLINERY FORM

Ingenuity in window display is shown in this illustration of goods made up in the form of millinery in one of the show windows of a hardware store in New Liskeard, Ont. In the lower left-hand corner is a milk

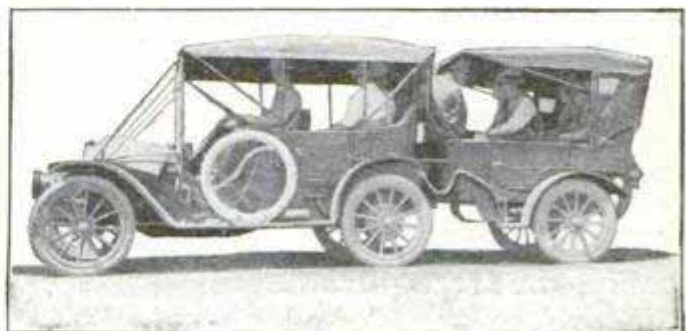


Millinery Creations Made of Articles Sold in All
Hardware Stores

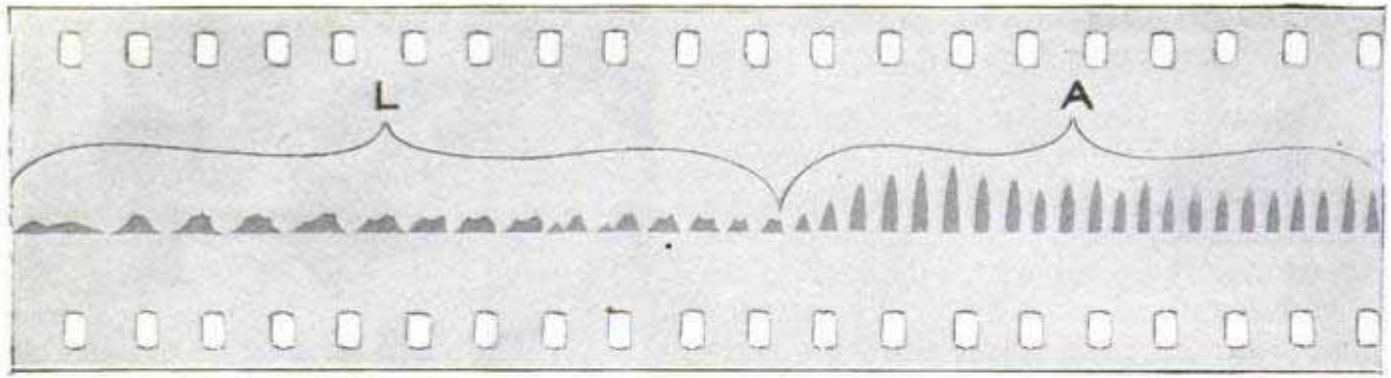
strainer wound with cotton clothesline and trimmed with fish hooks of the trolling type, and thumbscrews. The millinery creation dominating the window is a large picture hat, made by decorating a tool basket with a screwdriver, rules, a revolver, a coil of warp and a feather duster. The creation at the lower right-hand corner is made of a washbasin, placed bottom up on a bread-dish cover. A leather belting forms the band, and the hat is trimmed with chain, corkscrews, shaving brushes and fish line.

TWO AUTOS COMBINED INTO AUTOMOBILE STAGE

The six-wheeled auto stage which runs between Folsom and Sacramento, California, is of local design, being formed by attaching an automobile body, with rear wheels in place, to the back of another automobile. The service of this ingenious stage is regular, and it easily maintains a speed of 25 miles an hour.



Ingenious Six-Wheeled Automobile Stage of
Homemade Design



A Sound Photograph of the Letters L and A

RECORDING SOUND BY PHOTOGRAPHY

BY DR. A. GRADENWITZ

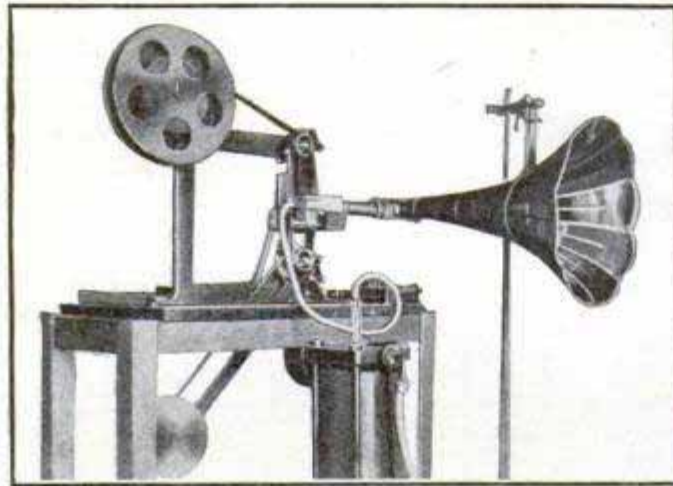
TO photograph the human voice has long been the dream of inventors. To do away with the intermediary of stenographers, by enabling dictation to be fixed automatically, is indeed a fascinating idea likely to appeal to many minds. Fancy all the shortcomings of stenographers, together with any chance of typing mistakes, being once for all done away with and substituted by the automatic and faithful record of the phonograph. Some inventors have indeed gone so far as to expect from that wondrous machine an automatic reproduction in plain type, heedless of the fact that there is no intrinsic connection between spelling and sound.

Besides these dreamers in the realm of invention there are others of a more practical bent who would be quite content with some sort of tracing, even in the shape of a mere curve or the like, provided each sound be recognizable to the eye of the skilled observer. This aim is not only within the region of

possibility, but in some way or other has actually been attained. In fact, the phonograph records of Dr. Marage and other inventors already allow some, if not all, of the vocal sounds to be distinguished with the naked eye, and, by further improvement of their methods, it is conceivable that these records might be made quite as readable as ordinary writing or type.

A drawback experienced in this connection was that vibrations of the phonograph stylus would more or less alter the original character of the voice, as shown by the jarring noise that accompanies any phonographic performance. In order to eliminate this difficulty, it would be necessary to do away with the recording stylus of the ordinary phonograph or gramophone, using in its stead some kind of photographic process, and this has actually been achieved by a young Russian scientist, Dr. S. Lifschitz, of Moscow University.

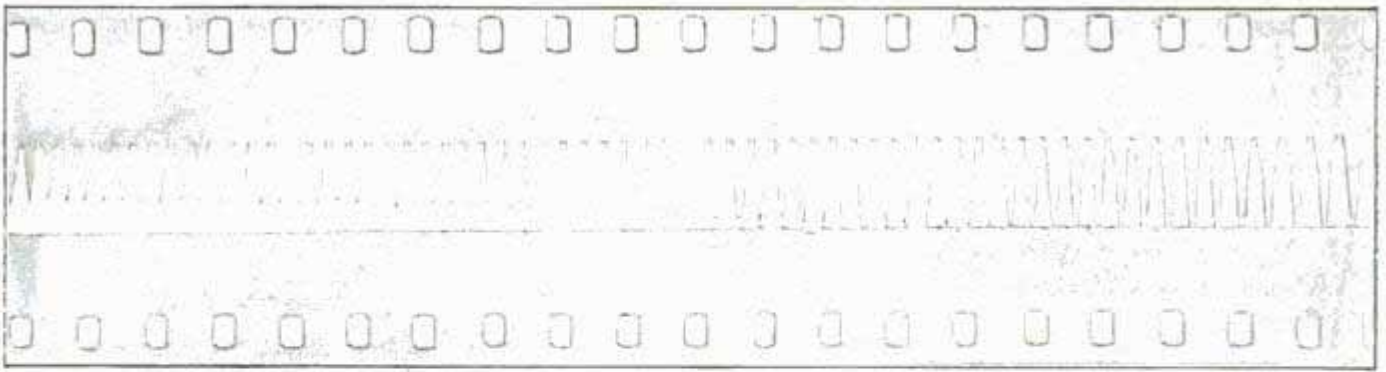
In the apparatus used,



The Reproducing Apparatus



View of the Recorder with the Mirror in the Center



A Section of the Perforated Film

the small end of a phonograph horn is closed by a membrane, the vibrations of which are transmitted to a small pivoted mirror. A beam of light is thrown onto the mirror, and the reflected beam of light, passing through a slit in a screen, impinges on a photographic film which is moved along at a uniform speed. As long as the membrane is at rest, the beam of light will trace on the moving film a straight band of constant width; but as soon as it begins to vibrate under the influence of sound, the reflected beam moved to and fro by the mirror, is cut off to a varying extent by the slit in the screen, so that the record on the film takes the shape of a succession of dark spots and stripes of varying length, corresponding in their outline to the sound pronounced in front of the phonograph horn.

The original film is then printed against a second film of bichromated

gelatine from which a perforated record may be obtained by known photographic processes, and this can be used to reproduce the original sound without any disturbing secondary noise. Such a record may be considered as the photographic picture of the sound.

The reproducer comprises a chamber connected to a source of compressed air and provided with a very narrow slit in its curved outer surface upon which the phonographic film is made to run along. The slit is arranged so as to be entirely open when the highest part of the perforated sound record passes before it, and quite closed when the sound wave decreases to zero. The air stream issuing from the slit thus varies in accordance with the shape of the sound record on the film, and the result is that the original voice is faithfully reproduced without the scratching noises characteristic of the ordinary phonograph.

WINNIPEG A MUNICIPAL OWNERSHIP CITY

Winnipeg, Manitoba, incorporated only 35 years ago, but now having a population of 200,000, and spoken of as the Chicago of western Canada, owns nearly all the public utility plants in the city, and is reaching out after the remainder.

The first municipal ownership move consisted of buying out the company supplying the water supply and sinking more artesian wells. There are now seven of these wells, from which there is secured a supply of nearly 15,000,000 gal. per day. This water is sold at the rate of \$1.50 per quarter for a house of four rooms, with an in-

crease of 30 cents per room over this number. The city also owns a high-pressure water system for fire protection, the water being taken from the Red River; an asphalt plant which has supplied the material for nearly 70 miles of pavement up to date, much of it 150 ft. wide; a stone quarry; and a plant for laying granolithic sidewalks. One hundred miles of such sidewalk have been laid by city workmen, a large proportion of the material being derived from the municipal stone quarry, which has an annual output of about 75,000 cu. yd. of crushed stone.

One of the most important of the

municipal ownership projects is a hydroelectric power plant, now practically completed at a cost of about \$4,000,000. The plant is located on the Winnipeg River, 77 miles northeast of the city. The waterfall, which has a natural drop of 32 ft., is increased by a dam to 47 ft. The total

power available without storage is 60,000 hp., which can be increased to 100,000 hp.

The latest project is a municipal gas works, which was voted for recently, and the purchase of the Winnipeg street railway is now being considered.



Automobile Lunch Wagon and Confectionery Shop

AUTO TO REPLACE LUNCH-WAGON HORSE

The perambulating confectioner who not only dispenses sweets to a hungry populace, but sells sandwiches and coffee and other substantial as well, is making ready to discard the poor tired horse that was usually attached to the lumbering vehicle which served him as show room and store house, and is taking up the motor car. A start in that direction is credited to a Wisconsin confectioner who has installed a complete power plant in his moving lunch room and candy store. A 30-hp. gasoline motor propels the vehicle, another 3-hp. gasoline motor drives a dynamo which furnishes him light, and a steam plant keeps his peanut roaster going and maintains the temperature of the warm foods he serves. The vehicle is highly ornamental as well as useful,

and the proprietor has installed every device that can possibly be of service to him in the narrow space he has at his disposal. The machine is equipped with solid rubber tires and can be run from 3 to 30 miles an hour.

Ⓒ During the warm summer weather in Muskogee, Okla., electric fans were operated in the hot manholes of the telephone and telegraph company while employes were busy splicing cable and making other repairs.

Ⓒ A restaurant has been opened in Berlin, Germany, which has accommodations for 10,000 diners and has a kitchen staff of 500 people.

TESTING THE GOVERNMENT'S COAL

BY L. WILLIAM THAVIS

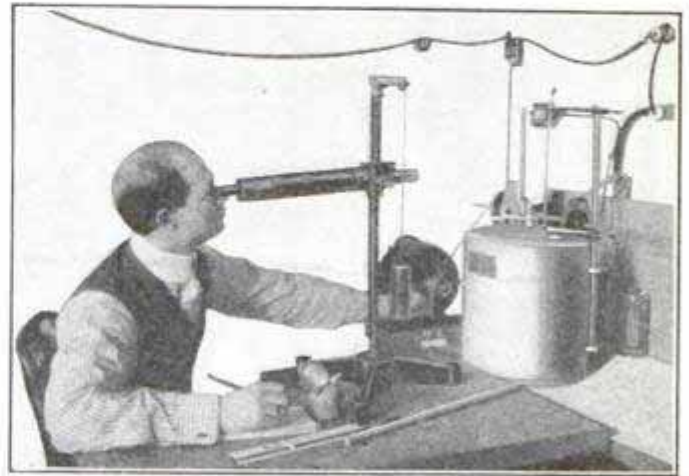
UNCLE SAM spends nearly \$10,000,000 annually for coal, and, through an intricate system of testing, the new Bureau of Mines sees to it that he receives a full dollar's worth for every dollar expended.

It requires each year a mass of coal one mile square and over 10 ft. high, a veritable black sea, as fuel for all the government buildings from the Atlantic to the Pacific, the army posts and forts, the lighthouses and the navy's battleships. These last alone consume over a million tons a year.

The fact that coal is found in 30 states of the union tends to simplify the matter of procuring fuel. In the West, Colorado supplies most of the coal for that section of the country. In the northern central section, Illinois and the neighboring states meet the nation's demand for fuel, while in the South, Alabama and her sister states furnish what is needed from their mines. West Virginia and Pennsylvania with their almost inexhaustible beds of both bituminous and anthracite coal, contribute of their abundance to the government's demand for the eastern section of the country.

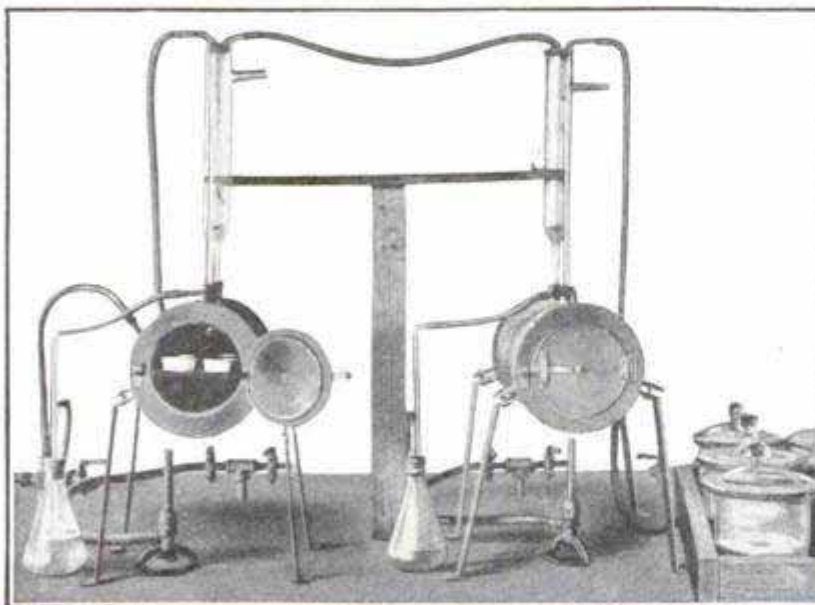
The government purchasing agents endeavor to determine the coals best

suitable for the various uses for which they are needed. With the establishment of the new Bureau of Mines, a

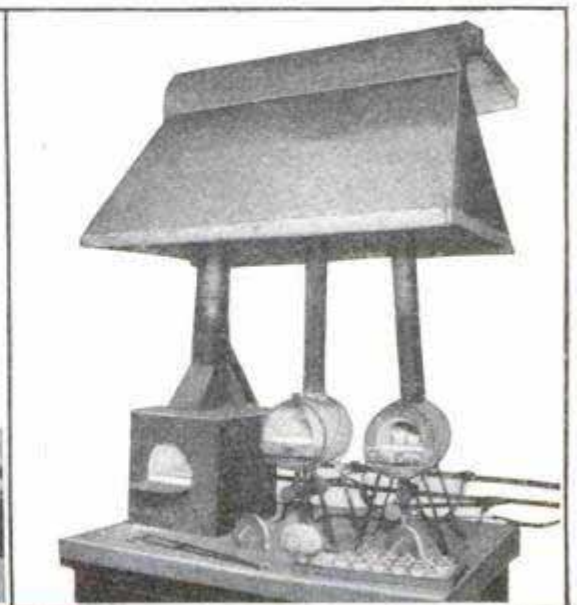


An Observer Watching the Rise in the Temperature of Water Surrounding "Bomb" of a Calorimeter in Which One Gram of Dry, Pulverized Coal Has Been Burned

comprehensive system of fuel testing and valuation has been evolved to determine the true value of coal for special purposes. The fuel-testing station at the Washington bureau examines specimens of all the coal used by the government. By exact laboratory methods, the chemical and physical properties of the coal are determined, and from this knowledge its heat value is accurately computed, so that the government gets exactly the character



Apparatus to Determine Moisture in Coals



Device Used in Determining the Ash Content of Coal

of coal it desires and fixes the price accordingly.

Each year the purchasing agents of the various governmental departments receive bids for contracts specifying the kind of coal to be supplied, its commercial name, the name of the mine from which the coal shall come, and even the coal bed. The heating value must also be shown on the estimate as well as the percentage of ash in it and the price per ton. Tests of coal are made before and during delivery.

When a delivery of coal is made to the government, there is always an inspector on the ground. It is his business to remain during the unloading and to take samples according to certain instructions furnished him. Samples are taken not only from the cars, but also later from every wagon load in the final delivery. These samples are sent direct to Washington in air-tight sealed cans for examination.

In the process of determining the number of heat units given out by the coal in burning, an apparatus called the "bomb calorimeter" is used. This is an externally nickel-plated, internally enameled steel shell, immersed (when in use) in a water bath contained in a thin brass vessel. One gram (0.0353 oz.) of pulverized coal is placed on a small platinum plate which is introduced into the steel shell. The shell is then filled with oxygen gas under pressure and closed by a stopper through which platinum wires extend inwardly and connect with a piece of fine iron wire. When the shell is immersed in the water bath, an electric current burns up the iron wire and thus causes the coal to be consumed, the increase in temperature of the water bath and metal parts being noted by a highly sensitive thermometer. From this the heat generated in burning can be determined. The ashes are also weighed.

The government refuses to pay for the ash in coal if the percentage of ash content exceeds that of the established standard. When there is more ash

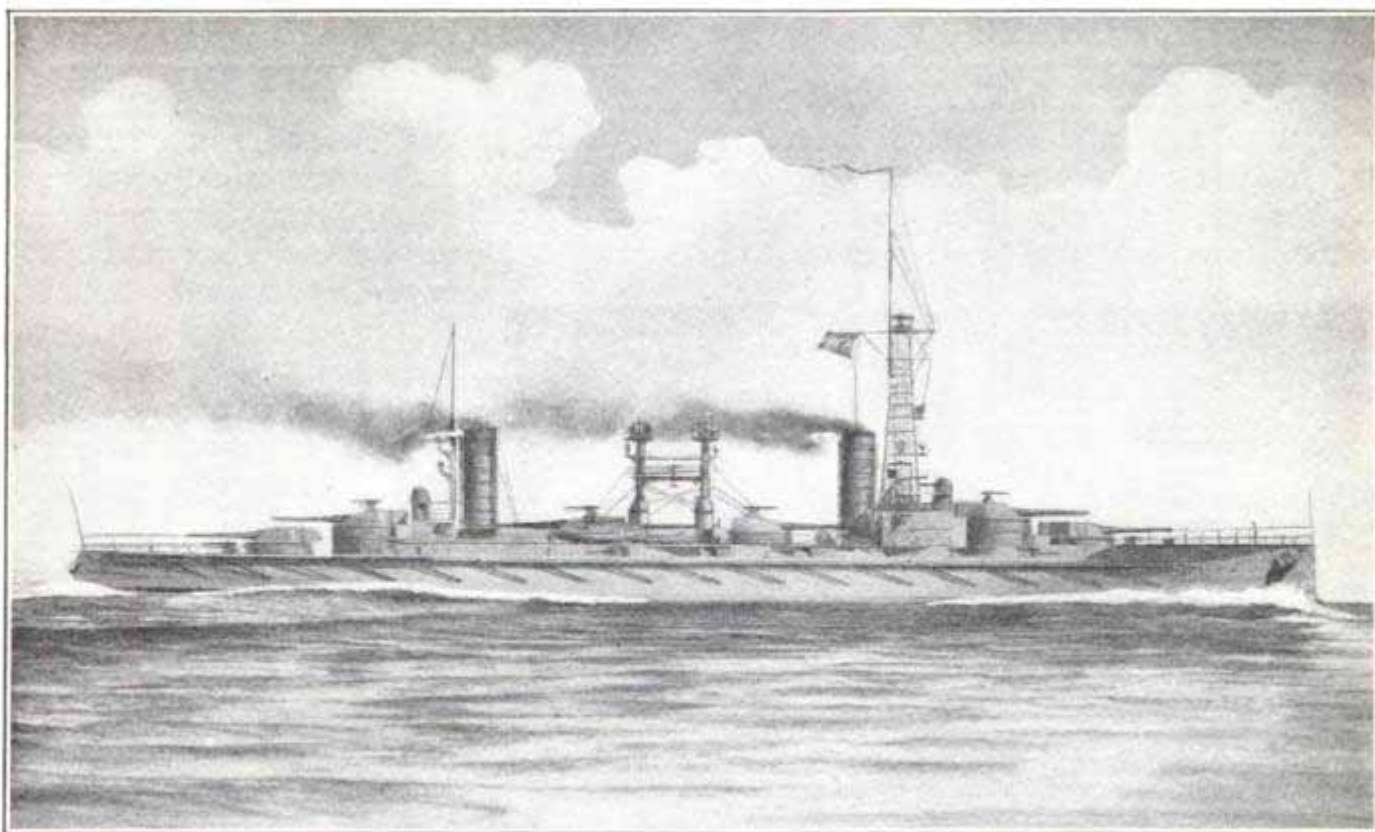
present in the coal than the maximum amount of the contract standard, a certain amount is deducted from the contract price for every one per cent of ash in excess of the maximum standard. When the coal contains less ash than the contract standard, the government pays an additional price at the same rate for every one per cent of ash lower than the contract standard.

After the moisture, the heat units and the ash content of the coal have been computed from the gram sample of coal from the large 70-lb. can, then the final standard of coal is determined. This is computed by combining the contract price with the results of all three determinations as to moisture, heat units and ash content. In this way the price to be paid for the coal is ascertained.

Although such an extensive inspection of sample coal is made from coal actually delivered to the government, the work of inspection is even more comprehensive. In order that the Navy Department may at no time be at a loss to know where to buy great quantities of coal in an emergency, the Bureau of Mines makes inspection of coals in various mines throughout the country. The value of these coals are then sent to the Navy Department, so its patronage may be distributed in an open market and especially that it may have a basis upon which to place large orders for the sudden coaling of its battleships. Even in these deals fairness between contractor and government is the keynote of the trade.

ARGENTINE REPUBLIC HAS LARGEST BATTLESHIP

The super-dreadnought "Rivadavia," built for the Argentine navy at the Fore River plant, Quincy, Mass., and now ready to be launched, gives the Argentine Republic the largest and most powerful battleship afloat. Unlike any other battleship so far completed, the "Rivadavia" will be able to fire twelve 12-in. guns on either broadside, or eight ahead and eight astern.



The American-Built "Rivadavia" of the Argentine Republic is Largest and Most Powerful Battleship

Aside from the main battery of 12-in. guns, the armament consists of twelve 6-in. guns, and twelve 4-in. guns. The vessel has a length of 585 ft., a breadth

of 98 ft., her tonnage is 28,000, and, driven by turbines developing 40,000 hp., she will speed $22\frac{1}{2}$ knots (about 26 miles an hour).

COMBINATION TAIL LIGHT AND LICENSE NUMBER

A movement is on foot to compel automobile owners to display an illuminated license number at the back of the machine as well as in front, the latter being compulsory in many states. The police claim that an illuminated number at the back is of much more importance than in front, as it is after an accident and while the offending machine is speeding away that the necessity of ascertaining the number is greatest.

An illuminated license number for the rear of the car is now available in a combination tail light and license number. It is simple in construction, consisting of a sheet-steel box, 6 by 16 in., with ruby glass bull's-eye and space for six numbers of regulation size. The numbers are of white opal glass on a black background and are interchangeable, making it convenient for dealers to supply any license num-

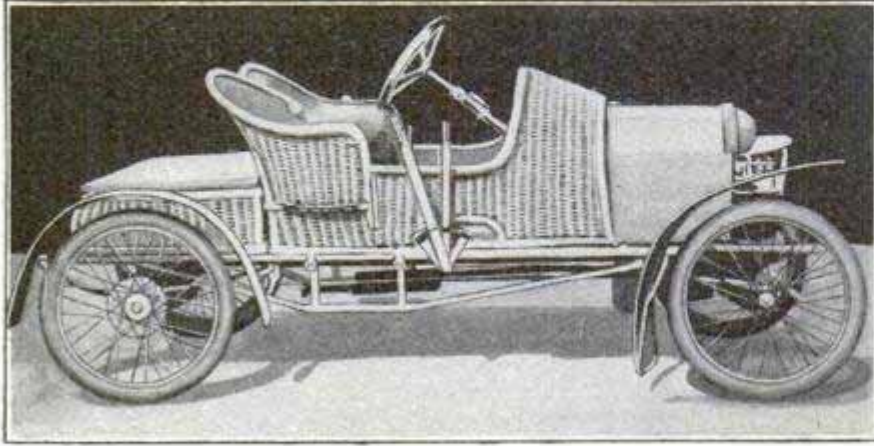
ber at a moment's notice. The box is lighted from within by two small lamps. The numbers show clearly at night at a distance of 200 ft.



Combination Tail Light and License Number of Great Value at Night

LIGHT RUNABOUT HAS WICKERWORK BODY

A runabout having several interesting features has been placed on the market in England. The body is of wickerwork, and the front part of the



A Light, Fast, 8-Hp. Runabout with Wickerwork Body

machine presents a striking appearance, a semi-torpedo gasoline tank being mounted above the 8-hp. twin engine, which is set across the frame well forward.

The drive is a hollow shaft and worm gear. The rear portion of the body, used for the storage of luggage while touring, is separate from the seat portion.

AERIAL PROPELLERS FOR CANAL BOATS

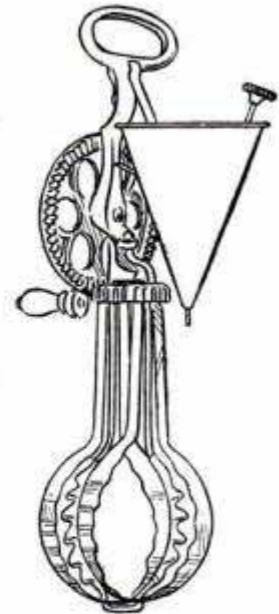
Interesting experiments have been made recently with aerial propellers as a means of propulsion for canal boats in France. One of the tests was made on the canal connecting the Seine and Marne Rivers, the aerial propeller, mounted on an ordinary canal barge, being 8½ ft. in diameter, driven by a 9-hp. gasoline engine. The propeller was mounted at the bow and easily drew the vessel at 4¾ miles an hour, which is the fastest speed allowed on these canals. The barge was a flat-bottomed vessel, 115 ft. long by 16 ft. wide. The propeller started it in motion almost immediately, and the boat reached its normal speed in less than a minute.

AUTOMATIC MAIL DELIVERY FOR APARTMENT HOUSES

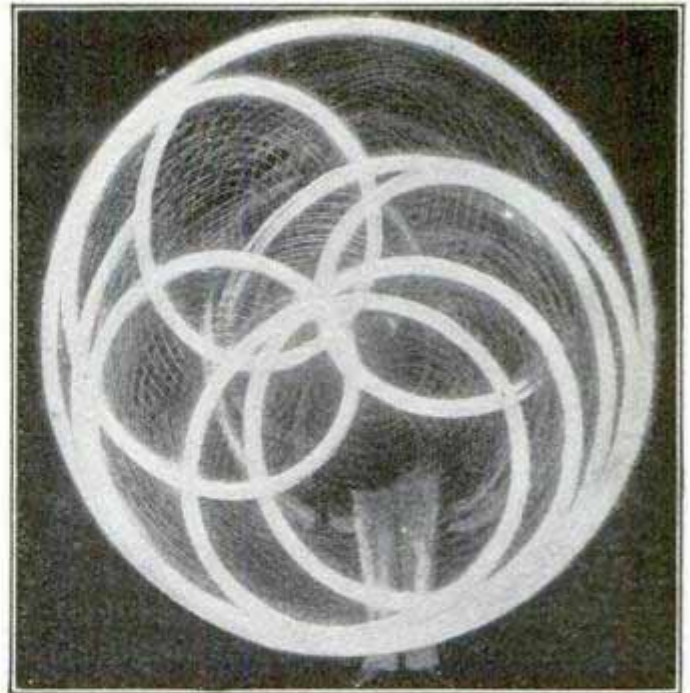
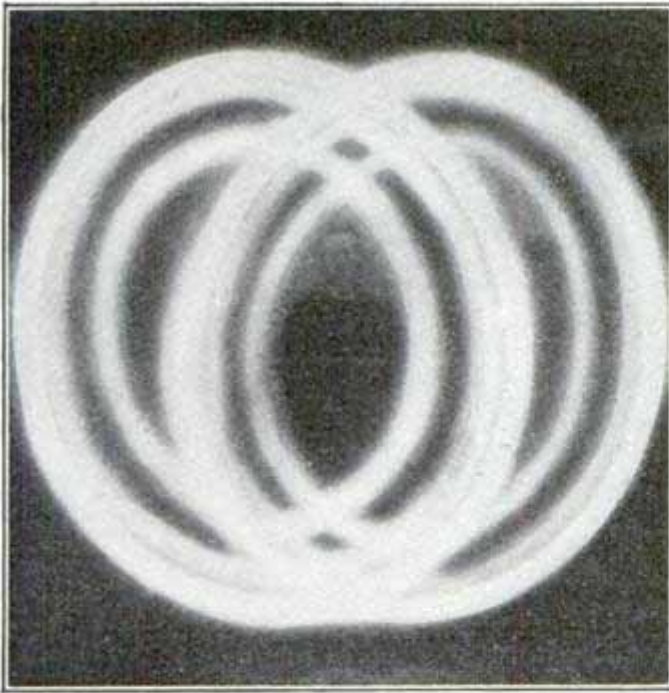
An ingenious electrical mail-carrier apparatus, which automatically delivers mail to each apartment, has been installed in several New York and Chicago apartment houses. Entering the vestibule, the postman places the mail in the various boxes of the automatic carrier, and closes the door, this action starting the electric machinery. By a simple contrivance the boxes are dropped from the carrier at the apartments to which they belong, and at the same time overturned, so that the mail falls out into the locked receptacle inside the apartment. The automatic carrier keeps on going until it reaches the top, then descends again, picking up the boxes as it comes down.

COMBINED EGG-BEATER AND CREAM-WHIP

A combined egg-beater, cream-whip, and mayonnaise-mixer is being marketed by a Tarrytown, N. Y., manufacturer. The oil dropper is attached to the handle of the beater when it is to be used as a mayonnaise-mixer. The attaching or detaching only takes a few seconds.



Short circuits, caused by hawks and other large birds settling on the towers of the Roosevelt hydroelectric transmission lines, have been stopped by means of birch-rod guards, which prevent the birds from settling on the towers near the wires.



Effects Produced by Use of Electrically Lighted Indian Clubs

ELECTRIC-LIGHTED CLUBS LATEST GYM NOVELTY

An enthusiastic and inventive gymnast has devised a means of electrically illuminating his Indian clubs so as to produce startling yet beautiful effects.

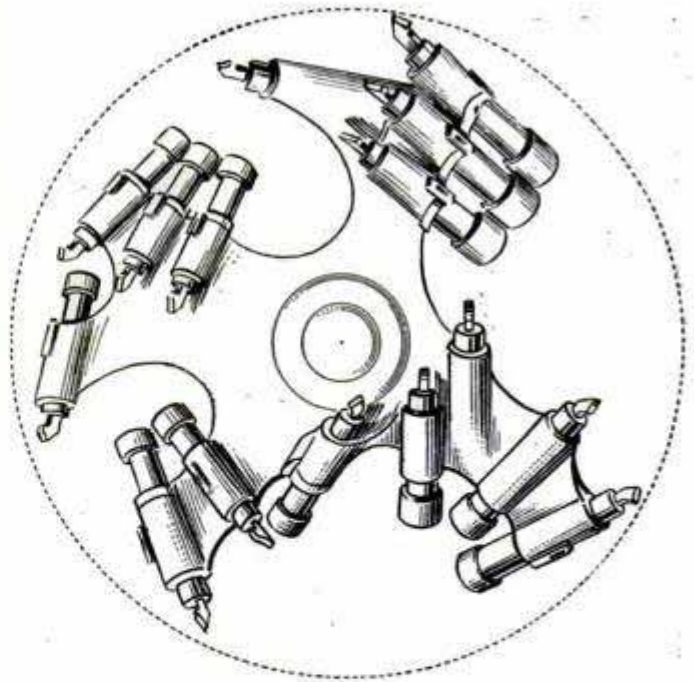
The idea of attaching electric lights to the Indian clubs was the result of an accident during an evening exhibition. At one of his gymnastic performances the lights suddenly went out, and the electrician declared that it would be another hour before he could get the lights on again. The club swinger happened to have in his dressing room a number of electric torches. He attached them to the clubs, lighted them, and continued his exercises in the unlighted room. Apart from saving the situation, the lighted clubs were very popular, and he determined to find out if it would be possible to fix electric lights to the clubs and swing them successfully.

The first thing was to design a special club. The ones now in use are made in two parts, the split being lengthwise. A flexible cable of five wires leads into the club handles through a rubber tube, the wiring of course being concealed. Three series of eight miniature lamps of 3 cp. each are set in small, brass sockets the length of the club, so that the lamps stand out at right angles to its surface. As the little globes are colored, there are no fewer than six series of different-colored lights when the current is turned on. But these clubs could be used only in halls or houses wired for electricity. To overcome this difficulty, the inventor of the electric club carries a battery about with him. The figures or effects obtainable with clubs lighted in this way are practically unlimited.

TUNNELER THAT CHIPS OR GOUGES, AUTOMATICALLY

An improved rock-tunneling machine that chips out the hard rock with hammer drills and automatically changes into a gouging machine when soft rock is encountered, is being introduced by

a New York concern. It can be controlled and operated by one man, although it weighs 25 tons, is 18 ft. long, and has a capacity of from 25 to 75 lineal feet of 8-ft. tunnel in 24 hours.

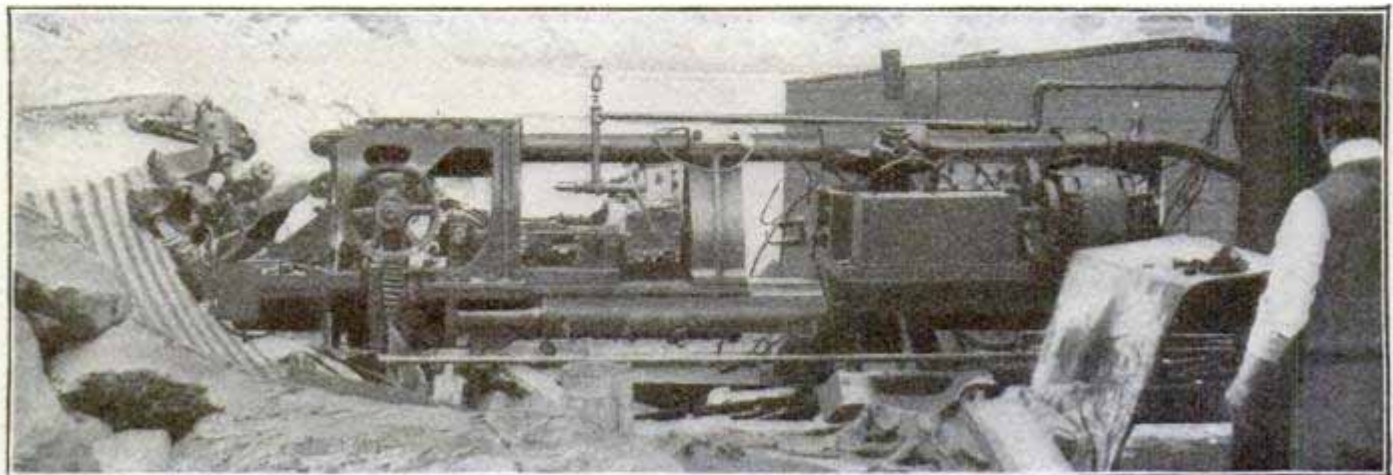


View of Head of Tunnel-Boring Machine and Sketch Showing Arrangement of the 15 Drills

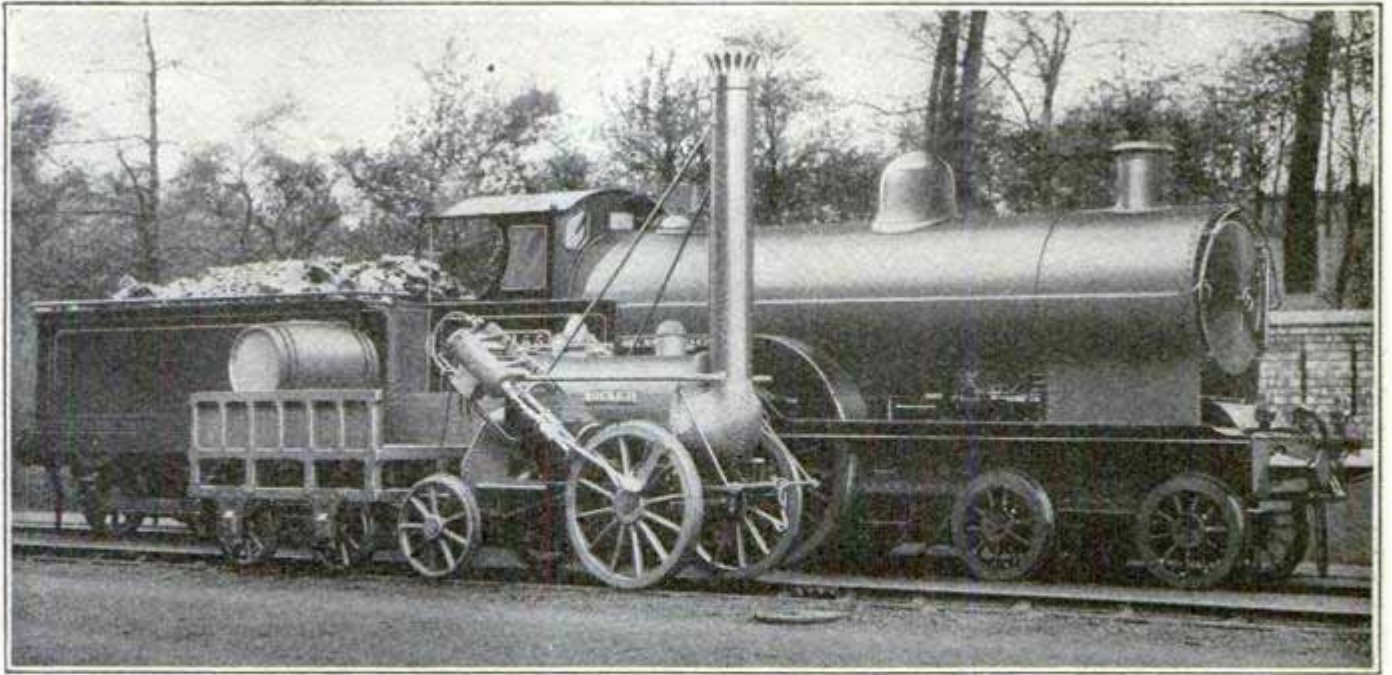
The working part of the machine is a massive, four-armed, cast-steel head to which are attached fifteen 3-in. hammer drills, operated by compressed air which is supplied at about 100 lb. pressure through the horizontal, hollow shaft on which the head is mounted. This shaft is rotated through a wormwheel drive by a 25-hp. air engine. The machine is held firmly in position by a pair of 40-ton hydraulic jacks which engage the roof of the tunnel, and vertical and transverse alignments are provided for by means of a set of adjustable screws. The forward movement is effected by two jacks, 8-in. diameter and 48-in. stroke. The pumps for supplying water under pressure to all the hydraulic jacks are operated by a 2-hp. electric motor. The

material excavated is removed by a drag elevator, also operated by a 2-hp. electric motor, and is dumped into cars which follow the machine on a track laid behind it.

Probably the most interesting feature of the tunneler is an arrangement by which the hammer action of the drills is maintained only so long as the pressure against the rock face exceeds 700 lb. When the resistance against the points of the cutters drops below this figure, owing to the presence of soft rock, fissures, or other cause, the hammer action is automatically stopped, and the drills operate simply as gouges, milling off the tunnel face, until the hard rock is once more encountered, when the hammer action of the drills begins again.



Side View of the Tunneler, Showing the Drills, the Mechanism for Rotating the Head, the Hydraulic Jacks for Pushing the Head Forward, and the Hydraulic Pumps and Motor in the Rear



The Reconstructed "Rocket" Compared with a Modern English Express Locomotive

MODERN ENGLISH ENGINE AND THE "ROCKET"

The first of all railway locomotives, Stephenson's famous "Rocket," was recently reproduced at the Crewe works of the London & Northwestern Railway, and is here shown taken alongside one of the modern express locomotives of this system. The "Rocket"

weighs 8,300 lb., and the modern locomotive 117,700 lb. The former, drawing a train weighing 13 tons, made a speed of 19 miles an hour, and the latter, drawing a train weighing 358 tons, makes a speed of over 60 miles an hour.

SOME HINTS FOR AIRMEN

Charles C. Turner, an English aviator, during his apprenticeship, took the pains to study whether his theoretical instructions were borne out in practice, says Aeronautics, London. He has observed that the draft on the pilot's face is the same whether flying before or against the wind, but in the former case the aeroplane always has a tendency to fly downward, and in the latter, to rise higher. He has also verified an opinion held by scientific and technical experts, that it is unsafe to fly before a wind, the velocity of which is higher than half the speed of the machine. In flying at the rate of 38 miles an hour before a wind of 30 miles velocity, he has repeatedly noted that the machine refused to obey the controls. Once, when caught in a fog and strong wind, he found himself, when emerging out of it, at so low an

altitude that he was surrounded by telegraph and telephone lines and could only land by sacrificing one of his ailerons. He justly remarks: "With an inclinometer on my machine I would never have flown so low."

In conclusion he gives some general rules, the soundness of which he has himself tested:

During flight, do not watch any particular part of the machine.

Do not fix your eyes on the horizontal rudder.

Do not look at the lever operated by the feet.

All levers should be operated smoothly and without jerking.

In approaching the ground do not be in a hurry to raise the rudder in order to land horizontally. It is a common error of judgment to believe one's self

close to the ground too soon, at least for the beginner.

Before turning, go a little higher, in order to overcome the descent that always accompanies a turn. Never try to elevate the machine while turning; nor try to escape eddies or airholes by elevating yourself.

If a puff of wind raises one of the wings dangerously, turn into the wind with the vertical rudder, at the same time operating the ailerons or warping.

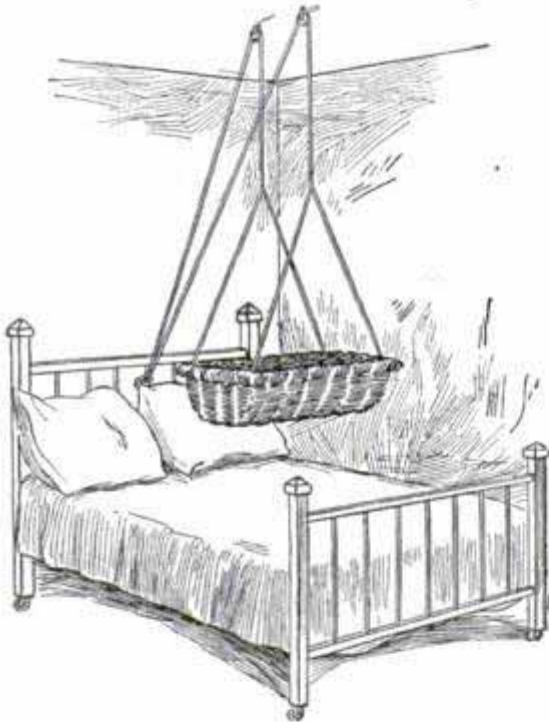
Always tilt the machine in turning, except when the wind comes from the outside and might strike the machine from below.

Do not depend only on the ailerons or warping for lateral stability; restore it also by means of the vertical rudder.

Never try to land with the wind from the side. Look down on the ground. If objects are passing across your line of flight in any direction turn in that direction in order to face the wind.

BABY CRIB SUSPENDED OVER BED

A basket suspended from the ceiling above the bed in the manner shown makes a most excellent baby's crib.



An Excellent Baby Crib Arrangement

In this position it may be set swinging gently from the bed with but little effort. Care must be taken, however, that the pulley blocks are securely fastened in the ceiling.

FINGER MARKS VARY ONE IN SEVENTEEN BILLION

According to a paper read before the French Academy of Sciences at a recent meeting, identification by means of finger-prints is almost absolutely infallible. The investigator, on whose

researches the paper was based, magnified the print about five times and divided each into an equal number of squares, which were then studied separately and compared as to the interruption, branching off, and direction of curvature of the lines. Thus he discovered that in order to find in any square common characteristics in two different individuals, he must examine 16 prints; for three characteristics, 64 prints; for four, 256 prints, etc. According to the rules of the calculus of probability it would then be necessary, in order to find 17 common characteristics in the finger-prints of two individuals, to examine approximately 17 billion prints, or, in other words, as 17 characteristics are only a small number compared with the whole number of characteristics found in any individual print, the chance of mistake in identification by means of finger-prints is less than one in 17 billion.

TELEPHONE WIRE SHOT ACROSS RIVER

A life-saver's equipment, comprising life line and cannon for shooting it to wrecked vessels, was recently used by a Los Angeles telephone company to get its line across a river. Sudden floods had washed out the poles which carried a heavy cable across the stream, and it was impossible to ford the torrent while the current was so swift that no boat would live in it. Finally the bright idea was hit upon to utilize the mortar and life line held by the



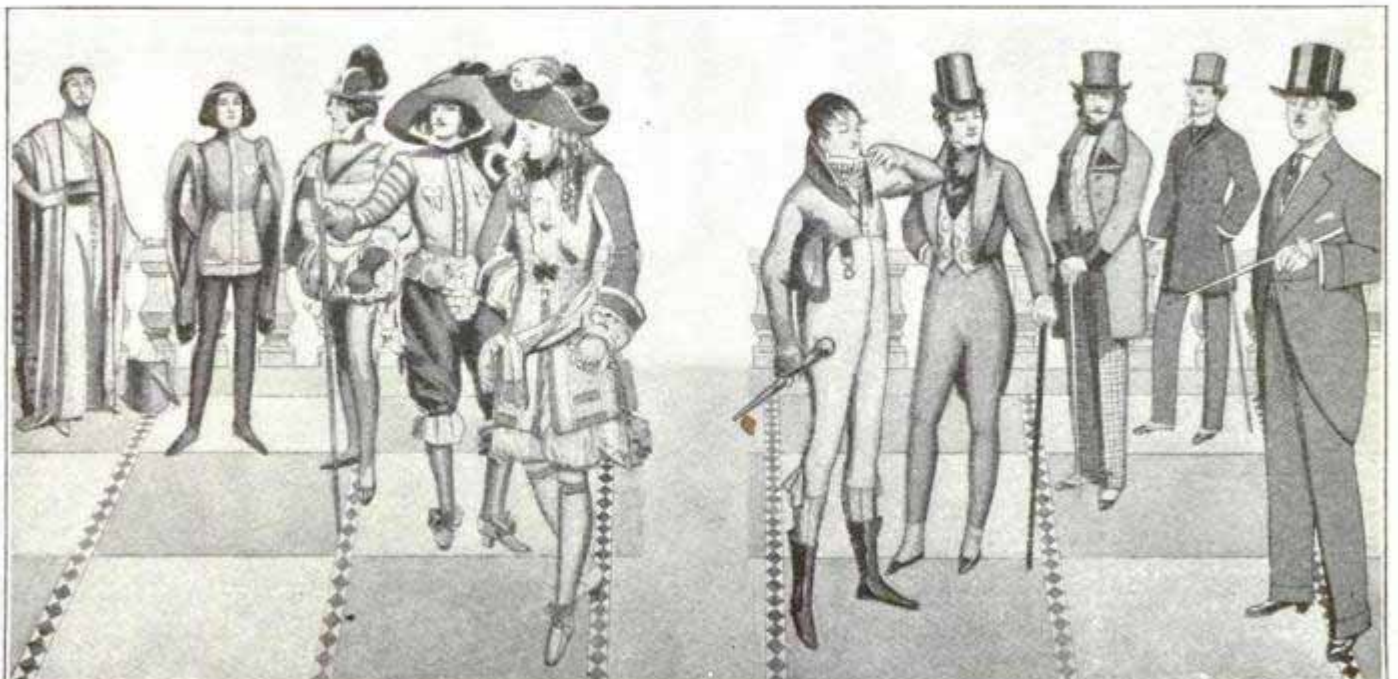
Stringing a Telephone Cable across a River with a Life-Saver's Outfit

life-saving crew at a nearby beach, and this outfit was hurriedly sent for. As the projectile with its trailing rope had to carry a distance of 1000 ft., a generous charge of powder was poured into the muzzle of the gun, but unfortunately more zeal than discretion was used in that part of the feat for the cannon promptly exploded owing to the overcharge. Fortunately, none of the bystanders was hurt and, in spite of the accident, the telephone man's purpose was accomplished, for the ex-

plosion sent the projectile across the river, and the crew on the opposite bank soon had the line in working order.

THE EVOLUTION OF MASCULINE DRESS

The evolution of masculine dress from the old Greek to the style which flourishes today in Paris is shown in the accompanying illustration as portrayed by M. Fabiano, a French artist.

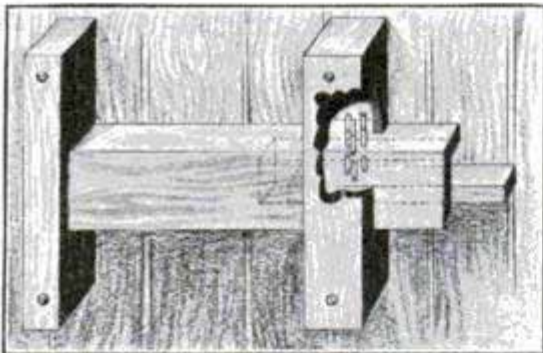


These, According to a French Artist, are Types of Fashionable Dress for Men from the Ancient Greek to the Present

The reason for the portrayal is due to the fact that a movement is on foot in Paris to revolt against the influence of the English and American designer of masculine fashions. If a radical change is made, it will be entirely the work of the French tailors, and there will be no seeking of inspirations from London and no American touch. Instead, there will be a reversion to one of the more or less romantic styles of the past. According to the French artist, the figure at the extreme right of the illustration is a "modern gentleman of fashion."

OLD EGYPTIAN PIN-TUMBLER LOCK

Strange as it may seem, Linus Yale, Jr., the inventor of the separate cylinder, pin-tumbler, revolving-plug lock, which revolutionized the art of lock-



Curious Old Egyptian Wooden Lock Which Gave the Idea for the Famous Yale Lock

making, got his idea of pin-tumblers from this old Egyptian wooden lock with its iron pegs for tumblers.

SIGNAL-RECEIVING DEVICE FOR SUBMARINES

The only means of signaling submarines when submerged—outside of experimental trials with wireless telegraph or telephone—has so far been by sounding bells sunk below the water. But to perceive such signals, the observer on board the submarine had no other way than to place his ear against the side of the vessel, many foreign sounds thus reaching him and making it almost impossible to determine from which direction the signal emanated. An apparatus, invented by two French engineers and described at a recent meeting of the Academy of Sciences, Paris, overcomes these difficulties in a simple manner.

On either broadside of the submarine is provided a thick metallic sounding box, inside of which is a ring, so constructed as to vibrate in unison only with the tone emitted by the signal bell. A microphone attached to this ring amplifies the vibrations corresponding to this particular tone, effectively excluding all foreign sounds, and a telephone receiver permits the observer to listen alternately to the sound from the two boxes. If the sound from one is stronger than that from the other, it is evidence that the vessel is presenting the corresponding broadside toward the bell, and by swinging the submarine about until the sounds are of equal strength, the direction from which the signal comes is found.

AUTOMATIC MACHINE FOR ROUGHCASTING WALLS

The finishing of exterior wall surfaces with pebble dash or roughcast, or even with plain stucco or cement, is always an item of considerable expense, as hitherto it has had to be done by hand labor. Recently, however, an inventor has perfected a simple automatic machine which does this work quicker, better, and at less expense than it could be done by the most experienced building constructor using the ordi-

nary methods of trowel work that have prevailed for centuries.

In the illustrations, the machine is shown operated by hand power, although there is nothing in its construction to prevent a gasoline engine or electric motor being used to furnish the power, thus reducing the attendance to a single operator. The pebble dash, roughcast, stucco, etc., is placed in the hopper and falls on to the spirally ar-

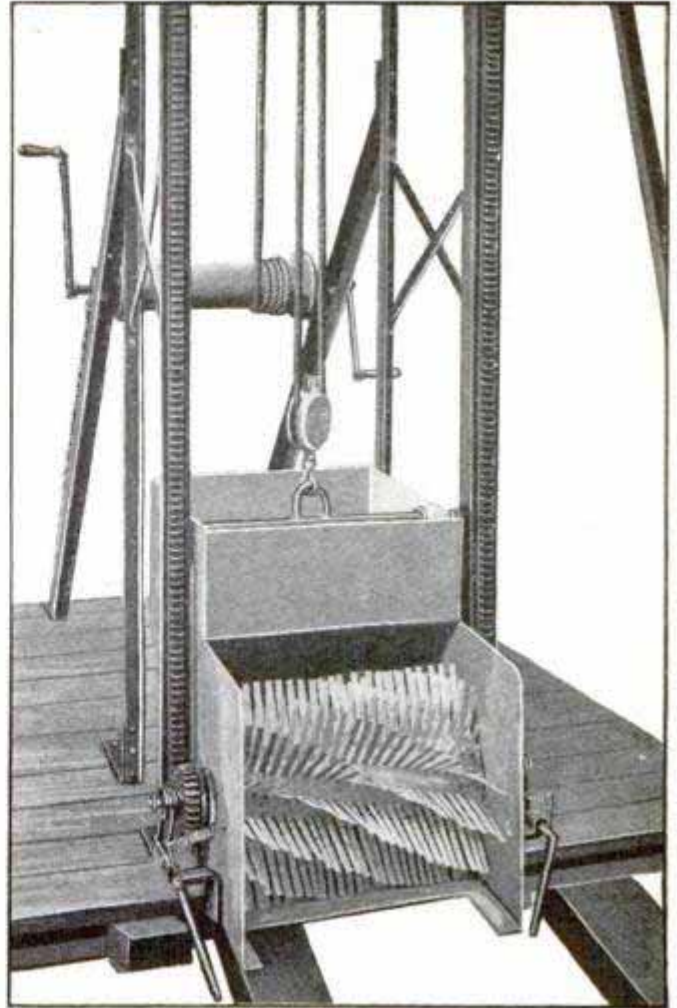


The Roughcasting Machine in Action, Throwing Material against Wall

ranged blades below, which, by their rotation as the carrier is being lowered, throw the material forcibly against the wall surface in much the same way as a plasterer throws the stuff from his trowel in doing the same kind of work. Lowering and raising of the carrier are effected by the windlass arrangement shown near the base of the machine, and the throwing device is rotated by the action of a pair of gear wheels, one at each side, which mesh with the long straight racks on two of the vertical uprights.

It is obvious that with this machine a vertical strip of wall, equal in width to the carrier, can be roughcasted in a few minutes, and that by moving along the device to successive positions, the covering of the whole surface of an exterior wall is an easy matter.

¶The history of the present day is to be preserved for posterity in moving pictures, a start having been made in that direction by the depositing in

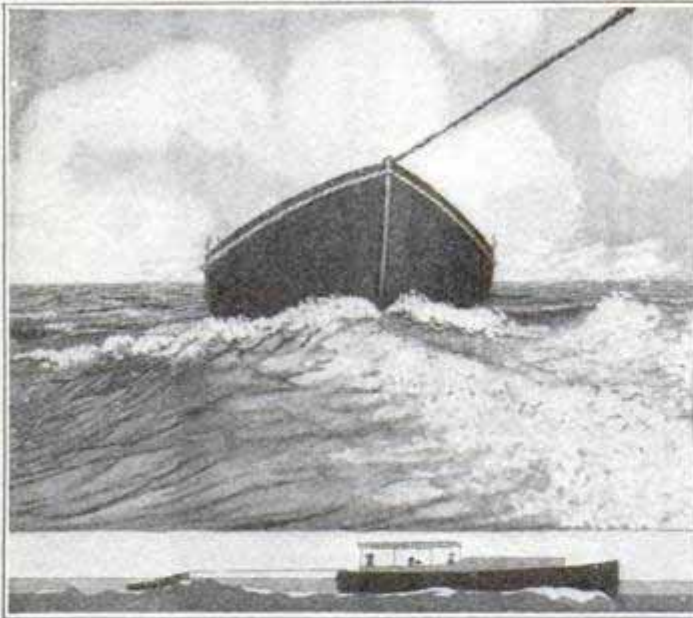


Detail of the Machine Showing the Windlass, Hopper and Throwing Device

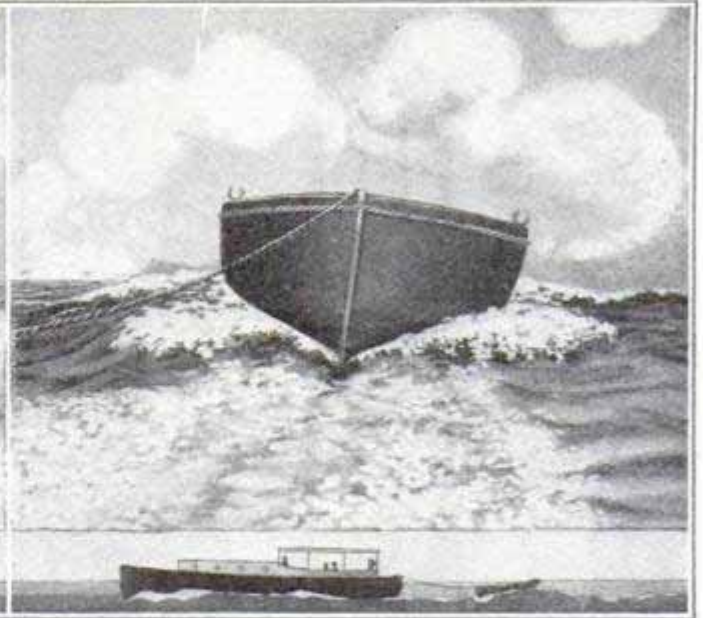


Rough Pebble-Dash Work as Done by the Roughcasting Machine.

Wilkesbarre, Pa., of films made of events of importance in sealed packets that are not to be opened for 100 years.



Pulling Hard on the Backward Slope of a Following Wave



Dragged Along Easily on the Forward Slope of the Following Wave

THE TOWING OF A DINGHY

The pull of a dinghy, which is the name given the small boats acting as tenders for yachts, is considerable, but whether or not this pull is to be strong or comparatively light is the result of proper manipulation of the tow line. If the dinghy is towed so that she is apparently riding on the back of the

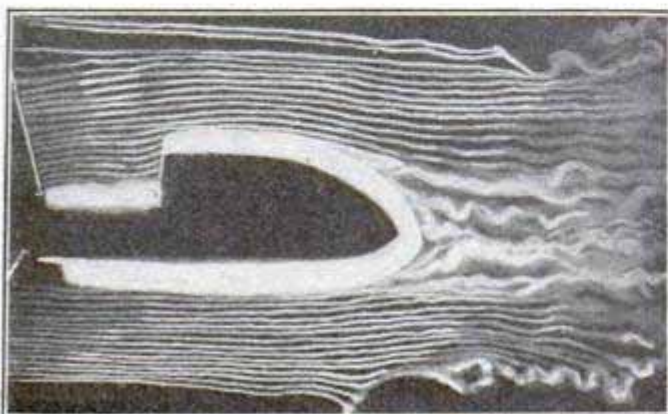
wave astern she will exert much more drag on the rope than if riding on the forward slope of the wave. It is well, therefore, to give the boat just sufficient rope so that she will be riding on the forward slope of the wave following the yacht, as shown in the right-hand illustration.

