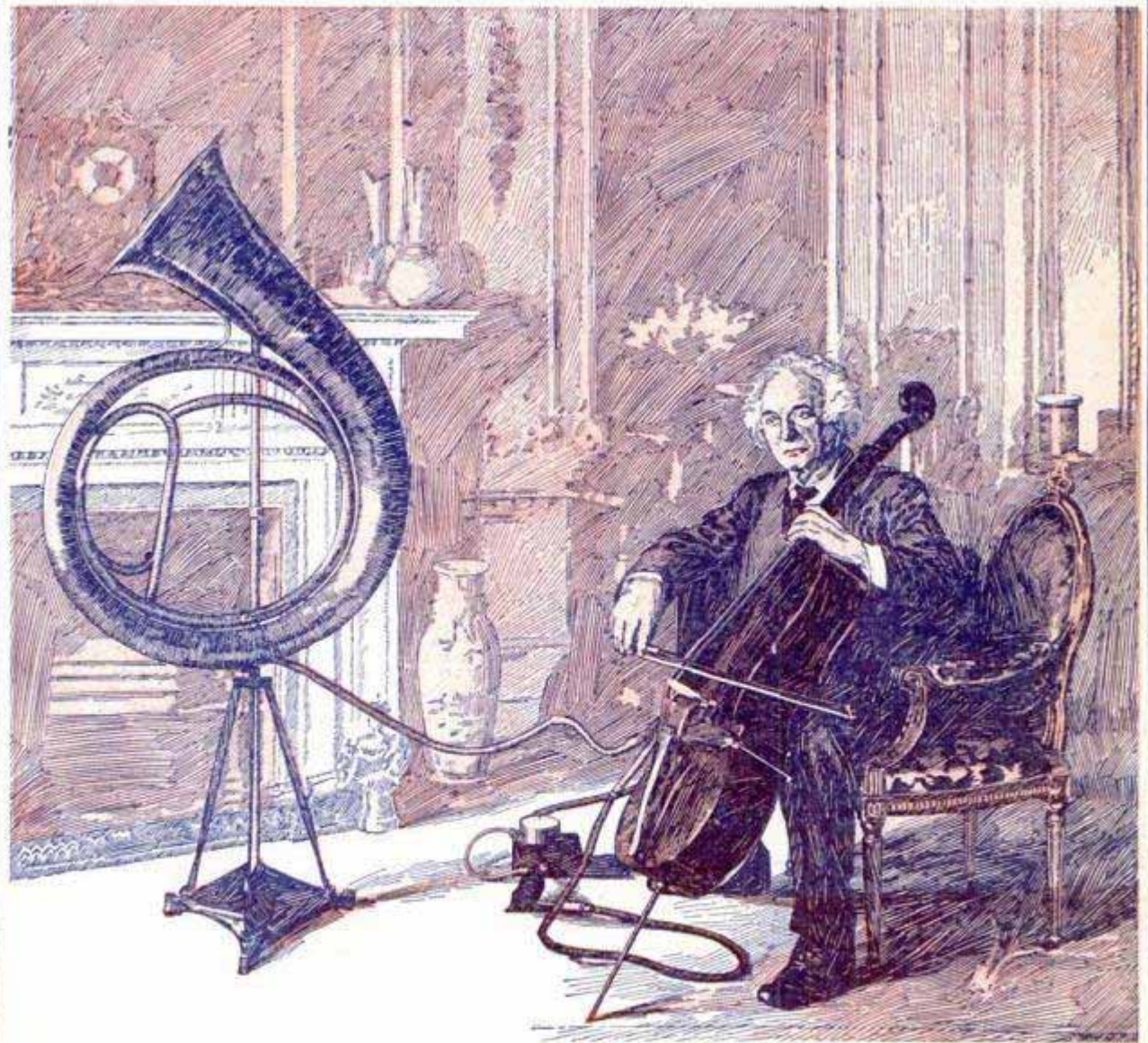


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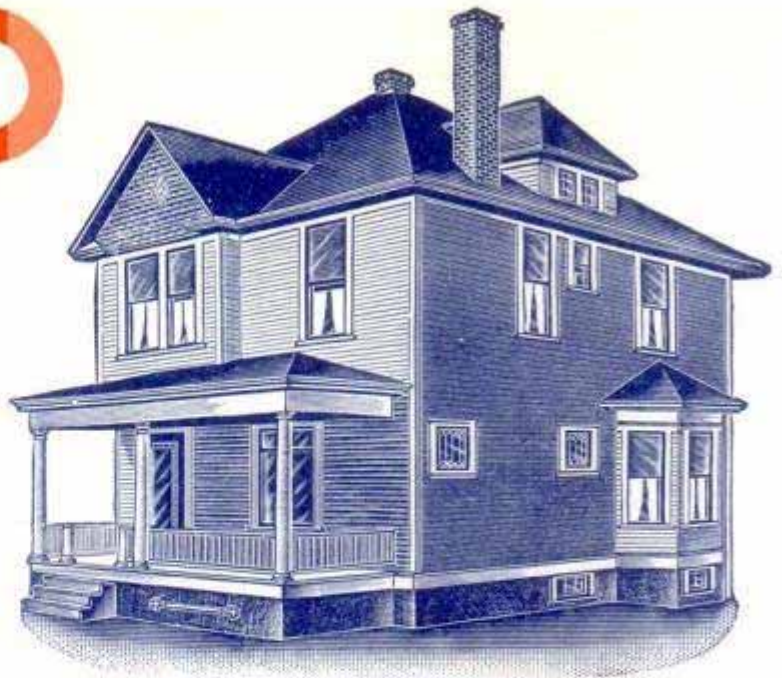
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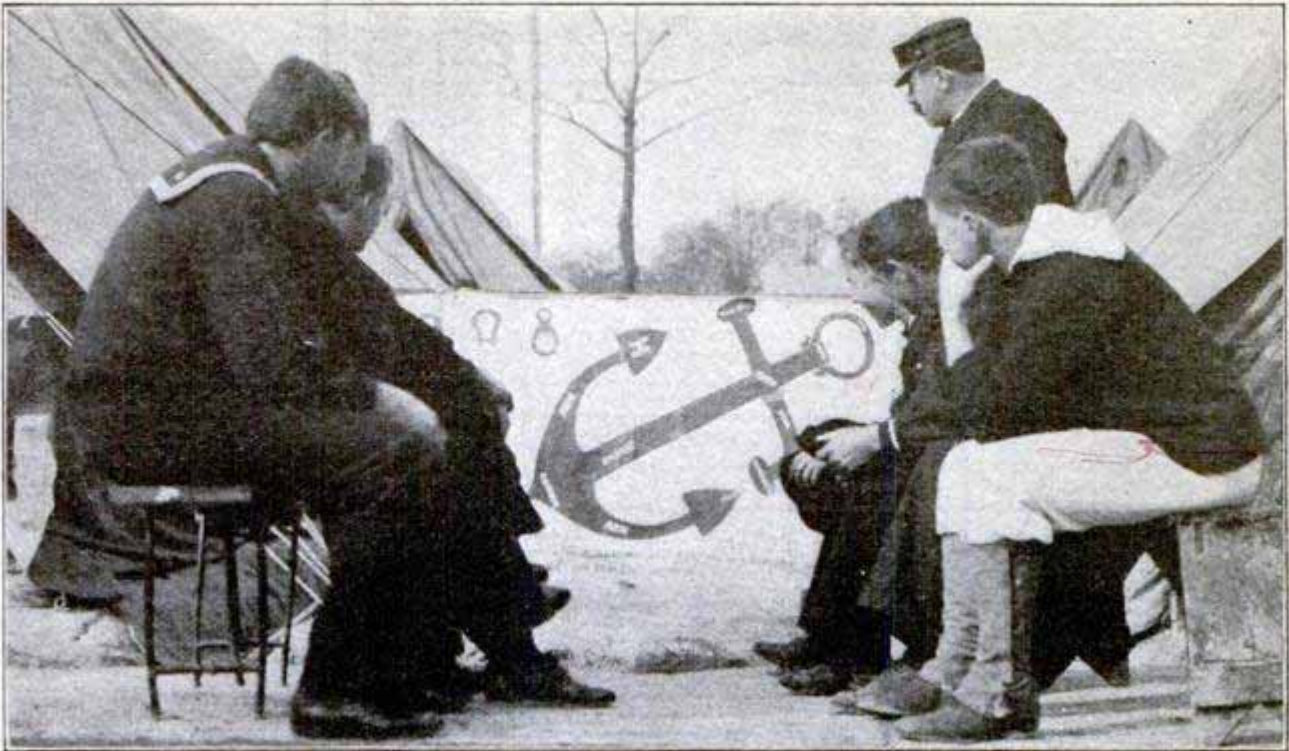
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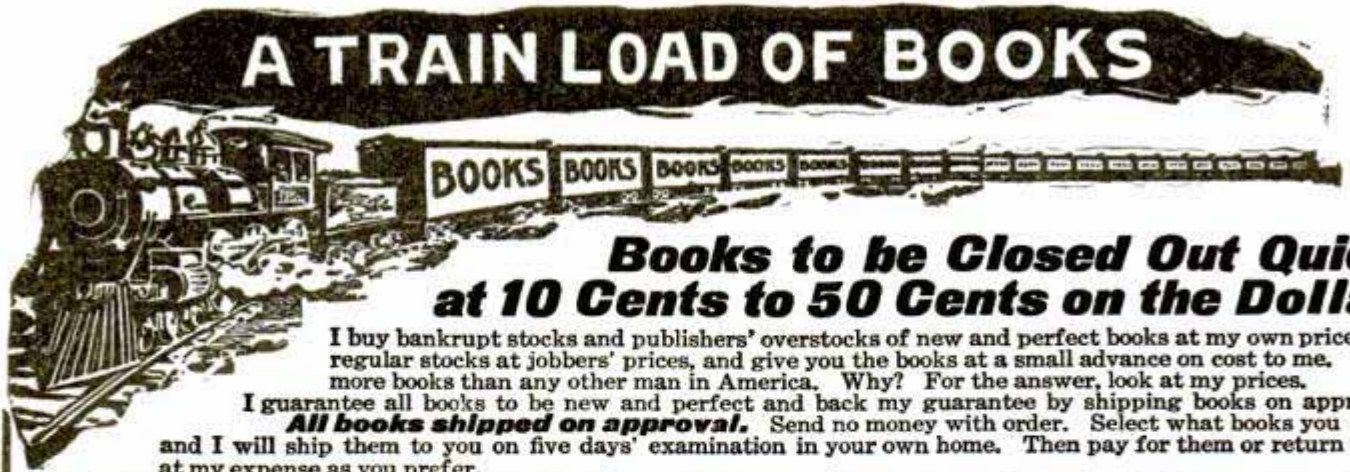
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Contents for November, 1909

Railroad Construction at Jersey City.....	543	Land Lottery Marred by Fatal Collision.....	577
Foot Races for the Blind.....	544	Artistic Concrete Buildings—No. 1 Residence of	
The Tribute to Harriman.....	544	Alexander Cochrane, East View, N. Y.....	578
Lions in Barless Menagerie.....	545	A Folding Wagon House.....	579
"Perpetual Motion" Advertising Novelty.....	546	Continuous Wooden Water Pipe.....	579
Baldwin Breaks Dirigible Height Record.....	546	France Prohibits White Lead in Paint.....	580
The 890-Ft. Steamships.....	546	Automobile Will Spread the Gospel.....	580
Sectional View of "Olympic".....	547	Old Pianos as Library Tables.....	581
Moving Pictures of Chimney Collapse.....	548	Chinese Style in Modern Industry.....	581
Norwegian Wood Flour.....	548	Denatured Alcohol (Industrial Alcohol).....	583
Flying Machine Flaps Its Planes.....	548	"Here Comes the Bogey Man".....	586
Centuries of Arctic Explorations.....	550	Economically Operated Army Target.....	587
List of Lives Lost in North Pole Explorations.....	550	Result of Wisconsin Flood.....	587
Instrument by Which Peary and Cook Took Ob-		Measuring Intensity of Light.....	588
servations.....	552	Most Gruesome War Relic in World.....	588
50-Ton Boulder Drops on Track from Mountain	553	Building Concrete Piers.....	590
One Man Hooks 14,000 Codfish.....	553	A Vegetable Furnace.....	590
Iridium in Pen Points.....	554	How to make a Mission Rocker.....	591
Lefebvre Killed by Wright Aeroplane.....	554	A Remarkable Battleship.....	592
Views of Osaka's Great Fire.....	555	A Skimming Motorboat.....	593
Rubber Tanned Leather.....	556	New Target for Rifle Practice.....	593
Strengthening Tone and Volume by Horn Attach-		Care and Preservation of Street Trees.....	594
ment.....	557	Electric Suction Sweeper.....	596
Do Dogs Climb Trees?.....	558	Ancient Automobiles.....	596
Pumice Stone Railroad Ties.....	558	Pneumatic Wheel Polishing Machine.....	598
Blind Hunter Shoots Rabbits.....	558	Manufacture of Liquid Gas.....	597
Balloon Accident at Brussels.....	559	Feather Dusters in the Making.....	598
Angora Goats Eat Trails Through Forest.....	559	New Cups for Every Drink.....	601
Mimic Warfare Scenes.....	560	Topsy-Turvy Game of Pool.....	602
Shipping the Half Moon.....	562	Largest Automatic Gun in the World.....	602
England's Aerial Selections.....	562	Universal Spindle on a Milling Machine.....	603
Washington's Auto Patrol Wagon.....	562	A Wagon that has Carried Billions.....	603
Sand Sculpture at Atlantic City.....	563	Pitching Machine for Cricket Practice.....	604
A Portable Chicken House.....	563	A Fleet of Gold Dredges.....	604
Water Tank Wrecks Canadian Building.....	564	Poison-Arrow Ambush Gun.....	604
A Wrist-Purse Novelty.....	564	Boiler Thrown 500 ft. in Air.....	605
Immense Fan for Coal Mines.....	564	Trans-Atlantic Liner Burns at Dock.....	605
Rebuilding a High Bridge.....	564	Mechanical Wave Bathtub.....	605
Ballooning and Parachuting, Its Ups and Downs		New Type of River Steamboat.....	606
—How it Feels to Drop from the Clouds.....	566	Automobile Watering Places.....	606
Formic Acid for Dyeing.....	567	Growing and Changing the Nature of Plants by	
Huge Photographic Pineapple.....	568	Drugs.....	607
Lincoln Penny Game.....	568	British Steamer for South American Route.....	610
Wooden Skeleton for Dirigible Airships.....	568	Weather Kiosk Taken for Mail Box.....	611
The British Submarine Accident.....	570	Another Bridge-Raising Feat.....	611
Interesting Machine to Demonstrate Gearing.....	570	Hospital Children See Out Doors Through Mirrors.....	611
Wood Grows in Form of Flower.....	571	Ingenious Lock for Canoes.....	612
World's Fair to Celebrate Panama Canal.....	571	"Lusitania" Breaks Three Records.....	612
Croquet on the French Seaside.....	571	Displaying Hose in Form of Bell.....	612
Fort Shaped Like Steamboat.....	571	Two Houses from One House.....	613
Projectile of 16-in. Gun.....	572	Rules of the Air.....	613
Fire Hose Washes Horse from Quicksand.....	572	Cannon Ball as Clock Weight.....	613
Cork Fabric Clothing.....	572	Old Tank Locomotive Used on the Paris-Orleans	
Cellar in Big Boulder.....	573	Railway.....	614
California Has Cotton Crop.....	573	How to Make a Table for the Den.....	614
Frozen Meat from China.....	573	Hints on Road Signs.....	615
Moving Texas Town by Train.....	574	Electrifying the U. S. Army.....	616
Three Oil Tanks Destroyed by Lightning.....	574	Interior Walls Made of Shredded Wood Fiber.....	618
Squirrel Starts Forest Fire.....	575	A Telephone Trick.....	619
Formation of Cyclone and Its Effect.....	575	Huge Single Mass of Copper.....	619
How Shackleton's Motor Sleigh Was Operated.....	577	Scene in Delft, Holland.....	619
		Railroad Has News Bulletin Service.....	619

(CONTINUED ON PAGE 6.)

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Contents—Continued

Great Concrete Arch in Switzerland.....	620	Oiling the Links of a Chain Drive.....	663
Frogs Exterminate Cockroaches.....	620	A Method of Recovering a Diamond Drill.....	664
The Manufacture of Wood Alcohol.....	620	Reversing Marks on Angle Iron.....	664
Locating Wild Bees' Nests.....	621	Area of a Square Not Increased in a Rectangle.....	665
Chimney Twisted by Storm.....	621	Removing Gasoline from a Punctured Float.....	665
Life in Our Navy—No. 4, Athletic Sports on Board Ship.....	622	A Toolmaker's Clamp.....	666
Editorial by H. H. Windsor.....	623	How to Make an Angle Drop Light.....	666
The Ill-Fated U. S. S. "Yankee".....	624	Starting the New Furnace Right.....	666
Experiment Laboratory on Mount Whitney.....	625	How to Refit Tiling Spades.....	667
Curtiss Wins in Italy.....	625	A Convenient Candle Holder.....	667
Fans of Imitation Flowers.....	625	Guying a Smoke Pipe.....	668
Woman 8 ft. 6 in. Tall.....	625	Magnetic Feed for the Compound Rest of a Lathe.....	668
Fire Apparatus Decorated with 10,000 Roses.....	626	Waterproofing a Common Electric Socket.....	669
Steamships Direct from Memphis to New York.....	626	An Offset Tap Wrench.....	669
Galvanized Iron Cyclone Cellar.....	626	Home-Made Snow Plow for Sidewalks.....	669
Time and Its Measurement.....	627	A Barn Door Latch.....	670
Ancient Saw Still in Use.....	633	A Clamp to Hold Long Work.....	670
Iron Bedsteads as Concrete Reinforcement.....	638	Another Pencil Sharpener.....	670
Torpedo Boat Runs Nearly 40 Miles an Hour.....	639	Metal Melts in a Cupola Quicker in Cold Weather.....	671
Head of Humboldt in Curious Position.....	639	Home-Made Spring Fork for a Bicycle.....	671
New Electric Fire Whistle.....	640	Bushing a Flange Coupling.....	671
Aerial Prizes in England.....	640	A Sandpaper Holder for Dressing Commutators.....	671
Electric Sign Advertises City.....	641	Substitute for a Windmill Quadrant.....	672
Automatic Electric Crossing Gate.....	641	Chamois Strainer for Gasoline.....	672
Government Posts Burned.....	642	Turning Tool for Wood.....	672
Fighting Oil Fires With Cannon.....	642	How to Make a Dowel-Cutting Tool.....	673
Four Miles of Cable on a Spool.....	642	Safety Alarm for a Steam Heater.....	673
Wreck of a Tennessee Steamboat.....	643	A Wheelwright's Holding Tool.....	673
Painting Immense Gas Tank.....	643	Moving Large Steel Furnaces.....	674
Swans Ring Bell When Hungry.....	643	Making Use of Scrap Paint.....	674
Tower of Vegetables and Greens.....	644	A Commutator Clamp.....	674
Machine to Sterilize Air.....	644		
Auto Multi-Horn Played by Key.....	644		
What Waterways Mean to the Country.....	645		
A "Crazy-Quilt" Road.....	645		
Boy Meets Death on High Voltage Pole.....	646		
Religious Fanaticism in Kerbela.....	646		
Motorboats in Tasmania.....	647		
Curious Coconut Raft.....	647		
Great Repair Ship of British Navy.....	649		
Amateur Wireless Installations.....	649		
Tack Hammer Draws Splinters from Eye.....	650		
Grading a Street in Oregon.....	651		
Wale City Objects to Auto Traps.....	651		
Bees Occupy Vacant House.....	651		
Motor Cars in Place of Combination Trains.....	652		
A Large Coal Storing Gantry Crane.....	652		
Foreign Autos in England.....	653		
One Thousand Paintings as Souvenirs of Trip.....	653		
What the Engines Said—A Poem.....	654		
Two Interesting Balloon Flights.....	683		
Sleeping Slings for Railroad Coaches.....	683		
Gold in Dutch Guiana.....	686		

SHOP NOTES

Home Made Motor Iceboat.....	655
A Home Made Furnace.....	655
Removing Dents from an Automobile Radiator.....	656
Steel Lighter than Wood in Construction Work.....	656
Claw Bar for Removing Concrete Forms.....	656
A Kangaroo Bicycle.....	657
Temporary Water Heater in an Apartment Building.....	657
Home Made Sink Trap.....	657
Steel Trestle for Telephone Cables.....	658
Truck for a Garage.....	658
Bracing Gate Posts of a Wire Fence.....	659
An Oiler for Hand Tools.....	659
Foot Power Feed for a Breast Drill.....	660
How to Make Britannia Metal.....	660
Vertical Pipe Supports.....	662
Home-Made Engine Stop.....	662
Anti-Freezing Mixtures.....	662
Home-Made Slipper.....	663

AMATEUR MECHANICS

How to Make a Whisk Broom Holder of Sheet Metal.....	675
How to Make a Camp Stool.....	676
A Small Home-Made Electric Motor.....	676
Rocker Blocks on Coaster Sleds.....	677
How to Make a Watch Fob.....	677
Novelty Clock for the Kitchen.....	678
How to Make a Small Silver Plating Outfit.....	678
Removing a Tight-Fitting Ring from a Finger.....	679
A Photographic Jig-Saw Puzzle.....	679
Rolling Up Hill Illusion.....	679
Annealing Chisel Steel.....	680
How to Make a Post Card Holder.....	681
Perfume Making Outfit.....	681
Home-Made Duplicator for Box Cameras.....	681
Optical Illusions.....	682
Use of Kerosene in Polishing Metals.....	682
How to Make Lamps Burn Brightly.....	682

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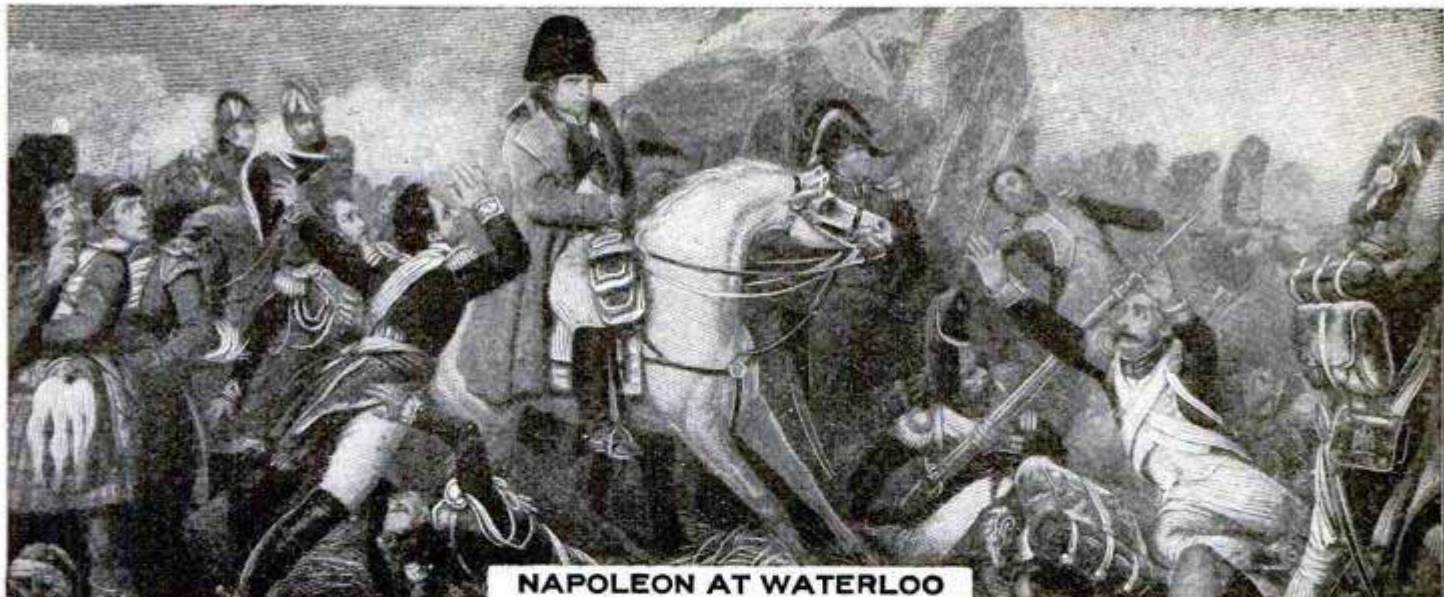
Potato Planting Machine.....	684
Handy Telephone Standard.....	684
Automatic Fire Alarm System.....	684
Three Combs in One.....	684
Collapsible and Suspensible Baby Chair.....	684
Portable Wardrobe.....	684
Clothespin Holder.....	684
Long-Handled Scrubber.....	684
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Handy Fork Cleaner.....	684
Fireless Chicken Brooder.....	685
Arm-Worked Husking Device.....	685
Spoon Designed for Beating.....	685
Portable Winch for Mines.....	685
Skirt-Lifting Device.....	685
Removable Steel Clothes Posts.....	685
Erasing Device for Typewriters.....	685
A Hobby-Horse that Moves.....	685

PATENT OFFICE RELICS

Burial Case from Which a Prematurely Buried Person Can Escape.....	686
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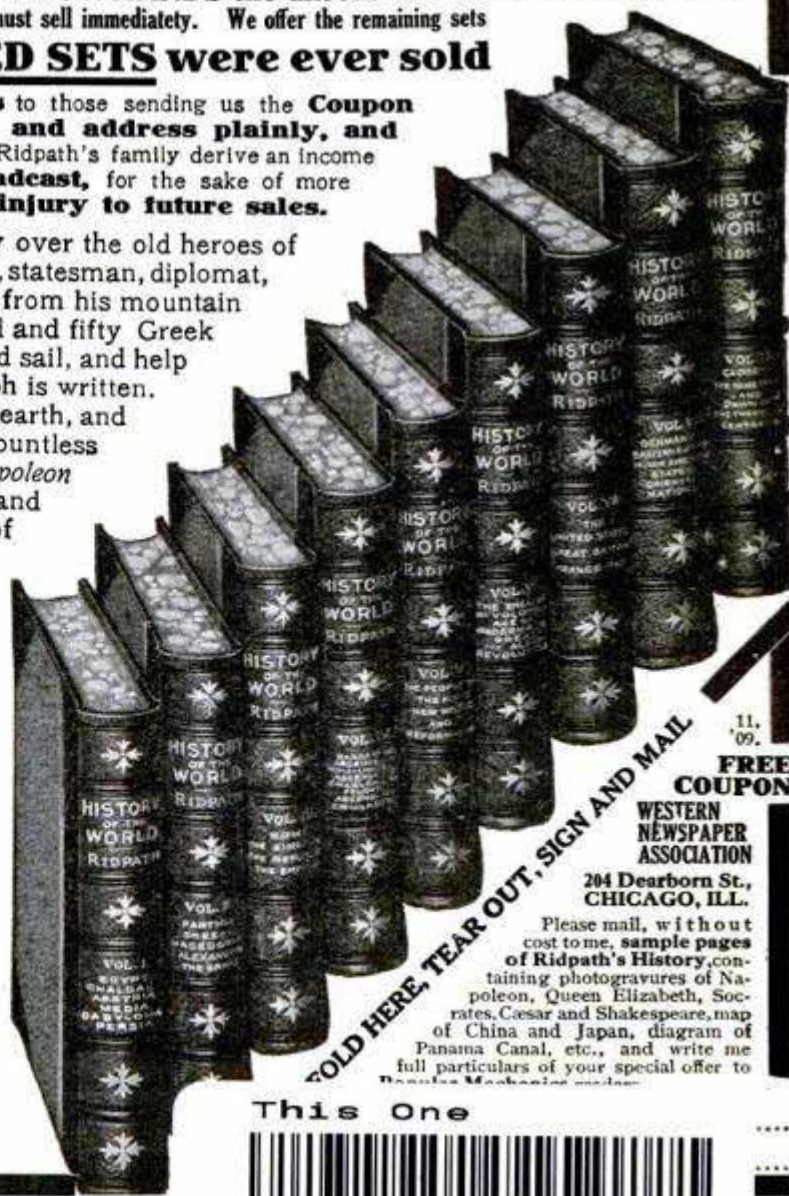
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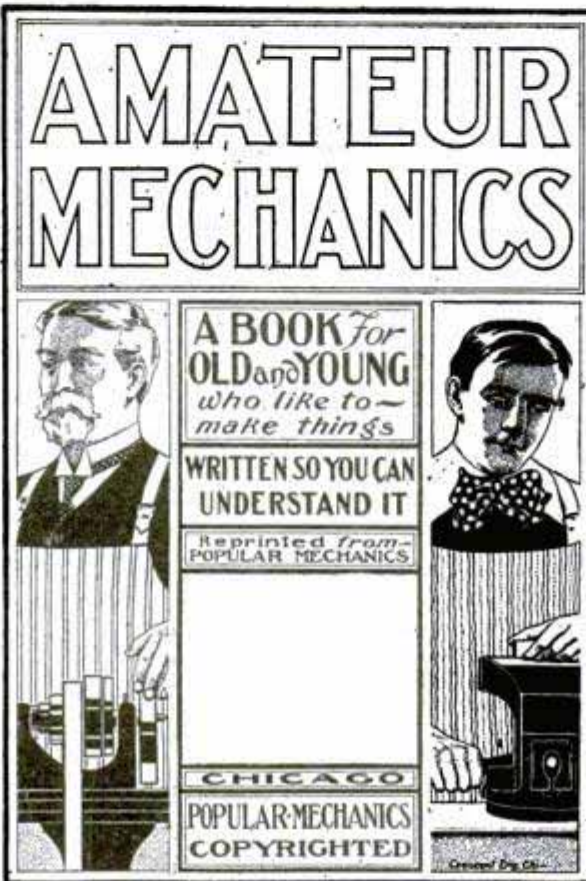
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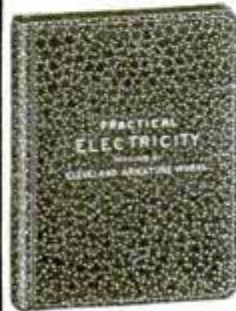
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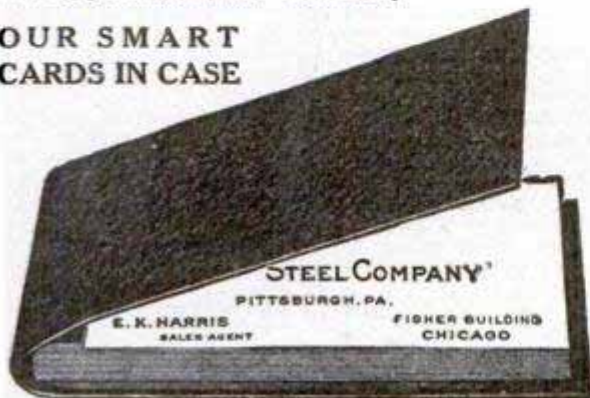
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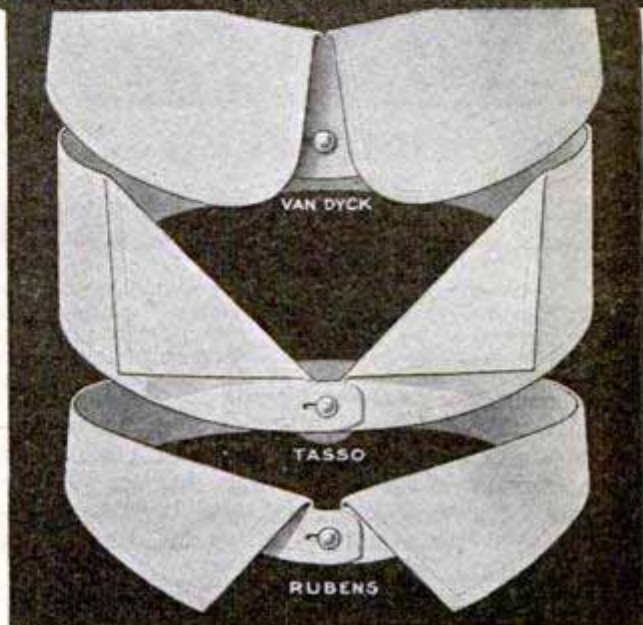
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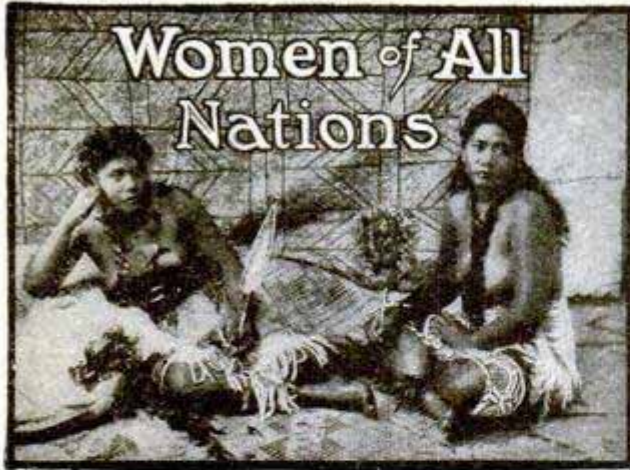
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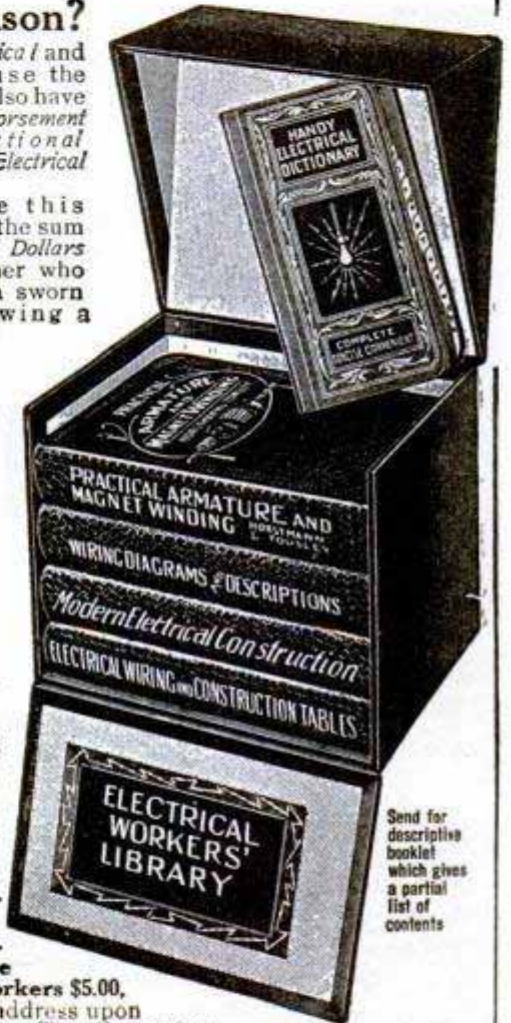
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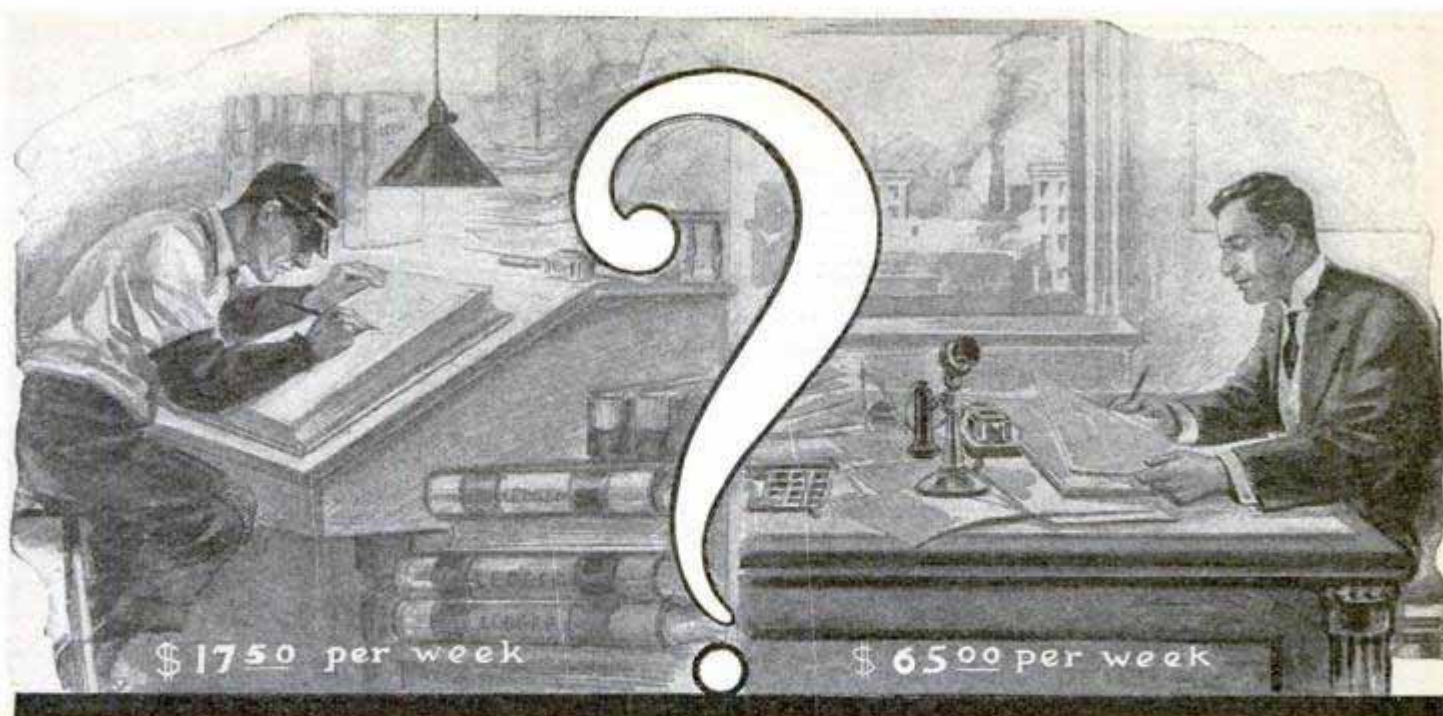
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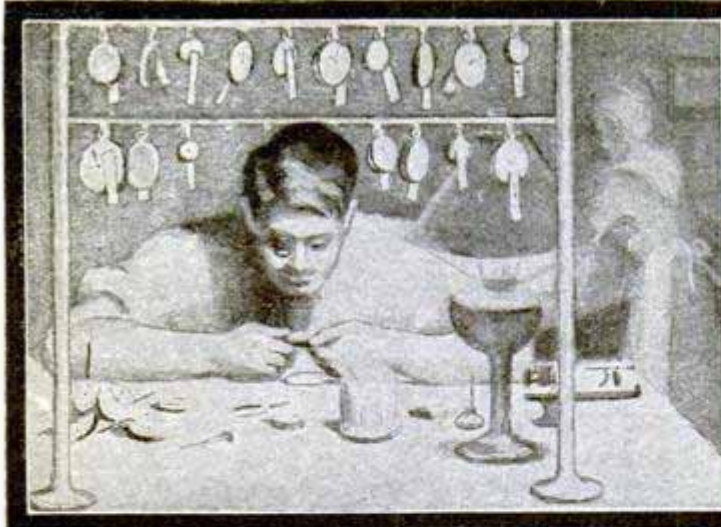
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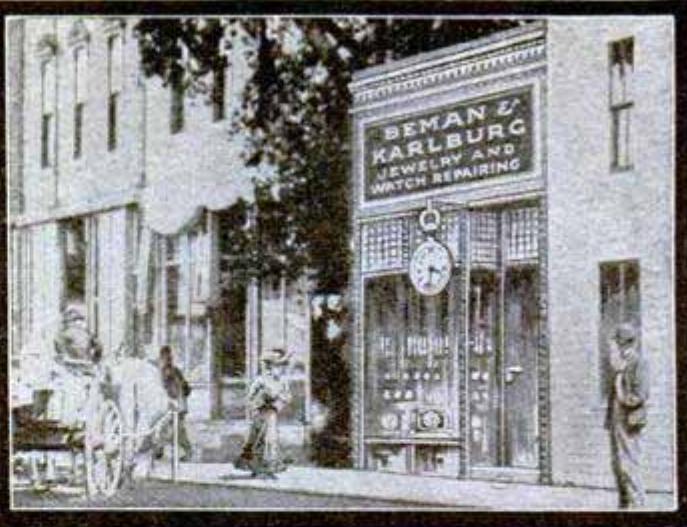
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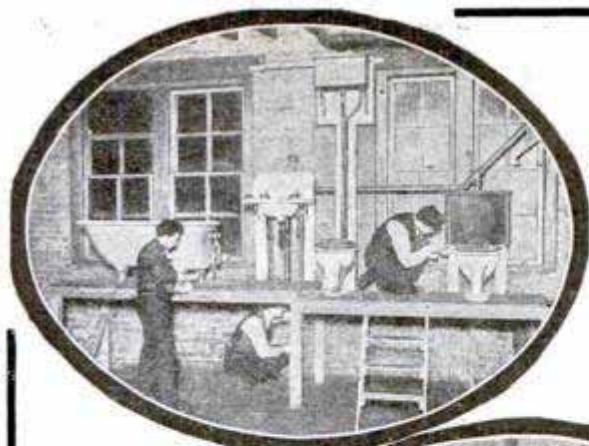
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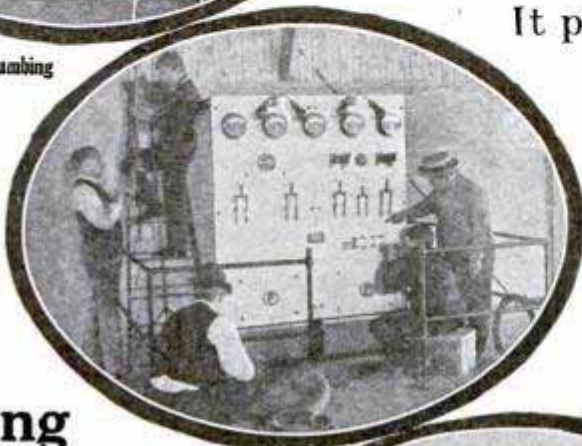
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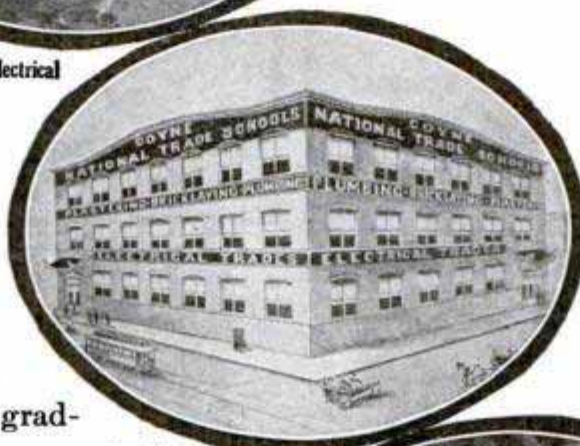
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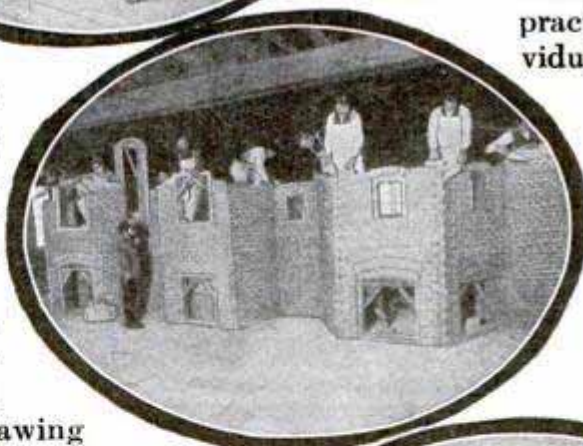
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Advertisements in this section, 5 cents per word, payable in advance. To insure ads being inserted under proper classified head in the December issue, copy must reach this office not later than November 1.

Popular Mechanics,

Sirs: Some time ago I placed an ad. in your publication advertising a moving picture machine. I have sold the same, but still the replies come and I have answered till I am tired. What will it cost to notify your readers of the fact?

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G. E. KURK.

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WILL EXCHANGE, 3 clear Waukesha lots for Auto, \$600. Wm. Hardy, Waukesha, Wis.

TO TRADE—Olds-Runabout for '09 Motorcycle. Box 178, Faulkton, S. Dak.

AN AUTO OUT OF YOUR BUGGY. Easy to make the change. The Norfolk System shows how. Instructions with reproduced drawings post paid \$1.00. Carleton F. Norfolk, 795 Jefferson, Detroit, Mich.

AUTOMOBILE FOR SALE, light racing car, 22 H. P. 4 cylinders, just built. Send for photo. Robert Perrine, 4096 Olive St., St. Louis, Mo.

BUICK 1909 MODEL F. top glass front, silk mohair top; in first-class condition; \$990 if sold quick. Box 331, Mt. Vernon, O.

COMMERCIAL MOTOR VEHICLES—Read the "Power Wagon" for reliable information concerning motor trucks, motor buses, motor cabs, and other machines employed for business purposes. Issued monthly; single copies, 20 cents. \$2 a year. The most valuable paper of its kind published. The Power Wagon, Metropolitan Block, Chicago.

WANTED AUTOMOBILE, second-hand, in exchange for 25-H. P. boiler and 18-H. P. engine, center crank, all in first-class shape, or what have you? Address S. D. Hughes, Dana, Ill.

FOR SALE—One 4 wheel guide steamer, easily made 4 drive, needs repairing. One 10 H. P. Loco steam outfit complete. No reasonable offer refused. L. J. Rice, Arenzville, Ill.