"STREAMLINE" BODIES FOR AUTOMOBILES

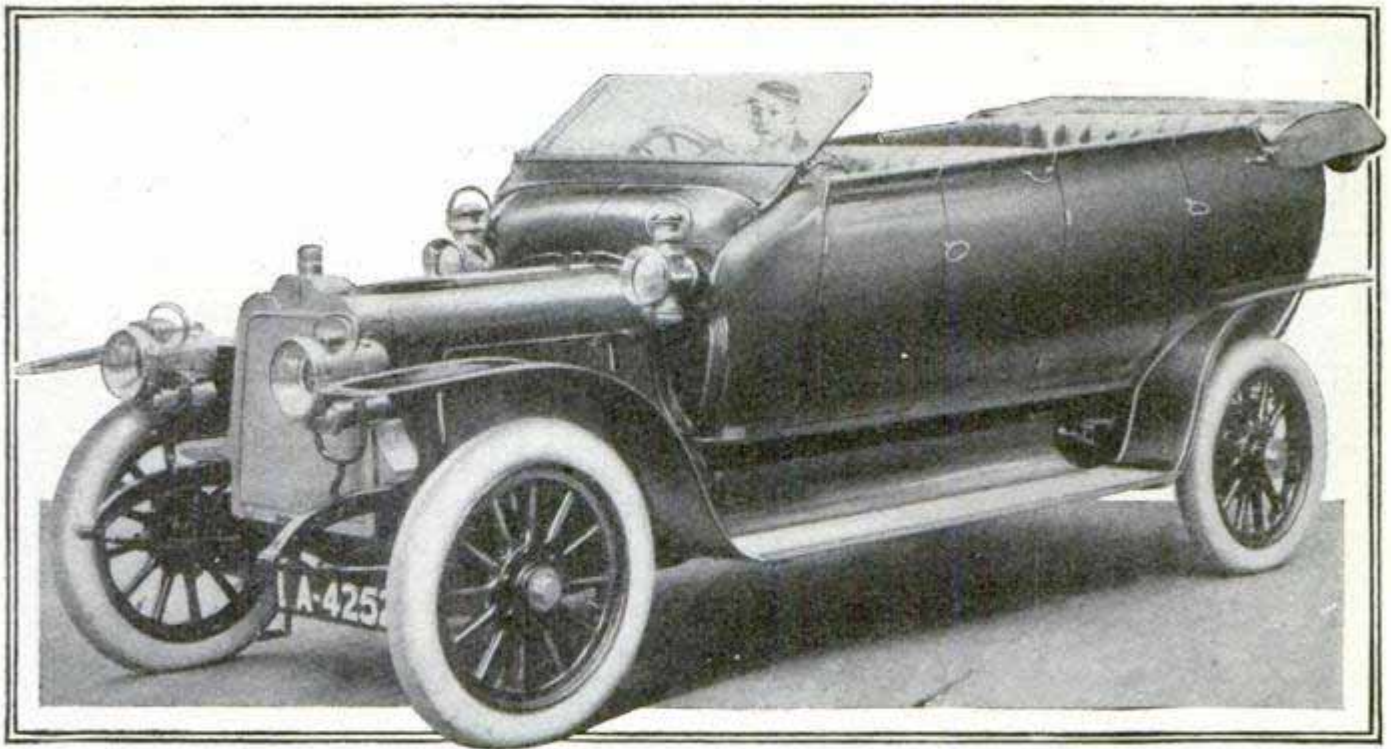
When air currents can flow past an aeroplane, airship or automobile in unbroken curved paths resembling the lines of flow of water in a smooth stream, it follows that the resistance of the vehicle to the air is much less than when the air currents are broken

up into whirls and eddies. Some few years ago, Prof. H. S. Hele-Shaw made a classic series of experiments on streamline flow in water, and succeeded in taking a large number of beautiful photographs of this phenomenon, while Prof. Horace Lamb worked out the mathematical analysis, which, together with the experimental results, caused marked improvements to be effected in the design of the under-water bodies of sea craft.

Recently, automobile designers have been working out the shape of the car bodies to give a good streamline effect in moving through the air, and a recent announcement in this connection is that the new Gregoire automobile body, which simulates or suggests the airship model, has been designed strictly with a view to minimum air



From Actual Photograph Showing Streamlines around Model of the Car Body. Smoke was Circulated Past the Model in Order to Give an Effect Visible to the Camera



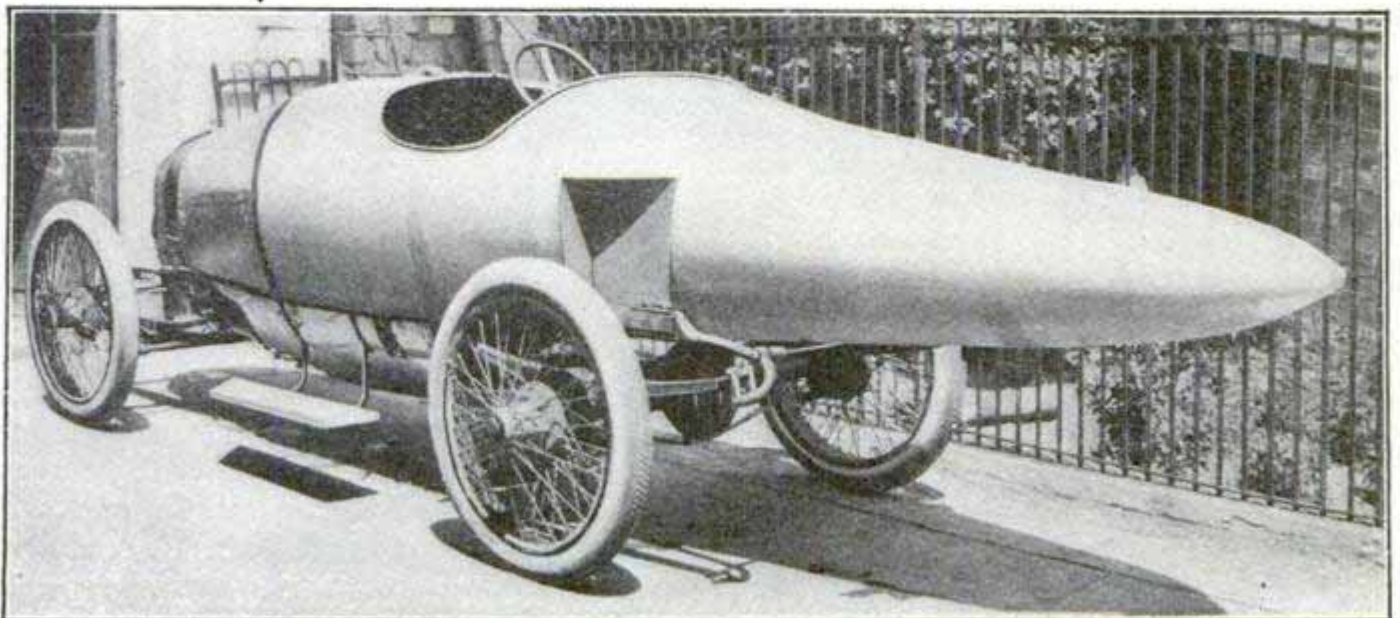
Automobile with "Streamline" Body Designed by an English Engineer

resistance. According to experiments by M. Eiffel, of Eiffel Tower fame, the rear lines of any body moving rapidly through a fluid have a greater effect on the resistance than the shape of the forward part. The influence of this is shown in the egg-like shape of the rear end of the Gregoire car, and it is said that not only is the resistance decreased materially, but that the tendency of the car to raise the dust behind is almost eliminated.

Before the shape of the body was finally decided upon, models were built

and tested by M. Eiffel's instruments, and photographs were taken of the streamline effects. The pictures were made possible by circulating smoke instead of air past the models in the testing tunnel.

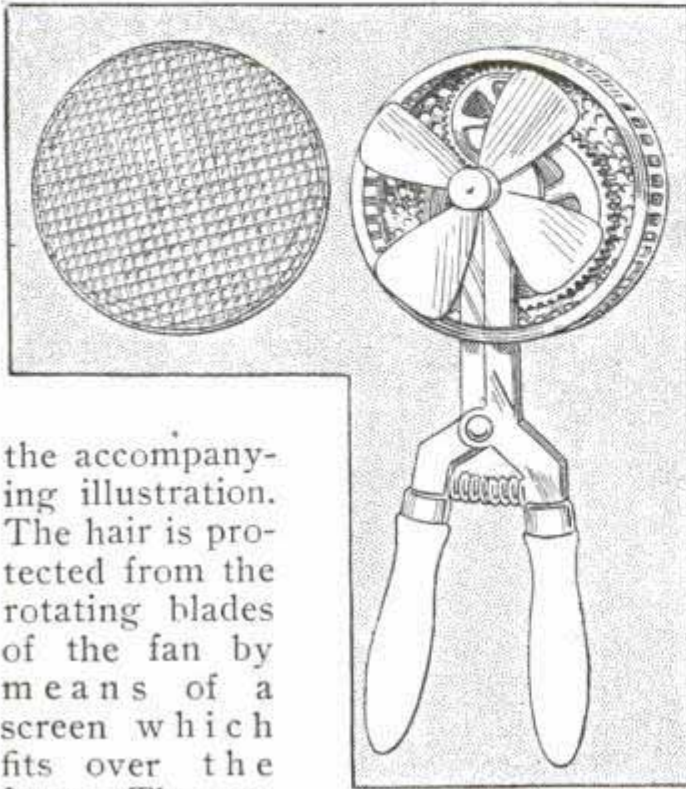
An English concern has also taken up this matter of "streamline" bodies for automobiles. The illustration above shows the first machine built to the design of H. Waymouth Prance on streamline principles, which has met with favor on its recent road trials in England.



Gregoire Racing Car, Design of Which is Result of Streamline Experiments

HAND-OPERATED FAN FOR DRYING THE HAIR

An ingenious hand-operated fan, designed for drying the hair, is shown in



Hair-Drying Fan Operated by Hand

the accompanying illustration. The hair is protected from the rotating blades of the fan by means of a screen which fits over the front. The motive force for rotating the fan is obtained by alternately drawing together and releasing the handles.

NEW EMERGENCY DOOR FOR THEATERS

An ingenious door, designed for use at emergency exits of theaters or other inclosures, has been patented by a



Chicago man. It consists of a hollow door made in the form of a shallow box having its inner wall or panels mounted in such a way that a slight pressure against any part of its surface will cause the latch or latches to be-

come inoperative, thus allowing the

door to swing open outwardly. To be exact, the slight pressure against any portion of the inside of the door causes the inner wall to telescope into the shallow box-like portion forming the outer wall, and thus operate the mechanism which draws the latch or latches. The door cannot be opened from the outside without a special key.

REFUSE USED IN MAKING PAVING BLOCKS

The clinker residue of cremated house refuse is now being used in England as the chief material in the manufacture of paving blocks. The method of manufacture, evolved by a Nottingham firm of engineers, received the bronze medal awarded by the road experts of the Royal Sanitary Institute, as an acknowledgment of the advantages of the process, and the Borough of Kensington, London, now has a plant in full operation.

The system is simple, the clinker which issues from the cells in which the refuse is burned, being fed into a specially constructed grinding mill. After passing under chilled rollers, weighing about two tons, which grind the mass to a sufficient degree to enable it to pass through a fine mesh screen, it is conveyed to a revolving dryer, where it is subjected to a high temperature. The feature of the process is the combination of the ground clinker with asphalt in such proportions as will yield a homogeneous material at a minimum expense. The asphalt undergoes preparatory treatment while the clinker is passing through its initial stages. First, it is fed into large melting vats of particular design and construction, provided with special facilities for heating and maintaining it at a high temperature. When it reaches a suitable fluxing condition, a quantity of residuum oil is introduced, and the product is conveyed to the final mixing tank, where it is combined with ground, heated clinker. From this mixing tank the mass passes to the block presses, where

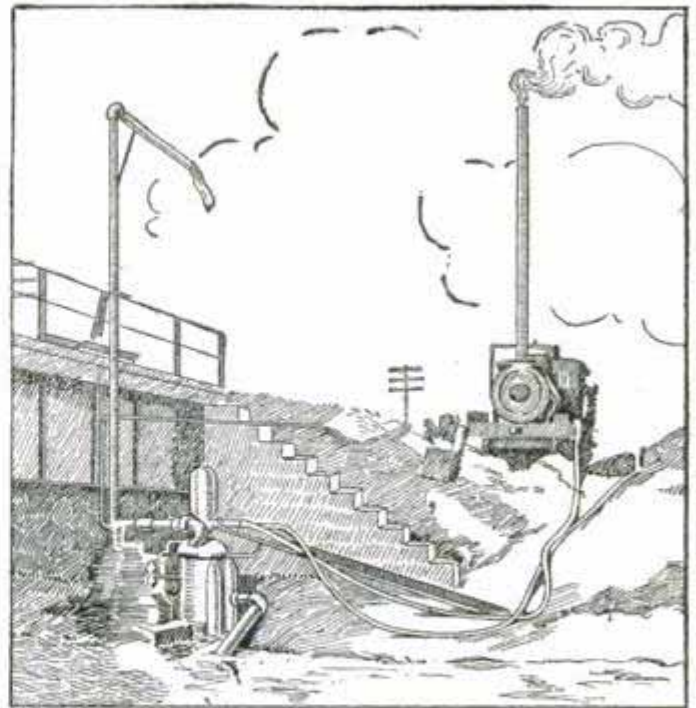
it is formed in blocks and submitted to a 100-ton pressure.

The process is said to be highly economical in regard to the consumption of asphalt, about one ton of asphalt being mixed with $3\frac{1}{2}$ tons of clinker to produce 1,000 blocks. The total cost of manufacturing 1,000 blocks averages about \$20 for materials, and \$3.50 for labor.

The Kensington plant is capable of turning out 500 blocks per hour. The blocks have been subjected to exacting tests on London roads with perfect satisfaction.

OLD LOCOMOTIVE OPERATES WATER-TANK PUMP

When locomotives are no longer fit for work on the rails they are usually sent to the scrap heap, but this old locomotive, stranded on the bank of a creek near Grand Rapids, Mich., is utilized by the Pere Marquette Railroad in pumping water for the nearby



This Old Locomotive, No Longer Capable of Running over the Rails, Furnishes Steam to Operate a Pump

water tanks. Although unfit for hauling purposes, the boiler is still in fairly good condition. The steam is sent through rubber hose to the pump in the creek.

LIGHTNING EXPLAINED BY NEW THEORY

It is well known that lightning is an electrical phenomenon, and it has been popularly supposed that a lightning flash is caused by a momentary electrical breakdown of the air between a cloud and the earth or between two clouds when the density of the electric charge in the cloud or clouds exceeds a certain amount. But, as Dr. Charles P. Steinmetz pointed out in a recent lecture, this would presume an electrical pressure of nearly a million volts for each foot that the lightning traveled, and he regarded it as inconceivable that any reasonable source of electricity could produce the immense energy implied by such a figure.

Dr. Steinmetz suggested a new theory which besides being quite plausible may also be made to account for the phenomenon of "heat lightning," which has hitherto been regarded as merely a reflection of far-off lightning.

This new theory regards lightning not as a simple electric rupture but as an equalization of internal strains and stresses. A mechanical illustration is afforded by the well known "Rupert's drop" which is made by dropping molten glass into water. When the pear-shaped head of the drop is scratched, or when its tail is broken off, the drop immediately bursts into a mass of fine powder. Similarly, a badly annealed plate of glass will crack in all directions when it is scratched or splintered in one place.

Thus, in the thundercloud, the electrical charge may be very unevenly distributed, owing probably to the different rates at which the individually charged rain particles become massed together at various places. When the electrical density becomes excessive in some one spot, a flash over a few inches or so in length is produced. This increases the density in the next

spot, and so the discharge surges on, increasing as it travels, and results very quickly in a lightning flash which may extend many miles. And all this may very well be started by an initial electrical pressure of only a few hundreds of volts.

An extension of this theory accounts for heat lightning. If the rain particles are not charged sufficiently to produce lightning in the manner already explained, a change in atmos-

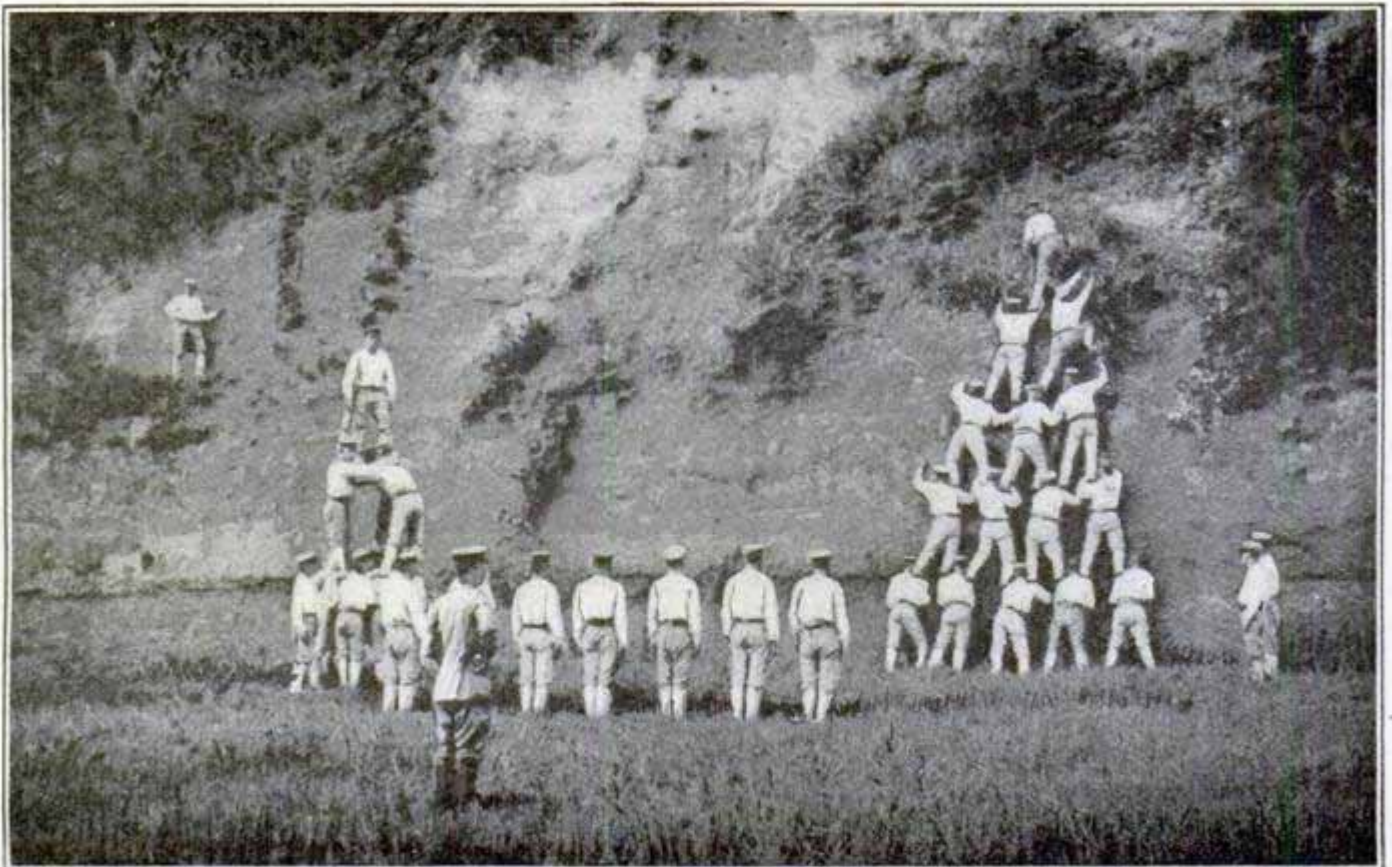
pheric conditions may cause the raindrops to re-evaporate. Since gases do not carry electric charges, each dwindling raindrop retains its original charge. But the charge, being spread over a diminishing surface, increases in density, until finally the tension becomes so great that a lightning discharge is propagated throughout the cloud mass which has now become so attenuated as to be practically invisible to the eye.

JAPAN'S SOLDIER-ACROBATS A REAL AID IN WAR

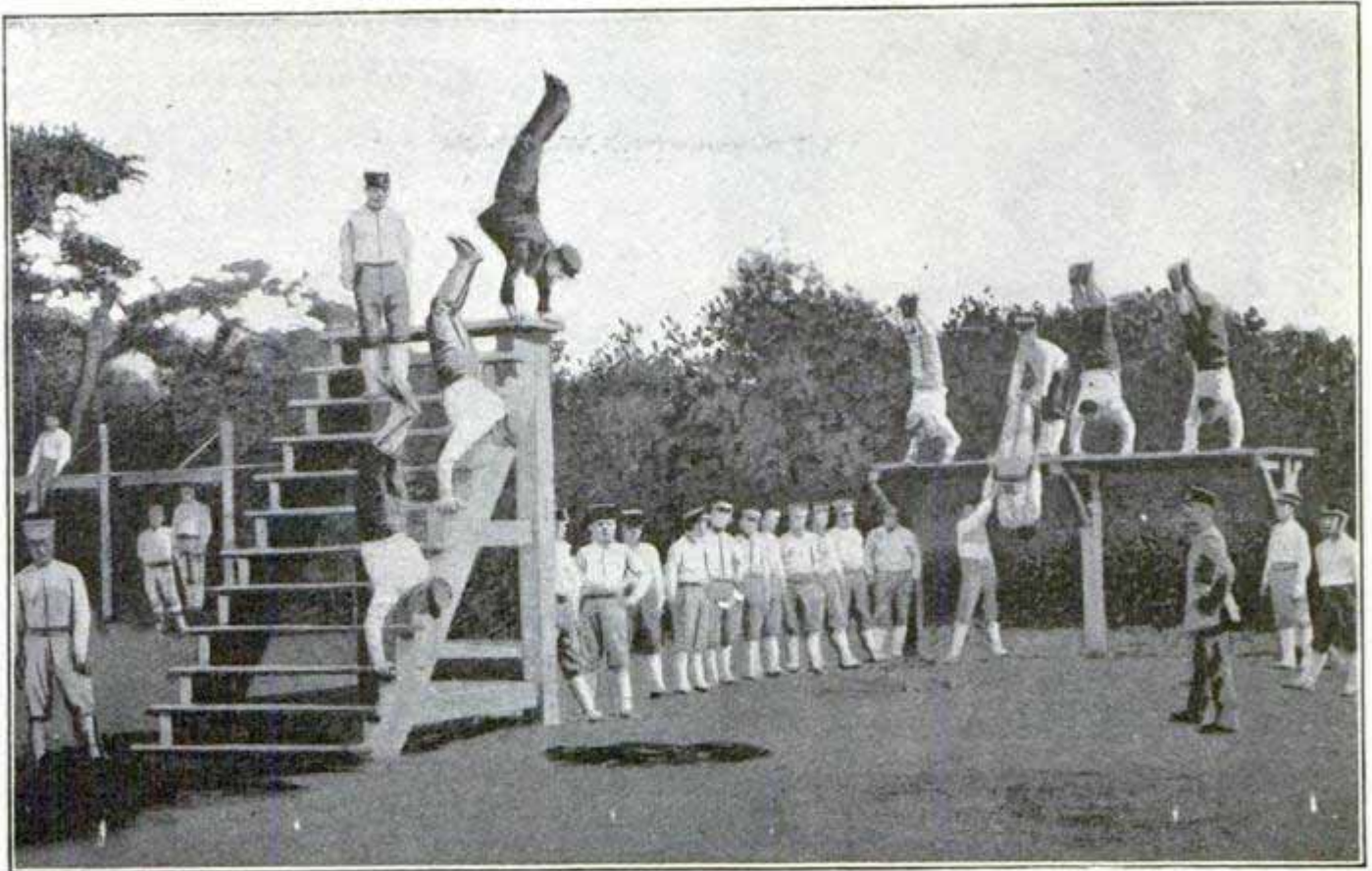
With an agility that would do credit to the average circus acrobat, the Japanese soldier is taught to do tricks which, beside serving to keep him in first-class physical condition, have a real value in time of war. Of course there is no apparent use in being able to walk on one's hands up and down a flight of stairs, as shown in one of the illustrations, but such an exercise may well prove of value in training the muscles to perform safely the difficult feat of wriggling quickly along a cable

stretched over a river, as the hardy little Nipponese were doing when the photographer snapped the picture shown in another view. And no great stretch of the imagination is needed to appreciate the usefulness of the living pyramids illustrated in the third picture, to realize the value of such formations in scaling an embankment or other defensive work of an enemy.

These are only a few of the many exercises that make up a Japanese soldier's gymnastic education. He is

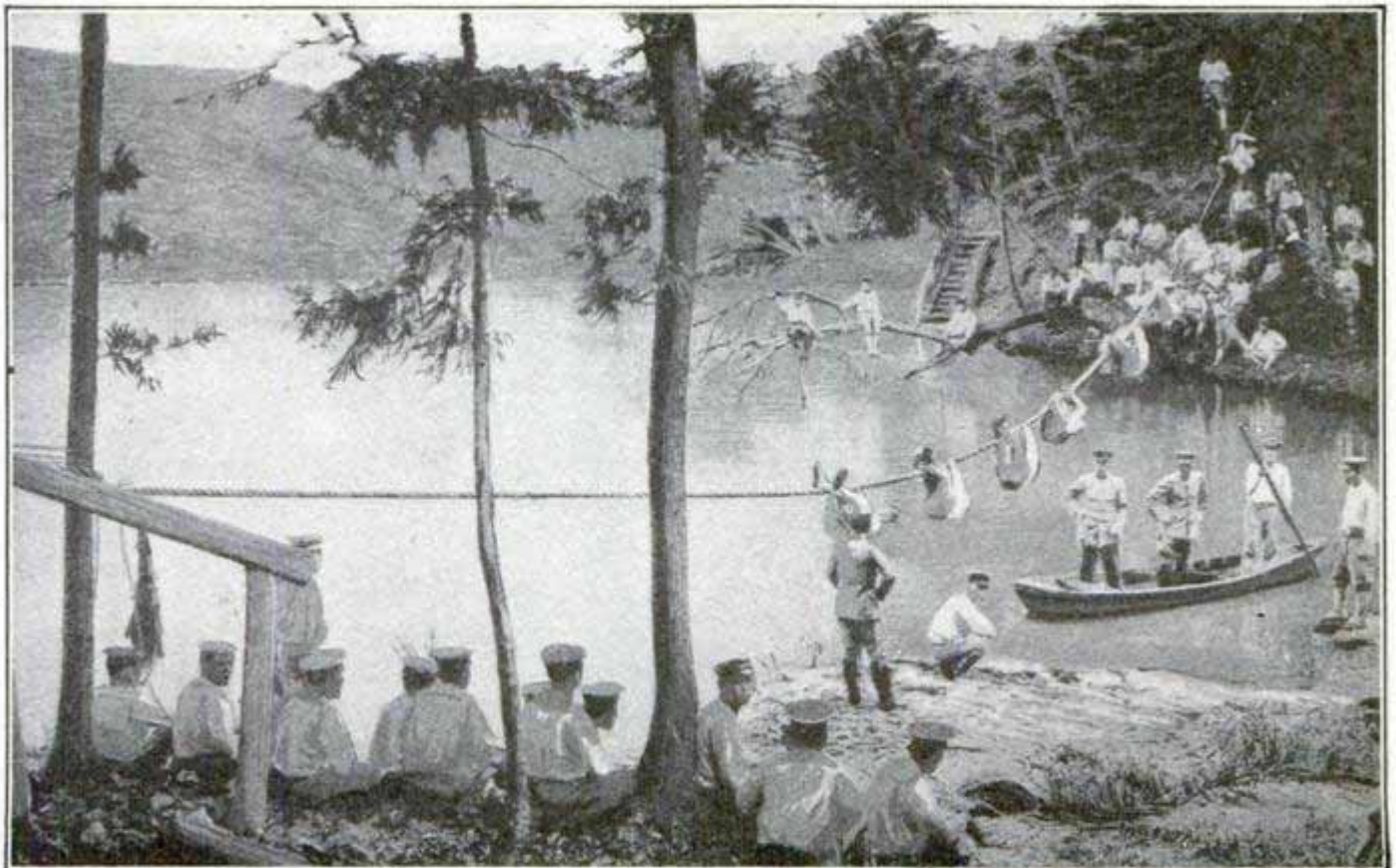


Soldiers Who can do this Trick do Not Need Ladders to Scale Even the Steepest of Embankments



Soldiers to Whom This Feat is but Play are Not Likely to Fall Out by the Way in a Forced March

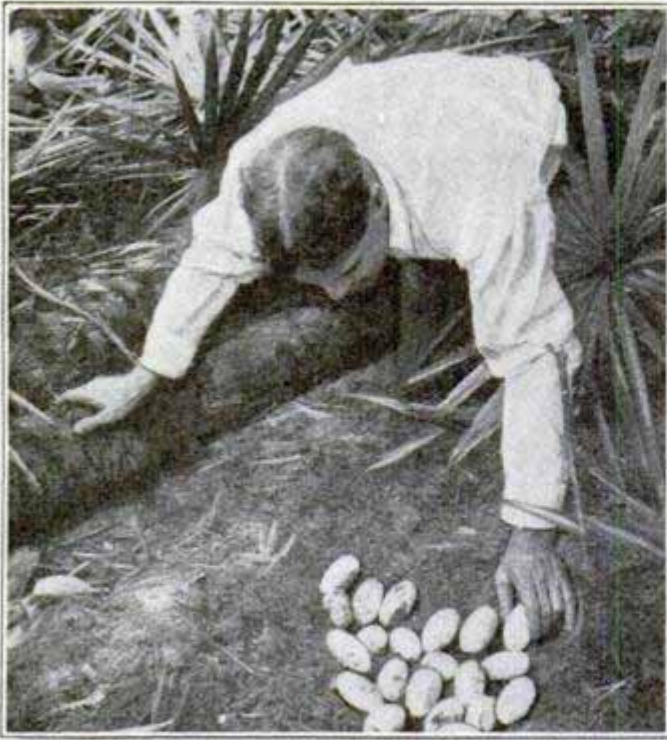
taught to swim, so that even broad rivers will not impede the forced march of an infantry regiment. He is specially drilled in climbing steep hillsides, vaulting breastworks on the run, fencing with bayonets, and the like. Altogether, nothing is overlooked that is calculated to make him the physically perfect fighting machine that struck terror into the hearts of the sturdy Russian fighting men in Japan's last and greatest war.



Not Monkeys, but Japanese Soldiers Crossing a Stream. Dignity of Appearance Does Not Concern the Mikado's Men when Celerity is Required

AN ALLIGATOR'S NEST IN THE EVERGLADES

Contrary to the general belief, the wild alligator is still to be found in large numbers in the everglades of Florida. Indeed, the surveying parties of the Florida East Coast Railroad Extension were more than once attacked by these ferocious beasts. It is seldom, however, that one discovers the nest of this creature, but recently a naturalist-photographer met with such luck, as is shown by the accompanying illustration. There were 23 eggs in the nest, which is not a particularly large number, considering that these creatures often lay from 30 to 60 eggs in a single nest. They are similar in shape to an ordinary duck egg, and about 3 in. in length.

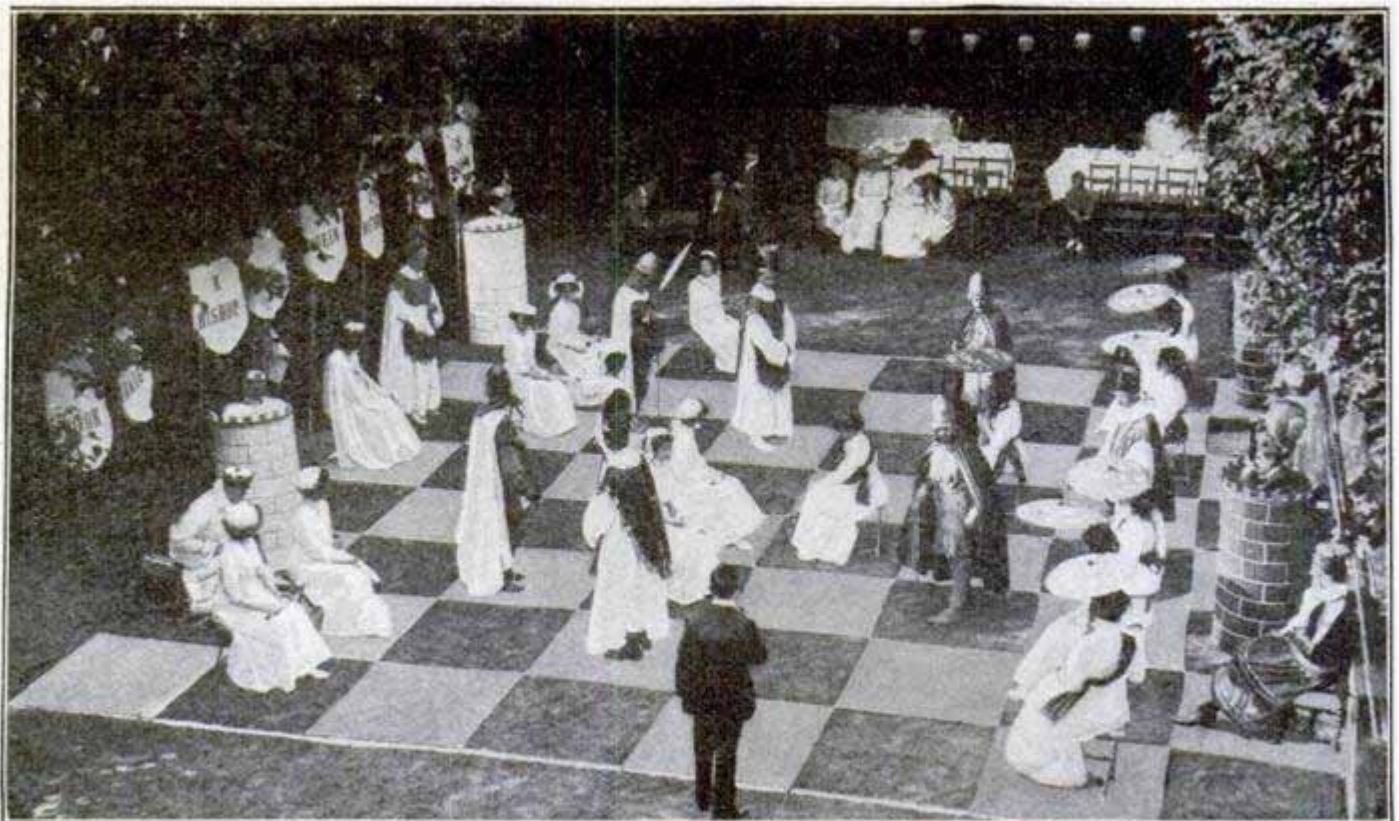


An Alligator's Nest in the Florida Everglades

PLAYING CHESS WITH LIVING PIECES

During one of the coronation fêtes in England, two famous chess players played a game in which living chessmen and chesswomen figured. The game was actually played on a regulation chess board with regulation ivory

pieces, but a great chess board was laid out on the grass adjoining the spot where the game was played, and living pieces were moved about on this according to the moves made on the small board. Women, garbed in white,

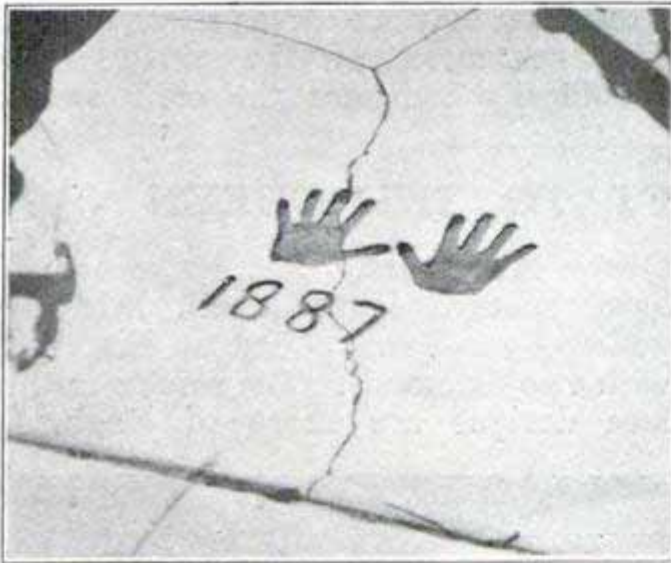


A Game of Chess with Living Pieces, Women Representing the Queens and Pawns

represented the pawns, the black pawns being distinguished by means of a black ribbon. The white queen was dressed in white, and the black queen in black. The kings, bishops, knights and rooks or castles were represented by men. As the game took several hours to play, the queens and the pawns were provided with stools.

"SMALL BOY, HIS MARK"

A home builder in California hit upon a charming idea when he had his little son make the impression of his hands in the wet cement of the walk before his door. Although the imprint was made in 1887, the outlines of the little hands are perfectly clear and will remain as a dainty souvenir of the small chap's play days. It is

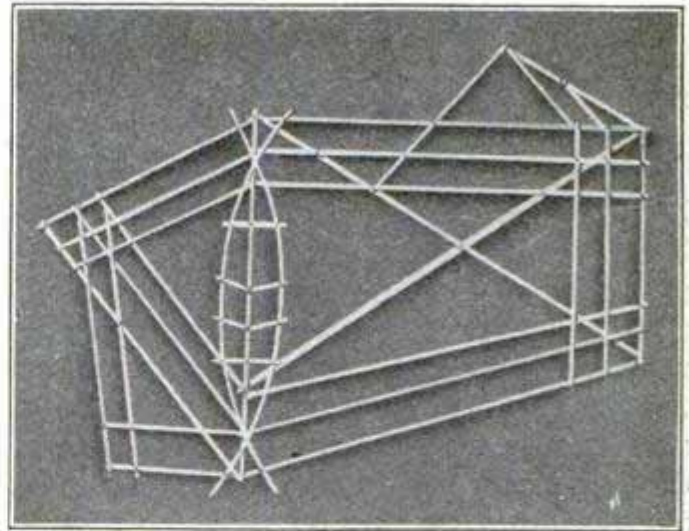


An Interesting Souvenir Imprinted in Cement Walk Leading to California Home

just such touches of sentiment that make the difference between a house and a home with all that the dear word implies. Another variation on this idea is the imprint of ferns, leaves or flowers upon the fresh cement, the delicate and graceful lines being perfectly retained.

PRIMITIVE CHART OF THE OCEAN

This picture represents a "rebbelib." But the statement does not convey very much enlightenment. It should be explained, therefore, that a "rebbe-



Ocean Chart Made of Bamboo by Polynesians

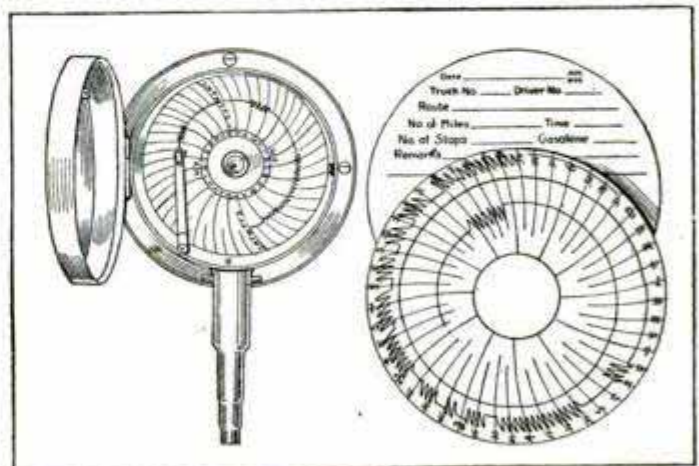
lib" is a primitive ocean chart, used in former days by the Polynesians as a guide to navigation.

Polynesians were wonderful navigators. By the aid of just such charts as this, they made voyages thousands of miles in length all over the vast Pacific. It was thus, indeed, that the widely scattered islands of that ocean came to be settled.

Such a chart shows not only islands, but also the ocean currents. It is made of thin strips of bamboo tied firmly together.

AUTOGRAPHIC RECORDER FOR AUTOMOBILES

What time did the automobile leave the garage every day for the past week or so? How many stops each day did it make? When was each stop made and for how long? How many miles did the machine travel between stops?



The Automobile's "Automatic Diary" with Weekly Recording Chart, and Front and Back of a Daily Chart Indicating from 8:15 A. M. One Day to 1:45 P. M. Next Day

What was the speed of the vehicle between stops? What time did the car return to the garage?

The correct answers to all of these questions can be automatically recorded by a clever clocking device which has been brought forward. The apparatus is operated by the car itself, and all that is needed to enable the automobile to furnish its own diary is to wind up the clockwork once every eight days and apply a new card or disk once a day or every seven days, according as a daily or a weekly record is desired. On the back of the card there is a tabular statement which is intended to be filled in by the motorist, and including such information as the date, number of the car, chauffeur's name, gasoline consumption, etc., so that a very thorough analysis may be made and permanently recorded of the performance of the automobile.

The apparatus comprises a revolving chart, a recording device, and a clock.

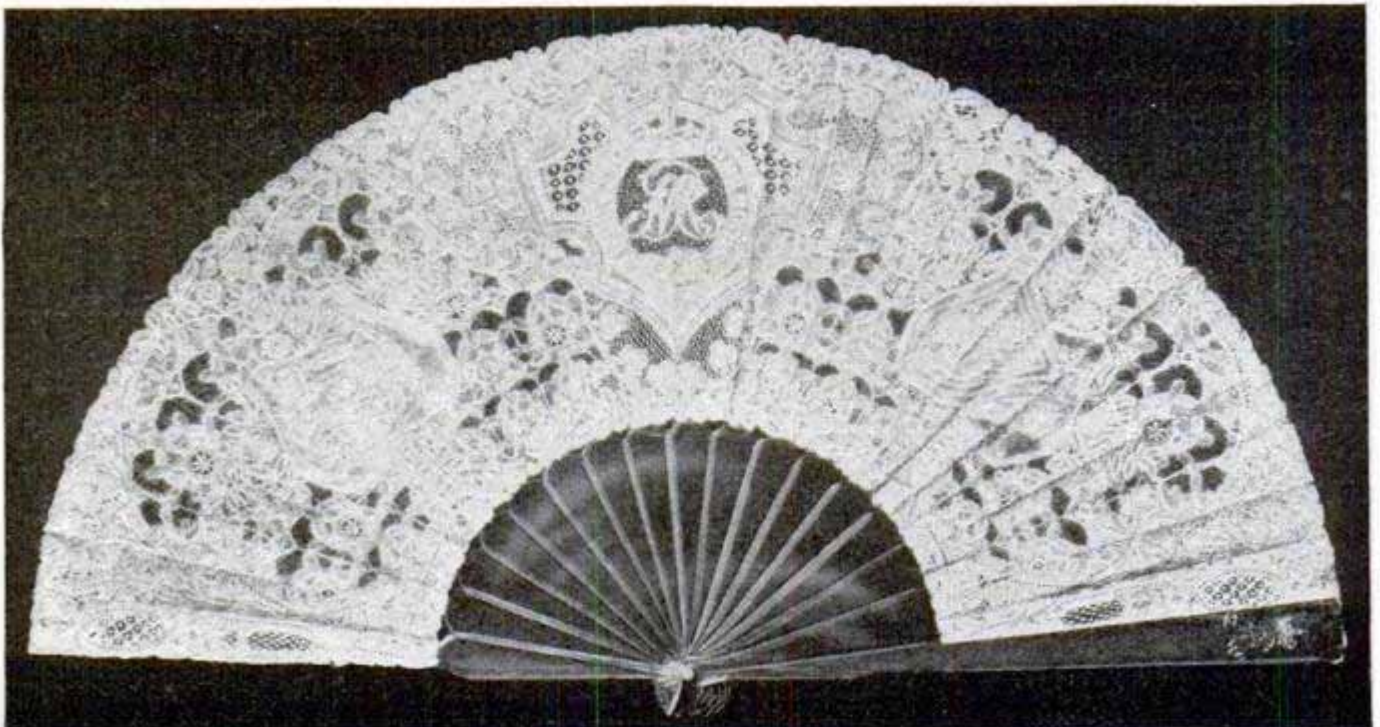
The curved radial lines divide up the surface of the chart into sectors representing the 24 hours of the day, and the days of the week (in the weekly chart) or the halves of the day (in the daily chart) are indicated on concentric circles intersecting the radial arcs at the proper distances from the center. The pointer traces a line on the chart from left to right, making one complete revolution of the disk per day on the circle corresponding to the day of the week, on the weekly chart, or two such revolutions on the daily chart.

While the car is standing still, a plain line is made, but when the vehicle is moving a zigzag line is formed, each short line indicating two miles of travel. It is apparent, therefore, that if the chart is set to record at the proper hour, the time of starting, the time a stop is made, and the distance covered meantime may be seen at a glance. The acuteness of the zigzag line graphically indicates the car's speed.

THE FANMAKERS' GIFT TO THE QUEEN

Among the interesting coronation gifts to England's queen was a beautiful fan, presented to her by a fanmakers' company, which had also presented fans to Queen Victoria and

Queen Alexandra. The sticks are of light yellow tortoise shell, held together by a bar studded on the ends with two diamonds. The shields in the lace designs are those of England,



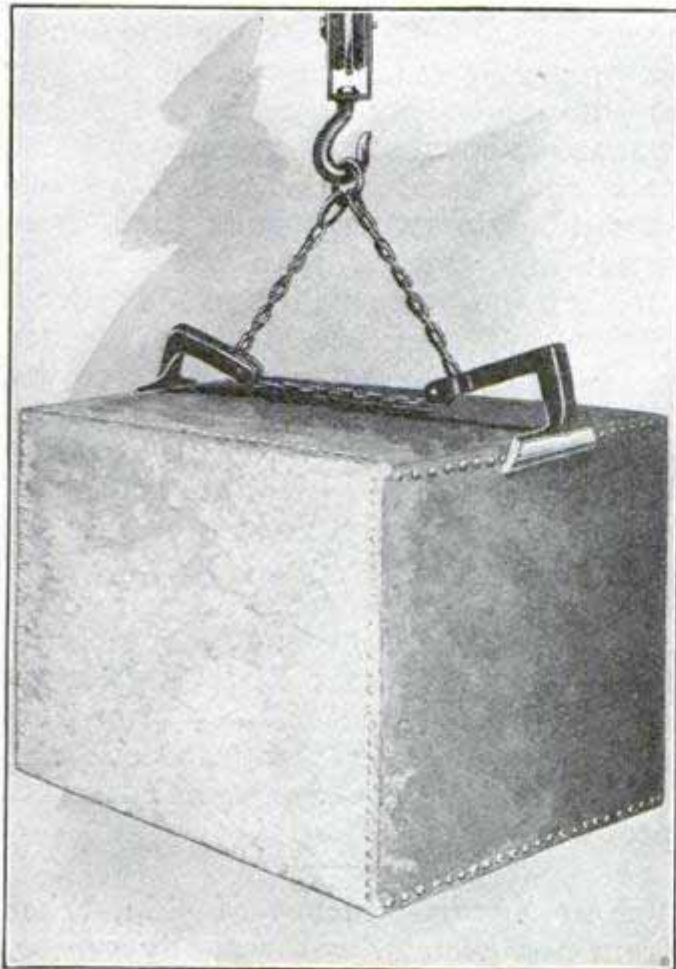
The Beautiful Fan Presented to Queen Mary by Fanmakers as a Coronation Gift

Wales, Scotland, and Ireland. In the center is a large cartouche with Queen Mary's crown and cipher, and in the border are the rose, thistle, and shamrock.

GRAPPLING TACKLE FOR SHIPPING TANKS

A safety grappling tackle, especially designed for the handling of the wrought-iron tanks extensively used in shipping hollow-ware and metal goods to Australian ports, has been introduced by a British firm. In this tackle the lifting chain causes a canting action of the hooks, which bite securely under the slightly protruding riveted ends of the tank, taking the greater part of the bearing from the heads of the rivets.

The tanks most generally in use are of 400-gal. capacity, and weigh about a ton loaded. It is difficult to get a rope slung around such a tank, and the ordinary chain hooks frequently injure the sides.



Grappling Tackle Designed Especially for the Handling of 400-Gallon Shipping Tanks

DESK BUREAU FOR HOTELS

An ingenious means of making a bureau perform the services of a writing

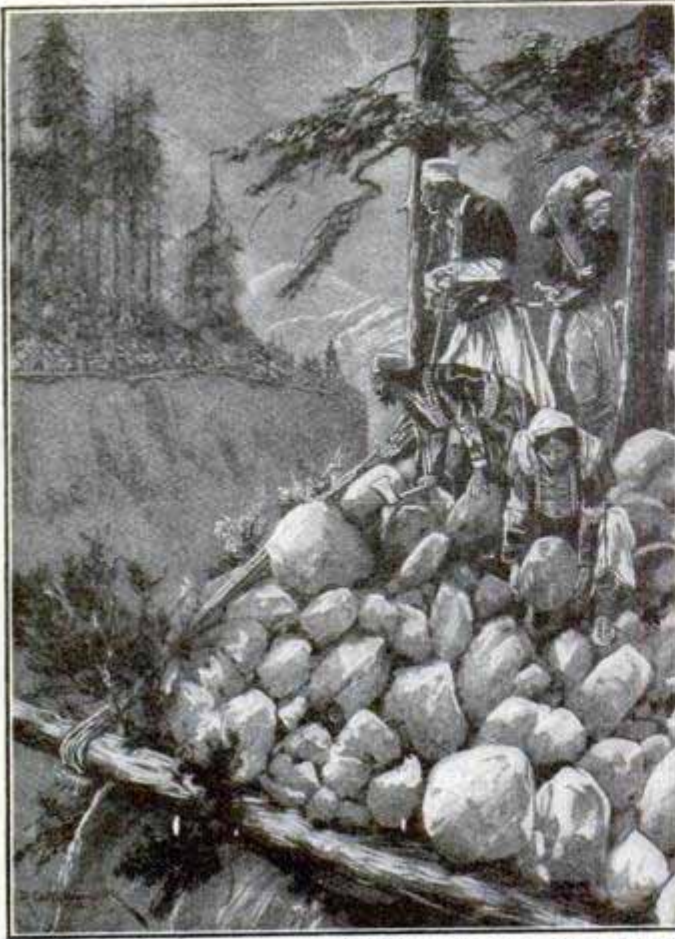


The Upper Drawer of this Bureau is Provided with a Desk Top for Writing Purposes

desk as well as its customary duty as a container for clothing and a dressing table, is shown in the accompanying illustration. About two-thirds of the top of the upper drawer is covered with a desk top, and a well and groove are provided for an ink bottle, pens, pencils, etc. When the desk drawer is pushed in, this piece of furniture, which is especially designed for hotels, has the appearance of an ordinary bureau.

ARTIFICIAL AVALANCHES AS WAR PROJECTILES

The Mirdites, who form one of the largest tribes in central Albania, which is the southwest district of European Turkey, inhabit a mountain fastness of immense gorges and plateaus. They are half civilized mountaineers, frank to a friend, vindictive to an enemy, and are constantly under arms, living in al-



Courtesy London Illus. News

The Mirdites of Albania Ready to Loose an Artificial Avalanche of Great Stones on an Enemy

most perpetual anarchy with the other Albanian tribes.

Although well armed with rifles, this tribe has other means of protecting its fastnesses from an invading enemy. Above the passes leading to Kroia, which is the capital of the Mirdites, great stones are piled up in the manner shown, held in position by tree trunks and ropes. Should an enemy approach along these passes, the ropes are cut, and the artificial avalanche of stones rushes down upon them. Until 30 years ago the only means of access to Kroia, which is built on a rock, was by ropes and baskets.

FALSE HAIR NOT OBTAINED FROM DEAD CHINESE

Human hair sold in the markets of the world does not come from the heads of dead Chinese. The purveyors of this commodity have become much wrought up during the past few months by the publication of statements to the effect that the hair was taken from the

queues of dead Chinese. They indignantly deny this charge and point out that even if there were a commercial possibility in such a supply, the veneration of the Chinese for their dead, which forms an important part of their religious philosophy, would prohibit the practice. The hair is really the combings from the heads of the men and women who can afford to employ valets and maids to care for their rather extensive braids, and these combings are sold to the exporters instead of being thrown away as was the case before the European and American styles created a demand for it.

A very large proportion of the human hair that is found for sale in Europe and America is shipped out of Hongkong. Formerly it was shipped in the "raw" state—just as it came from the heads of its original owners. Recently an establishment has been set up to prepare it for sale so that it will be a finished product when it arrives in the world's markets. An American expert has charge of this establishment and employs about 600 Chinese men, women and children to do the work. In preparing it for the market, the hair is first combed into lengths and is then washed in soda, soft soap and ammonia. It is then dried and is boiled for one day in plain water. It is then dried again and treated with chemicals to sterilize and preserve it and so render it fit for use. It is then bleached, washed again and prepared in different colors. The "raw" hair is shipped to the United States and Europe without preparation of any kind and is invariably in small wads or twists. Full heads of hair are seldom taken for this purpose and queues are never used. The prepared hair is made into lengths of from 10 in. to 36 in. The mass of hair shipped out of Hongkong comes mostly from Canton and is literally composed of small bits from the heads of millions of people.

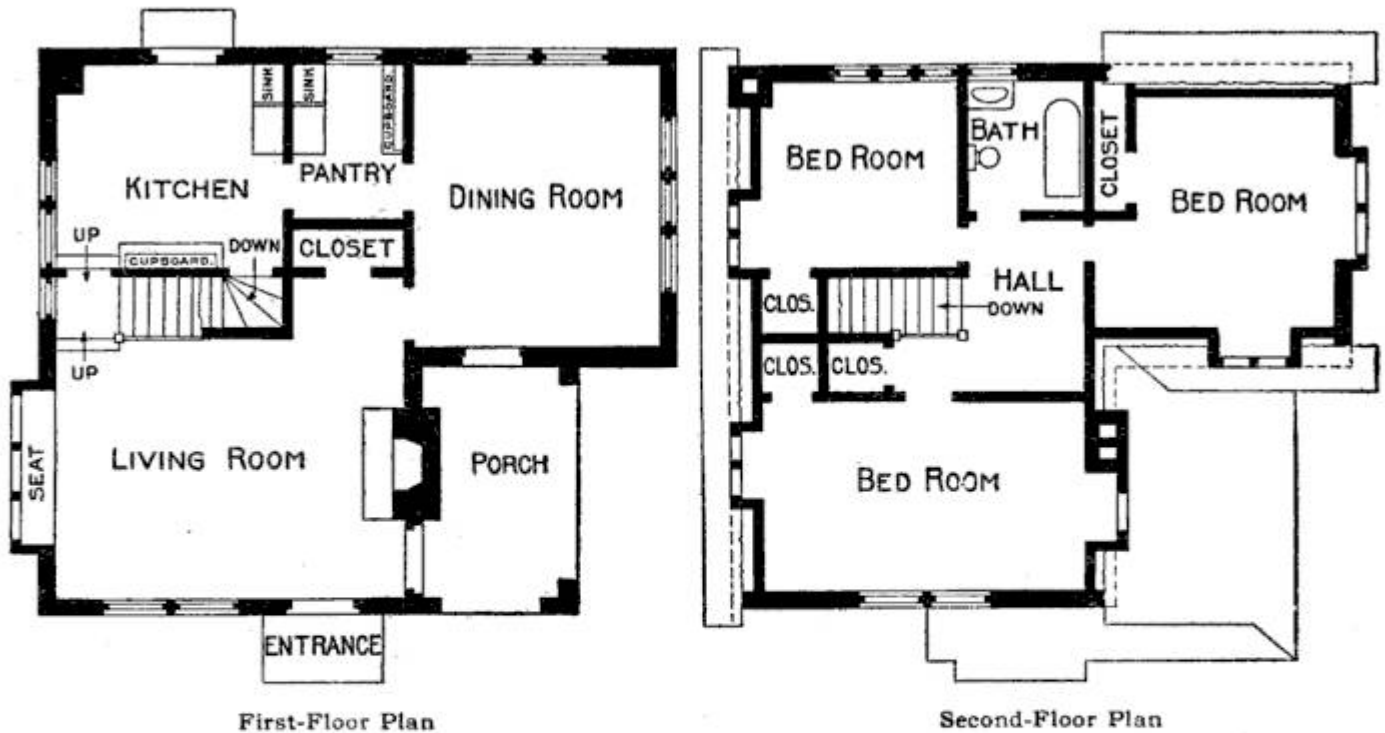
☞ Four hundred inches of skin, taken from her friends, was recently grafted on the burned body of a Los Angeles girl, and saved her life.

PLAN FOR OLD-ENGLISH CONCRETE COTTAGE

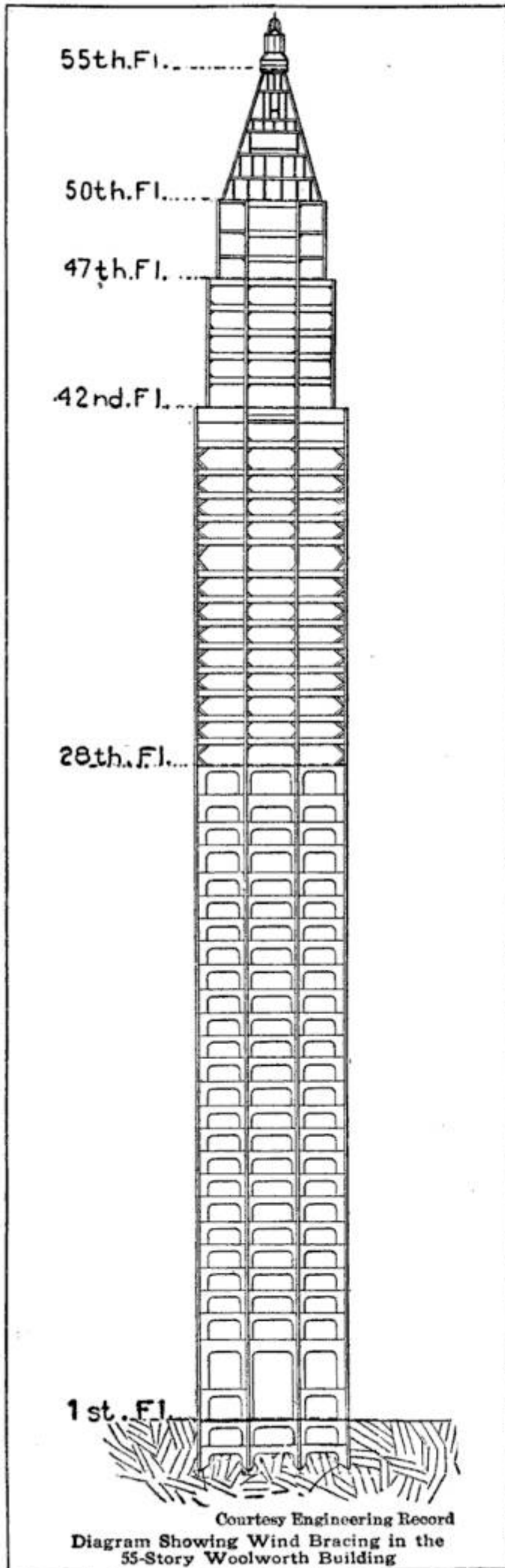


William J. Ryder, Philadelphia, Pa.

Front Elevation of Concrete Cottage Built on Old-English Lines



An adaption of an old-English cottage to modern needs and materials forms the basis of the design for a \$4,000 concrete house, the strong feature of which is the allowance of ample space in all the rooms without the box-like outward appearance that spoils so many plans made with the idea of giving the rooms a maximum of space. In this design every straight line seems to be broken in a way that makes an attractive aspect on every side. The plans provide for six rooms and bath and unusually generous closet space.



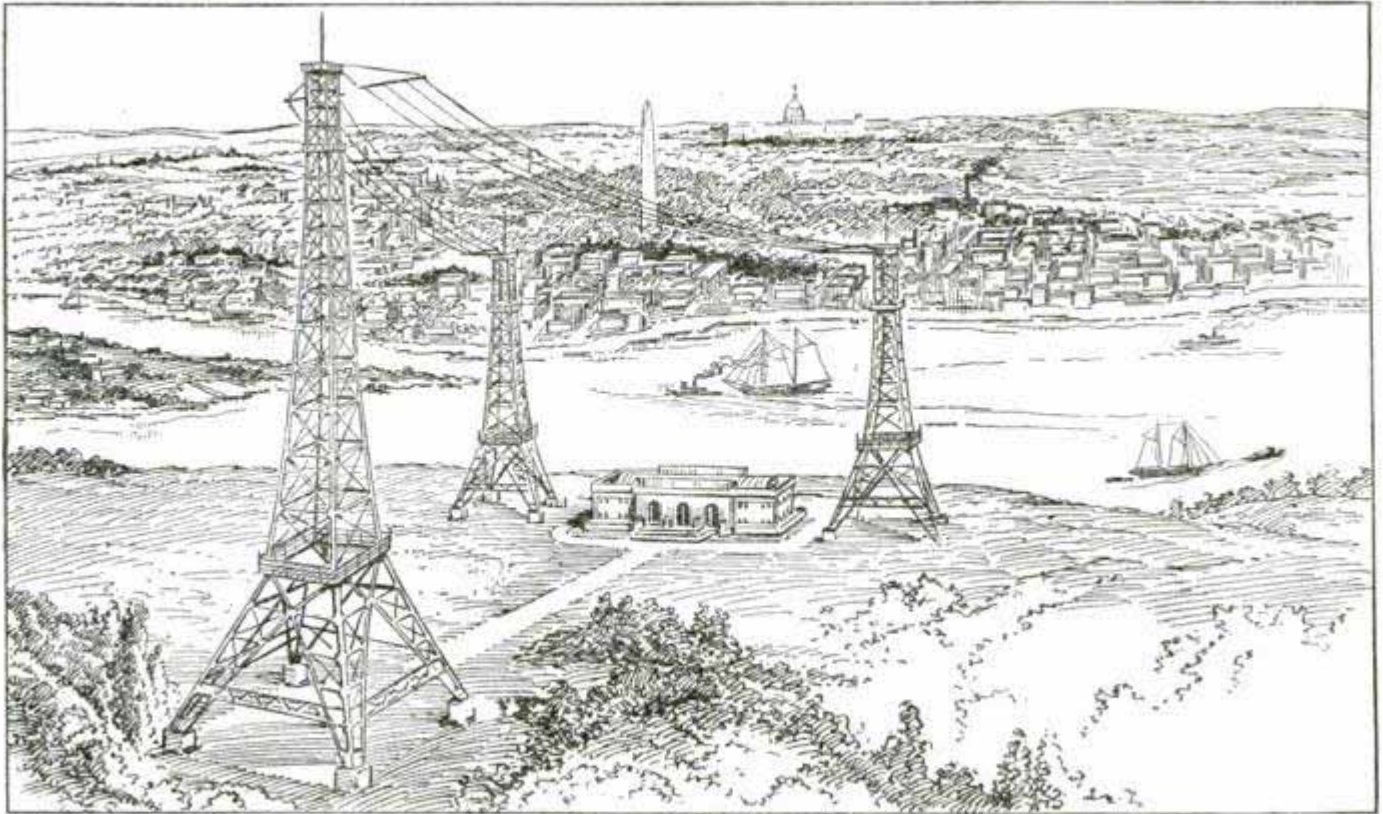
Courtesy Engineering Record
 Diagram Showing Wind Bracing in the
 55-Story Woolworth Building

WIND BRACING FOR WORLD'S TALLEST BUILDING

The problem of designing the 55-story Woolworth Building, in New York, to support not only its own weight but also the stresses induced by wind pressure, made necessary the use of special bracing in the upper stories of this 775-ft. structure. Up to the 28th floor, every panel between the exterior columns on Broadway and the opposite side of the building is supported by a solid-web portal construction, with heavy flange angles, thus giving access through the floors but providing a strong reinforcement around and about them. Between the 28th and 42nd floors, the vertical columns are braced by deep wall girders and by specially long and heavy knee braces. Above this, and up to the 47th floor, the outer columns have deep, diagonal or gusset stays, and from the 47th to the 50th floor, the wind stresses are transferred to the four interior tower columns which are provided with solid gusset-plate connections to deep floor girders. Above the 50th floor, the inclined members of the pyramidal tower provide the necessary reinforcement against wind pressure.

The mammoth structure, which fronts Broadway for 155 ft. and extends from Barclay Street to Park Place, with a depth of 200 ft., is designed to withstand a wind pressure of 30 lb. per square foot over any of its faces, which is the pressure that would be produced by a direct and unobstructed wind, blowing at a velocity of 77.5 miles an hour. Such a wind would increase the maximum column load of 9,500,000 lb. (due to dead weight of the building) by about 2,500,000 lb.

¶With a view to prevent fatal accidents in factories, a device has recently been invented which enables all the machinery in a particular department or the entire plant to be shut down from any of several predetermined points in less than five seconds. The invention has been given freely to the American public.



View of the Wireless Towers at Fort Myer, Va., as They Will Look when Completed, Looking toward Washington

GREAT WIRELESS STATION FOR WASHINGTON

With the erection of the projected wireless station towers near Washington by the Navy Department, the Washington Monument will be stripped of its supremacy, the national capital will gain a new sight, and the United States Navy will acquire a new and wonderful control of its battleships.

The new station, for which contracts have just been let, is expected to prove the most powerful in the world. Direct wireless communication will then be established between Washington and Colon, at the eastern entrance of the Panama Canal. Guantanamo, where Uncle Sam is building a great naval base, will be within constant speaking distance, and battleships will be in easy range in crossing the Atlantic as far east as the Azores. The towers are expected to have a working range of 2,000 miles, while under favorable conditions, it is expected much greater distances will be spanned. Navy officers, while conservative in their predictions, hope to pick up San Francisco on the west, and the Eiffel Tower in Paris on the east.

The new station was designed by Civil Engineer R. C. Hollyday, and will mark an epoch in construction for wireless telegraphy. It will consist of three steel towers, arranged in an isosceles triangle, with the tallest tower as the apex. This tower will be 600 ft. in height, and the other two 450 ft. high. The aerial wires will be stretched from outriggers on the top of each tower.

Each tower will rest on a cast-steel base, supported in turn by a concrete foundation, and anchored to the earth by great bolts. The anchorages will be insulated by marble slabs and sulphur fills. It is expected that 900 tons of steel will be used in the construction, which will cost about \$150,000. This will include the erection of a two-story building for the sending station, operators' quarters, laboratory, and engine room.

A 100-kw. (134-hp.) Fessenden wireless set will be installed. If this proves insufficient, a more powerful set will be used. It is proposed to purchase the necessary power in Washington, at first, and ultimately to use oil engines

THE MAKING OF ARTS-CRAFTS LAMPS

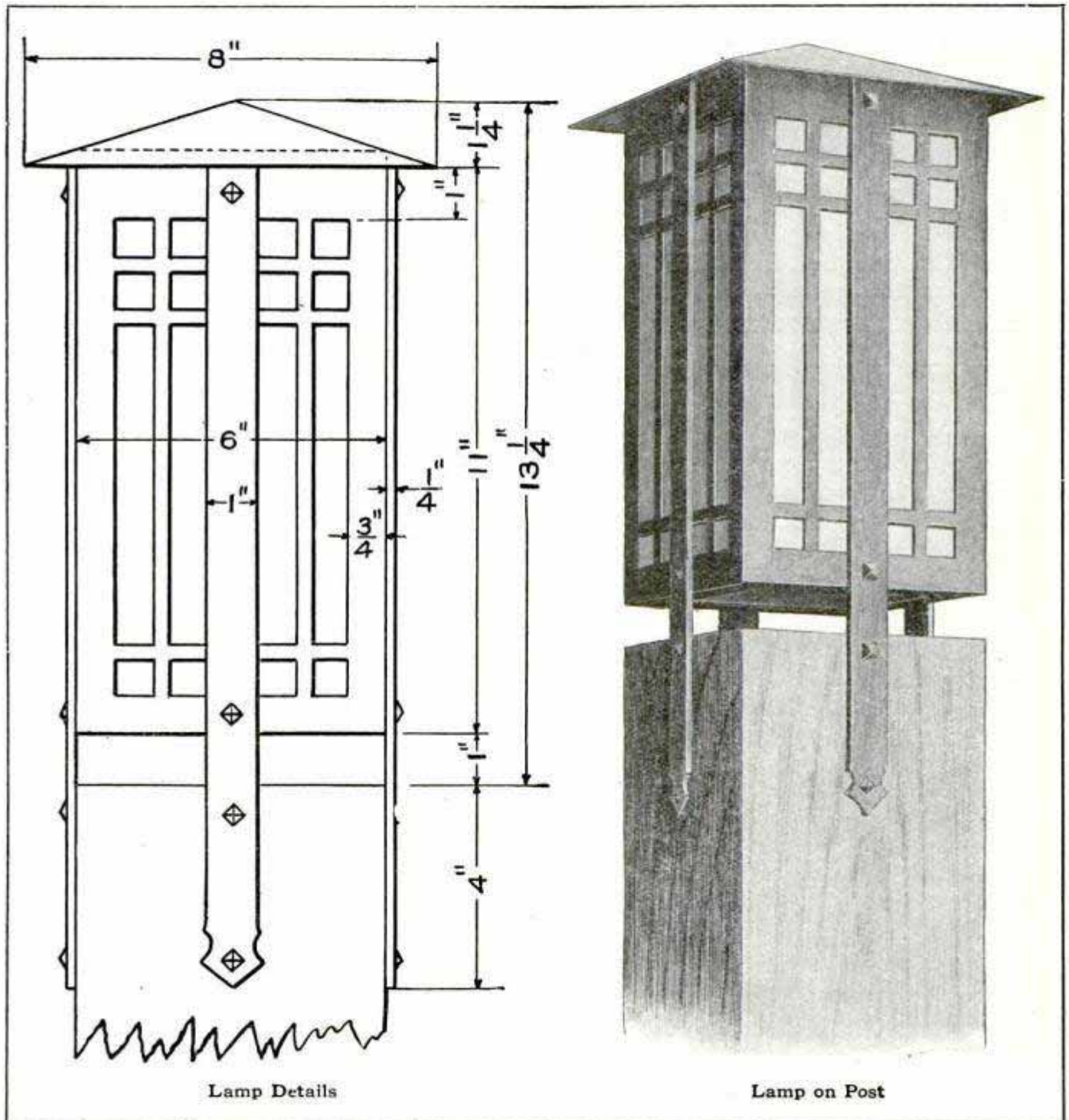
By JOHN D. ADAMS

PART XIV — NEWEL-POST LAMP

THE old-fashioned turned newel post is no longer used in the modern home with its arts-and-crafts atmosphere. The square post sur-

the reader will experience no difficulty in adapting the design to suit any particular post.

Having procured a sheet of good



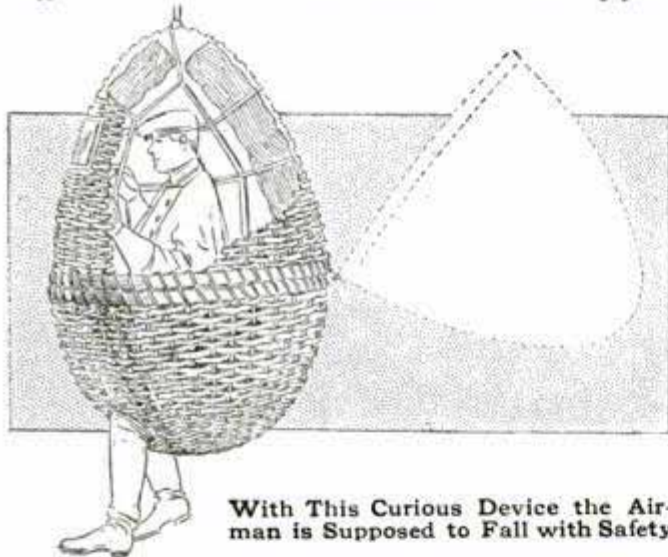
mounted by an attractive lamp is much more appropriate. Our design is for the usual 6-in. post, but as the lines are all rectangular and quite simple,

tough cardboard, carefully mark out the pattern shown in the working drawing, which makes provision for extra strips at the top and bottom of

HUMPTY-DUMPTY DEVICE FOR FALLING AIRMEN

In a recent issue of "L'Aero," the French aviation journal, in the section set aside for description of inventions aerial, was found this unique and humorous safety device for falling airmen.

It consists of an egg-shaped body large enough to accommodate the body of the airman, crouching in it, and is made of interlaced band steel or rattan, so as to possess the necessary elasticity. The inner wall is padded with hair mattresses, inside of which is a leather cage, with one leather belt running across as a seat. At the bottom of the egg are two holes for the legs of the aviator, and in the upper



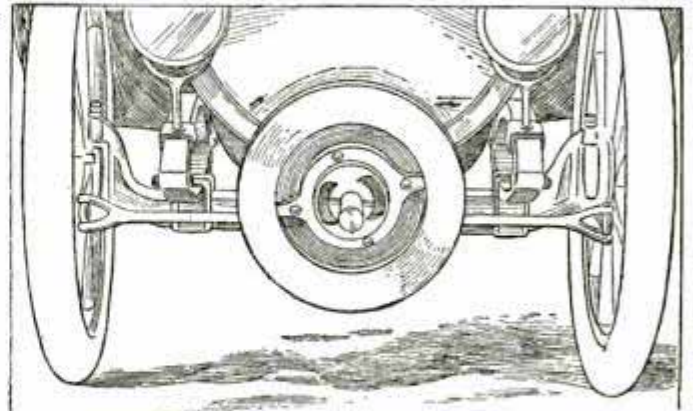
With This Curious Device the Airman is Supposed to Fall with Safety

part, at the level of the eyes, is a mica-covered window, which can be closed by a solid shutter when falling.

The idea of the inventor is for the airman to sit within this shell when flying, and, in a moment of danger, draw in his legs and prepare for a fall. No mention is made of any openings for the arms, so it is presumed that the flying is to be done with the upper part of the shell pushed back, as shown by the dotted lines. Nor does the inventor say how the aviator is to cut loose from the aeroplane after he has inclosed himself. He probably considers these details of minor importance as long as a safe and sound airman will hatch from the egg after it strikes the ground, in which happy ending he expresses firm belief.

GYROSCOPE TO PREVENT AUTO SKIDDING

In distinct contrast to a form of motor which was designed recently with oppositely revolving sections on the



Gyroscope in Front of Automobile to Prevent Skidding

theory that gyroscopic action was the direct cause of skidding by automobiles in turning on a wet road, another inventor has sought to achieve the same result apparently by exactly the opposite method. This consists in mounting a heavy gyroscope wheel, which is turned directly by the engine and supported in a manner similar to a mariner's compass, in front of the radiator of the automobile. Thus the universally jointed wheel, by its own contained energy, tends to keep the machine from moving out of a straight line.

WIRE-COVERED WIRE ROPE

An improved form of wire rope or cable, manufactured by a New York concern, consists of a number of



Wire Rope Covered with Flat Wire to Protect the Strands from Abrasion

strands made in the customary way from round wire, but is additionally covered with a spiral layer of flat wire. The strands are intended to take all the strain, and the cover is merely to protect the strands from abrasion and

exposure, and to assist in retaining the grease supplied for internal lubrication.

The rope illustrated is a $3\frac{1}{8}$ -in. dredge cable, having an approximate breaking strain of 400 tons and weighing 15.9 lb. per foot.

WIRE CABLE CONVEYOR HANDLES KEGS

The transfer of empty kegs from the cooperage plant to the rod and wire department of an Ohio manufacturing



Gravity Chute at Delivery End of Keg Conveyor

concern, is now accomplished by means of a wire cable conveyor. The gravity discharge chute at the delivery end of the conveyor is shown in the accompanying illustration. The conveyor, driven by a $3\frac{1}{8}$ -hp. motor, travels at a speed of 60 ft. per minute.

SMALL MOTORBOAT SHOWS EXTRAORDINARY SPEED

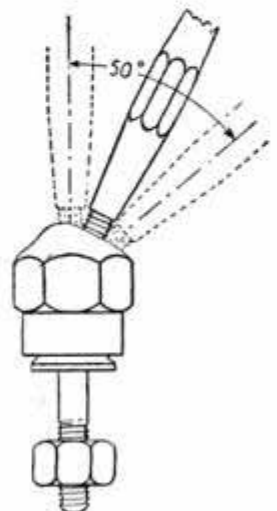
In the little town of Alexandria, Va., seven miles south of Washington, D. C., on the Potomac River, there may be seen a small boat, barely 26 ft. in length, which has become the wonder of the motorboat world, for she has made the phenomenal record of $42\frac{1}{2}$ miles an hour over a measured mile, and a continuous run of $40\frac{1}{2}$ miles in two seconds over an hour.

This latter feat included one turn, but a feature of the "Furlong"—for that is the name of this latest speed marvel—is her balanced rudder by which she is enabled to make turns at the same high rate of speed at which she travels straightaway. This, together with the peculiar pitch and diameter of her oppositely revolving, twin propellers, accounts to some extent for her wonderful speed, but it is her engines which are responsible for most of it. There are two, six-cylinder, 125-hp. engines, each with its cylinders cast in one piece, and weighing but 2.25 lb. for each horsepower developed.

The boat is built of aluminum, ash and oak, for the pounding of her powerful engines would be sufficient to open the seams on any ordinary craft. Her sharp keel extends but half of her length from the bow toward the stern, and the latter half of her is as flat as the proverbial board. When in full speed her bow rises from the waves and she rides entirely upon her flatter rear half, her propellers buried beneath the surface of the water. Her 12 exhaust pipes rising amidships give her a strange appearance.

SELF-ADJUSTING EYEBOLT FOR AEROPLANES

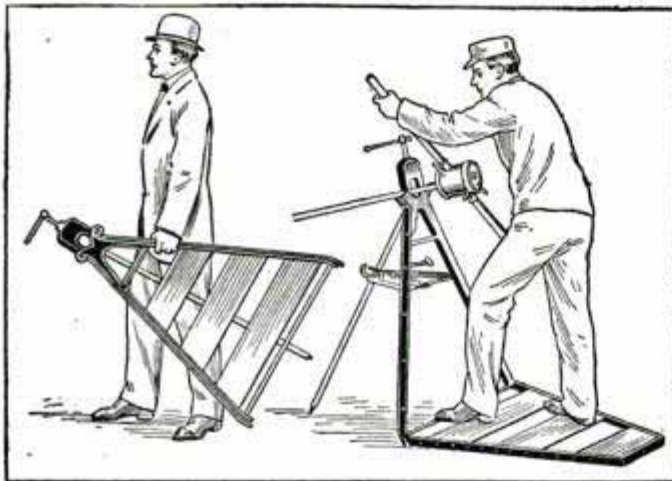
This ingenious self-adjusting eyebolt for aeroplane construction was placed on the market recently by a French firm of machinists. The knuckle joint, coupling the main bolt and the eyepiece, gives a play of 50 deg., which can be increased or decreased if specially ordered. This device does away with one of the ties necessary when a turnbuckle is used, it can be quickly and easily mounted, and it is claimed that the



knuckle joint eliminates the jarring and vibration of the framework which results when the guy wires are fastened solidly to it.

PORTABLE, FOLDING PIPE-THREADING STAND

A European firm has devised a portable, folding pipe-cutting and threading stand of ingenious construction. It is easily carried by one man, and can be solidly set up in a moment. The special feature of the device is the means of holding the three-legged standard solidly to the ground during the threading operation. This is successfully accomplished in the manner



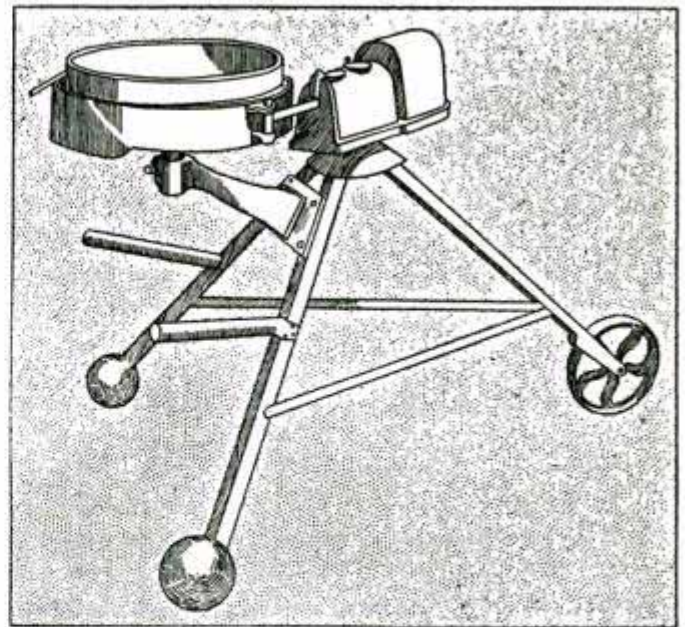
Portable Pipe-Threading Stand Folded Up

The Pipe-Threading Stand in Operation

shown, the operator standing on a sort of platform attached to two of the legs and resting directly upon the ground. The stand may be used for ordinary vise work as well as for threading and cutting pipes, a special vise attachment being provided.

OSCILLATING SAND SIFTER

An oscillating sand sifter, operated by compressed air, is being placed on the market. In designing the piston and valve, the principle of the steam engine was applied. The piston rod, which has a 5-in. stroke, connects directly with the sieve holder or clamp, and the sieve oscillates on a central post as shown. The motor is completely inclosed, so that sand cannot reach the working parts. The appa-

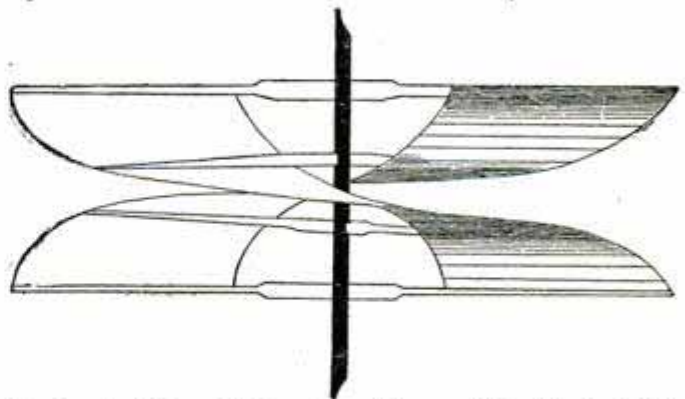


An Oscillating Sand Sifter Operated by Compressed Air ratus can be easily wheeled from point to point in the foundry, the front supporting leg being provided with a small wheel, and the two rear legs with handles.

NEW FRENCH PROPELLER CALLED REMARKABLE

A new French propeller for which much is claimed was recently tested by a commission of experts headed by an admiral of the French navy. It is claimed that in these tests the new device was found three or four times as effective as the three-bladed type of propeller commonly used on ships.

The new propeller consists of two symmetrical curved surfaces, attached

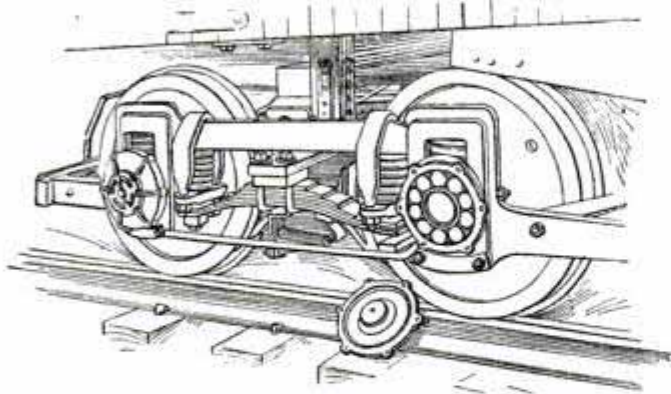


Curiously Shaped Propeller Successfully Tested Out in France

to the shaft by means of four steel bands. The hub of the ordinary propeller is thus done away with, it being claimed that the central part of a propeller is not only useless but objectionable on account of the eddies caused.

METHODS OF OVERCOMING JOURNAL FRICTION

Two methods recently developed to overcome the retarding effect of jour-

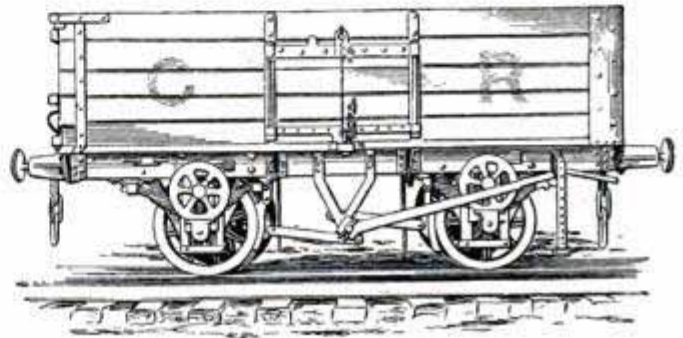


American Railroad Truck Running on Roller Bearings

nal friction are shown in these illustrations, one being an English method, and the other American. In the latter, a series of short rollers of relatively large diameter take the place of the ordinary ball bearings. These rollers are adapted to the existing type of truck without much difficulty. It is claimed that the results show a saving in power of over 25 per cent, and

a saving of at least two-thirds in lubricating oil.

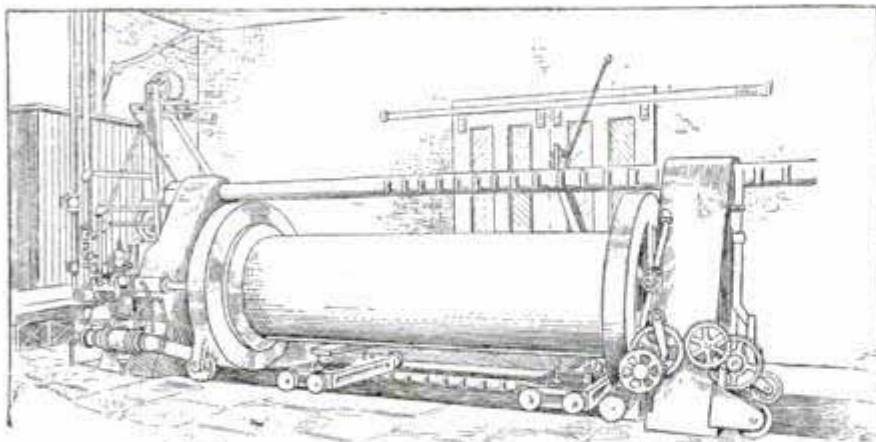
The English device consists of an anti-friction roller or wheel, mounted as shown. It is claimed that at least 50 per cent of the friction developed in the ordinary axle-box is done away with, the anti-friction wheels being mounted in separate journals over the ends of the axles. One great English railroad company has equipped over 1,000 of its cars with this device. In actual service the wheels are covered with thin metal shields to keep out the dust.



English Car Equipped with Anti-Friction Wheels

HYDRAULIC MACHINE TESTS HUGE PIPE

A hydraulic machine which will test pipe in lengths up to 40 ft. and a diameter of 7 ft., has been installed in a Chicago plant. The length of pipe to



Length of Pipe Being Tested in Hydraulic Machine Capable of Testing Pipe 7 Ft. in Diameter and 40 Ft. Long

be tested is held between two heads, one of which is in the form of a hydraulic press with a 40-in. cylinder. This head is stationary, but the other

is movable, and, although weighing 8 tons, may be readily shifted to accommodate the different lengths of pipe. It is secured in position by means of lock bars engaging with the top bar connecting the two heads. Suitable packing is used to make watertight joints between the length of pipe and the heads.

The pipe is set directly in place by means of a traveling crane, the top bar connecting the two heads being offset from the center line a distance sufficient to enable the hoisting chain to be swung directly over the center line. After the length of pipe is in place, it is filled with water by means of a large centrifugal pump, then pressure is applied by

means of a high-pressure hydraulic pump which has a capacity of 2,500 lb. per square inch. The machine is capable of testing 40-in. pipe to 1,000 lb. pressure, and other sizes in proportion to their area.

ILLUMINATION IN CHINA'S INTERIOR

The Japanese have installed an oil refinery to handle the products of the petroleum wells of northern Shensi, China, and the larger cities throughout central Shensi are now being supplied with native kerosene at 30 cents per gallon, competing with foreign kerosene at 43 cents per gallon. The supply of petroleum is said to be inexhaustible, and it is believed that, as soon as western China is tapped by modern transportation facilities, electricity as well as kerosene will take the place of rapeseed oil for illumination purposes.

Throughout western China, rapeseed oil has served almost universally for centuries as the only illuminant, the little taper in the oil vessel giving but a dim flickering light. But today, Taiyuan is illuminated with electricity, Chungking is installing a \$100,000 electric plant, and Sianfu and Chengtu, as well as several other large cities, are being lighted with patent kerosene lamps.

GUARDING CHILDREN FROM AUTOS BY TETHERING

The simple device adopted by the wife of a Kentish farmer to prevent her son from being run over by the automobile traffic which has converted the quiet country roads of England into speedways, is shown in the illustration.

The method consists simply of tying up the boy every day to a post or tree by the roadside, allowing him a certain length of rope, which will not permit him to go farther than to the edge of the road while still giving him freedom enough to play. And best of all, the boy likes it, because it allows him near

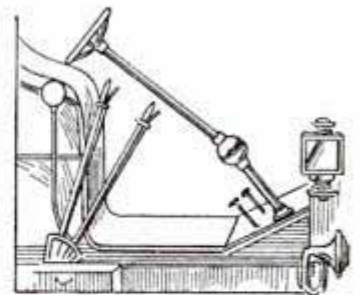


Tethered to the Roadside, Where He May Watch Passing Automobiles, but in no Danger of Being Run Over

enough to watch the many passing automobiles, and to make friends with the passers-by.

FLEXIBLE STEERING ROD FOR AUTOMOBILES

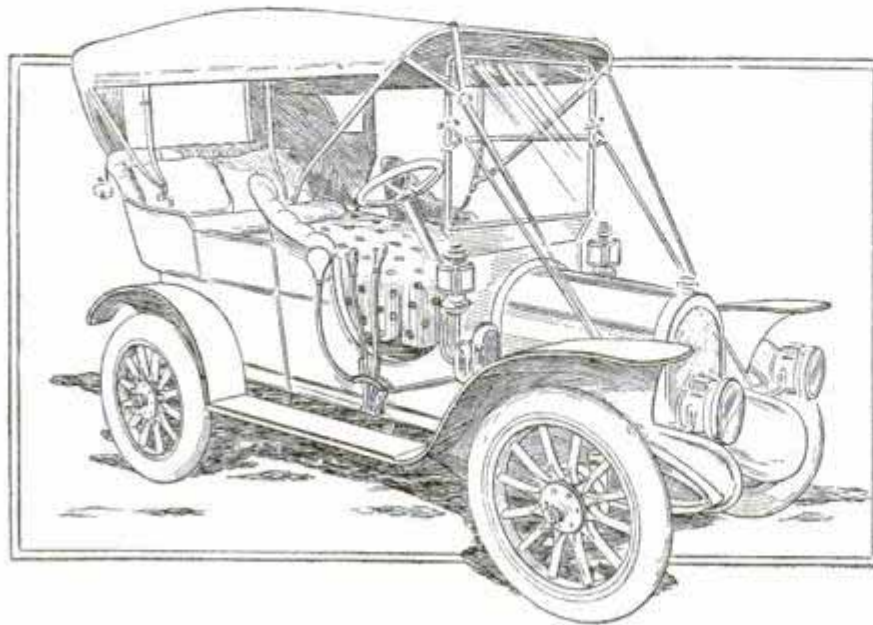
The accompanying drawing shows a flexible steering-wheel shaft recently placed on the market in France. It consists essentially of a universal joint about two-thirds way down the shaft. This joint is enclosed in a spherical hood, which confines



the action of the upper part of the shaft to a forward and backward movement, the extent of this movement being limited by stops. Normally, the shaft is held in the usual inclined position for steering, both by its own weight and the pressure naturally exerted on the steering wheel by the driver. It is only when the driver wishes to leave the car, or when a sudden jolt might throw him against the wheel that the joint comes into play.

AUTOMOBILE EQUIPPED AS A SLEEPER

A Chicago physician, H. C. Newton, and his wife, started out this summer on a 3,000-mile automobile trip in a machine equipped for sleeping as well



Touring Automobile with Interior Converted into a Bed

as being provided with a fireless cooker, alcohol stove and the necessary accessories for preparing a meal.

The automobile is a four-passenger

touring car of the ordinary type, with the interior prepared for conversion into a sleeper at night. This was accomplished by sawing vertically through the back of the front seat close to both sides, and placing hinges where the back joins the seat, thus permitting the back to fall and bridge the open section of the tonneau between the forward and rear seats. A raised section of light wood placed in front of the forward seat completes the arrangement. The berth is made up at night by dropping the seat back and placing a pneumatic mattress upon the surface formed by the seats, the lowered seat-back and the raised section

of light wood.

Old wire rope is being used in French mines as reinforcing for old timbers.

CUT LONDON'S FREIGHTAGE \$100,000,000 A YEAR

The tremendous saving of at least \$100,000,000 a year in the cost of transporting freight in London was promised by A. W. Gattie, in the course of a recent lecture before the Royal Society of Arts, provided the railroad companies and other common carriers would agree to do the work of handling and carting merchandise on scientific plans. And if the same system were applied to the whole of the United Kingdom in its densely populated centers, it was stated that an economy well within the reach of science could be made that would effect a saving more than equal to the entire revenue of the British government.

The plan advocated by Mr. Gattie and heartily indorsed by many prominent men, calls for the establishment of a great central clearing house for

freight, in which carloads of general merchandise, freight, bales of goods, and parcels could be collected and re-distributed, the method being analogous to that of a bankers' clearing house for checks, etc. Instead of freight being handled in switching yards by the railroads, it would be sent direct to the clearing house through subways or "tubes," and being packed in suitable receptacles which could be lifted off the cars by cranes, it would be automatically sorted and carried by an electrical apparatus to the train for which it was intended, or loaded on motor wagons for delivering in the city, or stored for the time being, as might be required. The empty train would then be loaded up with other freight and sent on its way without loss of time. By means of the system pro-

posed, it was claimed that a freight train of 50 cars could easily be unloaded and reloaded in ten minutes.

Mr. Gattie said that in England the average life of a freight car is 17 years, but that it is actually moving on the track only six months of that time, owing to waiting on sidings, time consumed in switching, etc. By his system, the efficiency of the cars would be increased several hundred per cent, and the cars would have a much longer life.

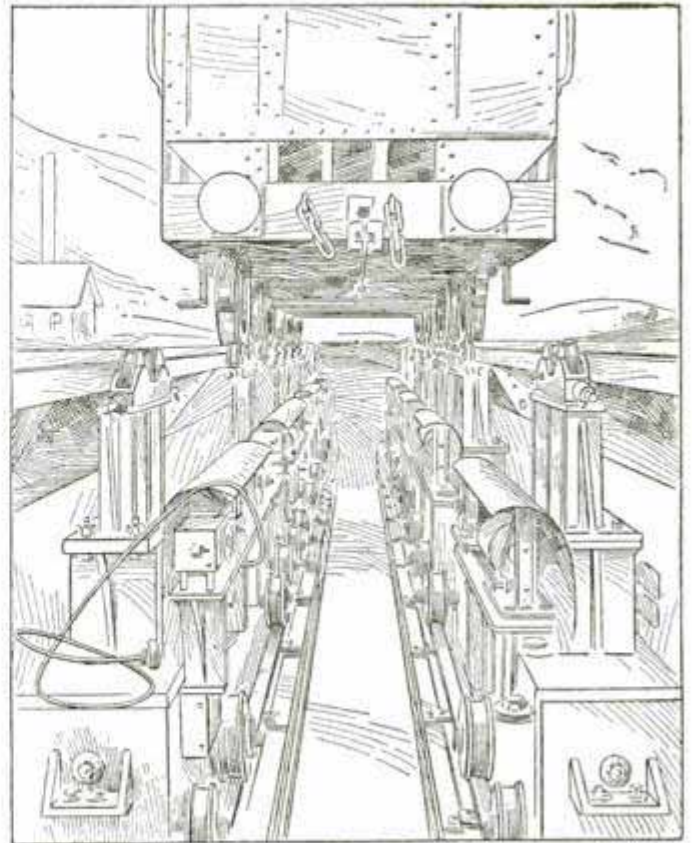
At present there are about 290 freight trains arriving daily in London. It would be possible to route these through the three proposed tubes to the clearing house and handle them in less than five hours a day. By actual observation on the present rate of handling freight in London depots, and the estimated speed of the clearing-house machinery, the present rate of handling and distributing freight could be increased 500 times.

The effect on street congestion in London was shown by the fact that 2,000 or so clearing-house motor wagons, in conjunction with the clearing house itself, would displace at least 20 times that number of street wagons which are now needed. And in view of the fact that there are several street crossings in London, notably Hyde Park Corner, Piccadilly Circus, Charing Cross and the Bank, where an average of over 2,000 vehicles an hour pass between 8 a. m. and 8 p. m., the need for some such relief will be apparent.

APPARATUS FOR WEIGHING LOCOMOTIVES

As the stability and drawing power of a locomotive depend largely on the weight distribution on the axles, it is important that this be ascertained, either by careful calculation or actual weighing. An improved locomotive scale has been developed by a German concern, and is said to be the best of its kind for this particular purpose.

The complete apparatus comprises as many individual, movable weighing devices as there are wheels on the lo-



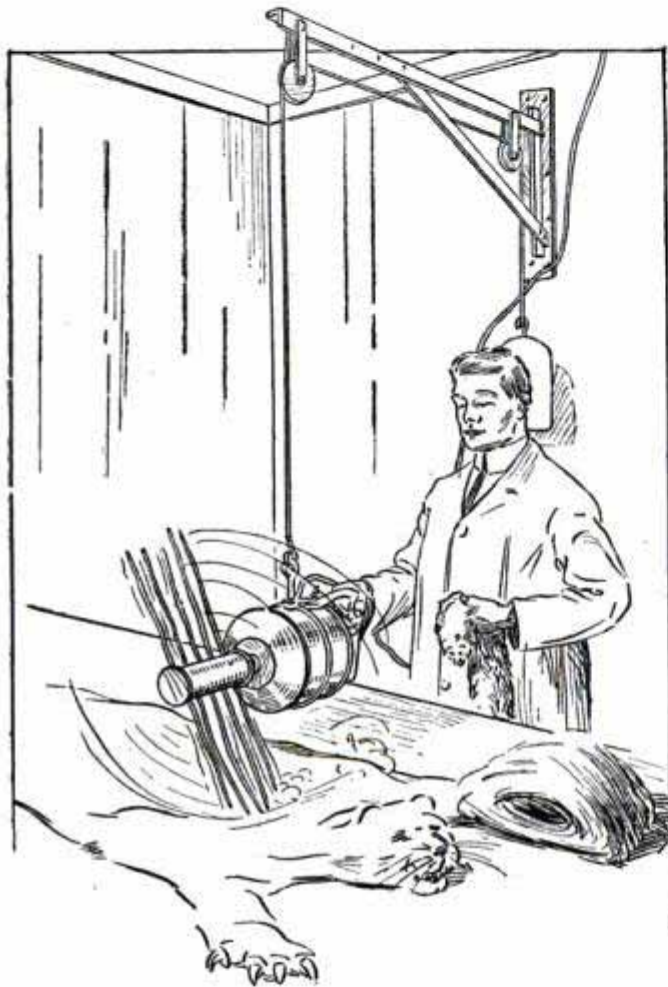
Complicated Device for Weighing Locomotives. Each Wheel Rests on Pair of Small Wheels

comotive. These are mounted on carriages in a pit under the engine and are designed so that the upper part of each can be raised under the locomotive wheel and bear up against the rim so as to lift the wheel off the track. A special method of gearing insures that all the weighing devices are extended simultaneously, so that the locomotive is raised quite equally and without oscillations. The reading of each device is accomplished by moving a sliding weight along a scale until a correct balance is indicated. As the locomotive wheels are supported on rollers, different readings can be obtained for the various points of revolution of the locomotive wheels.

Successful experiments have been carried on in England with guinea pigs as substitutes for lawn-mowers. A number of the little animals are placed on a lawn and immediately attack the weeds and grass, in a short time cutting it down in a manner that resembles the work of the closest mowing lawn-mower. The pigs are enclosed in wire netting during the operation and are moved about on the lawn.

ELECTRIC MACHINE BEATS FUR GARMENTS

Fur beating by hand has given place to electric beating in several German fur concerns, the electric beater con-



Renovating Furs by Beating with Electric Beater

sisting of a number of flexible rods mounted on the shaft of a light motor. The motor is suspended from the ceiling by means of a pulley and counterweight and is easily moved around above the fur garment or pelt being beaten and renovated.

SIMPLE METHOD OF CHECK PROTECTION

Various devices, most of them more or less cumbersome and practically all of them expensive, have been placed upon the market for protection against check raising. A simple and thoroughly effective method of securing ample protection to checks has been devised and is in use in the postoffice at Los Angeles, Cal., and the mechanical apparatus used consists of a

typewriter and a piece of ordinary carbon paper. In writing checks, the carbon paper is simply reversed so that a carbon impression is made on the back of the check. The impression on the face of the check made by the typewriter ribbon, and the impression of the carbon paper on the back of the check produces the same result as if the printed portion of the check were printed all the way through the paper, and whatever is thus written cannot be erased, either with a rubber or with ink-removing chemicals. If a copying ribbon in the typewriter and copying carbon are used, the application of chemicals will cause the ink to run and will show any attempt which might be made to change the figures or written amount of the check.

NEW TYPE OF TELEPHONE RECEIVER

A telephone instrument, the receiving part of which is mounted at the top of the stand in such manner that the user has simply to place his face between the clips as shown, is now being placed on the market. Both hands are free to take notes, and there is no danger of breaking the receiver by dropping it, as with clip receivers supported by the head instead of by the stand.



Self-Supporting Receiver Clip for Telephones

LIGHTNING VAPORIZES WIRELESS ANTENNA

A remarkable "freak" of lightning was witnessed recently at one of the meteorological observatories in France, about 210 ft. of the antenna of its wireless installation being entirely vaporized. A delicate self-registering apparatus connected with the antenna, however, was not damaged, but at the very point where the electric discharge ceased to affect the wire, appeared a ball of lightning. This ball, after touching several buildings, passed through a window pane and disappeared, leaving a clean-cut hole in the glass.

The scientist in charge of the institution believes that the construction of the antenna, which had a very sharp bend at one point in the stretch consumed, was in some way responsible for the appearance of the lightning ball. He is now preparing to attempt to repeat artificially this natural occurrence, in hope of obtaining an inkling of the nature and formation of such balls.



SHAKESPEARE AND THE TELEPHONE

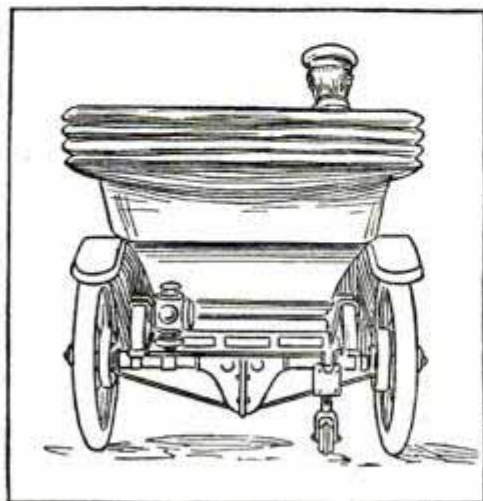
Incongruous as it may seem, one of the new telephone booths of the British Museum, London, stands side by side with a statue of Shakespeare, shutting off the view of the statue almost completely when the door is swung open.

INTERESTING ATTACHMENTS FOR AUTOMOBILES

Three recent ideas for automobiles, consisting of an anti-skid wheel, a traction board for use when stalled in deep sand or mud, and a pair of hot-air gauntlets fastened to the steering

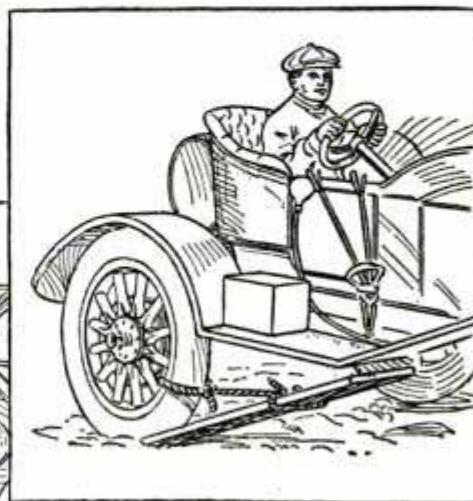
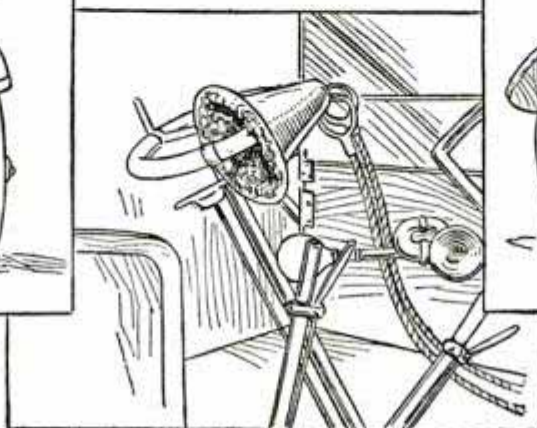
wheel, are shown in the accompanying illustrations.

The anti-skid device, which has been taken up by a number of English motorists, consists of a small wheel at-



Anti-Skidding Wheel Attached to Rear Axle

Gauntlet Heated by Engine Exhaust



Traction Board for Use When Car is Stalled

tached to the rear axle of the car. This wheel is provided with a flange about $1\frac{1}{4}$ in. wide, and is so designed that it tilts and grips the road with the edge of one of the flanges immediately the car attempts to skid. The wheel is fitted with a rubber tire, which runs evenly on the road when the machine is not attempting to skid. When the roads are dry the wheel may be raised up out of contact with the road surface.

The traction board is a device to assist the car when it has become stalled in sand or slippery mud. It consists of a board track which the wheel draws under itself as it turns. The end of the board is placed in front of the wheel, a chain or rope is run from the metal insert in the center of the

board to one of the lower spokes, or to the tire of the wheel at a point in front and a short distance from the ground. The chain grip automatically disengages itself from the board as the wheel passes over.

The hot-air gauntlets are certainly ingenious, and are designed to fit the steering wheel of the car as shown. The outside coating of the gauntlets is patent leather stretched around a metal form, the interior of which is lined with fur. A pair of flexible tubes inserted at the ends of the gauntlets connect with the exhaust pipe of the car. An adjustable clip is provided so that the hot air can be cut off at any time. It is claimed that an adequate warmth is imparted to the gauntlets within a minute of the starting of the engine.

A CUP FOR EACH EMPLOYEE

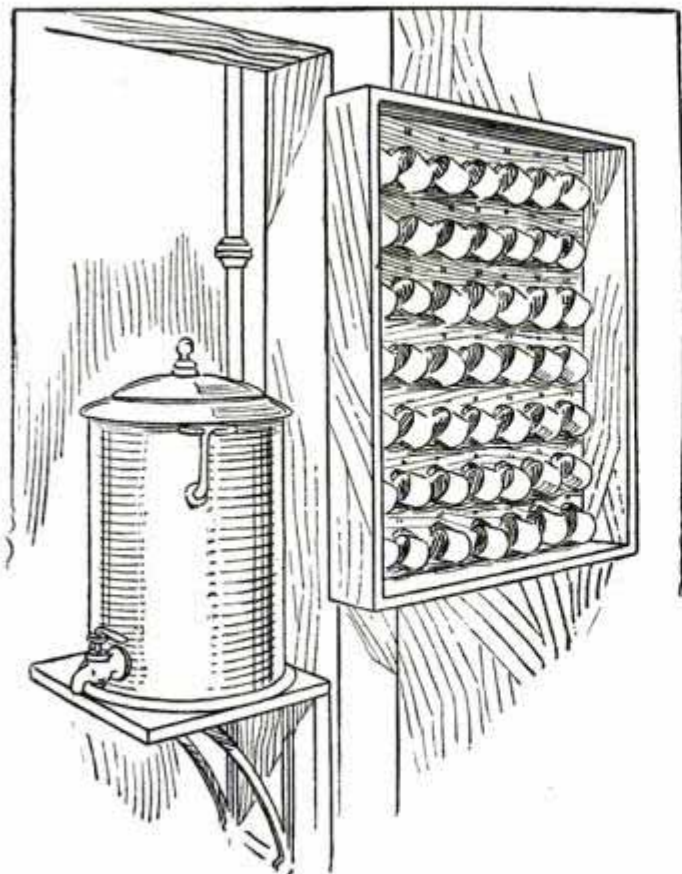
Each compositor on the force of the Ohio State Journal has an individual drinking cup, the cups being kept in a wall case as shown in the illustration. The case is 3 ft. high by 27 in. wide, and accommodates 49 cups. A number is stamped on each cup and

a check bearing the same number is tacked above the cup nail on the back of the case, along with the printed name of the owner of each cup.

THE RIGHT WAY TO HOLD A CIGAR

There is only one right way to hold a cigar, that is, if the smoker has an especially easy chair in which he is liable to fall asleep while enjoying the fragrant weed. John H. Starbuck told about it at a recent meeting of opticians in Springfield, Mass. If one holds a cigar between the first and second fingers, the act of falling asleep will invariably cause the hold to become relaxed, and the cigar will drop from the fingers, to the imminent danger of the clothes or the carpet. That is how not to do it. But if the seductive roll be held between the second and third fingers, the cigar would still be found safely grasped in the hand even if the sleeper did not wake up until the "morning after."

CA new device for detecting firedamp in mines, which gives its warning with an alarm bell and a flashing red light, has just been invented by two Austrian mining engineers.



A Cup for Each Employee as a Sanitary Measure

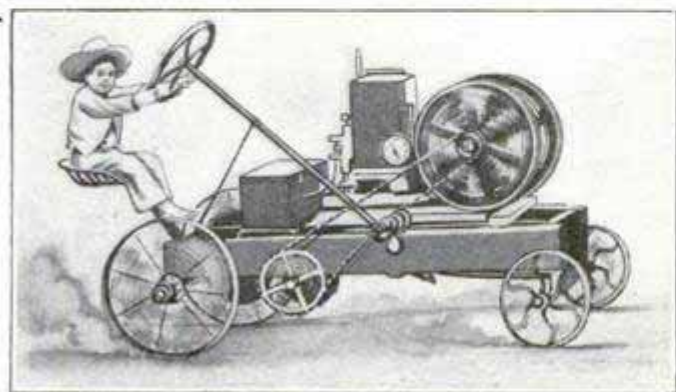
GERMAN TECHNICAL ATTACHES

The German government is to make an important innovation within the diplomatic service, consisting of the creation of new posts as technical attachés to the German legations. It is proposed to place these technical attachés, who will be engineers and technical experts of note, on exactly the same footing as the military and naval attachés.

The work of the new technical attachés will be to keep themselves informed on all technical inventions and progress of any importance in the different countries, and make reports. This work has formerly been confined strictly to the consular service, which has not been as satisfactory as it might be, because the consular officers are seldom engineers or technical men.

MINIATURE MOTOR TRACTOR

The ingenious miniature motor tractor here shown was built by a Minnesota concern as an advertising feature. The engine develops 2 hp., which is sufficient to drive the truck along the street at a fair speed. The tractor is complete with driver's seat and steering wheel. The power transmission is clearly shown.



A 2-Hp. Motor Tractor

CHINESE CONTRACTORS' LEVEL

Although primitive, the level still used by Chinese architects and contractors serves the purpose for which it is intended. It is made of wood and



Chinese Contractor Using a Primitive but Effective Level

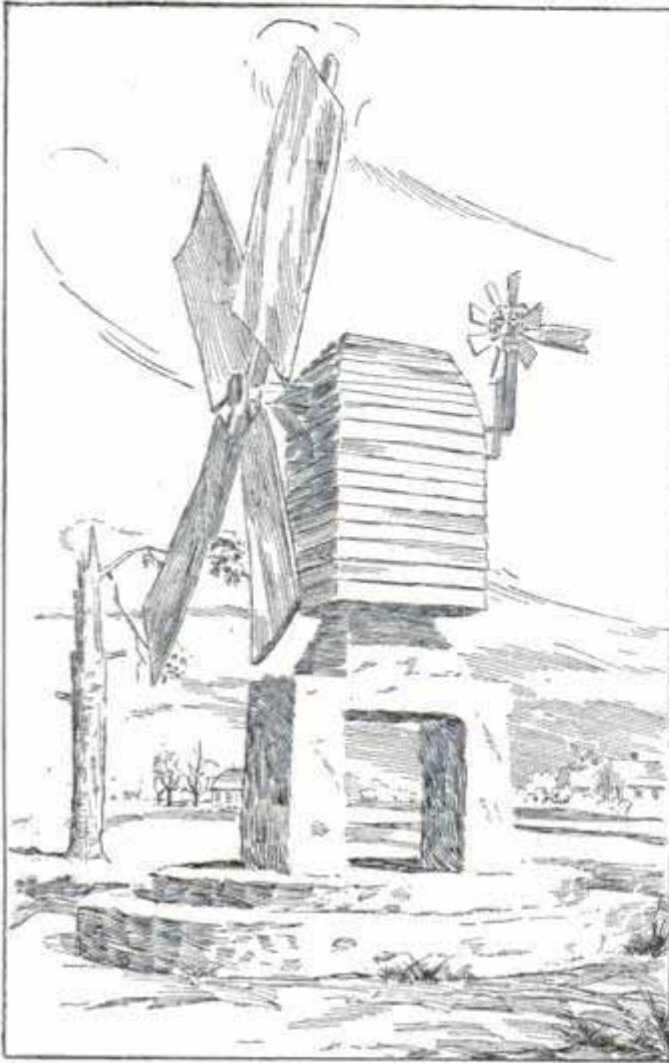
has three compartments for water, the end ones containing floating blocks about an inch high. The sighting is done over these blocks to a target held by a helper. The level is about $3\frac{1}{2}$ ft. long, supported by a stand that will allow it to be turned to any angle in the horizontal plane. The stand is held securely upright by placing weights around its base.

WIND FLOUR MILL IN BACK YARD

Wholesome flour for home bread and other baking is obtained by E. L. Burne, a London engineer, by means of a windmill erected in his back yard. The mill was made during his leisure time, largely out of old material, and is a more or less faithful model of the old-fashioned post windmill, with such modifications as its small size rendered necessary. The sails measure 7 ft. from tip to tip, and the millstones are only 6 in. in diameter.

The mill is entirely self-acting, the

fan tail keeping it to windward, while the sweeps automatically "give" to the wind, so that, if the wind is too high, it slips by without imparting un-



Grinding Flour in the Back Yard

due velocity. The supply of grain to the stones also adjusts itself to the speed at which the sails are driven.

ELECTRICITY WILL NURSE BABE ON ARCTIC TRIP

The genii of electricity will guard the comfort and health of the ten-months-old son of Capt. Louis L. Lane of the power schooner "Polar Bear" which recently sailed from Seattle for an exploration voyage in the far north. The "Polar Bear" will visit the Bogoslof volcanoes, Mount Shishaldin, the great Miles and Muir glaciers, the seal rookeries of the Pribilof islands and even far Siberia. Mrs. Lane and the baby are accompanying Capt. Lane on the expedition. Plans were made in

the building of the "Polar Bear" to care for the infant. Electrical heating devices will warm the baby's crib. Another electrical device will warm the milk bottle. In order that the baby may have fresh milk, two goats were taken along. While the stout bow of the "Polar Bear" crushes through the arctic ice floes, baby Lane will lie snug and warm within, with the electrical genii keeping benevolent watch.

ELECTRIC FANS IN PLACE OF SCREEN DOORS

Electric ceiling fans as substitutes for screen doors are being given an interesting test by several business houses in Mobile, Ala. The fans are installed over the doorways on the outside and the draft created is said to effectually prevent flies from entering.

The idea was first tried over the entrance of a store located next to a restaurant, the flies from which were most persistent and annoying in getting past the screen doors. Since the fan has been installed, it is claimed that not a fly has passed through the entrance, although the 6-ft. doorway is wide open and customers are continually passing in and out.



Fan above Door Makes Barrier of Air against Flies

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the seventh of a series of articles by Dr. Ogden, who is professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.

VII — The Friend of the Housewife

WHO of us, in the golden days of youth, has not been charmed with the wonderful stories of brownies, fairies, elves, dwarfs, and others of the "little folk," who did all sorts of household tasks for the poor shoemaker while he slept? With what eagerness did we listen to the accounts of the washing of pots and pans, of the setting to rights of untidy kitchens, the brewing of foaming ale, and the baking of untold loaves of bread? And how delighted we were with the shoemaker's consternation and perplexity when he came down in the morning and found all these things done! And we chuckled with glee when we felt that we knew more about it than the shoemaker did, and that he had not noticed the scurrying away of the little folk as soon as they heard his step on the very top stair.

The Kingdom of Dust is made up of little folk, and some of them are eager to help the housewife in her manifold duties. Indeed she could not get along without them, as they make her bread spongy and light, furnish her with good, sour vinegar, and manufacture all the alcohol that is made in the world.

These little folk, and they are really very small, as 2,800 can find plenty of room on a thread one inch long, are the chemists of the Kingdom of Dust, and they are the most efficient chemists in the world. They do not charge enormous fees for consultation, and are always at hand, ready for work. In fact, we can buy a whole university of them for five cents at the nearest

grocery. They come in very small cakes wrapped in tin-foil, and every cake contains millions of these erudite chemists, known to us as yeast.

These compressed tablets are what might be termed the aristocrats of the yeast family, to distinguish them from the wanderers and tramps known as "wild" yeast, which are scattered everywhere in the atmosphere, and have no regularity of lineage or habits of life. Compressed yeast is literally the "cultured" variety of the yeast tribe, and is made up of strong, healthy plants that are known to do the very best work, and to produce no unpleasant results in the way of making sour bread, or causing other mischief, as their wild brethren of the atmosphere are so prone to do.

Yeast plants have been with us since the beginning of things terrestrial. They worked and slaved for our ancestors back in the dim twilight of the remote past. The Bible tells us of "leavened" and "unleavened" bread that was made over 30 centuries ago, and no doubt our prehistoric forbears of cave and cliff were familiar with the wonderful thing that happened when fruit juices were exposed to the air. Every tribe of savages has known from time immemorial, how to make intoxicants of one kind or another. Leaven is yeast, and practically all intoxicants are produced by yeast.

The yeast plant was first discovered by a Dutch microscopist about 200 years ago, but it was not until nearly the middle of the 19th century that the systematic study of these minute

organisms was taken up, and their functions and habits of life understood. Yeast plants are known as the "budding" fungi, unlike bacteria which reproduce by self-division or fission. Sometimes, under adverse conditions, yeast will produce spores, but ordinarily the habit of reproduction is by the growth of a bud on the parent cell, that afterward separates to form a distinct plant.

These minute members of the vegetable kingdom reproduce with great rapidity, as one single cell may be the parent of millions in 24 hours. Yeast spores may be found anywhere on the globe, from "Greenland's icy mountains, to India's coral strand." Every puff of air may be laden with dried scions of this humble but important family, and every breeze may carry whole colonies, seeking, like the Pilgrim fathers of old, a new abode. When they finally come to rest in a place favorable for growth, they start into business at once, and a yeast factory is formed on the spot.

The yeast in the atmosphere, as has been said, is known as "wild" yeast, and from its many different varieties man has selected a few that have proved themselves to be the most suitable for his purpose, making careful cultures of these special forms. Some of these wild yeasts are inclined to mischief, and give a bitter or sour taste to whatever they infest. Man has therefore taken suitable precautions to educate and train only those that are free from such propensities. Otherwise, they would perform such tricks on the good housewife as giving an exces-

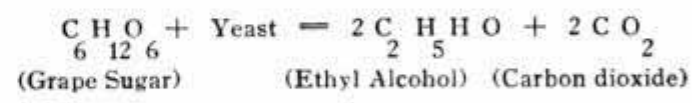
sively sharp, pungent taste to her preserves, her jellies, her canned tomatoes, and her maple sugar. Ordinarily, however, any material that contains a high percentage of sugar is immune from the ravages of these atmospheric marauders, as a yeast cannot thrive where there is a large excess of the substance so dear to the palates of children.



The Housewife Runs a Private Distillery Every Time She Bakes

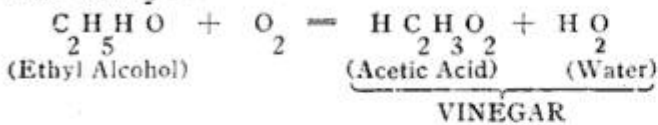
The question that now has to be answered is: How does the yeast plant do all these wonders? All we can say in answer is, that the yeast plant is an individual to whom has been given a single talent. And that talent is the power to break sugar into two simpler substances, both of which are of the highest importance to man. One of these substances is known as alcohol, the other is carbon-

dioxide gas. Let us consider for a moment the simple chemical changes involved, and learn just what the yeast plant does to bring about such wonderful results. Grape sugar is made up of six parts of carbon, twelve of hydrogen, and six of oxygen. Suppose we put a little of this in a dish of water, and let the yeast enter. This is what happens:



Here we have the story of how cider becomes "hard," how grape juice turns to wine, and how barley turns to beer. But we are not through with the chemical changes. Everybody knows how easily and speedily "hard" cider and wine turn sour. We shall have to hold

the oxygen of the atmosphere responsible for this radical change. Here is the story:



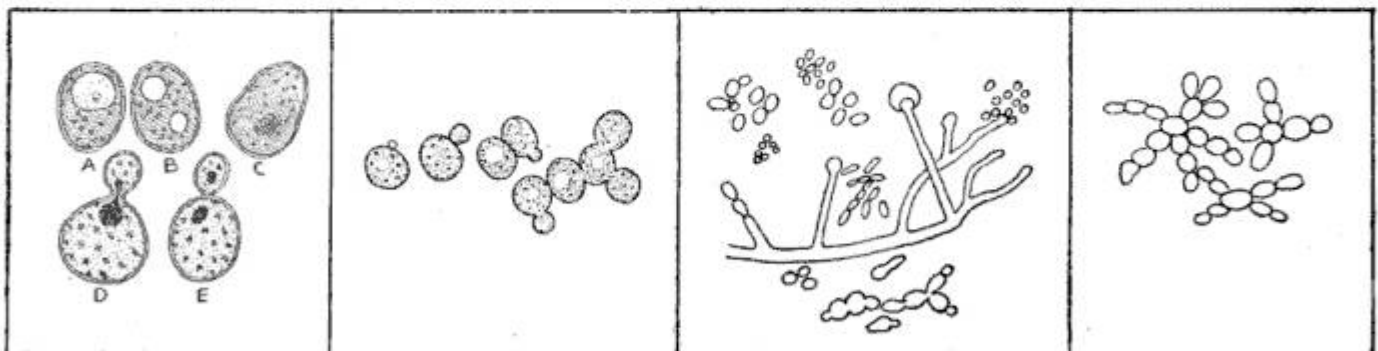
Alcohol, old King Alcohol, comes to us then from the dust, and does his best to bring us all there. Crush an apple, or a grape, or any other fruit containing sugar, and stealthily there creeps into the sweet mixture, generally from the skin of the fruit, a tiny wild yeast spore. Then with wonderful rapidity the yeast cells multiply, and presently start an alcohol factory. The apple juice turns to apple wine, and the grape juice also ferments. The flavor and bouquet of the wine, likewise, depend largely upon the variety of yeast that causes the fermentation. The best wines and champagnes of the world come from very limited areas, simply because the special wild yeasts that bring about the chemical changes, are to be found only in those places, for some curious and obscure reason.

Beer, ale and wine do not contain a very high percentage of alcohol, but by distillation the alcoholic content may be concentrated, and brandies and whiskeys are the result. Gin is prepared from juniper berries, rum from fermented molasses, brandy from wine, whiskey from rye, corn, wheat or potatoes, peach brandy from peach juice, and absinthe from wormwood. Even such a mild, sweet-smelling herb as mint is forced to give up, through the agency of the yeast plant, an alcoholic preparation known as *crème-de-menthe*, which, in spite of its high-sounding

name, is as arrant a poison as all the rest. If the yeast plant were a sentient being, burdened with a conscience, we wonder how it would feel as the one individuality responsible for the presence of alcohol in the world? If there were no yeast plants, there would be no alcohol, unless the chemists, in their desperation should attempt to synthesize it from water, soot, and a little hydrogen gas. If there were no yeast plants, there would be no saloons, no breweries, no drunkenness. There would be no frightful roll of murders and other crimes committed by man while under the influence of alcohol. Poorhouses and penitentiaries would disappear almost to the vanishing point, were the Kingdom of Dust to lose only the yeasts from its untold myriads of subjects. It is quite a stretch of the imagination to see a saloon and a penitentiary in a few motes of dust, but if we only look hard enough, and with the proper focus, we shall surely see all of these resultants of strong drink, in every beam of sunlight, twinkling with its millions of dust particles.

Let us not dwell upon this function of the yeast plant, if we intend to portray the "Friend of the Housewife," but let us turn our attention to the other by-product of yeast,—namely, the carbon-dioxide gas, which is the real helping friend to the woman whose aim it is to make good bread for the regalement of her liege lord.

Bread-making is almost as old as the hills, but it is the tiny yeast plant that is responsible for the bread's spongy lightness and its delicious flavor. For



Common yeast highly magnified; A and B show vacuoles; C, a nucleus inside the yeast cell; D, a budding cell with nucleus dividing; E, the cell divided.—Growing yeast cells, showing budding and forming of groups of cells.—Organisms found upon the skin of a grape and concerned in fermentation of wine.—*Cerevisia* from beer.

thousands of years the faithful fungus has toiled incessantly where yeast has been used in the making of bread. The housewife makes up a batch of dough with flour, potatoes, water and yeast. Then the yeast begins its work of fermentation. Countless thousands of little bubbles of gas are formed that push the particles of dough farther and farther apart, until the "rising" is complete. Then comes the heat of the oven which hardens the distended walls of dough; the gas escapes with the alcohol, and the bread is made. It is just as well for the peace of mind of the housewife that she does not know she is running a private distillery every time she bakes. Should she attempt to collect the alcohol she has distilled, and keep it from escaping up the chimney, a paternal and kindly government would take a special and abiding interest in her, even to the extent of boarding her at its expense.

In bread-making there are certain details that are essential, such as a proper temperature for the oven, thorough kneading of the dough to scatter the yeast cells uniformly, a limit on the time it should stand before baking, and the prevention of "chilling." Otherwise disaster will result, and the bread will be "holey," heavy, or sour. Sometimes a wild yeast finds its way surreptitiously into the dough with its tame brethren of the atmosphere, and an evil, decidedly unpleasant flavor, is sure to be the outcome. The careful housewife does all in her power to prevent this, and carefully wraps her batch of dough in blankets as though it were a child. It is well she does so, as the wild yeasts are thereby prevented from making their entrance, and the tame yeasts are protected from a congestive chill.