FORD—Fine passenger, two cylinder, side entrance, new top, search light, good tires, extra tubes and chains. Good order, climbs any hill. First check for \$350 takes it. E. E. Brass, Petersburg, Ill.

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FOR SALE—Orient Buckboard Automobile, gear-drive, good running order, \$85. Aug. Bayard, Green Bay, Wis.

FOR SALE—Runabout in running order, \$175.00. Address C. Hurst, Cape Vincent, N. Y.

1909 60 H. P. 7-passenger Knox, fully equipped, both limousine and touring bodies; engine never been used. Apply, The L. Schreiber & Sons Co., Cincinnati, Ohio.

UP-TO-DATE \$4,000 TOURING CAR \$1,450, a \$1,000 touring car \$165. Moving picture machines, 50,000 ft. film, tent, 2 electric plants. Bargains. Enclose stamp. Wills, Canal Dover, Ohio.

THOMAS—with tonneau, good top, storm front, new engine, good condition, will accept reasonable offer, write for photo and description. S. G. Shaw, Warsaw, O.

AUTOMOBILES \$65.00 to \$1,000. Condition guaranteed. Others need repairing \$35.00 up. Orient Buck-Board thoroughly overhauled \$85.00. Knox runabout \$125. New list for stamp. Robert O. Rubel, Jr., Louisville, Ky.

MOTORCYCLE BARGAIN list for stamp. Robert O. Rubel, Jr., Louisville, Ky.

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NEW 12 H. P. Cincinnati automobile engine. Can use screw-cutting lathe, motorcycle. Ulysses Fortier, St. Anne, Ill.

4x4 4 CYLINDER Air Cooled Motor, \$140.00. Rear axle single chain drive; front axle to match with wheels, \$40.00. Steering gear, \$15.00. Runabout bodies, \$15.00. New wheels and discs for friction drive, \$15.00. Butts, Oxford, N. Y.

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BUILD YOUR OWN CARS—We can furnish you with chassis parts, including engine, axles, transmission, frame, etc., at attractive prices. Write us for details. John H. Blacker & Company, Chillicothe, Ohio.

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25 STEAM AUTO ENGINES at \$12.00 each. J. L. Lucas, Bridgeport, Conn.

FOR SALE—A 24 in. Auto boiler, \$60.00. J. L. Lucas, Bridgeport, Conn.

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FIVE DOLLARS will buy our Complete \$25.00 Course in Real Estate and Brokerage for a limited time. Satisfaction guaranteed or money refunded. Booklet free. Finks Realty & Mining Co., Ft. Smith, Ark.

ANYONE, ANYWHERE, can make \$100.00 a month easy, without capital. Nothing to buy and sell. Drop me a postal and I will tell you how. J. F. Pollard, Box 231, Joplin, Mo.

WHY NOT START A PERMANENT BUSINESS? We as manufacturers start you and furnish everything. No canvassing. Three simple successful Mail Order plans to keep our factories busy. We coach you and show you how to get business. You pay us in three months and make big profits. Spare time to start. Write today for positive proof. Pease Mfg. Co., 1017 Pease Bldg., Buffalo, N. Y.

BIG MONEY can be made by all lovers of music during spare time. Particulars free. W. W. Saunders, 2554 University Place, Washington, D. C.

MAKE MORE MONEY! "Booster Magazine" tells you how. Puts you next to a bona fide business proposition whereby you give your customer \$3.00 value for \$1.00, and make a profit of 88 cents on each dollar order. Tells of another business enabling you to make \$3,000 a year. Chucked full of juice. October and November issues, 10 cents. Money back if not satisfied. Booster Magazine, 341 Dearborn St., Chicago.

ENORMOUS PROFITS, manufacture soap at home, no machinery, easy and pleasant. 200 page book of soap formulas, 25c. Chas. T. Schantz, Beatrice, Neb.

TRICK BILL-BOOK transfers money like Magic. Different denominations always kept separate. Money always on inside; your "Ad" always on outside. Sample 10 cents. Eureka Novelty Co., Smithville, Ohio.

FREE—FREE—FREE. To advertise our brilliant 32 faced ¼K Brazilian Diamonds, will give free a \$2.00 Hall self-filling fountain pen with safety clasp and catalogue, for \$1.00 P. O. order or bill. State whether ring, pin or stud is desired. Wayside Novelty Co., Dept. M., 16 Argyle St., Everett, Mass.

BE YOUR OWN BOSS. Anyone with ordinary intelligence can make big money putting up Incandescent Gas Arc Lamps. We teach you free. Write for particulars. Sterling Arc Lamp Co., 835 Broadway, New York.

\$\$\$ IN THE MAIL ORDER business; Modern Advertising tells you how to start without capital and make from \$50 to \$200 a month. Trial subscription, 10c; no free copies—too valuable. Modern Advertising, 239 C. O., Grand Rapids, Mich.

START A NURSERY BUSINESS on our capital. Credit extended until business established. One thousand upward yearly easily made. No triflers. Fairview Nurseries, Rochester, N. Y.

START legitimate mail-order mercantile business of your own; possibilities unlimited; cash orders, good profits; conducted by a.y.o. We print your catalogs, supply everything; sell you merchandise at wholesale; show you how, on small investment. Write for free booklet and sample catalog. Central Supply Co., Kansas City, Mo.

BIG MONEY—Start a dyeing, cleaning and pressing establishment, practically no capital required, splendid profits, unlimited field. We teach a successful method by mail. Particulars free. The Ben-Vonde School, The Original School of Dyeing & Renovating, Dept. C., Staunton, Va.

"SCHEMER" MAGAZINE, Alliance, Ohio, prints 48 pages new \$-getting schemes every month; copy with catalogue 775 big winners, only 10c.

\$3,000 TO \$10,000 YEARLY easily made in real estate business. No capital required. We teach the business by mail, appoint you special representative, assist you to success. Valuable book free. The Cross Co., 3234 Reaper Block, Chicago. See our other advertisements in this magazine.

\$ MONEY \$ MAKING \$ Secrets \$ Send 10c at once for a Valuable Collection of over Two Hundred Ways to Get the Dollars, start a business of your own and make money. Satisfaction guaranteed or dime (doubled) refunded. That's fair; isn't it? Bc. Frankson Co., Baltimore, Md.

THE SOUTH, Opportunities, Real Estate, Investment Securities, and Loans in the Southern States and Mexico. Southern States Development Co. Geo. B. Edwards, Pres. Tribune Bldg., 154 Nassau St., New York, N. Y. References.

TO WAGE EARNERS. Have you \$15.00 to invest? One Hundred and Seventy invested in California Oil made a Millionaire. Plenty of instances where California Oil stock has paid back 100% in a year. Write for "Questions and Answers about California Oil." Sagar & Loomis, Phelan Bldg., San Francisco, Cal.

\$21,500 made in 22 months by one man. Another—a new man—has made \$6,500 since January 1st. Most are making \$200 to \$400 monthly. Would you like to do the same? Write us. The Oxygenator Co., 203 Pearl St., Buffalo, N. Y.

I TEACH YOU the Mail Order Business and guarantee that what you learn will help you to increase your income. I made \$25,000 in two years and started in a small way. Let me hear from you. I will send particulars absolutely free. Address, Hugh McKean, Room 257, No. 232 Eighth Ave., New York, N. Y.

I MADE \$50 from a 38c ad, office work permanent business, total expense from \$50 made, is 90c; no experience needed; full details for 50c no other cost whatever. Transpot Agent, KKO Pasadena, Cal.

ANYONE, anywhere, can start a mail order business at home. No canvassing. Be your own boss. Send for free booklet. Tells how. Heacock, Lockport, N. Y.

MAKE MONEY IN THE STOCK MARKET. Write for book and methods of trading on amounts of \$10 to \$10,000 for large profits. Best service—Advice—30 years experience. S. J. Peck, Consol. Stock Exchange, 422 Walnut St., Philadelphia, Pa.

CASH YOUR BRAIN WORK—Get our list of Inventions Wanted and our book "Inventor's Guide"—they will show you how to work at inventing PRACTICAL, SALABLE articles. Sent free on request. Write, H. C. Evert & Co., 121 Smithfield St., Pittsburg, Pa.

START YOUR BRAIN WORKING for yourself—Our books—"Inventor's Guide" and "Inventions Wanted" by manufacturers will help you. Sent free. If you have an invention not patented, write us. Consultation free. H. C. Evert & Co., 121 Smithfield St., Pittsburg, Pa.

ADVERTISING PLACED anywhere, everywhere, daily, Sunday, weekly papers, magazines, mail-order publication, etc. Lowest rates, prompt, reliable service. Lists, rates and estimates free. Moss & Co., Advertising Agents, Philadelphia.

\$500.00 YEARLY PROFIT from twelve hens. Most wonderful scientific discovery makes this possible. Secrets fully revealed in 172 pages. Price \$2.00. Send 60c with order, balance when satisfied. Particulars gratis. National Institute, 6945 N. Clark St., Chicago.

HUNDREDS BECOME RICH conducting mail-order business at home evenings. Fifty samples and secret of getting thousands of orders \$1.10. Circulars free. Popular Self-Culture Society, Rogers Park, Ill.

ANYONE CAN START a paying business at home, in spare time. Be your own boss. Particulars free. P. A. Seewagen, Dept. A 42, Dunkirk, N. Y.

MAKE MIRRORS AT HOME. Big profits with little outlay. One 18x36-in. mirror costs \$2 to \$5. You can silver a glass this size for 20c. Send 50c in stamps or money order and we will send you explicit directions how to do it; also how to emboss, grind, foil, gold leaf, frost, chip and make imitation stained glass! How to transfer photos on glass, bore holes in glass and cut skylights. George L. Patterson & Co., Dept. 3, Brooksville, Ky.

OUR COMBINATION ADVERTISING and match vending machines make salesmen \$10.00 a day. If we have no representative in your territory, write for agency. International Vending Co., 46 Fifth Ave., Chicago, Ill.

DON'T SLAVE FOR OTHERS. Reap the benefits for yourself. Fortunes made operating automatic penny weighing machines. Our scale speaks your weight. Write for Talking Scale circular. The United Vending Machine Co., 629 Caxton Bldg., Cleveland, O.

AGENTS—\$300 every month selling our wonderful 7-piece Kitchen Set. Send for sworn statement of \$12 daily profit. Outfit free. Thomas Mfg. Co., 262 Third St., Dayton, Ohio.

AGENTS make \$103.50 per month selling wonderful self-sharpening scissors and cutlery. V. C. Geibner sold 22 pairs in 3 hours, made \$13; you can do it. We show how. Free outfit. Thomas Mfg. Co., 362 Third St., Dayton, Ohio.

CAN START you in good home business for 10c to \$1. Twenty-page catalogue of books on mail business, compounding, advertising, etc., free. Puritan P. Book Co., Buffalo.

ANYBODY—either sex—can make \$4 daily all year raising mushrooms for hotels and restaurants with my spawn in cellars, sheds, boxes, etc. Free illustrated instruction booklet. Hiram Barton, 329 W. 48th St., New York.

SEND FOR FREE BOOK telling why so many patents are worthless as a protection. O. C. Billman, Patent Lawyer, Cleveland, Ohio.

INCORPORATE FREE; pay expenses; we take stock for service. Listed Securities Co., Elmira, N. Y.

MY NEW STORE necessity is better than a telephone. Sells better than cash registers or scales ever sold. Sells for \$50 to \$1,000. Your ability alone limits your possibilities. Salesmen, Territory Managers and Local Agents wanted. Ref. First National Bank, Chicago. M. L. Pitmeier, 183-189 Lake St., Chicago.

"DOLLARS & SENSE" FREE! Col. Hunter's great book free with Advertisers' Magazine one year at 50 cents. Indispensable to business men who advertise. Best "Ad School" in existence. Three months' trial subscription, 10 cents. Advertisers' Magazine, 747 Commerce Bldg., Kansas City, Mo.

AGENTS AND OTHERS. Start a business of your OWN. Dependable and high-class. Exclusive territory. Steady income. Particulars free. Standard Mfg. Co., 858 Congress St., Portland, Maine.

WE EXCHANGE ANYTHING you require, for whatever you no longer need. Merchandise list for stamp. Jenkins Universal Exchange, Chicago.

AGENTS

MEN AND LADIES—Useful household specialties; sell in every home; big profits. Agents earning \$200.00 monthly. Best proposition on the market. Write for catalogue of over 300 fast sellers. Henry Martin & Co., 5323 Greenwood Ave., Chicago.

CLEAN, STRAIGHTFORWARD PROPOSITION and steady employment for reliable, energetic agents. Our men stay with us because we treat them right. No delivering or collecting. Free outfit. Pay weekly. Perry Company, Rochester, N. Y.

MEN AND WOMEN—We manufacture hosiery—replaced free when hole appears. Easy sales. Large profits. First reply obtains agency your city. Triplewear Mills, Dept. D., 724 Girard Ave., Philadelphia, Pa.

SIMPLIQUE ELECTRIC GASLIGHTER sells at sight. Most practical article for the home, office, workshop, store. Splendid proposition for active agents. Simplique Mfg. Co., 237 Broadway, New York.

TRIUMPH Fruit Jar Wrench and Triumph Fruit Jar Holder. Endorsed by Boston Cooking School Magazine, Table Talk, and food experts generally. Go Like Wildfire. Agents, 150% profit. Sample wrench, polished nickel, 25c; Holder, 25c, postpaid. Other specialties. Send today for catalog. Benj. P. Forbes, 411 Beckman Bldg., Cleveland, Ohio.

WOULD YOU LIKE to wear a beautiful suit made to your exact measure, tailored in latest Chicago style, if the price was less than you pay for ordinary ready-made store clothes? Write at once for free samples and full particulars. We ship on approval, express prepaid, absolutely guaranteed perfect fit and satisfaction. **AGENTS WANTED—**Any bright man can make \$25.00 a week in his spare time taking orders for our fine custom tailoring. Our samples, new up-to-date styles and low prices surprise everybody. Orders come easy. We give exclusive territory. You can build up a fine business for yourself on our capital. We furnish agents samples and outfit free and explain everything. You can't fail. No money or experience required. If interested ask for agents' outfit and we'll make you a special inside price on a suit for yourself as a sample; or else please show this ad to someone who would appreciate it, for it is a wonderful opportunity. Address Banner Tailoring Co., Dept. 182, Chicago, Ill.

SELF-FEEDING MATCH CASE. Feeds from original package; no transferring; no robbing; no spilling. Great "Ad" Novelty. Sample, 10 cents. Eureka Novelty Company, Smithville, Ohio.

OUR MARVELOUS FIRE EXTINGUISHER—Just perfected, puts out any kind of a fire in ten seconds. Agents of character can obtain exclusive rights for towns, counties or states. A fortune for you. Bank references. Hanks Mfg. Co., Dept. A., Augusta, Maine.

POCKET MANY-TOOL—The most complete combination tool ever invented. Contains pen, pencil, compass, knife, file, T-square, marking point, dividers, rule. Sample, 25c. Rose Co., 4732 Park Ave., Chicago.

AGENTS—New gas burner; no mantle. Big money. Sample, 25c. Lustig, 1460—50th Ave., Melrose, Cal.

AGENTS of both sexes are earning money selling our "Soap and Silverware" Outfits, Jewelry, Cutlery, Razors, Shears, Ladies' Bags, Pocketbooks, Watches, Lace Curtains, Hosiery, Handkerchiefs, Clothing, Rugs, Lamps, Wm. Roger's Silverware, Clocks and 1,200 other quick selling Household articles. 50 per cent of our Agents make more than \$100 per month. Experience not necessary, we show you how to succeed. Write for our Free Catalogue and Agents' Terms. The Phillips Co., 261 Phillips Bldg., Dayton, Ohio.

PERFUME—GLOSS IN STARCH—Gives clothes lasting perfume of Azure Violets. Makes them white as snow. Other quick sellers. Large profits. Agents wanted. Sample, 4 cents. Shipman, Lewis Block, Buffalo, N. Y.

BE A CHEWING GUM MANUFACTURER at your home; no machinery necessary; 500 per cent profit; big demand; particulars free. R. Jensen, 1000 Thirteenth St., Denver, Colo.

AGENTS wanted, cash weekly. International Nurseries, Denver, Colo.

ALL KINDS most useful combination kitchen utensils ever manufactured. Agents wanted, fast sellers. Catalogue free. Western Supply Co., Montesano, Wash.

LADIES EARN \$10 WEEKLY decorating post cards. Dime brings package beautiful sample and complete particulars. Baylis-Bernet Co., East Orange, N. J.

BE YOUR OWN BOSS: Start Mail-Order Business at home; devote whole or spare time. We tell you how; very good profits. Everything furnished. No catalog outfit proposition. For "Starter" and free particulars address, P. M. Krueger Co., 155 Washington St., Chicago, Ill.

AGENTS make quick sales and big profits selling our combination can openers and knife sharpeners. Free sample. Clinton Co., 1063 Argyle St., Chicago, Ill.

AGENTS—Here's a corker; only paucake griddle in world that bakes square cakes; turns them; bakes six each time; 100 per cent profit. Canton Griddle Co., Canton, Ohio.

AGENTS SEE our New Selling Plan Doubles your Sales and Profits. Easy to sell 43 articles with one sample. Write for particulars and \$2.00 free offer. Fair Mfg. Co., Box 153, Racine, Wis.

MERRY WIDOW HANDKERCHIEFS, the joke of the season, nuf said. Agents price, 15c pp. Percy Ewing, Decatur, Ill.

BURGLAR PROOF LOCK. "The Cannon" locks windows with 1 to 6-inch opening, 25c each. Agents send for prices. Cannon Mfg. Co., 1318 Ashby Ave., Evanston, Ill.

BIG PROFITS. Reliable manufacturing jeweler wants agents to sell 1,000 extensively advertised and fully guaranteed articles. Experience unnecessary. All goods sent prepaid. Extra premiums of watches, diamonds and table-ware. Write for finest catalog ever printed, valuable book of salesmanship and booklet of offer—all free. A. W. Holmes & Co., 62 Broad St., Providence, R. I.

AGENTS GET BUSY. Our Big Xmas. Money-Makers are Winners. Just out—attractive assortment of perfumes, cold creams, sachet, soap, etc., with premiums have the flash that gets the money. 1 to 6 sales in every home, 100 per cent to 300 per cent profit. Buy from the Manufacturer and save money. Get Busy for the Holiday rush. Each day's delay means \$10 lost. Write now for exclusive territory and profit-sharing plan. Davis Soap Co., 80 Union Park Ct., Chicago.

THE NEW "SWIFTLIT" LAMPS light instantly with ¼ match; like city gas; no alcohol used; radically different from any other; portable or systems, 100 to 1,000 candle power at will; burners cheap for old lamps; Agents making money; great novelty; wholesale price for introduction. Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

BE INDEPENDENT! Start a mail order business in your own home. We tell you how, and furnish everything needed wholesale. An honorable and profitable business for man or woman. Particulars free. Many make \$3,000 a year. Murphy Mfg. Co., South Norwalk, Conn.

SELL "DEN" PICTURES. Immense profits; catchy; sell on sight. My plan ensures success. \$2 started me four years ago. Third year spent \$15,000.00 in advertising alone. Will show you how free. Address F. E. Armstrong, President Gordon Art Co., Dept. P., New York City.

AGENTS make big money selling our new sign 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.

AGENTS WANTED—A rare opportunity presents itself for a high class salesman to handle an article of utility needed on every street, in every home and store as well as halls and churches. Substantial commissions or straight purchase plan. Standard, 13 W. Michigan St., Chicago.

AGENTS—Either sex. \$25 to \$50 weekly guaranteed. To your interest to inquire. **Pacific Novelty Co.**, Drawer 366, Salem, Oregon.

AUTOMATIC POTATO PEELER. Peels 12 potatoes perfectly in a minute. 250 other new patents. Big profits. Exclusive territory. **Frank Edgren Company**, Milwaukee, Wis.

CANVASSERS—Four to six dollars daily sure. Permanent. Capital unnecessary. Free outfit. Latest, best selling novelties. Triflers need not apply. **Fairview Nurseries**, Rochester, N. Y.

CREW MANAGERS in every town. Household article. 200% profit, big seller. Sample 25c. **Reyman Supply Co.**, Chicago, Ill.

UNUSUAL OPPORTUNITY for agents on a 25c article, particulars and small sample free. **Bayro Company**, 447 Bagg St., Detroit, Mich.

50 PER CENT PROFIT to Agents selling New Modern duplicator. 100 copies in 15 minutes. Write for particulars. **C-curity Selling Co.**, Box 556, San Mateo, Cal.

AGENTS—\$100 weekly selling our wonderful invention. Send for proposition P. **Standard Manufacturing Company**, Bridgeport, Conn.

GET A LIVE ONE—Agents making twenty dollars per day selling "Climax" Note Book Holders to Stenographers and business houses. Sell at sight. Good territory open. **American Specialty Co.**, Bridgeport, Conn.

AGENTS—New Invention; never before sold in your territory; horse owners wild about them; automatic hame fastener sells at sight; coin money; a fortune in your territory; free sample to workers; write at once. **Automatic Fastener Co.**, G 727, Cincinnati, Ohio.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. **Fred Resag Co.**, 1205 W. Randolph St., Chicago.

MEN WANTED to sell the widely advertised Little Giant Household Pump. Saves Plumbers bills. Removes all stoppages in waste pipes, every one can afford it. Big commission. Write to **J. E. Kennedy**, Dept. P., 41 Park Row, New York.

AGENTS—Everybody is looking for this. What? Stoll's flat iron shoes. The fastest seller and best agency proposition ever offered. Get Busy. Address, **Dexter Supply Co.**, 334 Dearborn St., Chicago.

AGENTS WANTED—Big Money! No experience required. Portraits, Bromides, Photo Pillow Tops, 30c. Frames at our factory prices; credit given. Catalogue and samples FREE. Dept. 8R. **Ritter Art Studio**, Van Buren St., Chicago, Ill.

WANTED AGENTS—MACHINISTS ATTENTION! Do you want to increase your salary? New, revised edition Saunders' "Hand Book of Practical Mechanics," fills the bill for every day shop reference. Machinists say: "Can't get along without it." Shop Kinks, secrets from note books. Tough problems figured by simple arithmetic. Pocket size price postpaid, \$1.00 cloth; \$1.25 imitation leather; \$1.50 real leather flap. Big profits, sells itself. Send for list of books. **E. H. Saunders**, 216 Purchase St., Boston, Mass.

WANTED—Buyers and agents to sell our cement block and fence post machinery. Send for circulars and prices. Address, **W. L. Keller Cement Block Machine Co.**, Kearney, Neb.

THIS MAN MAKES MONEY EASILY. S. W. Boyson, Thornton Park, Winthrop, Mass., has 100 Kirk Peanut Vending Machines netting \$65.00 weekly. Started with free sample machine offer. Particulars write **Kirk Mfg. Co.**, 3831 Old So. Bldg., Boston, Mass.

AGENTS—Portraits, 35 cents; frames, 15 cents; sheet pictures, 1 cent; stereoscopes, 25 cents; views, 1 cent. 30 days' credit. Samples and catalog free. **Consolidated Portrait Co.**, 1198 W. Adams St., Chicago.

VALUABLE INVENTION, agents wanted to introduce The Success envelope and stamp moistener. Can be carried in pocket. Sold in offices and homes. Sample, 20c. **Success Moistener Co.**, 1720 State St., Harrisburg, Pa.

100 PER CENT PROFIT to agents selling ladies' folding extension hand-bags 2-3-4 in one; send for particulars. **C-curity Selling Co.**, Box 556, San Mateo, Calif.

AGENTS WANTED in every county for our patented automatic Door Holder 100 to 200 per cent profit, household necessity, sells on sight. Sample and terms by mail, 25c. **Crescent Door Holder Co.**, Santa Monica, Cal.

AGENTS WANTED to sell our new Pocket Skate Sharpener, one that will absolutely do the work. Retail 15 cents, big profits, quick sales. **White Vend. Co.**, 5 West Madison, Chicago.

MAKE \$15.00 WEEKLY, spare time, selling things by mail. 125 page book tells how. Worth \$1.00—25c. **Chas. Schantz**, Beatrice, Neb.

AGENTS to sell Dutch Cooking Set; sells every house. Write us. **Pace Bros. & Sons Pottery Co.**, Roseville, Ohio.

IF YOU WANT to connect with best agency proposition in America, send 7c (actual expense) for full 15c sample, and our proposition. Opportunity limited; write quick. **Merit Sales Co.**, 85 B, Philadelphia.

SIGN LETTERS for store and office windows, attractive, durable, inexpensive, sample free. **Johnston Mfg. Co.**, Quincy, Ill.

AGENTS WANTED:—Something new, sells on sight, \$3 to \$7 a day guaranteed our book "Piling Dollars" sent FREE. Address, **Darling Bros.**, Derry, N. H.

MOTORCYCLE BARGAIN list for stamp. **Robert O. Rubel, Jr.**, Louisville, Ky.

ENERGETIC AGENTS WANTED to handle our quick selling household specialties. Large profits. Instantaneous sellers. Particulars quickly sent. **Stuart Co.**, 391 Lawton Ave., Detroit, Mich.

AGENTS WANTED EVERYWHERE to sell our newly patented pencil holders for telephones. Enormous quantities being sold. Exclusive territory given. Liberal terms. Sample, 10 cents. **The Wm. W. Bythner Mfg. Co.**, 308 Race St., Philadelphia, Pa.

A NEW MONEY MAKER—10,000 sold in Minnesota. Costs agents 10 cents, sells for \$1.00. New copyrighted article; no peddling; new selling plan. A dollar sample to agents by mail for only 10 cents. Address **CHEMIST "A."**, 214 Kasota Bldg., Minneapolis, Minn.

1.218 OF OUR MEN average \$6.92 profit per day selling "WEAR-EVER" aluminum specialties. Few of these men had any previous selling experiences. Work made pleasant by our 175 page Instruction Book. No door to door canvassing. Let us show you what others have done. Address, **Desk 52, Aluminum Cooking Utensil Co.**, Pittsburg, Pa.

AGENTS—Men and women in every town to sell the celebrated Triplex Handbag for women, four bags for four separate purposes, all in one. Can be enlarged to meet your needs as you go along. Write for terms and particulars of other new patented articles. **S. J. Diamond & Bro. Co.**, Manufacturers, 35 West 21st St., New York.

AGENTS WANTED. \$2.19 SAMPLE OUTFIT FREE. 50 per cent profit. Credit given. Premiums. Freight paid. Chance to win \$500 in gold extra. Let the largest wholesale agency house in the United States start you in a profitable business without one cent of capital. Experience unnecessary. Write for free outfit at once. **McLean, Black & Co., Inc.**, 54 Beverly St., Boston, Mass.

AGENTS. Brand new. Nothing like it ever sold. Our own patent. All women buy. Your profit large. Write for particulars today. **Boyle & Co.**, Box 672, Centerville, Iowa.

\$150.00 worth goods free; free advertising to sell them, and \$60 expense allowance first month, to start you as Manager for big Chicago mail order house. Address **President**, 1274 State Street, Chicago.

AGENTS make 500 Per Cent Profit selling Our Novelty Signs. Any one can put up our New Gold and Silver Sign Letters, and make \$5.00 per day. Enormous demand. Catalogue and particulars free. **M. O. Sign Co.**, 4741 State St., Chicago.

\$5 TO \$10 A DAY, is what my agents are earning, selling my wonderful Buttonhole Gauge Knife, absolutely the best and quickest 25c seller ever handled by agents; every woman buys one. 15 other articles, all necessities and rapid money makers. Big offer for house to house agents only. **A. M. Young & Co.**, 12 Young's Bldg., Chicago, Ill.

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

STIKPATCH MENDS STOCKINGS quicker and better than darning, wears longer, will wash, 20 patches, 10c, postpaid. Agents write for terms. Excellent profit. Sells on sight. **The Stikpatch Co.**, Box 3294, Dept. C, Boston, Mass.

ONE CENT—A Postal costs one cent. Our Catalogue costs many dollars—it contains Brand New Specialties.—It is yours for the asking. For territory, first come, first served. **Agents Supply Company**, 3629 Willett Ave., New York.

AGENTS are coining money selling our great combination tool, the Washington Hatchet. Ten tools in one. Sells at sight to farmers, housekeepers, storekeepers, etc. We can show you how to make from \$3 to \$10 a day; experience unnecessary. Write today for our agents' offer. **H. Thomas Mfg. Co.**, 562 Third St., Dayton, O.

WANTED—Capable agents to handle new, high grade, up-to-date articles; lightning sellers in all homes, offices, stores, shops, \$3 to \$10 daily. **Thomas Mfg. Co.**, 662 Third St., Dayton, Ohio.

ONLY THINK! \$30 a Week Easy with our NoSew Hooks and Eyes, and 70 other Big Money Makers; 6 brand new sellers; everybody buys. Anybody can sell. Biggest profits. Outfit free. **P. M. Miller & Co.**, Box 155, Muskegon, Mich.

AGENTS—Sell Patented Radiumite Self-Honing Strop. Just being put out as an agency proposition. Strop covered by 16 patents. A \$2.00 razor given free with every strop sold. Strop retails for \$1.50. Millions being sold and agents coining money. Throw away old, worn-out propositions for something new and salable. **F. J. King** made 33 sales one Saturday afternoon in two hours. Outfit free. **Thomas Mfg. Co.**, 762 Third St., Dayton, Ohio.

DASHBOARD LINE HOLDER, beautifully enameled, best snap for agents on the market; easily attached to any dashboard; holds lines securely while horse and buggy are standing. 24c. Illustrated catalogue free. **Eureka Company**, Wheaton, Ill.

AGENTS, CREW MANAGERS, AGENTS—We want your name. New Catalogue—brand new specialties—each article an improved household need. Find out what the other fellow is doing, a postal will bring the catalogue and a chance for big money. **Agents Supply Company**, 3629 Willett Ave., New York.

POPULAR MECHANICS wishes to secure an agent in every town and city in this country to sell our 5-volume set of Shop Notes. These books sell readily among machinists, shopmen, farmers, carpenters, blacksmiths and all who use tools. The commission to agents is very liberal. If interested write **Mgr. of Book Dept.**, Popular Mechanics Co., 225 Washington St., Chicago.

WONDERFUL INVENTION—Canchester Incandescent Kerosene Lamp. Burns with or without mantle, 10 times brighter than electricity, gas, acetylene, at 1/10 cost. Burner fits all standard lamps; saves 75% oil. No trimming wicks. \$10 daily. Beware of imitations. Outfit free. Canchester Light Co., 26 State St., Dept. P. M., Chicago.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forshee Mfg. Co., Box 248, Dayton, O.

IF THERE WERE NO TELEPHONES in your territory now, and you had the exclusive right of selling them there, your proposition would not be as good as one I have to offer you now, if you are the man or men. References First National Bank, Chicago. M. L. Pflaer, 183-189 Lake St., Chicago.

EXCEPTIONAL OPPORTUNITY for energetic solicitors with grit and selling power. Article absolutely new and guaranteed. Tremendous seller. Everybody buys if shown. 60c to \$2 profit each sale. Virgin field awaits hustlers everywhere. Write today. Sanitax Co., 2309 Wabash Ave., Chicago.

MALE HELP

BE A DRAUGHTSMAN: Make \$125-\$150 monthly, we guarantee you actual draughting room experience in Architectural, Electrical, Mechanical, Structural, Gas Engine Drawing, etc. Books and tools furnished. Write catalogue. Columbia Correspondence School, Dept. J., Drexel Bldg., Philadelphia, Pa.

WORKMEN—RAISE YOUR WAGES by selling Vanco Hand Soap in shops. Big money made on the side. Splendid opportunity. Large can and particulars, ten cents. The J. T. Robertson Co., Box P, Manchester, Conn.

WE HAVE A HIGHLY PROFITABLE SIDELINE to offer energetic young men; exclusive territory. The Hydraulic Oil Storage Co., 604 Penobscot Bldg., Detroit, Mich.

WANTED—RAILWAY MAIL CLERKS, City Carriers, Postoffice Clerks. Examinations everywhere November 17th. \$600 to \$1,600 yearly. No "layoffs." Short hours. Annual vacation. Salary twice monthly. Over 10,000 appointments during 1910. Country and city residents equally eligible. Common education sufficient. Political influence unnecessary. Candidates prepared free. Write immediately for schedule of examinations and free bulletin. Franklin Institute, Dept. L 21, Rochester, N. Y.

WANTED—RAILWAY MAIL CLERKS, City Carriers, Postoffice Clerks. Examinations everywhere November 17th. \$600 to \$1,400 yearly. 10,000 appointments coming. Candidates coached free. Write immediately. Franklin Institute, Dept. L 21, Rochester, N. Y.

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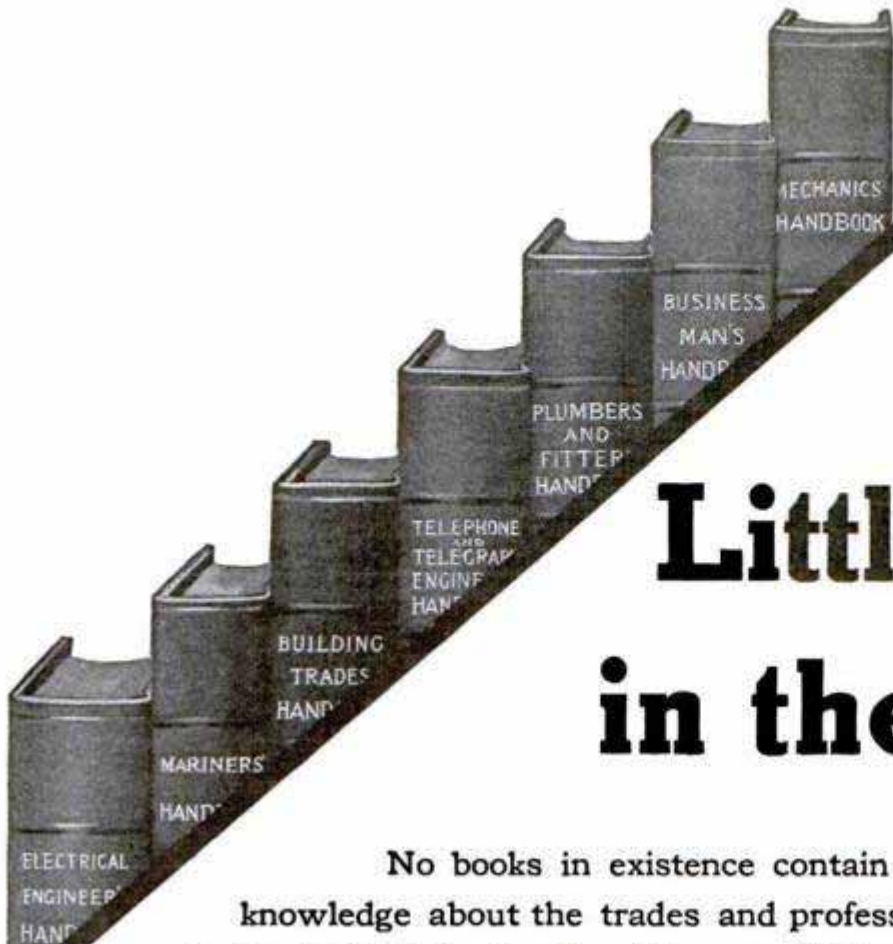
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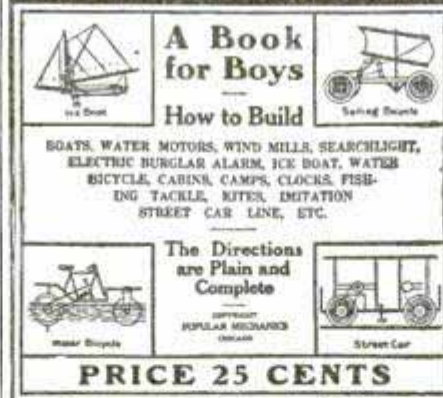
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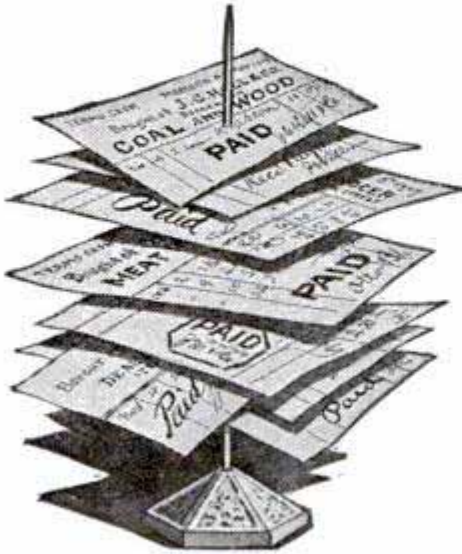
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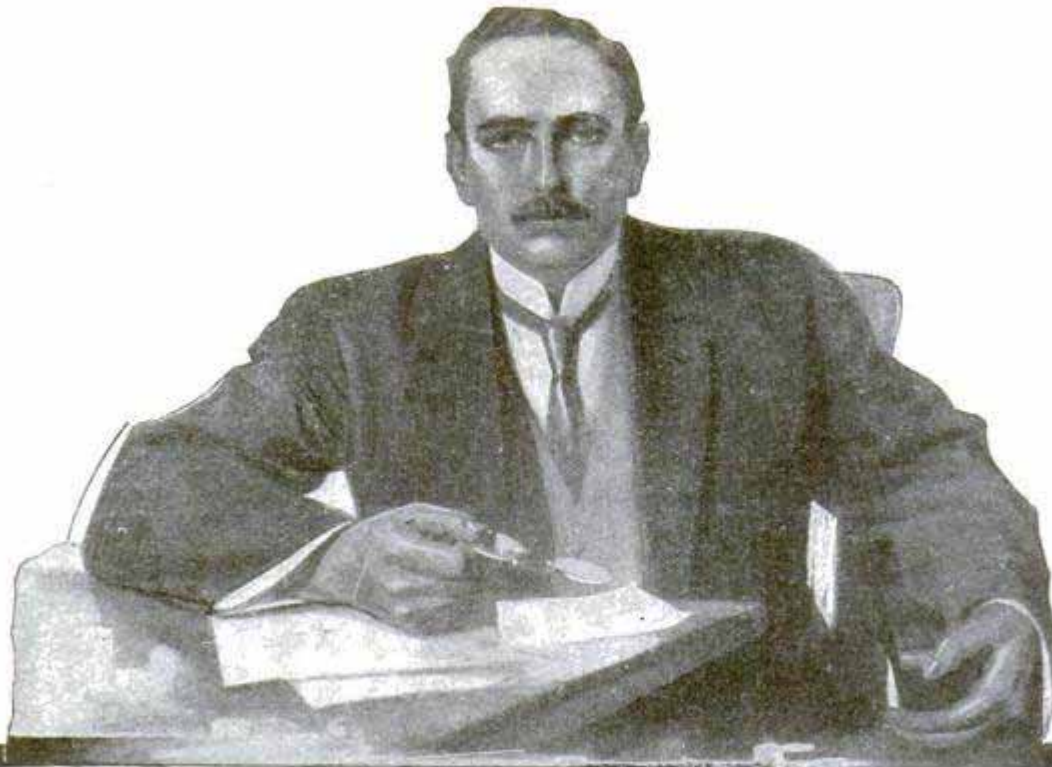
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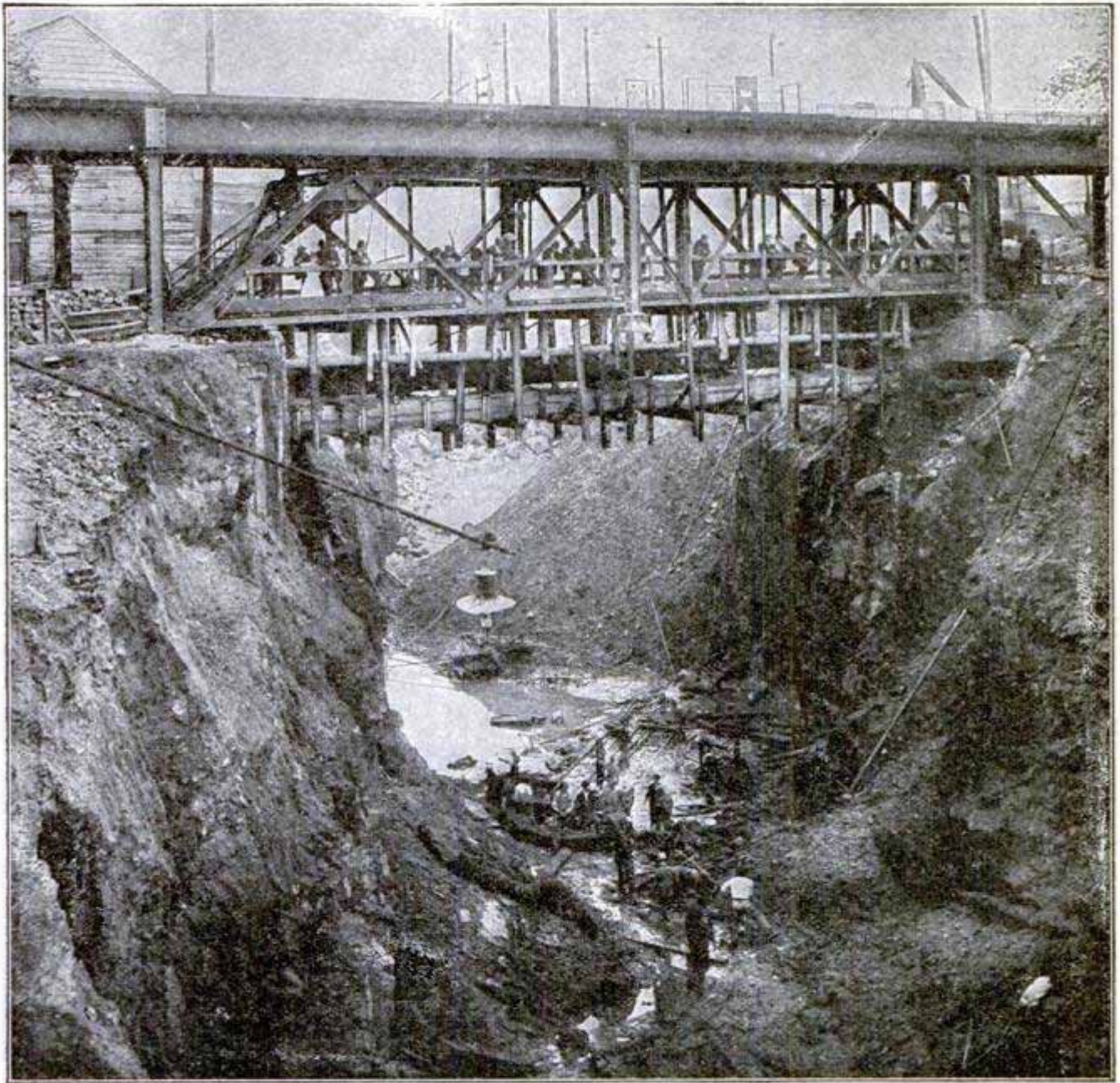
Popular Mechanics

Written So You Can Understand It

Vol. 12

NOVEMBER

No. 5



Method of Supporting the Structure

RAILROAD CONSTRUCTION AT JERSEY CITY

The Erie railroad is constructing an open cut through Bergen Hill (tunneling under the public streets encountered), at Jersey City, N. J., so as to

relieve the traffic through the double-track tunnel now existing through the same hill. The open cut will be used for passenger traffic only, while the old tunnel will be used exclusively for freight traffic. At the point of tunneling under Central ave., the finished crown of arch of tunnel comes within a foot or two of top of solid rock and it was decided to work this crossing by an open cut, arching over the street and back-filling afterwards. There is an elevated trolley road along Central ave., operating very heavy loads, which had to be taken care of. The accompanying illustration shows the method of supporting this struc-

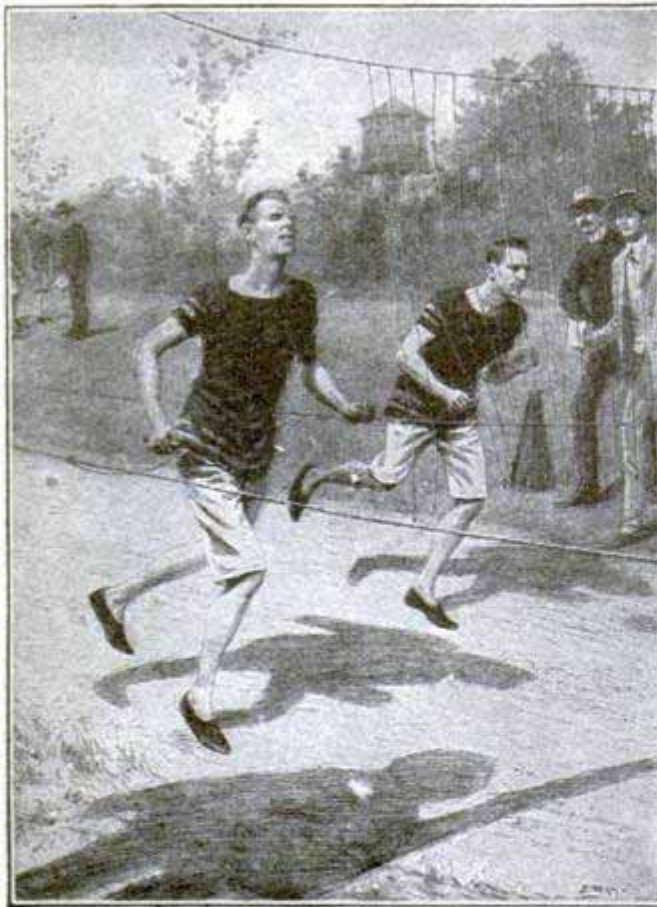
ture. It will be noticed that in addition to supporting the structure, the trusses carry a 36-in. water main, and a 24-by 24-in. box sewer, and gas pipe. The regular street traffic will be carried upon the bottom chords.