There are many varieties of yeast, and it was formerly a serious matter for the housewife to get just what she wanted. She was often compelled to manufacture her own yeast, and occasionally she struck a bad lot of unprincipled urchins of the yeast world, and as a result, all the men folk of her household growled most vigorously at

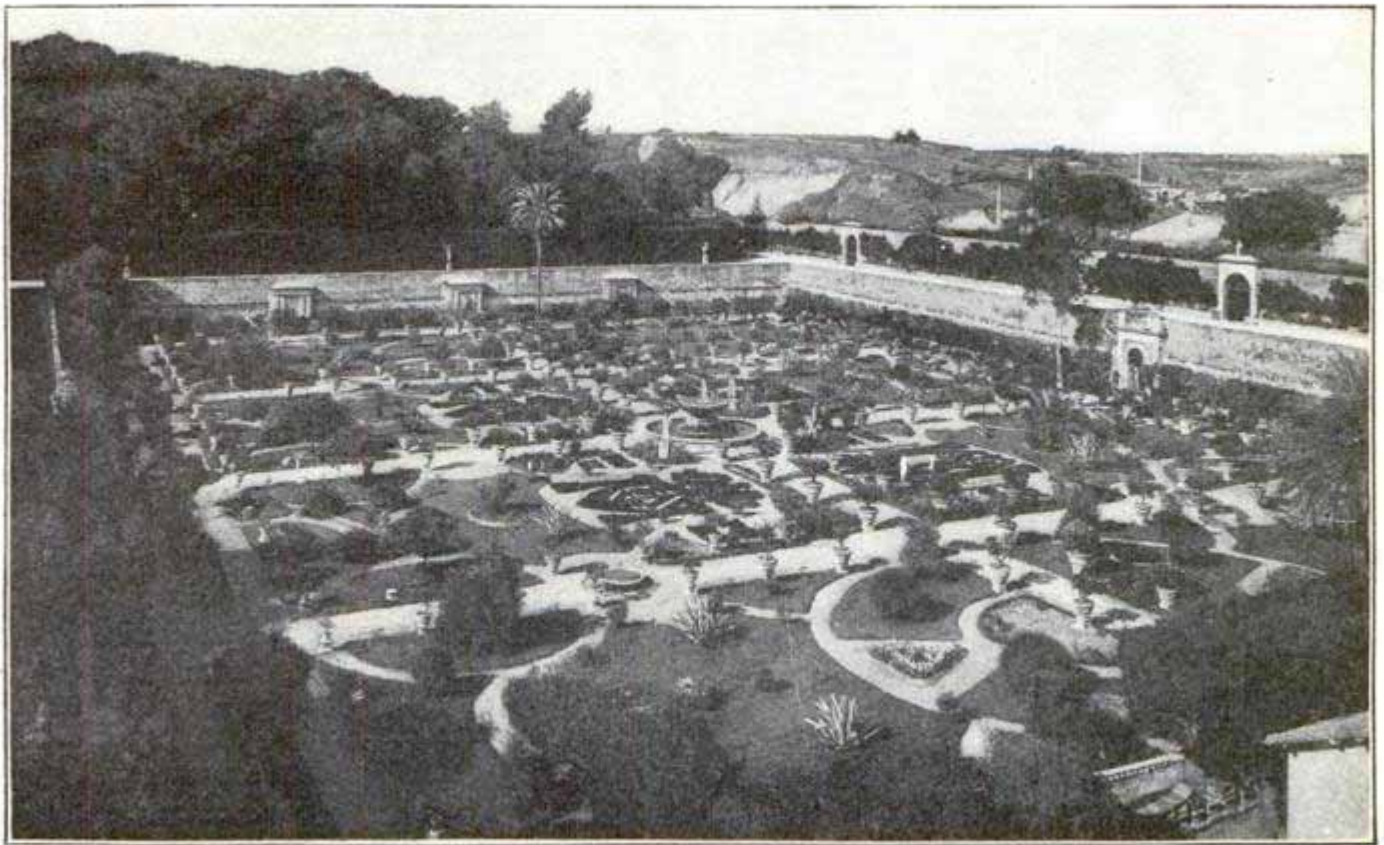
the unusual flavor of her bread. Sometimes she went to the brewer's for her yeast. Here again a peculiar flavor would result that is not pleasing to some palates, and besides, brewer's yeast is too slow in acting.

Occasionally she would make up a batch of Scotch "barms," as it is termed, from flour and hops; unfortunately, however, wild yeasts appear to be especially fond of this mixture, and create havoc with the flavor. As a last resort she would be compelled to fall back upon the old "salt-rising" process, where common salt is added to milk and placed in a warm place for a few hours. The wild yeasts start to work in the mixture, and it soon froths from the abundance of carbon-dioxide gas produced. The salt interferes with the production of flavor-producing bacteria, and possibly has some obscure effect on the yeast itself. At any rate, it is just as unreliable, under certain conditions, as all the others.

With the coming of compressed yeast and dried yeasts, however, all these difficulties are practically overcome. Compressed yeast is really derived from wild yeast, and is obtained in large quantities from distilleries. The objectionable vagrant yeasts are practically eliminated, and a pure culture of the best kinds obtained.

It may be interesting to note that the Viennese bakers who are said to make the best bread in the world, prepare their yeast from a mixture of three kinds of grain: Indian corn, barley and rye (all sprouting). These grains are finely powdered, and macerated in water at the temperature of 120 deg. Fahrenheit for several hours. Yeast of the kind most desired thrives best in this mixture and at this temperature; it soon forms a thick scum that is carefully skimmed off, dried, and hydraulically compressed for future use as the "Friend of the Housewife."

☞The engineers' standards committee of England has recently adopted a report recommending standard nuts, threads and bolt heads for automobiles.



Beautiful Gardens Set Apart for Exclusive Use of the Pope

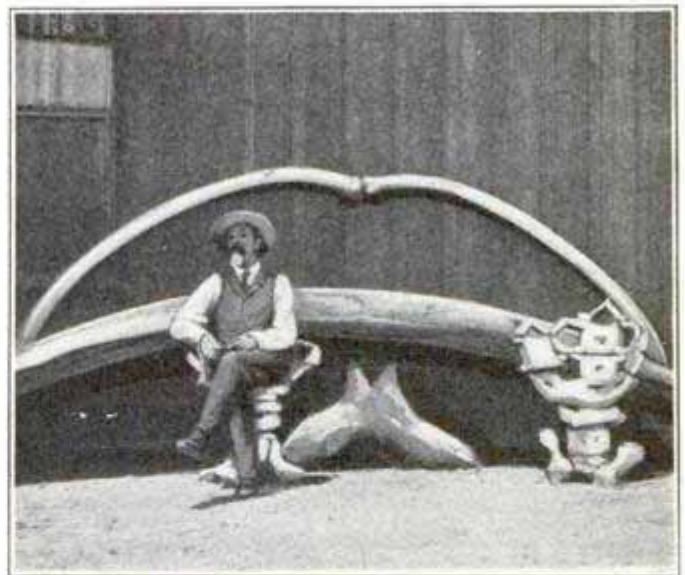
POPE'S PRIVATE GARDEN

Adjoining the Vatican grounds in Rome stands the palatial residence of the Pope with its quaint private garden, famed for its display of carpet bedding, fountains, innumerable statues and graceful flower vases with their rare plants. This small plot of ground is exclusively set apart for the use of His Holiness the Pope. With the Vatican and St. Peter's, the Pope may be said to reign over a territory of 30 acres, for, strictly speaking, this is not Italian soil and is entirely under the jurisdiction of the Vatican authorities.

UNUSUAL CHAIRS MADE OF WHALE'S BACKBONE

Eight bones will make an attractive porch chair, that is, if one can select the right kind of bones and join them with sufficient skill and taste. The chairs shown in the picture were made by the man who is taking his ease in one of them and are formed of parts of the spinal column of a whale. It will be noticed that they have a resemblance to a Gothic armchair. The join-

ing of the bones is accomplished by means of iron rods which are run through holes drilled to receive them.



Curious Chairs Made from Whale's Backbone

The large bones in the background are from the same creature, being part of the jaw of the leviathan.

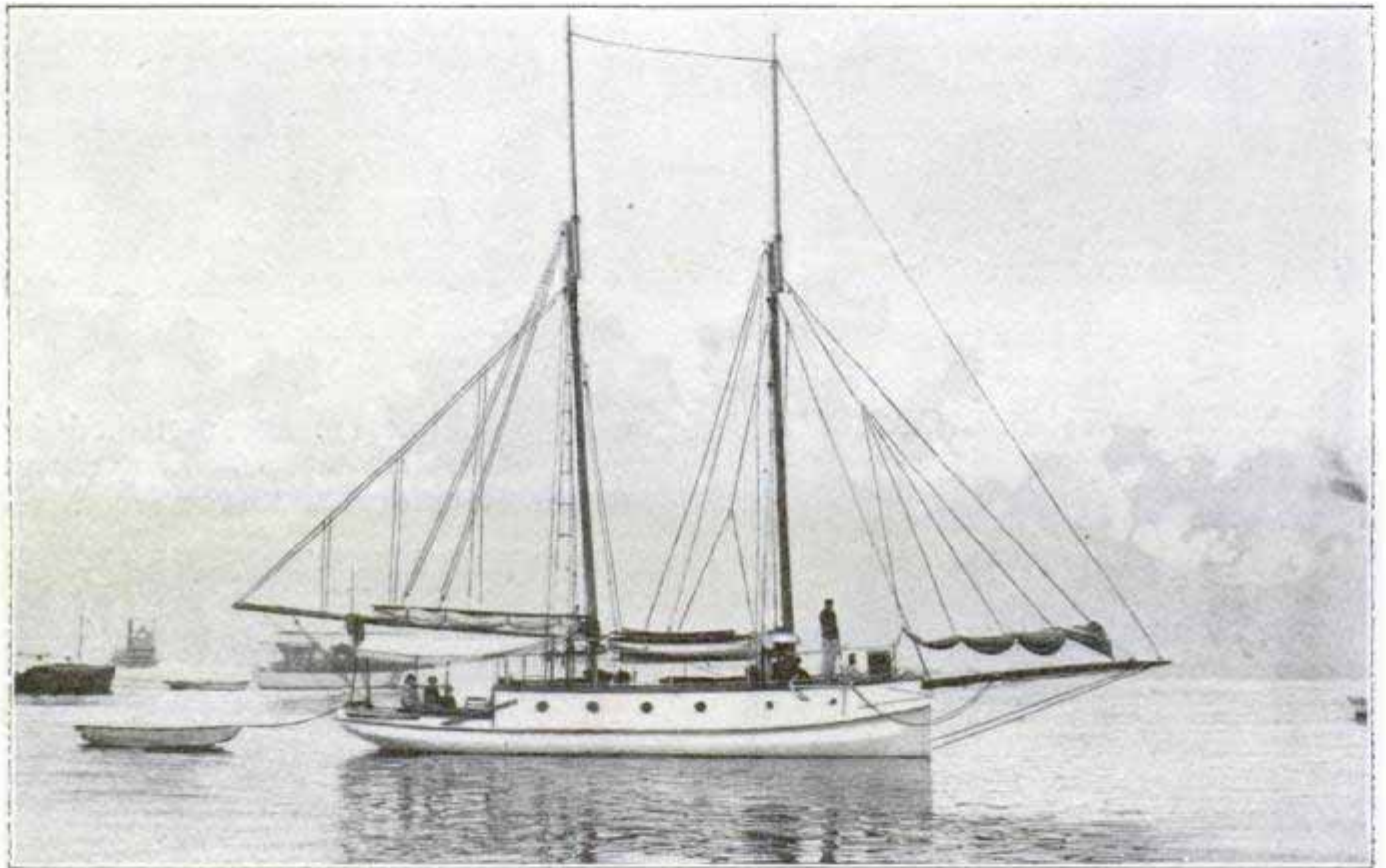
Ⓒ American electric-railroad officials are contemplating the formation of a code of rules to regulate interurban traffic throughout the country.

A RAISED-DECK SCHOONER

By STUART STEVENS SCOTT

Ever since the advent of the internal-combustion engine there have been new types of craft evolved. From the original glass-cabin type came the trunk cabin, following the idea of sailing craft. The next departure was the raised-deck type of the power boat, a distinctive model that has proven to be most acceptable because of the great amount of room afforded below deck

"Signal" is 45 ft. over all and 13 ft. beam, of centerboard type. Originally she was of the trunk-cabin type, but since being rebuilt she has practically double the space, besides having full headroom from the samson post in the bow to the after end of the cabin. It was found, by measuring, that her present deck is but 7 in. higher than the top of her cabin trunk, so it was not



The Raised-Deck Auxiliary Schooner "Signal"

where the full width of the hull is available.

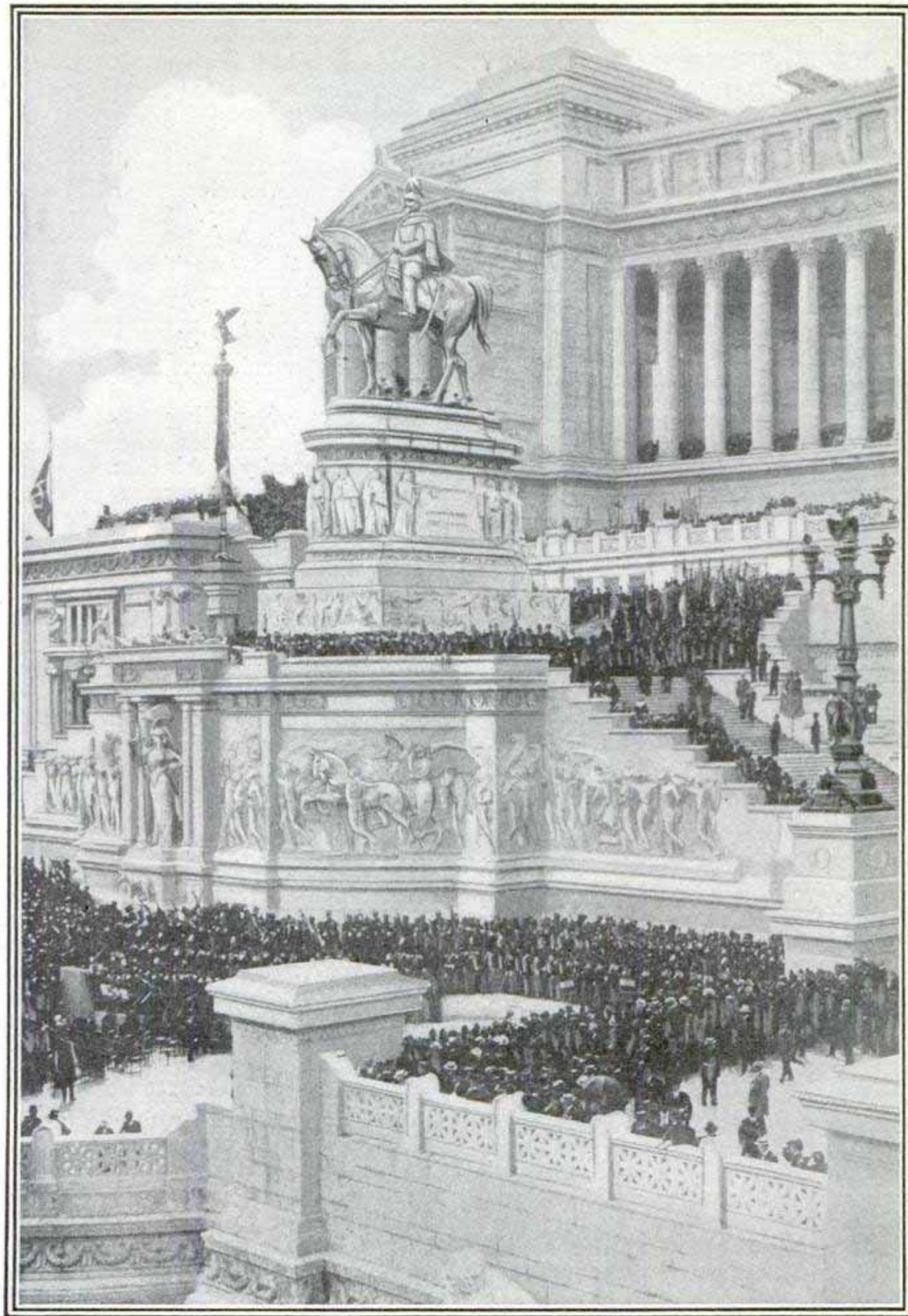
Since the motorboat designers followed the designers of sailing craft in adopting the trunk cabin, it seems only fair that there should be a turn about. This has come. Last season there was turned out, as an experiment, a raised-deck auxiliary sloop, and, from what the owner has said, she was a success.

W. W. Varney, of Baltimore, however, has gone one better, and his contribution this year is the raised-deck auxiliary schooner "Signal," a picture of which is shown on this page. The

necessary to alter her sails. Under canvas she sails just as well as she did before, so there has been a decided gain by the change.

By means of two wheels and wire ropes, the rudder and the engine reversing gear are controlled from forward. The steering gear is attached to the wheel in the cockpit by means of a drum which can be disconnected when the vessel is under canvas.

ⓄTyphoid vaccine has absolutely immunized the army camp at San Antonio from typhoid fever.



HEROIC STATUE OF UNITED ITALY'S FIRST KING

One of the important functions during the celebration of the 50th anniversary of the federation of all the Italian states in one kingdom was the dedication of an heroic memorial to Victor Emmanuel I in Rome. The memorial cost \$7,500,000, and its principal feature is an immense equestrian statue of the first King of Italy. It required 26 years to complete the work.

WHITEWASHING THE COAL OF THE KING'S SPECIAL

The train which carried King George and the royal party to the race meet at Epsom was specially prepared to



Whitewashing the Coal so that the King's Train Should Have a "Clean" Appearance

present as clean an appearance as possible. The engineer, fireman and guards were all garbed in spotless white for the occasion, and even the coal in the tender was whitewashed.

350 MILES OF SUBWAY TELEPHONE CONDUIT

With the final threading in of the telephone conduits connecting Wilmington, Delaware, and Washington, there is just completed a continuous underground telephone and telegraph cable which will make communication by electricity possible under almost any circumstances of weather or climatic conditions. This connecting link makes the cities of Boston, New Haven, New York, Philadelphia, Wilmington, Baltimore, and Washington the first cities in the United States to have long-distance telephone service by underground cables.

The line, which is about 350 miles in length, was built in sections through a protracted period. The section between New York, Philadelphia, and Boston was finished first and then the work between Wilmington and Washington was taken up. This last portion, of about 100 miles, was carried through by three working forces in different states along the line. First the line was surveyed by one party, followed by a gang digging ditches, putting in manholes, and making ready for the laying of the cable. The final work of pulling the cables through the manholes and splicing them was done by a third force.

The ditches were carried just below the frost line and four "pump logs"—wooden pipes, creosoted for preservation,—were laid in the level bottoms of the ditches and joined through their tight-fitting butts, each junction being treated with a preparation to make it waterproof. At intervals of 500 ft. manholes were built, in which the pump logs terminated. These manholes, made of reinforced concrete, which was shipped in sections to the point of use and assembled on the job, are unlike any type ever before invented or used. To furnish the gang of workmen with these manholes it was necessary to establish a factory in Maryland with a capacity of 25 manholes each day.

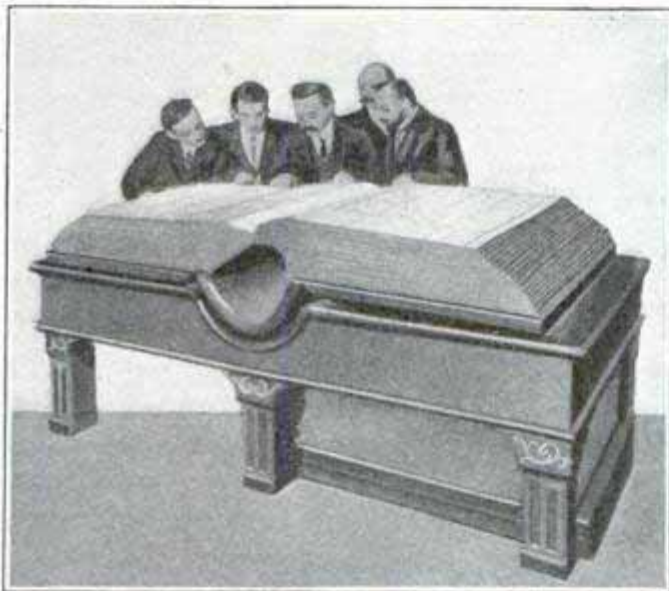
The work was carried on with great dispatch, the progress each day being about 2.3 miles, this including the building of crossings of bridges and streams, each of which presented its own individual problem. Over 50 bridges were crossed by the four conduits during the entire job, and in each case the conduit boxes were armored with sheet iron or steel wherever they came to the surface.

The telephone and telegraph cables, four in number and measuring $2\frac{3}{16}$ in. in diameter, are protected by lead, and telephone conversation much facilitated by the use of "loading coils" at intervals. The cables, while similar in outward appearance to the kind installed in cities, are different from any

others in that the copper wires are larger and so arranged that three complete telephone, and eight complete telegraph circuits can be secured from each two pairs of the large-gauge wires. There are, in addition, a number of pairs of smaller wires contained in the lead sheath, which are intended for toll service between intermediate cities. Each cable is capable of allowing 99 telephone subscribers and 296 telegraph operators to carry on communication simultaneously.

BOOK WEIGHS OVER HALF A TON

This book was made for a Chicago medical firm as a holder for the original testimonials received by it from all

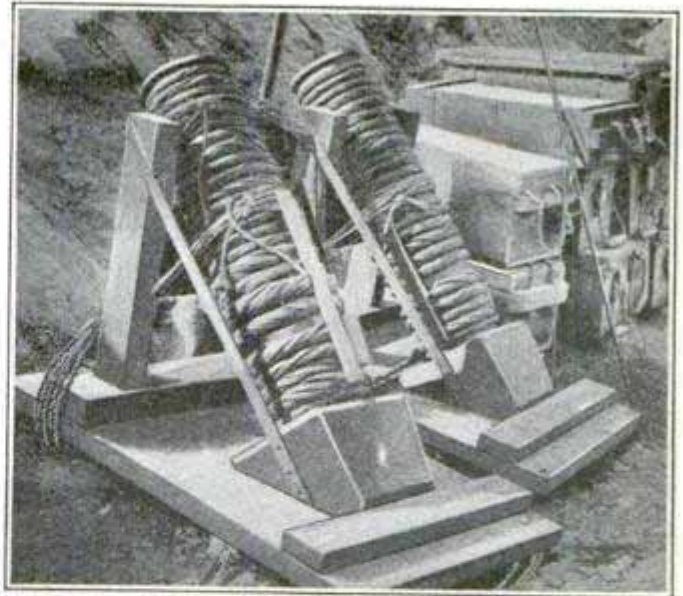


This Book is Claimed to be the Largest in the World and Weighs 1,200 Lb.

over the world, weighs 1,200 lb., and is claimed to be the largest book in the world. It is 1 ft. thick when closed, and, when open, its dimensions are 3½ ft. one way and 7 ft. the other. It rests on a specially constructed table.

WOODEN GUNS IN RUSSO- JAPANESE WAR

Although the Japanese, during their recent fight with Russia, were provided with the most modern and up-to-date contrivances of all sorts for war purposes, they found a use for cannon so primitive in pattern as to hark back to the very beginnings of ordnance.

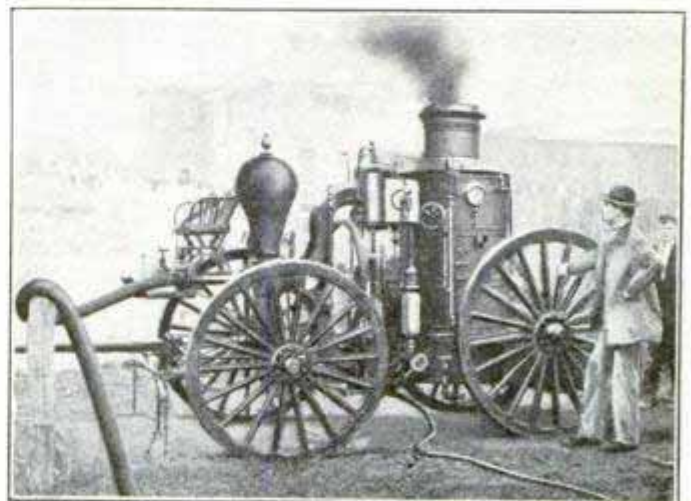


Modern Wooden Cannon

These cannon, two of which are illustrated in the accompanying photograph, were made of sections of tree trunks hollowed out and wound with ropes of bamboo fiber. They were used at Port Arthur and elsewhere for firing explosive bombs, and for this purpose they did excellent service.

FIRE ENGINE SERVING SIXTY- FOURTH YEAR

Although the fire department of Muskogee, a thriving city of Oklahoma, has two big modern fire engines, an Amoskeag steam fire engine 63 years old is still doing excellent service. One of the minor but interesting features of this old engine is the driver's seat, which looks like an old-fashioned office armchair.



Fire Engine Still in Use in Oklahoma after 63 Years of Service

CHURCH AND MOSQUE SIDE BY SIDE

At the famous monastery of St. Catherine, on Mount Sinai, one may see a Mohammedan mosque adjoining the belfry of a Christian church. As



Christian Church and Mohammedan Mosque on Mount Sinai

a matter of fact, however, the mosque is merely a "blind," having been erected by the monks to curry favor with the Moslems who dwell in this mountainous region. At the same time visitors to the convent are at first astonished to see the cross and the crescent in such close proximity. The monastery is one of the oldest in the world, having been established some 15 centuries ago.

German shoe manufacturers are planning a commission to regulate and put a check on rapid changes in footwear fashions, as this prevents the sale of old stock.

AN INTERESTING WATER POLLUTION SUIT

An unusual case of indirect infringement of water rights was recently brought before the courts in Kansas. The defendant in the case was a salt company which made a practice of depositing refuse salt upon its own land, thus forming a dump holding about 40,000 tons. The plaintiff, who owned an adjacent property, claimed that the rain dissolved a part of this salt and that the brine percolated into the soil of his land, injuring the vegetation and imparting a salty taste to numerous springs.

The case in the trial court was decided in favor of the defendant, the court holding that the plaintiff was not entitled to an injunction on the ground that percolating water is to be regarded as a part of the soil containing it, and that the owner of the soil has an absolute right to make whatever use of it he may see fit.

The supreme court of the state, however, held that this is not really good law, and that no one has a right to accumulate upon his own land refuse matter of any sort, whether in itself offensive or not, by which

the water underlying the land of a neighbor and feeding springs upon it is so affected through percolation as to be unfitted for ordinary use.

COLOR AEROPLANES TO DENOTE THEIR MAKE

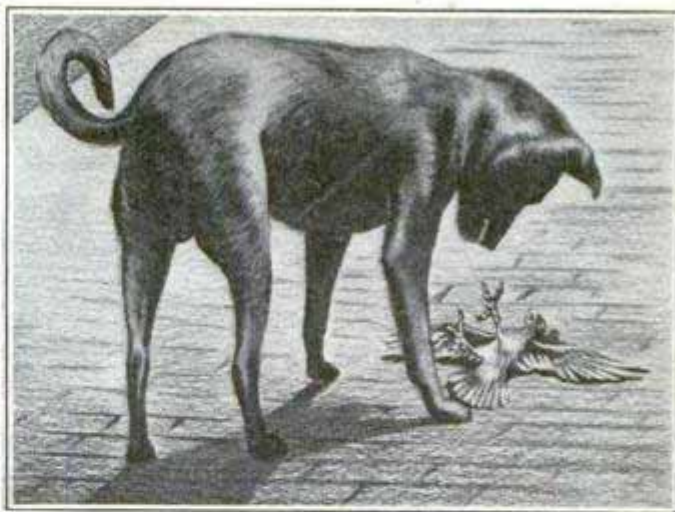
It has been proposed that the different French constructors of aeroplanes adopt special colors for their machines in order to facilitate identification of the various types, and that the color selected should be registered as a trade-mark. One manufacturer, for instance, has already adopted red as his color, but, as only those colors

which are easily distinguished at a distance could be used, a special color scheme would have to be worked out.

Consequently, a tentative plan has been evolved which utilizes combinations of colors and figures, and consists of bodies of different colors, with different-colored borders, crosses, single and multiple bars, transverse and longitudinal rays, etc. The originator of the idea also proposes that the airmen be provided with "riding colors" similar to those affected by professional jockeys at race meetings. The idea is hailed by many of the French aviators as not only practical but picturesque, lending brightness to the machines.

DOG AND PARROT ARE PLAYMATES

Pedestrians in Fleet street, London, have been amused recently by the queer gambols of a dog and parrot, which come out into the street in the

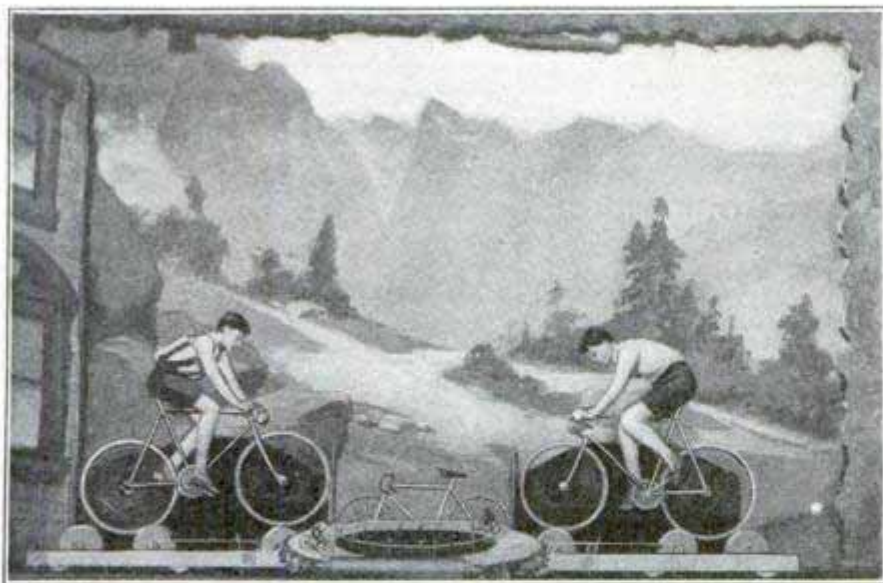


Dog and Parrot Playing Together in a London Street

cool of the evening to play together. The parrot usually gives the invitation for the fun to begin, and then these remarkable playmates commence a series of friendly gambols in which each seeks to assert supremacy over the other. In the illustration, the parrot is on its back but is far from bested, beak and claws being in readiness for any move the dog may make.

BICYCLE RACE IN A SHOW WINDOW

Bicycle racing in a show window is made interesting to spectators by

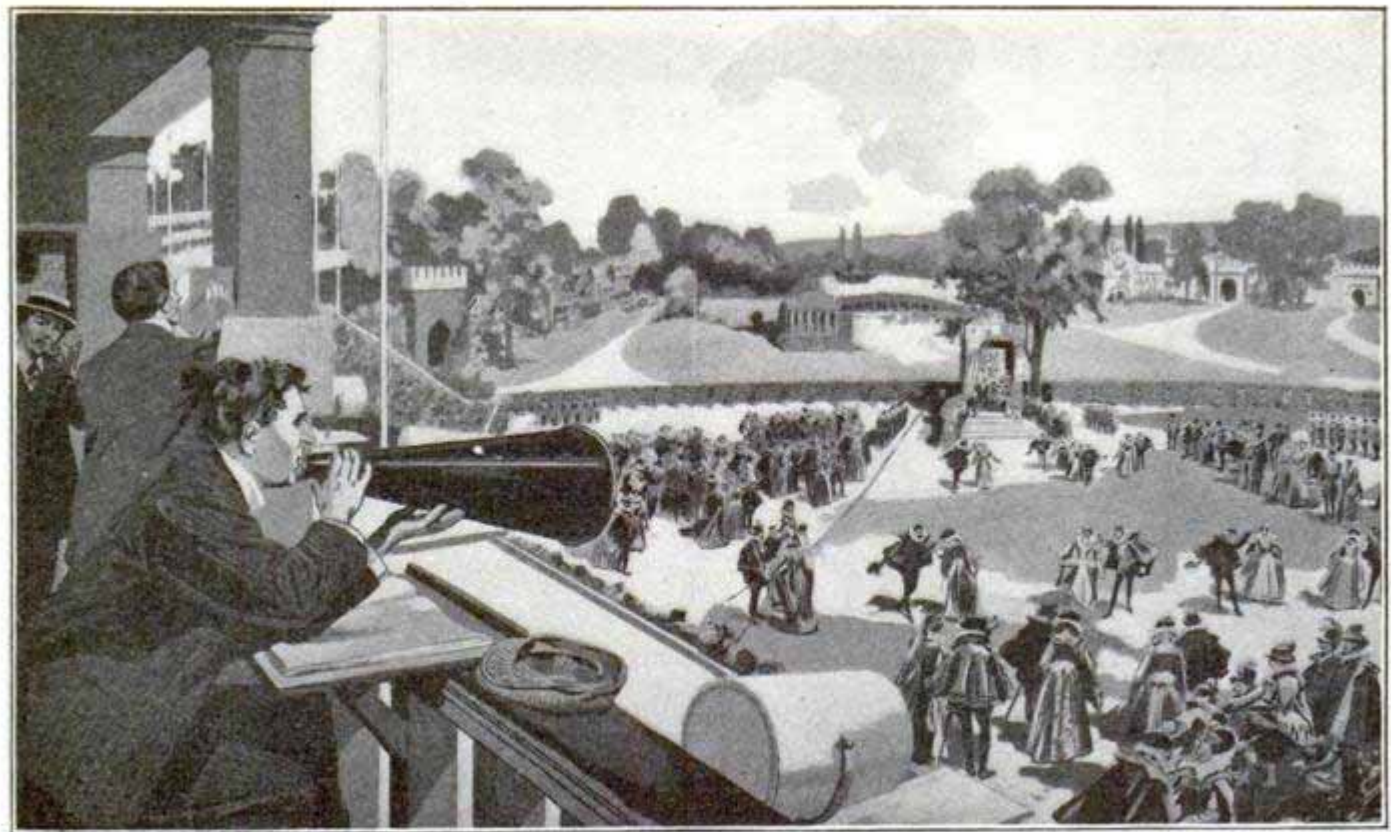


The Operation of the Rollers Drives the Mannequins around the Miniature Track

means of a miniature track, with mannequins representing each rider whirling around it at the exact speed made by the actual bicycle riders, who drive their wheels on a set of rollers, called

"home trainers." These "home trainers," which are used by bicycle riders as a means of training in a confined indoor space, consist of two large ball-bearing rollers in back, and one in front. The mannequins, each bearing a ribbon similar to that worn by the rider it represents, are placed side by side on the track, and, when the riders start racing, speed around the track. Each mannequin is geared to the rear rollers on which the rider it represents is riding.

An indicated speed of a mile in 45 sec. is possible on the rollers, as the rider, being stationary while the rollers revolve, has no wind resistance to contend with, and is always on the same level.



Rehearsing the Festival of the Empire in Connection with the Coronation Exercises in London

STAGE MANAGING BY MEGAPHONE AND TELEPHONE

The telephone and the megaphone as assistants of the manager of a stage production made their first appearance, jointly, in London recently during the production of the mammoth spectacle in connection with the coronation which was given the title of "The Festival of the Empire." The megaphone has been used for this purpose before, on a small scale, but there has never yet been a production of such proportions as to require a telephone to reach the uttermost ends of the stage. In this instance a spectacle of 32 scenes was staged with 15,000 people, the players presenting various important scenes in the history of the English people. This necessitated an enormous stage in the open air which was so vast the voice of the stage manager could not reach all the sections. Telephones were therefore installed and the director occupied a commanding position where he could see everything that was going on and make such corrections as were necessary by wire or by megaphone.

ENGLISH RAILROAD TO USE TRAIN TELEPHONES

Passengers from London to Brighton, England, will shortly be able to send or receive telephone messages while on the train, as the London, Brighton & South Coast Railway has decided to install the train-telephone system on this section of its line. The system, although it uses no antenna, is a wireless one and is capable of being "tuned" so that each instrument receives only the message intended for it, to the exclusion of all others. It was given a commercial test on April 20 last on an experimental track at Stratford-on-Avon, the birthplace of Shakespeare, when Marie Corelli, the well known novelist, spoke the inaugural message.

☪Caterpillars are not only threatening the growth of poplar timber in Ontario, Canada, with extinction, but are making traffic on the railroads suffer by collecting on the rails in such large numbers that trains are stopped by slippery track.



Exterminating, the Jersey Skeeter

By JOHN B. SMITH, Sc. D.

State Entomologist of New Jersey

New Jersey is justly famous for the size and ferocity of its mosquitoes. For many years the name of the state has been closely associated with the pestiferous insect, but the state is now making an effort to repudiate it. Professor Smith who has been in charge of the work of extermination, describes his efforts in the following article. Recently the aid of dynamite was enlisted, and experiments have been made with it, blasting large excavations into which the water of the marshes is drained and treated with oil to destroy insect life.

THAT "knowledge is power" is a trite saying, and never did ignorance lead to a greater waste of time, energy and money, than in some of the early mosquito campaigns. The life history of a few of our commonest species had been known for many years and, while it was recognized that there were others yet unknown, it was assumed that all were about alike in their development.

Essentially the story was this: The female mosquito lays her eggs in a raft or mass on the surface of water; the larvæ or wrigglers hatch shortly thereafter, live for a few days on the microorganisms found in the liquid, change to the pupal stage, remain in that a day or two, and then transform to the adult or fly form. This adult does not normally fly far from its place of birth—not over 100 ft. or so—and in turn lays eggs and dies after feeding as often as it gets a chance. This sort of reproduction continues throughout the season and the winter is passed in the adult or mosquito stage. Furthermore, while mosquitoes would breed in stagnant or filthy water of any kind, they did not breed in salt water.

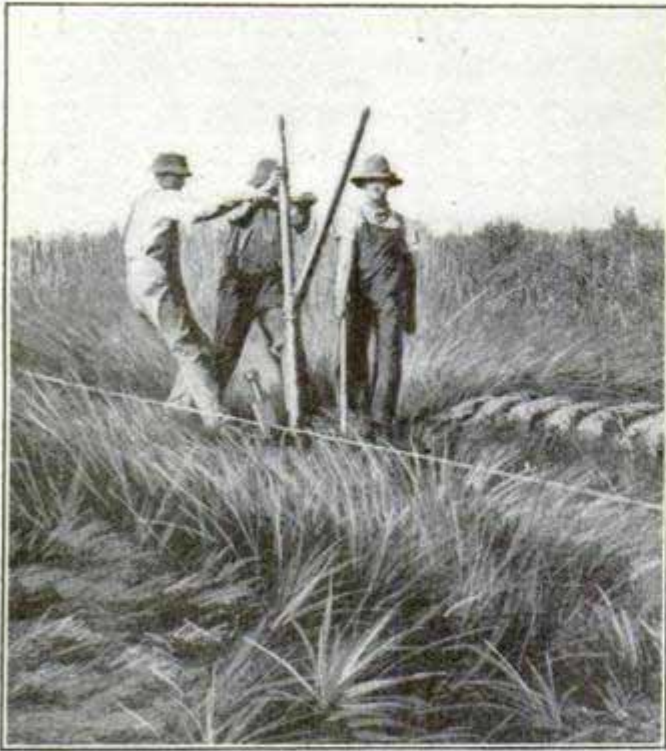
When the question of dealing with the New Jersey mosquitoes was first considered, I spent three years and \$10,000 in first studying the problem and I discovered a lot of interesting things. I found that we had, in our own blessed state alone, over 40 different kinds of mosquitoes, and that not more than three or four of them came anywhere near living up to the book

history. Most of them do not lay their eggs on the surface of the water, but in the soft mud of dried-out pools; only a few of them live through the winter in the adult stage; many of them hibernate in the egg and a few in the larval condition; a number of them breed only in woodland pools and have one brood only each year, others breed only on salt marshes, and in sea as readily as in brackish water; many species travel freely and some of the salt-marsh species migrate habitually, often as far as 40 miles from their place of birth; instead of living only a few days and biting once only, the adults may live for weeks or months and bite as often as they get a chance!

At first blush all this information seemed to complicate the problem which had been treated as a beautifully simple local matter of applying oil; but it also explained the many failures of local campaigns, and, after a little consideration, left the matter in two distinct parts.

It is the business of the state to deal with the migrating swarms that breed in the salt marshes, for against these, inland municipalities are helpless. It is the business of municipalities of all kinds to deal with those forms that breed within their own jurisdiction and are not migrants.

Legislation bearing out this idea was enacted and about \$58,000 has now been expended by the State of New Jersey in draining about 33,000 acres of salt marsh with over 4,000,000 ft. of



A Patented Ditching Spade at Work. It Requires Three Men and Digs 1,000 Ft. per Day, under Favorable Circumstances

ditching. There are in our state about 290,000 acres of salt marsh, and it seems, at first blush, almost an impossible task to make this entire area mosquito-proof. But the problem is not so serious as it looks, for, first of all, marsh covered at every tide needs no treatment; nor does that immense area of flat marsh that is just above normal high tide and is inhabited by fiddler crabs, which form drainage channels in countless numbers on the territories inhabited by them. That leaves a strip, great enough in all conscience, lying close to the highland, intermittently covered, full of depressions and a veritable wriggler paradise most of the summer.

Here again a study of marsh structure helped us out. We found that the soil for from one to three feet is a coarse peat—a mass of root fibers built up by ages of vegetation and preserved from decay by the salt water. This rests upon a foundation of mud, sand, clay or gravel as the case may be,

and it is just as porous as a sponge. Give the water half a chance, and it will run out of this peat layer just as fast as the channels will carry it. The opportunity is given by our ditches, and these ditches are cut down to a 30-in. depth whenever possible—in any case to the sand or gravel underlay, when that is less than 30 in. below the surface. Ten inches wide is all that is necessary for these ditches and, in a reasonably good marsh, placing them 200 ft. apart gives all the drainage necessary. We are not concerned with a quick drainage, nor with laying the marsh completely dry. All that is needed is to remove the surface pools within two or three days. Deep narrow ditches such as described, will stand indefinitely if not interfered with. No vegetation ever starts from the bottom as in shallow, broader ditches, and as they are always connected with tidal creeks, fish run in them everywhere and into every connected pool. This method improves the meadow by bringing in better grass and making it easier to harvest. Incidentally it also destroys the breeding places of the green-head flies.

Many experiments and trials were made before the best methods of ditching were developed, but there are now two contractors who have patented spades that dig these ditches cleanly



Where Millions of Mosquitoes Develop during the Summer

and rapidly, taking out huge sods to the full depth and placing them in a row alongside the ditch, 3 ft. away, so as to prevent them from tumbling in. From 600 to 1000 ft. of ditching can be cut with each spade in one day; by a gang of two or three men, according to which tool is used. One of the contractors also has power machines for large areas where long ditches are required, and with these, 4000 ft. per day can be cut by a crew of five men. Six of these machines are in service and, were the funds available, the entire salt-marsh area in New Jersey could be cleaned up and freed from mosquito-breeding places in less than two years.

Some striking contrasts between the drained and undrained areas have developed within the past year or two, and the work, which was ridiculed at its inception, is demonstrating its value.

In the cities and towns the local authorities have become alive to the importance of the matter, and the inhabitants demand relief. The state work has removed, near the large cities, all danger from the migratory forms, and the local problem assumes first rank. And here again it seemed as if ordinary city and town conditions offered little opportunity for breeding, until it was found that almost every catch-basin



Another Spade at Work Cutting Ditches to Drain Mosquito Infested Sections. Two Men Can Dig about 600 Ft. a Day

for storm water or surface drainage was a natural incubator. As ordinarily built, these catch basins have a settling pool extending from 1 to 2 ft. below the sewer inlet to hold the heavy material swept into the basins. Whenever, during a dry period, the water level in such a basin is lower than the sewer inlet, a beautiful breeding place is complete, and this lasts until a heavy rain flushes out all the wrigglers. We have the anomalous feature then, that in cities a lengthy drought favors mosquito development, a fact many municipalities realized during the past year. This condition is fought with fuel oil sprinkled over the surface of the water in a thin film.

This fuel oil is really a low-grade kerosene, somewhat heavier in specific gravity than the ordinary illuminating oil and of a much lower flash test. It is not a crude oil, and crude oil will not answer, because it forms globules on a water surface and not a continuous film.

One thing all mosquito



A Double-Width Main Ditch, Nearly a Mile Long, on Salt Marsh

larvæ have in common: Without exception they live and develop in water, and with few exceptions they are dependent upon atmospheric air, drawn through a breathing tube at the end of the body, for their supply of oxygen. If a coating of any oil be spread over the surface of the water in which they live, this oil enters the body of the larva through the breathing pore, and kills it. This fact furnishes the foundation upon which all our campaigns against local forms are based, and the fuel oil works as well on brackish and salt, as it does on fresh water. The objection to oiling as a sole reliance is that it is not permanent, and that it is necessary to renew applications every two or three weeks during the summer, depending on conditions. Besides sewer basins, pools in open lots, drainage ditches and dumps are dangerous, and these must be dealt with by oiling until the breeding places themselves have been permanently removed.

The old idea that mosquitoes do not travel far from their place of hatching has been pretty well exploded except for the strictly woodland species. The common house mosquito will fly half a mile or more in search of food or shelter, and often farther than that. A bad breeding place at the edge of a city or town is therefore sufficient in many cases to supply the entire settlement, especially along the line of the prevailing light winds.

The work of ridding a state of the mosquito pest is, however, entirely practical, and good progress is being made. So far as the state is concerned, its work will be done long before all the municipalities have their problem under control. But just as soon as one municipality has met with success, the residents of every other within the state will demand of their own officials equally efficient work. The pest has been with us since the beginning,—its elimination may reasonably be a matter of a decade or two.

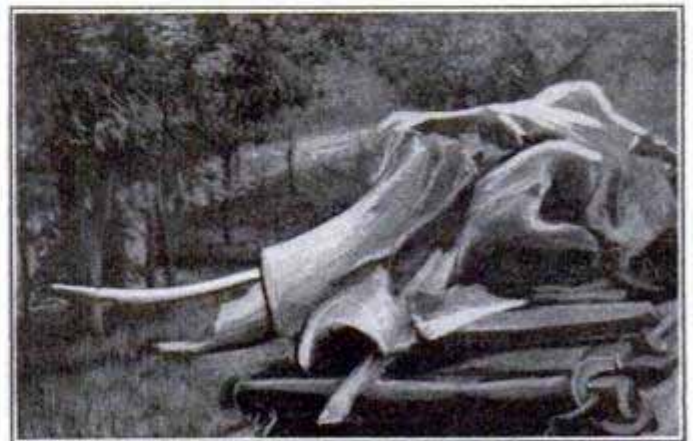
MASTODON SKULL WEIGHS NEARLY A TON

A mastodon skull weighing nearly 2,000 lb., said to be the largest bone ever discovered in one piece, was found recently by workmen while excavating in a gravel and sand embankment on a farm in Clermont County, Ohio, and was thought by them to be a rock until completely removed from the gravel. Further excavation revealed the immense tusks, which were recovered in pieces, and, at a distance

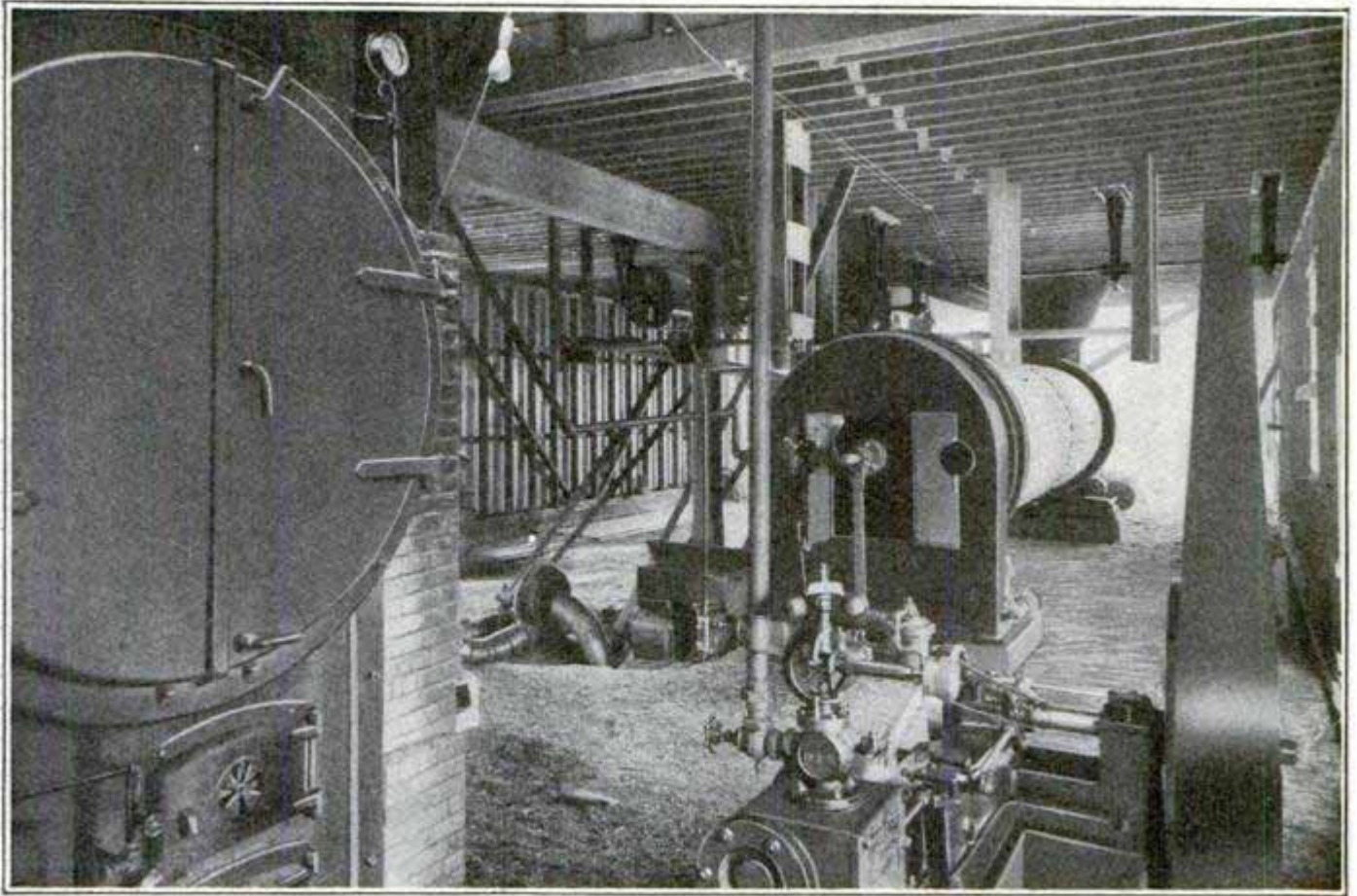
of about 20 ft., other parts of the huge prehistoric beast were found.

The rich find is attracting much attention, and the Smithsonian Institute will probably acquire it.

According to the latest statistical compilations, the world's population at the end of 1908 reached a number of 1,700,000,000, the proportion of men to women being as 1,000 to 990.



Two Views of a Mastodon's Skull Weighing Nearly 2,000 Lb., Found in Ohio



New Alfalfa-Meal Mill Built at a Cost of \$15,000, Which Grinds and Dries the Green Alfalfa and Effects an Enormous Saving

NEW MILL GRINDS AND DRIES GREEN ALFALFA

An alfalfa-meal mill at Chico, Cal., which has a capacity of 60 tons of alfalfa meal a day, and which was recently erected at a cost of \$15,000, has been found to effect such an enormous saving that plans for several mills of the kind are now under way in northern California.

The green alfalfa is taken as soon as mown and fed directly into the cutting machine, which reduces it to lengths of from $\frac{1}{16}$ in. to $\frac{1}{8}$ in.

It is claimed that by taking the alfalfa direct from the field as cut to the mill the grower saves from 300 to 1,200 lb. of alfalfa to every ton harvested, the loss to alfalfa left on the ground to dry resulting from the leaves and stems left on the ground in cases of a sun-cured product. It is also said that the alfalfa leaves contain from 75 to 80 per cent of the protein value of the whole plant.

The saving by the new mill is effected through the fact that the green alfalfa is cut and immediately delivered

to the mill where it is ground in half an hour into a pea-green meal, perfectly dry and ready for storage or market. It can be ground in wet weather as well as dry without affecting the quality of the meal. The grinding of the green alfalfa practically avoids all losses.

The new mill does not contain much machinery, and what there is is not complicated. There is a cutting machine, a drying machine, and a grinding and sacking machine. After the alfalfa has been cut into lengths of from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. in the cutting machine, it passes into the dryer, a large revolving drum, measuring 25 ft. in length by 6 ft. in diameter, and containing a number of steam pipes. An average of about 275 deg. Fahr. is maintained in the drum while the alfalfa is drying. The drum is lower at the discharging than at the receiving end, and makes seven revolutions a minute.

The finely cut alfalfa passes from the

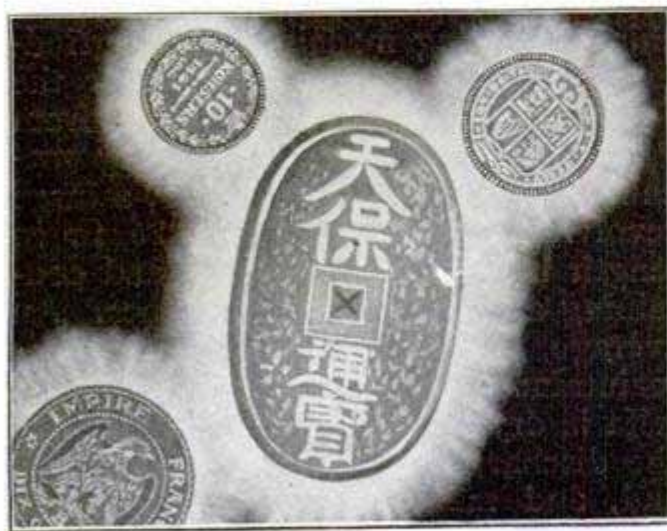
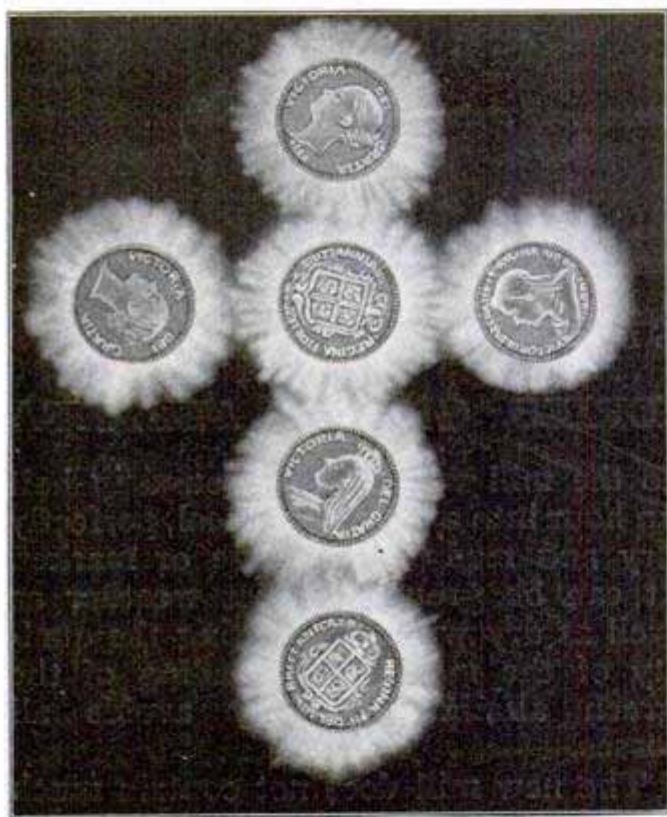
cutter into the receiving end of the dryer and is carried by gravity to the point of discharge, an operation requiring 30 minutes. It emerges from the drum dried and cured. Unless a finer meal is desired, it is then run directly into the packer and is sacked. To

make it finer the cured alfalfa is run into a pulverizer and is there reduced to any required degree of fineness.

As alfalfa is the most important forage plant in the west, the value of an economical device in the production of alfalfa meal is enormous.

PHOTOGRAPHING ELECTRIC DISCHARGES

A. W. Clayden, of the Royal Memorial University College at Exeter, Eng., has taken many curious photographs of the high-frequency electric discharges obtained by means of the



Photographs of Electric Emanations and Metal Coins without Camera or Dark Room

Tesla transformer. The photographs are taken without a camera or dark chamber, simply by placing metal coins on the sensitized surface of a photographic plate resting on a copper plate. The coins and the copper plate are connected with the free ends of the secondary circuit of the transformer. Not only were the radiating emanations reproduced perfectly, but excellent pictures of the metal coins were also obtained.

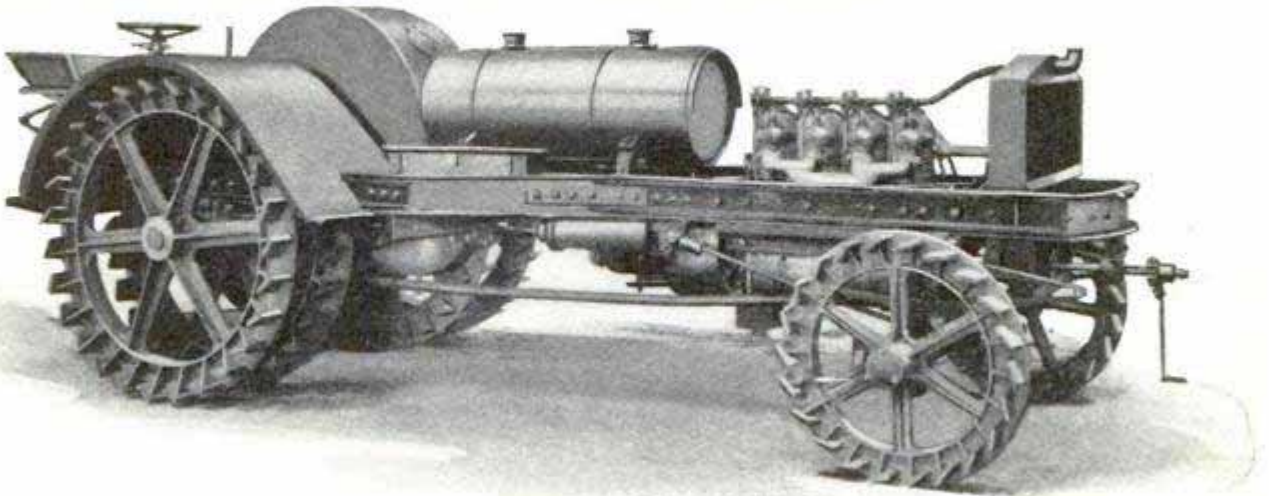
Under the action of the transformer all metallic objects connected to it become luminous on the whole of their surface, but in order to obtain a sharp picture it is necessary that the metal object rest directly on the sensitized surface of the photographic plate. If it is placed even as little as $\frac{1}{32}$ in. away from this surface, the picture becomes very indistinct.

LUXURIOUS PRIVATE CAR FOR CHINESE ROAD

With the introduction of railroads throughout the Orient, the love of luxury inherent in the people of the Far East has resulted in the building of one of the most handsome private railroad cars in the world. The car was constructed in England for use on the South Manchurian railroad, the designs for it having been made by M. Yoshino, chief mechanical engineer of the company. There are many departures from the ordinary type of private car, the construction being really a composite of the ideas of European and American builders. It has a length of 80 ft., $3\frac{1}{2}$ in. over the platforms, and a width of 10 ft. over side

panels. The height from the floor level to the under side of the roof is 9 ft. 8 in. The under frame is of steel throughout and the body of the car is built of teak with steel trusses, polished steel plates, and joints covered

writing desk so that it may be used as a library. The entire car is lighted with electricity and is provided with plenty of electric fans and other appliances for the convenience of the passengers and crew.



Motor Tractor for Orchardists and Ranchers

with brass mouldings. The floors are double, the space between being filled with granulated cork. The roof is also double with an air space between the inner and outer roofs.

The interior arrangement of the car includes an open or observation platform at one end provided with curtains so that it may be closed if desired. Opening from this platform is an observation room furnished with lounging chairs and a couch upholstered in the softest morocco. The couch can be used as a berth if need be. A corridor leads from this room past the various staterooms to the dining room. There are two commodious staterooms fitted with brass bedsteads, lavatories, wardrobes and dressing tables, and between the rooms is a completely furnished bath. The drawing room is also of stateroom type and contains seats that may be converted into berths. There is also in this room a handsome paneled Pullman berth that folds up into the roof. The dining room extends across the width of the car and is furnished with everything the most fastidious could require. Back of this are the galleys, refrigerators, etc. The dining room has accommodations for ten persons and it also contains bookcases and a

A NEW MOTOR TRACTOR

A motor tractor for which much is claimed is being manufactured by a California concern. It is a 40-hp. machine, equipped with a type of wheel which makes the tractor suitable for the orchardist as well as the farmer and rancher. The company claims to obtain greater tractive power on soft ground with this wheel than with any other wheel experimented with. The illustration shows the machine without the engine hood.

NEW ALLOY MUCH LIGHTER THAN ALUMINUM

A new alloy, said to be suitable for aeroplane construction and having a specific gravity of 1.762 as against 2.6 for cast aluminum, has been announced from Paris. It is known as "liège metal" (metal cork) and is grayish white in color. Its composition is given as: magnesium, 99.30 per cent; zinc, 0.44; sodium, 0.21; aluminum, 0.04; iron, 0.01. This would make it nearly pure magnesium, which, when absolutely pure, has a specific gravity of 1.74 and burns readily in air, when ignited, with a brilliant, bluish-white light.



German Peasants in Full Dress for a Wedding

GERMAN PEASANTS GARBED FOR A WEDDING

The quaintly costumed group shown in the accompanying illustration is a peasant family garbed for a wedding. They are in full dress for the occasion, even the women wearing high

hats, which is a customary feminine headdress for such occasions among the peasants in some parts of Germany.

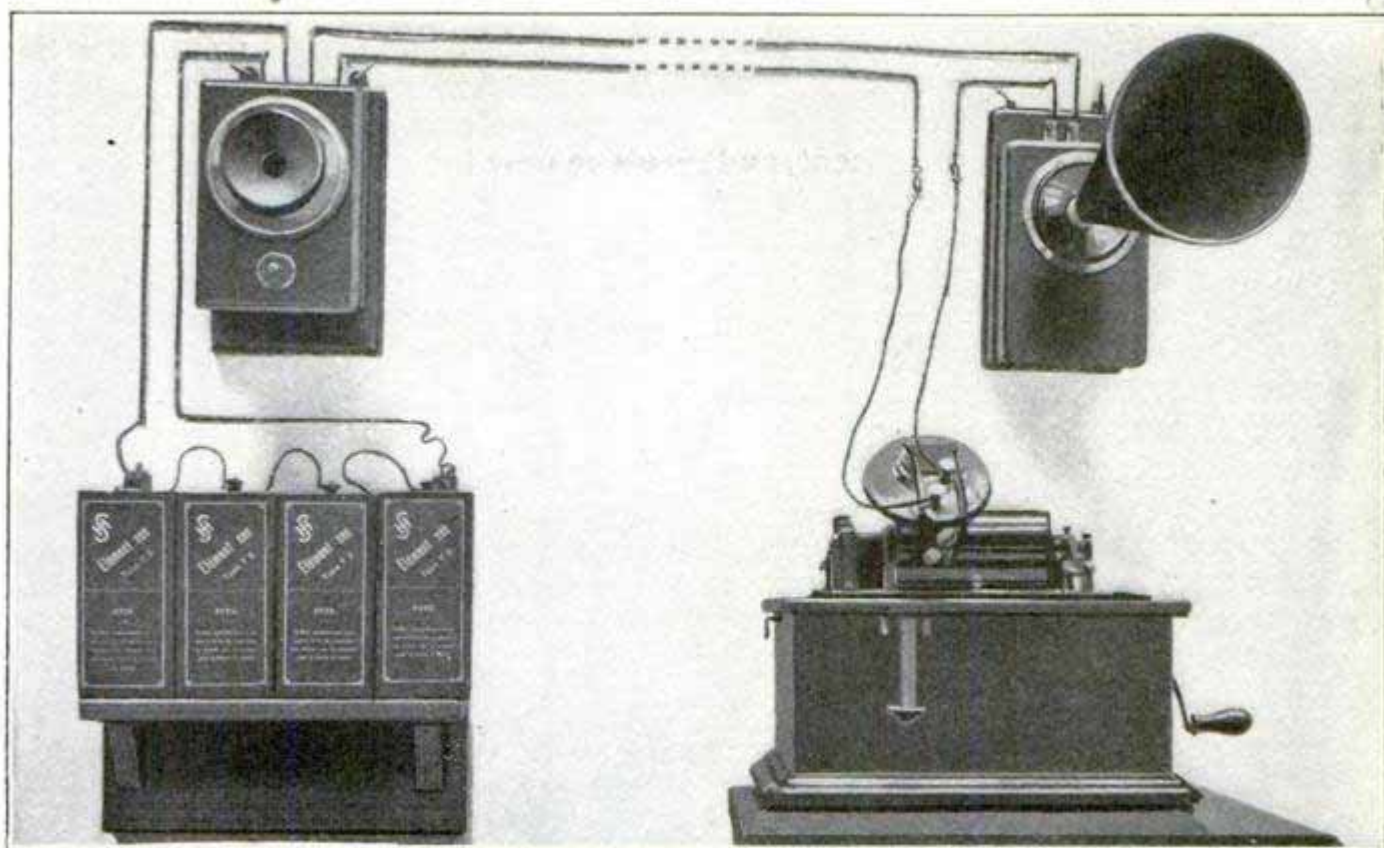
VISIBLE "HEAT WAVE" IN CEMENT ROADWAY

Weather so hot that it warped the pavement was one of the summer visitations at Valparaiso, Indiana. The pavement in question was laid but a short time ago, the basis of it being vitrified brick over which was placed a layer of cement that filled all the space between the bricks.

During the extreme heat of mid-summer, the people living along the thoroughfare were surprised to see a ridge or hump rise directly across the thoroughfare. The heat is supposed to have caused the cement to expand, and, as no provision had been made for this expansion, the surface gave way. Had asphalt been used it is probable that the accident would not have occurred.



Section of the Pavement at Valparaiso, Indiana, Showing a Ridge Caused by the Intense Heat



The Telephonograph, an Apparatus Comprising a Telephone Outfit Connected with an Ordinary Phonograph for Making Permanent Wax Records of Telephone Conversations

RECORDING TELEPHONE TALK

As an ordinary telephone conversation leaves no trace of its existence in the apparatus, it has so far been impossible to use the telephone in a practical way for the definite settling of any important matters requiring a lasting record. It is true that Poulsen's telephonograph enables telephone talk to be registered on a magnetic steel tape, but this apparatus seems to be too expensive for general use.

An Italian electrician, Pierluigi Perotti, has devised a scheme allowing any ordinary phonograph or gramophone to be used for the recording of telephone talk, and has tested this very inexpensive arrangement on the telephone lines of the Italian state.

By this arrangement the receiving post comprises, in addition to the receiver used for listening to the communication, another instrument, the mouthpiece of which terminates in a flexible tube connected with the mica plate of the phonograph membrane, which accordingly is separated from the iron membrane of the telephone by a small enclosed mass of air. To the mica plate is fixed (according to the

usual arrangement) a sapphire point exerting a certain pressure on the phonograph cylinder. All the vibrations of the telephone membrane are thus faithfully communicated to the phonograph membrane and inscribed in the wax of the cylinder.

Though this arrangement is very sensitive, it is recommended to talk a little louder than otherwise in telephones (with about the same intensity as in dictating), while keeping the current intensity somewhat higher than in ordinary telephone plants.

By displacing a small lever, the person listening to the telephone talk can at any moment start the mechanism of the phonograph, so that either the whole or part of a conversation can be recorded. If then the recording membrane be replaced by a reproduction membrane and sound funnel, a phonographic reproduction of the telephone communication can be insured at any time and any place, quite distinctly and with the same pitch and timbre as the original talk.

This apparatus thus allows telephone communications to be endowed with

the same official character as possessed by a record in writing. It also lends itself for leaving word to telephone subscribers happening to be absent, and for dispatching news in the form of inscribed phonograph cylinders, the records of which can be transmitted from the telephone exchange to any subscriber. Moreover, it would seem to be quite suitable as a sort of long-distance dictaphone, enabling the dictation of correspondence over a telephone line.

As shown by the tests above referred to, this remarkably cheap and durable arrangement can be handled by any

layman and is perfectly sufficient for the recording of phonograms on any existing telephone line.

The new telephonograph will even be found preferable in many cases to telegraphs, allowing as it does to transmit, in the place of some conventional signs, the incomparably more characteristic picture of the correspondent's voice. It moreover allows dispatches to be kept secret without the aid of any code. An additional advantage over ordinary telephones is the possibility of causing the apparatus to repeat as often as may be desired any telephone conversation caught only imperfectly.

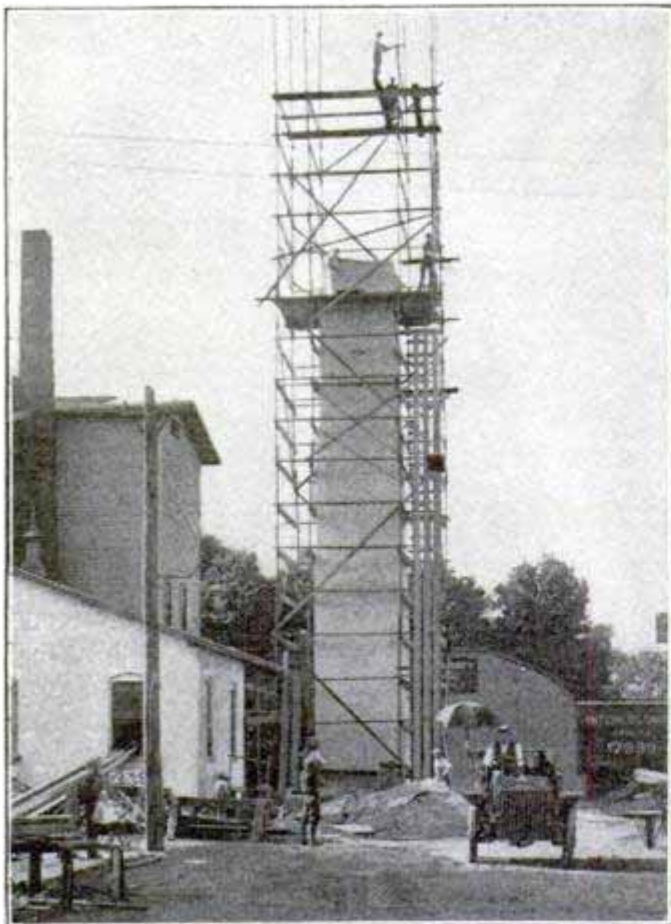
CHIMNEY BRICK LIFTED BY AN AUTOMOBILE

In building a new brick chimney, the McKinzie Milling Co., of Quincy, Mich., used the proprietor's automobile in raising the brick to the required heights on the staging. The lifting cable was passed through a pulley and attached to the rear axle of the auto-

mobile, the machine being run forward to elevate the lifting buckets and backward again to lower them. This method of elevating the brick and mortar was found much more rapid than with horse power.

JULIUS CAESAR FOUGHT RACE SUICIDE

A French investigator gives Julius Cæsar the credit for being one of the foremost anti-race-suicide propagandists. At least, in an article in a French scientific paper commenting on the futility of attempting to increase the birth rate of a nation by means of legislation favoring large families, this investigator cites the great Cæsar as one of the rulers who made such an attempt. Cæsar promulgated a law dividing certain of the Roman public lands between fathers of three or more children, giving them also many privileges denied unmarried men or childless men and women. A few years later, about 9 A. D., Emperor Augustus increased the privileges granted fathers of families by his distinguished predecessor. The mothers of families were honored in many ways, while childless married people and unmarried men were made to pay heavy taxes and were not permitted to inherit wealth except from their nearest relatives. The result of these drastic measures was almost the reverse of



An Automobile being Run Back and Forth as a Means of Lifting Brick and Mortar to the Top of a Chimney

what had been expected, for, as the unmarried people were not treated so harshly as those who were married but had no offspring, the people preferred to remain single to assuming the responsibility of raising families.

Louis XIV of France found it necessary to resort to giving pensions to the heads of large families, and exempted them from taxes in addition to granting other privileges. The promulgation of these laws resulted in so much fraud that they were repealed after 17 years' trial. There has been considerable agitation of the subject in France and other countries where the birth rate has become alarmingly low as compared with the death rate, and the drastic measures that have from time to time been proposed during the past few years brought up the discussion which led the French savant to an investigation of the subject.



This Bear has been Taught to Roller Skate in an Almost Human Manner

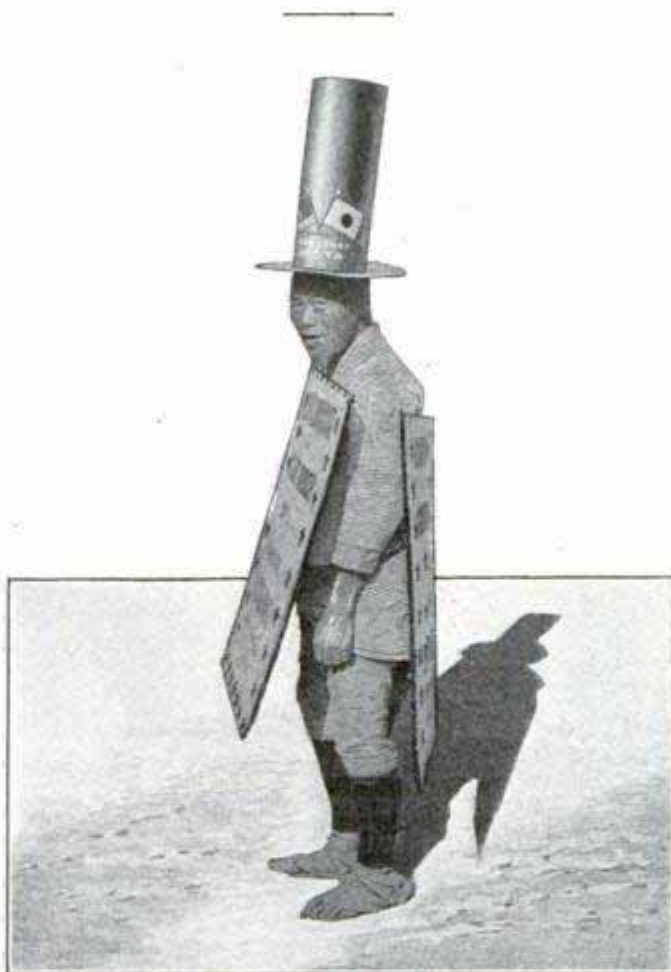
A ROLLER-SKATING BEAR

One of the amusing sights at one of the menageries in London is a large bear who enjoys roller skating with an almost human delight. His hind feet or paws are incased in strong leather shoes, to which the skates are attached. This bear has been a roller skater for some time, is quite proficient in the art, and looks less awkward on wheels than the average man just learning to skate.

HOTHOUSE GRAPES

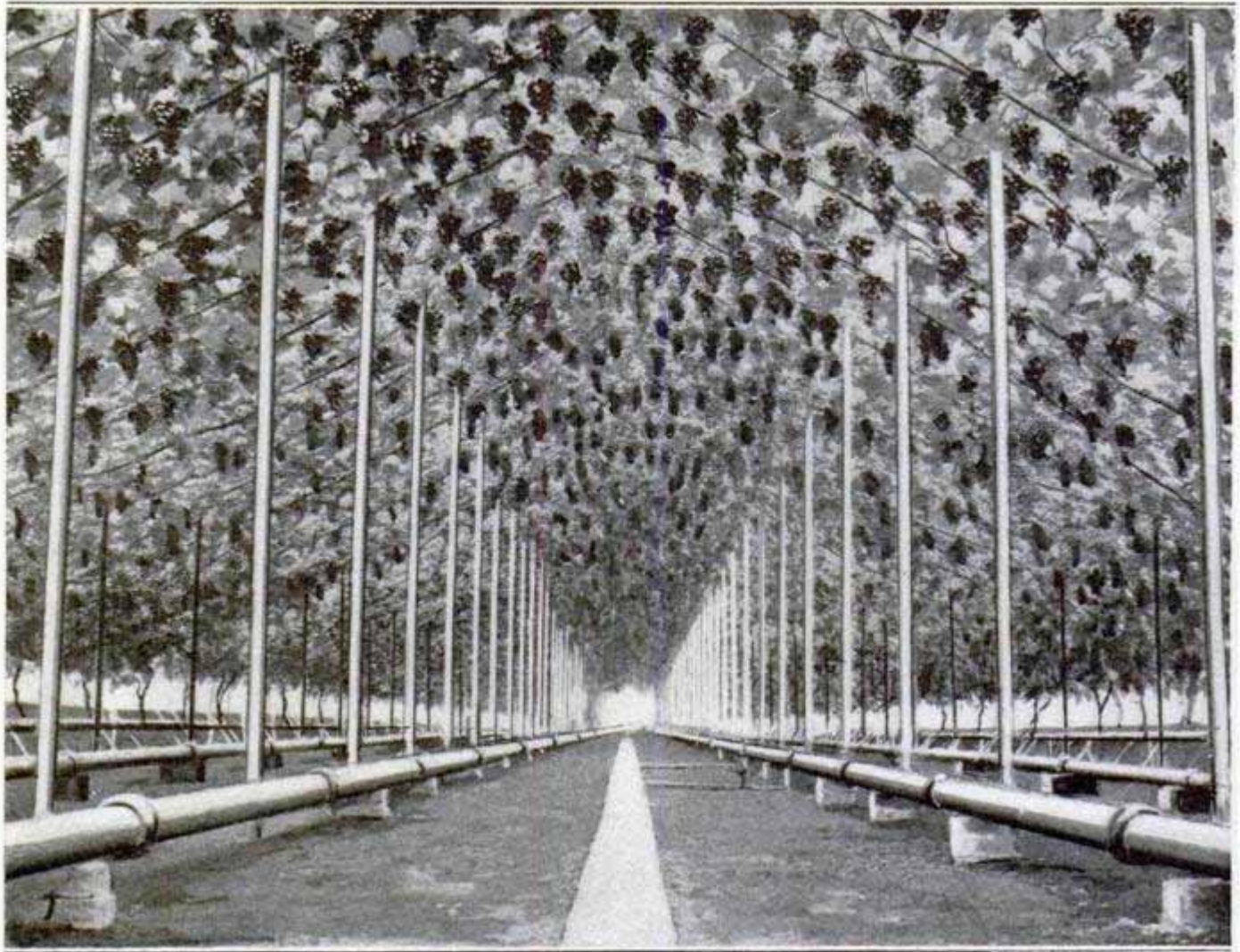
The hothouses in which the forced-grape industry of England is carried on, are chiefly built on the span-roof system, and vary in length from 100 to 800 ft., and in width from 20 to 40 ft. From four to six or eight rows of 4-in. piping are run through the center and along the sides of the houses, and the heating is done by horizontal tubular boilers.

The vines are usually planted 3 ft. apart at the sides of the house, one or



JAPANESE SANDWICH MAN

This Japanese sandwich man, in his quaint stovepipe hat, with crossed American and Japanese flags in its band, is advertising a bargain sale of a Japanese silk store in California.



English Hothouse for Raising Grapes

two leaders being trained up beneath the glass to the ridge pole. For the first three or four years no returns are expected from the vines, which are first established and grown to a good

size before they are allowed to bear. An excellent idea of the extent of a crop in such a forcing-house, after the vines have fully grown, may be gained from the illustration.

VARIATION IN SUN'S HEAT—THEORY NOW UNDER TEST

That the sun's heat varies and produces a corresponding fluctuation in the earth's temperature, is a theory on which Dr. C. G. Abbott, Director of the Astrophysical Observatory of the Smithsonian Institution, will shortly conclude an investigation covering six years. If the predicted results are demonstrated, there will have to be recorded a scientific discovery of the utmost importance, and one that will have beneficial effects on agriculture, long-distance weather forecasts, and in other lines of practical scientific work.

To complete the tests which have been and still are being made at the observatory in Washington (sea level), at

Mt. Whitney (three miles elevation) and at Mt. Wilson (one mile elevation), Dr. Abbott finds it necessary to establish a station in the cloudless region of southern Mexico. Observations then will be taken at the new station and at Mt. Wilson simultaneously, and if the two sets of measurements should agree, the conclusion will be proved. While the expedition will not set out for Mexico until definite assurances are received that peaceful conditions will be restored in the southern republic, work of preparation is already under way.

When the government scientists began to make these measurements, there was nowhere in the world any exact

scale of measurement of radiation, although physicists had been working in devising instruments for that purpose for about 60 years. Still there remained an uncertainty of 5 to 6 per cent in the scale of pyrheliometry, as it is called. Several instruments to be used as standards for that purpose have been devised, and during the past year the Astrophysical Observatory made a careful comparison of two of its instruments of the most improved type, and these agreed perfectly in fixing the scale of measurements.

This apparatus is used now as a standard by which to standardize other apparatus which has been sent around the world. The measurements at Mt. Wilson have been carried on for several years, observations being made daily for six months of each year since 1905. Simultaneously complete measurements were carried on in good weather on the summit of Mt. Whitney, which is the highest mountain in the United States. The results were absolutely the same at both points, as well as at Washington.

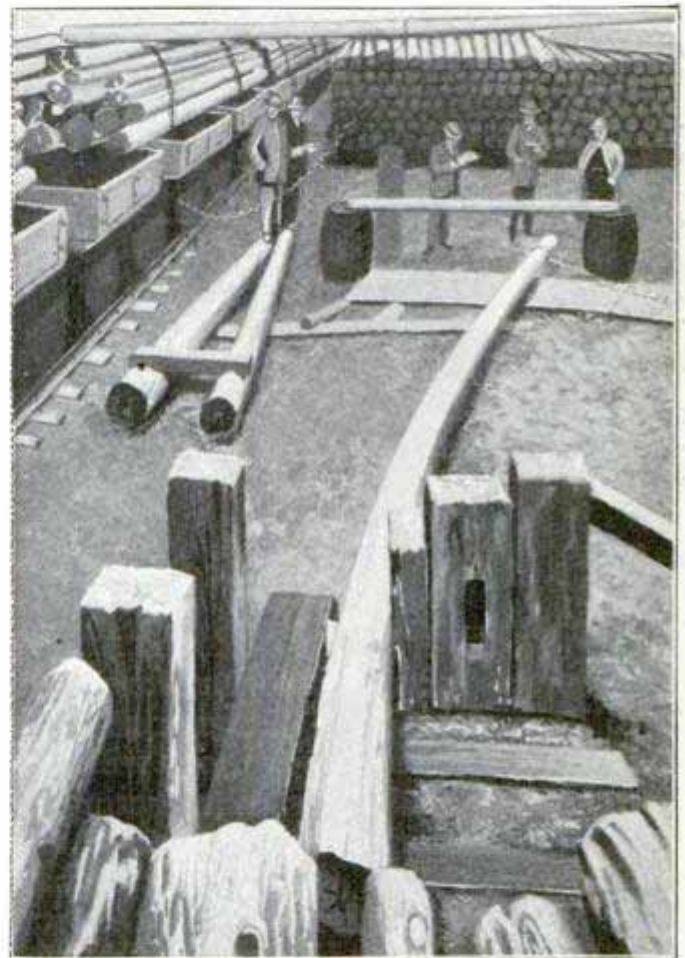
Having established a standard scale of measurement, the scientists are now able to state the value of the solar constant of radiation. This value is of an importance equal to that of the distance of the sun in astronomical work. Their results show differences in the value of the solar radiation (outside of our atmosphere) of about 8 per cent. Now by taking stations so far apart that no local condition in the atmosphere can affect them both, they may actually prove whether or not these variations are in the sun or are something that they have not eliminated in the atmosphere. If they find them in the sun, they will have made a discovery of the first rank.

It is clear that if the sun varies, the temperature of the earth must vary correspondingly, though perhaps not always the same at all stations, because the earth is so affected by the presence of water and mountains and the like that not all stations would behave alike; but yet the observatory officials are confident they will find a relation

between the radiation of the sun and the temperature of the earth that will be so important to the meteorological service of this country and abroad that undoubtedly this work will eventually be continued daily at several stations over the world if they succeed in proving the variation in the sun.

TESTING WOODEN POLES

One of the largest distributors of wooden telegraph poles in the world makes interesting tests of its poles to



Bending a Wooden Pole to Determine the Deflection It can Sustain

determine their ability to resist the pressures and strains which must be borne under practical working conditions. The illustration shows the test to determine the deflection a pole can sustain without cracking.

George G. Rockwood, the pioneer photographer who died recently in New York, began taking pictures 58 years ago. His records show that he photographed more than 350,000 persons.

A LADY'S WRITING DESK

This desk of mission style is a little more complicated than some of the



A Simple Design for a Lady's Writing Desk

other pieces of mission furniture that have been described, but anyone who has a fair knowledge of tools will not have much trouble in constructing it in the home workshop if the plans are carefully followed. Quarter-sawed oak is the best wood to use. Order the stock from the mill ready cut to length, squared and sanded. Following is a list of the stock needed:

- 2 front posts, 2 by 2 by 30 in.
- 2 back posts, 2 by 2 by 50 in.
- 1 bottom rail, $\frac{3}{4}$ by 3 by 31 in.
- 2 end rails, $\frac{3}{4}$ by 3 by 18 in.
- 1 stretcher, $\frac{3}{4}$ by 8 by $33\frac{1}{2}$ in.
- 2 end slats, $\frac{3}{8}$ by 8 by 15 in.
- 1 back slat, $\frac{3}{8}$ by 8 by $15\frac{1}{2}$ in.
- 2 back slats, $\frac{3}{8}$ by 3 by $15\frac{1}{2}$ in.
- 1 front drawer rail, $\frac{3}{4}$ by $1\frac{1}{4}$ by $31\frac{1}{4}$ in.
- 2 side drawer rails, $\frac{3}{4}$ by 3 by $18\frac{1}{4}$ in.
- 1 drawer front, $\frac{3}{4}$ by 6 by 30 in.
- 1 desk lid, $\frac{3}{4}$ by 18 by $31\frac{1}{4}$ in.
- 1 desk board, $\frac{3}{4}$ by $19\frac{1}{4}$ by $31\frac{1}{4}$ in.
- 2 end boards, $\frac{3}{4}$ by 19 by $21\frac{1}{4}$ in.
- 1 top board, $\frac{3}{4}$ by 10 by 34 in.
- 1 top back board, $\frac{3}{4}$ by 5 by $31\frac{1}{4}$ in.
- 1 back board, $\frac{3}{4}$ by 30 by 22 in.
- 2 drawer sides, $\frac{1}{2}$ by 6 by $19\frac{1}{2}$ in., S. W.
- 1 drawer end, $\frac{1}{2}$ by 6 by 29 in., S. W.
- 1 drawer bottom, $\frac{1}{2}$ by 18 by 29 in., S. W.
- 2 pieces for pigeon holes, $\frac{3}{8}$ by 7 by 23 in., S. W.
- 8 pieces for pigeon holes, $\frac{3}{8}$ by 4 by $6\frac{3}{4}$ in., S. W.

Start with the back posts, being sure they are square and of the right length; place them side by side and lay out the mortises for the lower rails, the desk rails and the top back boards, as shown in the accompanying detail drawing. Lay out the front posts in the same manner. Cut the tenons on the ends of the rails to fit the mortises in the posts. Also cut mortises in the rails for the back and end slats. The end rails have a mortise in them for the tenons on the ends of the foot boards. Clamp the ends of the desk together, with the end rails in place; then fit the side boards. Bore holes through the posts into the side boards for dowels as shown. After the dowels are in place the holes can be plugged.

Cut and fit the top back board, the bottom rail, the back board and the stretcher.

Cut the top and desk boards

at the back corners to clear the posts. The top board is to be fastened to the side boards with blind screws. The back board is fastened to the posts with dowels as shown.

When all the parts fit square and tight they can be glued together. The ends of the desk should be glued up first and left to dry, then the other parts put in place and glued. When clamping the parts together see that they fit perfectly square and tight. While the glue is drying the drawer can be made. The front board is made of oak, but the other parts may be made of some soft wood. The side pieces are mortised and glued to the front board. The end and bottom boards can be nailed together.

The drop lid of the desk is made as shown. Two or more boards may have to be glued together for the lid, the desk bottom and the back board. The

lid is fastened to the desk board with two hinges, and it should be so arranged that when closed it will be even with the sides. Brackets or chains are fastened to the inside to hold it in the proper position when it is open. Small blocks of wood fastened to the inner edge of the side boards will prevent it from closing too far. A lock, if desired, can be purchased at a hardware store and fitted in place. Suitable handles for the drawer should also be provided.

When the desk is complete go over it with fine sandpaper and remove all rough spots. Scrape all glue from about the joints, as the finish will not take where there is any glue.

The pigeonholes are made from $\frac{3}{8}$ -in. stock. They may be tacked in place after the desk is finished.

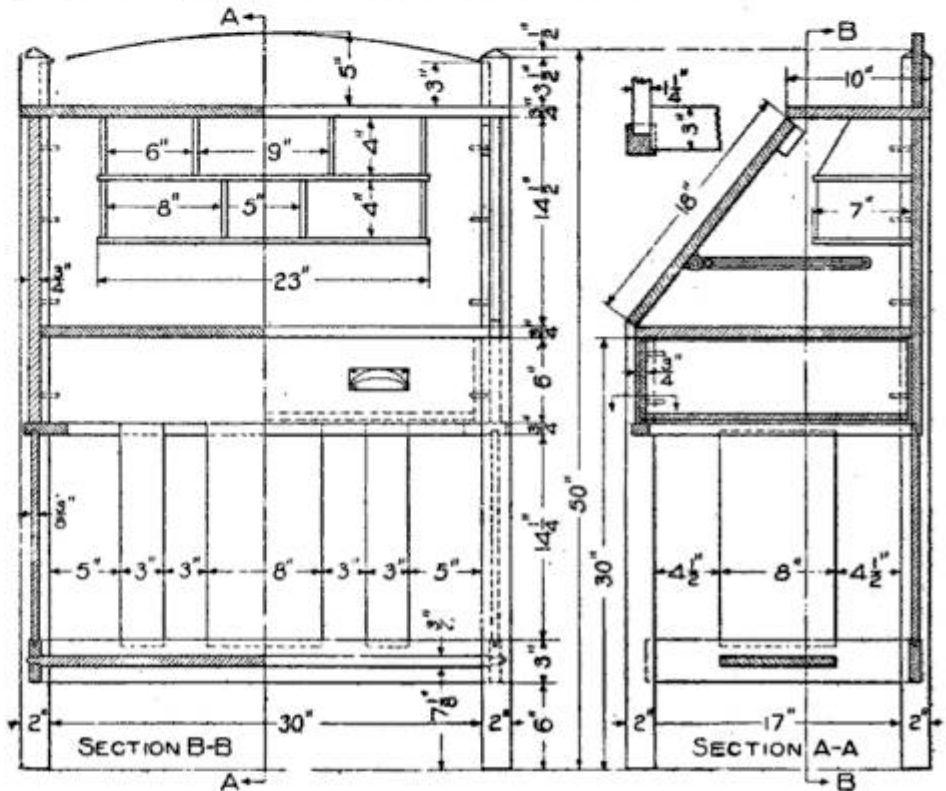
The finish can be any one of the many mission stains supplied by the trade for this purpose. If the desk is well made and carefully finished it will have a very neat and attractive appearance.

SH! ELECTRIC LIGHT FROM SALT AND WATER

The Electrical World tells of a mysterious man at Mansfield, Arkansas, who, according to a local newspaper account, has discovered a method of producing electricity for electric lighting from salt and water.

The newspaper account clothes him with all the secrecy and mystery of an inventor of the melodrama. The newspaper states that the inventor is a stranger who came to the town about a year ago and has shrouded himself in mystery, living in a house on a neighboring mountain and rarely being visible. The newspaper account proceeds as follows: "Then one day Brice came down to the village post office,

where he mailed a number of letters. A week or so later mail began arriving at the post office for him in large quantities. This fact soon became known, and the entire village wagged with gossip as to Brice, the strange lights in his home and the mystery in which he kept himself clothed. Finally aristocratic-looking men began arriving in Mansfield quite frequently and they journeyed at once to Brice's home. At

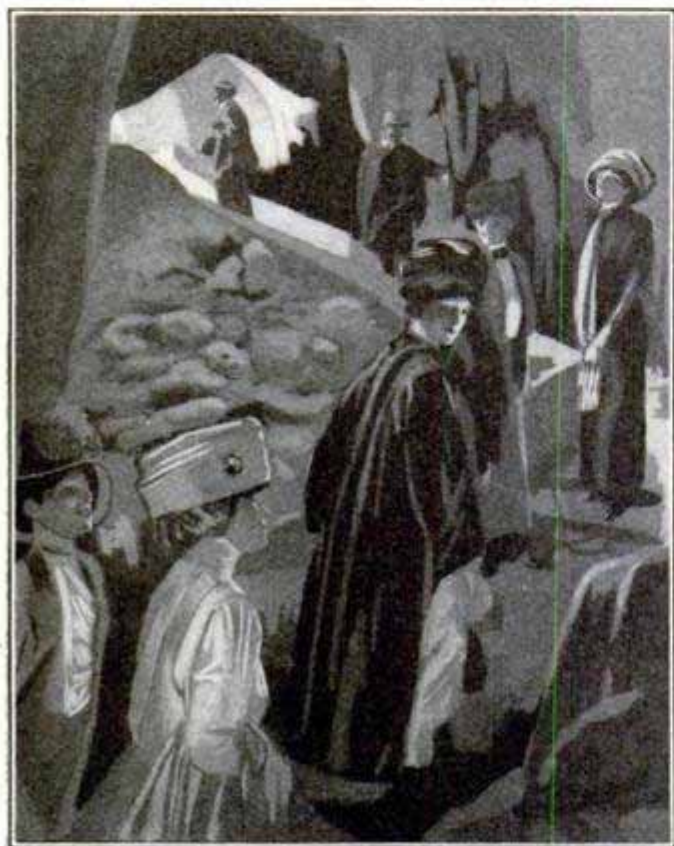


Details of Lady's Writing Desk

night the villagers were amazed to see a constant switching on and off of the lights in the Brice home on the mountains. The electricity made by Brice's system makes a better light than the present electricity. It can be made 75 per cent cheaper than the present kind. The most remarkable part of it all is that the electricity is perfectly harmless, except that a charged wire will burn. However, it produces no shock and can be handled with perfect ease and without danger, except that to come in contact with it will have the same result as placing one's hand on a red-hot iron. Brice refuses to reveal his secret, declaring that already a plan is on foot to rob him of his invention. However, it is known that an effort is now being made to place his invention on the market and that a gigantic company is in process of organization."

ROBBER'S CAVES FORM HOTEL ENTRANCES

The hotels of Sorrento, on the Bay of Naples, Italy, are on the fringe of low precipitous cliffs which are honey-combed in part with natural caves, once



Courtesy The Graphic, London

Cave Entrance to a Hotel on the Bay of Naples

said to be the abode of robbers. Travelers are landed from the steamers in hotel boats, and pass up through these caves and excavated passages to the hotels.

THE CURRENTS OF THE UPPER AIR

The study of the natural laws governing air currents is just now absorbing the attention of airmen all over Europe. An English investigator, in a recent lecture before the Aeronautical Society stated the following facts which he had observed: On an island, the wind has a greater velocity a few hundred feet above the ground. Above 2,000 ft., an easterly wind does not increase much. A southwesterly or westerly wind increases even between 2,000 and 3,000 ft. A wind that is southeasterly in the

stratum near the earth veers to south or even southwest at a short distance from the ground. A northerly wind sometimes changes direction higher up, becoming northwesterly. As a general rule, for other winds than northerly, a change in direction of two points on the compass (one point equals an angle of $11\frac{1}{4}^\circ$, the compass having 32 points) and a doubling of the velocity may be expected between the ground and an altitude of 3,000 ft., excepting on warm, sunny spring and summer days, when the currents mix and become equalized.

The English journal *Flight* adds the following facts: The limits between which a 20-mile wind varies are 15 miles and 25 miles. The time interval between variations may be less than four seconds, as many as 17 changes in one minute having been observed. These variations affect not only the velocity but also the direction. One has not been able, however, to find any regular coincidence of the changes in direction and velocity.

Flug-Zeitschrift, published at Vienna, gives an account of similar investigations, the results of which, in the main, correspond with those obtained in England. In this journal an attempt is made to explain the phenomena as being caused by the earth's rotation and by obstructions on its surface.

A writer, in *L'Aéro*, recounts similar experiences reported by French airmen who also call attention to sudden gusts of wind in a vertical direction, whereby the aviator may be suddenly elevated 70 to 80 ft., and as suddenly brought down again, or vice versa. The changes in the horizontal plane are not much feared by experienced airmen, but they often precede and give warning of a gust in the vertical direction, and the aviator should be on his guard.

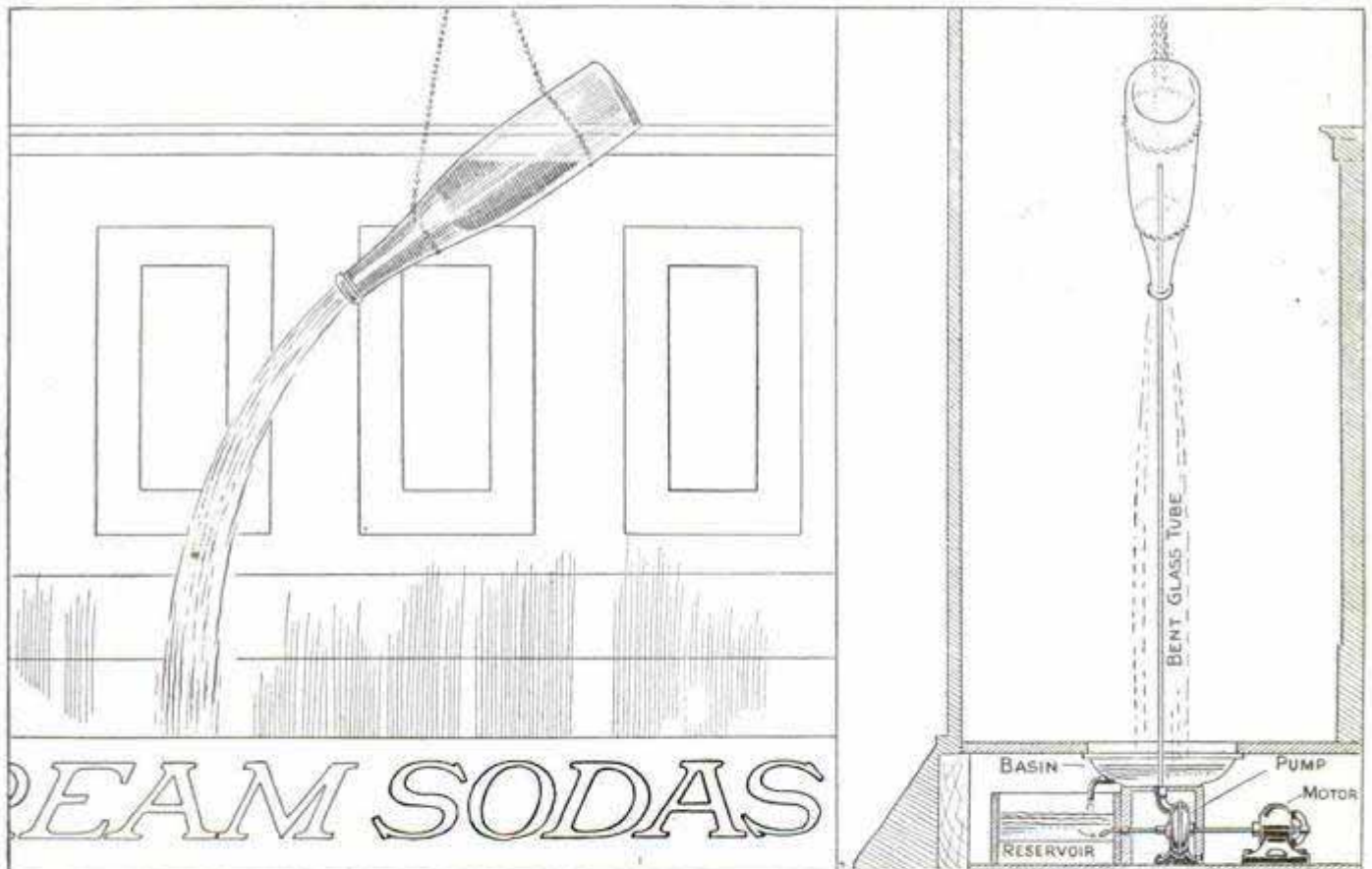
☞ First prize has been awarded American plows by the managers of the international exposition held at Bangkok, Siam, during the month of April, 1911.



Endless Supply of Liquid Flowing from a Bottle

An interesting advertising object as well as a center piece for a show window for a drug store or candy shop is a bottle with an apparently inexhaustible supply of liquid flowing from it, without any visible source. The bottle

out. A small centrifugal pump is run by a small motor concealed under the base of the platform. This pumps the liquid back into the bottle through a small tube. The liquid in leaving the bottle flows down the outside of the



Continuous Flow of Liquid and Device to Keep Bottle Full

is suspended by wires or a chain in an inclined position. If used in a candy shop or ice cream parlor, grape juice can be used for the liquid. The exhibit will attract a large crowd and create a great deal of speculation as to its mysterious source of supply.

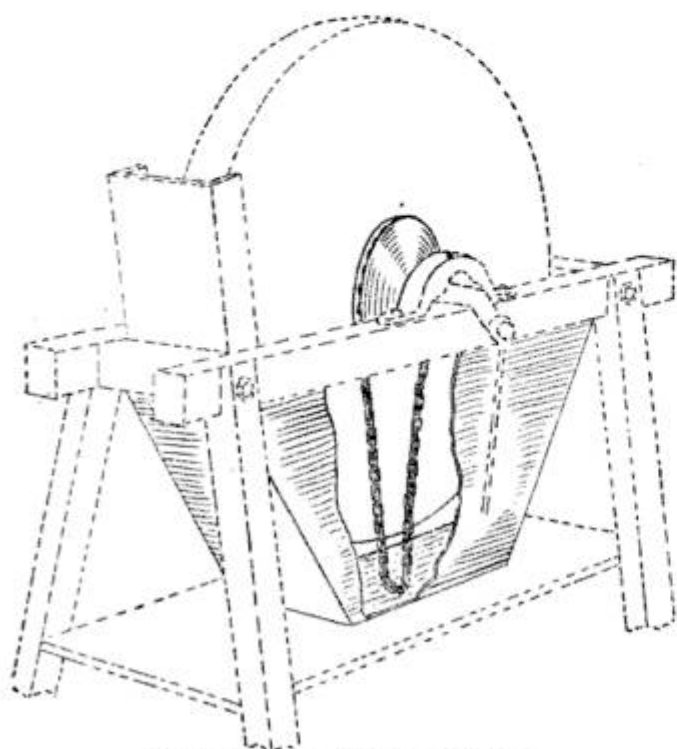
The bottle is suspended over an apparatus shown in the sketch which keeps it filled as fast as the liquid runs

tube into the basin, thus concealing the position of the tube by the opaque color of the fluid. If an opaque bottle is used, the illusion is perfect.—Contributed by Morgan Larsen, Brooklyn, New York.

☛ Malleable cast iron is made by heating ordinary castings for a number of hours in contact with oxide of iron.

Wetting a Grindstone

Grindstones are frequently made so as to have the lower edge run in water in order to obviate the necessity of



Chain Throws Water on Stone

pouring water on the face. When the stone is not in use, the lower part is always in the water, usually at the same portion of the circumference, which soon softens and wears out of true.

When the grindstone is set up, bolt a disk of wood against the stone. The wood should be of sufficient thickness to allow a narrow detachable-link chain to run over its circumference. Fasten a flange of tin or sheet iron against the board to keep the chain running in place and attach a water trough under the stone, so the water level will not touch its surface. The chain runs in the water at all times, and carries the water to the surface of the stone.—Contributed by C. R. Poole, Los Angeles, Cal.

Putty is composed of dry whiting and raw linseed oil. For glazing, add about 10 per cent of white lead to increase durability. In hot climates a little cotton-seed oil should be added to prevent the putty from drying too quickly.

How to Spread Fertilizer

Fasten a common rotary blacksmith's blower to a small hand sled and attach a 6-ft. length of 2½-in. rubber hose to the delivery pipe. Make a hopper of an old can and attach it so as to feed the fertilizer into the side opening of the fan. The slight vibration of the turning fan will work the fertilizer into the fan wheel. The air current will force it out through the rubber hose. The device is worked by two men, one man handles the hose while the other turns the fan. A horse is used for drawing the sled over the field.—Contributed by J. W. Bauholster, Gresham, Oregon.

An Electric Vacuum Cleaner

The principle on which many vacuum cleaners operate is the setting in motion of a large volume of air, and the efficiency of such cleaners is proportional to the volume of air set in motion rather than to the degree of vacuum created. The air being in motion carries with it dirt and dust which are subsequently sifted or screened from the air.

If a box is constructed and an ordinary electric fan placed so that the fan rotates in an opening in one end, the chief essential part of the cleaner will be completed. In Fig. 1 is shown such an arrangement. The other end

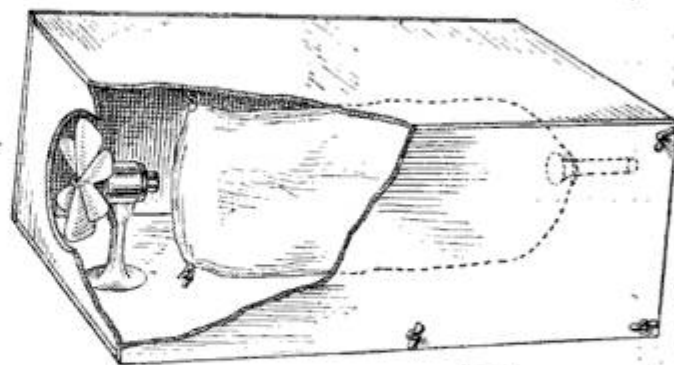


FIG. 1

Fan in End of Box

of the box should have a funnel shaped inlet as shown in Fig. 3. A bag is made of cloth, preferably cheesecloth, and tied around the neck of the funnel, the other end being fastened in the box

with screweyes turned into the sides just back of the motor.

As it is necessary to remove the bag for cleaning, one end of the box should be fastened with carriage bolts and thumbscrews as shown in Fig. 2. All joints should have a strip of chamois skin or other soft material placed in them so that little or no air enters the box except through the orifice in the end provided for the passage of the dirt and dust.

When the motor is started, the fan tends to create a vacuum in the box, but the air rushes through the opening in the end of the box, carrying with it dirt and dust which are kept in the bag while the air passes through the cloth. A good electric fan costs

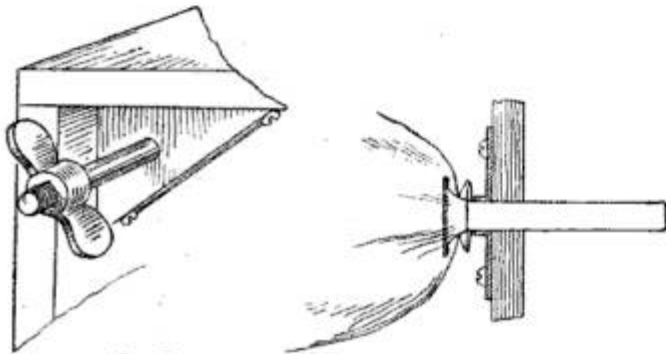


FIG. 2
FIG. 3
Joints and Air-Tube Connection

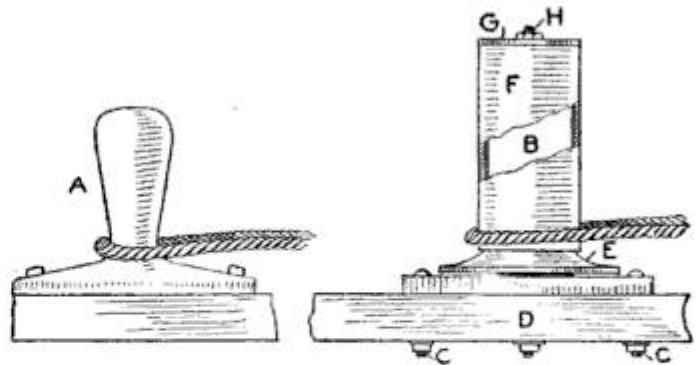
very little in comparison to a vacuum cleaner.—Contributed by J. E. McIntire, Watsonstown, Pa.

Tie Post for Wharves

Owing to the friction between the ropes and the iron posts when the design shown at A in the sketch was used, a new line had to be supplied every day, which made it quite an expense. A scheme was successfully carried out by a ferry company which reduced the repairs to a very low figure.

A post was made as shown in the second figure, in which B is a straight iron post bolted at C to the wharf D. A collar, E, is riveted to a plate, F, which fits around the post B. On top of the post is a disk, G, held by a bolt, H, which allows the part F to turn and remain in place. When the line is

thrown over F and resting on E to tie up the boat there is no appreciable



Two Forms of Posts

friction on the line.—Contributed by Maurice Baudier, New Orleans, La.

Angle Faucet Fitting

Finding it necessary to connect a large tubing to a small hose connection at a certain angle and not having a proper fitting, I cut off a portion of a worn-out faucet as shown on the line AB, Fig. 1., and placed on the hose connection at the desired angle, securely soldered to make a satisfactory job as shown in Fig. 2.

To secure it at the proper angle before soldering, wedges of brass or copper wire were driven in tightly between the hose connection and the faucet end, as shown in Fig. 3. The other end of the faucet section was plugged with paper to prevent the solder from running where it was not wanted. The hose connection was

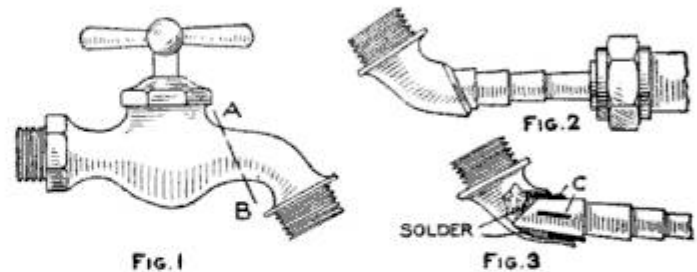


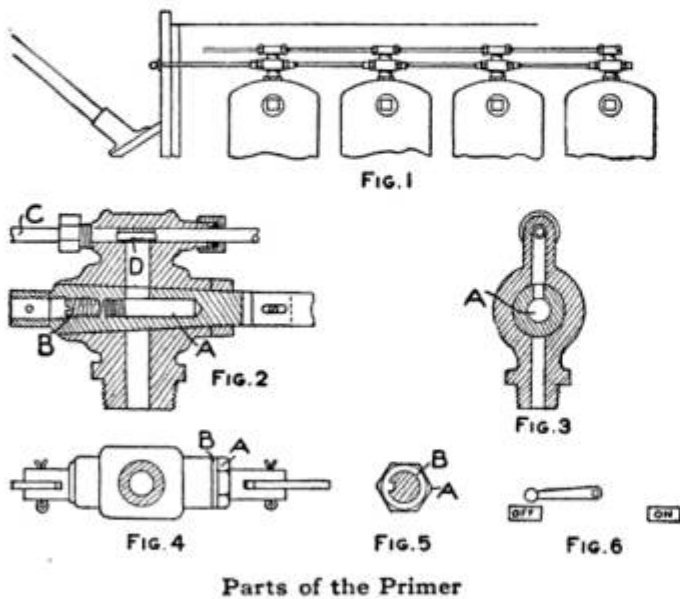
FIG. 1
FIG. 2
FIG. 3
Parts of Old Faucet

tinned before it was placed in the faucet section.—Contributed by J. M. Kane, Doylestown, Pa.

☞ A good polish for woodwork is a mixture of 2 parts copal varnish, 1 part gum arabic, 5 parts of shellac cut in 100 parts alcohol and thoroughly mixed.

Primer for Automobile Engines

A primer is almost indispensable for the owner of an automobile, especially in cold weather. The method of install-



Parts of the Primer

ing a primer in a machine is shown in Fig. 1. A cross section of the primer and the method of connecting the parts are shown in Figs. 2, 3 and 4. In this way any number of cylinders may be connected.

The gasoline supply comes through the pipe C and enters the small chamber A through the opening D. This keeps the chamber A filled at all times. The action of throwing over the small crank shown in Fig. 6 causes the charge to be turned into the cylinder. The amount of gasoline may be adjusted by the small screw B. The nut and washer A and B, Figs. 4 and 5, are used to keep the cone-shaped valve in place.—Contributed by D. H. Fairchild, Pana, Ill.

Friction Hold for Drilling

A piece of metal of such a shape that it is hard to hold and too small to bolt on a drill-press table makes a difficult thing for drilling. Such a piece of metal can be kept from turning by placing a stiff piece of paper or emery cloth between it and the table. This method is very effective.—Contributed by H. W. Hankin, Troy, New York.

Concrete Mixtures

A rich mixture is composed of 1 part cement, $1\frac{1}{2}$ parts sand and 3 parts gravel or crushed stone. This mixture should be used for structural parts where water is to be kept from columns and other parts subjected to high strain.

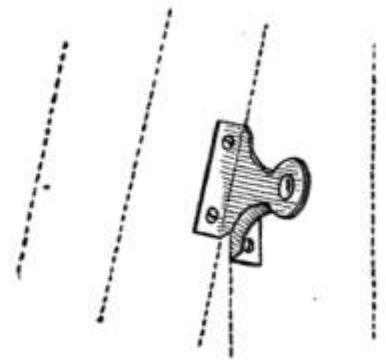
A standard mixture is composed of 1 part cement, 2 parts sand and 4 parts gravel. This should be used for machine or engine reinforced foundations subject to vibrations, for reinforced beams, columns, arches, floors, and for watertight work such as tanks, conduit sewers, etc.

A medium mixture consists of 1 part cement, $2\frac{1}{2}$ parts sand and 5 parts gravel. This mixture is used for ordinary floors and machine foundations, piers, thin foundation walls, abutments, retaining walls, sidewalks and heavy wall sewers.

A lean mixture is composed of 1 part cement, 3 parts sand and 6 parts gravel. This mixture should be used only for unimportant mass work, heavy walls, backing stone masonry and for large foundations supporting a stationary load.—Contributed by G. M. Peterson, Buffalo.

Repairing a Mirror Friction Hinge

The mirror and frame on a dresser and chiffonier very often come loose from the standard and then the friction hinge will break. As it is hard to procure these hinges, I make them from shade-roller brackets. The ends having the holes for the roller pins are riveted together to make a hinge joint and their bases are fastened to the mirror frame and standard as shown in the sketch.—Contributed by Jos. L. Schriek, Portsmouth, O.

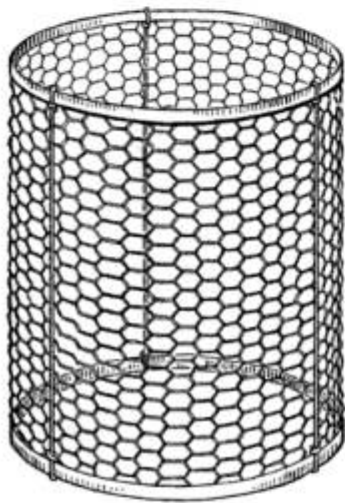


Drilling Deep Holes

When drilling deep holes with a twist drill the cutting edge should be ground so that the point will be a little out of center. This will make one cutting edge longer than the other, thus causing the drill to make a trifle larger hole. This gives clearance to the drill.

Wire Firebox for Burning Papers

A firebox for burning waste matter should be in every yard, providing no city ordinance prohibits the burning of refuse on personal or public property.



The box can be made by any boy. Procure two iron hoops from a barrel and attach to them a piece of poultry wire 24 in. wide for depth. Three stout braces of heavy wire or straight pieces of iron can be

interlaced through the wide meshes to support the wire on the sides. To attach the wire at the top and bottom hoops cut the wire and fasten the edges securely with short pieces, using a pair of pinchers to square the ends and bend under all projecting points.

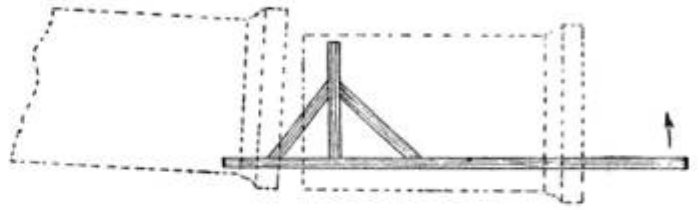
While this is useful for its original purpose, it also offers a good suggestion for making a pretty flower trellis. Fill the center with red salvia and surround with myrtle or ivy.—Contributed by Margaret S. Humphreville, Mount Pleasant, O.

Laying Terra-Cotta Sewer Pipe

Much time and labor can be saved in laying terra-cotta sewer pipe by using the device shown in the sketch.

The base is a piece of wood about 5 ft. long and 1½ in. square. These dimensions of course will vary with the size of the pipe used. On this is

fastened another piece of wood about 21 in. long and 1½ in. square. Two



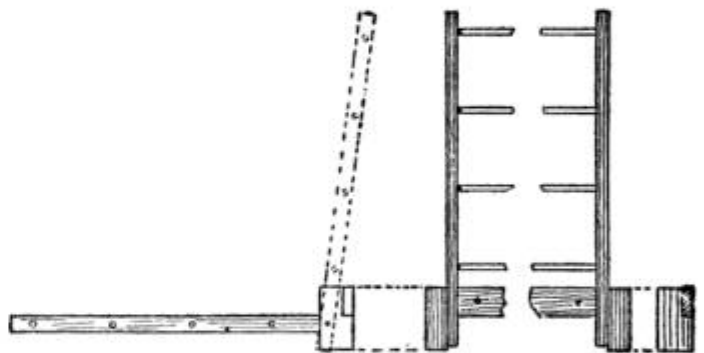
Lever for Lifting Tile

braces are attached as shown in the sketch.

To use this device it is only necessary to lift the stick by the long end and push the pipe in with the knees. I have seen one man lay 36-in. terra-cotta pipes with ease by means of this little device.—Contributed by Gilbert A. Wehr, Baltimore, Md.

A Wall Clothes Rack

The towel or clothes rack shown in the sketch has the advantage over the ordinary kind that it is always ready for use while it is out of the way when not in use. The main arms are 17 in. long, 1 in. wide and ½ in. thick. Four bars are fastened in holes bored in the arms at equal distances apart. The holder for the arms is made of a piece of wood, 2 in. wide, ½ in. thick and as long as the space will allow for the rack. Two blocks, 5 in. long, 2 in. wide and ¾ in. thick, are fastened to the ends of the strip as shown in the sketch. The arms are pivoted to these

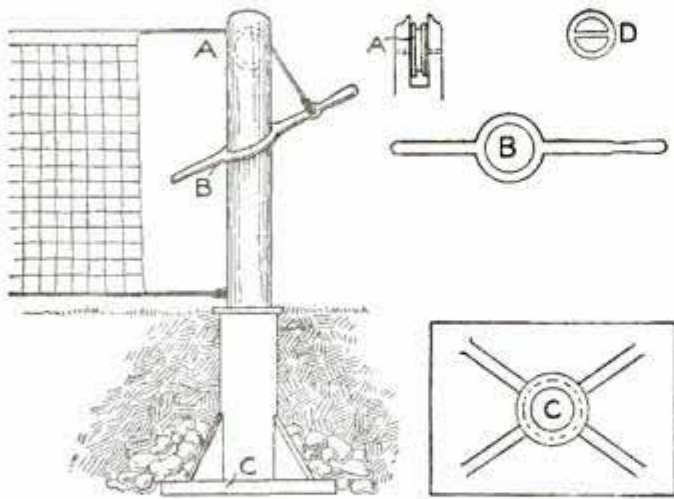


Rack Turns Back Against Wall

blocks by driving a large nail through the end of each arm and into the block. When the rack is not in use, it is turned back against the wall.—L. R. Buzzell, Malden, Mass.

Removable Lawn-Tennis-Net Pole

The net pole shown is especially adapted to country places where a tennis court is wanted with the least possible



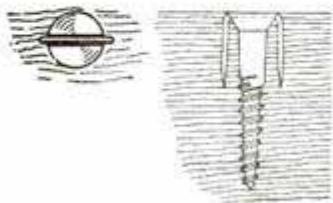
The Post and Its Parts

delay and where it is desired to have a lawn without obstruction for mowing or rolling purposes, says the Field.

The lower end of the post is set in a box which is solidly embedded in the ground. This box C has a large flat base which is covered with earth and stones and well tamped. The pole has an attachment for tightening the net. The stretcher B is made to slip over the pole loosely and when the net is taut, the lever is canted up at an angle. In the upper end of the pole there is a slot in which is fitted a grooved pulley, at A. A cover, D, is provided to place on the opening over C, when the post is removed.

Locking a Wood-Screw

A simple way to prevent a wood-screw from working loose is to drive

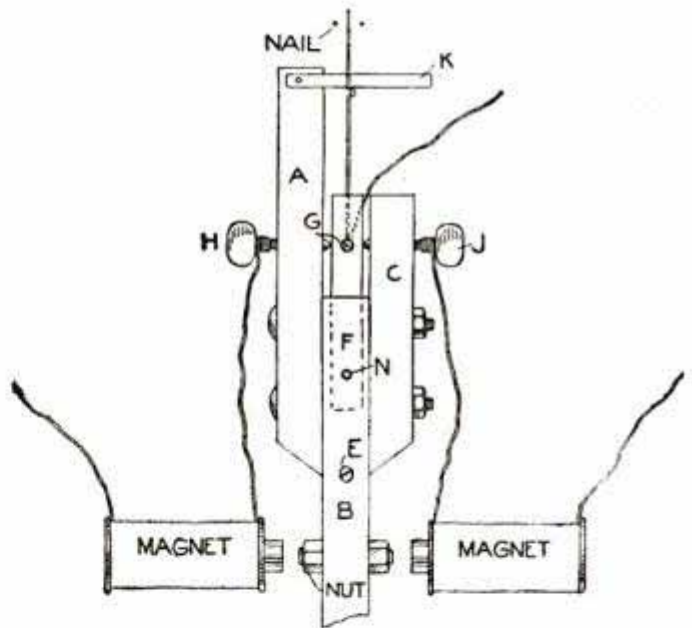


a small staple, such as used for tacking screen wire or matting, over the head so that the straight top will enter the slot cut in the screw head. In places where the wood is liable to shrink, this method is quite satisfactory.—Contributed by Irl R. Hicks, Hallsville, Mo.

An Electric Sign Flasher

The arrangement for alternately flashing the lights on our firm name and the name of our business I made principally of wood binding strips used for fastening windows in the frame. The pieces A, B and C are fastened securely together with two bolts. The piece B is about 6 ft. long and has a small weight fastened to the lower end and is pivoted on a screw E which is turned into the wall.

The piece F is 6 in. long and is fastened on the back of B with a screw, N, so that its upper end can move from A to C and vice versa. In this piece a screw, G, is fastened so it will come in contact with the thumbscrew ends H and J alternately. In the top end of F a hatpin is driven to form a spring which strikes two nails alternately, as the piece B swings.



Details of Flasher

When the piece B swings, it causes the hatpin to strike first one and then the other nail, causing the screw G to touch first the end of the screw H and then J, and so on, making contact for the electric current to travel through one magnet and then the other. The magnet attracts the metal of the nuts placed on the sides of B. The strip K is made of metal and fastened loosely on the upper end of the piece A. The outer end lies on a bend in the hatpin. This holds the screw G in close contact

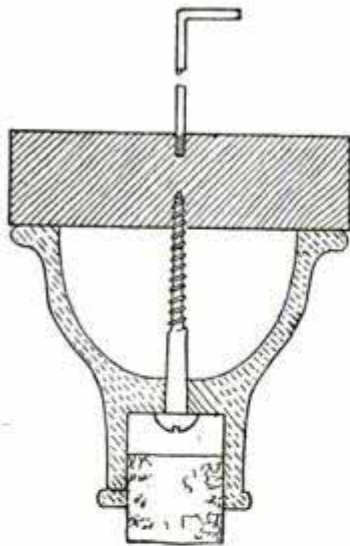
until it is driven to the other side. The electric connections are shown. The flasher when started will run continuously as long as the current is applied.—Contributed by Ralph Edwards, Spencer, Ind.

Face Lotion for Mechanics

A good lotion for removing grease and dirt from the face and hands can be made according to the following formula: To 7 oz. of pure alcohol add 1 oz. of glycerine and a drop or two of camphor. This not only dissolves the grease, but reduces the size of the pores in the skin thus preventing the muddy appearance of most mechanics. The solution is quite harmless. In cold weather it will prevent cracked hands if used after washing.—Contributed by Loren Ward, Des Moines, Iowa.

Substitute for a Flush-Box Release Ball

The rubber release ball in my toilet flush-box became unserviceable and had to be replaced. For a substitute I removed the rubber from a cheap plumber's force pump and fastened it with a brass screw to a circular piece of painted wood. A cork was fitted in the place where the handle was removed. This works as well as the original ball.—Contributed by Lloyd G. Miller, Chicago.