The pile of dirt beyond the trusses, nearly half-filling the cut, is to be used in the back-filling, when the arch is completed.

Work was carried on continuously, day and night. The construction has been unusually dangerous, nearly 100 lives having been sacrificed since the work started due to premature blasts and loosened rocks falling upon the workmen below.

FOOT RACES FOR THE BLIND

An athletic idea is being carried out at one of the large blind schools in England that is worthy of being copied



Courtesy London Illus. News
Blind Boys in 100-Yd. Dash

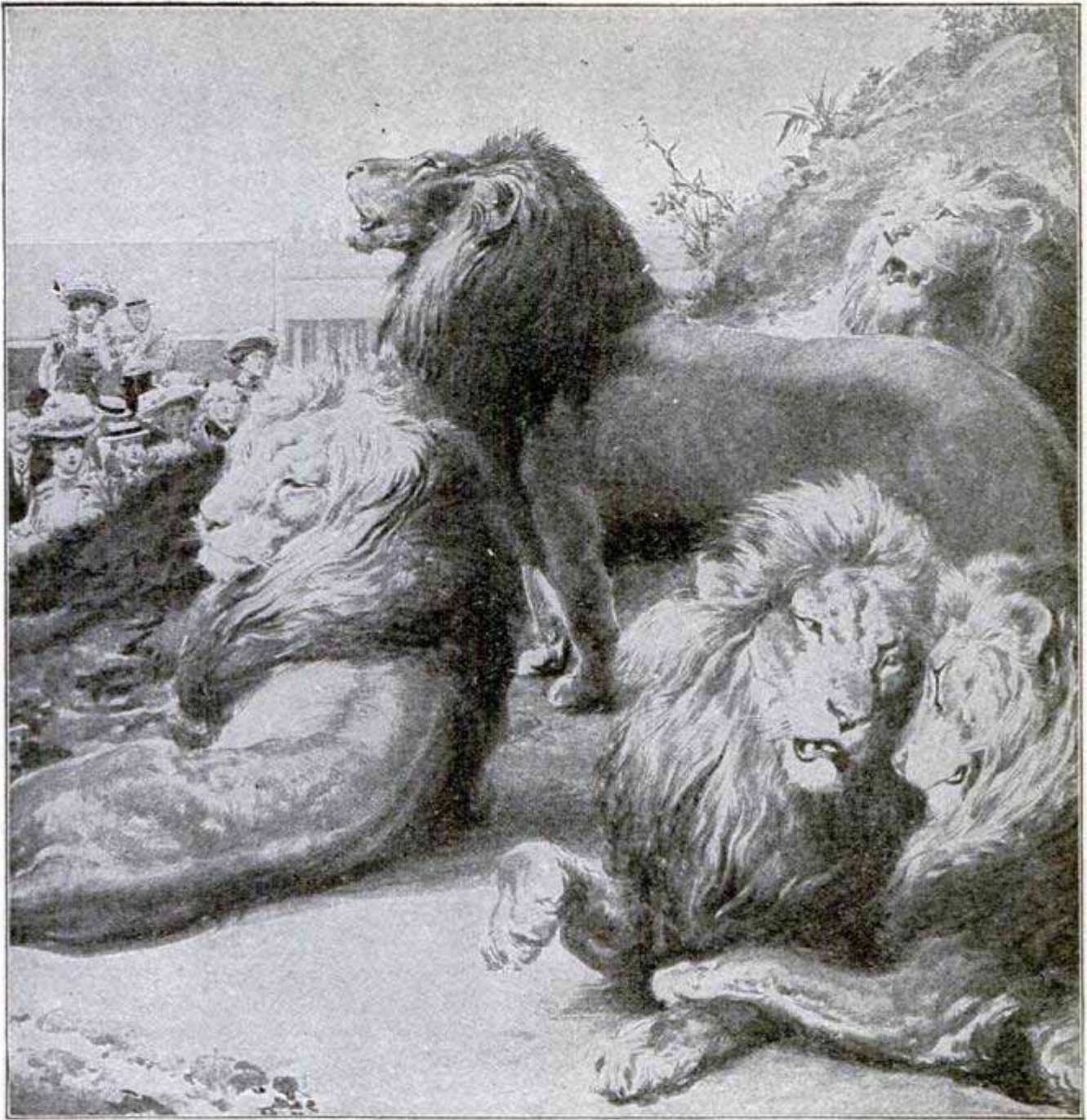
in all such institutions in this country. A running track is provided upon which the afflicted boys enjoy running races almost as much as do their more

favored brothers in other schools. The record for the 100-yd. dash at this school is 10 $\frac{4}{5}$ seconds, which is very remarkable time when all is considered.

The runners being blind necessitates the stretching of wire cables the full length of the track. On these are rings large enough to run easily, and to these rings are attached short chains with handles. The runners each hold a handle on a separate cable and are thus able to keep the exact course. The finishing tape is a fringe of cords similar to those hung above railroad tracks to warn trainmen that a bridge is being approached, and when the runners strike these they know the race is finished. Although blind, the boys know whether or not they are winning by the sounds made by their rivals, this adding to the zest of the sport.

THE TRIBUTE TO HARRIMAN

As a tribute to one of the greatest railroad men the world has ever known, railroad trains, steamships, and telegraph and telephone lines stopped activity for periods ranging from one to five minutes during the funeral service of Edward H. Harriman. Through and local passenger trains on all the lines controlled by him stopped for



Courtesy Sphere, London

A Great Trench Separates Animals from Spectators

five minutes; suburban, freight, and switching trains stopped for two minutes; telegraph instruments were silent one minute, and telephone calls remained unanswered for the same period. Steamships of the system in the Pacific stopped their engines for one minute, a longer time being impossible because the ships would lose steerage-way with loss of propulsion.

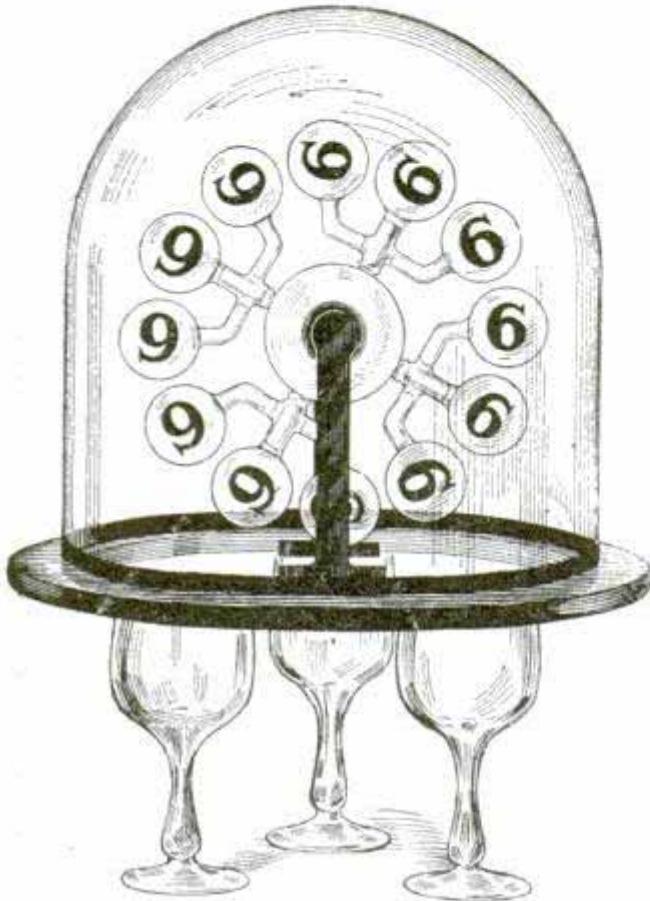
A four-year-old girl, accompanied by her parents, recently mounted on foot to the top of Nevada Falls, a height of 3,000 ft. above the valley.

LIONS IN BARLESS MENAGERIE

The collection of wild beasts at the exhibition at Shepard's Bush, London, is arranged in a manner unrivaled in any country, and the result is as startling as it is pleasing. One sees the animals roaming about unchained and unbarred in a background suited to them. There is really a great trench separating animals and spectators, but this is at first hardly realized, because of the absence of anything to break the vision. The illustration shows the lions in natural surroundings.

"PERPETUAL MOTION" ADVERTISING NOVELTY

Thousands of people have watched this presumed perpetual motion machine whirl in store windows where



Motion Machine That Interests the Public

it has been displayed as a means of drawing attention, but none of them so far have guessed what makes it go. Nothing like a wire, magnet, or motor can be found anywhere about it, yet the glass balls keep revolving, ceaselessly, day and night. To prove perfect insulation from outside forces the glass balls revolve on a glass axle under a glass bell, on a glass plate, supported by wine glasses, but the inventor is an electrician.

BALDWIN BREAKS DIRIGIBLE HEIGHT RECORD

Captain Baldwin, builder of the U. S. army dirigible airship, broke the world's record for height of flight in dirigibles by flying to an altitude of 3,500 ft. while testing the airship he used during the Hudson-Fulton expo-

sition. The great height reached, which is claimed to be 500 ft. higher than Count Zeppelin's record, was not intended at the start, but he found the wind sufficiently strong at an altitude of 1,500 ft. to force him to go higher or give up the flight. At an altitude of 2,000 ft. the wind was also too turbulent, therefore he rose to an altitude of 3,500 ft., where he found a steady current of air. At this altitude he carried on a series of maneuvers at a speed of more than 25 miles an hour. The flight occurred at Worcester, Mass.

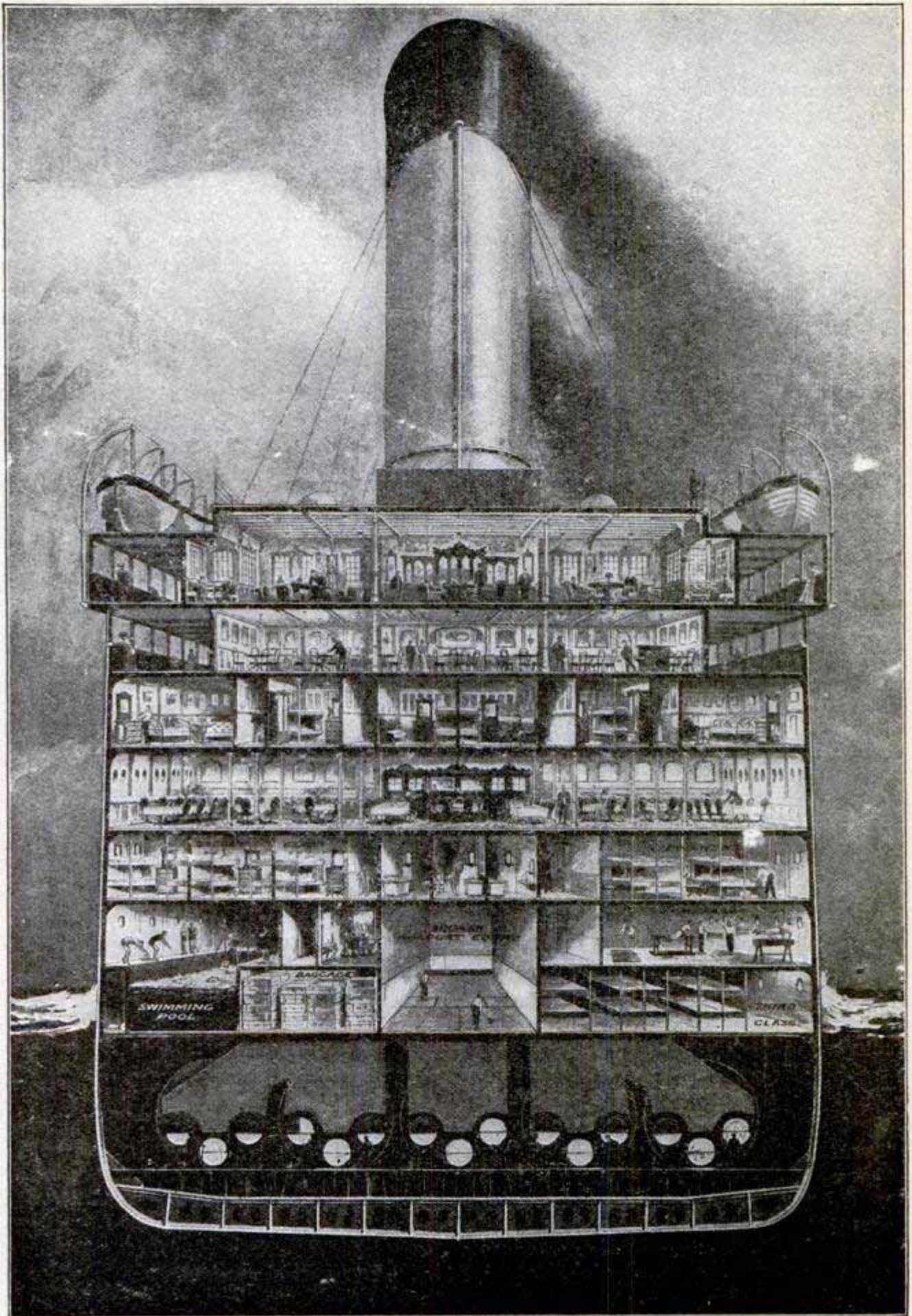
TWO 890-FT. STEAMSHIPS UNDER CONSTRUCTION

When the "Lusitania" and her sister ship slipped from the ways into the water the world felt that it had reason on its side in believing that the limit of great ships had been reached, but so the world has felt every time a larger ship has been launched, only to find itself mistaken in the course of a short time.

The two latest, and for the time being "greatest," trans-Atlantic liners under construction are the "Olympic" and "Titanic" of the White Star line. These huge ships are to be 890 ft. in length, 92 ft. in beam, and 64 ft. in depth. From the keel to the roof of the pilot house they will have a height of 105 ft. The freeboard at the bow will be 52 ft., a height that would seem sufficient to overtop the spray of the largest waves.

Several years ago this magazine predicted that trans-Atlantic liners would reach a length of 1,000 ft., and this, at that time startling prophecy, is being graphically fulfilled. The "Lusitania" is 760 ft. long, 240 ft. less than the 1,000. The "Olympic" and "Titanic" are only 110 ft. less, and no one today can deny that the next great advance in size may exceed the 1,000 mark.

The illustration accompanying this article is a sectional view of the new ships showing three interesting features. These are the swimming pool, the squash racquet court, and the gymnasium.



Courtesy London Illustrated News

Sectional View of "Olympic"

MOVING PICTURES OF CHIMNEY COLLAPSE

These active photographs were taken just before and while a 135-ft. brick smokestack was being demolished at Lafayette, Ind., and are exceptionally good.

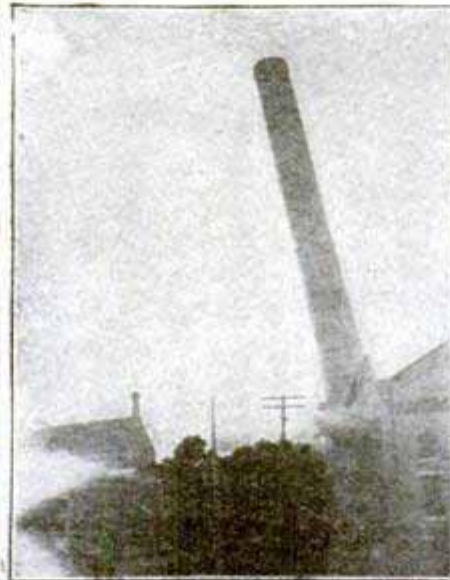
The stack, which was part of a heating and power plant, was condemned as unsafe, and it was decided that the best way to demolish it was to cut it from under, in somewhat the same manner that a giant tree is felled. The direction for the stack to fall was first determined and then several bricks were taken out at a point just above the square base. In the opening thus made was wedged an oil-soaked block

NORWEGIAN WOOD FLOUR

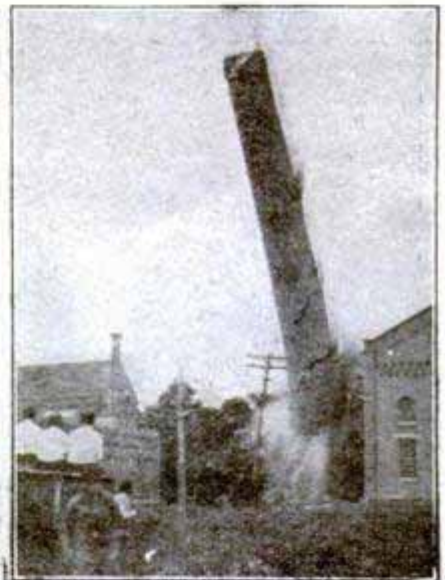
Wood flour, or pulverized wood, manufactured in Norway and used in the manufacture of dynamite and linoleum, is, according to U. S. Consul Bordewich, an article distinct from wood pulp and cellulose. It is made of sawdust from spruce or pine logs, bought from the proprietors of mills. It is first kiln-dried and then ground between millstones, in about the same manner as wheat flour. It is then passed through the hopper of a vibrating sieve, built on the principle of a fanning mill. This sieve is provided with cloth-covered sides, through which the mass must pass. Some idea of the fineness of the wood flour is gained



Preparing the Collapse



First Stage of Fall



Second Stage of Fall

of wood, then more bricks were removed and more oil-soaked blocks were wedged in until the opening extended a little more than half way around the stack. Lighter wood, also drenched in oil, was piled around the blocks, a block and tackle was made fast to the top of the stack, and the saturated wood was ignited. When the blocks had burned almost through, the stack, directed by the pressure on the tackle, fell in the direction planned.

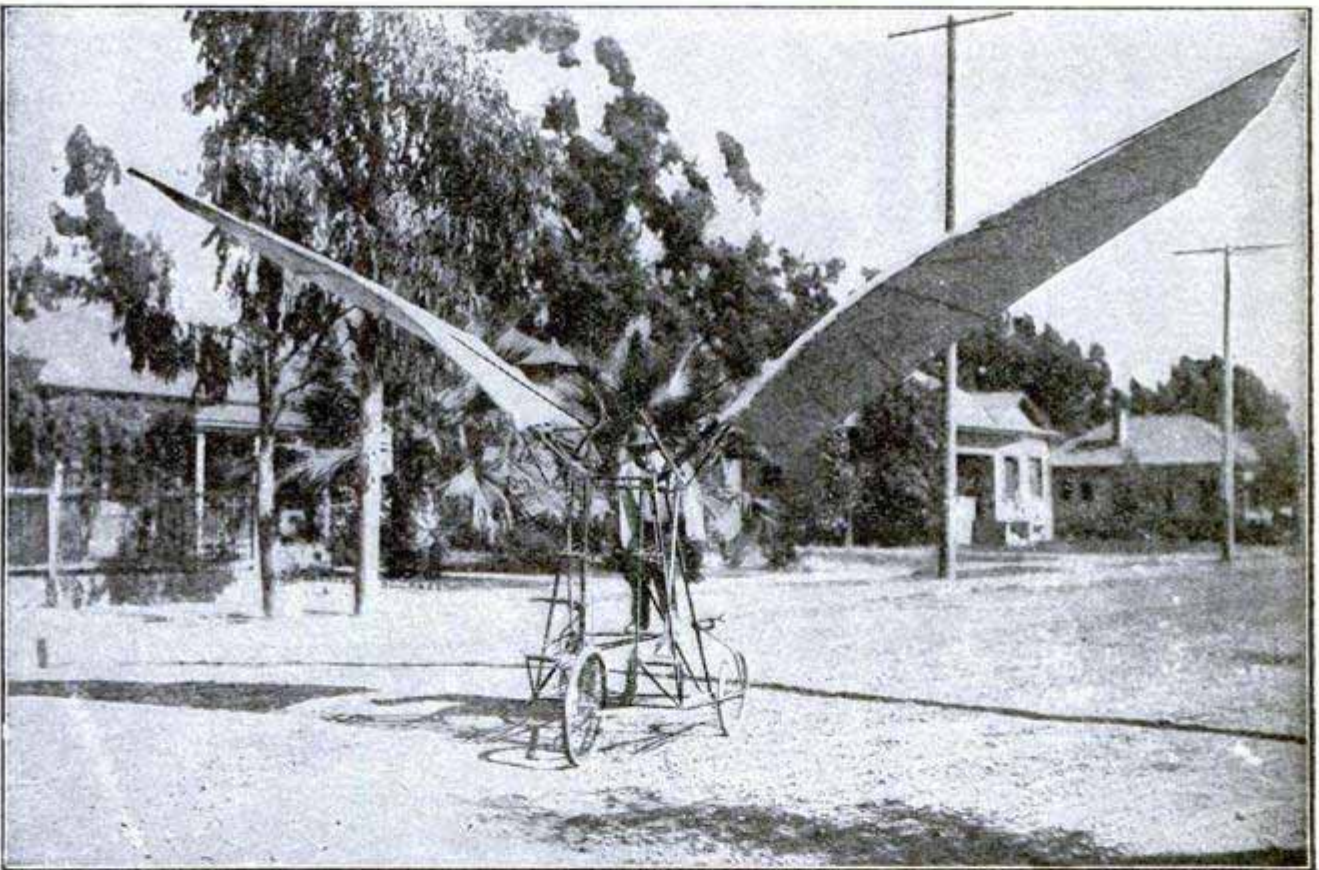
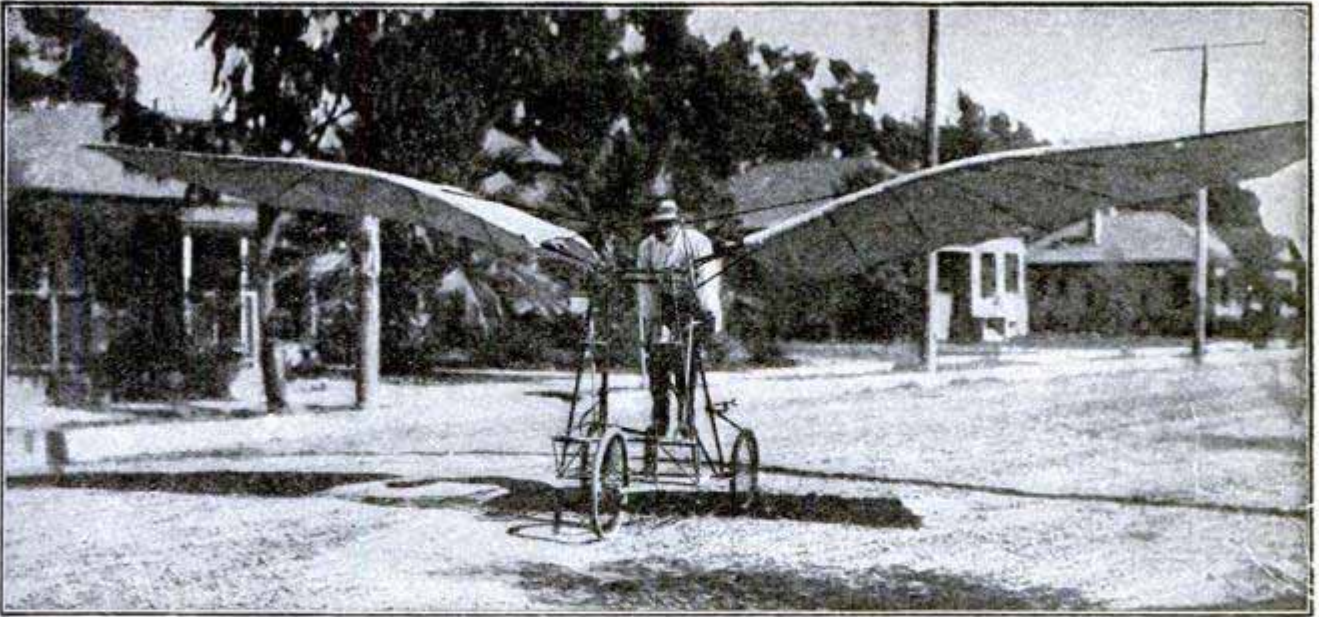
The illustrations show how the work was done and the first and second stages of the fall.

The value of eggs exported from Ireland annually is \$20,000,000.

from the fact that the cloth has from 2,500 to 4,000 meshes, or holes, to the square inch.

FLYING-MACHINE FLAPS ITS PLANES

That the dream of the ancients was not such a bad idea after all, Prof. H. L. Twining, of the Polytechnic High School in Los Angeles, is trying to prove with a flying-machine that flaps its wings as does a bird. His machine consists of a pair of great wings, carefully modeled after those of an eagle, measuring 27 ft. from tip to tip, attached to a frame of bicycle tubing.



Two Positions of the Wings of Prof. Twining's Machine

The weight of the entire machine, minus an engine, is 100 lb., and the wings have a sweep of 15 ft.

Many inventors have endeavored to fly with wings, but according to Prof. Twining they have overlooked the fundamental principles of bird flight.

"The trouble with machines that have previously been modeled after birds was that it was not considered essential to have the wings attached

only by the forward edges and above the center of gravity. When the wings are attached all the way across they are not able to perform the work that is done by the wings of real birds. The power must also be applied very close to the body, so that with a slight movement the wings may be given a great sweep. The upstroke of the wings is another important feature of bird flight that has been previously ignored."

CENTURIES OF ARCTIC EXPLORATION

Arctic Sea First Entered About 875 A. D.—First Great Explorations Were to Discover Northwest Passage Around America to India—Pole Did Not Become a Serious Goal to Explorers Until 1850—More Than 750 Lives Lost Since 1550—
Idea That Garden of Eden May Have Been at Pole.

[Editor's Note—Mention of Cook and Peary's announcements that their attempts to reach the pole were successful will be found in the last few pages of this issue.]

The announcements, coming rapidly one after the other, that two men, in separate expeditions, had succeeded in reaching the North Pole has turned all eyes toward the frozen north and raised a world-wide controversy the extent of which has no parallel in scientific circles. But while this is progressing with more or less bitterness it is interesting to turn back through

to the explorers themselves it has meant achievement and a place in history.

The Arctic Sea was first entered by Other, a Norwegian, who sailed to the north coast of Russia about 850 and made a report of his voyage to King Alfred. About 1001 the west coast of Greenland was colonized by the Ic-lander, Erik the Red. No further prog-

LIST OF LIVES LOST IN NORTH POLE EXPEDITIONS

Year	Explorer	Lost	Year	Explorer	Lost
1553	Sir Hugh Willoughby	32	1821	Parry, second voyage	7
1554	Richard Cancellor	8	1825	Franklin, second voyage	4
1578	Sir Martin Frobisher	40	1829	John Russ	4
1585	Capt. Davis	14	1838	Pease and Simpson	5
1594	Barents	35	1845	Franklin, third voyage	135
1606	John Knight	3	1848	J. C. Ross, search expedition	1
1607	Henry Hudson	10	1849	North Star expedition	5
1612	Sir Thomas Button	14	1849	Plover and Herald	3
1619	Jens Munk	62	1853	Rae	6
1631	Thomas James	14	1853	Kane expedition	3
1633	Isle of Jan Mayen settlers	7	1860	Isaac Hayes	1
1634	Isle of Jan Mayen settlers	7	1860	Hall, first voyage	2
1648	Deshneff	70	1864	Hall, second voyage	3
1719	James Knight	50	1870	Hall, last voyage	2
1728	Bering	10	1872	Peggethoff	2
1735	Pronchistcheff	2	1872	B. Leigh Smith	2
1735	Lassinius	53	1875	English expedition	4
1739	Charlton Laptier	12	1878	Jeanette (De Long)	23
1742	Bering	31	1881	Greely	20
1773	Lord Mulgrave	8	1896	Andree (balloon)	3
1776	Capt. Cook	4	1900	Abruzzi	2
1818	Parry, first voyage	1			
1819	Franklin, first voyage	2			
			Total		756

the pages of history and review in a superficial way the struggles through the frozen north that have led, step by step, to the present climax. It is a story of great hardships, of many deaths, and of great achievements. Success has not meant benefits shared by the whole world as by explorations in the warmer, more livable parts of the world; it has not meant new nations and colonies to which overcrowded Europe could send its overflow to build homes and fortunes; it has meant nothing more to the world as a whole than knowledge of already pretty well proven facts, but

ress was made in Arctic exploration until 1553 when Sir Hugh Willoughby sighted Novaya Zemlya. His party lost 62 persons, the first great loss on record in the frozen north. The list of deaths running down through the years from this date to 1900, and totaling 755 in all, are shown in the table accompanying this article.

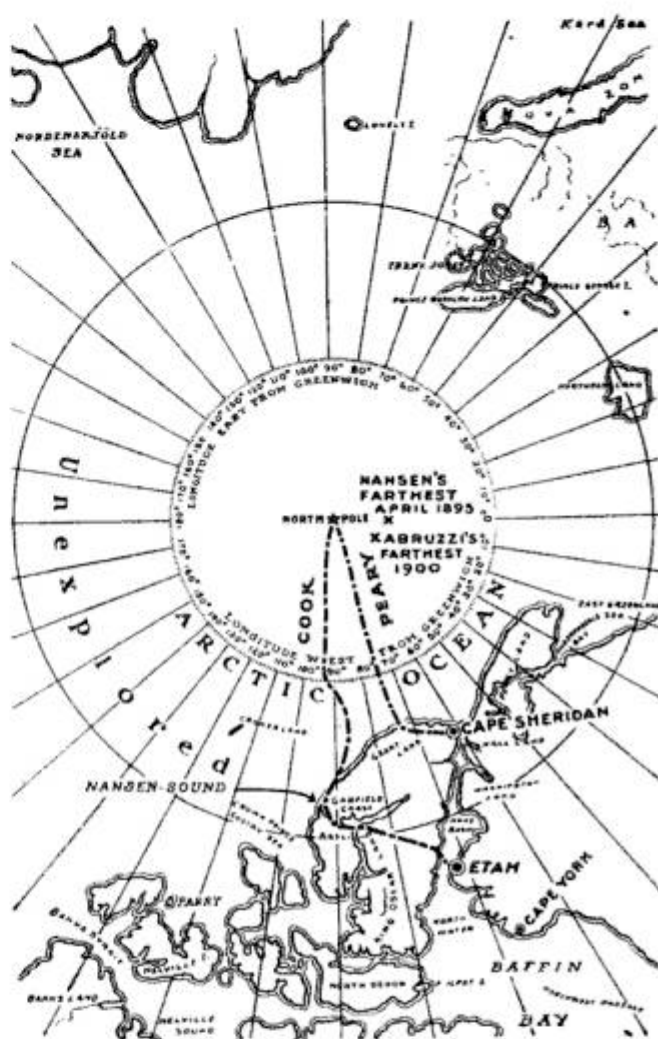
The search for the Northwest passage around America was commenced when Sebastian Cabot was commissioned in 1517 by Henry VIII to find such a passage, and from that time onward it became a favorite project with

explorers. Frobisher, Davis, Hudson, Bylot, Paffin, and others, successively engaged in the enterprise, almost every attempt adding deaths to the steadily growing list.

Then after a lapse of nearly two centuries the record of Arctic research was taken up by such men as Ross and Parry, followed by Sir John Franklin in 1819, 1825, and 1845. This last expedition of Franklin will go down in the annals of Arctic exploration as the most disastrous. He set sail in May, 1845, in command of the "Erebus" and "Terror." On July 26 the ships were seen in lat. $74^{\circ} 48' N.$, after which no further intelligence concerning them was received. Not until the beginning of 1847 was serious apprehension entertained regarding the expedition, then followed several years in which expedition after expedition was sent out by both England and America to find trace of him. Among them were those of Richardson and Ray by land, 1847; of Moore, 1848-1852; Kellet, 1848-1850; Shedden, 1848-1850; Sir James Ross, 1848-1849; Austin and Ormaney, 1850-1851; Penny, 1850-1851; and MacClure, 1850. To MacClure fell the honor of ascertaining the existence of the long-sought-for Northwest passage, but he found no trace of Franklin. Many other expeditions were sent out between 1850 and 1855, but MacClintock, 1857-1859, was the first to set all doubts at rest regarding the fate of Franklin and his party. He established the fact that all had died in 1847, and the list of 404 deaths was enlarged to 539.

It was not until after the middle of the Nineteenth century that the Pole became a serious goal for arctic explorers. The Germans sent out their first expedition in 1868 under Capt. Koldewey. In 1872 an Austrian expedition discovered Franz-Joseph land, and in 1875 England reached lat. $83^{\circ} 20' N.$ Of later expeditions is that of Lieut. De Long, which suffered a loss of 23 men in 1878 in an attempt to explore the Arctic Sea through Bering Strait, and that of Sir C. Young, who went in search of De Long in 1881 and lost several men.

Then America started seriously to try to reach the Pole. In 1881 an expedition was sent out under the command of Lieut. Greely. He established a new record by reaching lat. $83^{\circ} 24'$,



Showing Relative Success of Expeditions

but suffered greatly from famine, losing 20 out of 26 men. In 1892 Peary made his first demand for fame, tracing the Greenland coast to lat. 82° . In 1895 Nansen reached the furthest point north attained up to that time, $86^{\circ} 33'$, or only 260 statute miles from the coveted goal. His record was beaten in 1900 by the Duke of the Abruzzi expedition, which reached $86^{\circ} 33'$. In 1906 Peary reached lat. $87^{\circ} 6'$, or within 200 statute miles of the Pole.

The only serious balloon attempt ever made to reach the Pole was that of Andree, a Norwegian, in 1897, and that undoubtedly ended fatally. He left Dane's Island, Spitzbergen, in a balloon having a capacity of 170,000 cu. ft. He estimated that he could reach the

Pole in six days, provided a constant and favorable wind was blowing. Two days after he departed a message was received by carrier pigeon saying that the balloon had reached lat. $82^{\circ} 2'$, and was still making good progress. This was the last heard of the party of three, and a year later Eskimos brought into Hudson Bay pieces of cordage and basket work which are supposed to have belonged to the balloon.

The Pole, for which all this hardship has been borne is, with the South Pole, one of the most unique spots on the globe. The explorer standing there would know no north, east, or west—every direction he turned would be south, while his weight would be greater than on any other part of the earth, and he would be more than 20 miles nearer the earth's center than if he stood at the equator. He would see the sun rise and set but once each year, and half the stars he would see steadily for six months, while the other half he could never see.

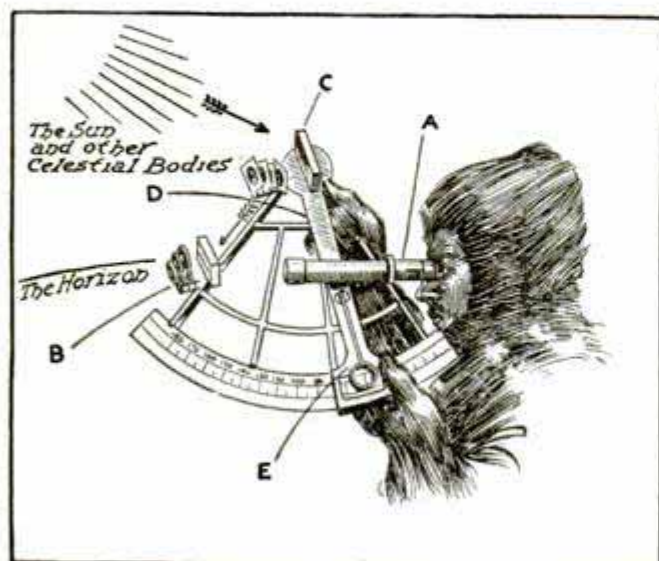
Some time ago the theory was ad-

vanced by scientific men that the Garden of Eden, the first habitation of man, was somewhere in the region of the Pole. Geologists believe that the earth was originally a huge molten mass, and that the cooling process was more rapid at the poles than anywhere else. Hence the two extremities would have been the first parts of the earth's surface to sustain animal life. It was argued that as the earth gradually cooled and became habitable man migrated southward, and that after the lapse of many centuries the cold at the poles was too extreme for life.

As far north as man has been able to make exhaustive research the bones of prehistoric mammals have been found. The remains of mastodons have been found imbedded in the ice in Siberia and Alaska, furnishing proof that at some time these animals ranged over the regions of the far north, while the vast coal fields of Spitzbergen show that sometime in ages past rank vegetation must have existed where but little can exist today.

INSTRUMENT WITH WHICH PEARY AND COOK TOOK OBSERVATIONS.

The sextant, the instrument which Peary and Cook used to take observa-



Sextant Used in Polar Exploration

tions during their dashes to the North Pole, is small enough to be conven-

iently held in the hand, and is equally well adapted for measuring the altitude of celestial objects, in order to obtain the latitude and local time, as it is for measuring the angle between the moon and sun, or the moon and a fixed star, to ascertain the longitude.

It is called a sextant because the measure is recorded on an arc of 60 degrees, one-sixth of a circle. It consists of a frame, usually of metal, stiffened by cross braces, and the arc at the bottom of the frame is marked off with double the number of degrees actually measured. This is done because the fixed and movable glasses attached to the instrument give a double reflection of the objects observed and thus form an angle with reference to each other equal to only half the angular distance between such objects, one of which is seen directly and the other

by reflection. The arc of 120 degrees thus records the actual angle.

Midway on the frame on one side is a telescope, and opposite, on the other leg of the frame, is a glass, transparent in the upper half and silvered in the lower half. Both the telescope, which is A in the illustration, and the glass, designated as B, are firmly attached to the frame. At the top of the frame is a mirror, C, which is movable by means of an arm, D, to which it is fastened. C is called the index glass and the arm, D, revolves around it. The instrument which the explorer in the illustration has the thumb of his left hand against, marked E, is a shifting scale for making fractional measurements.

The observer takes the instrument in his hand and holds the telescope horizontally. Looking through the telescope, he may see the horizon through the transparent surface of the glass B. Then, if wishing to bring the sun into line, he manipulates the mirror C as a child handles a bit of looking-glass for the purpose of catching the sun's glare and throwing it into the eyes of a companion. He turns the arm D until this mirror catches its reflection and throws it back to the silvered surface of the glass B. When the sun is thus made to coincide with the horizon, the section of the graduated arc over which the arm D has passed indicates the measure of the angle in degrees, which is exactly determined by the movable fractional scale or vernier.

Arabian astronomers are credited with having used a sextant as far back as the year 995. The modern instrument was invented independently about 1730 by Thomas Godfrey of Philadelphia and Captain Hadley of the British navy.

50-TON BOULDER DROPS ON TRACK FROM MOUNTAIN

The 50-ton rock shown in this illustration rolled from a mountain top near Huntington, Mass., and landed squarely in the center of the track of an electric railway company. Traffic had to be discontinued an entire day while



50-Ton Boulder Blocking Tracks—After It Was Blasted

the boulder was being blasted away. The illustrations show the rock before and after being blasted.

ONE MAN HOOKS 14,000 CODFISH

Codfishing is done with hand lines, and every fish caught has to be hooked and hauled into the fishing boat, yet Matt Tistil, a member of the crew of the codfishing schooner "Otilie Fjord", caught 14,000 codfish and numbers of other fish during the last season in Bering Sea. By this catch, which would weigh about 56,000 lb. in white meat, Tistil won the envied title of the catcher of the most fish during the season in question, and about \$400 in pay.

IRIDIUM IN PEN POINTS

Unaffected by acids and second only in hardness to the diamond, iridium, a



Fusing Gold Around Iridium Pen Points

metal that is brought from the Ural mountains on the borders of Asiatic Russia, and valued at \$1,500 a pound, is used by fountain pen manufacturers to add to the flexibility and non-corroding qualities of gold an almost indestructible wearing surface.

So delicate is the process of attaching the tiny particles, small as a pin point for each pen point, that only the highest skilled labor can be employed at the task. After the blank shape of the pen has been punched out from the gold, a notch is ground in the point, and this notch is just large enough to receive the small particle of iridium, which must be fused with the gold.

The placing of the iridium upon the notched point is accomplished with a small metal instrument which puts it in position and holds it there with the help of a solution of water and borax until it has been thoroughly fused with the gold.

The fusing is done with a blow-pipe, as is shown in the illustration. This does not melt the iridium, but fuses the gold about it so as to hold it in position. Iridium itself will not melt at a lower temperature than 3,542 deg. F., consequently, the heat available from the blow-pipe would not be sufficient. After the fusing, the pen point is ground into proper form for use.

LEFEBVRE KILLED BY WRIGHT AEROPLANE

The Wright aeroplanes, as well as holding many records for aerial flights, now hold, through the death of the French aviator, Lefebvre, in September, the record of deaths:—Lieut. Selfridge, flying with Orville Wright, and Lefebvre, flying in one of the French-made machines of the Wright model, are really the only two noted and accomplished aerial experts killed by heavier-than-air machines since such flight became an accomplished fact.

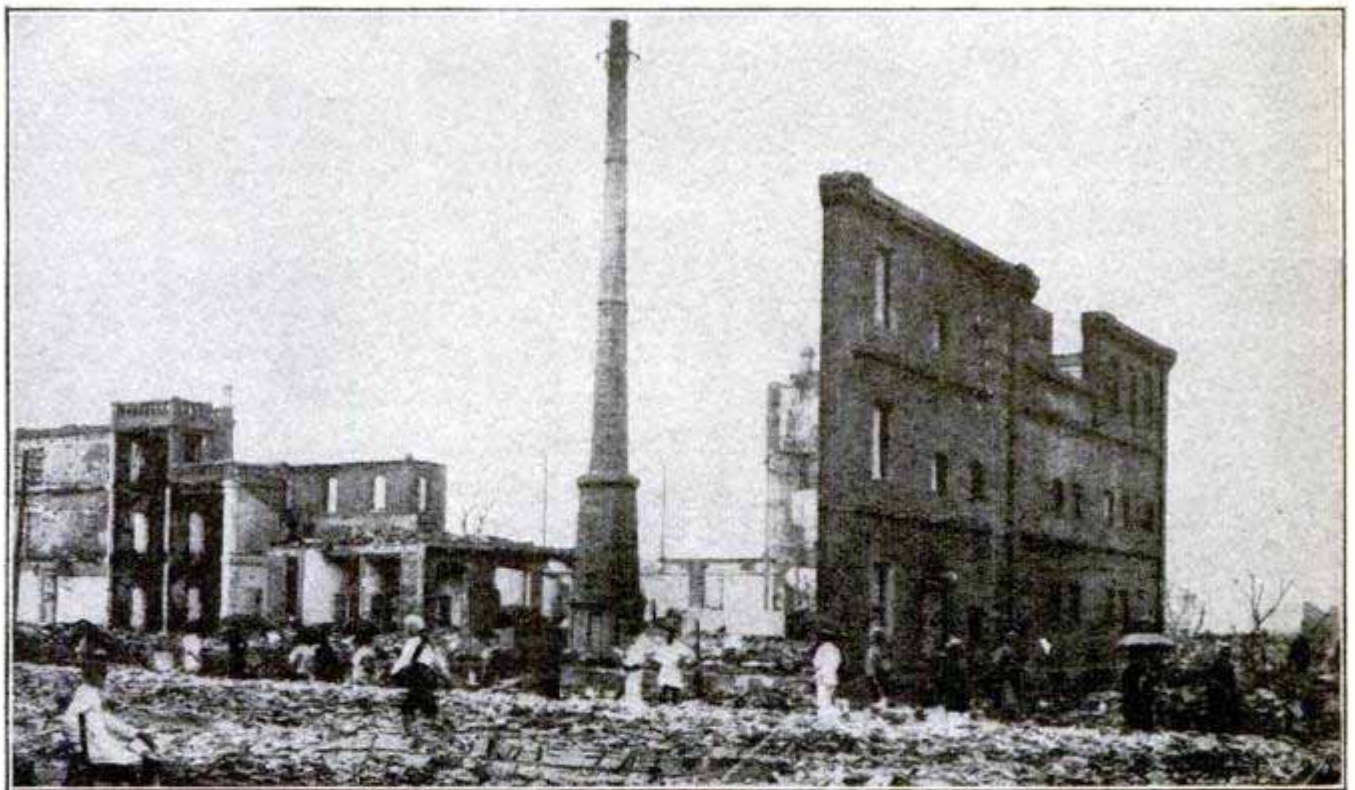
M. Lefebvre's death was due to his testing out of one of the French company's Wright machines at Juvisy. The wind was light, not more than eight miles an hour, and the machine apparently in perfect condition, but it had not been in the air two minutes, when, to the horror of the few present, it dived to the ground from its height of about 30 ft. Lefebvre was found among the wreckage on his back, his feet against the motor, and his head under a mass of broken wood. He was unconscious and died a short time after.

The killed aviator was 29 years old, and taught himself to fly the Wright machine in Holland. At the Rheims aviation meeting he came in fourth in the International cup race, won by Curtiss, and won second prize in the passenger race.