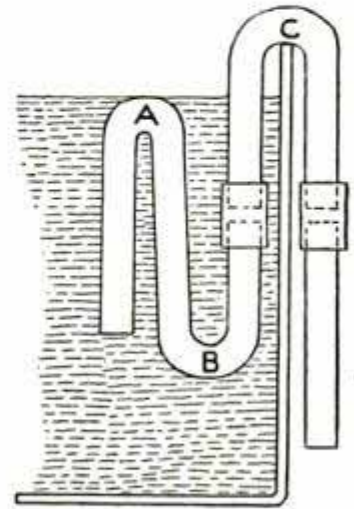


ⒸTack an old sack or other piece of cloth on the top of the door frame so that it will drag over the back of cattle as they enter, and it will keep most of the flies out of the building while milking.

Self-Starting Siphon

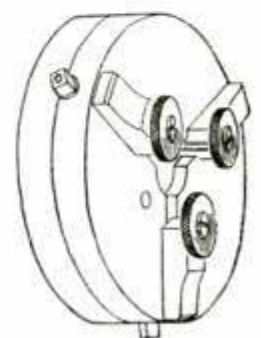
The little siphon shown in the sketch has proved very useful in laboratory work in siphoning certain solutions such as sulphuric acid or nitric acid when it would be dangerous to start the siphon by the usual method of sucking until the tube is full.

If made of one piece of glass tube, so much the better, although I have found it easier to use two or three pieces connected with rubber. The ratio between the lengths of A-B and B-C must be about as four is to five. To begin with, the solution must be high enough to cover the first bend, then according to the law that a liquid always seeks its own level, one would suppose that it would enter the tube and settle at a point between B and C. However, the kinetic energy produced by the falling of the liquid from A to B is sufficient to force it up over the bend C. From there it simply falls and the siphon is in running action, having started automatically.—Contributed by Willis H. Cole, Brooklyn, N. Y.



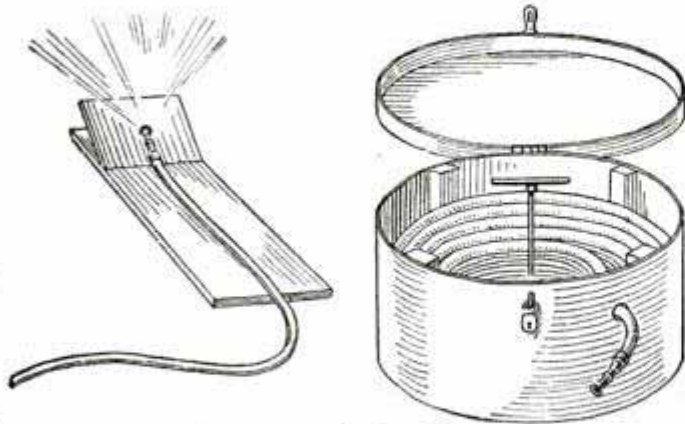
Knurls Attached to a Chuck

A novel way of using knurls is shown in the sketch. The knurls are attached to the jaws of a three-jaw universal chuck with small studs made to fit the holes in the knurls. When not in use, they can be removed.—Contributed by John M. Newbig, Brooklyn, N. Y.



A Hose Holder

The first sketch shows a sprinkling device for a hose. It is made of a base-board about 2 ft. long to which is at-



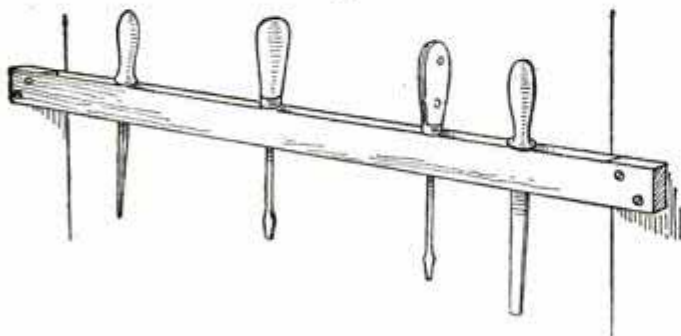
Sprayer and Hose Box

tached a 6-in. piece of board at an angle of 45 degrees. The force of the water striking the angle board spreads it in a spray several feet in each direction.

The holder is made of a common cheese box with the bottom knocked out. The cover is hinged and provided with a hasp and staple for a lock. The box is placed over a hydrant where the hose is connected and staked to the ground with four pieces of 2 by 2-in. material. The hose can be coiled in this box, which can be locked.—Contributed by Hazel Duncan, Denver, Colorado.

File or Screwdriver Holder

A very convenient file or screwdriver holder may be made of two strips of sheet metal spaced with a 1/2-in. block



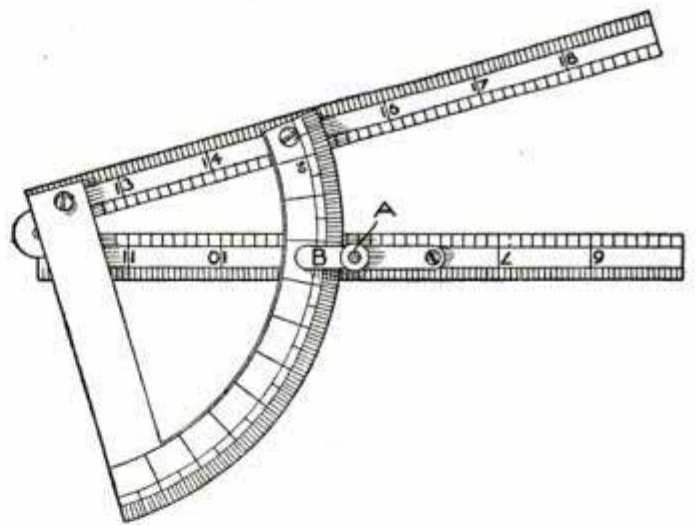
Sheet Metal Strips across Window

at each end and fastened across a window or opening as shown. Files or screwdrivers placed in this holder

are always in plain sight and the desired tool can be quickly found and easily taken out. The holder can be fastened to a wall by placing a piece of wood on the back of the strips.—Contributed by A. Lester Shipton, Watertown, Mass.

Homemade Arm Protractor

As I had a large number of winding courses to plat, it became necessary to have an arm protractor, and not being able to afford such an instrument I made one of a 10-cent pocket rule and a protractor. The protractor was fastened to the rule with screws taken from discarded electric light fixtures and the clamp was made of a binding-post, A, taken from an old battery, and a strip of brass B. The protractor was cut off so that it did not quite reach the outer edge of the rule and was



Carpenter's Rule Used for Arms

fastened on so that the 90-deg. line coincided with the inner edge of the rule. The angles were read against the inner edge of the arm. Either arm can be used against the T-square, as the rule is thicker than the blade of the T-square, which allows the projecting end of the protractor to pass over it. When the protractor is set the same angle can be ruled on either side of the 90-deg. line without changing it over.

The ends of the rule were cut off at the first joint as the hinge made a projection that would not allow the instrument to lay flat. This made the

arms only 6 in. long, but did not prove a drawback, as the line could be produced by sliding the T-square up and moving the instrument along until the lines coincided.—Contributed by F. G. Carscallen, E. Las Vegas, New Mexico.

Forcing Out Obstruction in a Drain Pipe

Instead of sending for a plumber or borrowing a force pump from a neighbor, I use the top of an ordinary pot in a sink when the outlet becomes obstructed. When the drain pipe is stopped the sink fills with water and I take the top of the pot and place it over the opening and quickly give it a hard pull upwards. The suction created is sufficient to clear the pipe.—Contributed by B. A. Taylor, Halifax, Nova Scotia.

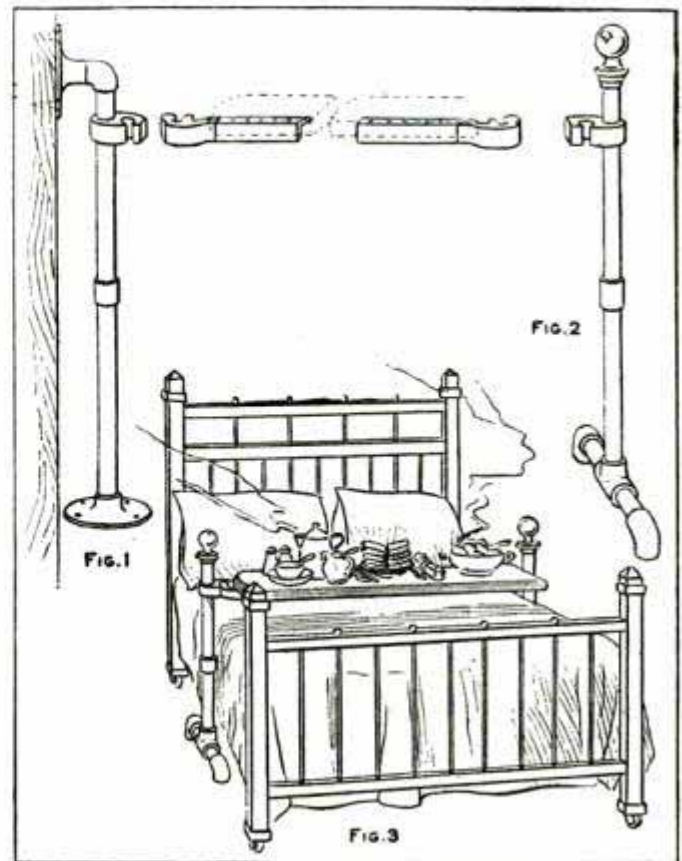
Keeping Squirrels out of Trees

The device shown in the sketch is used to keep squirrels from climbing trees and destroying the nuts. It is made of heavy tin or sheet metal fastened together with stove bolts after it is in place on a tree trunk. The device also prevents small boys from climbing a tree.—Contributed by Chas. M. Horsfield, Kansas City, Mo.



Use for Old Iron Beds

The illustration shows how a part of an old iron bed, or one that has been through a fire can be utilized for an ironing-board stand, all of which can be placed in a closet when not in use. All that is necessary is to thread the ends of the legs and add an extra length of pipe, using a coupling to connect them and employing three elbows and two floor plates, all of which are shown in position in Fig. 1.



Ironing-Board and Table Supports

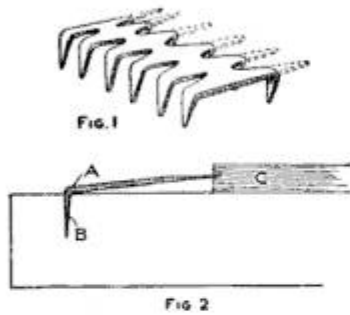
If two legs are made like the one shown in Fig. 2, and a nicely finished board screwed to another side rail of an iron bed, through which holes have been drilled to receive the screws, a most serviceable invalid's table can be made that will reach across a bed in front of the patient. Such a table, when not in immediate use, can be left in position and placed across the foot of the bed. It also has the advantage of being easily stowed away in a closet in a compact package.—Contributed by Victor Labadie, Dallas, Texas.

☞ Where large posts of oak are to be used in making a chair or any piece of furniture, plain oak can be used many times instead of the quarter-sawed, thus saving at least one-half the cost of the lumber. The only requirement is that pieces of heavy plain oak each having one or two quartered sides be selected.

☞ A much better way to keep gauge glasses than on a string is to set them on end in holes, bored in a wood block of sufficient size.

Belt Hook Used as a Bench Stop

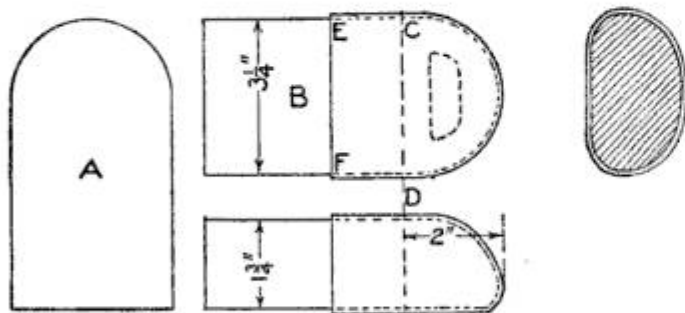
A very good bench stop can be made from an ordinary metal belt hook.



Procure one that measures $\frac{3}{4}$ by $1\frac{3}{4}$ by $2\frac{1}{2}$ in. and straighten out the points on one side as shown by the dotted lines in Fig. 1. If the points are too sharp, round them off a little with a file. Lay the hook on the bench top at the place wanted and strike the part marked A to drive the points B into the wood. Raise the points that hold the work C with the claw of the hammer.—Contributed by W. A. Lane, El Paso, Texas.

Homemade Ear Phone

A person who was slightly hard of hearing made a phone that enabled him to hear quite well while in church or at public meetings. While the phone is visible, it is not unsightly, if carefully made. It is constructed of paper glued together over a wood form as shown at A in the sketch. The form is first covered with a thin sheet of paper carefully shaped over the rounded end and the edge is pasted to the wood at E F. The thin paper is then covered by gluing narrow strips of brown wrapping paper all over the surface as far back as the line E F.



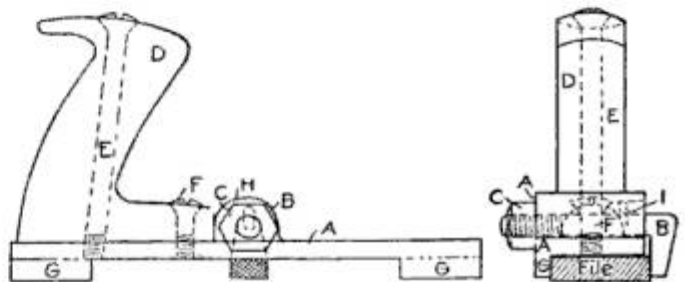
Phone Made of Paper

Cover it again and lay the strips so as to cross the first layers. Repeat the operation until there are six or eight

coverings. When the paper dries, rub it down with a very fine emery cloth or sandpaper, cut it neatly on the line C D, and slip it from the mold B. A hole is cut in the flat side to fit the ear near the head. The phone is very light, and, if carefully fitted, it can be worn without annoyance or fear of falling off. The phone acts on the same principle as placing the hand behind the ear.—Contributed by J. E. Noble, Toronto, Canada.

A File Holder for Flat Work

The tool or handle shown, when clamped to a large file, comes very close to being a planer when it is required to remove stock from a flat surface. For metal use a long file and for



Holder is Used Like a Plane

patterns use a short one, says a correspondent of American Machinist. A short file can be made of a 14 or 16-in. file, cut in half by grinding, then removing the tang and squaring the end, thus making two short pieces.

The holder consists of a piece of machine steel, A, with jaws, G G, and a hub, H, through which a $\frac{1}{4}$ -in. hole is drilled and reamed to receive the shank end of the jaw B. The jaw B is made of tool steel, threaded for a casehardened nut, C, and the inner surface of the jaw milled the same as the jaw of a vise. The position of the pin for holding the shank of the jaw B is shown by I. To allow a lateral motion for the jaw B in the boss H, a slot or keyway is cut to fit the pin I. A wood handle D, such as used on carpenter's planes, is fastened to the metal A, with two bolts, E and F. A section of the file is shown clamped in position.

Homemade Derrick Crane

A simple and cheaply constructed hand-power windlass and derrick is often desired for lifting bulky objects a short distance, loading heavy articles, etc. Figure 1 shows one type of crane. The bearing of the arm of the derrick is arranged to allow it not only to rise up and down but to revolve around the center post. One of the clips is shown at A. A windlass can be attached to the post with a stationary bearing or with one like that used for the arm with the extension as at B. The diameter of the post should be about 4 in., or heavy enough for the work it is intended. The bearings of the arm and windlass are $1\frac{1}{2}$ in. less in diameter. Any local blacksmith can make them and other iron fittings that are needed. The ends of the boom are supplied with parts as shown at C and D.

A boom derrick arranged as in Fig. 2 will be found of great service for loading and unloading boxes, barrels, sacks and any heavy articles stored in a basement. One man without some mechanical assistance of this kind is often unable to lift heavy articles from a cellar-way and load them on a wagon conveniently, and even if several men engage in the work they cannot remove

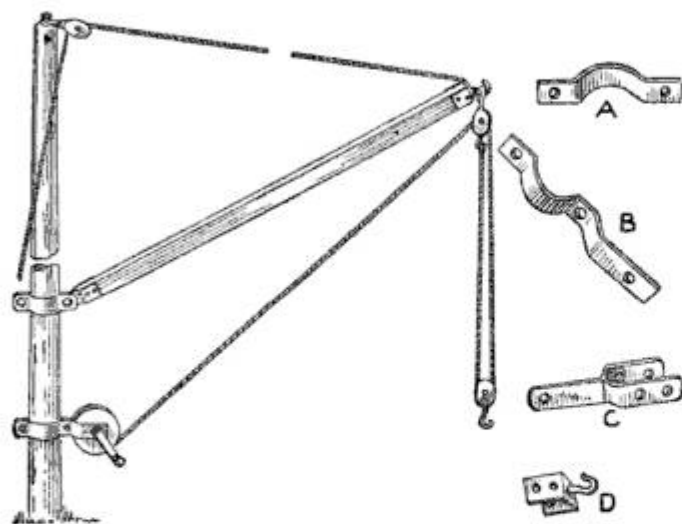


Fig. 1—Hand-Power Derrick

and load the articles as easily and speedily without the derrick as they can by its help.

Use a stout piece of timber for the derrick post, not less than 4 in. square, or a round pole, and a square piece of

wood 10 or 15 ft. long for the boom. Insert a heavy iron pin in the top and lower end of the post and shrink iron

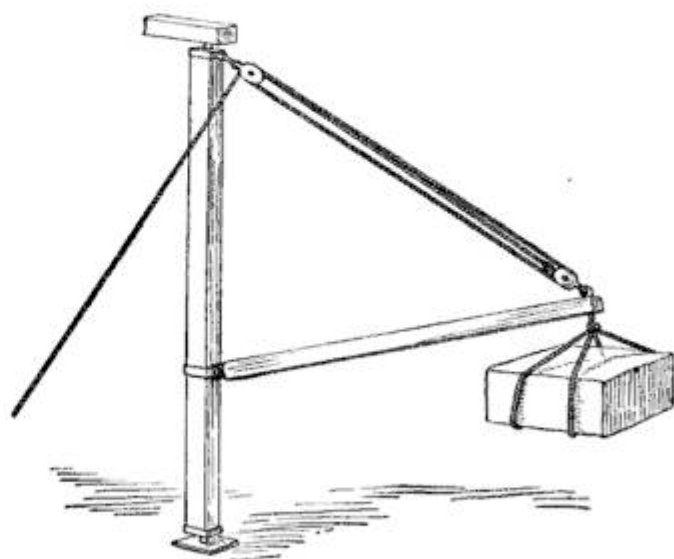


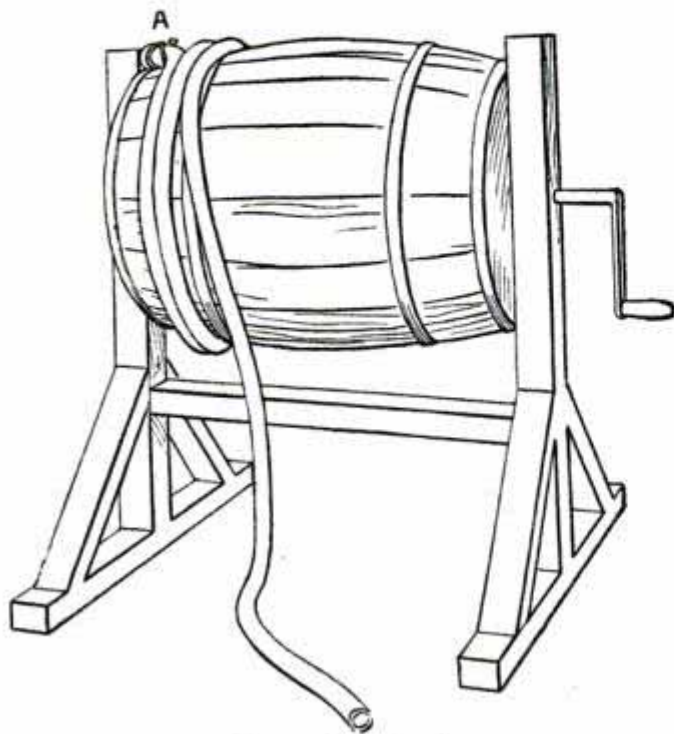
Fig. 2—Derrick Crane

bands around the wood. Hinge one end of the boom with iron straps and bolt them to the post about 5 ft. from the bottom, and on the other end put a band with eyes or hooks. If the post is round, the boom may be hinged by using a band on the post and a knuckle joint similar to the one shown in Fig. 1. These can be made of old wagon-tire iron. The top pin of the derrick post is held by a strong projecting iron or wood cleat, or one of the building timbers, and the lower pin revolves in a wood block having an iron socket or a heavy stone with a hole drilled to receive it.

The top of the post and end of the boom are connected with a rope and single pulleys or by a double-block tackle. One man with ordinary exertion will be able to handle conveniently a very heavy weight, which, when elevated by means of the boom, can be swung around to the point desired for loading or unloading. If a pulley is attached to the building near the foot of the post, the rope may be conducted over it and have a horse or windlass attached, when it is necessary to handle unusually heavy objects.—Contributed by J. G. Allshouse, Avonmore, Pennsylvania.

A Hose Reel

An ordinary nail keg hung on a shaft as shown in the sketch makes a good hose reel. The standards are made of

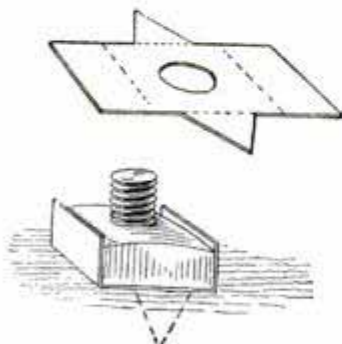


Keg on Standard

five pieces of 2 by 4-in. material braced with two $\frac{7}{8}$ -in. strips. Two nails are driven into the keg at A to hold the hose end connection. The shaft can be made of an ordinary $\frac{1}{2}$ or $\frac{3}{4}$ -in. rod with a crank bent on the end.—Contributed by Theodore Becker, Kansas City, Mo.

Combined Washer and Nut Lock

Nuts and bolts on wood framework frequently come loose. A way to prevent this is to secure a suitable piece of light iron and cut it as shown in the sketch. It is then placed over a bolt and the points bent down so they will press into the wood as the nut is turned.



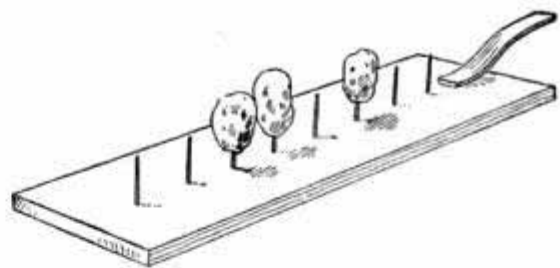
When the nut is set, turn up the iron clips to lock it.—Contributed by W. A. Jaquyte, Richmond, Cal.

Grinding Carburetor Valves

An expanding watch-key makes an effective tool to grasp the stem of the needle valve of a carburetor when grinding in a valve. As the stems of these valves are usually so small that it is difficult to get at them and to hold them securely, this watch-key kink is a great help in grinding in, removing and replacing valves of this class.—Contributed by James M. Kane, Doylestown, Pa.

A Potato Baker

The potato baker I made consisted of two pieces of sheet asbestos, 18 in. long, $\frac{1}{4}$ in. thick and 4 in. wide. Over these pieces I placed a piece of tin, 18 in. long, $11\frac{1}{2}$ in. wide, turning it over from the top and lapping on the bottom. Through the pad there were driven several nails on the points of which the potatoes could be impaled. The handle was made by folding a strip of tin over several times and driving brads through the end of the



Asbestos Pads with Nails Protruding

pad. Potatoes baked on this device cook through and through and are very mealy.—Contributed by Joseph H. Noyes, Murfreesboro, Tenn.

How to Make Paracentric Keys

Probably nothing is more puzzling to the amateur or even to some locksmiths than to make a key to fit a Yale or any other similar lock when the original key is lost, without partly destroying some part of the combination or defacing some part of the cylinder.

The sketches, Figs. 1 and 2, show the cylinders of a mortise lock and rim lock, respectively. These were orig-

inally made with a slide at G to keep the springs and pin tumblers in their respective chambers, all of which are shown in Fig. 3. The present method of making these cylinders is to bore the tumbler chambers from the bottom, insert the springs and tumblers, and then plug the holes.

If one has occasion to make a key for the former, it is rather a simple matter as the slide at G can easily be removed, the springs and upper pins carefully taken out, and then, after fitting the key, all the parts can be replaced.

With the more modern cylinder it appears to be a more difficult task, but after a few trials and careful study of the following instructions, it will be found much easier than the other, and less troublesome. First procure a piece of wood 3 or 4 in. long and of the same thickness as the barrel B, Fig. 3. Remove the screw at C and hold the cylinder in the left hand with the thumb on the back of the barrel and the index and middle finger on the front. The sketch Fig. 1 shows the mortise lock cylinder, also the proper way of holding either style of cylinder. Tap the top sharply at G with a hammer handle, at the same time applying a slight pressure with the thumb. After a few blows the barrel will move out of the cylinder. Be careful not to let it move more than $\frac{1}{16}$ in., then give it a quarter turn. Gently push out the barrel with the dowel stick and at the same time be careful not to let the tumblers drop out of the barrel. The dowel serves two purposes, viz., to push out the barrel and to keep the pins D and springs E in the cylinder as shown in the upper part of sketch Fig. 3.

Usually five or six blows will be sufficient, but do not be discouraged if success is not immediate, as a good many blows are sometimes required. Strike quite sharply as the hammer handle will not injure the lock in any way. After the barrel has been removed, take out the pins and lay them down in such a way that they can be replaced in their respective chambers

without trouble. Put a blank key in the barrel, and by using the tang of a file mark through the tumbler holes for each pin. Remove the key and replace

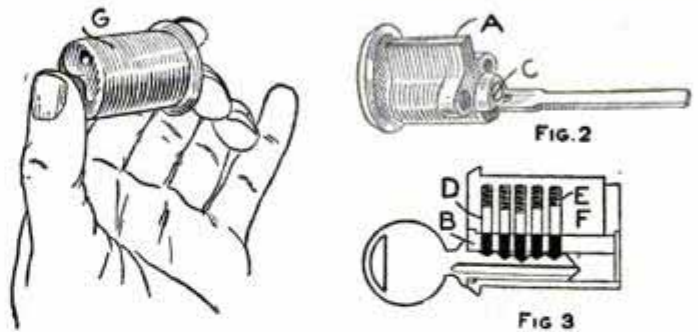


FIG 1

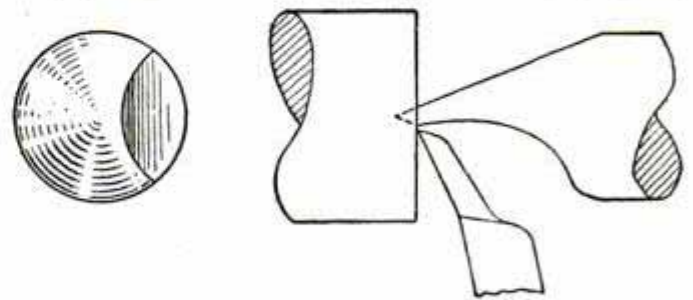
Parts of a Pin-Tumbler Lock

the tumbler pins. File V-shaped notches in the key, testing frequently so that each pin will be level with the top of the barrel. Leave the key in the barrel and carefully replace in the cylinder, finally screwing on the connecting bar.

The notches in a key for holding the pins at the proper height to permit the tumbler to turn in F are shown in Fig. 3.—Contributed by R. E. Davall, New York City.

Lathe Center for Facing Work

A center which does not have to be pulled away from the work a little to allow the side of the tool to face into the center is shown in the sketch. It is an ordinary lathe center which has been cut away on one side to within $\frac{3}{16}$ in. of the point. The corners of the portion cut away are rounded to avoid reaming the center hole. This center has been in use several years with entire satisfaction. It requires little time

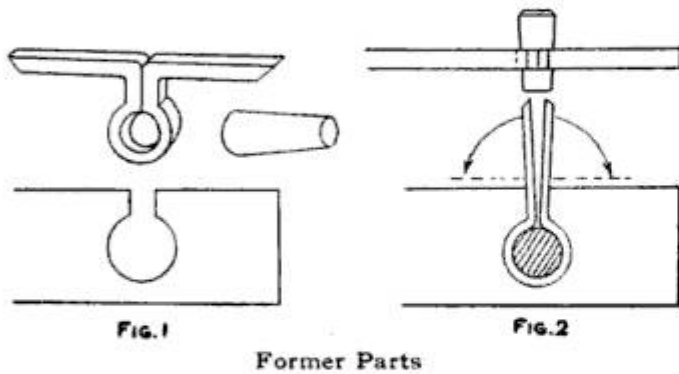


Center Cut Away

to take the full center out and insert the one-half center, when some work must be faced or recessed near the center.—Contributed by Andrew Smith, New Haven, Conn.

Former for Pipe Hangers

It pays to have tools to make pipe hangers where they are wanted in large quantities, says the American Black-

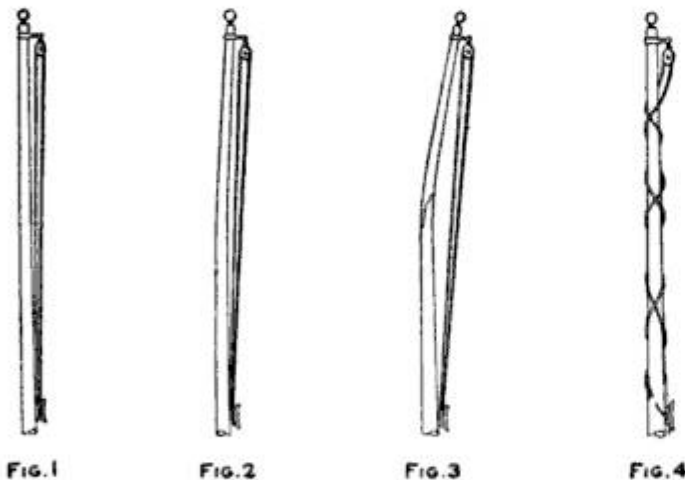


Former Parts

smith. One pipe hanger and the tools with which to make it are shown in Fig. 1. These are for a small pipe and are slipped on before screwing on the coupling. The pieces are cut to the proper length and bent in the middle in the shape of a rough eye which will go into the tool. The pin is then driven in. This trues up the eye and holds it secure while the ends are bent down as shown by the arrows in Fig. 2.

How to Tie a Flag-Pole Rope

When fixing a flag-pole rope it is necessary to tie it right to keep the strain off the pole caused by the drawing of the rope when it gets wet. If the rope is tied as shown in Fig. 1, it will begin to draw the pole out of



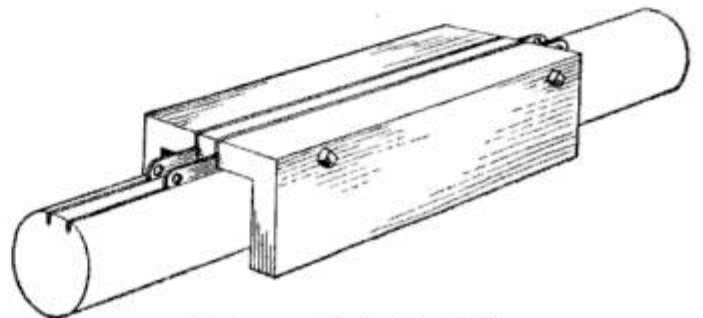
Tying a Flag-Pole Rope

plumb, as in Fig. 2, and as soon as the rope gathers some dampness and gets thoroughly soaked, it is liable to break

the pole as shown in Fig. 3. The proper way to tie the rope is shown in Fig. 4.—Contributed by Edward Von Kaenel, Cleveland, O.

A Keyway Cutter

Anyone who has had to cut keyways in shafting while in the hangers knows how hard it is to accomplish the work without proper tools. I find that a straight keyway can be cut by using the device shown in the sketch. The edges of two L-shaped pieces of wood are bolted together with another strip of wood having the width of the keyway to be cut placed between them. Hacksaw blades are placed in each joint before the nuts on the bolts are



Hacksaw Blades in Holder

drawn up. It will take only a few minutes' time to cut the depth of the keyway, when the metal between the saw cuts can be chipped out with a keyway cutter.

Collapsible Water Pail for Automobiles

Procure an old inner tube that has been discarded and select from 3 to 4 ft. or more of the rubber that is water-tight. Cut the desired length from the tube and close one end by cementing it under pressure. This is a cheap and easily made substitute for the ordinary collapsible pail, and can be packed in a small place.—Contributed by Wm. L. Hoff, Washington, N. J.

Leather washers cut from a piece of old belt and put on a monkey-wrench tang, then dressed down with a block plane, make a better handle than wood.

How to Remove Varnish from Floors

Dip an ordinary scrub brush in pure ammonia, scrub over the surface to be cleaned until all the varnish is removed, and wipe off with fresh water, using a rag or sponge. When dry, varnish or shellac, as desired. After drying, the surface has the appearance of new wood.—Contributed by H. W. Ravens, Seattle, Wash.

Reflector on a Lubricator

Sometimes it is difficult to see the oil drops in the sight feed of a lubricator, owing to its position. If the choke plug becomes stopped, it will flood the glass with oil. I had a locomotive-type lubricator, triple sight feed, of the bracket type connected to three air pumps on the testing rack.



Necessity required the placing of the lubricator on a cross bar quite high, between and over the pumps. The bar was in line with the sight-feed glasses and made it possible to watch the drops for timing only at close range, as the bar behind destroyed the usual transparency of the glasses. In this case, where the feed cannot be seen because of the location, the difficulty was overcome by fastening a mirror behind the feed glass, whereby the drops may be plainly seen almost as far away as the lubricator is visible.—Contributed by F. W. Bently, Jr., Huron, S. D.

Crane for a Cripple's Bed

The apparatus shown in the sketch may be attached to any bed and used as a swing or derrick for patients with disabled limbs, and especially for one with a broken limb when a plaster cast is used, making the disabled mem-

ber heavy and painful to move. With this device the patient can move about in bed at will, unassisted, by pulling



Crane on a Bed

the small rope. The limb can be raised so as to allow the patient to turn over, sit up, or lie in any position.

The arches are made of $\frac{1}{2}$ -in. iron rod with a shoulder at the ends where they rest on the side rods of the bed in which holes have been bored to admit them. The end for a wood rail is shown at A, and for an iron one, at B. The arch resting across the bed has a 2-in. loop at the top into which the rod resting on the foot of the bed is hinged so that it may have a joint that can be adjusted to any size of bed.

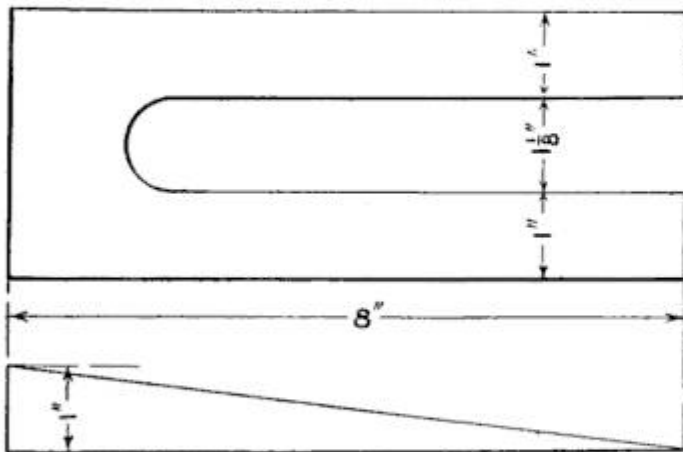
A pulley is attached in the loop at the top of the arch by a hook and a flat, notched $\frac{1}{2}$ -in. rod that is fastened to the cast by loose bandages so that the limb may be turned in it. This is swung on another pulley and the two pulleys are connected with a small cotton rope.—Contributed by Dr. C. A. Noland, Monroe City, Mo.

How to Clean Steel Tapes

Cover the tape with crude oil and rub down with No. 0 steel wool. This will clean the rust from the tape without injury to the etching. If the tape is not very rusty, it may be brightened up by rubbing with powdered pumice or dry cement.

A Bolt Remover

The bolts that become stuck in locomotive frames I easily remove with a split wedge, as shown in the sketch.



Details of Remover

The wedge can be used in removing bolts on all kinds of work. The bolt should be loosened first by pulling on the nut with a long wrench and striking the head with a hammer. The wedge is then started under the head and driven in with a hammer.—Contributed by Earl S. Goddard, Ridgway, Colorado.

A Tilting Manger

A very handy tilting manger for the barn is shown in the accompanying sketch. In Fig. 1 is shown the manger in place, the weight being sufficient to keep the front vertical. The lower part is hinged to the floor so that it may be swung back out of the stall for

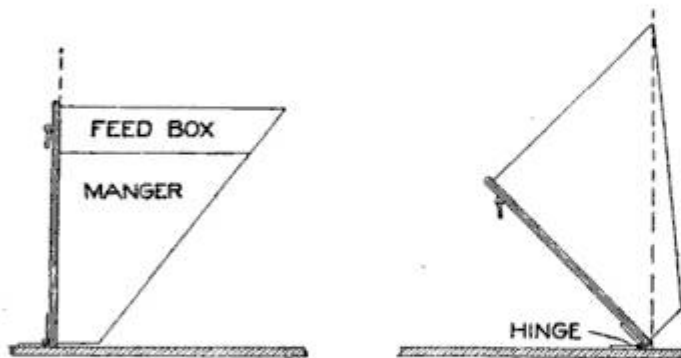


Fig. 1

Manger Swings on Hinges

Fig. 2

placing in the feed. See Fig. 2. This also provides more room for the animal.—Contributed by C. C. Brabant, Alpena, Mich.

One-Man Cable Test

Very few electricians and cable splicers know how to test dead cables, without a helper, and as an experienced helper is not always at hand, the following method may be of value.

The example used for illustration is a small telephone cable which has been "cut in" at random on the main distributing frame. It is understood that the cable is not "code," that one side of the pair is a solid color while the other side is white. After "cutting in" the cable on the main distributing frame or box, the tip of the pair No. 1 is grounded. The ring of the pair No. 1 is connected to the tip of the pair No. 2, and the ring of No. 2 to the tip of pair No. 3 and so on through the cable as shown in Fig. 1.

The cable having been connected up

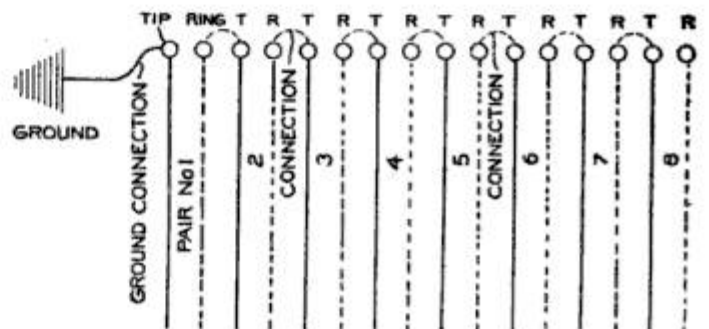


Fig. 1—Main Distributing Frame

as shown, the tester enters the man-hole, opens the cable, clears the ends of the wire, and connects up as shown in Fig. 2 with a head receiver in series with a battery. The other side of the battery is connected to the ground. A search line is attached to the open side of the receiver.

Test out by touching each wire with the search line until a loud click is heard in the receiver. This will be pair No. 1. The battery lead is now removed from the ground and placed on the ring wire of No. 1. Touch the ends with the search wire as before and pair No. 2 will be tested. Place the battery wire on the ring wire of No. 2 to test out No. 3 and so on through the cable, putting each pair into fanning strips as they are tested out.

This test, while slow in changing

the battery lead on each pair, is extremely simple and thoroughly practical, if the cable is tested for opens, crosses and grounds previous to making the test. If trouble is found on the preliminary test, that pair should be left out when "bunching" on the frame and left until the last. The odd pair will be the one which is in trouble and can be placed in its proper



Fig. 2—Testing Device

position in the fanning strip when found.—Contributed by G. M. Peterson, Buffalo, N. Y.

Lubricant for Threads in Heated Places

All nuts, cap screws, plugs and pipe fittings that are installed where they will be heated should have the threads well smeared with graphite and oil before they are screwed together. If oil alone is used, it is sometimes impossible to remove them as the oil burns out and the joints become rusty and stick.

Protecting Freshly Varnished Floors

It is often necessary to walk upon freshly varnished hardwood floors and the usual thing to do is to lay boards on the sticky surface and walk on the boards. When the boards are removed some of the varnish comes with them and the spots must be varnished over again. The boards may be kept

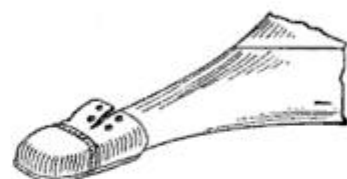


Cleats on Board

from sticking by applying a coat of wax to the side placed on the varnish. A little paraffin, beeswax or common floor wax rubbed on the surface will be sufficient. It is also advisable to build up the boards as shown in the sketch. This will make very little surface contact with the floor.—Contributed by Philip Edelman, Minneapolis, Minnesota.

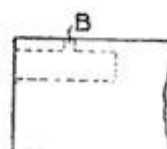
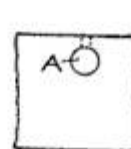
Shoe on a Plowshare Point

When passing from one field to another it is difficult to keep the point of a plow out of the ground. By carrying a part of an old shoe this trouble may be overcome. The sole of the shoe should be cut off just below the instep. The toe of the shoe is placed on the plowshare point as shown.—Contributed by Carl Lung, Camelius, Oregon.



Drilling Cotter Holes

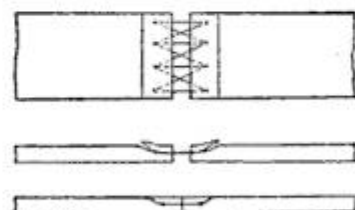
A simple jig that is in use in our shop for drilling cotter holes in small rods has proved a great time saver.



As it takes but a few moments to make it, we usually make one for each job. A hole B, the same size as the cotter, is drilled in an old piece of cast iron, near one edge and entering a hole drilled for the rod. The jig is clamped on the drill press and a drill run through the hole already drilled. With this jig a hole can be drilled through an ordinary nail. In drilling a number of pieces, the jig has the advantage of keeping the holes all the same distance from the end.—Harold M. Ilg, Lowell, Mass.

Lacing Belts

The method of lacing a belt shown in the sketch makes a neat joint and the belt will run smoothly over the pulleys. A light score is made with a knife, $\frac{1}{2}$ in. from the end and across the flesh side of the leather. If it is a 1-in. belt, about four holes $\frac{1}{4}$ in. apart are made with an awl endways through the leather,



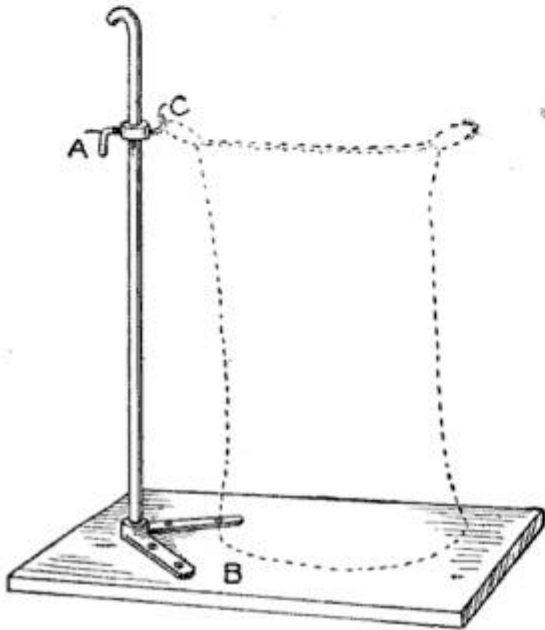
starting them in the score. Lace the belt through and through with a waxed thread and tie the ends in the score. When finished, the thread lies beneath the score in the thickness of the leather out of sight. The joint is almost in-

destructible, as the thread does not touch the pulleys.

This kind of lacing is particularly adapted for belts of dynamos or any high-speed machinery.—Contributed by Arden D. Whipple, Oakland, Cal.

Holding Sacks while Sewing

A device for use in holding sacks and bags while sewing up the opening is the invention of a correspondent of

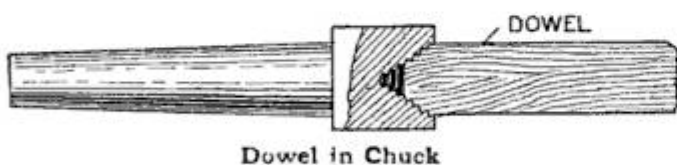


Position of Sack on Stand

American Miller. It consists of a table, B, with an upright round iron fastened to it as shown. The hook, C, is attached to a sliding collar with a set-screw (having a lever A) to hold it in place. This is to provide adjustment for long and short sacks. The sack is hooked on C to steady it while sewing.

A Chuck for Turning Dowels

A good chuck for turning dowels or other slender pieces of wood is shown in the sketch. It is made of tool steel



Dowel in Chuck

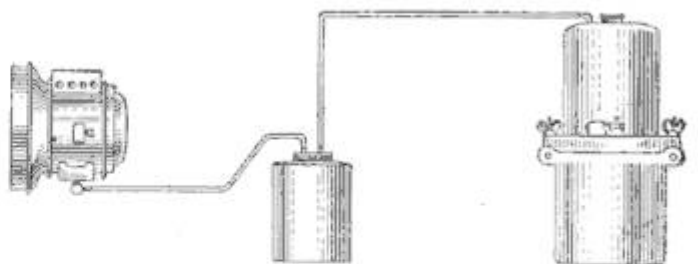
and is turned to fit the tapered hole in the lathe spindle. The other end is recessed at a very sharp angle taper and then a thread is cut on the taper. It is readily seen that the greater the

retarding force on the stick, the tighter it drives.

The great trouble with the common spur center for turning small work is its tendency to split the wood. One manufacturer had trouble until he made this driver which has so far never spoiled a stick. This tapered internal thread is rather hard to cut unless a lathe is equipped with special attachments.

Improving Acetylene Gas for Automobile Headlights

Wet gas is a certain cause of flicker in acetylene headlights for automobiles. Dry gas will burn steadily. For this reason, I constructed the dryer shown in the sketch. I made it from a solidly constructed 1-quart tin can having a screw top. Two small holes were punched in the cap and a 3-in. piece of brass generator tube inserted in each for about one-half its length, and



Connections from Generator to Lamps

soldered. The upper ends were bent so they would meet the rubber tubing. The dryer can be placed under the hood, seat or in the tool box.

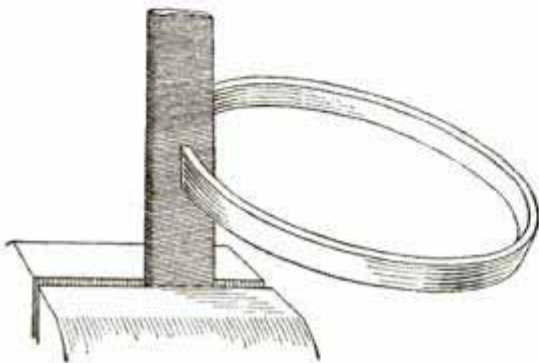
Put a small handful of carbide in the can and screw the cap on tight, then pipe from the generator to one pipe of the can and from the other to the lamps. The water in the gas which leaves the generator will be left in the can, as it cannot get out, and will drop to the bottom on the carbide and be

turned into gas. All moisture is taken up by this method and nothing but dry gas can reach the lamps.

The carbide should be renewed in the can from time to time, but not very often, unless the lamps are used every night.—Contributed by Earl R. Hastings, Corinth, Vt.

Filing Piston Rings

In filing small metal packing or cylinder rings, it is a hard task to get the ends of the split to fit close against



Filing Ends True

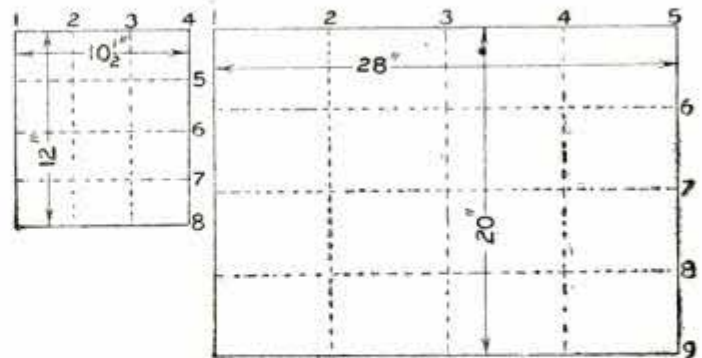
each other. If they do not come together closely, the ring will be weak, no matter how well it fits the bore of the cylinder. The sketch shows a way to file the ring so that this trouble will be overcome. The ends of the ring are grasped in the hands and worked on a file held in a vise.

Wiping and Catching Cloths

The best size for an all-around wiping cloth for wiping lead-pipe joints is about 3 by 3½ in. with strips on the material running lengthwise as shown in the sketch. The material is cut 10½ by 12 in. and strips fastened parallel to the 12-in. edge. The piece is then folded as follows: The first division is folded to 3, and 4 is folded to 2. This makes the cloth the width of one section. Using 4 as the top edge, fold 4 and 8 to 6 and then 5 and 7 to 6. Make a few stitches in each narrow end and soak the cloth in heated tallow and paraffin.

The catching cloth should be cut 20 by 28 in. with strips running par-

allel to the 28-in. edge and folded as follows: The first division 5 is folded to 7 and 9 to 7 and folding at 7 brings



Size of Cloths

6 and 8 together. Then fold 1 to 3 and 5 to 3, then fold at 3, bringing 2 and 4 together. Stitch on the narrow ends and soak in the tallow and paraffin.

Coloring Meerschaum

An easy way to color a meerschaum pipe and avoid finger marks is to use the method shown in the sketch. Cut a hole in the bottom of a bottle large enough to receive the bowl of the pipe. Place the pipe in the bottle with the stem protruding through the neck and wrap paper around the stem and seal it with wax to make an airtight joint. Place the stem of another pipe through the large hole in the bottom of the bottle and fill in with paper and seal with wax. Place the tobacco in the bowl of the protruding pipe and begin smoking through the stem at the neck



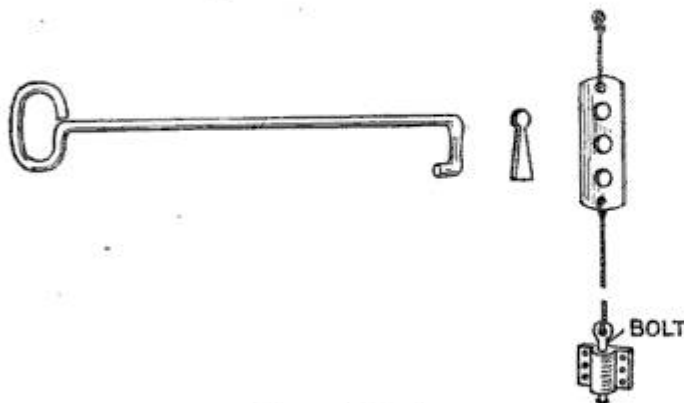
Pipes in Bottle

end. The coloring can be watched through the glass.—Contributed by Henry E. Seidell, Jr., Ft. Worden, Washington.

External corrosion of boilers is caused by leaking seams, rivets and gaskets. Wet ashes and soot will corrode the plate if left in contact with it.

Homemade Lock and Key

The illustration shows a simple fastening for a door that will keep out intruders better than the ordinary lock. The common locks are so much alike



Key and Lock

that a key may be found that will turn them. The fastening can be used on a door of which the key is lost, or as a double safeguard in locking the door. It may be made by attaching a bolt to the bottom of the door with a cord and a thin piece of wood with three or four holes in it that are near the keyhole as shown in the sketch.

A piece of $\frac{3}{16}$ -in. wire is bent as shown for the key. It is made long enough to reach through the keyhole and past the block of wood. It is then pulled back so that the point will enter one of the holes in the wood. A turn of the key lifts the bolt. A more elaborate lock can be made of brass and corded wire. One turn of the cord around the screw head keeps the bolt from the keeper when not in use.—Contributed by Bert Hillyer, Chrome, New Jersey.

Cleaning Brick Walls

A solution of about 2 oz. of muriatic acid to 5 gal. of water makes a good wash for cleaning brick walls. This wash should be applied and the wall scrubbed down with a wire brush made for this purpose. Care should be taken to keep the solution from touching the hands or clothes.

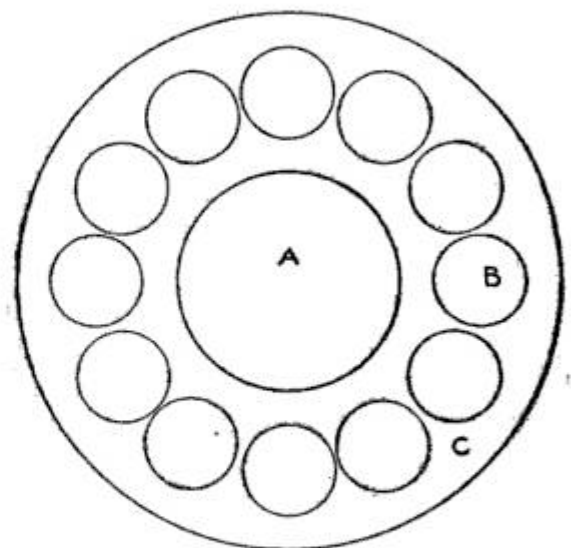
ⒸThe main bearings of a lathe should be loosened when they run hot.

Thumbscrew on Lathe Dogs

For quick work on small things to be turned in a lathe, a thumbscrew put in place of the usual setscrew on a lathe dog is much more convenient. Only light chips can be taken, of course, as the leverage is not enough to tighten for a heavy cut. Small drills, reamers and counterbores are quickly put in and taken out of the lathe, and much time is saved, if there is a large number of pieces to be worked.—Contributed by Andrew Smith, New Haven, Conn.

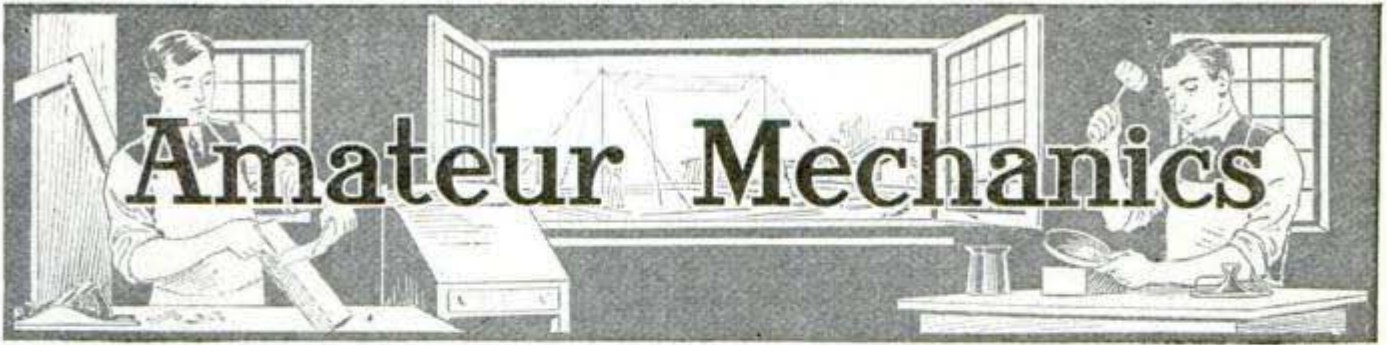
Boring Large Holes with an Expansive Bit

Anyone having used an expansive bit by hand to bore a large hole finds it a difficult job, as the material taken out by the cutting edge on the regular screw feed requires more power than can be applied to the brace. A good method is as follows: If a hole 3 in. in diameter is to be bored, set the bit to 3 in. and fasten it in the brace so that the cutter is in line with the handle of the brace. Lay out the circles A and C and bore a series of holes B with a $\frac{1}{2}$ or $\frac{5}{8}$ -in. bit to remove a part of the wood between A and C. Set the expansive bit in place and



Material Removed by Boring Small Holes

stand with the grain of the wood and turn with a slow steady pressure.—Contributed by W. A. Lane, Dallas, Texas.



How to Make a Monoplane Glider

By WILLIAM GROTZINGER

A simple glider of the monoplane type can be easily constructed in a small workshop; the cost of materials is not great and the building does not require skilled workmen. Select the material with care and see that the wood is straight-grained and free from knots. The following list of spruce pieces is required:

- 4 main wing spars, $\frac{3}{4}$ by $1\frac{1}{4}$ in. by 17 ft.
- 2 rudder spars, $\frac{3}{4}$ by 1 in. by 8 ft.
- 8 wing crosspieces, $\frac{3}{4}$ by $\frac{3}{4}$ in. by 4 ft.
- 4 rudder crosspieces, $\frac{1}{2}$ by $\frac{1}{2}$ in. by 2 ft.
- 1 piece for main-frame crosspieces, $\frac{1}{2}$ by 1 in. by 12 ft.
- 2 arm pieces, $1\frac{1}{2}$ by 2 in. by $3\frac{1}{2}$ ft.

The following list of poplar pieces is required in making the supports for the cloth covering on the wings and rudders.

- 34 main-wing ribs, $\frac{3}{4}$ by $\frac{3}{4}$ by 64 in.
- 8 rudder ribs, $\frac{3}{4}$ by $\frac{1}{2}$ by 36 in.
- 5 rudder ribs, $\frac{3}{4}$ by $\frac{3}{4}$ by 48 in.

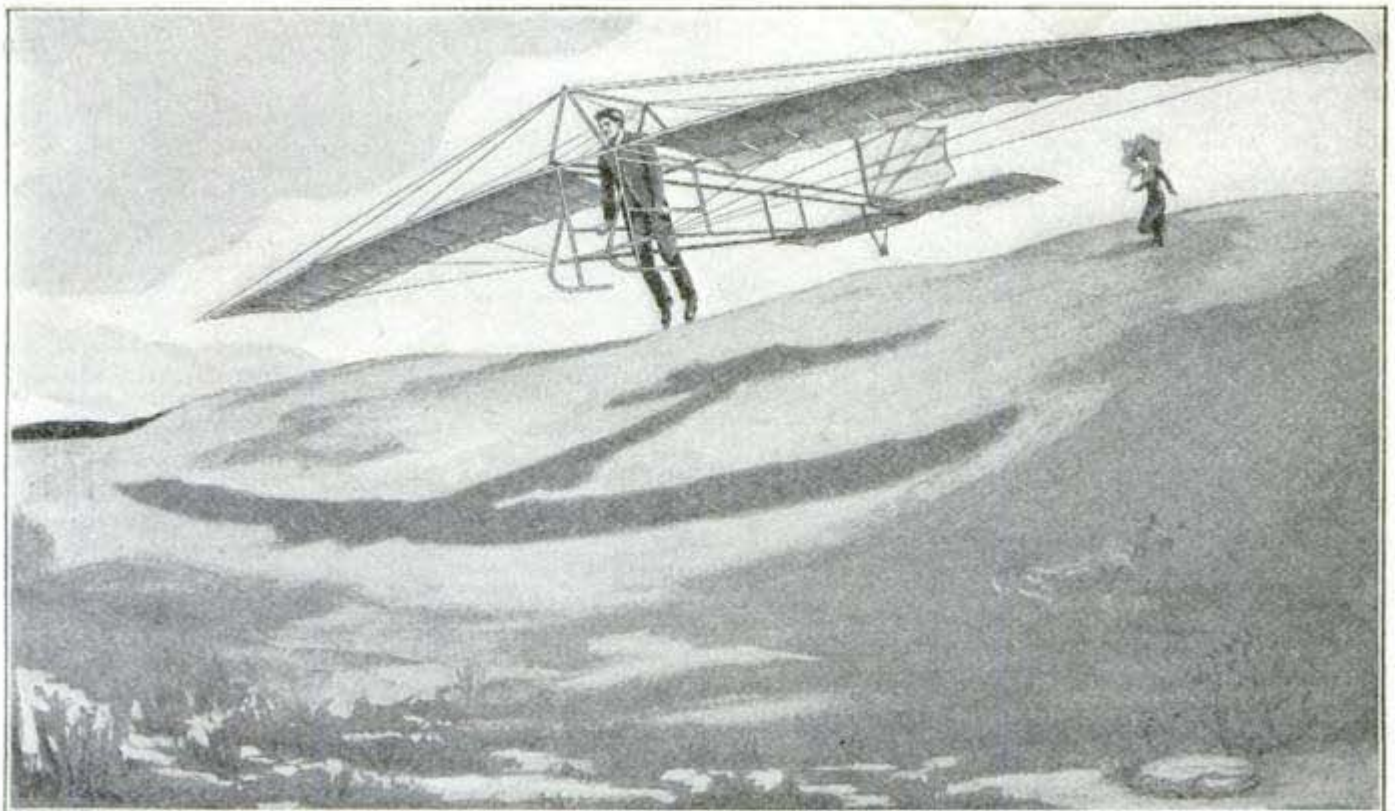
The following list of oak pieces is needed:

- 1 piece, $\frac{5}{8}$ by $1\frac{1}{4}$ in. by 12 ft.
- 1 piece, $\frac{5}{8}$ by $1\frac{1}{4}$ in. by 6 ft.
- 1 piece, $\frac{3}{4}$ by $\frac{3}{4}$ in. by $3\frac{1}{2}$ ft.
- 2 pieces, $\frac{5}{8}$ by $1\frac{1}{2}$ in. by 5 ft.
- 4 pieces, $\frac{3}{4}$ by 1 by 28 in.