RUINS OF OSAKA'S GREAT FIRE

Later details of the great fire in Osaka, Japan, give the number of buildings destroyed as 11,365; the num-

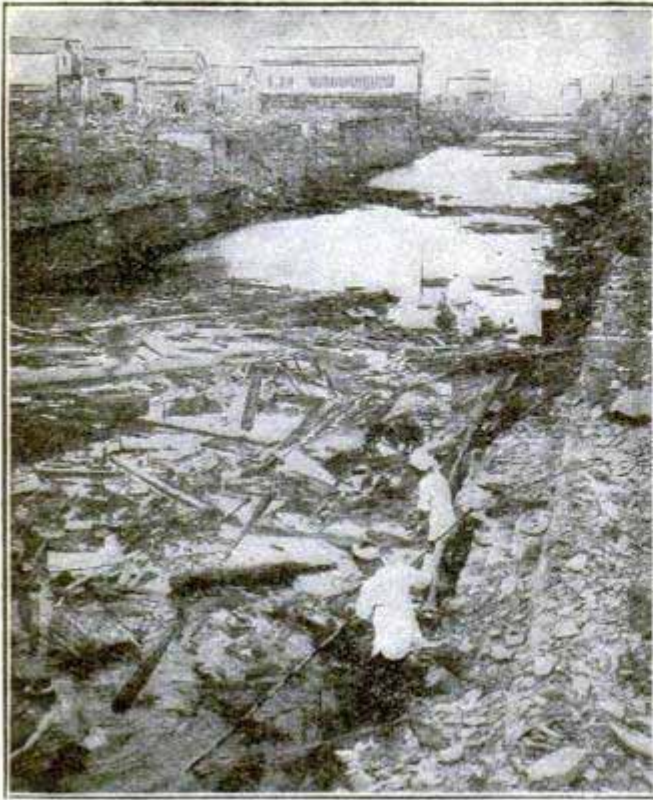
The fire started in a small building that was the home and factory of a knitted-goods maker. The household



Ruins of the Higher Commercial School, Dojima, Osaka, and of the Kwaisei Hospital

ber of deaths, 12; the loss of insured property, \$2,500,000; and the uninsured loss as several millions more.

consisted of a family of four and two male operators. About 4 o'clock in the morning of July 31, a lighted lamp,



Devastation at the Shijimigawa

hanging over a tin of kerosene oil, fell into this inflammable material, which ignited a number of Japanese paper umbrellas on the shelf above. The wind was blowing a gale and the fire soon spread beyond control.

The fire is the seventh serious one in the history of Osaka. In 1666 a fire destroyed 10,000 buildings, followed by a fire in 1724 which devastated the

most important parts of the city. In 1834 some 20,000 houses were burned to the ground. The next great conflagration broke out in 1838, during the insurrection of Oshio Heihachiro. It lasted 38 hours and involved 18,000 buildings. In 1846 a vast area was again destroyed. The last fire of any magnitude previous to the present fire occurred in 1890, destroying some 3,000 buildings.

The present fire makes many opportunities for improvement in Osaka. A main avenue 72 to 90 ft. wide is being constructed from the Fushin-machi street railway station to the section where the fire originated, a distance of two miles, and from this will run several new streets 36 to 48 ft. wide. It is also proposed to fill up the creek known as Shijimigawa with debris such as burnt tile, earth, etc., thus converting much new land. Public parks are to be laid out in sections of the devastated district formerly densely populated.

RUBBER-TANNED LEATHER

A syndicate has established a factory in London for the manufacture of a new form of rubber-tanned leather, for which a great future is claimed. The leather is submitted to a tanning pro-



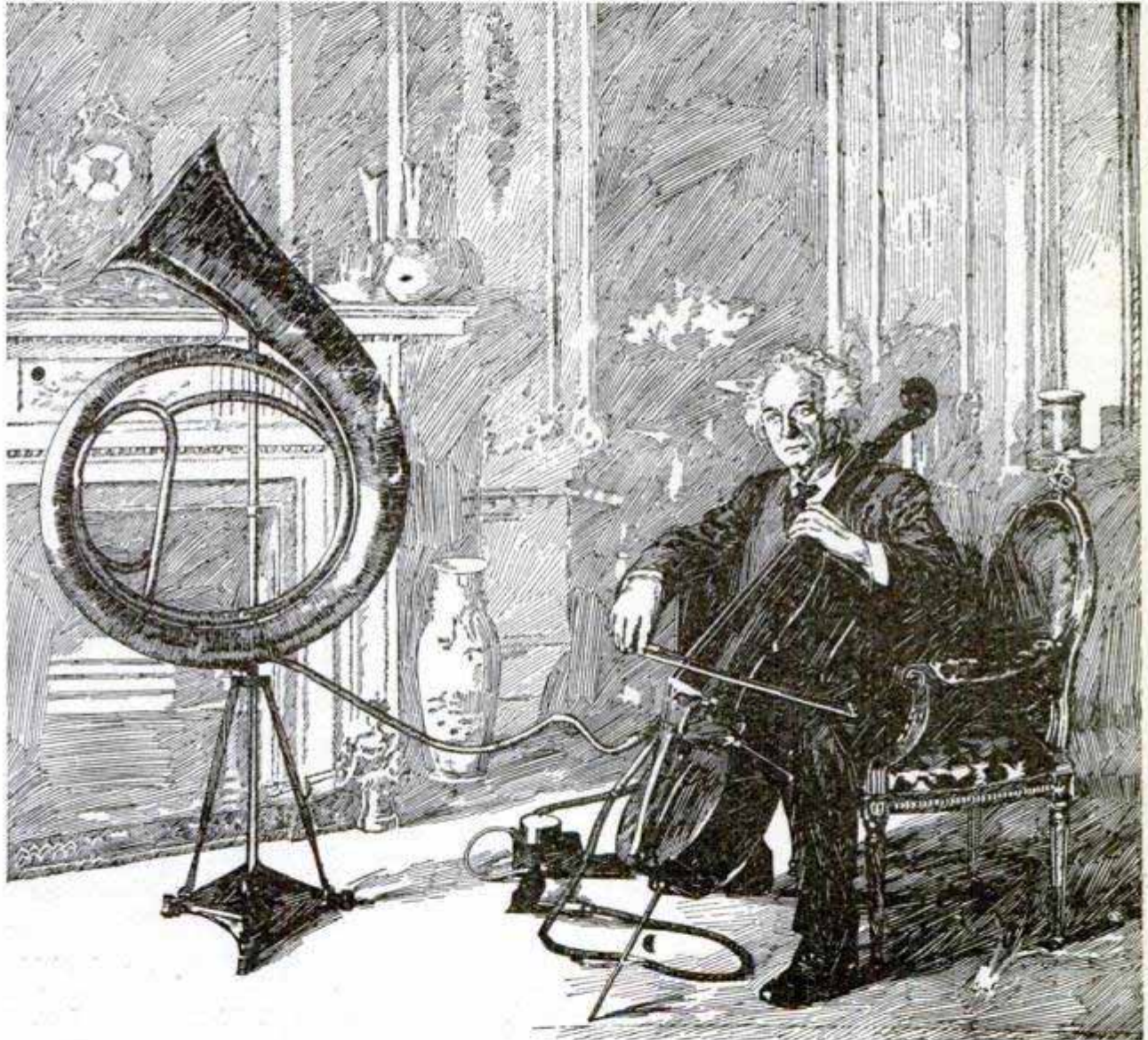
Heap of Ruins in Kamifukushima District

cess of the chrome variety. This preserves it and then a rubber solution is worked into the interstices, rendering the hide thoroughly waterproof.

The elasticity of the rubber permits of perfect flexibility and extraordinary toughness, especially of rabbit, goat, and sheepskins. Tests have been made with the new leather for automobile tires, soles for boots and shoes, machine belting, miners' boots, and many

STRENGTHENING TONE AND VOLUME BY HORN ATTACHMENT

The idea of strengthening the tone and volume of music from a stringed instrument by attaching a horn is not altogether new, but the method here employed, the invention of an English musician, has many new features. In the first place, compressed air is util-



Horn Attachment for Stringed Instruments

other articles. It is claimed that to puncture the leather is almost an impossibility, while the rubber makes it much more resilient than ordinary leather.

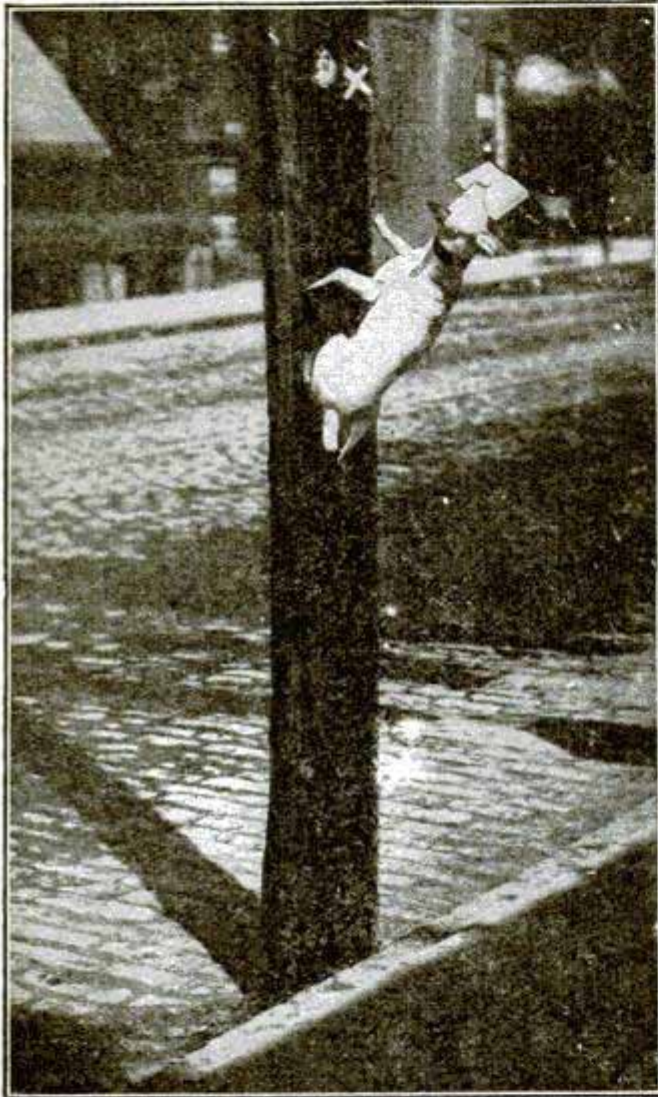
A sum of \$1,250,000 left by Henry Barnato is to be used for building and endowing an institution for cancer sufferers in London.

ized in its operation, and in the second, it can be attached to any instrument. When applied to the cello, as shown in the illustration, the valve is connected by a rod of aluminum to the instrument, and the compressed air passing through the valve is caused to vibrate by the vibration of the strings being played upon, thus producing a sound identical with that of the in-

strument itself, but much richer in tone and volume.

DO DOGS CLIMB TREES?

The canine whose portrait is here shown resides in Butte, Mont., and is



Dog Enjoys This Trick

very popular for his climbing proclivities. He is owned by the leader of a theater orchestra, rejoices in the name of "Deuce," from wearing two natural black spots, and is kept running up a telephone pole or the sides of a building most of his time, for which amusement he is very eager. The cross in the picture shows where his burden was placed, a distance by actual measurement of 6 ft., 9 in. above the sidewalk, nearly, if not quite, his record climb. He usually takes a start of about 15 ft., shoots up the pole or building, grabs his target and falls sidewise, alighting on all fours every time.—Photo by W. A. Billings.

PUMICE STONE RAILROAD TIES

Experiments carried out by Lewis E. Aubury, state mineralogist of California, lead him to believe that railroad ties made of crushed pumice stone are far superior to the concrete ties now supplanting wooden ties on many European railroads and experimentally on the Pennsylvania railroad in this country.

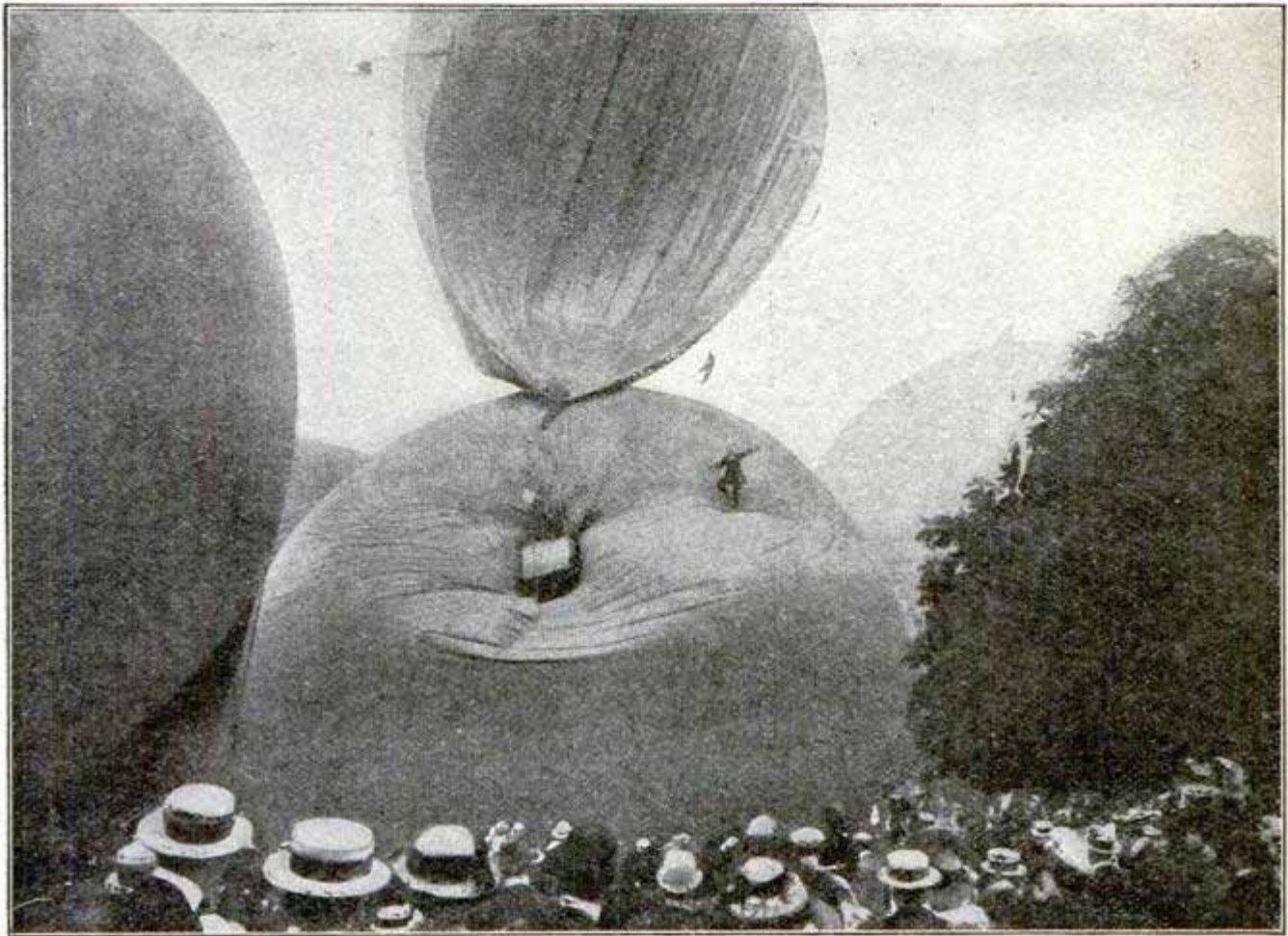
The crushed pumice stone makes the ties as light as wood, according to the mineralogist, and is sufficiently strong, when properly reinforced, to meet the requirements. Ties of the same size weigh only half that of concrete.

"The experiments with the pumice stone," says Prof. Aubury, "demonstrate the fitness of the material for the manufacture of telegraph and telephone poles of sufficient lightness and strength for all purposes. As pumice stone is light enough to readily float upon water it may also be used for the construction of boats. Concrete is being used for this purpose quite extensively in Italy, and pumice stone has the same durability with the added advantage of lightness."

BLIND HUNTER SHOTS RABBITS

A newspaper of Brazil, Ind., with seemingly the best authority, publishes an interesting article concerning a blind German inmate of an Indiana poorhouse who goes hunting with a revolver and seldom fails to return without game.

The game is always rabbits, and the way the blind hunter shoots them is interesting. He has a dog which he has trained to tree all the rabbits he scares up, and when the rabbit has taken refuge the hunter finds his way to the spot by the barking. He carries with him a forked stick, and if the rabbit has taken refuge in a hollow tree he soon locates his game with it. Then he uses his revolver with good effect, very seldom needing more than one shot.

BALLOON ACCIDENT AT BRUSSELS

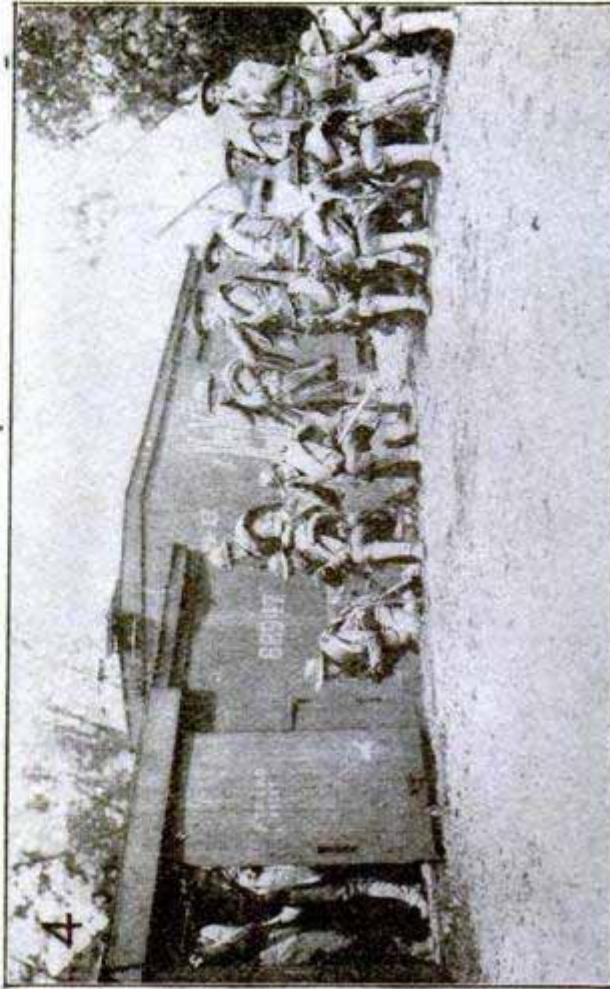
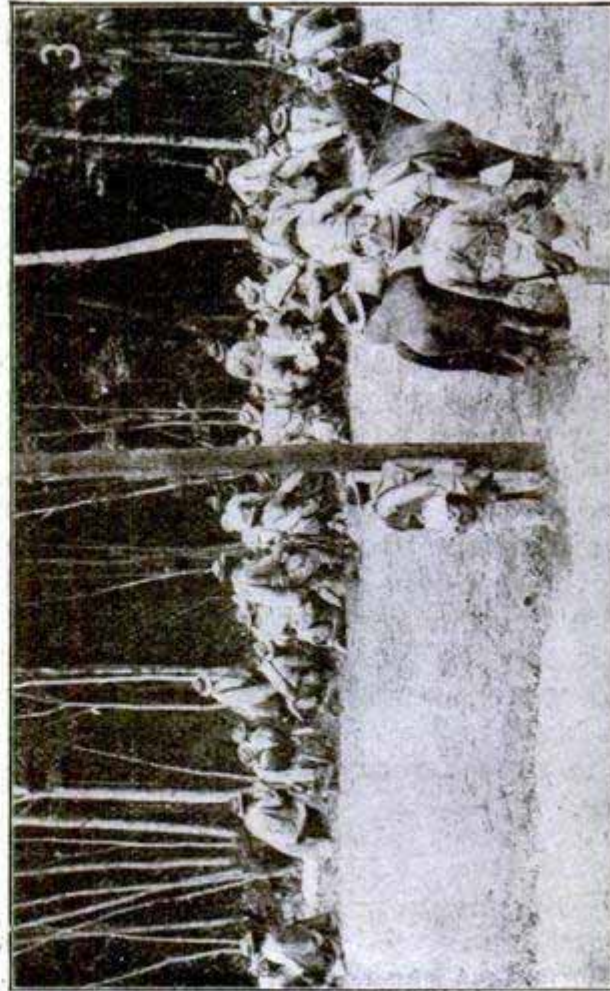
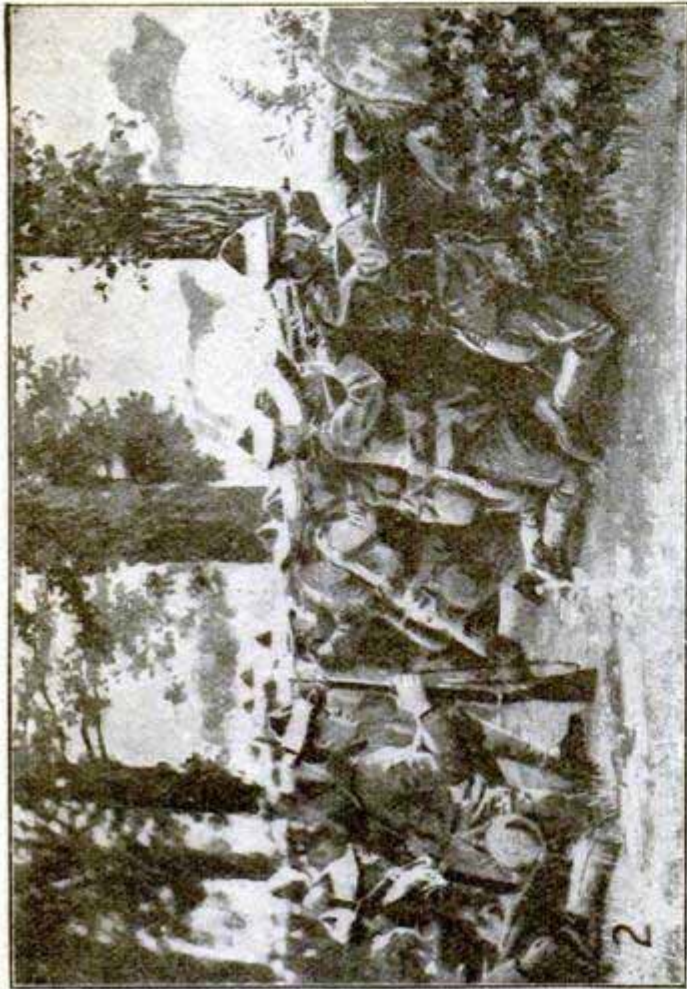
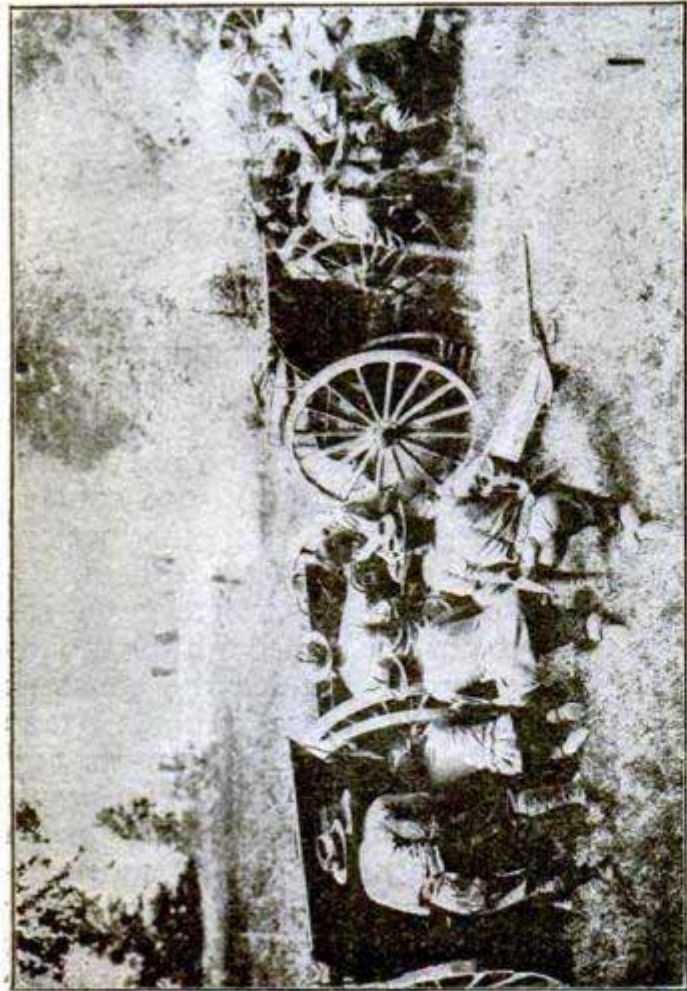
Balloon Collision at Brussels

During the preparations for the ascension of a number of balloons at Brussels the "Cosmos," one of the first to rise, did not ascend rapidly enough and was blown against another balloon. The basket, containing four passengers, landed in the center of the great inflated bag and its anchor tore a hole through which the gas escaped. Two of the passengers succeeded in regaining the ground safely by sliding off the balloon collided with, one of them being shown at one side of the basket in the illustration, but the other two were overcome by the escaping gas and had to be worked over for some time before regaining consciousness.

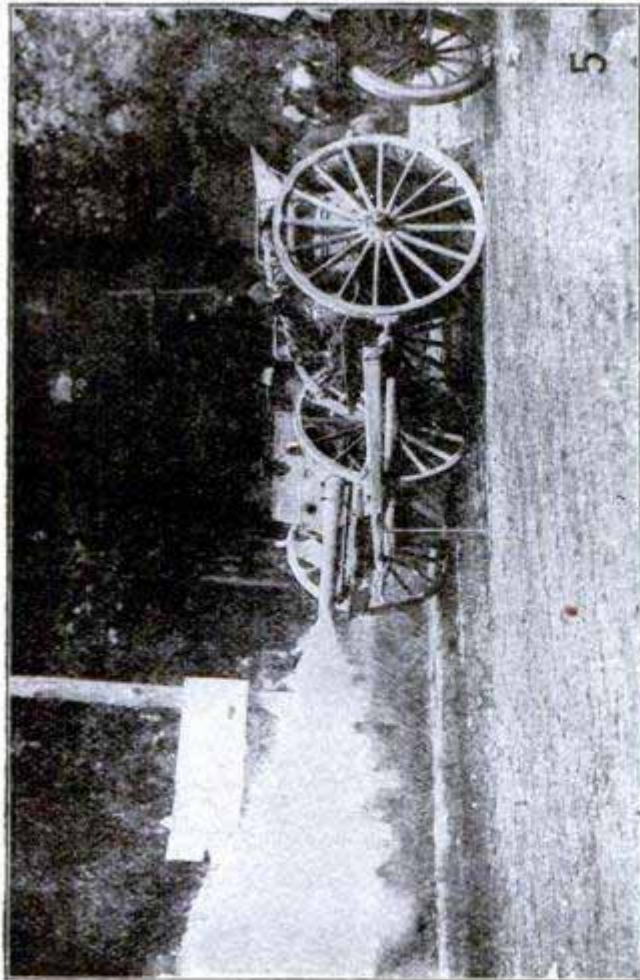
Experiments in abrasion at a French mint have proved that aluminum coins will be less rapidly worn by use than coins made of gold, silver or even bronze.

ANGORA GOATS EAT TRAILS THROUGH FOREST

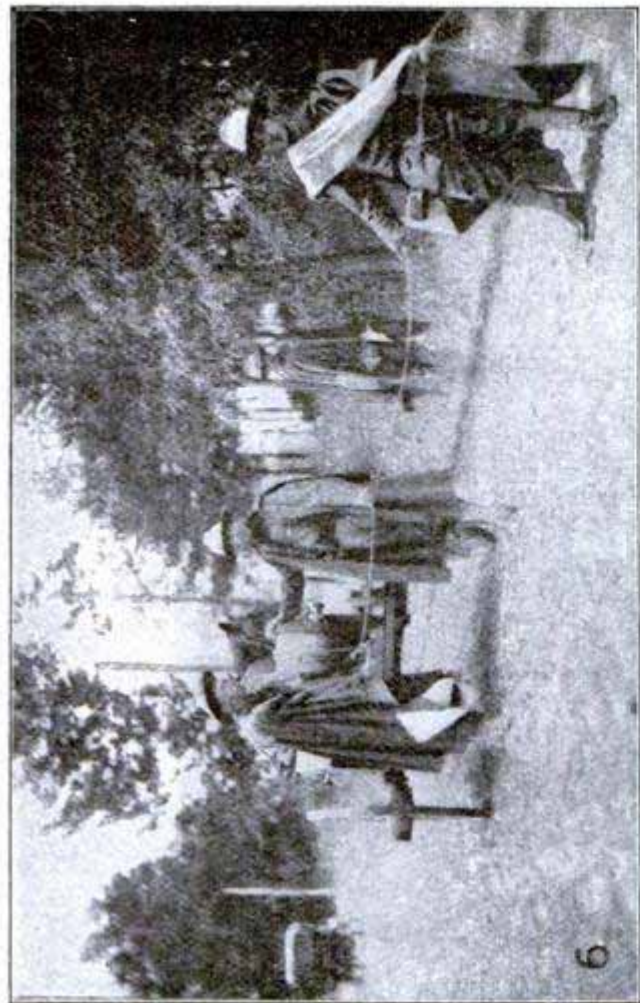
Probably the most curious and remarkable method of making trails through a comparative wilderness has been adopted in the National forest reserve of California as an aid to the fire guard patrol. Taking into consideration the brush-eating instinct of the Angora goat, 3,000 of them, divided into two herds, have been set to work to eat trails through the mountainous country. Under the constant care of herders, these animals graze within certain well-defined limits and are advanced day by day. The result is a practical killing off of all the brush by entirely eating it up in most instances, and the girdling of it when it has not been completely devoured. It is claimed that the goats destroy more brush in one year than a small army of men could destroy in ten.



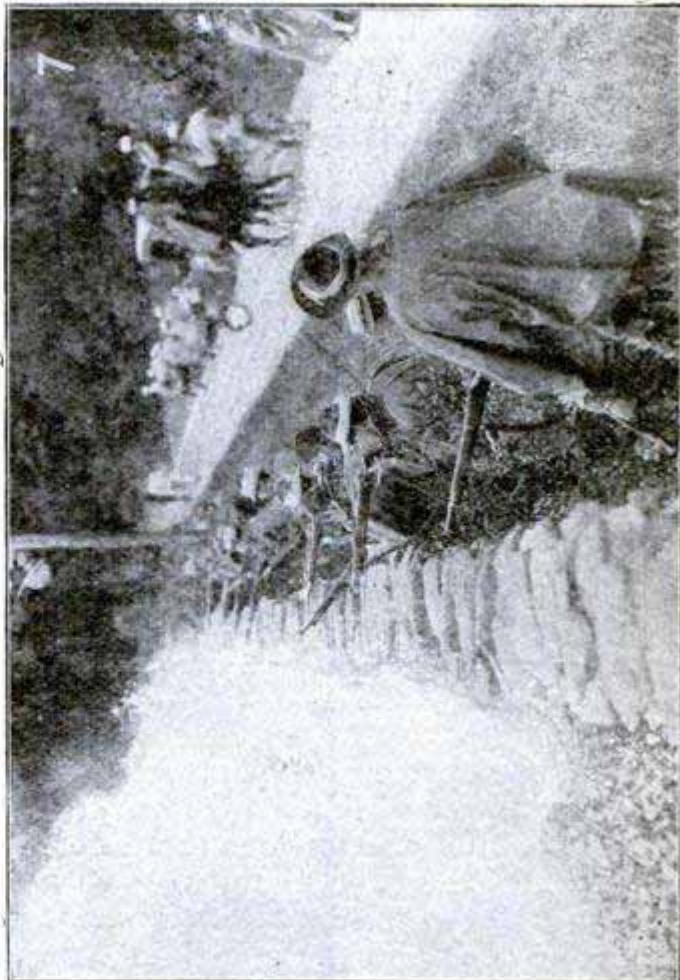
1—Essex Battery of New Jersey Shelling the Blues at South Hanson, Mass.; 2—A Fusillade from the Covert of a Stone Wall; 3—U. S. Regular Cavalry Serving as Scouts; 4—Seventh New York in the Advance at South Hanson, Trapped in a Railroad Yard.



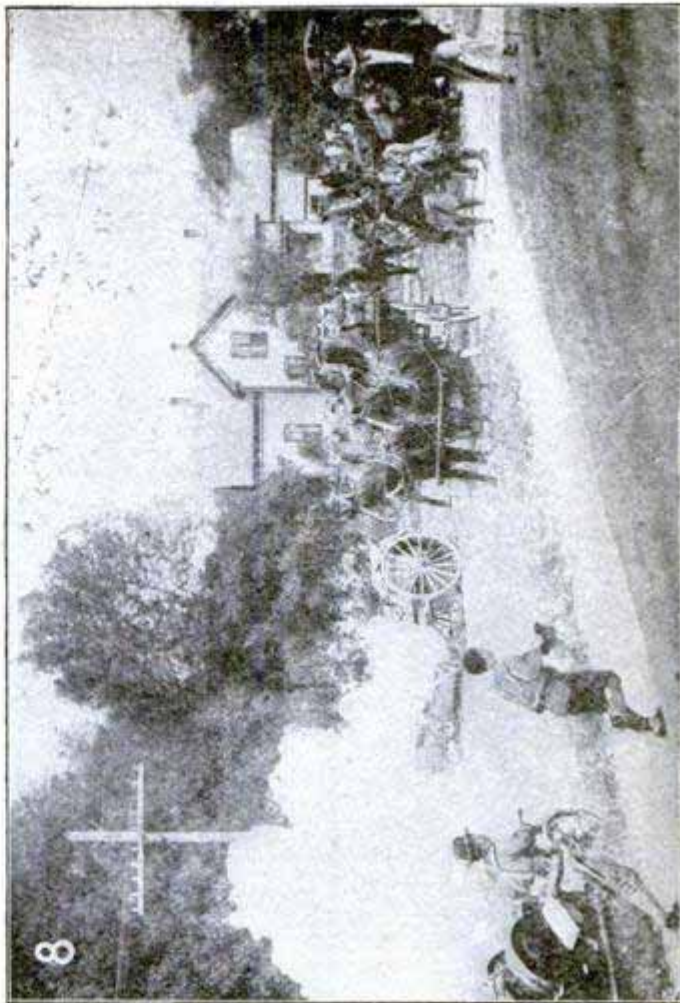
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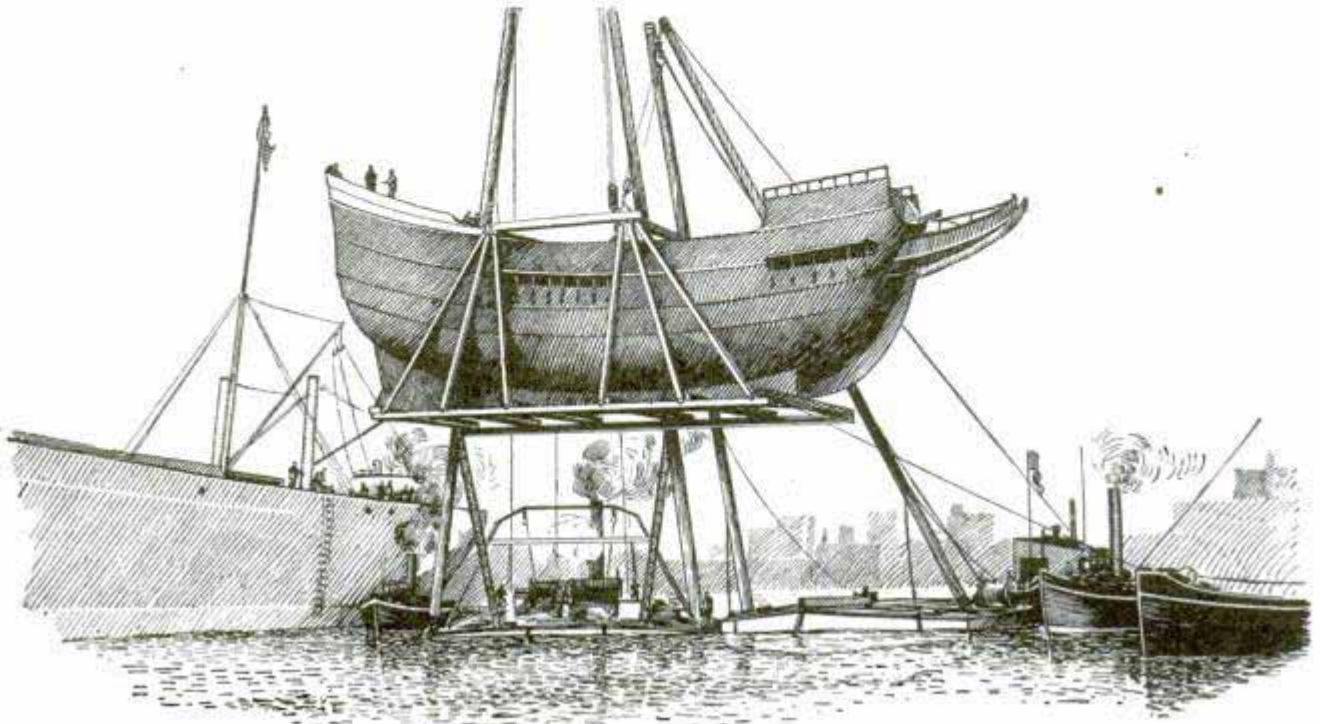
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5—Blue Battery Holding a Road Against Reds' Advance; 6—Blue Signal Corps Running Out a Field Telegraph Line; 7—Fifth Massachusetts Firing at the Seventh New York; 8—Connecticut Battery of Reds in Position at South Hanson at Close of Hostilities.

SHIPPING THE "HALF MOON"

The only difference between the "Half Moon," the ship in which Henry

rigid dirigible of the largest type from the Vickers, and the government factory at Aldershot is constructing three non-rigid dirigibles for the army.



The "Half Moon" Starting Her Voyage

Hudson sailed from Holland to the Hudson in 1609, and its modern replica, built in Holland for the Hudson celebration, lies in the manner of the voyages made by them. The original, most naturally, sailed across the stormy Atlantic in days when ocean courses were unmarked and strange, while the replica, as shown in the illustration, voyaged across snugly tucked on the deck of a Dutch cruiser.

So small was the "Half Moon," that it was impossible to stand between decks, and the crew had to squat when below. The men's quarters in the fore-castle were only $4\frac{1}{2}$ ft. high.

ENGLAND'S AERIAL SELECTIONS

A sub-committee of the Imperial defense committee of the British government, appointed to consider the different types of dirigible airships, gave a verdict in favor of the rigid type for naval purposes and the non-rigid type for the army. In consequence of this report, the Admiralty has ordered a

WASHINGTON'S AUTO PATROL WAGONS

The patrol wagon shown in this illustration has been adopted by the police department of Washington to take the place of the horse-drawn vehicles. Its speed is 15 miles an hour. The first couple of wagons will be given a thorough test before others are or-



A Police Patrol Auto

dered. Each wagon will carry two stretchers and a first-aid-to-the-injured pack.



Sand Sculpture at Atlantic City

A PORTABLE CHICKEN HOUSE

An English firm is making a specialty of this portable chicken house, designed for use on farms where it may be desired to move the chicken headquarters from field to field. The small coop on the shelf near the top is for brooding purposes. It may be left in that position, be



Courtesy Ironmongers' Ohron
Icle, England

placed on the ground, or, in wet weather and at night, be shoved inside the house. The box, divided into five sections, across the end of the house, is for nests.

The best asbestos yet found in the United States is located near the bottom of the Grand Canyon of Arizona, but it must be taken 12 miles down the canyon, 4,000 ft. up the other side, and then hauled 20 miles further to the railroad.

WATER TANK WRECKS CANADIAN BUILDING

A tank, containing 20,000 gal. of water as an emergency supply for a



Result of Water Tank's Fall

sprinkler system, and located on the top of this 6-story warehouse in Winnipeg, Can., was struck by lightning in July with the result shown. Fortunately, the accident occurred on Sunday and no one was in the building as the tank crashed through floor after floor.

A WRIST-PURSE NOVELTY

One of the latest novelties in women's purses is shown in this illustration. The strap over the wrist fastens with a button and neat silk cords secure the purse to the strap. For "snatching" purposes, however, it meets every requirement of street thieves, but it is only supposed to contain small change, visiting cards, and other articles of like nature.



IMMENSE FAN FOR COAL MINES

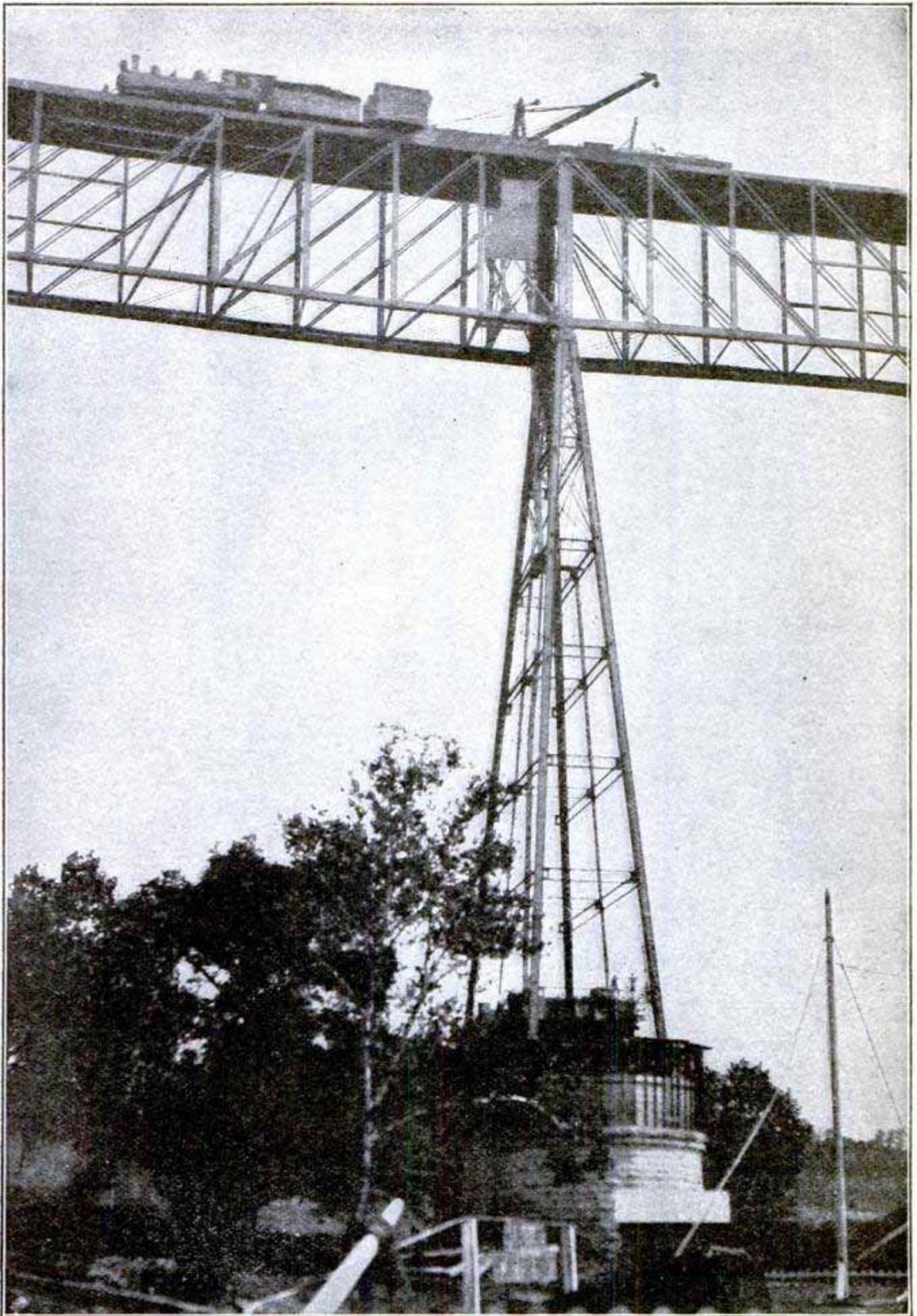
The largest mine fan in America, if not in the world, is planned for the ventilation of three mines at Marianna, Pa. The great fan will be 35 ft. in diameter, which is 5 ft. larger than any fan now in use in American mines, and will have a capacity of 1,200,000 cu. ft. of air per minute—enough to blow the whole summit of the hill at Marianna away if compressed. The fan and its accessory machinery, it is said, will involve an expenditure of \$200,000.

REBUILDING A HIGH RAILROAD BRIDGE

Owing to the steadily increasing weight of locomotives, railroads are obliged to rebuild or strengthen many bridges which were sufficiently strong a few years ago, but which are no longer equal to the loads the companies would like to put upon them.

An instance of this is the big Queen and Crescent bridge over the Kentucky river. In order to increase its stability, concrete is being built up around the steel supports. As the bridge is 286 ft. high and 1,100 ft. long, connecting two almost perpendicular bluffs the problem of supplying working material to the repair gangs at the foot of the piers without interrupting the regular railroad traffic, is not as simple as it looks.

By closely examining the accompanying illustration it will be seen that up under the railroad tracks at the top of the steel pier, a large hopper has been built from the bottom of which a chute runs inside of the pier to the work platform, two hundred odd feet below. Through this chute cement and sand are shot down as needed, while the heavier crushed stone is lowered from the crane shown. In this way the construction train is quickly unloaded and run out of the way for the passing of the regular trains. Water for the mixing of the concrete is, of course, easily pumped up from the river below.



Work on This Bridge Does Not Delay Regular Traffic Over It

BALLOONING AND PARACHUTING, ITS UPS AND DOWNS

How It Feels to Drop from the Clouds

By the Australian Aeronaut, Captain Penfold (Founder of the Aero Club of Australia)

The old temperance motto "Never take a drop too much" applies very forcibly to those who have adopted the



Balloon Rising into Air—Parachute and Aeronaut Suspended from It

somewhat elevating, yet hazardous avocation of an aeronaut. The principal essentials for success are: A thorough knowledge of what you are about to perform, to be possessed of a steady nerve and a cool head under the most trying circumstances, quick, watchful and ready to act and operate, and to do just the right thing at the proper moment, as the slightest hesitation and mistake may cost you your life.

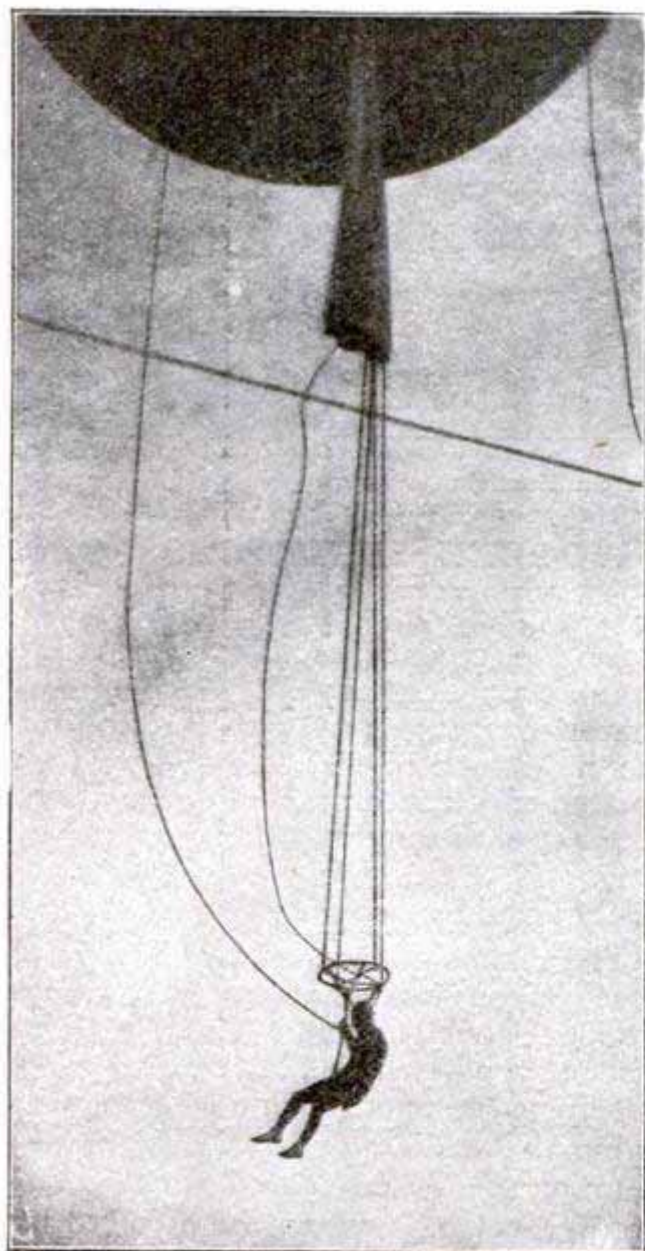
Having overhauled your parachute cloth and cords before the ascent, you (he or she, as the case may be, as some of the gentler sex now perform with great success) sit on the trapeze, or

rope sling, and as the word is given, the balloon is let go, and up you rise. The first objects that attract the aeronaut's attention are the ring of spectators around the inflating arena, and the buildings in the park where the ascent is made, but as you are being carried rapidly upwards, like the rising in a fast traveling elevator, the country around expands itself to view, the ground beneath running away like the sensation experienced when standing on the platform at the rear of a fast moving train, and it is also a peculiar fact that one of the most conspicuous objects seen from a few thousand feet up is a line of railway, which stretches like a black serpent across the country.

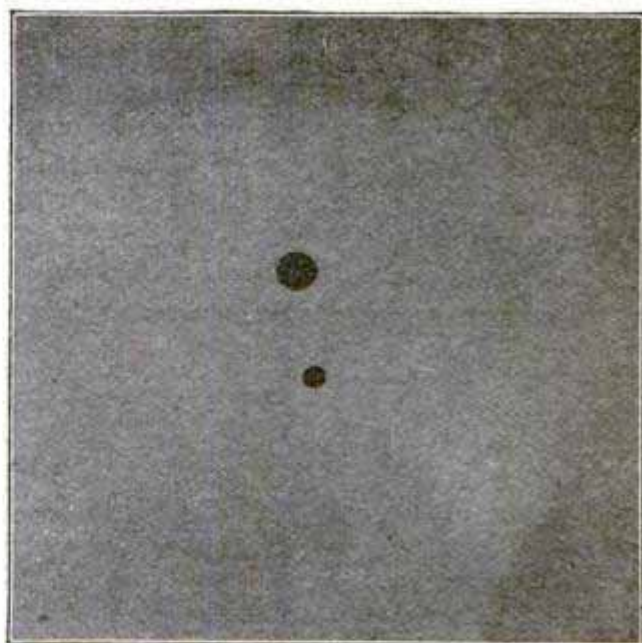
A magnificent panorama is presented to view, the landscape for miles around lays itself out like a gigantic map, streets and villages blend themselves into a huge real estate plan. At this height (about 3,000 to 4,000 ft.), assuming that the aeronaut has ascended with a hot air balloon (the usual method for parachuting), the balloon stops ascending. A perfect feeling of contentment and safety assures the mind, and the aeronaut is enabled to glance around at the surrounding country and enjoy the scenery to the full, observe any prominent landmarks, and get an idea of where he is likely to land. All is silence at this height, no dizziness is experienced, nor is it the same sensation as when looking from a lofty building; but soon a rustling of your parachute cloth is heard overhead, it tells you the balloon is cooling and descending, and seeing you are over a fairly clear spot, you prepare to drop.

Glancing up at your parachute to see if the cords are disentangled, you grasp your trapeze rope by one hand, your cutaway line with the other, cross your legs around your trapeze bar, collect your thoughts, and pull the knife. At once the wind rushes past you, the

trapeze seems not to hold your weight, you fall as if pushed, unprepared, from a high stage into the water at the baths. You look overhead to see the parachute open, the parachute cloth is dropping in a bundle to reach you as it were, but before it does, your weight tells and pulls the cords straight, the wind catches under the cloth of your canopy, you have a few anxious moments as it slowly unfolds like a huge umbrella and with a slight tug (as if a fish were running away with your fishing line) you are supported like a feather, and you experience a feeling of satisfaction and safety. Down you float to terra firma like a bird on outstretched wings, and if it is a calm day, your descent is almost vertical at the



Ready to Cut Away from the Balloon



Parachute and Aeronaut Dropping from Balloon

rate of 8 to 10 ft. a second. When nearing the ground the earth seems to rush up to meet you, and what, at a height of a thousand feet seemed a small box in an allotment, turns out now to be a good sized house. You reach the ground as if in a free drop from a height of about 4 ft.

The most exciting part of parachuting is making a good landing, especially where trees or buildings are about, but with a little experience you soon learn to manipulate the parachute cords, and thus save or direct the canopy to bear you in the direction required.

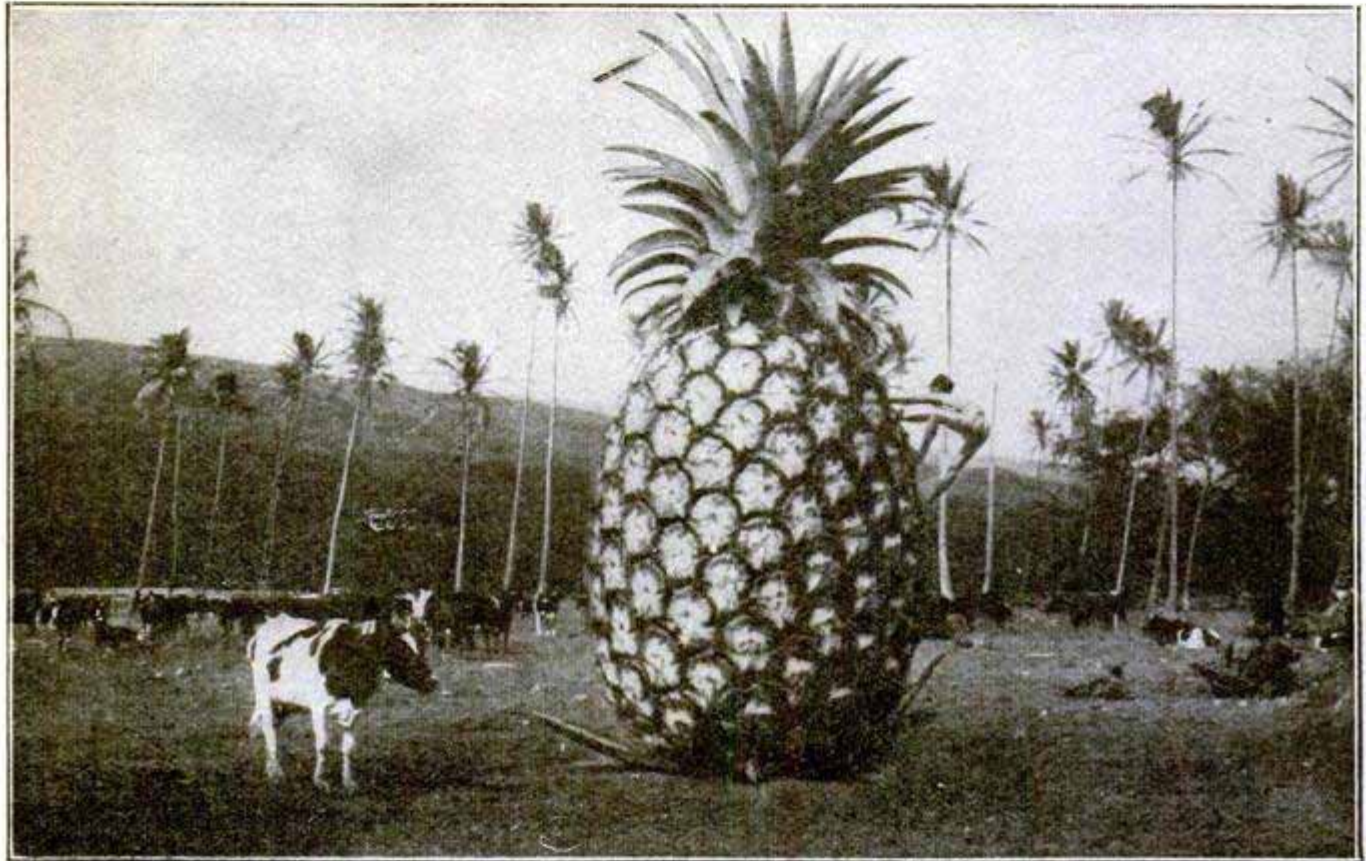
FORMIC ACID FOR DYEING

Formic acid, which has become a formidable competitor to acetic acid in the dyeing trade of Germany, is found in a natural state in ants, caterpillars, leaves of fir and pine trees, and in the common nettle. It also forms itself in a distillation of sugar, starch, and tartaric acid. It is extracted commercially by heating crystallized oxalic acid with glycerin, from which it is withdrawn by means of distillation.

Although chemically pure formic acid is used in small quantities for medical purposes, and to some extent in the manufacture of fruit essences, its chief commercial application is in the dyeing and tanning trades, in which

its corrosive effect is of great value. For dyeing purposes it is now substituted where formerly 30 per cent acetic acid was used. It gives to mercerized cotton the rustling effect of silk, and in silk trades it is used advantageously to produce the sheen.

of the coins were marked and the finders of these received \$5 gold pieces in return for them. The game was for the children, about 1,000 of whom joined in the search. But few hours elapsed before nearly all the pennies were found and the prizes claimed.



Photographic Pineapple from Honolulu

Copyrighted by J. J. Williams

HUGE PHOTOGRAPHIC PINEAPPLE

Photographic proof that vegetables grow large in Kansas was published in the July issue of this magazine, and as a result this proof comes from Honolulu to attest that one of America's Pacific possessions is as great in photographers and pineapples as is Kansas in photographers and cabbages.

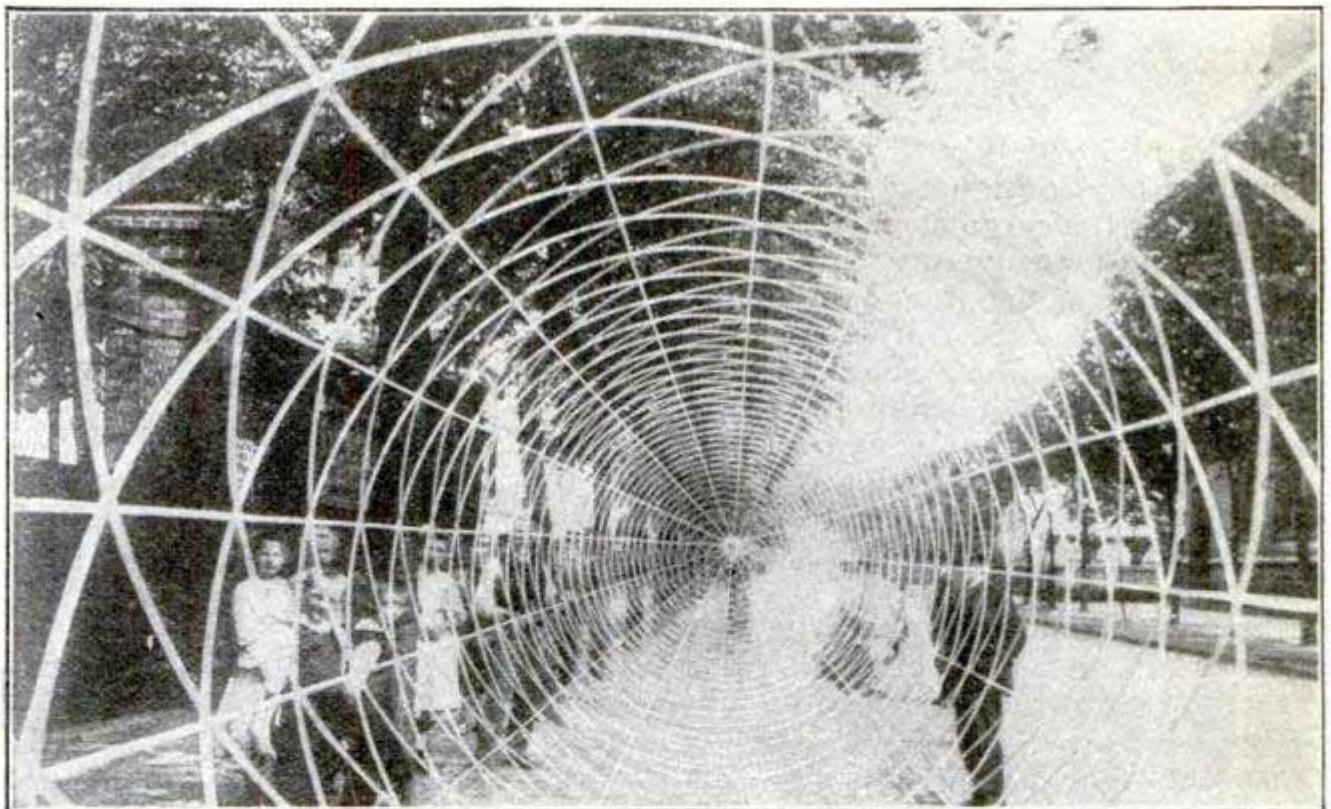
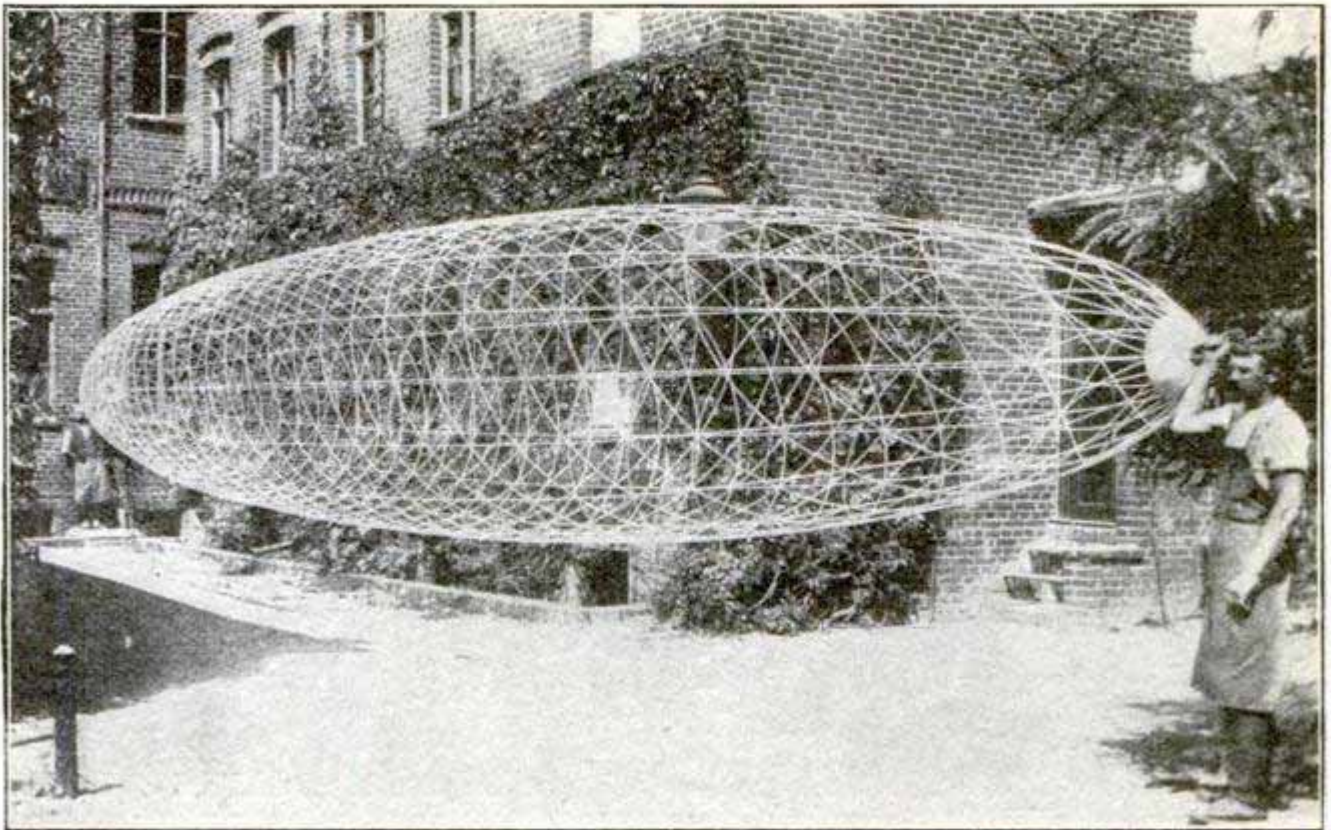
LINCOLN PENNY GAME

As a novel feature of an old-fashioned barbecue held at Randle Heights, Washington, D. C., on Labor day, 1,000 Lincoln pennies were secreted about over the highlands, under small stones, the ends of logs, in tufts of grass, and other places easily accessible. Twenty

WOODEN SKELETONS FOR DIRIGIBLE AIRSHIPS

At the recent aerial exposition at Frankfort, Germany, a German inventor exhibited a wooden skeleton for the rigid type of dirigible airship that created much interest and speculation. The skeleton on exhibition was 100 ft. long and 8 ft. high, yet it could be easily lifted by two men.

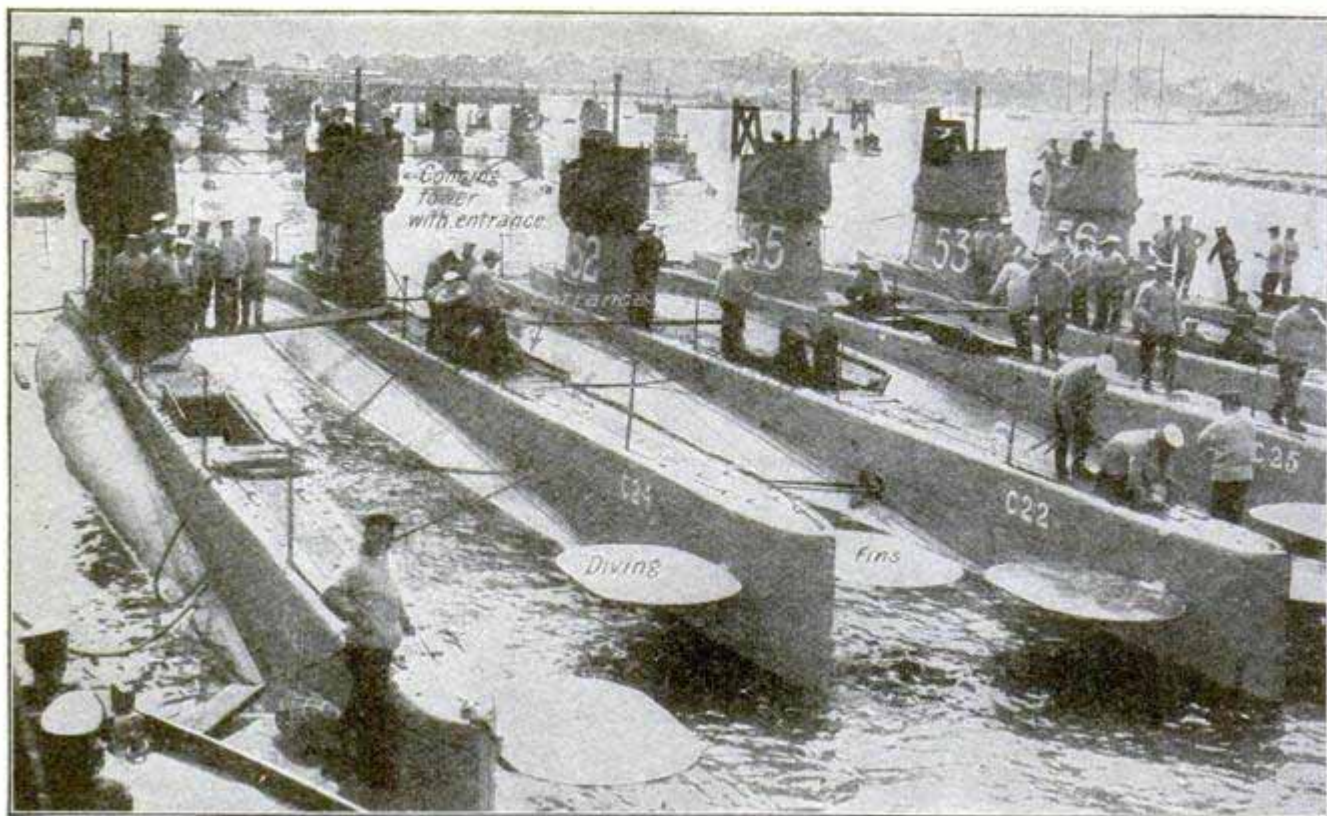
The claims advanced in its favor are based upon its shape as well as its wooden construction. The elasticity of the wood, which is Canadian pine, is believed to make such a skeleton less liable to bending or breaking than is aluminum. When coated with waterproof varnish, it cannot be affected by rain, heat, or cold, and most important, it can be repaired at any place where



Wooden Dirigible Airship Skeleton

there is an ordinary carpenter, while an aluminum frame requires special experience and tools. The shape of the skeleton is claimed to offer less resistance to the air and a better maneuvering ability than airships of cylindrical form, and better resistance to attacks.

Still another claim set forth is that wood cannot be electrified, while a thunder storm means great danger to an airship of the Zeppelin type. The aluminum, it is said, may even produce electricity through the friction between the metal and the envelope.



Newest Type of Submarines

THE BRITISH SUBMARINE ACCIDENT

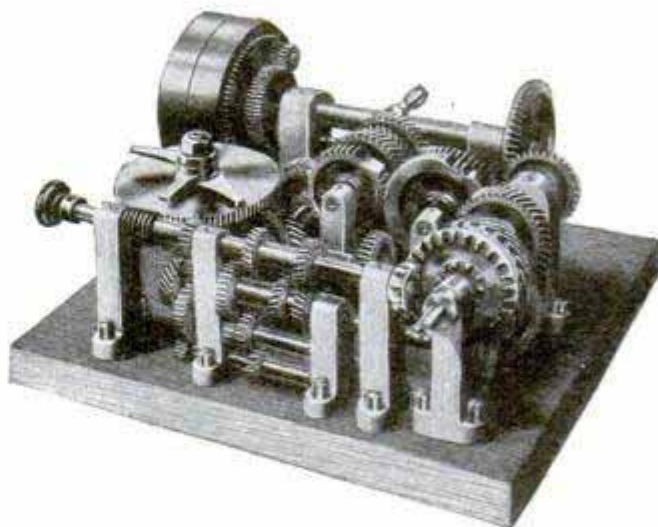
On the night of July 15, the British submarine boat designated as "C II," was sunk by the cargo steamer "Eddystone" while maneuvering with seven others off the Haisborough lightship. Only three of the crew of 16 escaped. The Eddystone ran in among the little fighters during a fog, striking the submarine and going completely over her. Two of the submarine flotilla ran into each other in endeavoring to avoid being struck, but neither was seriously damaged.

The illustration shows the little fleet that was run into. The big diving fins at the bows are the latest idea in submarine navigation. They act like the horizontal rudders of aeroplanes, the angle at which they are set giving the little vessels a tendency to dive downward, shoot upward, or hold a level course.

Yes, children, the really important thing about the discovery of the North Pole is that Santa Claus has permanently closed his toy factory there and moved South.

INTERESTING MACHINE TO DEMONSTRATE GEARING

To demonstrate the operation of gearings, L. C. Scott, superintendent of mechanical shops at Highland Park college in Des Moines, has constructed a machine only 14 by 16 in. that contains 45 gears. In this are the 10 most commonly used gearings. They are:



Contains 45 Gears

Spur, bevel, worm, crown, helical or spiral, herring bone, intermittent, sector, elliptical and planetary.

WOOD GROWS IN FORM OF FLOWER

A kind of wood that grows in the form of a flower, and is called a flower because of the lack of a more appropriate name, is found on the sides of Mount Agua and around the seared edges of the volcano of Fuego, in Guatemala. It has four distinct petals, the outsides of which are covered with bark, and the stem, usually about a foot high, is solid and also covered with bark. The growth measures



The "Rose of Hell"

nearly a foot across and is called the "Rose of Hell" because found at the edges of the crater.

WORLD'S FAIR TO CELEBRATE PANAMA CANAL

A company with John D. Spreckels, one of the leading men of California, at its head, and with U. S. Grant, Jr., as one of the directors, was incorporated in September to celebrate the opening of the Panama Canal in 1915 by a great World's Fair. The exposition, intended to equal, if not surpass, any great fair ever held on the Pacific coast, is to be at San Diego, Cal. The company is capitalized at \$1,000,000.

CROQUET ON THE FRENCH SEASIDE

Croquet in the sands of the French seaside resorts is a favorite game with



French Children on the Seashore

the children, nearly all of whom play in their bathing suits between splashing journeys into the water. The sand is usually compact enough to allow the balls to roll as nicely as on a lawn.

FORT SHAPED LIKE STEAMBOAT

This old fortification, which is Fort Fincastle, located near the top of the famous "Queen Staircase" in Nassau, Bahama islands, curiously resembles a modern side-wheel river steamer in

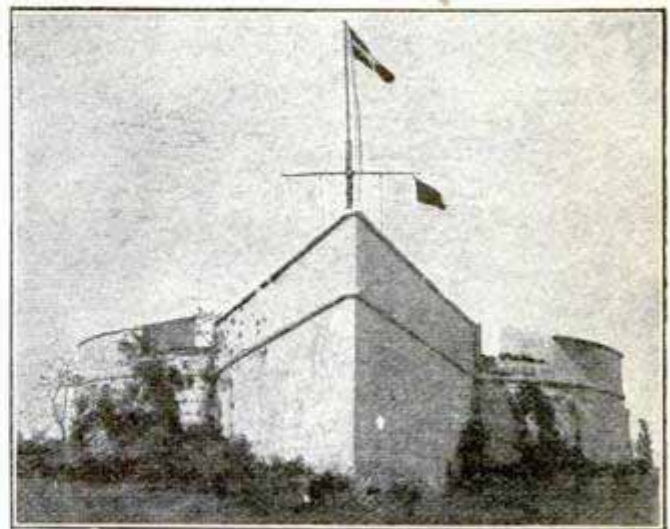


Photo by W. E. Pope

Shipsshape in But One Sense

shape, as seen from the point from which the photograph was taken.

PROJECTILE OF 16-IN. GUN

The giant projectile, compared with the size of a soldier in this illustration,



Giant Projectile of Giant Gun

is intended for the great 16-in. gun of the United States army, the largest gun in the world. The projectile weighs 2,400 lb., requires 400 lb. of powder to project it, and costs nearly

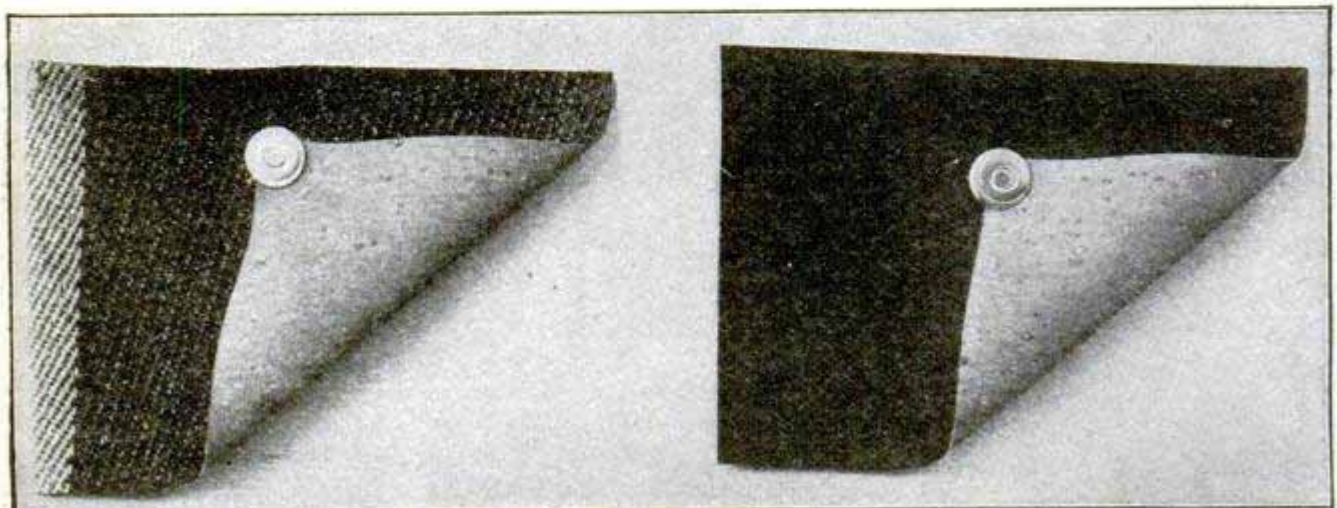
\$1,000. The Secretary of War has recommended a battery of such weapons to guard the approach of the Panama canal on the Pacific side.

FIRE HOSE WASHES HORSE FROM QUICKSAND

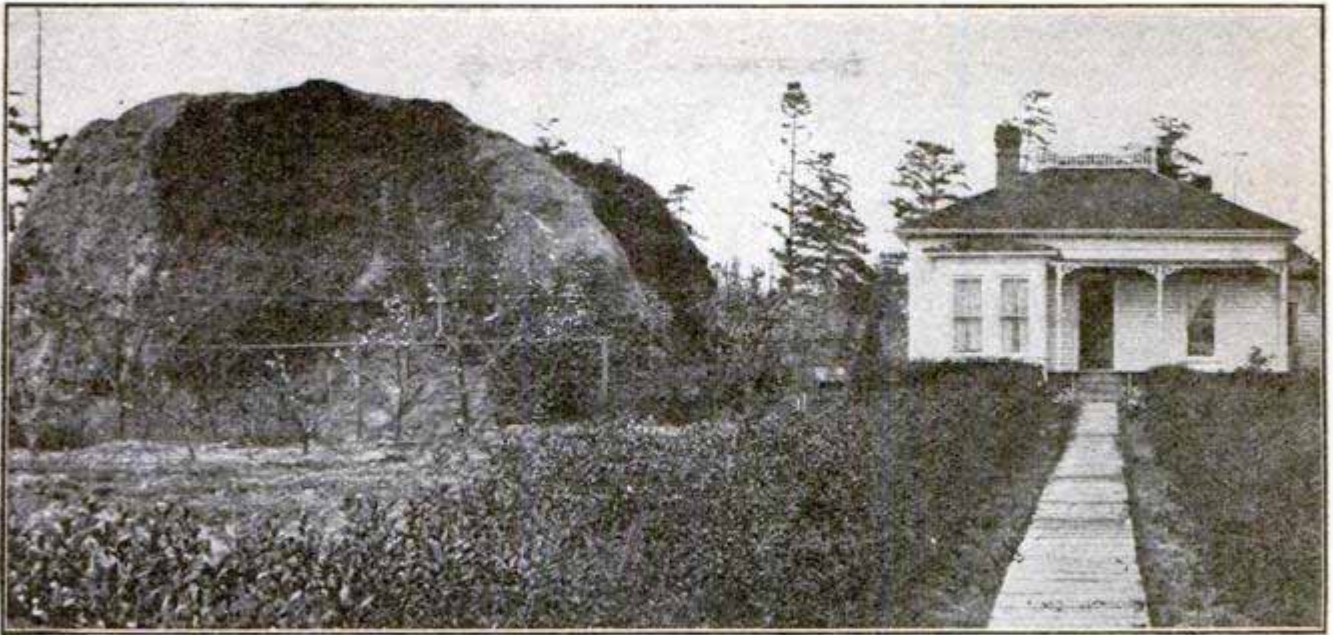
Saving a horse from death in quicksand by the aid of a powerful stream of water has demonstrated a somewhat new and unusual mission for fire departments located in sections where such death traps abound. A horse, driven by two boys, became caught in quicksand at the edge of a creek in Jackson, California, and gradually sank up to its shoulders. The persons who witnessed the accident were somewhat in doubt as to the proper procedure, and, as in many such cases, the fire department was called out. When the latter arrived only the horse's head was above the water and quicksand, but hose connections were made and the force of the stream sluiced the sand away sufficiently to allow the animal to be extricated.

CORK FABRIC CLOTHING

Cork, cut in very thin sheets and treated to remove all resinous matter, is being used in France in the making of waterproof garments and hats, caps, and shoes. After treatment it becomes as flexible as leather and will not break. In the manufacture of garments such materials as cotton, silk, wool, and felt are coated with it.



Two Samples of Cork Fabric Made in France



Natural Cellar and Observatory Combined

CELLAR IN BIG BOULDER

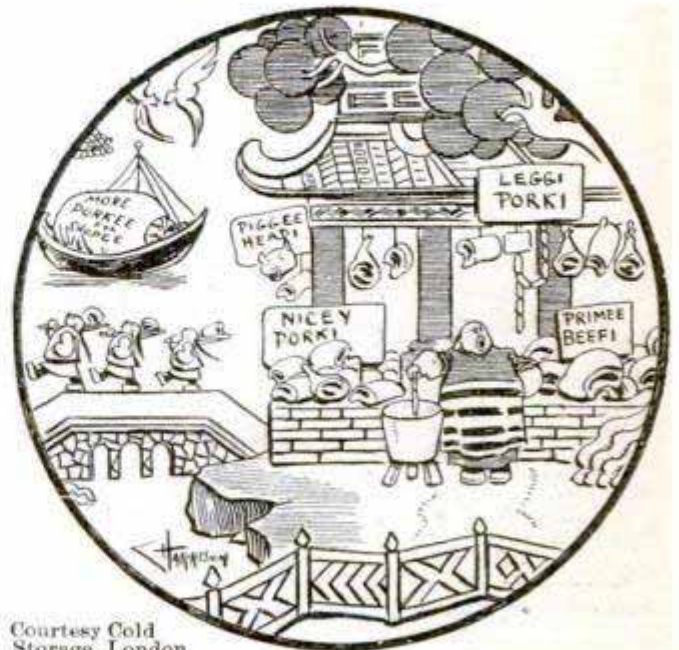
Few people in this country have cellars hewed out of solid rock, but such is the possession of a resident of Coupeville, Washington. In the yard is a huge rock which sits near the home of the owner. It is approximately 20 ft. high and 35 ft. in diameter. Vines grow in profusion over it and a stairway leads from the side next the house into a small alcove a few feet above the ground. This space is used as a cellar or storehouse. Another ladder runs to the top of the rock where visitors are taken for an uninterrupted view of the surrounding country. The country about is not rocky and one can hardly conjecture how this huge stone got where it is. That it may have fallen from a meteor is not unlikely.

CALIFORNIA HAS COTTON CROP

The experimental planting of cotton on 1,500 acres of land in the Imperial valley, California, has proved so successful that cotton is being hailed as a new staple product of that state. The picking of this, California's first cotton crop, commenced in September on the arrival of 200 Mexican cotton pickers. It is said that the crop will give the growers a profit of from \$50 to \$75 an acre.

FROZEN MEAT FROM CHINA

England is furnished with refrigerated and canned meats by many countries and colonies, but the recent shipment of a consignment of such food for the English people from China has caused more than a little comment by the English press, from which this curious cartoon is reproduced. The shipment in question included 4,663 pig carcasses, 1,345 deer carcasses, 12 beef quarters, 21,048 cases of eggs (frozen in tins), 10,674 cases of game, comprising wild geese, wild ducks,



Courtesy Cold Storage, London

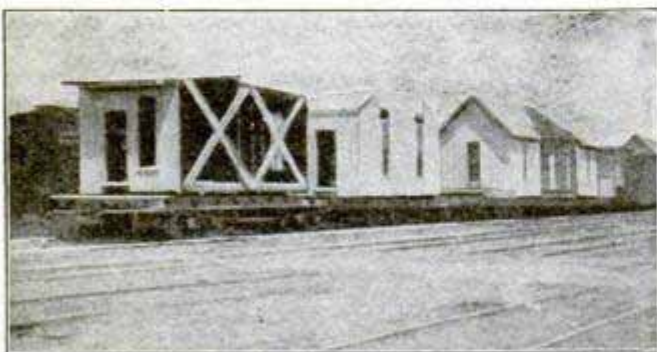
pigeon, teal, snipe, and pheasants; and 8,118 cases of poultry.



Oil Tanks Ignited by Lightning

MOVING TEXAS TOWN BY TRAIN

Moving small town or settlements bodily seems to be a growing item of railroad traffic in the western states, several instances having already been recorded. The creosote tie plant of the Missouri, Kansas & Texas railroad at Greenville, Tex., was recently destroyed by fire. A decision to rebuild the plant at Denison, Tex., necessitated the moving of the homes of the men to



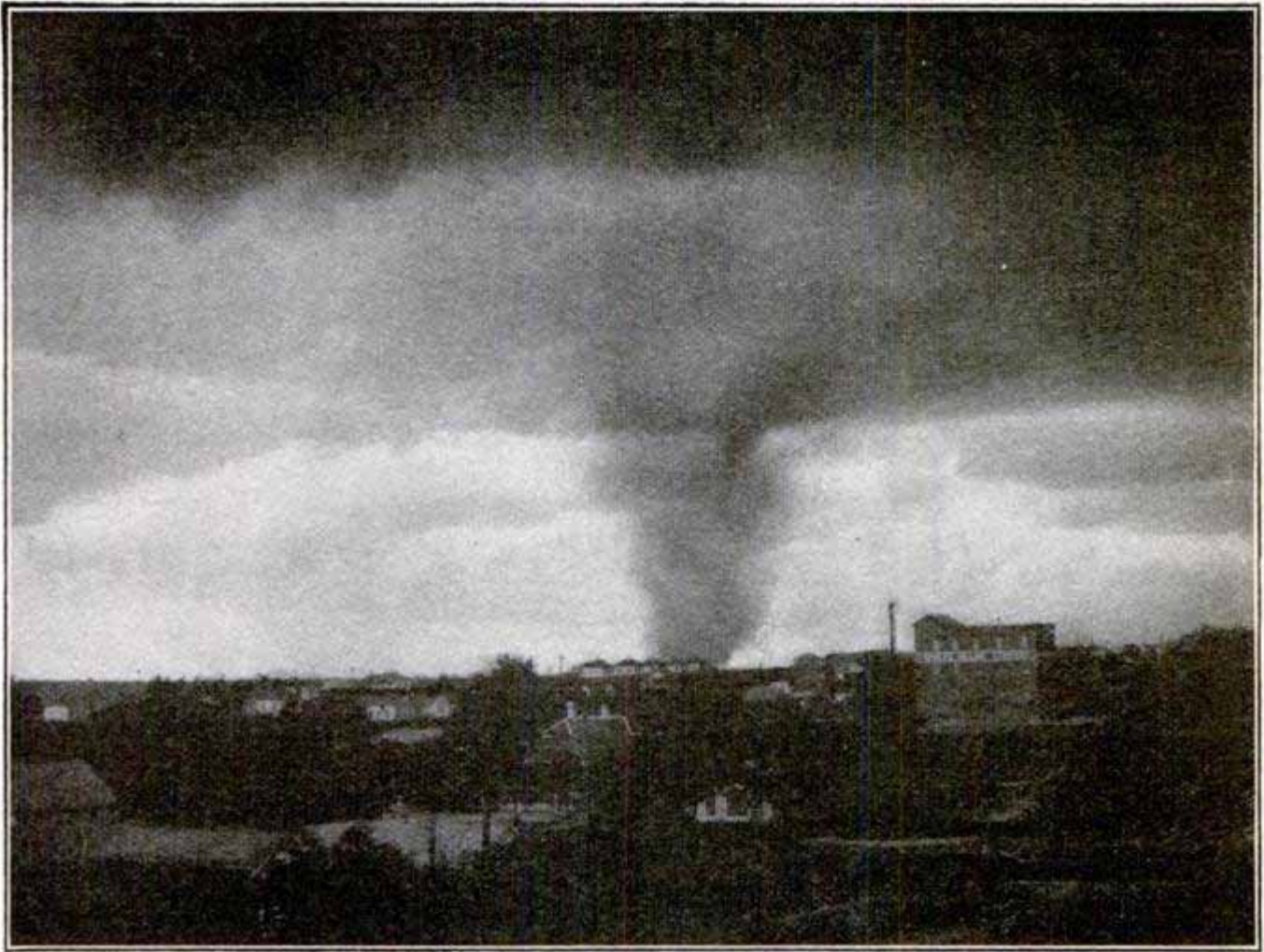
20-Car Train of Homes

that locality. Consequently, homes and portions of homes were loaded onto a train of 20 flat cars.

THREE OIL TANKS DESTROYED BY LIGHTNING

During a severe electrical storm in August, three great crude oil tanks of a pipe line near Cygnet, Ohio, were struck in quick succession by lightning and ignited. Each tank contained about 30,000 barrels of oil, some of which was saved by starting the field pumps and pumping until the oil became too hot to be handled. During the earlier part of the conflagration, which lasted about 30 hours, a gang of 350 men worked like mad to dig dikes around each tank, so that the boiling oil would not spread to other tanks in the vicinity. The estimated loss of oil and tanks was \$100,000.

Because a New Jersey man whose barn was burning had no money with him to pay for a telephone message the girl at "central," rigidly obeyed orders and refused to allow him to call for the fire department. As a result the farmer lost \$1,500.



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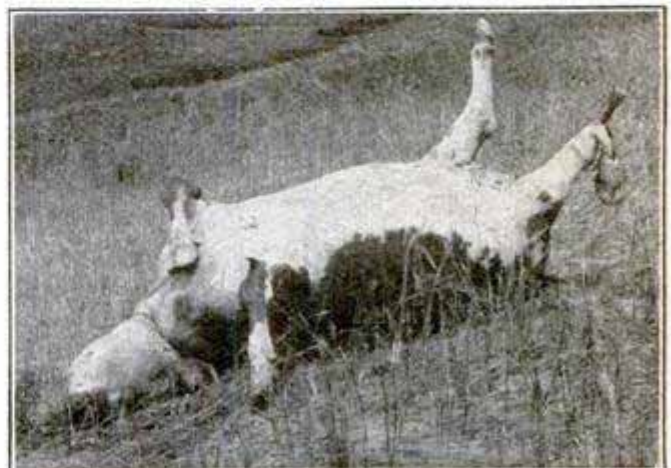
Formation of the Cyclone

SQUIRREL STARTS FOREST FIRE

A recent forest fire in the Grass Valley region of California that spread over a wide territory, doing great damage to timber and in many instances to crops and ranches, is claimed to have been caused by a squirrel and an electric wire. At the precise point where the fire started the charred carcass of a ground squirrel was found at the foot of a giant oak tree. Just at this place two heavily charged electric wires were also found, one of which was hanging over a branch. The tree and its limbs had been heavily coated with moss, which at the time of year the fire occurred was as dry as tinder. The squirrel, so the investigators decided, had become caught between the two wires and formed a short circuit; the intense heat generated had melted the wire that fell across the branch, and this had ignited the moss.

FORMATION OF CYCLONE AND ITS EFFECT

This series of illustrations is probably as extraordinary as any in existence, showing the formation of a cyclone and views of the devastation it was accountable for. The photograph of its formation was as seen from Morton, Kansas, June 24 of last year. It was first seen as a whirlwind close to



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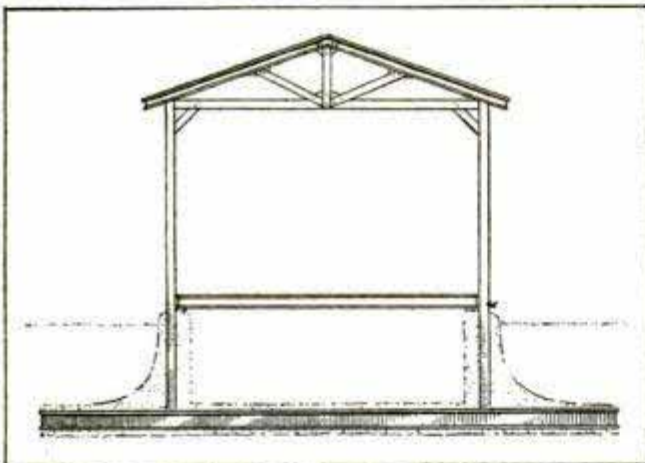
Cow Carried Half Mile Through Air



Farmhouse Damaged by Storm

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the earth and as this gained in size



Construction of Cyclone Cellar

and velocity the point was drawn down

from the clouds above, getting lower and lower until it formed the funnel shape and became the real twister. Thus all cyclones are formed. The second photograph shows a cow, only one of 43 that were carried over half a mile through the air by its force, and so high up that some people took them for birds. Another photograph gives a clear idea of all that was left of a farmhouse, and another shows two sides taken out of a house while the other two and the roof were left standing. The telephone seen on one wall was not injured, nor were the wires broken.