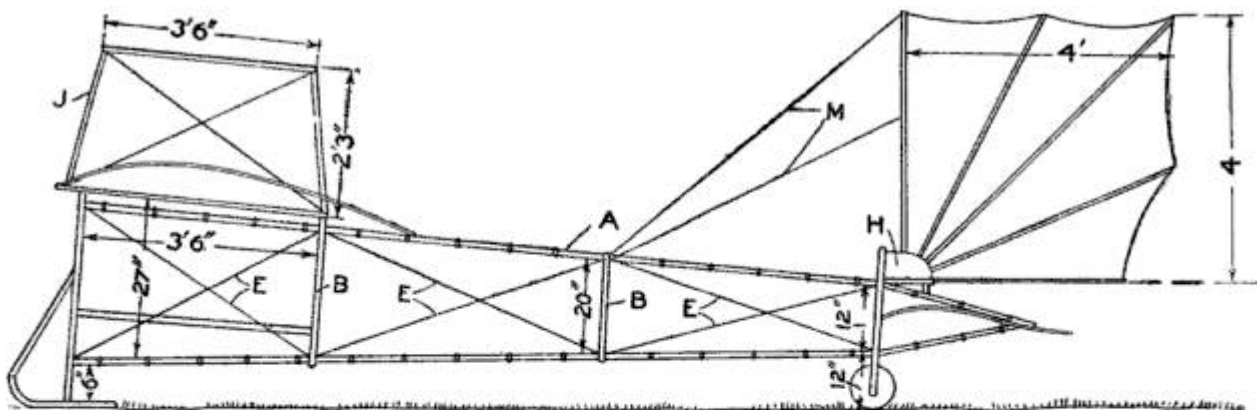
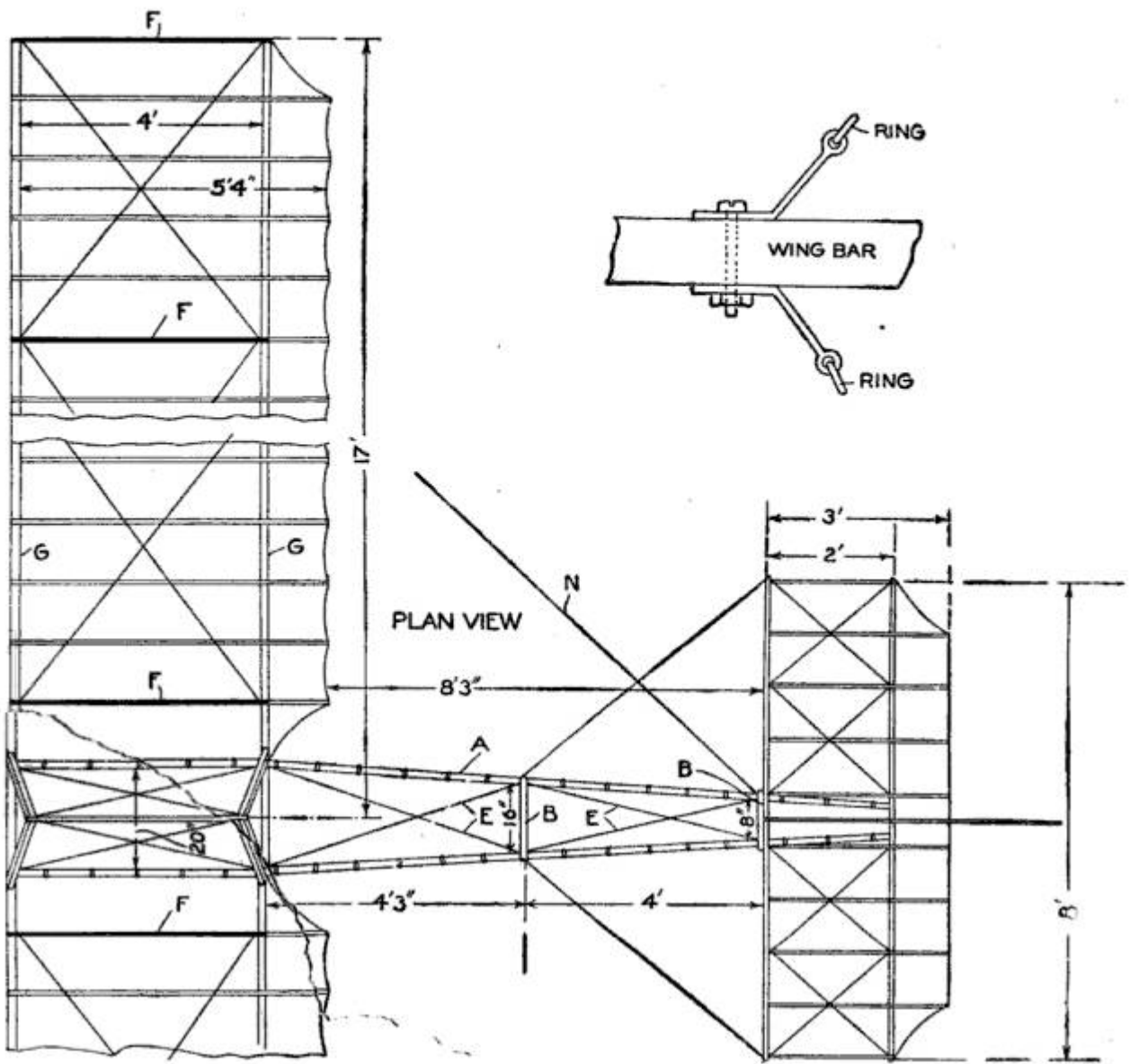
In addition to the lists given, four pieces of bamboo, 16 ft. long, tapering from 1 or $1\frac{1}{4}$ in. at the large end to $\frac{3}{4}$ in. at the small end, are used for the main frame.

Construction

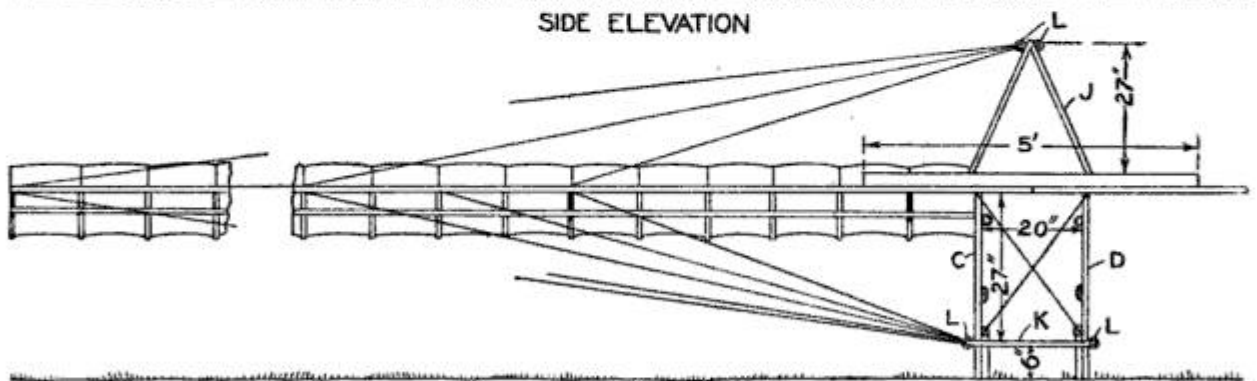
The first part to make is the main frame A which is constructed of the four bamboo poles. They are made into a rectangular frame with cross-bars marked B cut to the right length from the 12-ft. piece of spruce, $\frac{1}{2}$ in. by 1 in. The bars C and D are of oak



Monoplane Glider in Flight



SIDE ELEVATION



FRONT ELEVATION

Details of Monoplane Glider

cut from the 6-ft. piece, $\frac{5}{8}$ in. by $1\frac{1}{4}$ in. All of these crossbars are fastened together in rectangular form by means of stove bolts. The bamboo poles are then bolted to the inner corners of the frames with $\frac{3}{16}$ -in. bolts. Place the bolts through the bamboo close to a joint to prevent splitting. The frame is then rigidly trussed by diagonal wires marked E crossing all rectangles. The wire used for trussing all the parts throughout the glider is piano wire, 16 gauge. The arm pieces are bolted to the sides of the rectangular frames beneath the wings.

The framework of the main wings or planes should be put together by bolting the cross struts F at regular intervals on the under side of the main spars G. Brace the frame diagonally with the piano wire. The ribs are nailed to the main spars by using 1-in. brads. The ribs are spaced 1 ft. apart, and curved so that the highest part will be 5 in. from the horizontal. Each rib extends 15 in. back of the rear spar. The rudder is made in the same manner.

The vertical rudder is made to fold. A small pocket arrangement H is made from which the ribs of the vertical rudder diverge.

The covering of the wings and rudders should be a good quality of muslin or some light aeronautical goods. The cloth should be tacked to the front spar, to the ribs, and then sewn to a wire which connects the ends of the ribs.

Construct the triangular arrangement marked J to which the wings are braced. The wing bar supports are

shown in the illustration. The bottom wires are braced to the crossbar K shown in the front elevation.

The bracing wires are all fastened to a snaphook which can be snapped into the rings at the places marked L. This method will allow one quickly to assemble or take apart the plane and store it in a small place. The vertical rudder should be braced from each rib to the front spar of the horizontal rudder and then braced by the wires M to hold the rudder from falling back. The rudder is then braced to the main frame and the main frame is braced by the wires N to the wings. This will hold the plane rigid. Use snaphooks and eyebolts wherever possible so that the plane can be quickly assembled.

Assembling

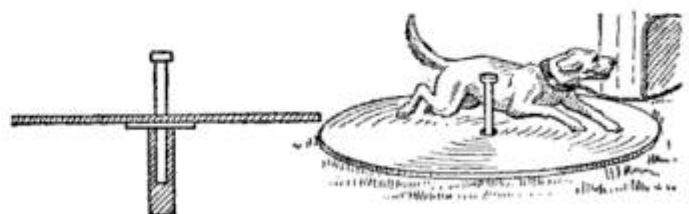
The triangular arrangement J is bolted to the wings and the top wires put in place. The wings are then put on the main frame and bolted to the bars marked C and D, after which the bottom wires are fixed in place.

Gliding

Take the glider to the top of a hill, step into the center of the main frame just a little back of the center of the wings. Put your arms around the arm pieces, face the wind and run a few steps. You will be lifted off the ground and carried down the slope. The balancing is done by shifting the legs. The glides should be short at first, but by daily practice, and, as the operator gains skill, glides can be made up to a length of several hundred feet. Do not attempt to fly in a wind having a velocity of more than 15 miles an hour.

Exerciser for a Chained Dog

The exerciser consists of a disk, 5 ft. in diameter, pivoted in the ground near the kennel. The disk revolves on a $\frac{5}{8}$ -in. pin set in a post made of a 4 by 4-in. piece of timber. The disk is made of common lumber fastened together with battens on the under side. Our dog seems to enjoy this kind of exer-

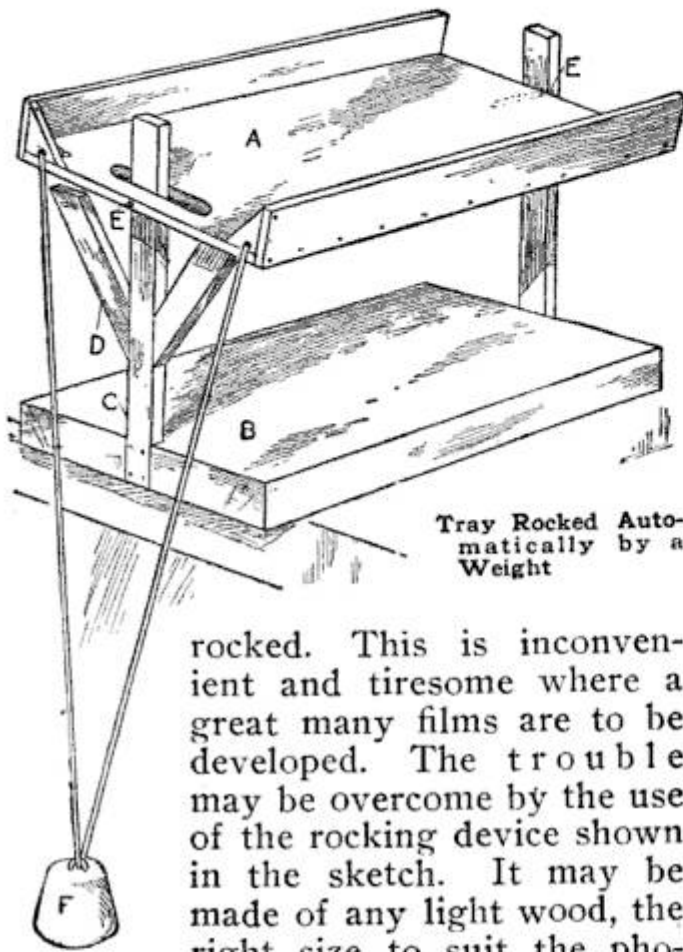


Revolving Disk Exerciser

cise.—Contributed by Hazel Duncan, Denver, Colo.

Photographic Tray-Rocking Stand

Films develop better if the tray holding the solution is kept in motion or



Tray Rocked Automatically by a Weight

rocked. This is inconvenient and tiresome where a great many films are to be developed. The trouble may be overcome by the use of the rocking device shown in the sketch. It may be made of any light wood, the right size to suit the photographer's needs.

The tray holder A is pivoted on the uprights C with pins EE. The uprights are fastened to a base, B. Two braces, D, one on each side of the upright C, limits the tip of the tray holder A. The weight F works as a pendulum, which automatically rocks the tray when set in motion.—Contributed by Abner B. Shaw, No. Dartmouth, Mass.

Kite-Line Traveler

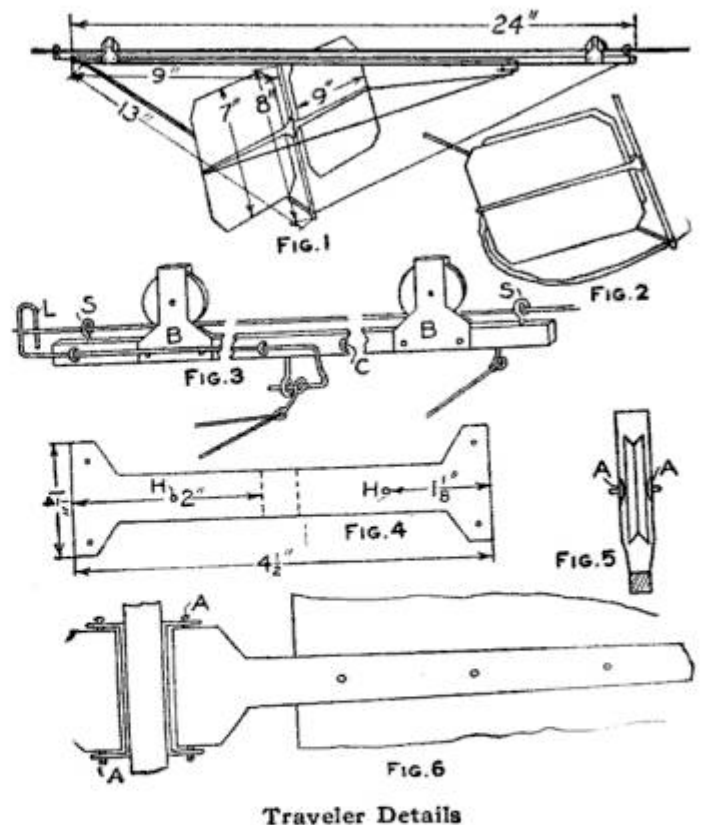
The amusement of kite flying can be broadened by adding the kite-line traveler shown in the sketch. The frame of the traveler is made of poplar, spruce or soft pine, $\frac{1}{4}$ in. square. The horizontal piece is 24 in. long and the piece to which the wings are fastened is 8 in. long. This piece is cut so it will have a slight slant. The brace is a mitered piece, 13 in. long. The frame is fastened together with small brads,

giving it the appearance shown in Fig. 1.

After the frame is finished, the traveler wheels are made and attached. They should be $\frac{1}{4}$ in. thick, about $1\frac{1}{4}$ in. in diameter, and have a groove cut $\frac{3}{16}$ in. into their faces. The pattern for cutting the bearings is shown in Fig. 4. These are bent at the places shown by the dotted lines and attached to the main frame stick as shown by BB in Fig. 3. The end view of the bearing is shown in Fig. 5. The metal is bent in as shown by AA, so that the wheel will rotate without much friction.

In Fig. 6 is shown the method of attaching the wings to the slanting frame part. The wings are made of light cardboard and each fastened with tacks to a wood arm, cut as shown. The large end of each arm is made to hinge in a piece of tin with brads AA.

Fasten a string to the ends of the arm pieces, as shown in Fig. 1, and attach a wire loop to the middle of the string, as shown in Fig. 3. The wire shown at L in Fig. 3 is bent and attached to the main frame so it will slide easily. The trip for dropping the



Traveler Details

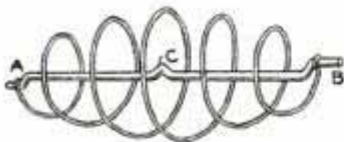
wings, as shown in Fig. 2, is a small block of wood about 2 in. square and $\frac{1}{4}$ in. thick with a $\frac{1}{2}$ -in. hole in the

center. Slip the kite line through the hole before tying it to the kite. Place the trip about 100 ft. from the kite and wedge it to the string with a small piece of wood. The eyelets SS are necessary, as they make it impossible for the pulley to run off the string.

The traveler is first put on the kite string with the end having the loop L (Fig. 3) up, then, after letting out 100 ft. of string, the trip block is fastened in place and the kite tied to the end of the string. Hook the wire loop on the string attached to the ends of the wings in place in the wire catch of L, and it is ready for the flight. When the traveler reaches the trip, the loop L is pushed back, thus causing the end of the wire to slip out of wire loop and the wings to fall back as shown in Fig. 2, when the traveler descends ready to be set for another flight.—Contributed by Stanley C. Funk, Bellefontaine, Ohio.

A Mouse Trap

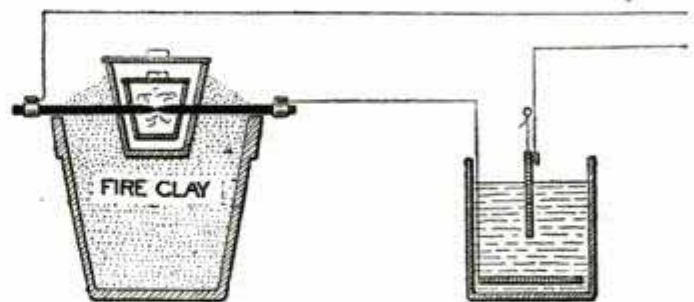
A simple mouse trap can be made of two lengths of steel wire. The spiral wire is $\frac{1}{16}$ in. in diameter and the center wire is of larger size. The trap is set by pulling out the spring and catching the ends on the bends A and B. The bait is tied on at C. When the mouse puts his head through the coils and pulls the bait, the springs are released and his head is caught between the coils.



How to Make a Small Electric Furnace

The furnace consists of a large flower pot containing an ordinary clay crucible about 6 in. in height, the space between the two being packed with fireclay. Two $\frac{3}{4}$ -in. holes are bored through the sides of the crucible about half way between the top and the bottom. Holes corresponding to these holes are molded in the fireclay, which should extend several inches above the

top of the flower pot. A smaller crucible is placed inside of the large one for use in melting such metals as copper, brass and aluminum. With metals that will melt at a low degree of heat,



Electric Connections to Furnace

such as tin, lead or zinc, the large crucible can be used alone. Each crucible should be provided with a cover to confine the heat and keep out the air. The electrodes are ordinary arc-light carbons.

The furnace is run on an ordinary 110-volt lighting circuit and it is necessary to have a rheostat connected in series with it. A water rheostat as shown in the sketch will serve to regulate the current for this furnace. Small quantities of brass or aluminum can be melted in about 10 minutes in the furnace.—Contributed by Leonard Stebbins, Denver, Colo.

Repairing a Broken Knife Handle

A piece was broken from the pearl handle of my knife and I repaired it in the following manner: After cleaning both the edges of the pearl and the brass beneath, I run in enough solder to fill the place of the piece of pearl broken out. The solder was then filed, sandpapered and polished. The broken

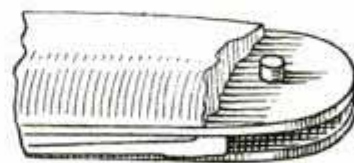


FIG. 1

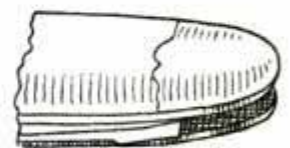


FIG. 2

Repairing with Solder

part cannot be felt and it appears to be only an end decoration.—Contributed by W. A. Humphrey, Columbus, O.

Crutch Made of an Old Broom

An emergency crutch made of a worn-out broom is an excellent substitute for a wood crutch, especially



when one or more crutches are needed for a short time, as in cases of a sprained ankle, temporary lameness, or a hip that has been wrenched.

Shorten and hollow out the brush of the broom and then

pad the hollow part with cotton batting, covering it with a piece of cloth sewed in place. Such a crutch does not heat the arm pit and there is an elasticity about it not to be had in the wooden crutch. The crutch can be made to fit either child or adult, and, owing to its cheapness, can be thrown away when no longer needed.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Toy Darts and Parachutes

A dart (Fig. 1) is made of a cork having a tin cap, a needle and some feathers. The needle is run through the center of the cork A and a pin or piece of steel is put through the eye of the needle. Take a quantity of small

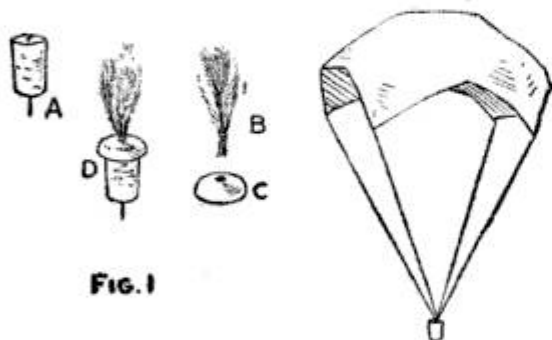


FIG. 1

FIG. 2

Dart Parts and Paper Parachute

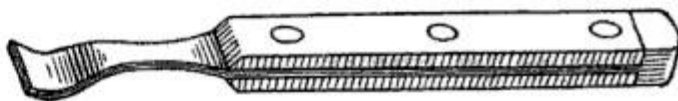
feathers, B, and tie them together securely at the bottom. Bore a hole in the center of the cap C, and fasten the

feathers inside of it. Fasten the cap on the cork and the dart is ready for use. When throwing the dart at a target stand from 6 to 10 ft. away from it.

The parachute is made by cutting a piece of paper 15 in. square and tying a piece of string to each corner. The strings should be about 15 in. long. Tie all four strings together in a knot at the end and fasten them in the top of a cork with a small tack. It is best to be as high as possible when flying the parachute as the air currents will sail it high and fast. Take hold of the parachute by the cork and run it through the air with the wind, letting it go at arm's length.—Contributed by J. Gordon Dempsey, Paterson, N. J.

A Tool for Lifting Can Covers

A handy tool for prying up varnish, paint, syrup and similar can covers can be made from an old fork filed down



Made of an Old Fork

to the shape shown in the illustration. The end is filed to an edge, but not sharp.—Contributed by Ben Grebin, Ashland, Wis.

Keeping Rats from a Chicken Coop

After trying for months to keep the rats from tunneling their way into my chicken coop by filling in the holes, laying poisoned meat and meal, setting traps, etc., I devised a simple and effective method to prevent them from doing harm.

My roosting coop is 5 by 15 ft. There is a 1-in. board all around the bottom on the inside. I used wire mesh having 1/2-in. openings and formed it into the shape of a large tray with edges 6 in. high, the corners being wired, and tacked it to the boards. This not only keeps the rats out, but prevents the chickens from digging holes, thus helping the rats to enter.—Contributed by John A. Hellwig, Albany, N. Y.

The Construction of a Simple Wireless Telephone Set

By A. E. ANDREWS

In Two Parts — Part I

Among the various methods for the transmission of speech electrically, without wire, from one point to another, the so-called "inductivity" system, which utilizes the principles of electromagnetic induction, is perhaps the simplest, because it requires no special apparatus. Since this system is so simple in construction, and its operation can be easily understood by one whose knowledge of electricity is limited, a description will be given of how to construct and connect the necessary apparatus required at a station for both transmitting and receiving a message.

Before taking up the actual construction and proper connection of the various pieces of apparatus, it will be well to explain the electrical operation of the system. If a conductor be moved in a magnetic field in any direction other than parallel to the field, there will be an electrical pressure induced in the conductor, and this induced electrical pressure will produce a current in an electrical circuit of which the conductor is a part, provided the circuit be complete, or closed, just as the electrical pressure produced in the battery due to the chemical action in the battery will produce a current in a circuit connected to the terminals of the battery. A simple experiment to illustrate the fact that there is an induced electrical pressure set up in a conductor when it is moved in a magnetic field may be performed as follows: Take a wire, AB, as shown in Fig. 1, and connect its terminals to a galvanometer, G, as shown. If no galvanometer can be obtained, a simple one can be made by supporting a small compass needle inside a coil composed of about 100 turns of small wire. The terminals of the winding on the coil of the galvanometer should be connected to the terminals of the conductor AB, as shown in Fig. 1. If now the conductor AB be moved up and down past the end of the mag-

net N, there will be an electrical pressure induced in the conductor, and this electrical pressure will produce a current in the winding of the galvanometer

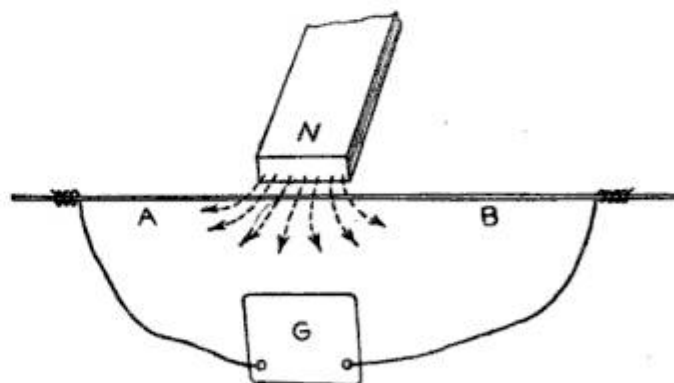


Fig. 1 — Wire Connected to Galvanometer

G, which will cause the magnetic needle suspended in the center of the coil to be acted upon by a magnetic force tending to move it from its initial position, or position of rest. It will be found that this induced electrical pressure will exist only as long as the conductor AB is moving with respect to the magnetic field of the magnet N, as there will be no deflection of the galvanometer needle when the motion of the conductor ceases, indicating there is no current in the galvanometer winding, and hence no induced electrical pressure. It will also be found that the direction in which the magnetic needle of the galvanometer is deflected changes as the direction of motion of the conductor changes with respect to the magnet, indicating that there is a change in the direction of the current in the winding of the galvanometer, and since the direction of this current is dependent upon the direction in which the induced electrical pressure acts, there must have been a change in the direction of this pressure due to a change in the direction of motion of the conductor. The same results can be obtained by moving the magnet, allowing the conductor AB to remain stationary, the only requirement being a relative movement of the

conductor and the magnetic field created by the magnet.

It is not necessary that the magnetic field be created by a permanent magnet. It can be produced by a current

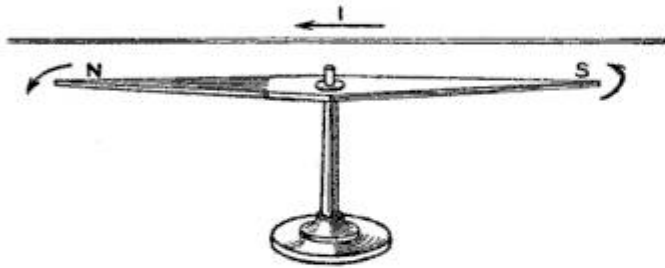


Fig. 2—Compass Needle Test

in a conductor. The fact that there is a magnetic field surrounding a conductor in which there is a current can

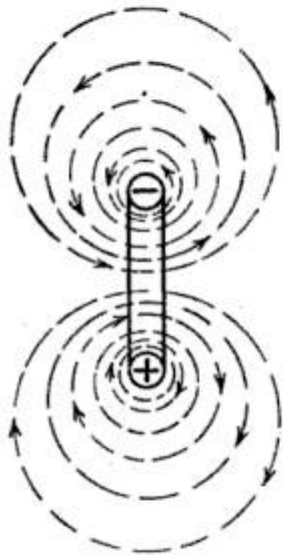


Fig. 4—Reversed Lines of Force

be shown by a simple experiment, as illustrated in Fig. 2. If a wire be placed above a compass needle and parallel to the direction of the compass needle and a current be sent through the wire in the direction indicated by the arrow I, there will be a force acting on the compass needle tending to turn the

needle at right angles to the wire. The amount the needle is turned will depend upon the value of the current in the wire. There is a definite relation between the direction of the current in the wire and the direction of the magnetic field surrounding the wire, because a reversal of current in the conductor will result in a reversal in the direction in which the compass needle is deflected. Remembering that the direction of a magnetic field can be determined by placing a magnetic needle in the field and noting the direction in which the N-pole of the needle points, this being taken as the positive direction, if one looks along a conductor in which there is a current and the current be from the observer, the direction of the magnetic field about the con-

ductor will be clockwise. Imagine a conductor carrying a current and that you are looking at a cross-section of this conductor (see Fig. 3), and the direction of the current in the conductor is from you (this being indicated in the figure by the cross inside the circle), then the lines of force of the magnetic field will be concentric circles about the conductor, they being nearer together near the conductor, indicating the strength of the field is greatest near the conductor. A compass needle placed above the conductor would place itself in such a position that the N-pole would point toward the right and the S-pole toward the left. If the needle be placed below the conductor, the N-pole would point to the left and the S-pole to the right, indicating that the direction of the magnetic field above the conductor is just the reverse of what it is below the conductor.

The strength of the magnetic field produced by a current in a conductor can be greatly increased by forming the conductor into a coil. Figure 4 shows the cross-section of a coil composed of a single turn of wire. The current in the upper cross-section is just the reverse of what it is in the lower cross-section, as indicated by the cross and dash inside the two circles. As a result of the direction of current

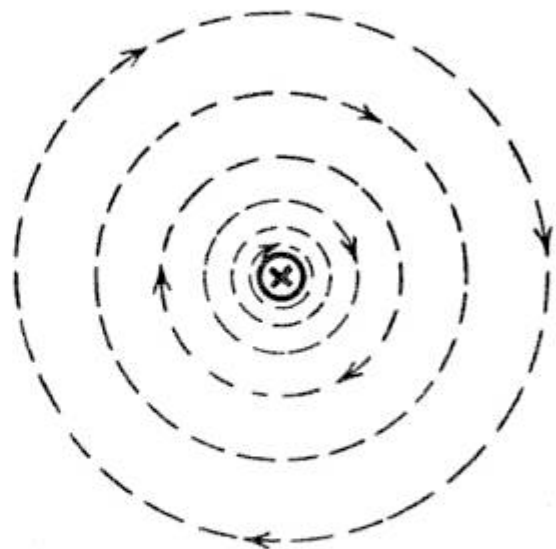


Fig. 3—Lines of Force

in the two cross-sections being different, the direction of the magnetic field about these two cross-sections will be different, one being clockwise, and the

other counter-clockwise. It will be observed, however, that all the lines of force pass through the center of the coil in the same direction, or the magnetic field inside the coil is due to the combined action of the various parts of the conductor forming the complete turn. This magnetic field can be increased in value, without increasing the current in the conductor, by adding more turns to the coil.

A cross-section through a coil composed of eight turns placed side by side is shown in Fig. 5. The greater part of the magnetic lines created by each turn pass through the remaining turns as shown in the figure, instead of passing around the conductor in which the current exists that creates them. This results in the total num-

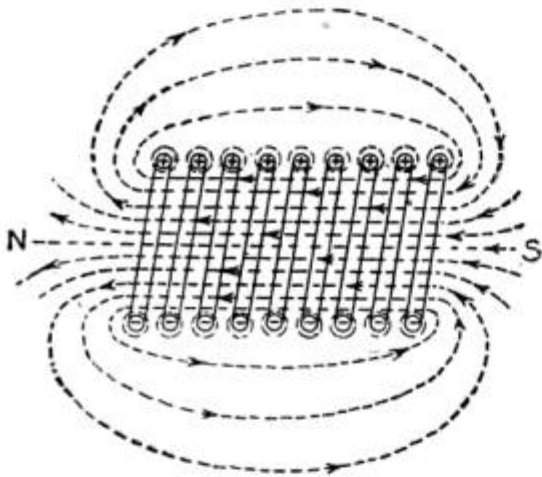


Fig. 5—Magnetic Lines Passing through Center

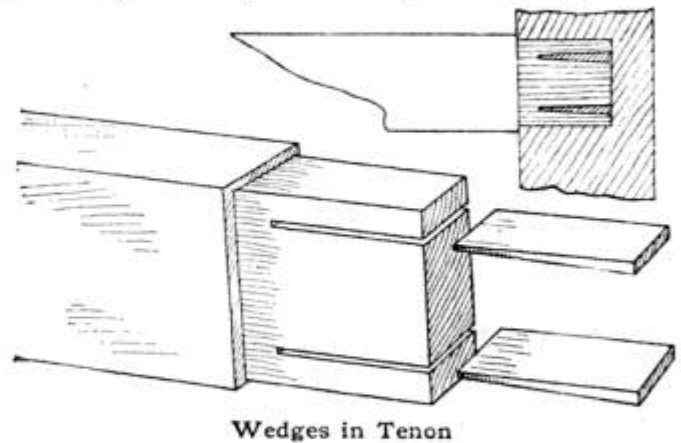
ber of lines passing through the coil per unit of cross-sectional area being greater than it was for a single turn, although the value of the current in the conductor has remained constant, the only change being an increase in the number of turns forming the coil.

If a conductor be moved by the end of a coil similar to that shown in Fig. 5, when there is a current in the winding of the coil, there will be an electrical pressure induced in the conductor, just the same as though it were moved by the end of a permanent magnet. The polarity of the coil is marked in Fig. 5. The magnetic lines pass from the S-pole to the N-pole through the coil and from the N-pole to the S-pole outside the coil, just as they do in a permanent magnet.

(To be continued)

How to Lock a Tenoned Joint

A tenon placed in a blind mortise can be permanently fastened, when putting the joints together, by two



wedges driven in the end grain of the wood. In some cases, where the wood to be used is very dry and brittle, it is advisable to dip the tenon in warm water before applying the glue. The glue must be applied immediately after the tenon is removed from the water, and then inserted in the mortise. The sketch shows the application of the wedges. The bottom of the mortise drives the wedges as the tenon is forced in place.

Fitting a Large Cork in a Small Bottle

When necessary, a large cork may be made to fit a small bottle, if treated as shown in the sketch. Two wedge-shaped sections are cut from the cork, at right angles to each other, as shown in Fig. 1. The points are then squeezed together (Fig. 2) and the end inserted



FIG. 1

FIG. 2

FIG. 3

Reducing Size of Cork

in the bottle (Fig. 3). Wet the cork slightly and the operation will be easier.—Contributed by James M. Kane, Doylestown, Pa.

Gear-Cutting Machine

Perhaps the last thing that would be thought within range of the amateur who lacks a full equipment of machinery is the cutting of gear wheels. The device shown in the sketch is very practical, and, with the most ordinary

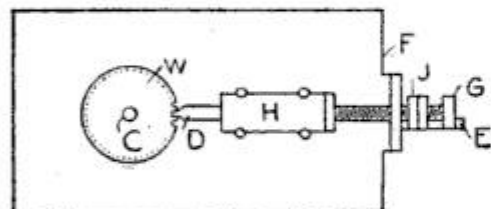


FIG. 1

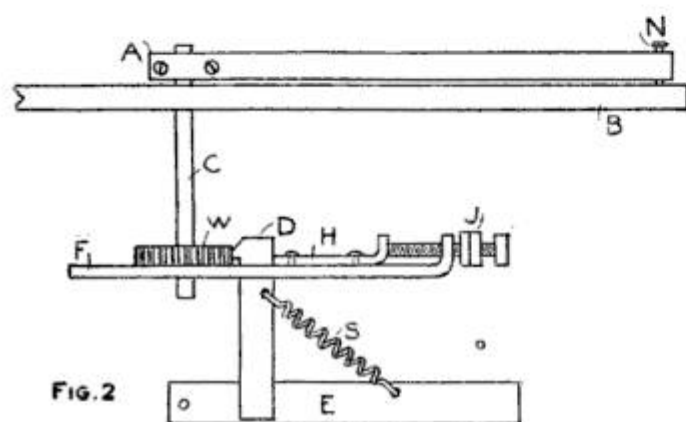


FIG. 2

Details of Gear-Cutting Machine

assortment of iron-working tools, will serve to turn out an accurate gear.

No system of supports is shown, as they are easily supplied. A flat, square board, B, as large as can be obtained—2 ft. on a side being the safest minimum—is used for a dial. A sheet of paper is pasted over the entire board and a large circle drawn on it. This circle is divided into as many parts as there are to be teeth in the gear. A depression is made with a prick punch at each division. A shaft, C, is run through the center, to which an arm, A, is firmly attached. A nail, N, is placed at the end of the arm so that the point can enter each of the punch marks on the periphery or circumference of the circle. A blank wheel, W, is attached to the shaft C, in the position shown, and resting on the iron plate or strap F. A cutting tool, D, works up and down in a slot in F. This cutter is held away from the blank wheel by the spring S, and moved

up to it by the screw G, acting through the sliding member H. A stove bolt may be used for G, with the nut firmly fastened to the strap F. The cutter is actuated with a handle E, whose motion is limited by the pegs as shown. In Fig. 2 is shown a top view of the strap E, with a cross section of the cutter and the slot in which it works.

The operation of the mechanism is as follows: With the blank wheel in place set the nail N in one of the punch marks and move the handle E downward. This will make a slight cut on the wheel. Then give the screw G a turn or two, which will make the cutter take a deeper bite, and push the handle down again. This operation is repeated, screwing G constantly deeper, until it is stopped by the lock-nut J, which regulates the depth of the cut. Move the nail N to the next punch mark and repeat. The operations are very quickly performed and the circle will be closed almost before you know it.

There are several points to be observed. The accuracy depends upon three things. First, the slot through which the cutter passes must be tight-fitting, even at the expense of working hard. Second, the shaft C must fit tightly in the holes made for it through B and F, also the arm A must be firmly attached, the shaft being filed flat at the point of attachment. The blank wheel should be keyed on the shaft or securely fastened with a setscrew. Third, the nail N must enter the punch marks accurately. As the grinding circle is so much larger than the blank, any error here is greatly reduced in the finished wheel. Once in a punch mark the nail must not be allowed to slip until the tooth has been cut.

In practice, it will be found better, after each stroke of the handle, to give a quarter turn outward to the screw G, thus avoiding the scraping of the tool on the up stroke. The cutter can be made of any suitable steel with the cutting point ground to give whatever

shape is desired for the tooth. The best shape for any particular purpose can be found by reference to a book on gears.

This cutter is adapted, of course, only to the softer metals. For experimental purposes a blank cast in type metal is excellent and will last as long probably as required. The mechanism here described will cut brass perfectly well and a gear made of this more durable metal will answer for a finished construction. Type-metal blanks commend themselves because they are so easily cast, any flame which will melt solder being sufficient, and the molds, of wood, plaster of Paris or any easily worked material, being quickly constructed.—Contributed by C. W. Nieman, New York City.

A Potato Peeler

The guard is made of a piece of wire about 1 in. shorter than the blade of an ordinary table knife. The ends of the wire are turned into a coil to re-



Guard Made of Wire

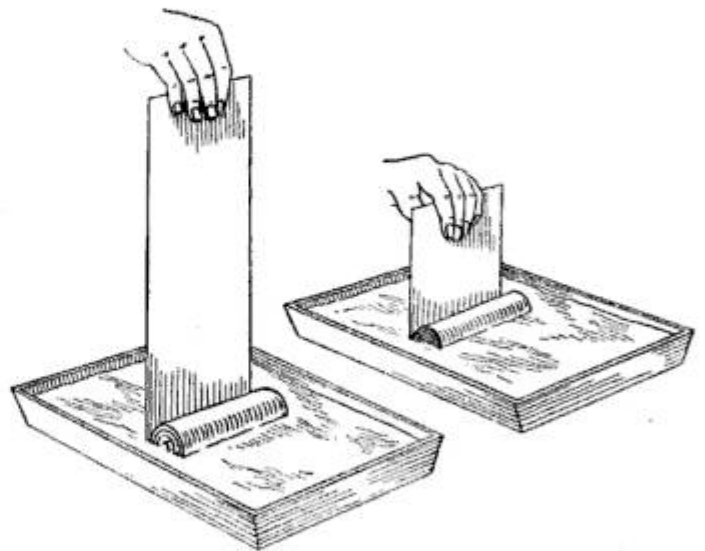
semble a coil spring with coils close together. Allow enough wire to project on one end to be flattened and pointed for an eye extractor.

When this device is placed on the knife, the contrivance works on the same principle as a spokeshave. The first setting peels the potato without any appreciable waste, the other setting may be as desired for cutting slices.—Contributed by H. W. Ravens, Seattle, Washington.

An Easy Way to Develop Roll Film

This is simply a different motion to the tiresome seesaw one usually employs when films are being developed. In wetting them down previous to immersion in the developer, do not keep them in the water long enough to become limp, but remove them after a few quick dips, says Camera Craft. They

will then retain some of their curling tendency, so that by taking one end in one hand and gradually lowering the

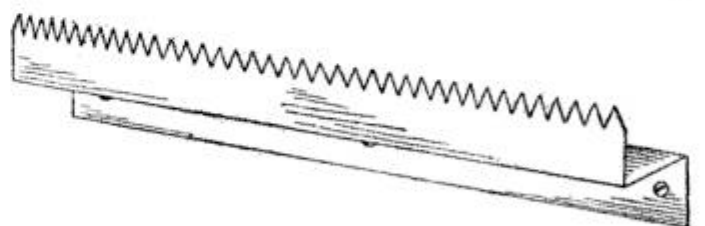


Developing Film

film into the dish of developer and then raising it out of the dish, it will be found that the film will roll and unroll quite readily, much as one would let out or wind in a reel. This method will result in quicker development, because the roll is nearly always immersed in developer. The method necessitates using only one hand, making it possible to develop a second strip at the same time with the other. The illustration shows quite clearly just how the film will behave.

A Shoe Hanger

An inexpensive shoe hanger can be made of a strip of tin, about $\frac{1}{2}$ in. wide and as long as the space will permit. Cut notches along one edge and bend the tin and tack or screw it on a strip

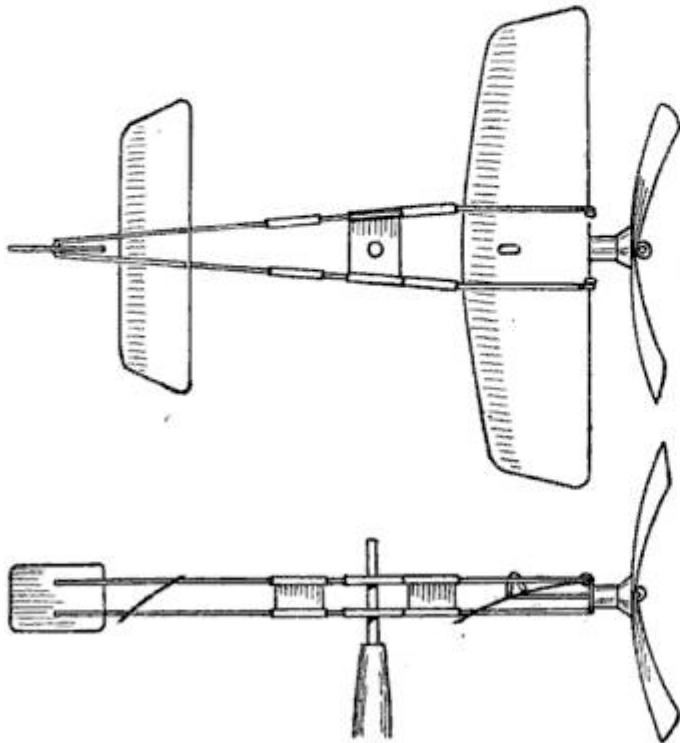


Notched Metal Hanger

of board or to the inside of the closet door. The shoes are hung up by the heels with the toes down.—Contributed by C. R. Poole, Los Angeles, Cal.

A Monoplane Weather Vane

The toy windmill or weather vane shown in the sketch is made to represent a Blériot monoplane. The pro-



Wire and Sheet-Metal Vane

PELLER is turned by the wind. The frame is made of heavy wire and connected with straps of tin. The construction is plainly shown in the illustration. The windmill vane can be made in any size to suit the builder.—Contributed by W. C. Bliss, St. Louis, Missouri.

How to Make a Minnow Trap

Glass minnow traps that will give as good service as those purchased at the tackle store can be made without difficulty. If a trap should be banged carelessly against the side of the boat or some other obstruction and smashed, instead of spending several dollars to replace it, a half hour's time will turn out a new one just as good, says a correspondent of *Outing*.

A trap of this kind can be made from an ordinary fruit jar such as used in putting up preserves, either of one or two-quart capacity. A one-quart jar gives good results, but if the bait to be caught is of fairly large size, the two-quart size may be used. As the jars have the same style top they can be

used interchangeably with one mouth-piece.

The mouthpiece is made of a round-neck bottle of which the glass is colorless and rather thin. If the neck of the bottle is cut at the right point, it makes a glass funnel that will just fit into the fruit jar. The funnel forms the mouth of the trap. Put the neck of the bottle into the fruit jar and mark the glass with a file where the bottle and jar meet. Make as deep a cut as possible with a file around the bottle on the mark and place two turns of a yarn string saturated in kerosene around just below the cut when the bottle is standing in an upright position. Set fire to the string and turn the bottle from side to side to distribute the heat evenly, then when the string has burned out, plunge the bottle in cold water and it will separate on the cut.

Bind some copper wire around the neck of the jar so that three ends will project $\frac{1}{2}$ in. or more. These are bent down over the funnel when put into the jar, forming clamps to hold it in place. The copper wire can be bent many times in emptying or baiting the trap without breaking.

Two copper wire bands are tied tightly around the jar about 3 in. apart. They should be twisted tight with a pair of pliers and the ends joined, forming a ring for attaching a cord.

For catching "kellies" or "killies," bait the trap with crushed clams or salt-water mussels and for fresh water shiners use mincemeat or bread crumbs and do not spill any bait outside of the trap. Leave the trap down ten to fifteen minutes and when resetting it after emptying, put back one or two of the victims, as the others enter more readily if they see some of their companions ahead of them.

A Remedy for Leaking Fountain Pens

Fountain-pen leaks may often be prevented by unscrewing the joint and lightly smearing the screw with vaseline. This also makes it easy to unscrew the joint for filling.

INTERESTING PATENTS

PRACTICAL OR UNIQUE

WATER-JET MARKER FOR TORPEDOES—

Believing that a jet of water rising intermittently from a torpedo would be the best possible means of following its course, a New York inventor has patented a mechanism for projecting such a jet. The mechanism comprises an upwardly directed discharge conduit, an intake conduit, and a force pump provided with a small motor, arranged within the torpedo as shown in Fig. 1.

**A FORK FOR KINDLING FIRES—**

A kindling device comprising a burner having three perforated tines, means for governing the supply of gas to the tines, and an insulating handle by which the kindler may be grasped, is shown in Fig. 2. Such a device, pushed into the bed of fuel in a furnace, is far superior to the old waste-paper and match method of igniting fires. Gas is supplied to the burner by means of a flexible hose attached to a gas cock near the furnace.

**COMBINED COMB, PENKNIFE, AND CIGAR**

CLIPPER—An ingenious combination of penknife, comb, and cigar clipper is shown in Fig. 3. A steel knife blade, tempered and ground on one side to a keen edge, is riveted to the handle of an aluminum comb and held in position by a specially constructed steel spring. A $\frac{1}{8}$ -in. beveled hole is provided in the handle of the comb for clipping the ends of cigars.

**WRINKLE-MASK—**

A wrinkle-mask that looks more like armor protection than a beautifier is shown in Fig. 4. It comprises a circular, nonadhesive, perforated rubber plate having an elongated central opening for the prominent features of the face, an elastic band located around the outer end of the plate, and a hood of knitted material to house the hair.

**HAND-MOUNTED MASSAGE APPARATUS—**

An ingenious means of mounting a massage vibrator on the back of the hand for operating purposes is illustrated in Fig. 5. The vibrator is fastened to a base adapted to be positioned on the back of hand, the base being held securely by means of a wrist strap and two elastic rings, the latter fitting over the thumb and little finger.

**SMOKING-PIPE SUPPORT—**

Figure 6 is a simple clip standard for smoking pipes, by which the pipe is held in an upright position when placed on a table or other like support.

**BEAN-PULLER—**

A great improvement over the ordinary rake as an implement for harvesting beans is shown in Fig. 7. Pulled through the bean plants, the vines slip through between the teeth and remain intact upon the plant, while the bean pods are pulled off and carried along on the solid upper portion of the blade.

**DEVICE FOR CLAMPING MITERED JOINTS**

Figure 8 is a clamp for mitered or other beveled joints, comprising a pair of bars adapted to extend across each other, means of attachment to the two parts to be jointed, and the necessary clamping means.

**NEW BUTTON FOR WASH VESTS—**

A new button for wash vests, recently patented and placed on the market, is shown in Fig. 9. This button is claimed to work very easily, both in placing it on and removing it from the vest, yet when placed on the vest it will stay there.

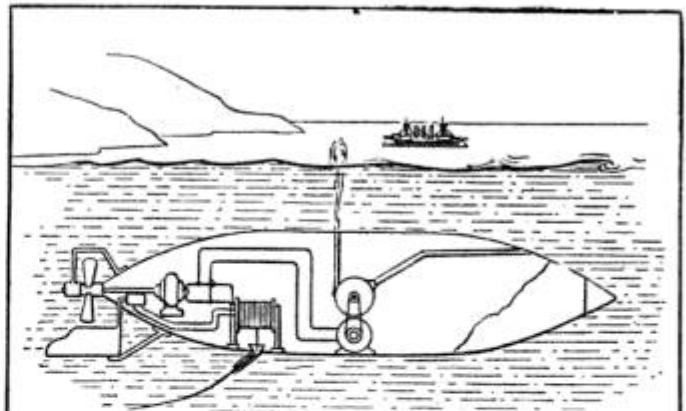


FIG. 1

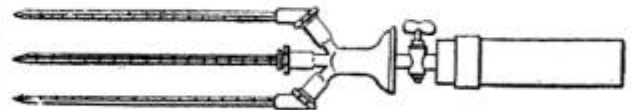


FIG. 2



FIG. 3



FIG. 4

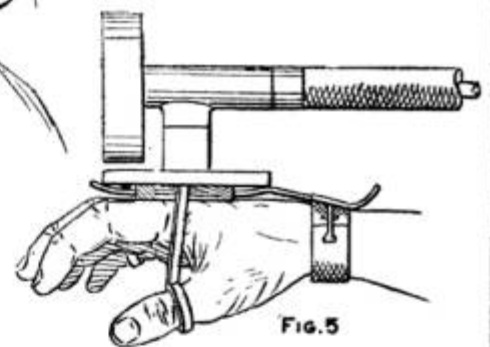


FIG. 5



FIG. 6

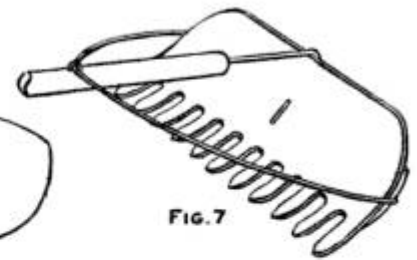


FIG. 7

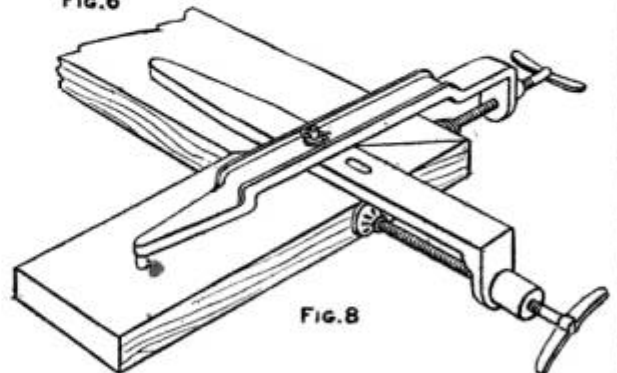


FIG. 8



FIG. 9

JOHN S. SARGENT, the eminent painter, was being discussed in a Philadelphia studio.

"Sargent," said a magazine illustrator, "gets \$5000 apiece for his portraits. Well, one day when he was in America, a deputation waited on him and asked him to paint a certain colonel of volunteers."

"For this work," said the spokesman, "we are willing to pay you, Mr. Sargent, \$2500."

"But—" the painter began
"The spokesman, however, interrupted hastily:
"Of course, sir, at that price, we would only want a half-length."

"Oh, very well," said Sargent. "And which half would you prefer?"—Philadelphia Inquirer.

"Jorkins is certainly in a good many positions at once."

"How so?"
"He is up in the air, down on his luck, on in years and back in his taxes."—Baltimore American.

Two Irishmen died, so the story ran. One went to heaven and the other didn't. Mike called down to Pat:

"What arre yez doin', Pat?"
"Shovelin' coal."
"Arre yez workin' harrd?"
"Not very. We has shifts an' work only three hours a day. What arre yez doin' up there in Hivin'?"
"O'im sweepin' the golden stairs."

"Arre yez workin' harrd?"
"Yis. Oi hov to worrk eighteen hours a day. We're short of men up here!"—Hardware Reporter.

Mrs. Grant—Didn't you feel terrible when Gracie married the aeroplane man?

Mrs. Willers—No; he's a man she can look up to.—Chicago News.

George III sniffed.
"Let 'em go!" he cried. "We'll get more money by having 'em come over to our coronation."
Calmly he watched America withdraw.—New York Sun.

A gentleman with decided tendencies towards looking after everybody's business but his own, saw a furniture removal van being loaded near his house.

"I say, carter," he said bumptiously, "are the people upstairs removing?"

The carter looked at him scornfully, and, wiping the perspiration from his manly brow, replied:

"No, sir, we're just takin' the furniture out for a drive."—Ocean Gazette.

"We Americans are an up-to-date lot," said Wilbur Wright in an after-dinner speech in Dayton.

"The other morning in New York," he resumed, "as I was driving out Broadway with a friend, I saw my friend's bookkeeper hurrying along with a spare part of a Gnome motor in his hand."

"Hello," I said, "I didn't know your bookkeeper could afford to go in for flying!"

"Hush! He can't," said my friend. "That's his lunch, but he doesn't want anybody to know it."—New York Evening Post.

Mrs. Gaddy—There are some distinctions in life which are very puzzling to me.

Professor Pundit—Like what for instance?
Mrs. Gaddy—When you write everything bad and mean in a man's life in a book for everybody to read, it is biography, but when you just tell the same things to a few people on a front porch, it's gossip.—Baltimore American.

Sir Patrick Spens, the noted London surgeon, praised, at a dinner in New York, the abundant and timely reading matter that American physicians have in their waiting-rooms.

"The English physician offers his patients reading matter, but I am afraid it isn't always up to date. One of your American millionaires consulted me in Harley street last month. He was kept waiting about an hour. When he finally entered my inner office he looked very much bored."

"I see by your papers, doctor," he said with a yawn, "that it is rumored that two Dayton men, Orville and Wilbur Wright, can actually fly!"—Los Angeles Times.

"Gosh, I hate to see summer come," said the farmer.

"Why?"
"Coz all summer long ma dishes up a lot of stuff we can't eat ourselves jes' to let the city boarders think they're gettin' plain home cooking."—Detroit Free Press.

"Our whole neighborhood has been stirred up," said the regular reader.

The editor of the country weekly seized his pen. "Tell me all about it," he said. "What we want is news. What stirred it up?"

"Ploughing," said the farmer.—Driftwood.

Patience—He takes an awful long time to weigh his words, doesn't he?"

Patrice—Yes, but it takes such a lot of them to weigh anything, you know!—Yonkers Statesman.



A Suggested Magnet Life-Saving Device

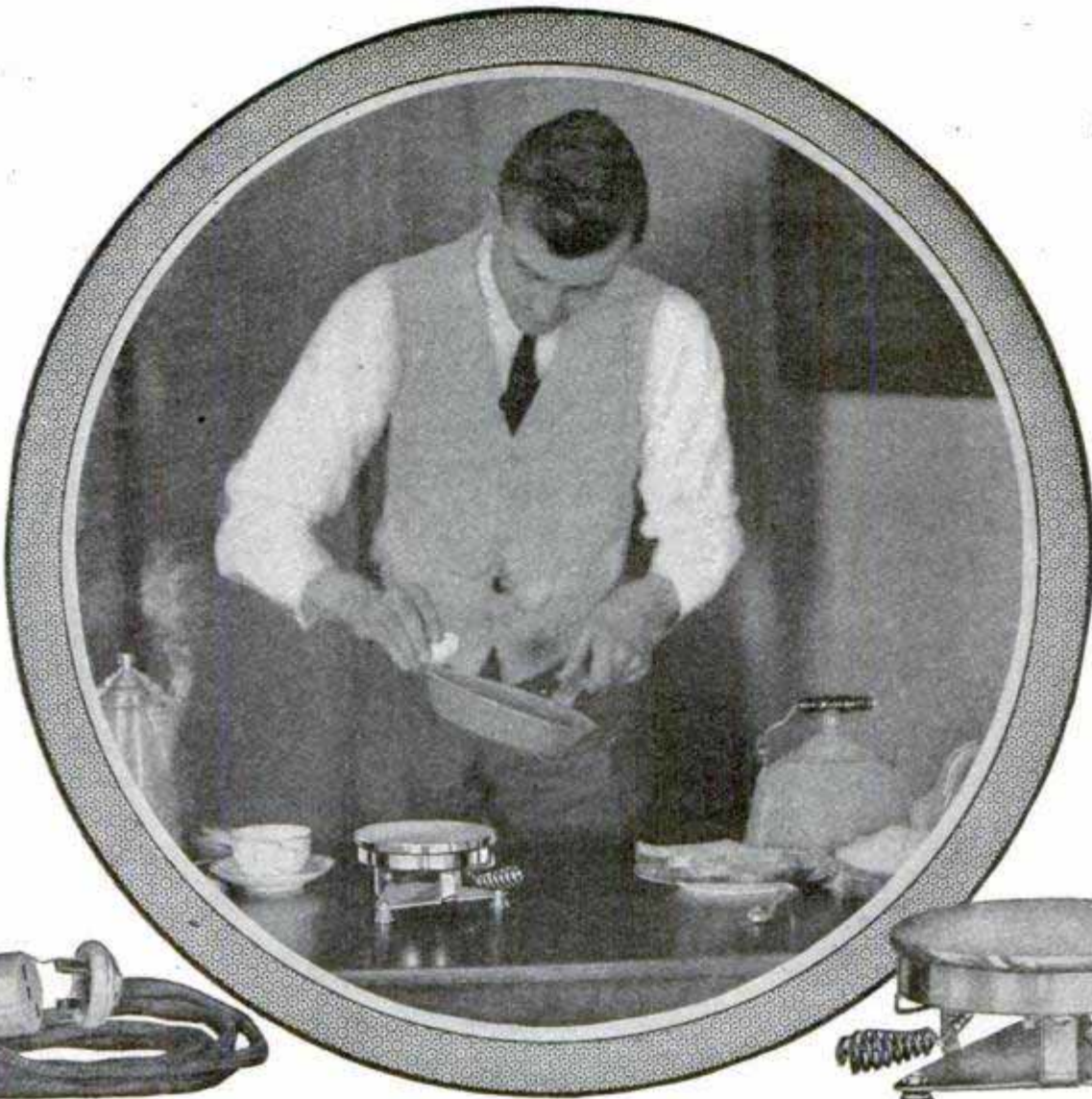
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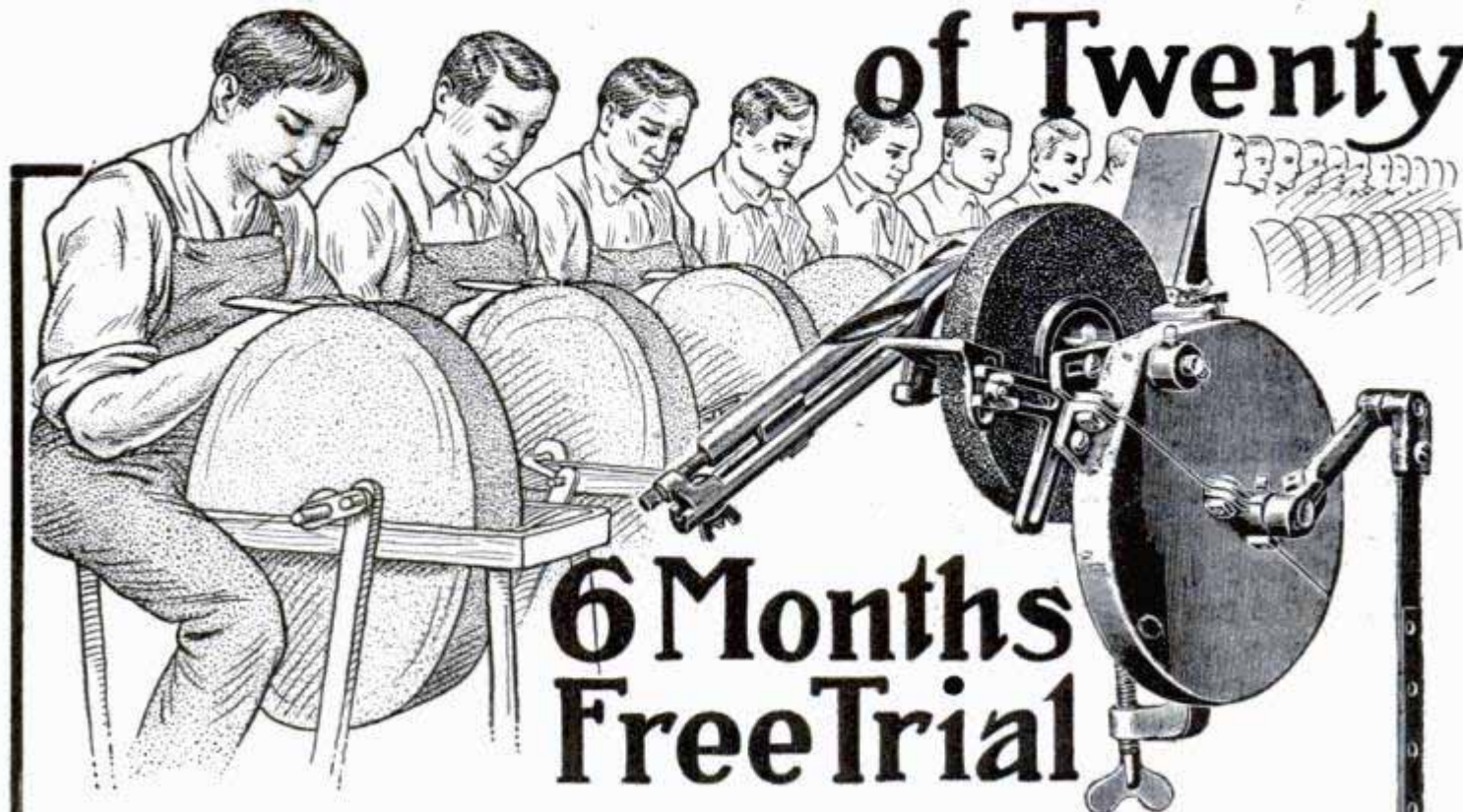
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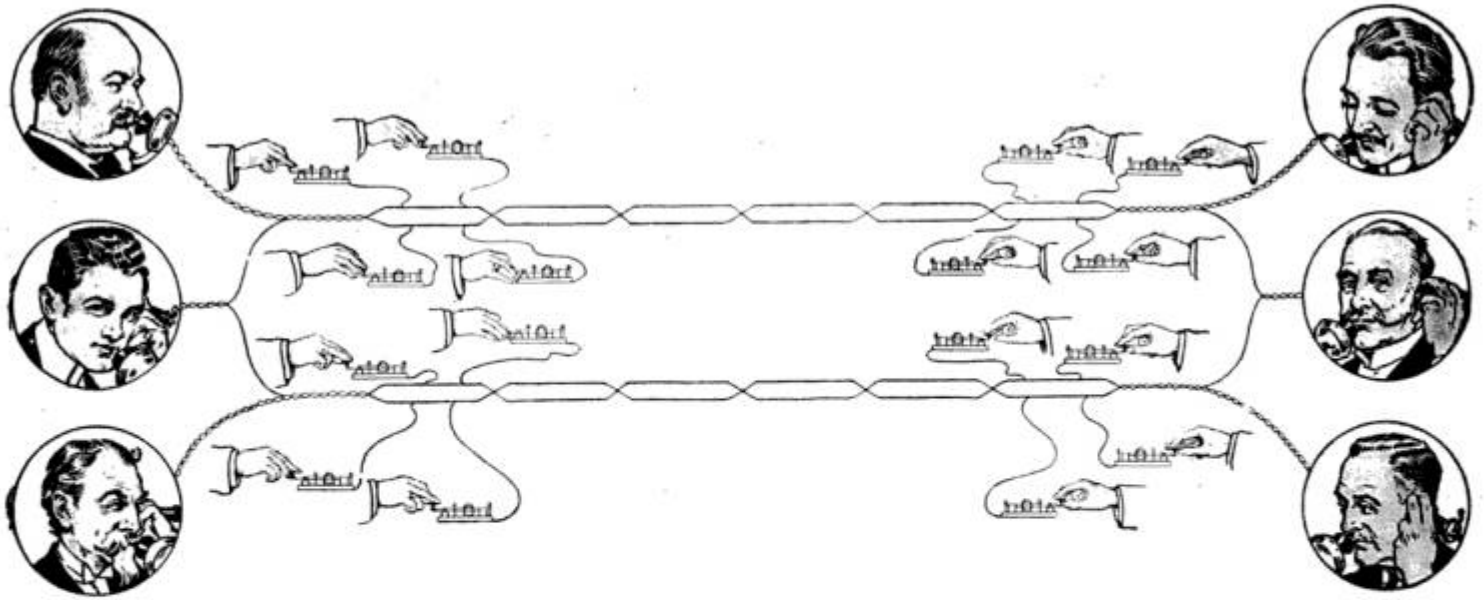
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Double Tracking The Bell Highway

Two of the greatest factors in modern civilization—the telephone and telegraph—now work hand in hand. Heretofore each was a separate and distinct system and transmitted the spoken or written messages of the nation with no little degree of efficiency. Co-operation has greatly increased this efficiency.