The only constructions that were left



Ruins of a Farmhouse

Copyright, 1908, by Reed, Morton, Kan.

uninjured were several round water tanks of galvanized metal, used for watering stock.

HOW SHACKLETON'S MOTOR SLEIGH WAS OPERATED

The motor sleigh which Lieut. Shackleton used on his recent and almost successful dash to the South Pole is drawing considerable attention in England because of the excellent condition in which it came through the ordeal and the method by which it was operated. In all its vital parts the machine is as good as new, and there never was a breakage. Even the tires used are in marvelously good condition.

So intense was the cold that the lubricating oil, although of special quality, froze up at once in the tank and pipes. A can of oil had to be slung close to the engine to keep it warm, and this thawed oil was used from time to time as required. A small quantity had to be poured into the base chamber every five minutes. When it was desirable to start the engine, a small tray, fixed around the carburetor, was filled with gasoline. This was ignited and served to warm up the carburetor, so enabling the gasoline to become vaporized for consumption in the engine. Despite the drawbacks of a temperature of 30 deg. below zero, the engine worked to great satisfaction.

LAND LOTTERY MARRED BY FATAL COLLISION

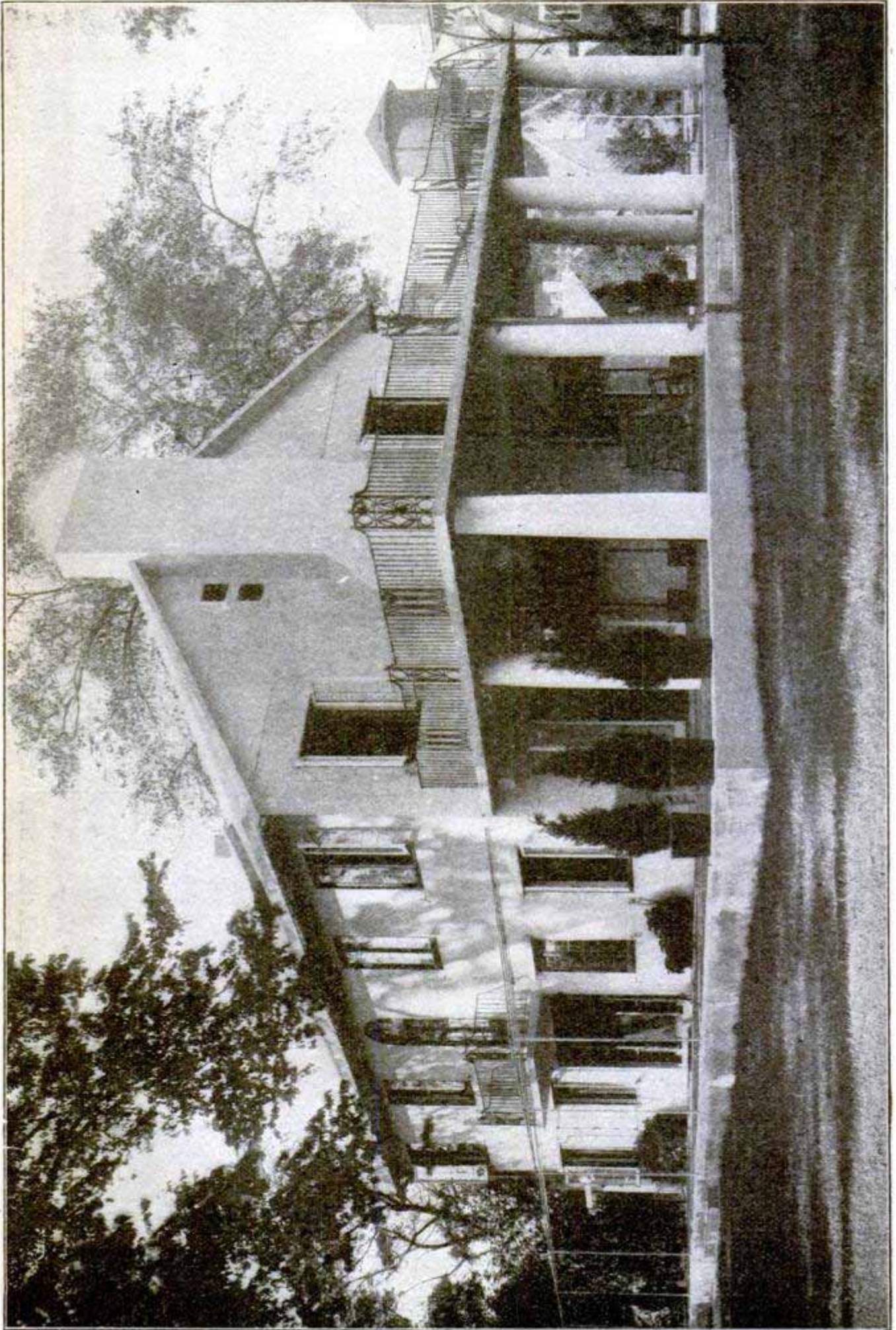
Two electric trains running between Spokane, Wash., and Coeur d'Alene, Idaho, the scene of the recent government land lottery, collided on a curve at La Crosse, Washington, killing 13 outright and injuring 60 passengers. Both trains were overloaded, all trains having been crowded during the land-drawing. The disaster is claimed to have been caused by an extra train running beyond the switch at which the meeting with the other train should have taken place.

The two illustrations, one of which shows a number of the dead and in-



Removing the Dead and Injured—General View of the Wreck

jured being taken from a shattered car, were taken a few minutes after the wreck occurred.



ARTISTIC CONCRETE BUILDINGS—No. 1, Residence of Alexander Cochrane, East View, N. Y.

A FOLDING WAGON-HOUSE

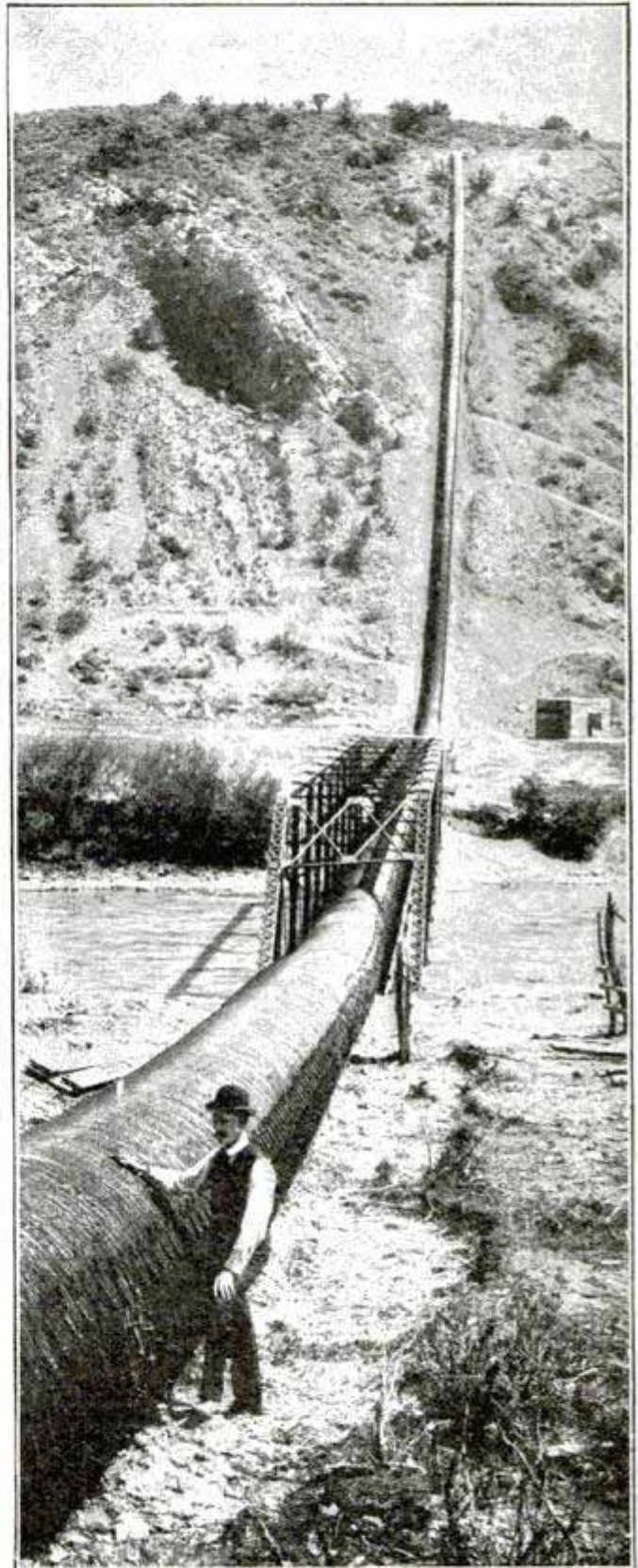
A German engineer has recently devised a bivouac wagon of an extensible nature to take the place of tents. When compressed, it can easily be drawn by two horses; but when extended, it provides several compartments for privates, in each of which are 10 cots, seats, tables, and utensils for washing; an officers' room, large enough for four clerks, with chairs, tables, and record closet; a cabin for officers, well equipped with conveniences, and a kitchen with all necessary utensils. From the roof of the kitchen rises a tower that when folded, does not extend above the wagon top, but which can be extended fully 90 ft. for use as a point of observation or as a wireless telegraph station. In the different rooms the fixtures are so placed that when the wagon is drawn together again they will fit exactly into their proper places. Steps lead to the upper story.

This is all made possible on one wagon in the following manner: The walls of the separate divisions, placed above each other in pairs, are made of sheets of spring steel, and are connected by hinged joints. In the entire mechanism there is not a single spring or cogwheel. When closed, the wagon is covered by aluminum sheets, lying above each other, and it is these, drawn out like an accordion, that serve as roofs for the partitions. When the wagon is to be extended, two anchors, which fit into the rear axle, are placed in the ground, in order to hold it firmly in place. By means of a winch, fastened to the front part of the vehicle, a wire rope is drawn in, this serving to open the extensions. In an incredibly short time the wagon can be transformed into a house of 12 compartments, for hospital or other purposes.

Concrete hot-water or steaming tanks cost more than such tanks made of wood, but their durability, freedom from leakage, and non-conductive properties are claimed to make such tanks a good investment.

CONTINUOUS WOODEN WATER PIPE

In a recent issue this magazine published a short article describing ma-



Pipe Line That Carries 300-Ft. Head

chine-banded continuous stave pipe for the great overland pipe lines of the west, of which one of these photographs

gives an excellent example, while the other shows its installation as part of



Laying Stave Pipe in Street

a city irrigation system. This latter line is of 14-in. pipe laid in a street in Boise, Idaho.

The first mentioned photograph shows a line that carries water across the Snake river and valley near Preston, Idaho. This line at its lowest point, which is on the specially constructed bridge that carries it across the river, is under a head of 300 ft., clearly illustrating the immense pressure such pipe can stand. After crossing the bridge, the line rises vertically 300 ft. in a horizontal distance of only 420 ft. The diameter of the pipe is 5 ft.

The "flying visit" so often mentioned in the country weekly bids fair soon to become literally true.

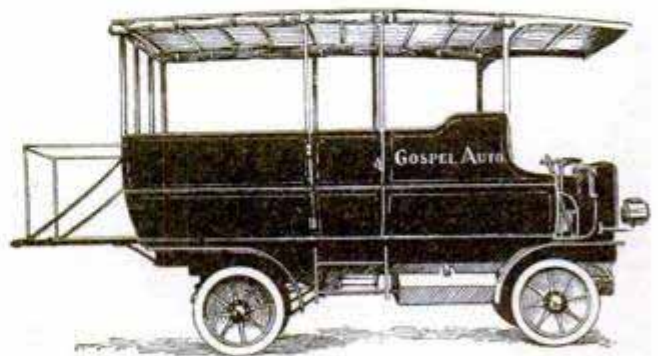
FRANCE PROHIBITS WHITE LEAD IN PAINT

A fight against the use of white lead in paint was started in France in 1904, and since then the battle progressed through different stages until in July of this year a law prohibiting its use was finally passed. It was claimed that white lead was injurious to the health of the painters, but as the death rate was very low, averaging only one in every 7,000 or 8,000 painters, the contemplated law was fought for some time.

Another point upon which the two French houses differed was whether an indemnity should be allowed to manufacturers of white lead for damages they might sustain from the loss of the market for the goods they had on hand. The law as finally passed prohibits the use of white lead in painting buildings, inside or outside, after the expiration of three years. Within that time it is believed the manufacturers will be able to dispose of their product now on hand.

AUTOMOBILE WILL SPREAD THE GOSPEL

This automobile was especially designed for the use of Miss Anna L. Cartwright, a well-known evangelist, who will tour several states spreading the Gospel. The platform at the rear is the speaker's rostrum. The sides and end of the auto may be closed by



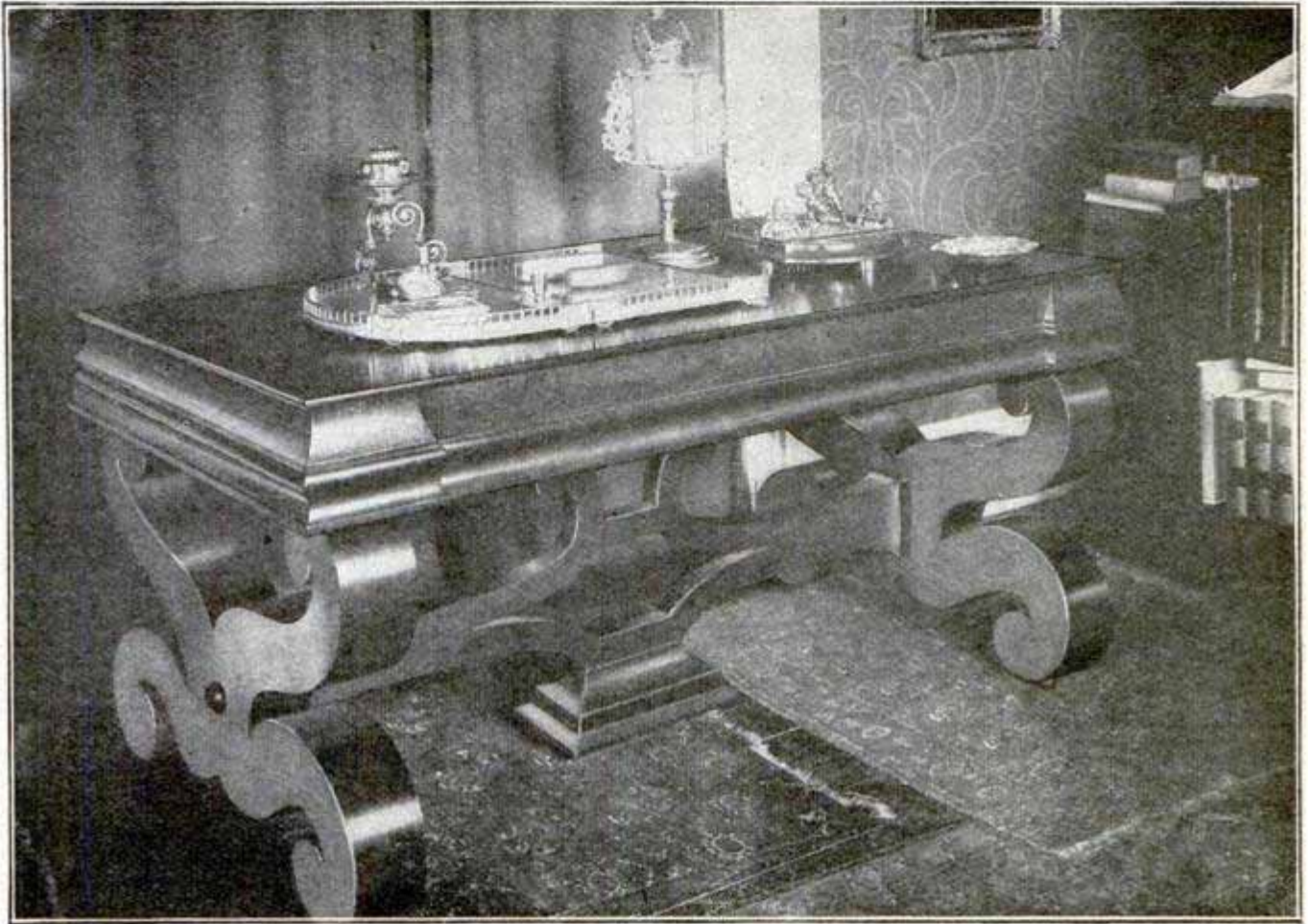
An Evangelist's Gospel Auto

curtains when desired. The entrances to the body of the car are by steps and doors in the center of each side.

OLD PIANOS AS LIBRARY TABLES

The old, out-of-date square piano, an instrument that can now often be picked up for a few dollars, makes a

many of the old pianos are usually of a better quality than now used for piano cases, and if the design is some-



Old-Fashioned, Square Piano Converted into Table

handsome table for living room or library, as is shown in this illustration. The rosewood or mahogany cases of

what quaint, as in this instance, such an addition to the furnishings of a room adds artistic dignity.

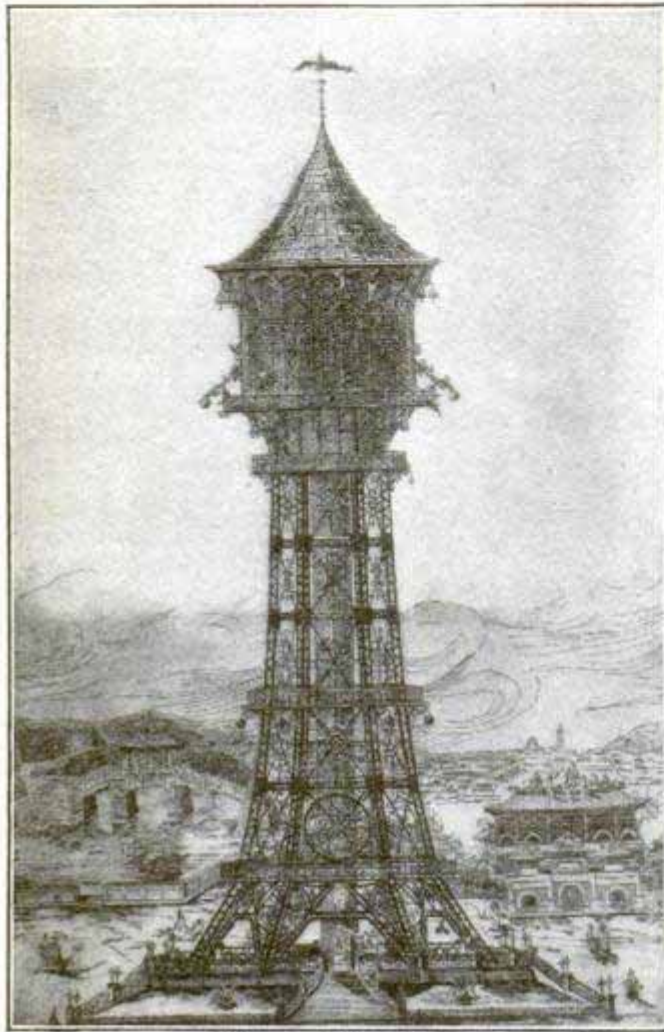
CHINESE STYLE IN MODERN INDUSTRY

By Dr. Alfred Gradenwitz, Berlin

The very rapid adoption and assimilation of European science and engineering by the Chinese, is perhaps not sufficiently appreciated. While being less prone to sacrifice their own civilization than their ancient disciples, the Japanese, they have, in fact, come to a full comprehension of the necessity for making some concessions to the European mind, in order to keep up their paramount position in the Far East.

Among the outward signs of this revolution should be mentioned the gradual development of a network of railways, and the rapid spread of modern constructions comparable in every respect to the productions of European industry. Now if these constructions obviously are in striking contrast with the character of the native architecture and engineering, a beginning fusion between these two heterogeneous elements can be noted occasionally.

There is no doubt but that the mind of the nation will, in a possibly not remote future, enfranchise itself from any



Chinese Water Tower

foreign domination by harmonizing the trivial style of modern engineering with the special exigencies of its oriental civilization. So far, it is true, the people cannot dispense with the services of European engineers, entrusted with the erection of all kinds of constructions for which their own national resources are still inadequate.

When designing the water tower represented in the accompanying illustration, Mr. August Klönne, of Dortmund, had the ingenious idea of meeting those aspirations of the Chinese by imparting to the decorations a typical Chinese character, while leaving to the technical part its strictly modern disposition.

This tower is destined for the water works in course of construction at Peking, the old imperial city. Though the scheme designed by Klönne neces-

sarily was rather more expensive than would have been a plain water tower adapted to the Western mind, the Chinese were so greatly impressed by it that they did not hesitate to accept it.

The tower, 208 ft. in height and 180,000 gal. in useful capacity, is installed on a projecting under-structure similar to that of the Eiffel Tower, which rests on six pillars. Beautifully decorated flights of stairs lead up to the several platforms whence a beautiful prospect is enjoyed. The water tower is to serve as an observatory tower also.

The different sections of the frame surrounding the tower, which, under ordinary conditions, would have been left free, have been filled up with decorations of a really artistic character, the most imposing being those arranged at the two main portals, viz, the grimacing faces of the Sun God, and two giant dragons, seeming to climb up to the summit of the tower at the pursuit of a sphere, exciting their curiosity.

The three remaining portals, like the remainder of the framework, comprise artistically forged decorations. On the second, third, and fourth galleries are situated electric lamp supports, which, by night, convert the tower into a giant candelabrum. The roof is resting on projecting brackets, to each of which is fixed a bell with its hammer of such size and weight that no wind short of a real tempest will be able to set it ringing.

The staircases, arranged on the four sides, lead up to the under-structure of the tower. The pillars, as well as the whole of the foundation frame, are provided with supports for electric and incandescent lamps. The base of the tower is ornamented with garden plots. The whole of this construction thus forms a really novel kind of tower, which, situated as it is in front of the Imperial Palace, will not fail to attract the attention of visitors of all nations.

A large department store built last summer in Milwaukee has on its roof a landing for airships.

DENATURED ALCOHOL (INDUSTRIAL ALCOHOL)

By Dr. Harvey W. Wiley, Chief of Bureau of Chemistry, U. S. Department of Agriculture

ARTICLE III

Materials for Making Industrial Alcohol

Common Sources of Alcohol. Up to the present time the chief commercial source of alcohol or high proof neutral spirits in the United States has been Indian corn. Both cane and beet molasses, residues of the manufacture of cane and beet sugar, have been utilized to a limited extent, but the quantity made from these sources has not been relatively large.

When the best methods of manufacture are employed, pure alcohol can be made as well from the lowest grade and no grade maize as from the best grades. The lower grade of grain, the lower the yield, and it is a simple calculation of comparative profits which leads to the purchase of either no grade or the lowest grade of maize. The higher grades are not used to any commercial extent for spirit making.

The molasses used for the manufacture of neutral spirits is, as a rule, the cheapest grade of cane molasses on the market, not suitable for human consumption nor for making rum. Beet sugar molasses is never used for human consumption nor for rum making, and that devoted to alcohol making is the residue after all the sugar possible has been removed by successive crystallization. It is interesting in passing to note that one of the purest samples of neutral spirits that has come under my observation was made from beet molasses. The distilleries making neutral spirits from cane molasses are located in Louisiana, Massachusetts and New York; and those making spirits from beet molasses, in Michigan and California.

In Germany neutral spirits are made chiefly from potatoes and partly from beet molasses; and in France, chiefly

from beets or beet molasses, and to some extent from wine. Formerly alcohol was made largely in France from wine and this led to the name "spirits of wine" which is still a synonym for alcohol. In England neutral spirits or "silent spirits," as there called, are made quite exclusively from Indian corn imported from the United States for the product used to mix with whisky and from molasses for the product intended for industrial purposes. Other cereals such as rye, barley, oats, and wheat have been occasionally employed for spirit making, but not to any important commercial extent.

The quantity of neutral spirits produced in the United States during the fiscal year ended June 30, 1908, was 50,935,821.2 proof gallons.

The quantity of commercial alcohol (heads and tails of neutral spirits) manufactured during the same time was 16,849,154.0 proof gallons.

The quantity of alcohol reported for denaturing for industrial purposes during the same period was 3,322,808 proof gallons.

These data show that although the law permitting the manufacture of denatured alcohol for industrial purposes has been enacted for two years, the quantity produced is not very large. This shows either that industrial alcohol is dear for common use or else the people have not yet learned to appreciate its value. Both of these causes probably are active in restricting the consumption of the product.

Materials for Making Industrial Alcohol. It is evident that any substance suitable for the manufacture of commercial alcohol or neutral spirits may also be utilized for producing the industrial article. Why then should there be any further discussion of this subject? For the simple reason that

if only the materials heretofore in use are still to be employed, industrial alcohol in the future will continue to be made where it is made now, viz, in the large distilleries and by a few large operators. If alcohol making is to be diffused in the form of small distilleries among our agricultural populations, there will have to be built a new and small type of apparatus that can be economically operated and knowledge of how to operate these small apparatus will have to be widely disseminated. First of all it may be laid down as a basic principle that the success of the small type of farmers' stills, if there is to be success, will be due largely to the opportunity of utilizing materials which are practically valueless and which if not used for this purpose will be wasted. In other words, the raw material for agricultural distilling must cost nothing more than the expense of handling it. It is only on this condition that the small still, no matter how effective and how skilfully operated, can hope to compete with its big brother typified by the giant Peoria spirit house.

The advantage of the agricultural still, if it is to have any advantage, is found in the fact that on farms, especially large farms, are often found large quantities of fermentable matter, representing a waste product which may be utilized for the manufacture of alcohol at practically no expense for the raw material. With a small distillery on the farm or near by, these materials could be devoted to the manufacture of alcohol. Unmarketable potatoes, cereal grains, apples, peaches, melons, green corn, etc., are articles which might thus be utilized.

Cereal grains are sometimes affected with fungus and other diseases which render them wholly unfit for food for man or other animals. Musty maize is known to produce a very serious disease, pellagra, and rye affected with ergot can not be eaten by man nor safely fed to other animals. In the Northwest, the cereal crops are often injured by frost and in rainy regions mould after harvest, thus becoming

unfit for market. The food and drugs act forbids the shipment of such injured grains in interstate commerce as animal foods, and the farmers ought not to use them at home for that purpose. Thousands of melons are left to rot in the fields and thousands of bushels of apples and peaches hang on the trees unharvested or decay on the ground.

The markets of our cities are burdened with partially decayed or debased fermentable materials, such as green corn, melons, fruits, and potatoes.

The sugar industry is rapidly growing in the United States and the quantity of molasses unfit for human food is in like measure increasing. In fact, the art of sugar making has been so improved that the molasses from which more than one crop of sugar crystals has been removed, is no longer suitable for human consumption. The so called "refiners' sirup," the last residues of the most perfect extractions of sugar and carrying often from 6 to 8 per cent of soluble mineral matter, is much better suited to the distillery than the table. It is to such sources of waste raw material that we must look for the success of the small alcohol distillery.

Quantity of Fermentable Matter in Different Materials. The amount of fermentable matter in the common materials used for the manufacture of alcohol is the sum of the starch and sugars which they contain. It is true that certain forms of cellulose and gums found in these materials yield alcohol after hydrolysis, but usually only after hydrolysis with an acid at a high temperature. This treatment usually destroys as much sugar as the hydrolyzed cellulose produces, so that little if any gain comes of treating these bodies with an acid under pressure.

Starches and sugars generally exist together in these fermentable materials. In the cereal grains there is a great deal of starch and very little sugar, with the exception of green Indian corn where the percentage of sugar to starch is relatively very high.

In melons and fruits, on the contrary, there is much sugar and little starch. In molasses there is practically no starch, the sugars providing nearly all the fermentable matter. In molasses the process of fermentation is promoted by the previous treatment of the material with a dilute acid in order to convert the sucrose (ordinary sugar) into its fermentable products, levulose and dextrose. The starches, as has already been described, are converted into fermentable sugars by malt.

Indian Corn. This most common source of alcohol contains in round numbers 70 per cent of fermentable matter. The typical composition of Indian corn is shown in the following data:

Weight of 100 kernels, 39 grams, (1.4 ounce).	
Water	10.93 per cent.
Protein	9.88 " "
Oil	4.17 " "
Fiber	1.71 " "
Ash	1.36 " "
Starch, sugar, etc.....	71.95 " "

A bushel of corn weighs 56 lb. and yields 39.2 pounds of starch and sugar. By hydrolysis it increases in weight about five per cent, in all a little over 41 lb. which yields half its weight of absolute alcohol, in round numbers 20 lb., or about 21 lb. of 95 per cent alcohol. Theoretically, a bushel of corn will yield a little over five gallons of proof spirits, but in practice it is difficult to secure this quantity. The richer in fermentable matter, however, the more nearly the theoretical yield is realized in practice.

There are cultivated in Indian corn in round numbers, 100,000,000 acres, yielding an average of about 27 bushels per acre or a total crop of 2,700,000,000 bushels. Assuming that the total output of alcohol of all kinds (except beverages) is 125,000,000 proof gallons, it is seen that 21,000,000 bushels of Indian corn would provide the whole amount, a very small proportion of the entire crop.

Potatoes. The total area devoted to potatoes in the United States is approximately 3,000,000 acres, the average yield being only about 90 bushels per acre. The best potatoes are sup-

posed to be grown in the northern part of Maine, but excellent tubers are produced in all parts of the country.

The average composition of Maine potatoes is shown by the following data:

Water	77.02	per cent.
Starch	18.29	" "
Fiber	0.66	" "
Protein	2.16	" "
Ash	0.91	" "
Undetermined	0.96	" "

It would not be fair, however, to assume that potatoes which would be used for alcohol making contain as high a content of starch as indicated. Such would not be the case. The culls, consisting of small, immature or injured tubers, would contain a much smaller per cent of fermentable matter, probably not over 12 or 14 per cent. The good potatoes would yield about 9 lb. of alcohol per hundred and the culls only 6 or 7 lb. In other words, it would require 100 lb. of cull potatoes to make one gallon of industrial alcohol of 95 per cent strength. Other root crops which might be utilized for alcohol making are as follows:

	Starch and sugar Per cent.	Alcohol Per 100 lb.
Cassava	30	15
Sweet potatoes	20	10
Sugar beets	14	7
Parsnips	10	5
Carrots	4	5
Mangel-wurzel	8	4
Turnips	6	3

Of these root crops it is evident that only cassava, the sweet potato (and yam) and sugar beet would be suitable for alcohol making, except as mere waste products otherwise of no value. The quantity of sweet potatoes and yams which could be grown on the sandy coastal plains of the South Atlantic and Gulf States makes them objects of great interest in this connection.

Too much importance should not be attached to root crops as a possible source of industrial alcohol, in view of the small yield which can now be obtained therefrom and the further fact that they are at present prices worth a great deal more for food purposes than for any other use. With white



"Here Comes the Bogey Man"
—London Sketch

potatoes at nearly a dollar a bushel, it would cost nearly 75 cents a gallon to make alcohol therefrom.

Stalks of Indian Corn and Sorghum. At the time the starch of the Indian corn kernels hardens there is still in the stalk large quantities of fermentable material, chiefly sugars. At this stage, the expressed sap has been used for making sirups and experimentally sugar. The difficulties of crystallizing the sugars, which are largely in an inverted state and mixed with starch and gums, apparently remove this material from the category of economical sources of sugar producing plants—but leaves it a hopeful source of alcohol. Especially is this true of those localities growing sweet corn for the market and for canning purposes. If all the maize stalks which furnish this sweet corn could be used for alcohol making, they would supply a large part of the material necessary to the production of industrial alcohol. There are, however, great and unsolved problems connected with the utilization of this material, and at the present time it can not be considered as available for this purpose.

Cannery Wastes. More hopeful sources are found in the wastes of sweet corn canneries, where large quantities of rejected ears, tons of cobs carrying large quantities of sugar and starch, and spoiled cans of corn give a rich and abundant supply of waste materials, which might be used with favorable economic results for distillation.

Sorghum. This most valuable plant grows everywhere in the United States and especially in the semi-arid regions. By reason of its opulent root system it will make a good crop in a region too dry for growing successfully Indian corn. It contains a sap very rich in fermentable matter and bears a starchy seed which will yield as much alcohol as an equal weight of Indian corn. The sap is readily expressed and is used in very large quantities for making a table sirup. Many attempts have been made to produce sugar from this source on a commercial scale, but these have not been financially successful. Sorghum may be considered as a very promising source of industrial alcohol.

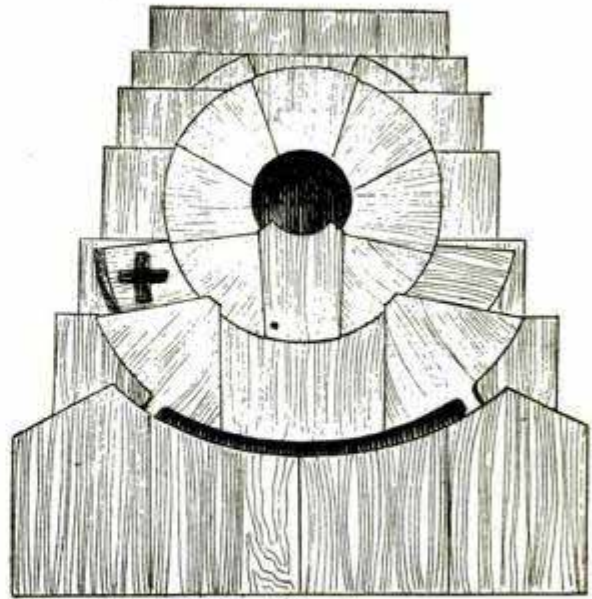
Wood Pulp and Sawdust. All woody fibers, straws, cane and corn stalks, etc., contain large quantities of a cellulose which may be converted into a sugar by means of an acid and then fermented. In competition with starch and sugar producing plants, however, the cellulose raw material has little chance of success. It is true there is one distillery in this country that has made commercial quantities of alcohol from wood pulp and sawdust, but the cost of production will make it extremely difficult to use this material with financial success. The alcohol made from sawdust is of excellent quality.

From the above résumé it will be seen that the materials of which alcohol is made are abundant, are produced in immense quantities every year, are inexhaustible in amount, and will supply every demand which the future industries using alcohol may make.

(To be continued.)

ECONOMICALLY OPERATED ARMY TARGET

In this target an absolutely new principle is employed. Instead of having its face all in one piece it is composed of a series of planes, each resting above the other and arranged like a flight of steps. At a distance of 100 yards or more, however, the face appears as in one plane. Each of the series that make up the entire face of the target is divided into a series of perpendicular plates attached by a hinged device at the bottom to the frame, so that when a bullet is fired, the plate it strikes falls to a horizontal position. The dropping of the plate exposes a background so painted as to notify the scorer of the value of the shot. If the color exposed is white, for instance, the scorer knows that a bull's-eye has been made, while red shows that the bullet struck within the four ring; a black cross, that it struck within the three ring; and black, that it struck within the two ring.



Courtesy National Guard Magazine

Army Target Formed in Steps

The target is shown in the illustration, the black cross indicating that a bullet struck in the three ring.

RESULT OF WISCONSIN FLOOD

A rise of water in the river at Odanah, Wis., was responsible for the damage these illustrations picture. The water reached a height of 10 ft. above high-water mark, flooding the entire town and surrounding country and

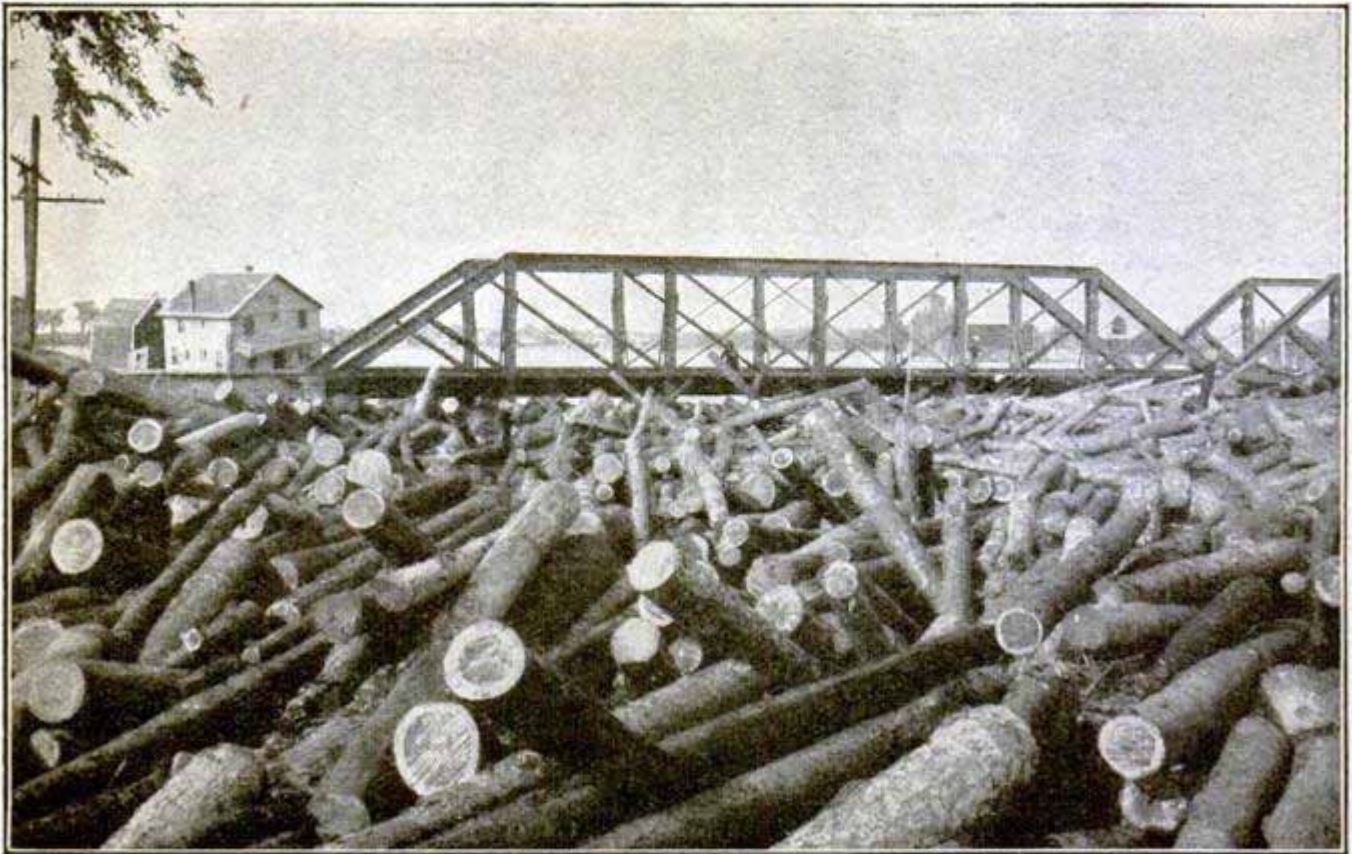
entailing a great loss of property. The lone house shown in one illustration was floated two miles down the river and left stranded half buried in the sand. An idea of the general destruction is clear from the illustration in



House Carried Two Miles



Tangle of Logs and Houses

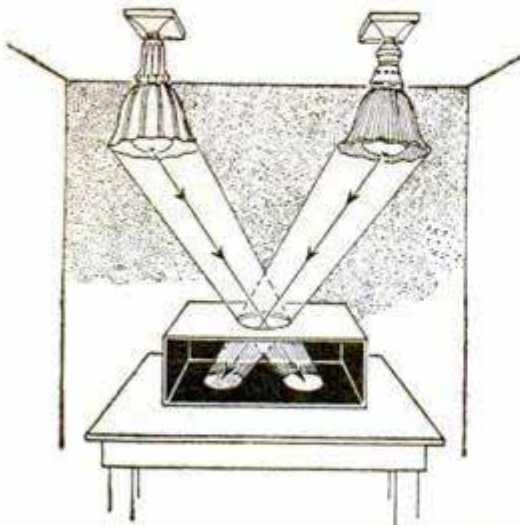


Jam of Logs That Carried Bridge Away

which houses and logs are tangled up in a bewildering mass. The mass of logs in the other photograph carried the railway bridge away before the flood was over and escaped into Lake Superior.

MEASURING INTENSITY OF LIGHT

Recognizing the fact that the average user of the electric light desires a



Courtesy Central Electric Co.

Comparing the Brightness of Lamps

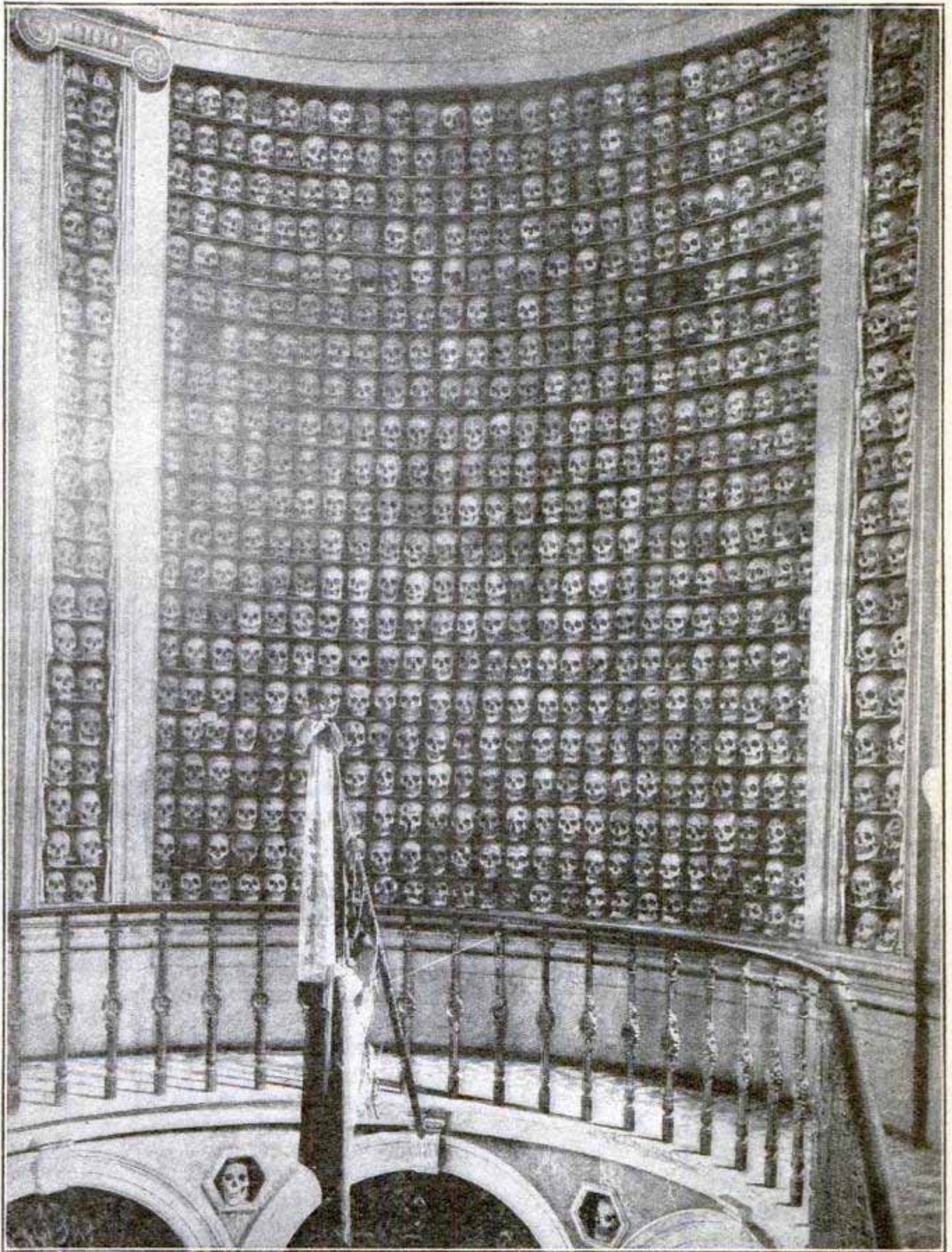
visual comparison of the intensity of illumination from different fixtures,

rather than figures, a Chicago company has devised this simple method of meeting the requirement.

The method is simply one of comparison, the two sources to be compared being located about 4 ft. apart on the ceiling. Under them, upon a table, is placed a rectangular box, provided with a round hole in the top and one open side. This hole is so located that a ray of light emitted from either of the lamps will throw a light spot on the horizontal shelf, on which is placed a piece of white paper. With two sources of light located as shown in the drawing, two light spots are thrown on the paper, and it is a very easy matter to select the brightest spot. The light rays, of course, cross; that is, the light from the left lamp is thrown to the right-hand side of the box, and the right lamp to the left.

MOST GRUESOME WAR RELIC IN WORLD

The most gruesome war relic in the world is undoubtedly this display of skulls in the village church of Solferino, Italy. They are memorials to



Courtesy Sketch, London

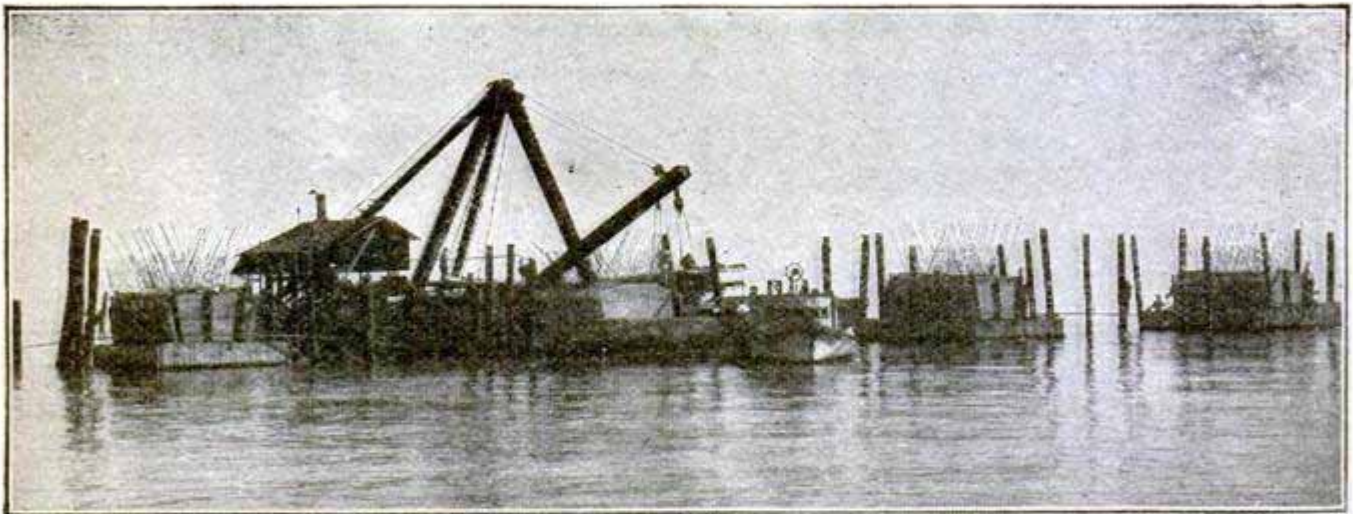
A Thousand Skulls as a War Relic

the God of War, and tangible evidence of the battle of Solferino, in June, 1859, when the allied French and Sardinian armies, under Napoleon III and Victor

Emmanuel, defeated the Austrians, under Francis Joseph. The allies lost about 18,000 men, while the Austrians lost 20,000.

POPULAR MECHANICS

BUILDING CONCRETE PIERS



Placing Piers in Deep Water for Concrete Railway Bridge

The building of great concrete piers in deep water is an undertaking that demands the best in concrete construction, as is shown in this illustration of the work progressing on four such piers for a railroad bridge. The steel reinforcing rods stand up above the cofferdams like cat-tails in a swamp.

A VEGETABLE FURNACE

A Prague professor has shown in several experiments an amount of spontaneous heating in leaves that proves their respiration to be far more intense than had been supposed.



Courtesy Knowledge and Scientific News, London

Recently plucked leaves, in a condition as dry as possible, were piled up in compact layers in a wickerwork basket, provided on the top with a pasteboard lid, perforated in the

middle for the insertion of a long and sensitive thermometer. The basket having been placed in a wooden case, the space between it and the case was filled up with wood wool, so as to avoid as

far as possible the loss of heat. The experiment showed that the leaves became heated in a period of 15 hours from about 55 deg. F. to 125 deg. F. During the following 37 hours a slow drop in temperature to about 80 or 85 deg. F. was observed, after which the thermometer rose again to about 110 deg. F., thereafter falling definitely and finally.

The considerable rise in temperature observed during the first 15 hours, so far from being due to the action of micro-organisms, can only be ascribed to chemical reactions and especially to respiration. At 98 deg. F. the leaves were still alive, and when placed on water would remain fresh and green for some days. The subsequent drop in temperature after 15 hours is quite comprehensible because the leaves, being burnt at the temperature of 125 deg. F., normal respiration had to come to a standstill, while only slight amounts of bacteria were as yet present. These micro-organisms, however, protected by the high temperature, soon began to thrive and multiply on the dead leaves, the heat produced by their intense respiration resulting in the second rise of temperature.

A bill has been introduced in the U. S. Senate making wireless telegraphy compulsory on all ocean-going steamships carrying 50 or more passengers.

HOW TO MAKE A MISSION ROCKER

In furniture construction such as this, nothing is gained by trying to plane up the stock out of the rough. This is mere drudgery and can be more cheaply and easily done at the planing mill by machinery. There will be plenty to do to cut and fit all the different parts. Order the pieces mill-planed and sandpapered to the sizes specified below. S-4-S and S-2-S are abbreviations for sized or surfaced on four and on two sides.

Plain sawed red oak takes a mission finish nicely and is appropriate. Some people like quartered white oak better, however. The cost is about the same.

The stock for the chair is as follows: Widths and thicknesses are specified exact except for the rear posts and the rockers; but to the lengths enough surplus stock has been added to allow for squaring the ends.

- 2 front posts, $1\frac{1}{2}$ by $2\frac{1}{2}$ by $22\frac{1}{2}$ in., S-4-S.
- 2 back posts, $1\frac{1}{2}$ by 11 by 40 in., S-2-S.
- 1 front horizontal, $\frac{3}{4}$ by $3\frac{1}{2}$ by 22 in., S-4-S.
- 1 back horizontal, $\frac{3}{4}$ by $3\frac{1}{2}$ by 20 in., S-4-S.
- 2 back horizontals, $\frac{3}{4}$ by $3\frac{1}{2}$ by 20 in., S-4-S.
- 2 side horizontals, $\frac{3}{4}$ by $3\frac{1}{2}$ by 20 in., S-4-S.
- 2 back slats, $\frac{5}{16}$ by $3\frac{1}{2}$ by 20 in., S-4-S.
- 2 arms, 1 by $4\frac{1}{2}$ by 25 in., S-2-S.
- 1 rocker, $2\frac{1}{4}$ by 6 by 33 in., S-2-S.
- 5 bottom slats, $\frac{3}{4}$ by $2\frac{1}{2}$ by $19\frac{1}{2}$ in., S-4-S.

Begin work on the posts first. The front posts should have one end of each squared, after which they can be cut to the exact length. The rear posts, according to the stock bill, are specified for the exact thickness. By exercising

forethought, both may be got from the piece ordered. The tops and bottoms of the posts should have their edges

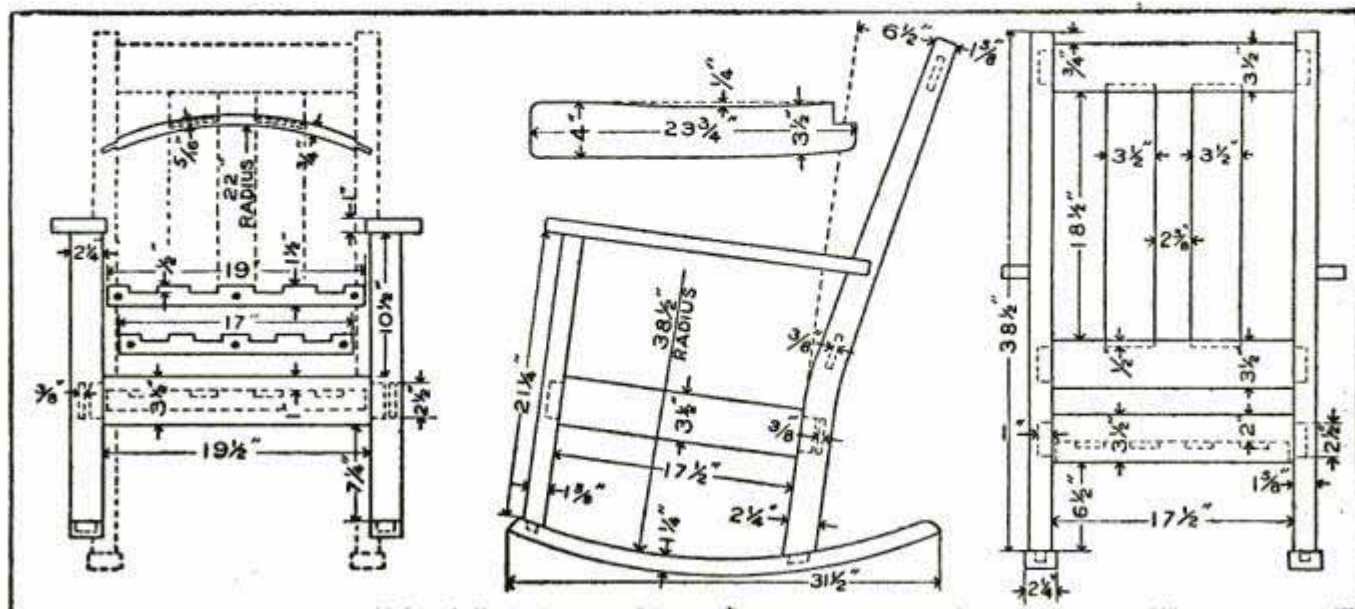


Rocking Chair Complete

slightly chamfered to prevent their slivering.

The shape of the arm is a little out of the ordinary, but the drawing indicates quite clearly how it is cut. The arm is fastened to the posts by means of dowels and glue after the other parts of the chair have been put together.

Now prepare the curved parts of the



Details of Rocking Chair Construction

back. These parts are worked to size, after which they are placed in a box and thoroughly steamed. If nothing better is at hand, nail four boards together and close one end, leaving room for the end of a piece of rubber garden hose. Place the pieces in the box that are to be steamed, stuff rags in the open end and connect the hose to the tea kettle spout from which steam is made to issue.

When the wood is pliable, take it out of the box and clamp the pieces to curved forms previously prepared, which shall have surface curves of 22 in. While these parts are drying out, go ahead with the cutting of the mortises and tenons of post and rail.

Inasmuch as the width of the front of the chair exceeds that of the back by 2 in., allowance must be made for slant either in the tenons of the side

rails or in the mortises. This will necessitate the use of the bevel in laying off the shoulders of the tenons.

The slats for the bottom are made long enough so that their ends may be "let into" the front and back rails, a $\frac{3}{4}$ -in. groove being plowed to receive them.

Assemble the back, then the front; and when the glue on them has dried, put the side rails in place, then the arms. The chair should now be scraped and sandpapered preparatory to applying the finish.

The cushion shown in the picture is made of Spanish roan skin leather and is filled with elastic felt. Such cushions can be purchased at the upholsterer's or they can be made by the craftsman himself. Frequently the two parts of the cushion are laced together by means of leather thongs.

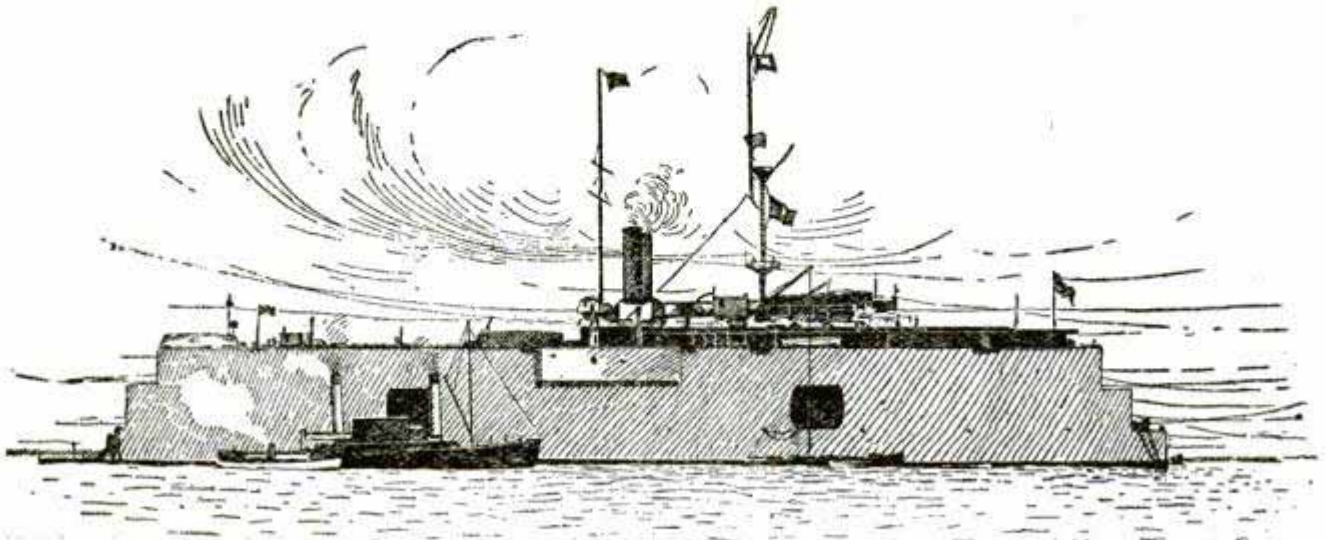
A REMARKABLE FLOATING DRYDOCK

This is not a new battleship of curious and remarkable design, as the illustration would seem to show, but an ordinary English battleship in the largest floating drydock in the world. The dock has a lifting capacity of 17,000 tons, and in it is the "San Pareil," which it lifted bodily out of the water.

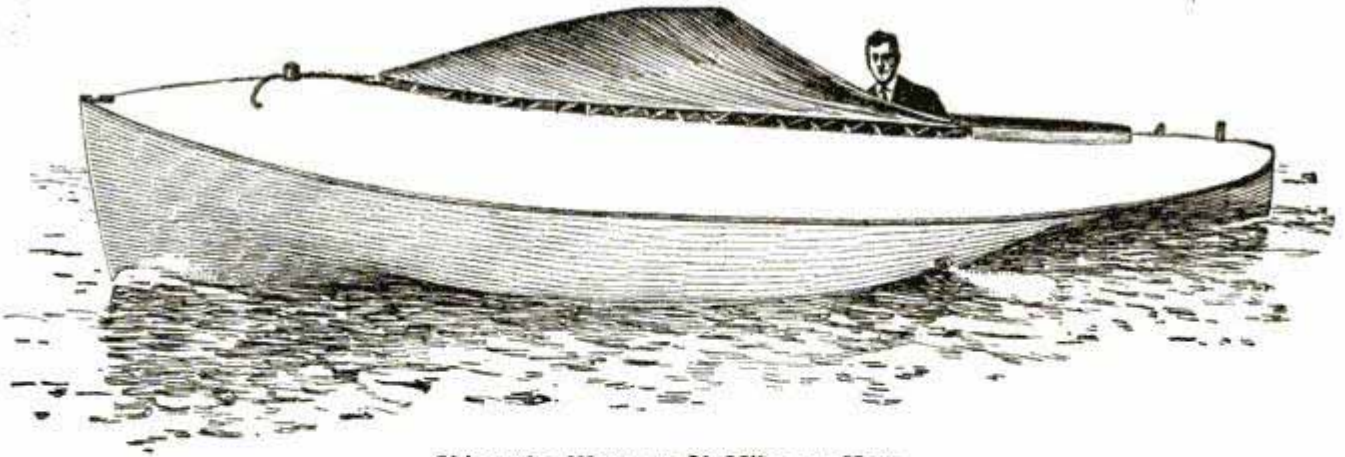
It is significant that the dock was built for service at Bermuda, where it will be installed after being towed to that island from England, a distance of 4,000 miles. Such a dock at Ber-

muda means probably that England intends to maintain a considerable fleet of fighting vessels at the Atlantic end of the Panama Canal, from which intermediate point it could be rushed back to European waters or to the protection of Australia, should necessity require.

Certain trains have been running in and out of Boston at the same hour on the same service and making the same stops for the past 60 years.



Great Floating Drydock for Bermuda



Skims the Water at 30 Miles an Hour

A SKIMMING MOTORBOAT

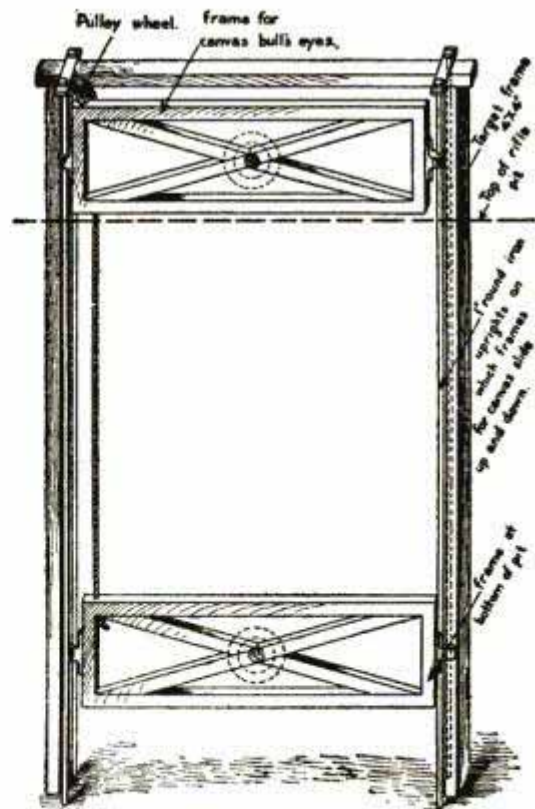
A whale-like hydroplane motorboat which is practically a cross between an ordinary motorboat and a water hydroplane, has been creating considerable interest on the Thames because of its speed and appearance. Only 22 ft. long, and equipped with a 50-hp. engine, it actually skims over the water at a speed of 30 miles an hour. The bottom of the boat is flat, with a horizontal plane on the forward keel to keep her steady. The speed and staunchness of the little boat has given rise to the idea that her design may be found of value for torpedo-boat destroyers.

NEW TARGET FOR RIFLE PRACTICE

The new alternating targets furnished U. S. troops for rifle practice from arsenals are a great improvement over the old revolving targets. The new small arms targets consist, briefly described, of two heavy uprights, with a cross beam at the top about 6 ft. long. There are four 1-in. round iron bars, or columns, two on either side of an upright, on which the target frames proper slide up and down by means of a pulley worked through a wheel at the top of the left-hand upright. The gate-like target frames are thus easily lifted by hand. These frames, when in use, are covered with heavy paper or canvas. When one target is down, the other is automatically exposed to fire at the top of the uprights, the lower one rising in turn to afford a target for

the second series of shots at the proper interval.

This scheme permits of great speed and accuracy, the target being always in the same steady position. While one target is down at the bottom the marker obliterates the hits made and adjusts the surface of the target preparatory to its rise again. Pastors are used to cover rents made by bullets, thus making it possible to tell where the next series of shots strike. The men in the pit, usually two to each set of targets, inform the recorder with the



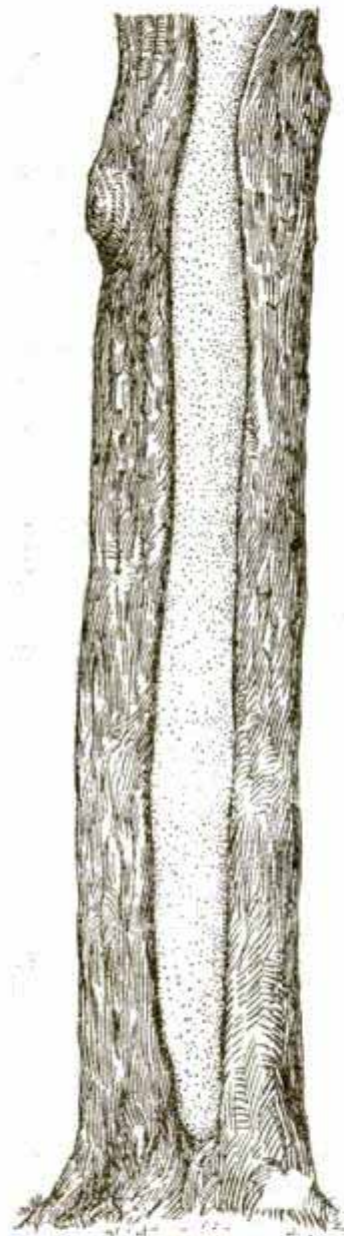
Alternating Target for Rifle Practice

firing party by red wig-wag flags waved above the top of the pit of the result of each series of shots.

CARE AND PRESERVATION OF STREET TREES

(Condensed from Department of Agriculture Bulletin)

The increasing number of state and municipal laws which are being enacted for the care and preservation of street trees is an ample evidence of a



Preserving with Cement
Filling

growing public interest, but the shade-tree laws of any community cannot be thoroughly effective unless the public is familiarized with the important sources of injuries to trees. These sources of injury are undoubtedly more numerous in the cities and large towns than along village streets and country roads. Nevertheless, the increasing number of overhead electric wires in the latter thoroughfares is resulting in much serious damage. Illuminating gas escaping into the soil is also a source of injury.

The piling of brick, lumber, and stone slabs close against the trunk of a tree may cause injuries which will allow decay to enter at that point. Tying guy wires for the purpose of supporting derricks or telephone poles is a common practice which will cause injury unless properly done. The correct method is to place a number of small strips of board against the trunk, as shown in one of the illustrations.

The cutting away of branches in order to make an unobstructed road

for the moving of a building along a highway is frequently encountered. This should be stopped by obtaining from the court an injunction, by which the work can be delayed until a judgment is given. The regrading, widening, and general improvement of highways cause annually an unnecessary loss of many beautiful park and avenue trees, which could well have remained, were some competent person directing the work.

In regrading lawn areas it sometimes becomes necessary to make deep cuts or large fills about the bases of trees, which may cause their death if they are not properly protected. In case of fills, a well should be built around the base of the tree to keep the soil from the bark. If a cut, a mound should be left to protect the roots.

Trees with brittle wood, as well as broad-headed, vase-formed trees, are often seriously injured by wind and ice storms and killed from the effect of freezing. The greatest danger from freezing lies, not in the fact that many trees in a normal condition of growth are killed, but rather that improper pruning and unprotected wounds cause cavities which fill with water during summer months. This water freezes during cold weather and the ice thus formed splits seams up and down the trunks or branches. These seams or cracks, small at first, close during the first summer, but during the succeeding winter are again subjected to freezing, which opens permanent cracks that continue to increase in size year by year. Just such a crack is shown in one of the illustrations, and the method of filling it with cement.

Along city streets, where conditions are so often unfavorable to tree growth, the holes for newly planted trees should be filled with loamy soil, and they should be large enough to provide for future development. A bed 4 ft. wide by 8 ft. long and 2 ft. deep is none too large. In streets which are often congested with people, an iron

grating, as shown in one illustration, should be placed around the base of the tree to protect the immediate soil

walking is done. In addition to sweeping floors, the machine is supplied with special attachments for cleaning cur-

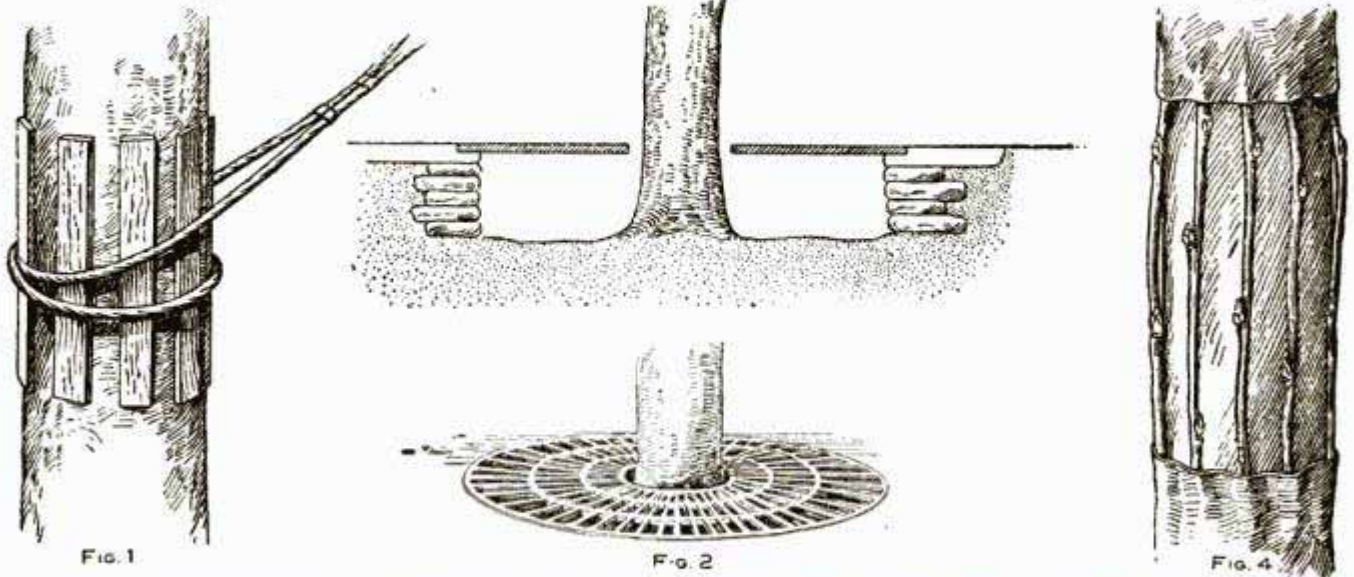


Fig. 1—Correct Method of Attaching a Guy Wire; Fig. 2—Well Around Tree and Grating to Cover Well; Fig. 4—Bridge Grafting for Girdled Trees

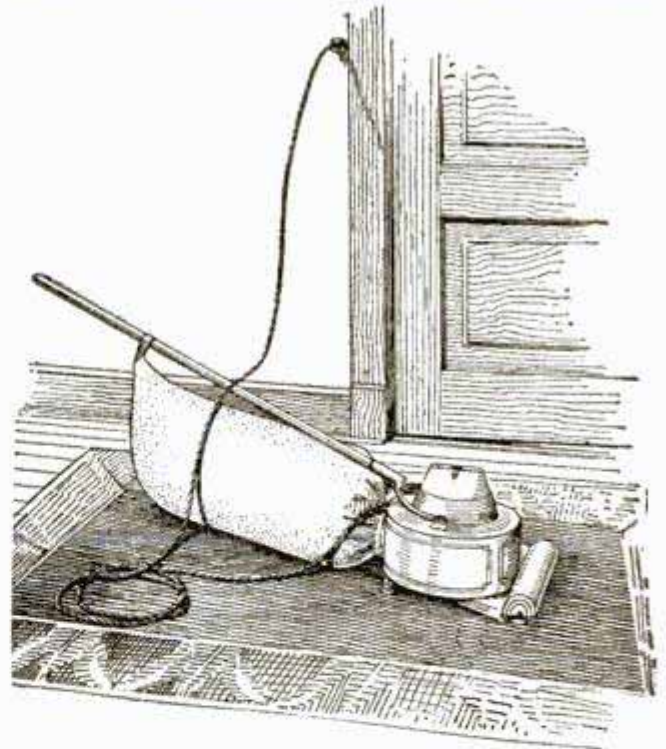
from being tramped on and made impenetrable to surface water.

Trees that have been seriously girdled through failure to remove wires, or from other causes, can often be saved by bridge-grafting the wounded part. This is done by trimming smooth the edges of the girdled part and inserting scions of the same species under the bark in such a way that the wound is bridged over. These scions, being placed very close together around the stem, become united at the ends with the old trunk and serve to conduct the elaborated food material along the lower parts of the tree. During the period of uniting, the scions are covered with grafting wax much as in an ordinary graft. In time, as the tree develops, the wounded part is entirely healed. This method of bridging is illustrated.

ELECTRIC SUCTION SWEEPER

This electric suction sweeper embodies several interesting features, among which is the combination of the vacuum principle and a revolving brush. The revolving brush raises the nap of a carpet or rug and wipes out the little matted paths that appear between doorways and where the most

tains, moldings, stairways, and the few places on the floor that cannot be reached by the sweeper itself. This is easily accomplished by attaching a length of hose and a nozzle to the machine. The dirt and dust accumulated



Air Suction and Revolving Brush Combined are sucked into the bag hanging from the handle.

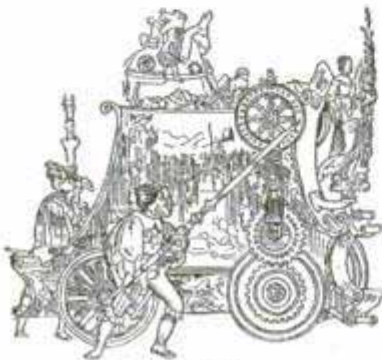
A bark disease, imported from Japan, has killed thousands of New York chestnut trees.

ANCIENT AUTOMOBILES

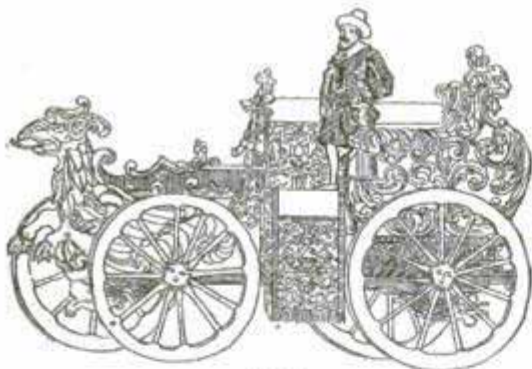
In Europe, during the ages when mechanical genius was just awakening, attempts were made to drive vehicles



1459



1459



1649

Forerunners of the Modern Automobile

by other than animal means. These attempts seem crude to-day, but in the fifteenth and sixteenth centuries they were thought wonderful, as much so, indeed, as are the successes in aerial flight today. In two or three hundred years from now people will probably laugh at the puny efforts of the twentieth century. Such is the history of progress, but underneath all are the little successes that, step upon step, lead to the greater victory.

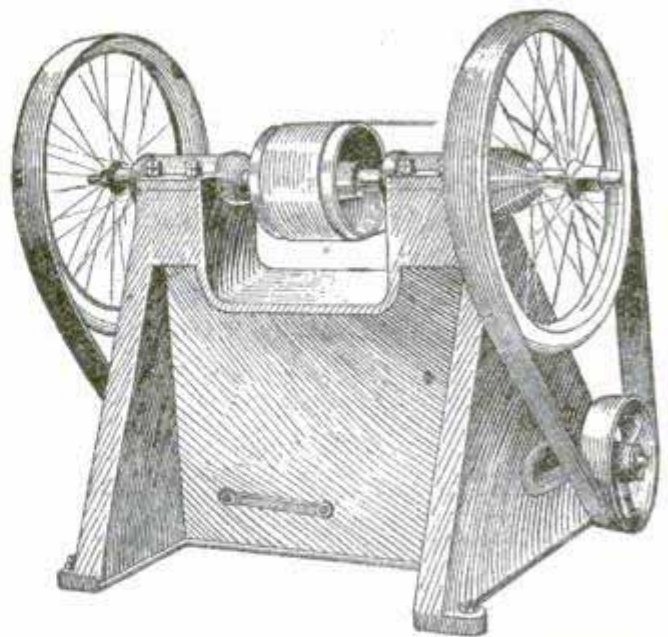
In 1459, the best man could do in mechanical propulsion is typified in the curious monocyde automobile built for Emperor Maximilian of Germany. It was propelled like a treadwheel, by

four men treading on the inside of the great rim, and was steered by means of a handle connected to the axle and held by a man walking beside it. The seat rested upon the axle and was balanced by weights to keep it upright.

The second illustration shows a vehicle built about 1459. It was driven by a crank which engaged with a cog-wheel connected with the drive-wheel. A man walked alongside and turned the crank by means of a long shaft or handle. The third illustration shows a Nuremberg motor car of 1649, which is said to have traveled about Germany in that year. It was driven by great springs which were wound up at short intervals.

PNEUMATIC-WHEEL POLISHING MACHINE

A somewhat novel pneumatic polishing machine has recently been patented and placed on the market by an English firm, its uniqueness being the pneumatic-tired wheels over which an endless belt, coated with abrasive, runs. The machine consists of a rigid stand upon which a shaft driven by a pulley is situated. At each end of this shaft a pneumatic-tire wheel, similar to those used on a bicycle, is fastened.



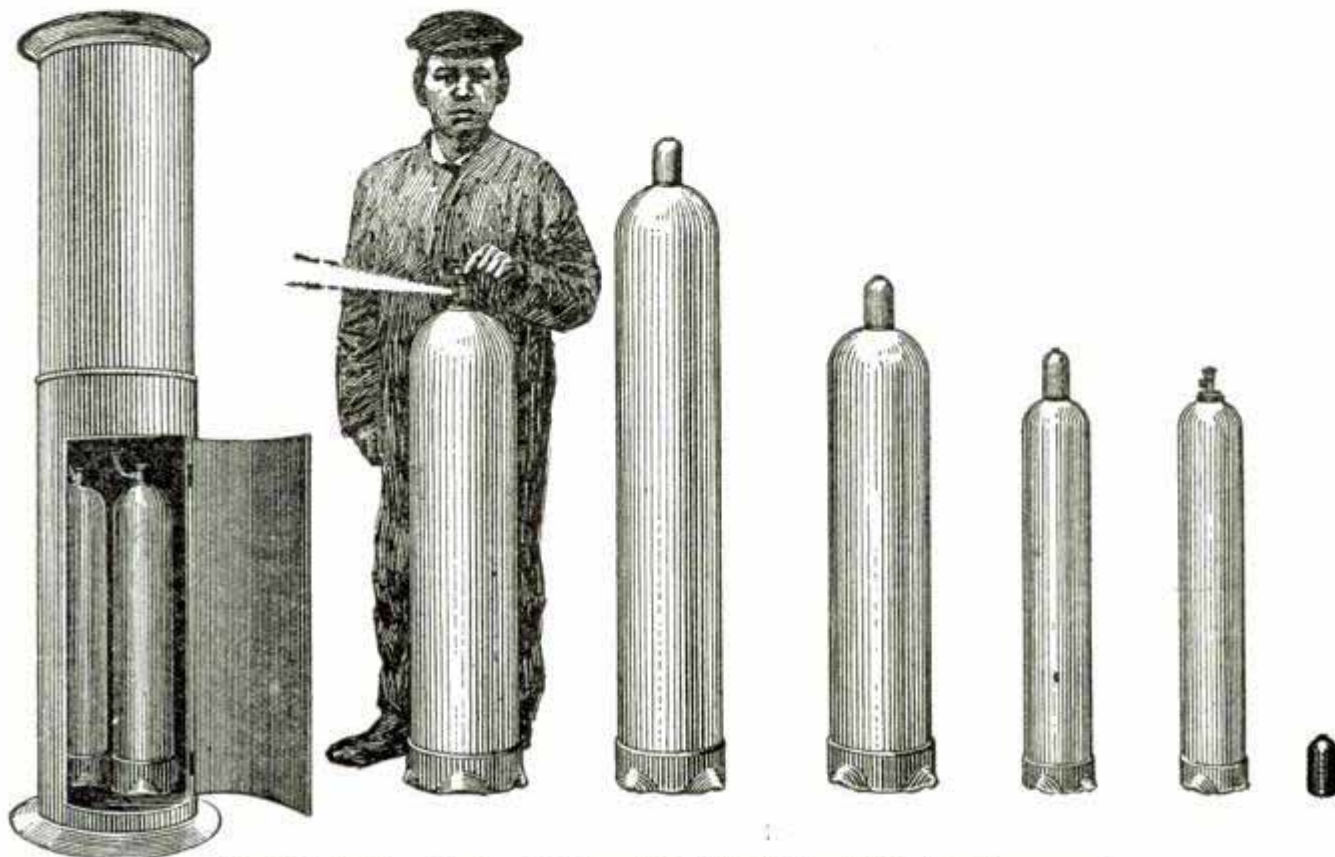
Courtesy of Brass World
Newest Polishing Machine

Over each rubber tire an endless belt travels, and these are connected to idler

pulleys that are movable so that the belt may be made tight or slack.

The machine is not used as a strapping belt as it would first appear, but instead, the work to be polished is applied directly to the face of the pneumatic wheel and ground or polished

in steel tubes holding from 20 to 80 lb. These tubes are accepted by European railroads without restrictions, as the gas is claimed to be non-poisonous and much less explosive than ordinary gas. It is used for heating, lighting, cooking, and for soldering and welding.



Small Lighting Plant and Tubes into Which Liquid Gas Is Compressed

as though a regular polishing wheel were used. The great advantage of the machine is the fact that the soft, rubber tire acts as a cushion for the work and prevents the "bumping" or vibration which so frequently occurs when an ordinary wooden wheel wears out of true.

MANUFACTURE OF LIQUID GAS

Liquid gas is made by compressing and freezing the gas obtained from the dry distillation of crude oil. The first plant for its commercial manufacture was established in Bavaria, and in 1907 a plant was established in Zurich. Over 100 installations for such gas have been made in Switzerland, and a plant for its manufacture is now being built in Boston.

After manufacture, the gas is placed

The illustrations show the tubes into which the liquid gas is compressed, and a small lighting plant. The liquid gas is bottled up in exactly the same manner as oxygen. It is compressed into the cylinders under a pressure approximating 1,500 lb. per square inch, and, although stored under such enormous pressure, the cylinders are perfectly safe to handle. All the user has to do is to connect up the tube with the gas-pipe distribution system of his home.

There is a block in the Brazilian mail service generally, but particularly in Rio de Janeiro, which renders the dispatching of circulars from abroad practically useless. In the postoffices are large numbers of bags and baskets filled with foreign printed matter many months old.

FEATHER DUSTERS IN THE MAKING

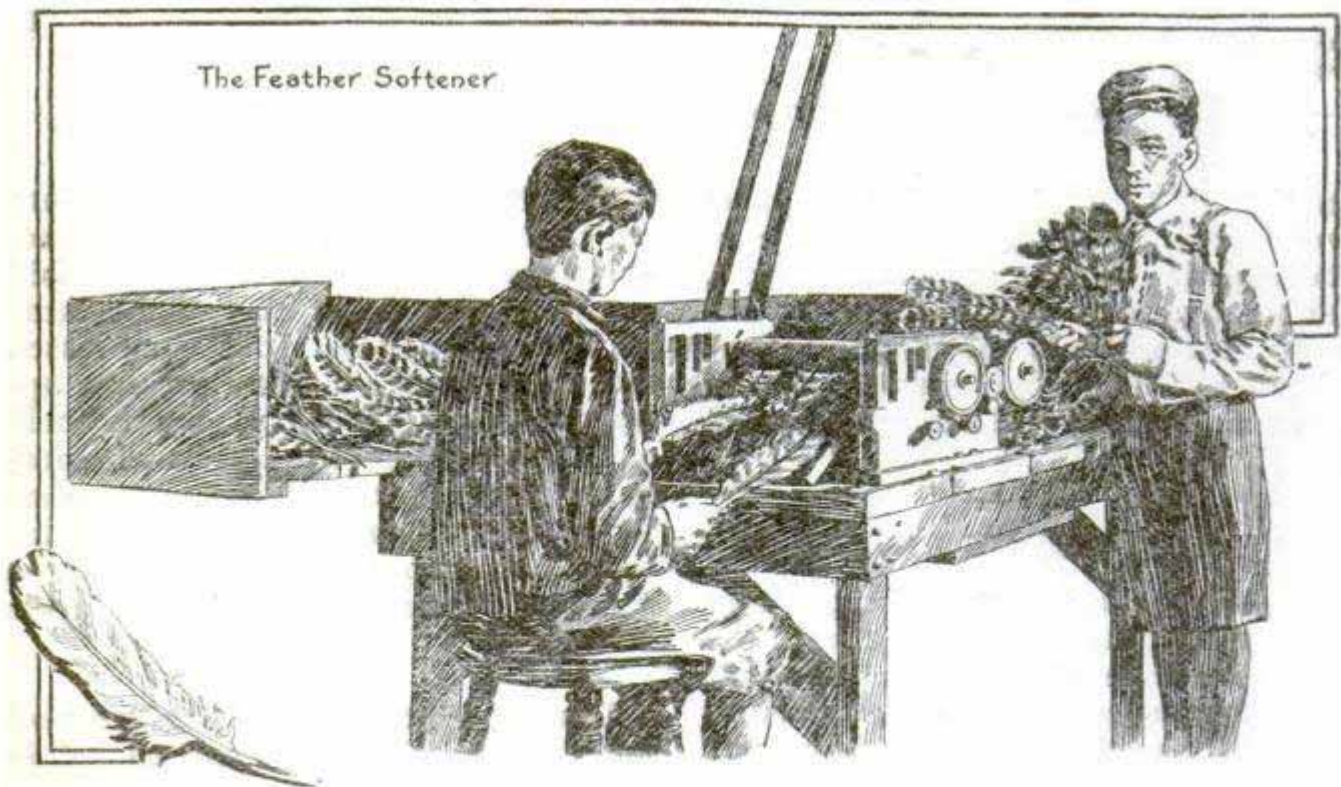
The fame of the turkey in America is mostly due to the fact that this bird is the chief part of the Thanksgiving



Before and After Stripping Badly Stripped

number, size, and kind of turkey feathers used in a duster is determined by the length of the dusters, the finished article usually ranging from 10 to 18 in. in length, not including the handle. Sixteen-inch dusters contain two bunches of 20 wing feathers cut 11 in., two bunches of 20 wing feathers cut 13 in., two bunches of 10 tail feathers cut 14 in.; and two bunches of 13 long skirt feathers.

The manufacture of dusters is not a business which needs a large plant or expert workers. It can be carried on in a couple of rooms of a home, and young people can soon become as proficient in the work as their elders. In fact, duster-making has been, and is becoming still more so, one of the means of livelihood taught the afflicted in the institutions of the blind. Complete machinery for small plants ranges in cost from \$330 to \$440, according to the number of machines duplicated. The machines required are a stripper, sizing board, bunchers' cutter, feather



Copyright, 1908, by Three "B" Duster Co.

Day dinner, but it is also of considerable commercial value because of the feathers, which are greatly prized in the manufacture of feather dusters. The

curler, head chuck, body duster chuck, feather curler, and feather softener. The feather softener is the most expensive of all the tools required, but one

is usually sufficient for an ordinary plant, while the others, with the exception of the moth-proofing outfit, range in number from 2 to 6, according to the number of people working.

The turkey feathers used in the manufacture of dusters are usually bought from concerns that furnish them in sacks about 6 ft. long. As the feathers are usually packed tightly, they appear badly mussed up when received, and should be thrown on the floor in some vacant spot, covering it to a depth of about 6 in. Then they are sprinkled with water from an ordinary sprinkling can, shaken up well with a pitch-fork and left over night. After shaking them up the next morning they are ready for use.

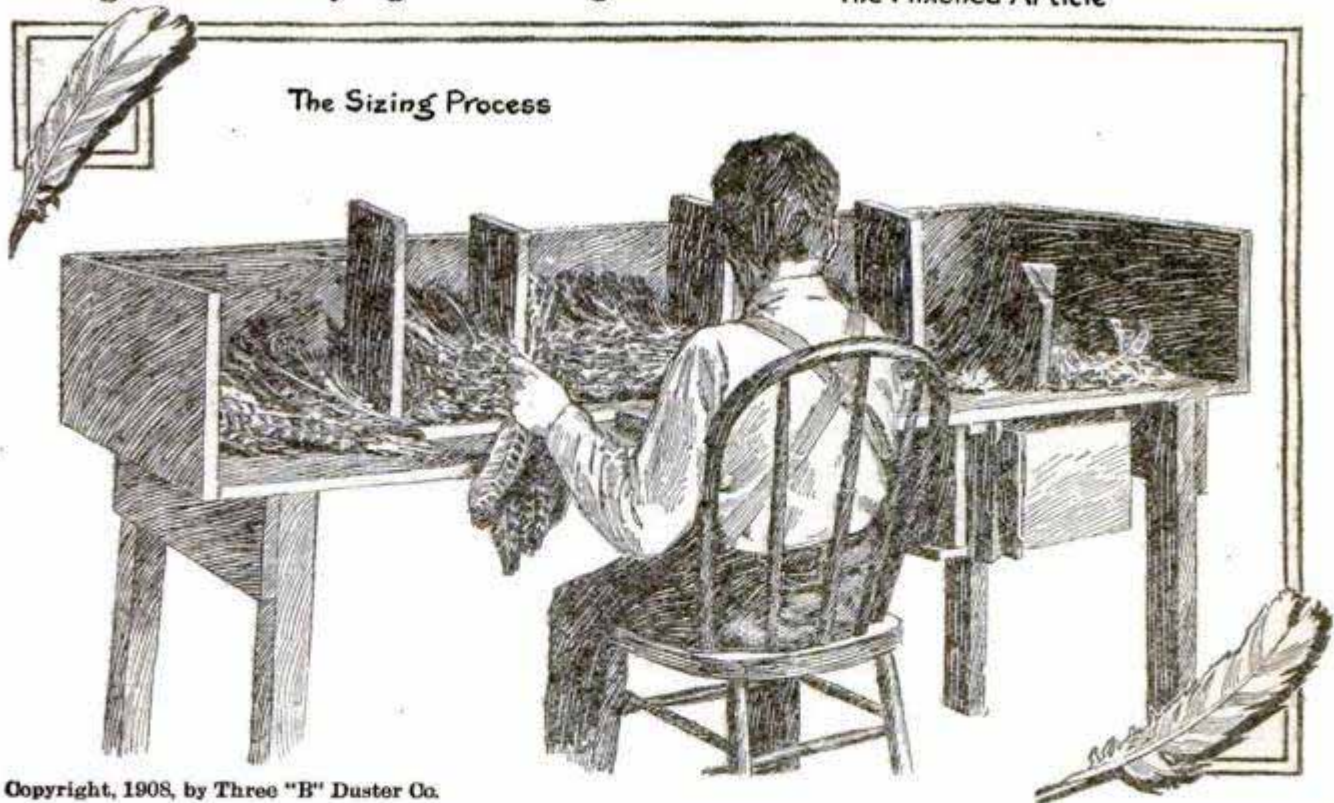
Each kind of feathers is tagged on the sack or bale. After the skirt feathers have passed through the shaking process they are sorted into four sizes, which are commonly designated as "short," "medium," "long," and "longest." This sorting is done by rough guess work, and any boy or girl can do it. The sorter picks up the feathers with the right hand and judges their lengths

small box kept for that particular size.