The simple diagram above strikingly illustrates one of the mechanical advantages of co-operation. It shows that six persons can now talk over two pairs of wires *at the same time* that eight telegraph operators send eight telegrams *over the same wires*. With such joint use of equipment there is economy; without it, waste.

While there is this joint use of trunk line plant by both companies, the telephone and telegraph services are distinct and

different. The telephone system furnishes a circuit and lets you do your own talking. It furnishes a highway of communication. The telegraph company, on the other hand receives your message and then transmits and delivers it without your further attention.

The telegraph excels in carrying the big load of correspondence between distant centers of population; the telephone connects individuals, so that men, women and children can carry on direct conversations.

Already the co-operation of the Western Union and the Bell Systems has resulted in better and more economical public service. Further improvements and economies are expected, until time and distance are annihilated by the universal use of electrical transmission for written or personal communication.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
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One Policy

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Universal Service

Waterman's Ideal Fountain Pen

ON THIS
Dynamometer
MADE THE
Official Record

of the operation of a regularly scheduled 14-car passenger train, from Chicago to Los Angeles and return.

This marvelous record was registered upon a strip of paper 9 miles long by 9 inches wide, representing a run of 4500 miles in 7 days,

Without a Single Pen Failure

The Dynamometer consists of an electric motor and gearings, acting upon magnets and indicators, which cause the Waterman's Ideals to inscribe an accurate record of all the essential points in Passenger and Freight train operation, such as Power of Locomotive, Revolution of Wheels, Speed in miles per hour, Time moments at $\frac{1}{2}$ second intervals, Air Brake control, and Passing Mile Posts and Stations, which locate the performance of the train at any point on the road.

IT IS A MATTER OF RECORD

that in the 8 years of service of this Dynamometer every kind of fountain pen has been tried. Two of the eight pens used at first were Waterman's Ideals *and are still in use.* Every other pen failed and a single failure means a loss of hundreds of dollars and valuable time.

For the past 3 years, Waterman's Ideals have been used exclusively. The official in charge of the Dynamometer car says:—"In view of the many troubles experienced with various makes of fountain pens during the first five years of the operation of this car, the satisfactory performance of the Waterman's Ideal is certainly very gratifying to me."

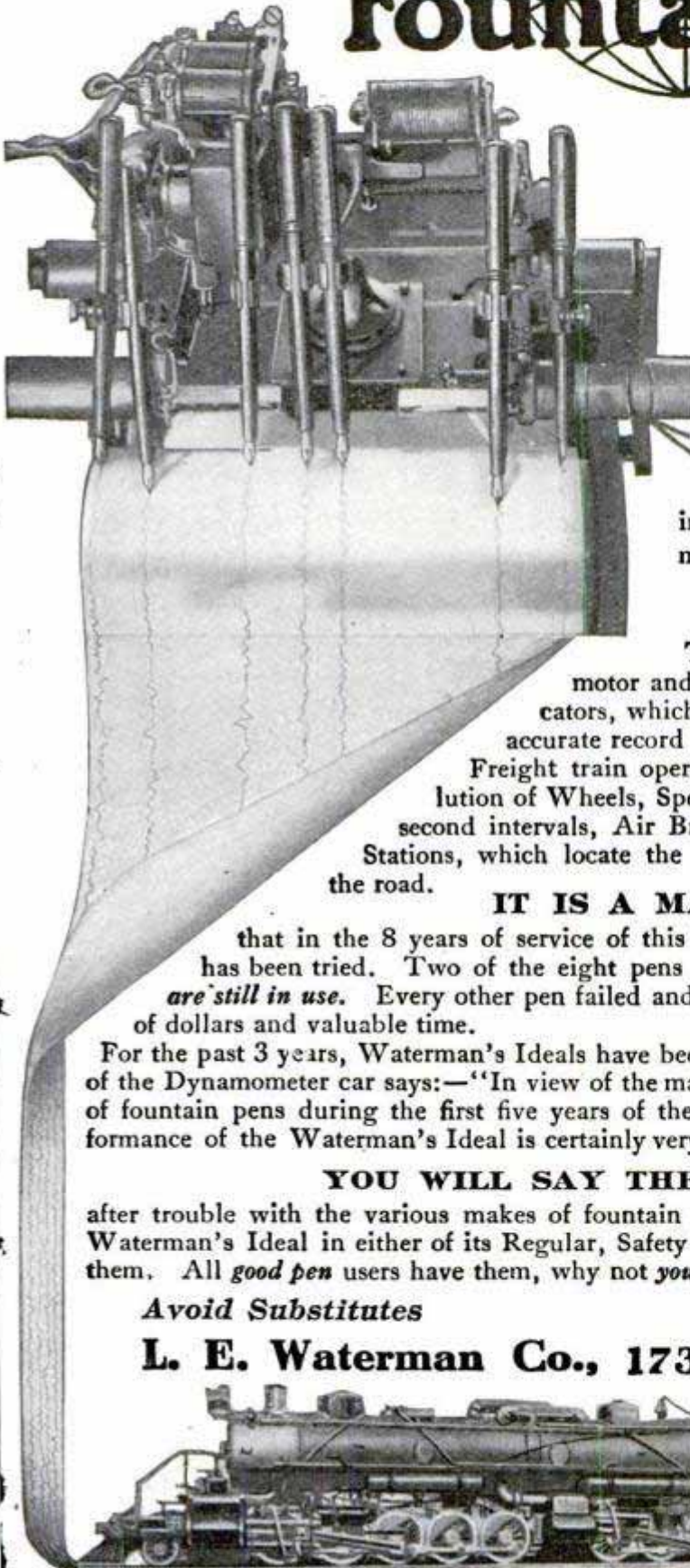
YOU WILL SAY THE SAME THING

after trouble with the various makes of fountain pens, if you equip yourself *to-day* with a Waterman's Ideal in either of its Regular, Safety or Self-Filling Types. No trouble to get them. All *good pen* users have them, why not *you*? Booklet mailed on request.

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If you haven't heard of our Mechanics' Handy List, a handy reference book and tool catalog widely advertised to mechanics, send for a copy.

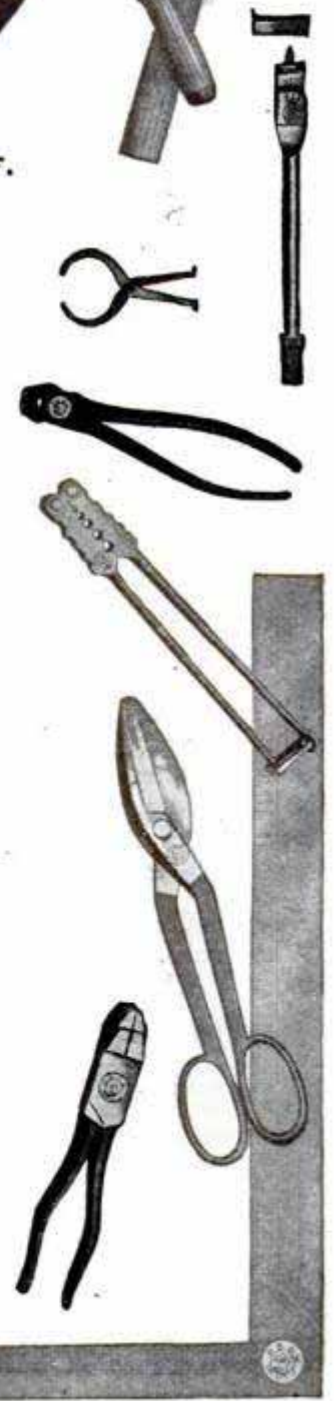
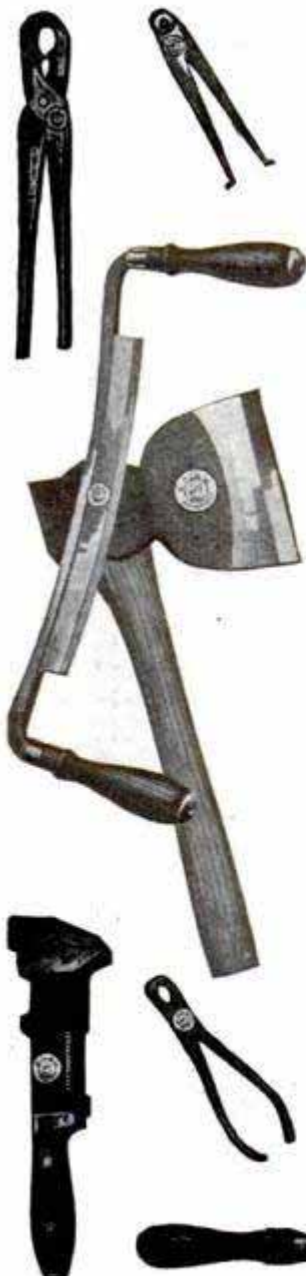
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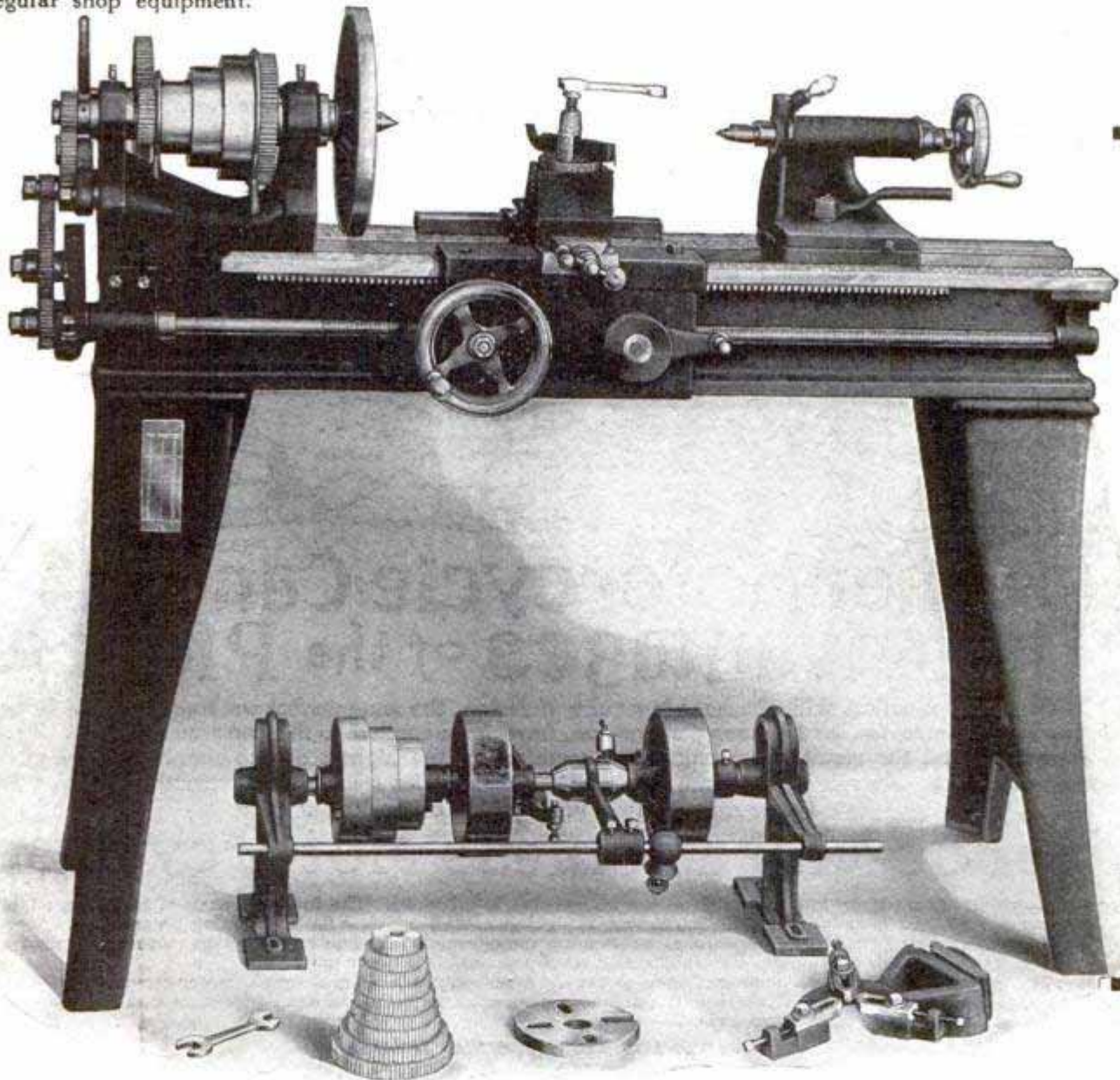
Our lathes are the best made for ordinary shop use. Judge for yourself.

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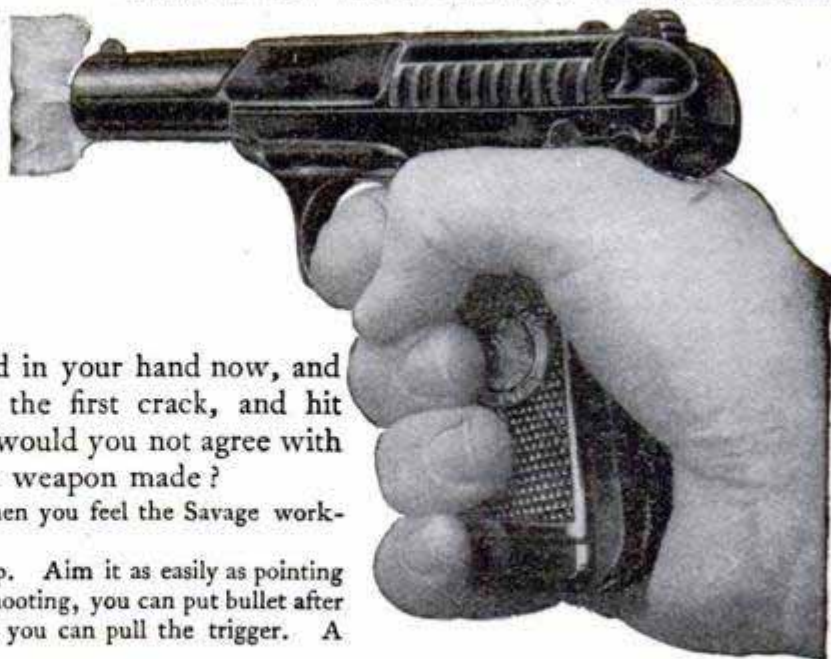
No. 9G4821 11-Inch Screw Cutting Engine Lathe, COMPLETE, AS ILLUSTRATED, \$88.00

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IF you had a Savage Automatic placed in your hand now, and you hit a mark 40 or 50 feet away the first crack, and hit it every time with all eleven shots, would you not agree with gun experts that it is the greatest pocket weapon made?

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It is not a military arm, and we invite comparison with any automatic made.

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THE NEW SAVAGE AUTOMATIC



No Other Motorcycle Can Claim The Advantages of the Pierce

THE same mechanical skill, the same ingenuity of design, the same perfect workmanship which have made the Pierce the leader among motor-cars, have been applied to the construction of the Pierce Motorcycle. And the result is a machine that combines in the highest degree simplicity, endurance, power, and ease. No matter what the going, the Pierce glides steadily and smoothly along. The Pierce rider is always the "King of the Road."

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have many points of superiority in design. There are no gasoline or oil tanks. The frame is made of extra large tubing which cannot break, buckle or dent, and this tubing carries gasoline and oil sufficient for long touring distances.

The **Single-cylinder** Pierce has a long-stroke, ball-bearing motor which runs free and develops more power than any other motor of this type. It is of simple construction and readily accessible in every part.

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Sent for
\$5.25

This splendid blue steel range with reservoir, warming closet and nickel trimmings. One of the 112 range bargains in our catalog, a guaranteed baker and fuel saver.

Price \$30.60.
Only **\$2.50 Monthly**

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Easy to Pay Terms

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On \$10.00 Purchase	On \$25.00 Purchase	On \$50.00 Purchase
Pay \$1.00 Cash 75c Monthly	Pay \$3.75 Cash \$2 Monthly	Pay \$7.50 Cash \$4 Monthly

Over a Year to Pay

And no matter where you live or how much you earn, you can buy your home-furnishings here—on credit—without publicity—without red tape. We have trusted the great working class for over 27 years, and we know they are honest. Several hundred thousand people all over the country have open accounts with us. We give them over a year to pay for anything they buy while they use and enjoy the goods. You too, can have the same easy-to-pay terms on any of the 3862 things in our catalog.

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Anything you select from our bargain catalog will be sent you for 30 days approval. You may use the goods a whole month before you decide to buy them. If they are not more than satisfactory—if we have not actually saved you 15 to 50% on your purchase—return the goods at our expense. We'll refund your small first payment—and even pay the freight charges both ways. Back of this offer is the endorsement of the First National Bank of Chicago.

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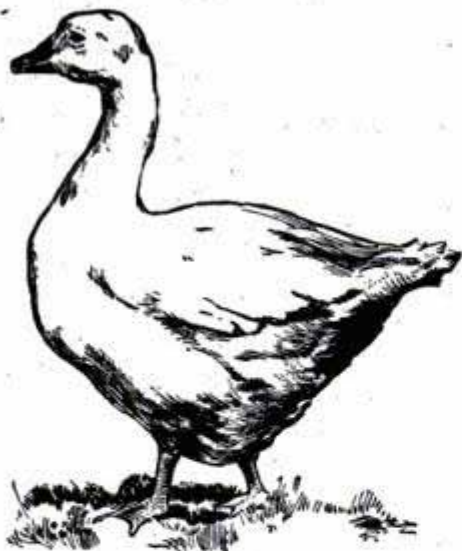
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Of course you would! You are producing the golden nuggets for yourself and family. Your income earning power should be so protected by insurance that if anything happens, you and your family will be provided for. Accidents occur daily which destroy or impair the earning power of the individual.

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A PRACTICAL MINIATURE AUTO propelled by a small gasoline motor. The greatest instructive, mechanical device ever invented. Boys all over the world now building Motor Bobs. Any boy of 12 years and up can build and operate the Motor Bob. Send 25 cents (coin preferred) for our complete instruction booklet, "HOW TO BUILD A MOTOR-BOB," which contains simple drawings, diagrams, pictures, instructions for building and operating, and list of parts.

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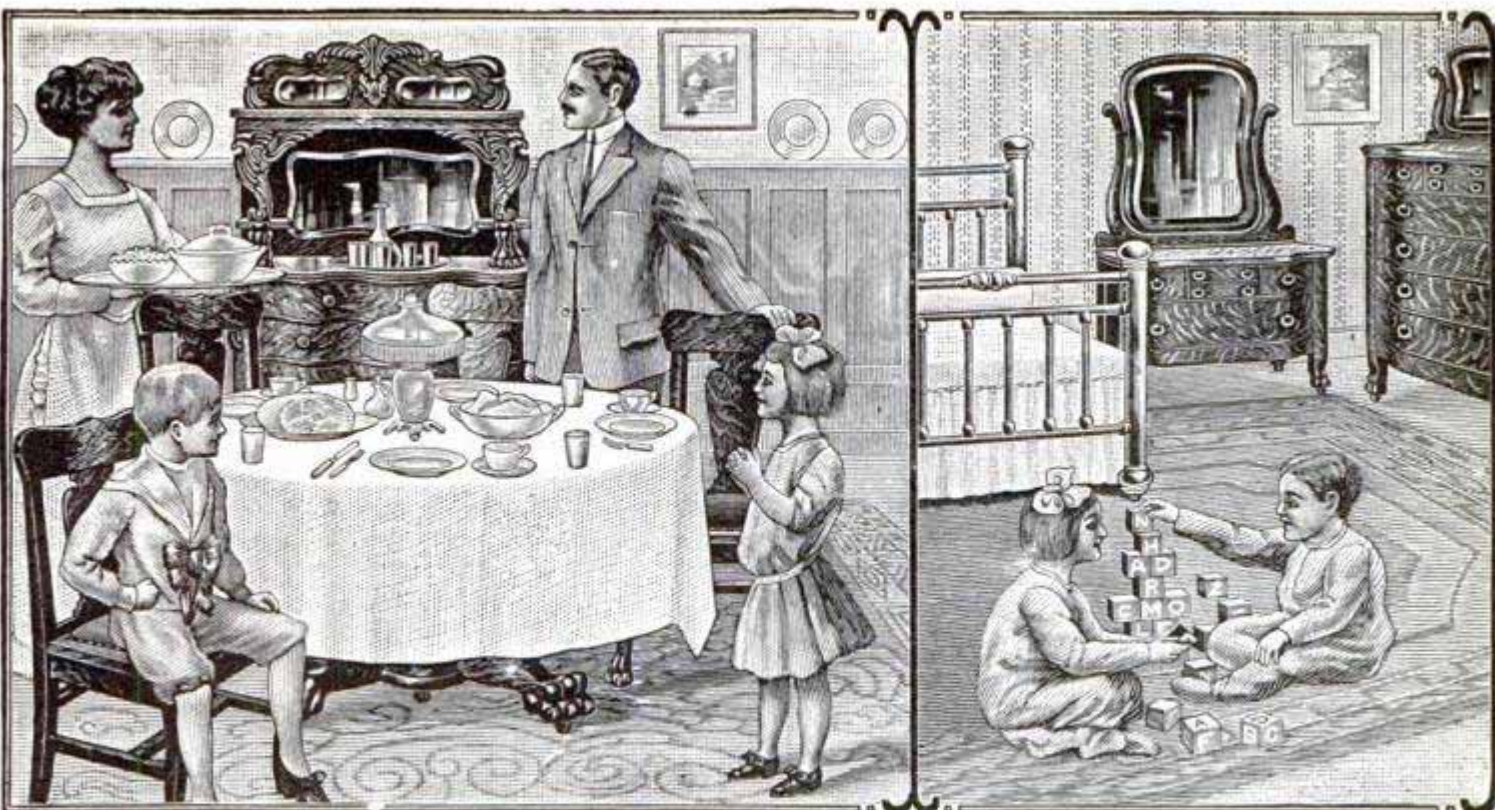
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which takes and finishes in one minute a square or button picture in a Postal Card or Brooch which costs you less than one cent and sells from 10 to 15 cents each. No dark room. No Experience Necessary. The best money getter wherever crowds assemble. Fairs, Carnivals, Conventions, etc. Be your own boss, a small investment starts you in business. Write for FREE catalog describing our Machines.

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We have furnished a million homes like this. There are some in every town. Many of your neighbors who have beautiful furnishings buy them all from us.

They buy most of the things at half regular prices. And they pay a little each month—as low as three cents per day. Our customers, on the average, take a year to pay.

Nine-tenths of those homes—about 900,000—have incomes under \$16 per week. Yet they have all the home comforts expected of men who earn \$40 per week. All because they buy bargains, and buy on long credit, paying the bill as convenient. Any man can save a few cents per day. Any man who will do it can have a home like this.

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Pianos	Baby Cabs, etc.

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Our business is to buy up surplus stocks from overloaded makers. We buy when factories are idle—when trade is dull—when makers must have money. We get the same things that dealers buy, but we pay less than they pay. Thousands of things in our bargain stocks are bought for less than cost of making.

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Our new Bargain Book is just out. It pictures 3,029 things for the home which we picked up in dull midsummer. It shows bargain stocks purchased in train-load lots from 200 hard-up makers.

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Please ask for this book and see for how little these beautiful things can be bought. Cut out this coupon, fill in your name and address, and mail it to us today. The big book will then come to you by return mail—absolutely free.

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Mail me new Bargain Book.
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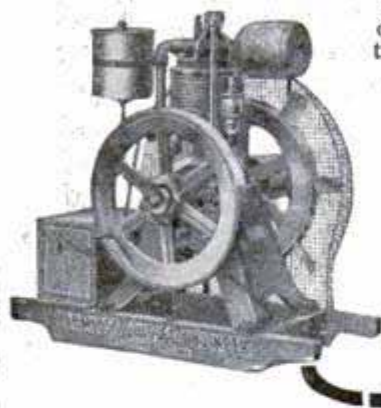
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(139)

Only \$7.50 After Trial—Nothing in Advance



AMAZING OFFER, NOTHING LIKE IT! Thousands of engines going out on this offer. Not a cent to us. The engines go out first. Use them ten days free. Do your own work with the engine. The only genuine test. Then decide whether you want the engine. If it is not the easiest running, perfect engine for all around use on the farm or in the shop, (and you are the judge) send the engine back to us at our expense. The marvelous Schmidt's Chilled Cylinder Gasoline Engine sent to you on request. **Write for particulars today.**

Send No Money

Don't send us a cent. **Easy Payments**

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Use the engine first. Then decide whether you want it.

Write for particulars of this ultra-liberal introductory offer on Schmidt Chilled Cylinder Gasoline Engine. If you want to keep the engine after using it, send us only \$7.50 as your first payment. Take long time on balance. You can take long time to pay without notes, mortgage or any security. And you get the engine at the same price dealers pay. Write to the Engine Works direct and get the dealers' quotations on Schmidt Chilled Cylinder Gasoline Engine. All who write promptly will receive a very useful book, "How to Use Power on the Farm or in the Shop" free. Everything sent postpaid free as soon as you send your name and address.

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Invented way back in the '60's and is still made in the same factory at Beloit, Wis.

For nearly half a century it has been the most practical and powerful pumping windmill.

It will pump the greatest quantity of water for the longest term of years at the least expense for maintenance.

It will pump water in as light a wind as any other mill and will pump in winds so strong that most other mills would be utterly ruined.

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Buy only the Eclipse

Do not be misled by imitators. The just-as-good kind never was as good and never will be

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Costs but little and will last for years. Weight only 15 pounds. Requires but little water, and no plumbing necessary. Folds into small roll and no more trouble to carry than a valise. Enjoy the delights of a full length bath in your private room. Far superior to a tin tub. Write for description and special offer to agents. **ROBINSON MFG. CO., 654 Jefferson Ave., Toledo, Ohio.** Mrs Turkish Bath Cabinets.

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The United Factories of 617 Wyandotte St., Kansas City, Mo., is making an offer to send a \$6 lamp free, **FREE** express prepaid, to one person in each locality in the U. S. who will show and recommend this marvelous incandescent 100 candle power oil lamp. **Simply send name and address for their offer.**

Consider the cat. Nine times out of ten she can whip anything twice her size. And yet, there's nothing to her except quick thinking, quick action, and almost maniacal intensity.—Dockrell.

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in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start.

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48 inch, Round Top, Pedestal Dining Table, extends to 72 inches, \$13.50. 4 Dining Chairs, \$7. 6 Dining Chairs, \$10

This sensational price is made possible by our original exclusive method of manufacturing in sections and shipping in a compact package which may be unpacked and the furniture made ready for use in thirty minutes.

Don't confuse this furniture with cheap furniture. We manufacture quality furniture only.

The oldest and largest firm of its kind in the world



You do not risk one cent. Use the furniture for thirty days in your home. Prove our claim that you cannot duplicate it for double our price—then if you are not satisfied notify us and we will return all the money you have paid.

Free catalog full of similar bargains, giving full details, and a postal will bring it to you. Send for it today.

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SEND for our free Booklet and see how an Aldine Fireplace is suited to your needs.

You can get as much heat with one Aldine Fireplace and save 60% of your fuel bill as from four common grates.



Mission Design

This is because it is really a return draft stove in fireplace form. 85% of the heat is thrown out into the room instead of

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It can be set in any chimney opening at half the cost of a common grate, no special chimney construction is necessary, no pipe to connect, extra large fire pot; made in seven patterns, at prices no higher than any good common grate. 50,000 now in use

Satisfaction guaranteed or your money back.



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CAT TRAMP RIDES BUMPERS—A frequent rider of the deadhead class, but one to which the Keokuk and Western and Chicago, Burlington and Quincy railroads, the lines patronized, never object, is a Center-ville, Iowa, cat.

Pussy was first observed by railroad men at Center-ville, where it was seen to leap under the car and take a place on the bumpers. Three times, fearing for the cat's safety, it was forcibly removed from beneath the car, and each time it managed to regain its place when no one was looking.

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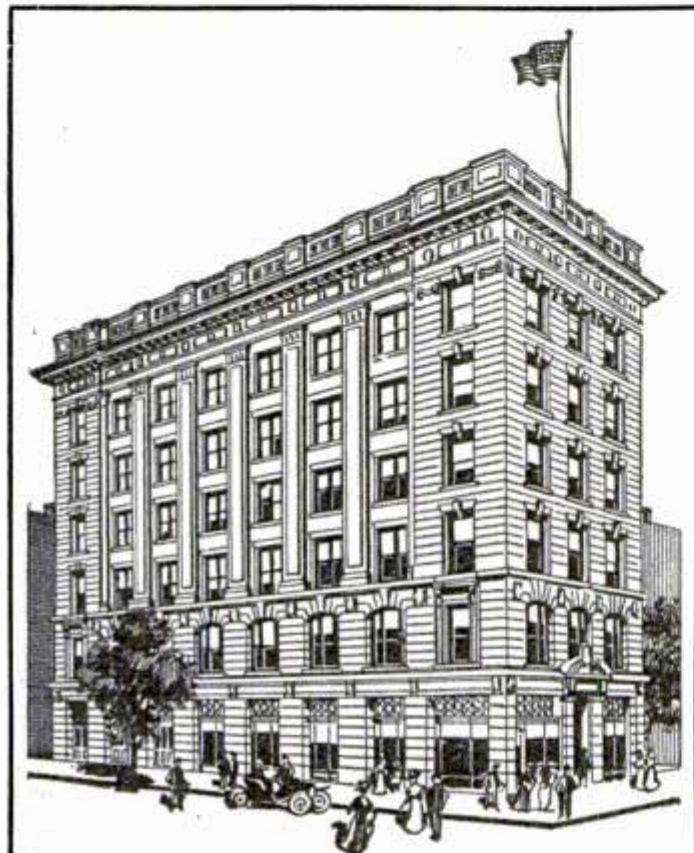
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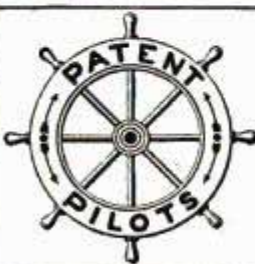
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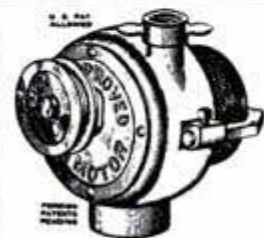
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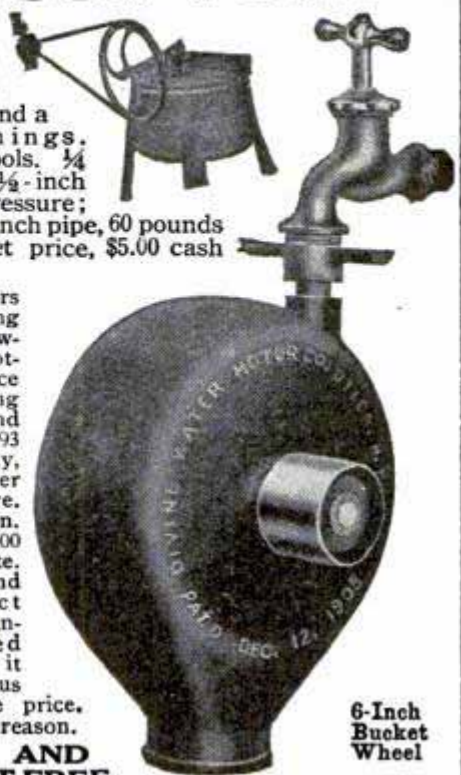
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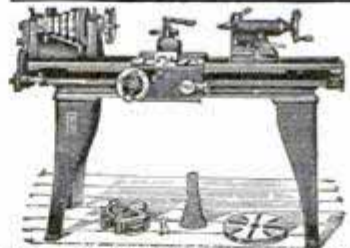
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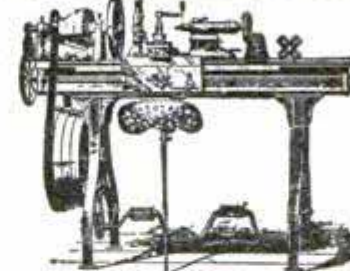


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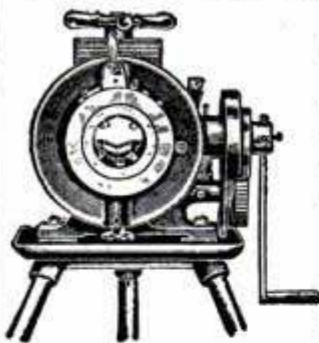


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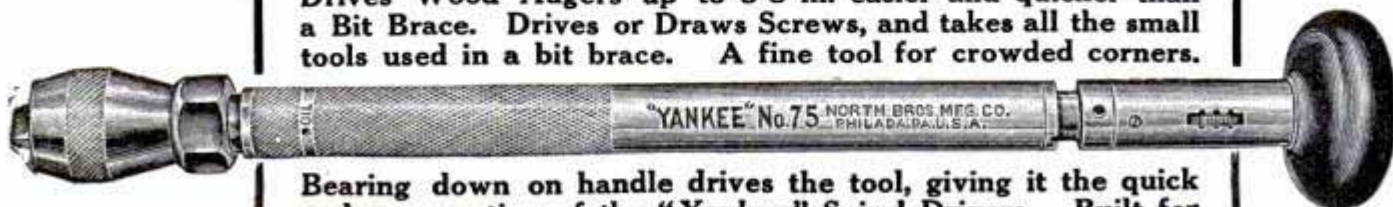
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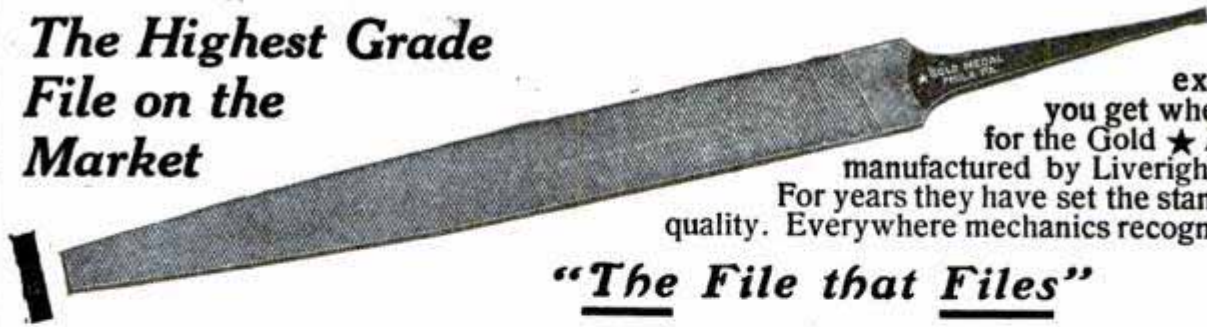


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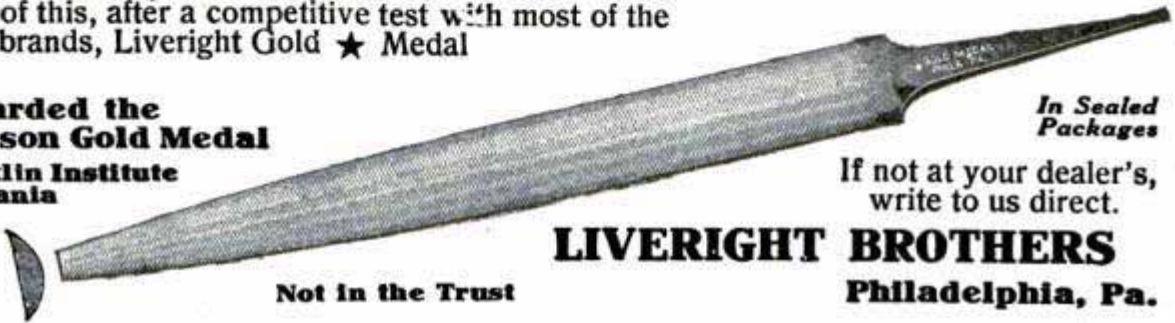
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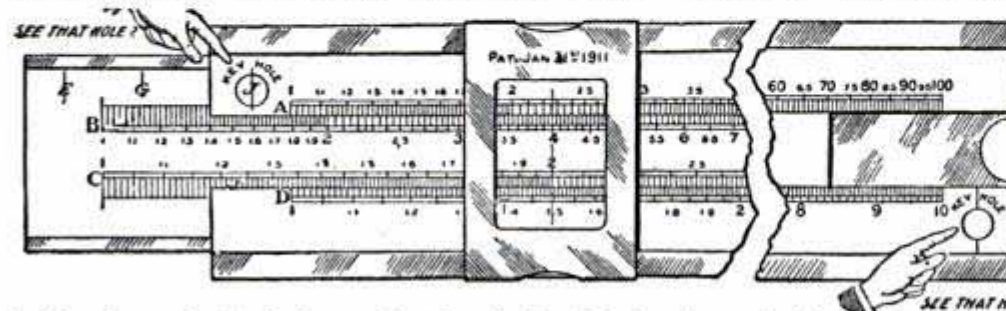
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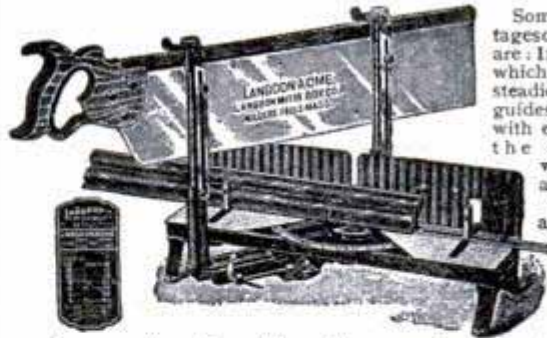
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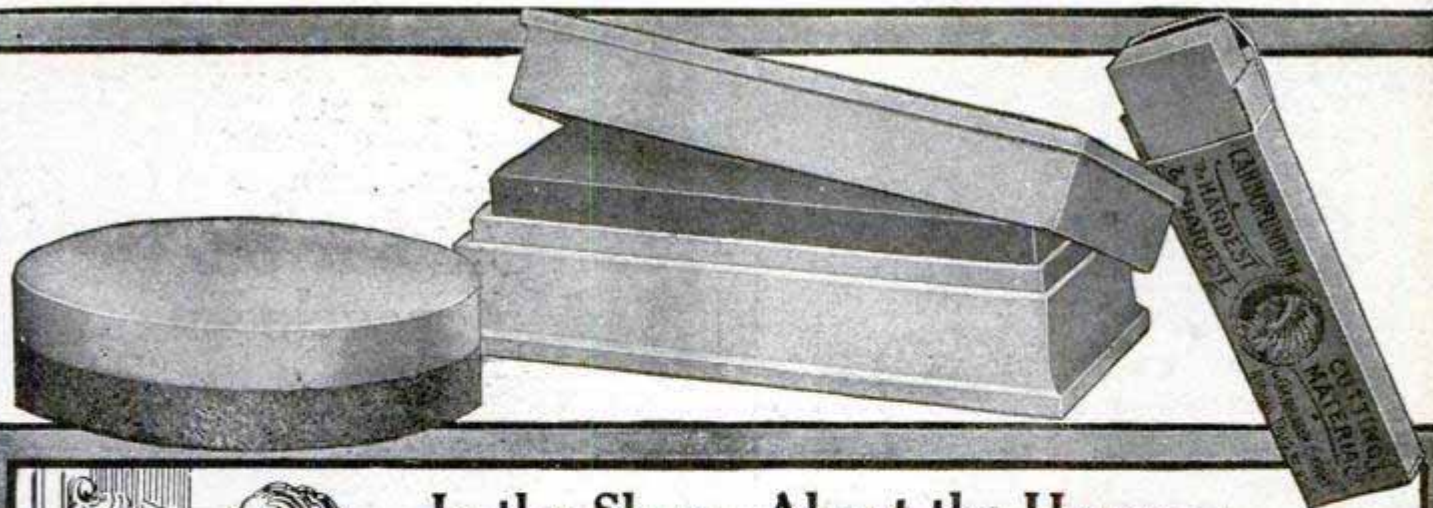
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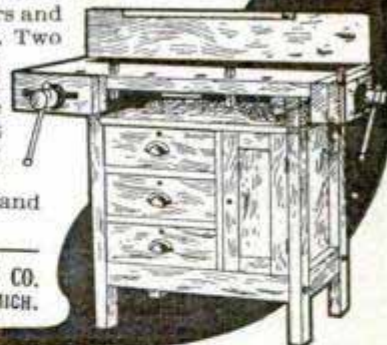
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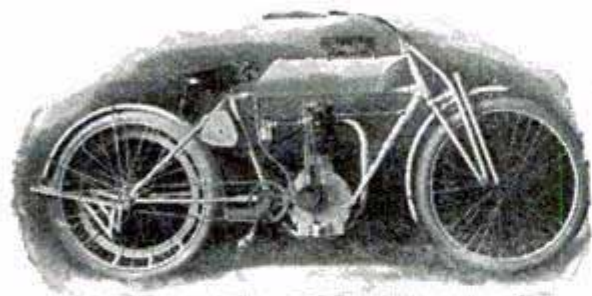
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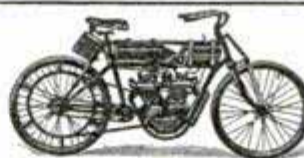
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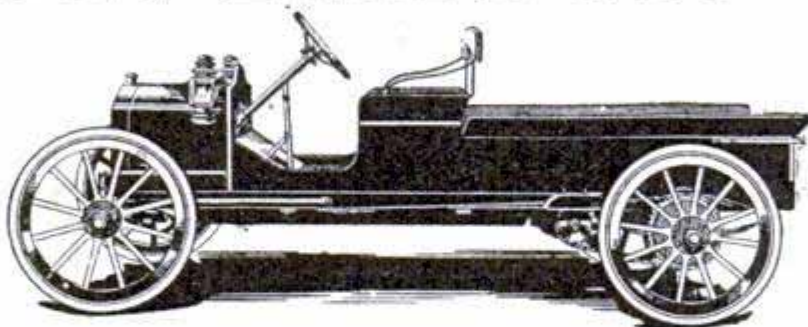
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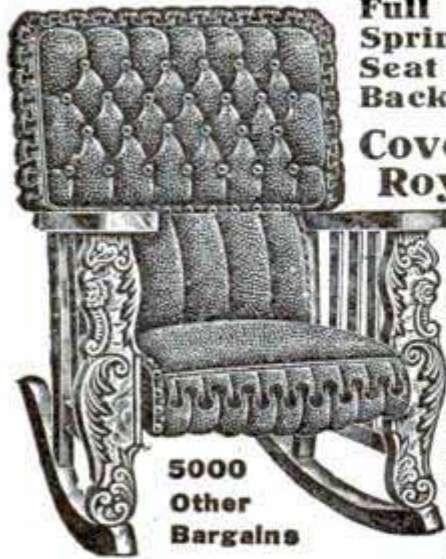
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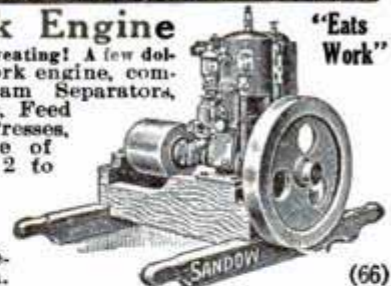
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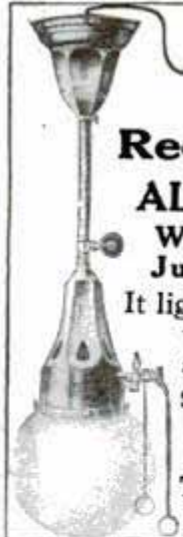
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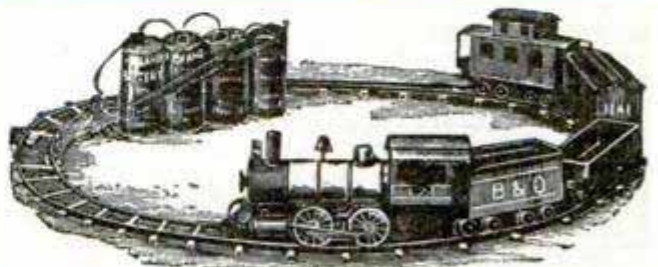


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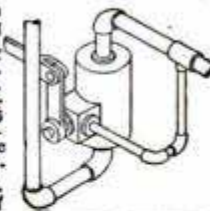
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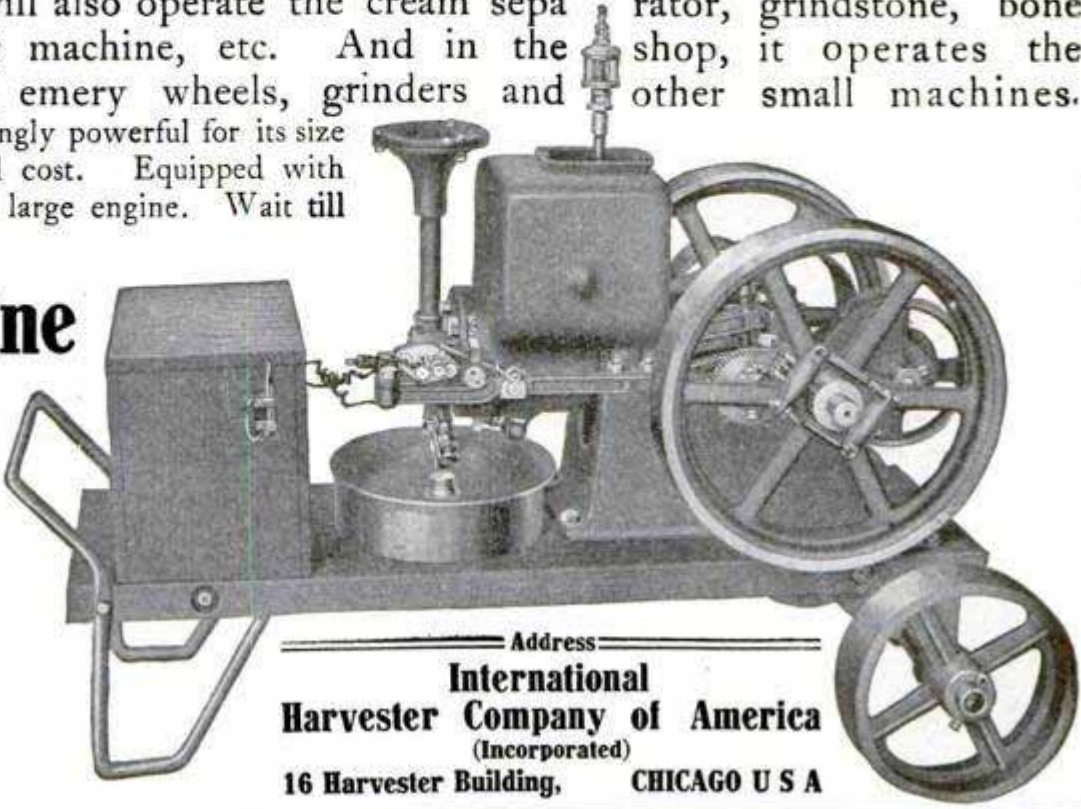
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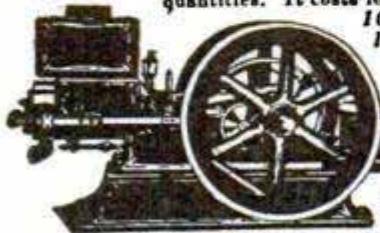


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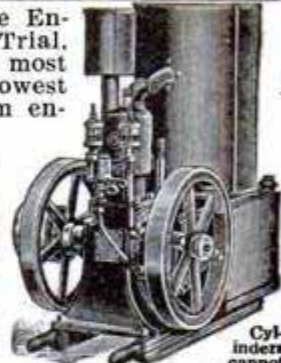
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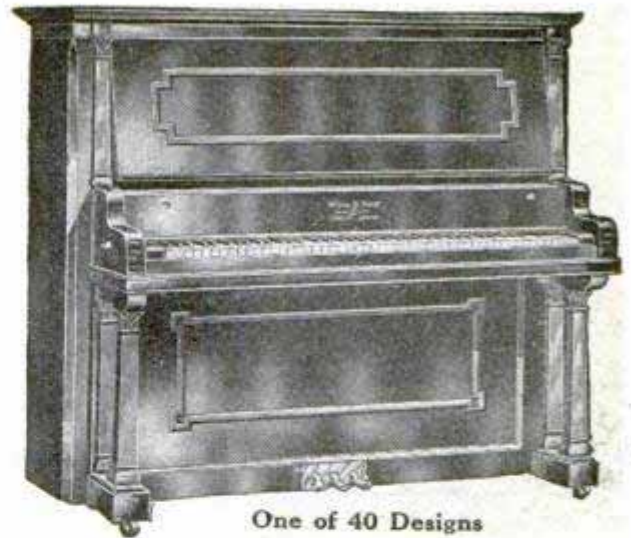


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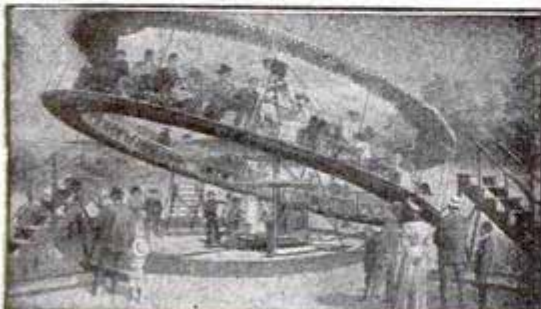


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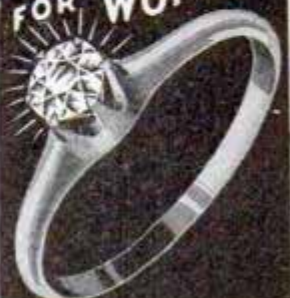
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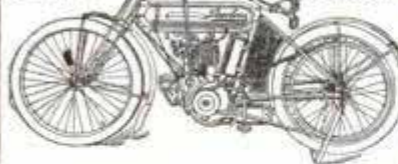
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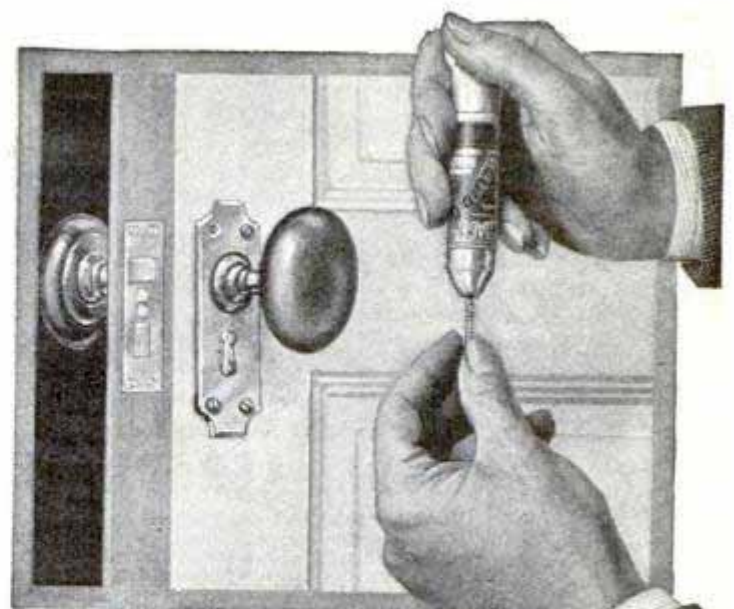


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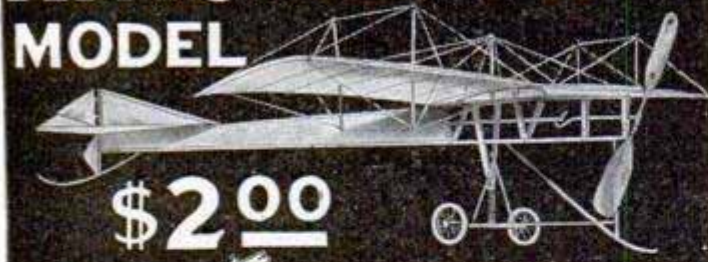
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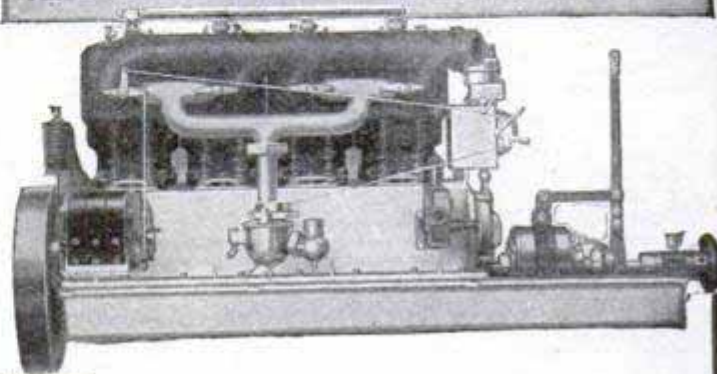
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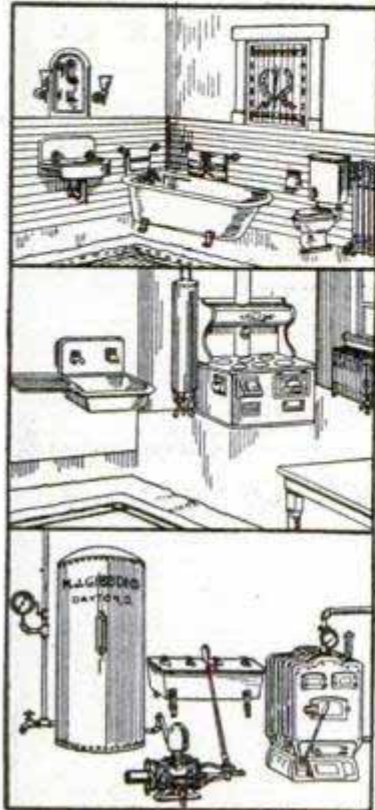
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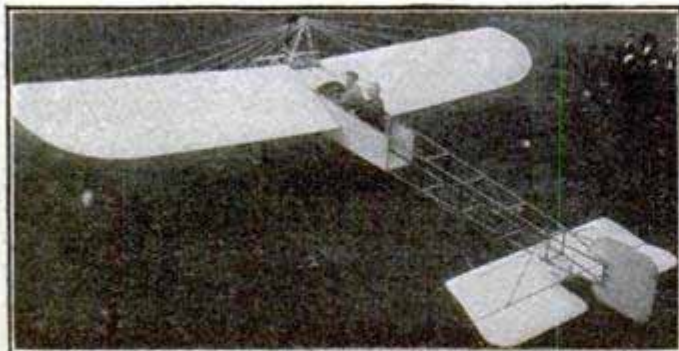
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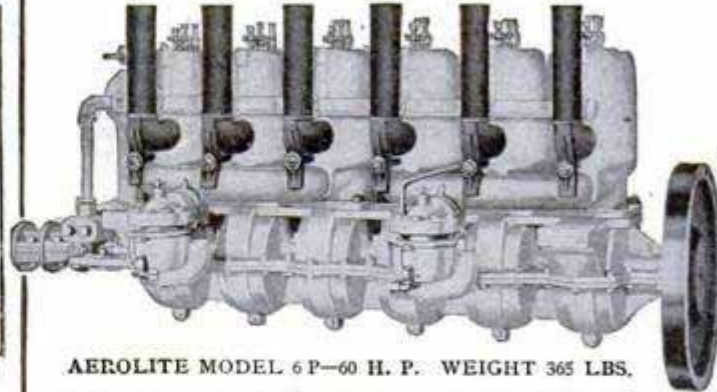
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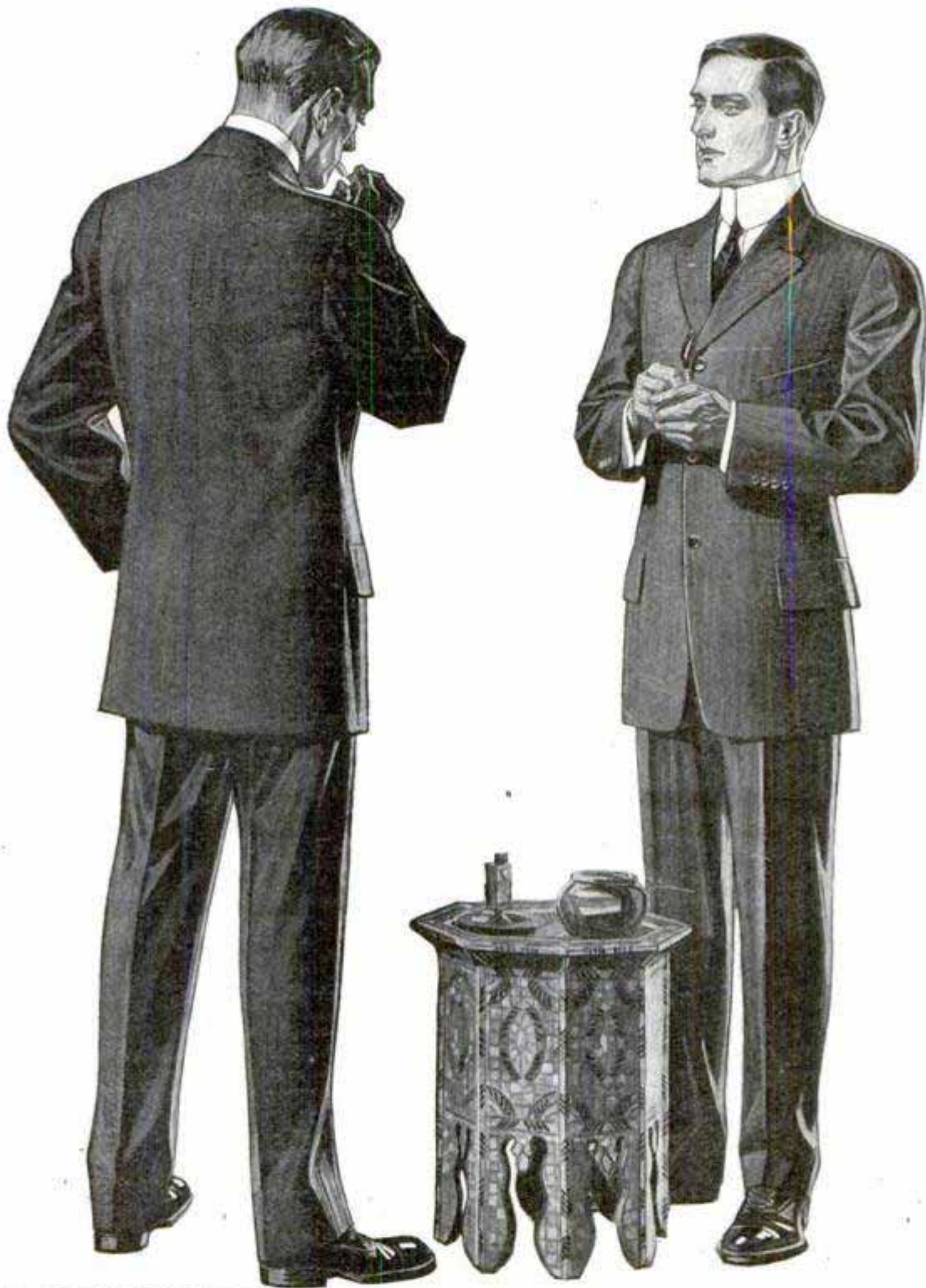


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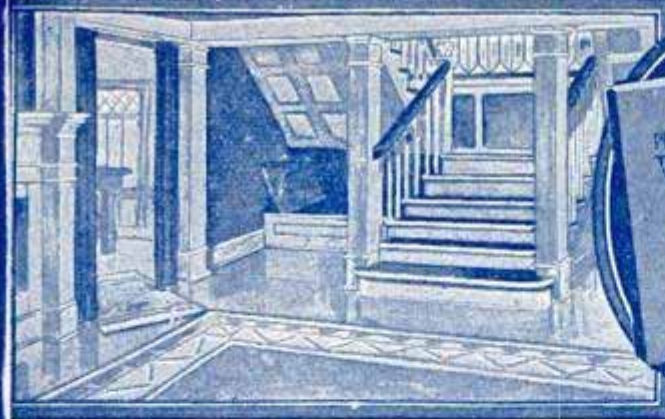
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