The wing and tail feathers are the only ones that have to be stripped, the inside rib of each of these being stripped close to the plumage. This is accomplished by a stripping machine. The feather is pushed, quill end first, between the knife and the roller. It is started from the right-hand end where the knife is farthest from the roller, and as it is pulled through, is also



The Finished Article



Copyright, 1908, by Three "B" Duster Co.

by eye, or, if blind, by feeling, and holds the various lengths between the fingers of the left hand. When this hand is full, each length is deposited in any

pulled toward the left-hand end of the blade, thus stripping the inner rib of the feather off close to the plumage for nearly its entire length. The right

hand pulls the feather through the machine, while the left starts and presses it downward. One of the illustrations shows a wing and tail feather correctly and incorrectly stripped.

The sizing process comes next, and although a number of machines have been designed for this purpose, the hand process is found to be more accurate and about as economical. This work, too, can be done by boys and girls as well as by men and women. The sizer used in hand work is a long open box or trough separated into compartments. The sizer measures each feather, one at a time, with the quill against the guard at the back of the board, and with the stripped part of the feather down, then places it in its proper rack. As the various compartments become filled, the feathers are tied in bundles with strips of muslin about 1 in. wide.

Before the different sizes and lengths of feathers are bunched for each duster, they are passed through the softening machine, which can be run either by machine-power or foot-power, the former, however, being more satisfactory. Ordinarily, one-half of a horsepower will run this machine at a speed of 800 revolutions per minute, at which it does its best work. When the machine is run by power, all that is necessary is to put the feathers, soft-tipped ends first, into the revolving front rollers. It can be fed with both hands at once, only taking care not to let one feather lap over on top of another, thus damaging both feathers. The mission of the machine is to effectually soften the feathers without spoiling the original springy qualities of the quills, and when the feathers have been so treated, they can be taken direct to the buncher's table.

The buncher simply picks up the feathers, one by one, with the right hand and lays them straight in the left hand with the soft tip ends all pointing one way, the stripped sides all uppermost, and the ends all even. As they are bunched they are also counted until the required number is reached. The bunch is then held tightly together with

an ordinary wooden clothes-pin until the proper length is measured off on part of the bunch cutter. The quill ends of the bunch are laid so that the cutter will sever them evenly. If, for instance, a 14-in. duster is required, the buncher will make two bunches out of 10-in. wing feathers, with 20 feathers to each bunch, cutting the quill ends off even 10 in. from the tip ends. Then he makes two bunches out of 11-in. wing feathers with 20 feathers in each, cutting the quill ends off 11 in. from the tips, and two bunches of 12-in. tail feathers, 10 feathers to the bunch, cutting the quill ends off 12 in. from the tips. As these bunches are completed they are laid on the upper board of the buncher's table ready for the winder. Two bunches of medium sized skirt feathers, 15 to the bunch, complete the list of feathers for the 14-in. duster.

The winding is done with an ordinary broom winding machine, provided with special head chucks, but before the feathers are wound all but the skirt feathers must be curled. To wind, for instance, a 14-in. duster, one bunch of 10-in. wing feathers is curled by pulling it across the curler with the stripped side of the feathers next to it. This operation requires a little practice in order to nicely curl the feathers so as to produce a good-shaped duster. After curling, straighten the quill ends if they have slipped out of place, and place the bunch around the head under the wire, leaving the quill ends standing out about half an inch. The stripped parts of the feathers should be turned next to the head and run entirely around it. The second bunch of 10-in. wing feathers is treated in the same way, excepting that the stripped sides are turned outward. The protruding quills of the two bunches are cut off close to the head, the wire is run over onto the second groove, and all is ready for the two bunches of 11-in. wing feathers. These are curled with the smooth side of the feathers against the curler, which is just the opposite to the curling of the 10-in. feathers. The feathers of the first 11-in. bunch have

their stripped sides turned toward the head, and run but half way around. The second 11-in. bunch, the stripped sides of the feathers turned inward, are made to reach the balance of the distance.

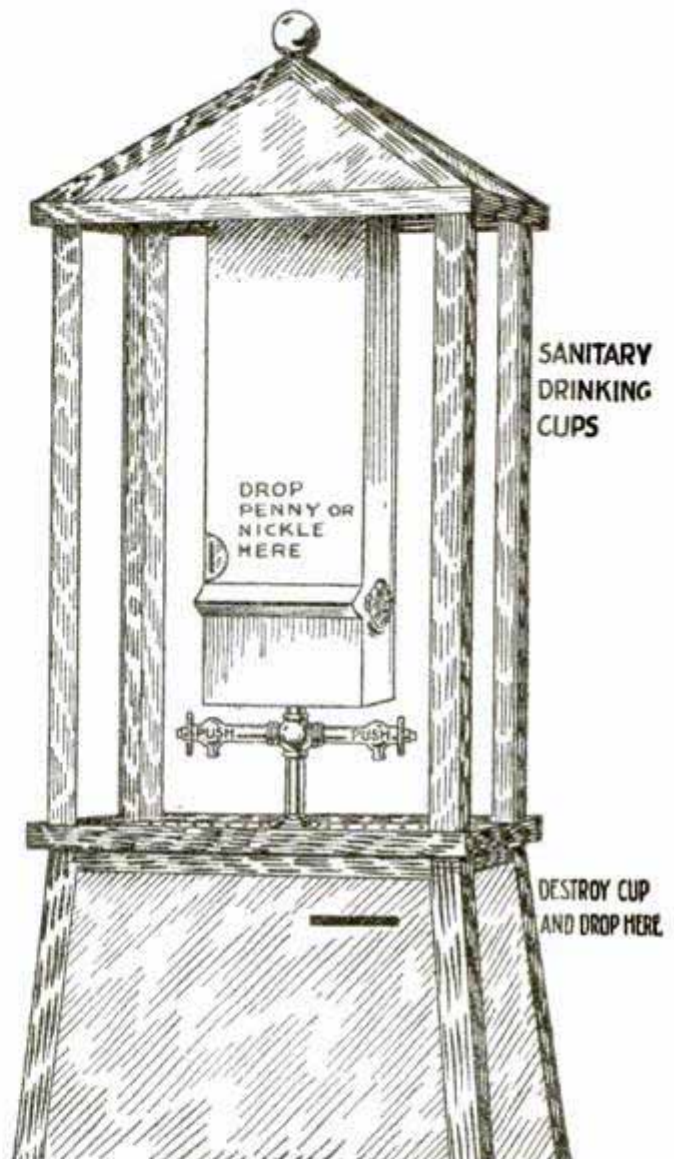
The wire is run around the feathers and into the third groove, and the two bunches of 12-in. tail feathers are curled and worked around the head in the same manner as the 11-in. bunches of wing feathers. The wire is then run around these feathers and into the last or "skirt" groove, after which a "paper collar" is placed around the groove and fastened by running the wire around it. Two bunches of medium-sized skirt feathers are placed over the collar, fastened by running the wire around, and the ends of the quills are trimmed off with a knife. Care must be taken to cut these quills close to the top of the skirt groove, not close to the wire, so that there will be left under the wire perhaps an eighth of an inch of quill end.

From the winding machine the dusters are taken to the trimming table where the loose plumage and dirt are removed by whipping them over a round-backed chair, and the paper "cuff" or label is tacked on. Screwing the handle into the head of the duster completes the operation and the finished product is ready for the market. Heads and handles are usually purchased from the concerns who furnish the feathers.

NEW CUP FOR EVERY DRINK

That the public drinking cup is an intermediary in the conveyance of germs from one person to another is conceded by all medical authorities, and this fact is the reason for the drinking fountain here illustrated. It is provided with a holder which contains 300 cups made of waterproof paper. A penny deposited in the slot of the holder procures one of these cups from which to drink. After use, the cup is again pressed flat and dropped in the slot in the base of the fountain. The water faucets are so arranged that it is

impossible to obtain water without a cup of some kind, and as the paper cups



Fountain Furnishes Cups as Well as Water

are the only ones available, their use is therefore required. Many boys are in the habit of placing their lips to the faucets where possible to get a drink, a practice as liable to spread germs as the use of common drinking cups.

Nearly 30 years ago the steamer "Alpena" sunk in Lake Michigan about midway between Chicago and St. Joseph and just a little north of the usual course, many persons being drowned. Mrs. Rosa Peyton, the widow of one of the drowned, died recently in Chicago, and as her dying wish was that she be buried near the spot where her husband went down, her ashes were lowered overboard from a lake excursion boat at a point as near as could be determined.

TOPSY-TURVY GAME OF POOL

One of the recently patented amusement devices is the game of pool played on a table constructed similar to a box



Playing the New Game

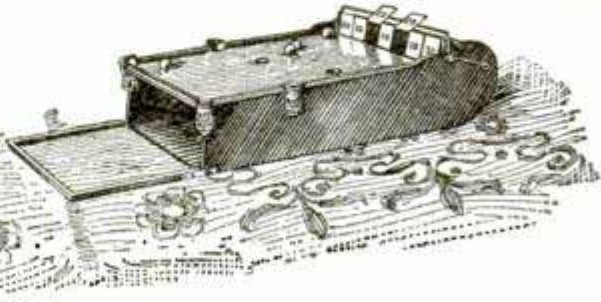
sled, through which a ball is thrown so it will make the rounding end and light on the table after passing through a door and land in a pocket or pit. The doors are numbered and the pockets have their value as well as the pits.

The game is played by the person standing about 8 ft. in front of the table and throwing the ball in the end opening; the ball passing through the box will come out on top or the table part. Seven balls are played by each person. If a ball rolls into a pit it counts 75, a corner pocket 25, or a side pocket 100. The balls must remain in the pockets

for its value. The balls are solid rubber, $1\frac{1}{2}$ in. in diameter, and the box is 15 in. wide and 30 in. long. The cushions are the same as used on regular billiard tables.

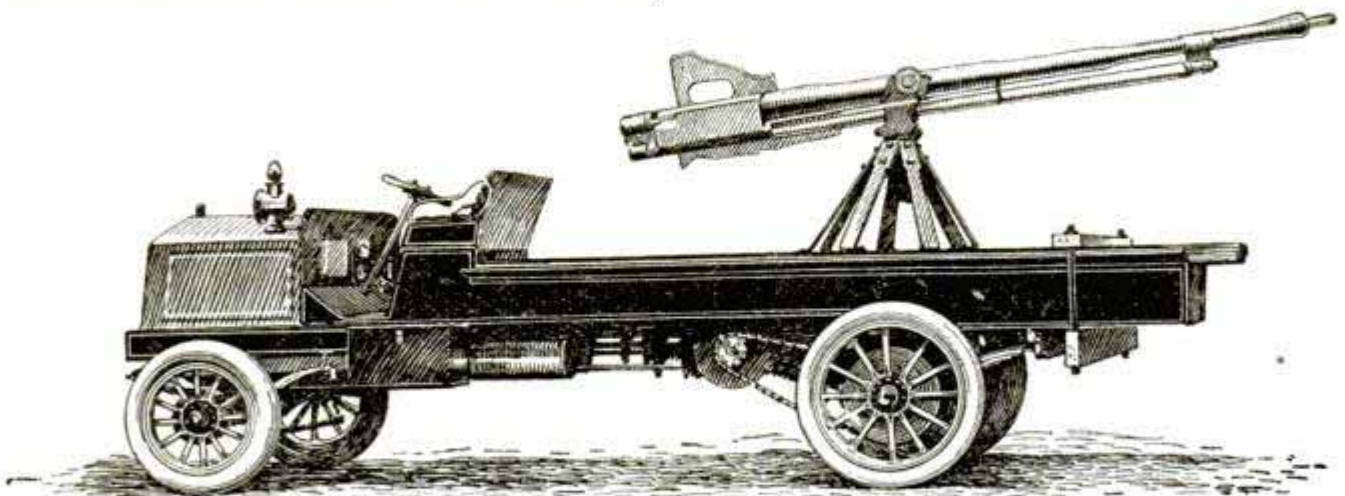
LARGEST AUTOMATIC GUN IN WORLD

The largest automatic gun in the world, mounted on an automobile



truck, was recently tested at Cleveland, Ohio, under the direction of Col. O. W. Lissack, of the ordnance department of the U. S. army. The great rapid-fire gun fires 3-lb. shots at a speed of 100 per minute, the range being $3\frac{1}{2}$ miles.

The tests were not only of the gun itself, but also its effect mounted on an automobile. Shots were fired with the brakes of the truck set, and with them released. In the former instance, the truck did not move and no shocks were felt by those on the truck platform. With the brakes released there



Largest Automatic Gun in World Mounted on Auto Truck

or pits until they are all played to count. The number on the door through which the ball passes counts

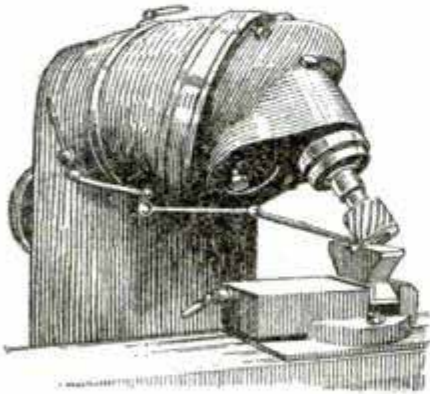
was a slight movement on the recoil, but no shocks. For war purposes the truck would, of course, be armored.

UNIVERSAL SPINDLE ON A MILLING MACHINE

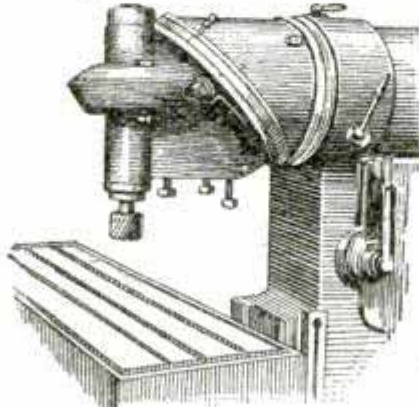
A new milling machine having a double joint spindle head to drive the cutter spindle at any desired position, thus making it universal, has been

form all possible operations of milling.

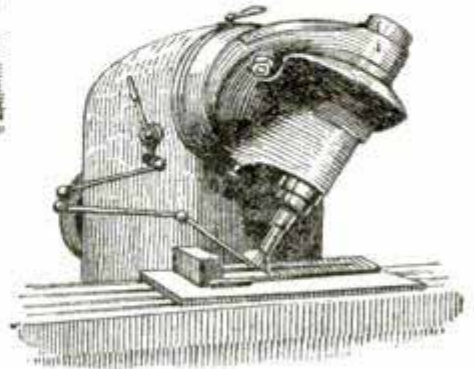
A constant speed drive is provided having 15 different speeds controlled by a knob and lever at the side of the machine. Attachments are made to fit on any plain horizontal milling machine in use.



Cutter Spindle in a Front-Inclined Position



Cutter Spindle in a Vertical Position



Cutter Spindle in a Side-Inclined Position

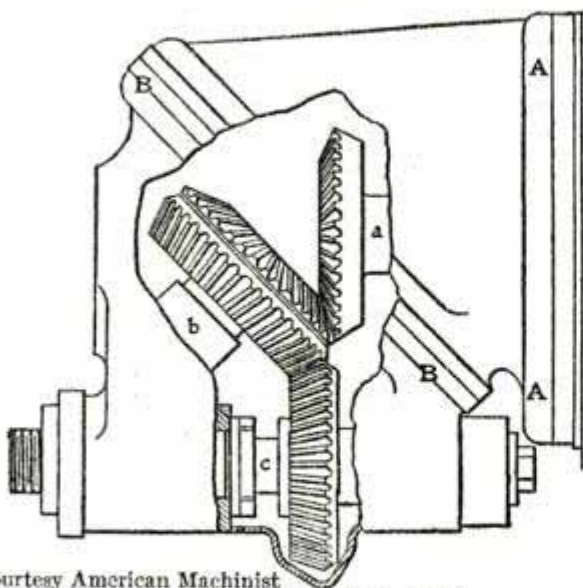
brought out by a French company. That part of the head where the spindle carries the cutters on a regular milling machine is made in two separate pieces, one pivoted upon the other, and both carried on a bearing attached to the machine pillar. The two bearings are circular in shape and one is located in a vertical plane, AA, while the other is at an angle of 45 deg., BB. The bevel gears are cut and arranged in the two pieces so as to drive the cutter spindle in any position the parts of the heads

A WAGON THAT HAS CARRIED BILLIONS

Very few of the people who pass the Treasury building in Washington realize that the old wagon, drawn by three patient, white horses, that often stands backed up at the curb has an intimate association with the paper money of the country. Every piece of paper money that any individual in the United States has spent or hoarded in the past 26 years has ridden in this wagon, and the amount hauled by it equals all the money there is in the world today.

The wagon plies regularly between the bureau of engraving and printing and the Treasury, always loaded down with rectangular packages of 12½ lb. each. In every package are 4,000 bills. If the bills are of the lowest denomination, each package is worth \$4,000. If the highest, which is \$10,000 bills, a package is worth \$40,000,000. One package, and only one, of this great value ever rode in the wagon. If the packages carried by the wagon were piled one on top of another they would make a monument 15 miles high.

Treasury officials insist that there is a U. S. coin known as a "cent," but that a "penny" is not an American piece of money.

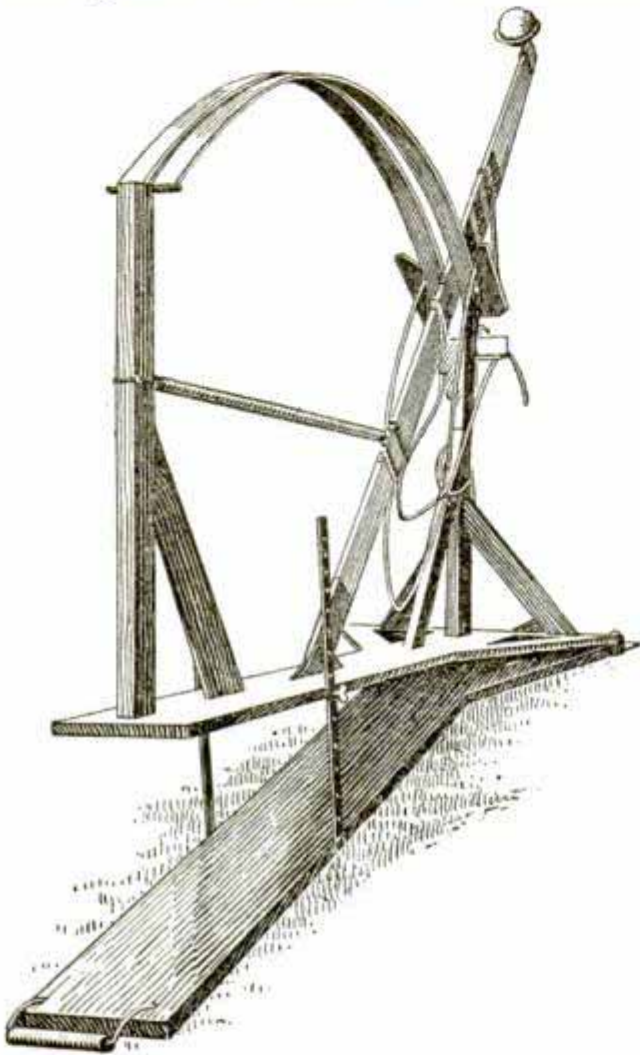


Courtesy American Machinist
Gears with the Double Joints

may be placed. This construction permits the cutter spindle to be revolved and inclined in all positions and per-

PITCHING MACHINE FOR CRICKET PRACTICE

Cricket is as popular a game of ball in England as is baseball in America.



Machine Pitches Cricket Ball

It is played with 11 men on a side, one side being dispersed in the field to deliver and catch the ball, and the other batting. The batsman stands before a wicket, which the pitcher, or bowler, as he is called in England, tries in every possible way to knock down. The game, which cannot be completely described because of lack of space, is very ancient, having been played under the name of cricket as far back as the sixteenth century. In itself, it has not undergone any changes to speak of, but once in awhile some auxiliary idea is developed, one of the most important of which is the bowling machine for practice, here shown. It is the invention of an expert player, and has just been tried and approved. It will bowl any length, pace, direction and break

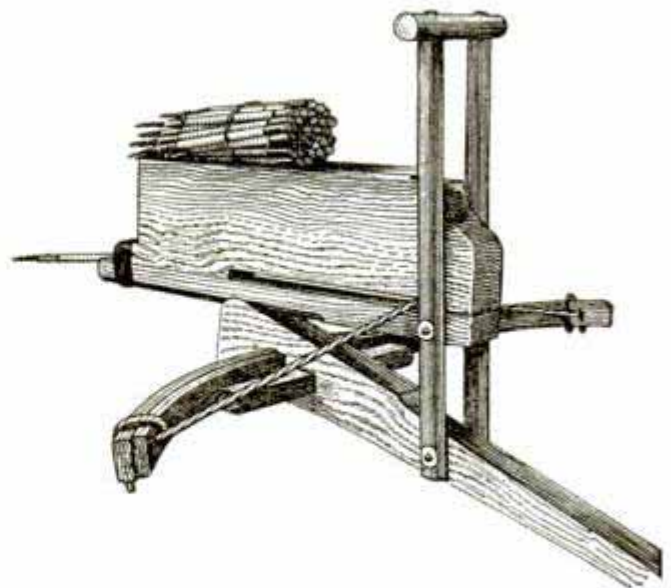
required, giving amateur players as excellent batting practice as could a professional bowler. The ball comes to the batter on the first bound, and "break" is the term applied to the slant it can be made to take after striking the ground.

A FLEET OF GOLD DREDGES

The Yukon territory now has a fleet of 16 gold dredges, or ships, as they are spoken of by the miners, and five or six more are being equipped. A dredge built ready for operation in the Yukon costs \$150,000 on an average, and handles daily from 2,000 to 5,000 cu. yd. of gravel, which will yield from 25 cents to \$25 of gold per cubic yard. The daily output of gold per dredge is from \$1,000 to \$5,000, although it is said that there have been days on which a single dredge has taken out \$15,000.

POISON-ARROW AMBUSH GUN

The crude cross-bow weapon shown in this illustration closely resembles the weapons used in the European wars before gunpowder was invented, but it is a modern weapon of the interior tribes of the Philippines, by which many soldiers and a few explorers have met death. It projects deadly, poisoned arrows of bamboo, one of which



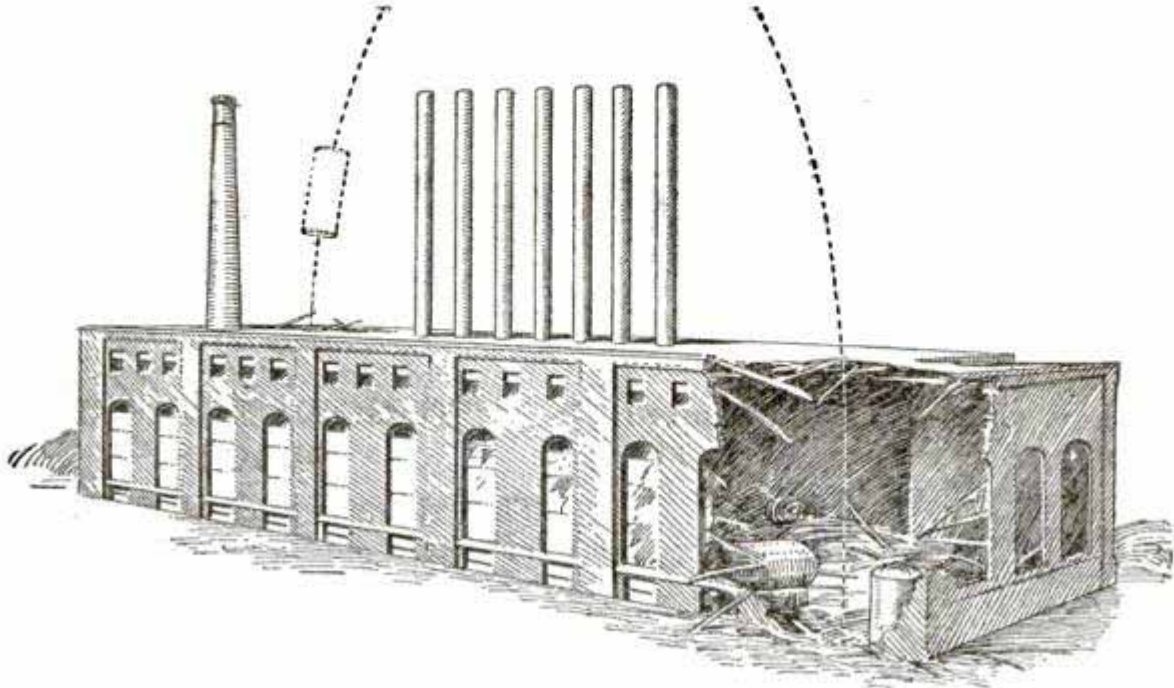
Deadly Poison-Arrow Projector

is shown in the illustration in position for discharging.

BOILER THROWN 500 FEET IN AIR

Some idea of the force of the boiler explosion which wrecked Denver's

the hull to allow of her being towed to Glasgow for re-fitting. The decks forward were found to be badly buckled and some of the plates of the hull were warped.



Boiler Thrown in Air by Exploding Companion

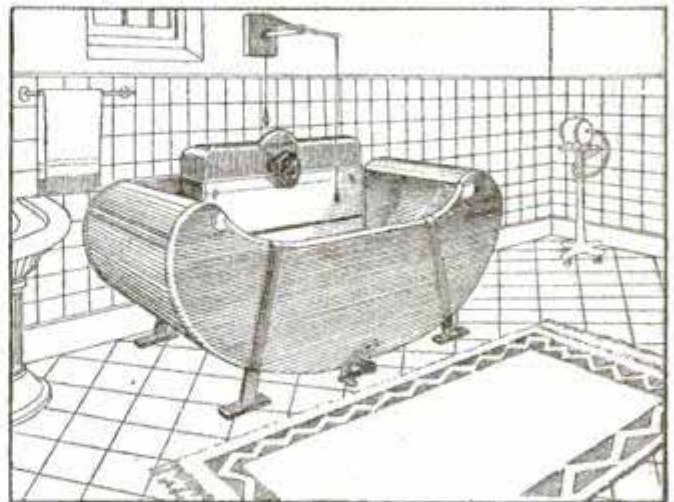
electric light plant and threw a second boiler high into the air in June, is gained from this illustration. People who saw the 8-ton boiler soar through the air say that it went as high as 500 ft. before dropping and crashing through the roof of the plant again. The glass in every building within three blocks of the explosion was shattered.

TRANS-ATLANTIC LINER BURNS AT DOCK

The Cunard liner "Lucania" was badly damaged by fire and then sunk at the Huskisson dock in Liverpool on Aug. 14. The flames, supposed to have originated in the saloon kitchen, were discovered about 7 o'clock Saturday evening, but despite the efforts of the ship's fire brigade spread rapidly from the first-class saloon to the stowage. The upper works of the big ship were burned out from the funnels forward, and to save any of her it was decided at 3 o'clock Sunday morning to sink her in the dock. She was later refloated and drydocked for sufficient repairs to

MECHANICAL WAVE BATHTUB

The mechanical wave bathtub shown in this illustration was originally invented by a French nobleman, but is now being used to some extent in Germany. It resembles in form and in action certain patent churns now sold everywhere, and is intended to produce a wave motion, such action being



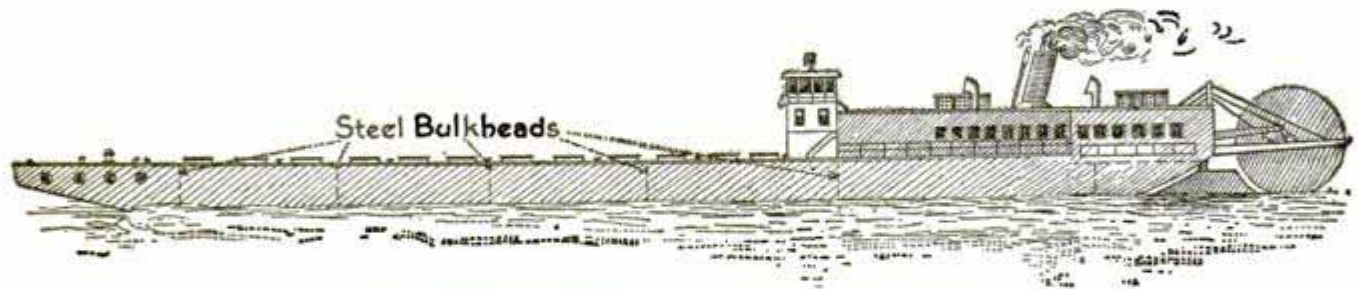
Mechanical Waves in a Bathtub

deemed more or less beneficial from a medical standpoint.

NEW TYPE OF RIVER STEAM-BOAT

An entirely new type of steamboat is to be used by the \$1,000,000 naviga-

every 500 tons. The total capacity is rated at 2,500 tons. It is estimated that the boat will make a speed of five miles an hour upstream and 15 to 20 miles downstream.



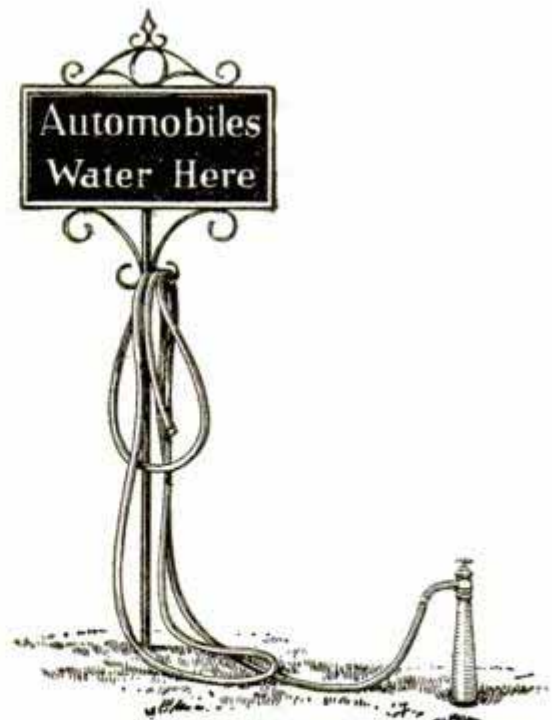
For Service Between Kansas City and St. Louis

tion company which is being organized by big shippers in Kansas City, Mo. The boat is intended for service between Kansas City and St. Louis and ultimately between Kansas City and New Orleans. It is modeled after the whaleback type used on the Great Lakes and is arranged like a trunk steamer. It will bear little resemblance to the type in common use now on the Missouri, Mississippi and Ohio rivers. The high upper works on the old-style boat that catches every ounce of wind will disappear in the new boat; only a pilot house, coal bunkers and quarters for the crew will be above deck. They are not intended for passenger traffic and the crew will be small. Machinery will do the loading and unloading and even the firemen will be replaced by mechanical stokers that will feed the fires on chain grates under the latest type of high-pressure boilers. Conveyors will carry the coal from the bunker to the furnace. Compound condensing engines will drive the stern wheel and electric power will operate the capstans, unloading machinery, and lights. A short smokestack with forced draft will serve in place of the towering stacks now used on river steamers to get enough draft to make steam. The three balanced rudders will be operated by a steam steering device. The boat will be built of steel with watertight compartments, and is designed to be 300 ft. long, 50-ft. beam and 14-ft. hold, drawing 20 in. light and 12 in. additional for

AUTOMOBILE WATERING PLACES

That there is toleration for automobiles where automobile drivers deserve toleration is strikingly shown in this illustration. It is a watering place for steamer automobiles, voluntarily arranged in Concord, Mass. In carrying out this original idea a long hose is attached to the hydrant to make it easier for a tourist to fill his tank, and a sign calls attention to it.

Middleboro, another city of that



Water for Automobiles

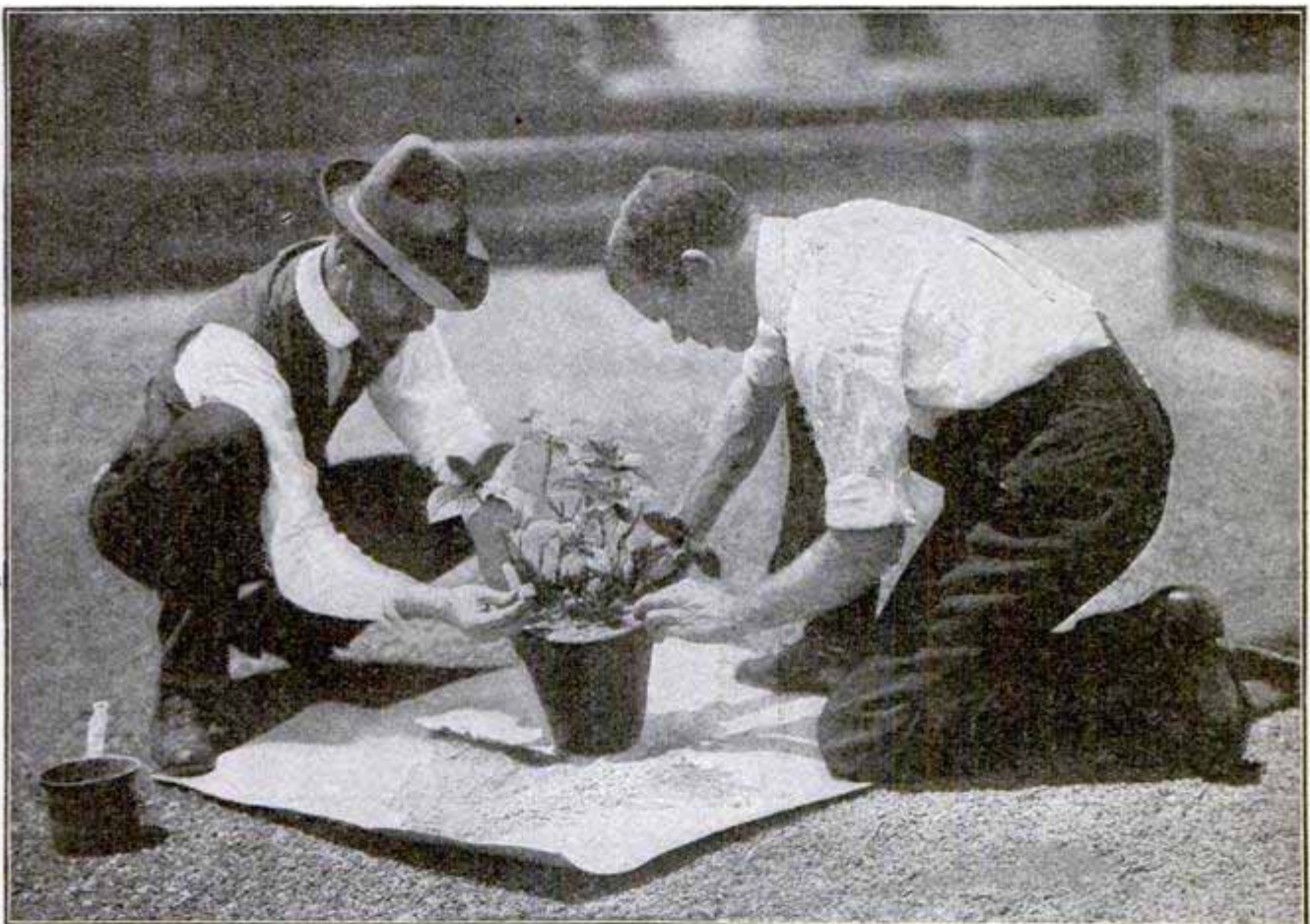
state, has hung out banners asking automobilists for a square deal and promising one in return.

GROWING AND CHANGING THE NATURE OF PLANTS BY DRUGS

With Chemical Stimulant Plants Are Made to Flourish in Soil as Arid as the Desert—Rare Tints Unnatural to Flowers under Ordinary Growth Are Produced, as Well as Many Other Curious Results

On the roof of the Philadelphia college of pharmacy, Dr. Henry Kraemer, professor of botany and director of the botanic laboratories, has established one of the most remarkable gardens in the world, in which he feeds plants drugs to make them grow and develop tendencies hitherto foreign to their na-

drug preparations with the sand and watching the growth of the plant he observes the effect on the various preparations. The result of this chemical feeding, and its summing up, will be announced when the experiments have become sufficiently advanced, but in the meantime an interesting descrip-



Dr. Kraemer Treating a Plant

tures. The object of the experiments is two-fold. First he is testing the possibility of growing under artificial conditions plants from which valuable drugs are taken, and secondly, as already mentioned, he is seeking knowledge concerning the effect of drugs and chemicals on other plant life.

To make the tests as severe as possible, Dr. Kraemer beds his plants in plain sand, in which, under ordinary circumstances, the plants experimented with would not live. By mixing his

tion of what is now progressing may be given.

In the garden a variety of specimens of the same plant are being treated with chemicals of widely different nature. The result, so far, is curious and interesting. A plant treated with one particular kind of chemical will bloom magnificently, while another, treated with another chemical but otherwise grown under the same conditions as the first, will have a profusion of beautiful leaves, but not a sign of a bud.

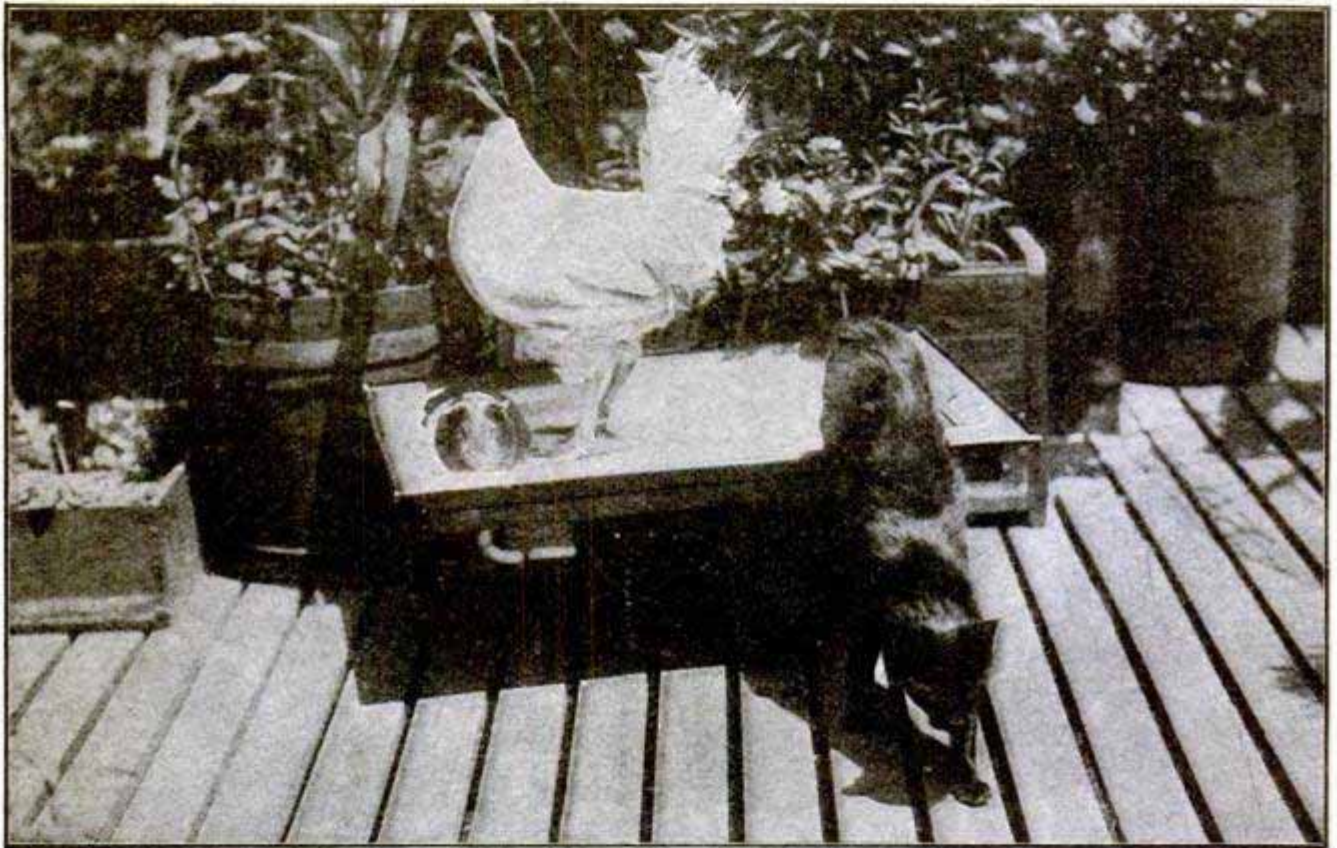
Some of the blooming beauties, treated with one kind of chemical, will flower with a gorgeous red, while another, of the same family exactly, will bloom out in blue or yellow colors or in delicate tints never achieved by that particular flower before.

Flourishing in one corner of the garden is a happy little family of camphor trees. Thriving on the drug diet provided by Dr. Kraemer these plants promise an object lesson to the Department of Agriculture of the possi-

success. Prof. Kraemer intends to prove.

His experiments in drug plants also include digitalis, which, when compounded with strychnine and morphine, forms the basis used in the treatment of alcoholism. The plant can be seen in all stages of cultivation, and through his experiments Dr. Kraemer makes the statement that strychnine produces the same effect as a stimulant as does alcohol.

Of his work in modifying the tints



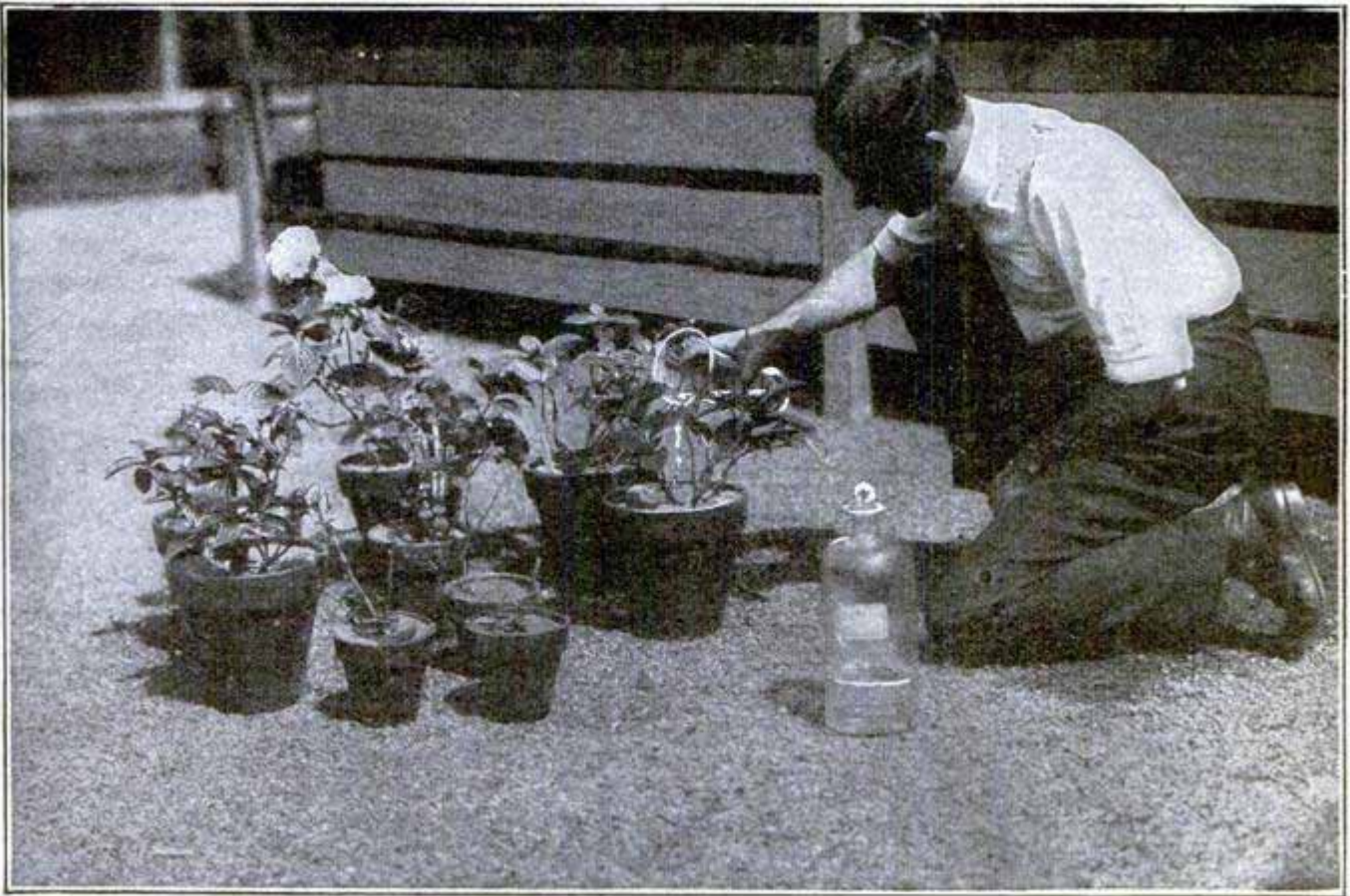
Drugs Are Tested on These Animals First

bility of establishing camphor plantations in America. The camphor trees in the roof garden were raised from cuttings obtained from a grove of these trees now growing wild in Florida. Forty years ago the trees were set out as an experiment by the Department of Agriculture. Later their cultivation was given up as a failure.

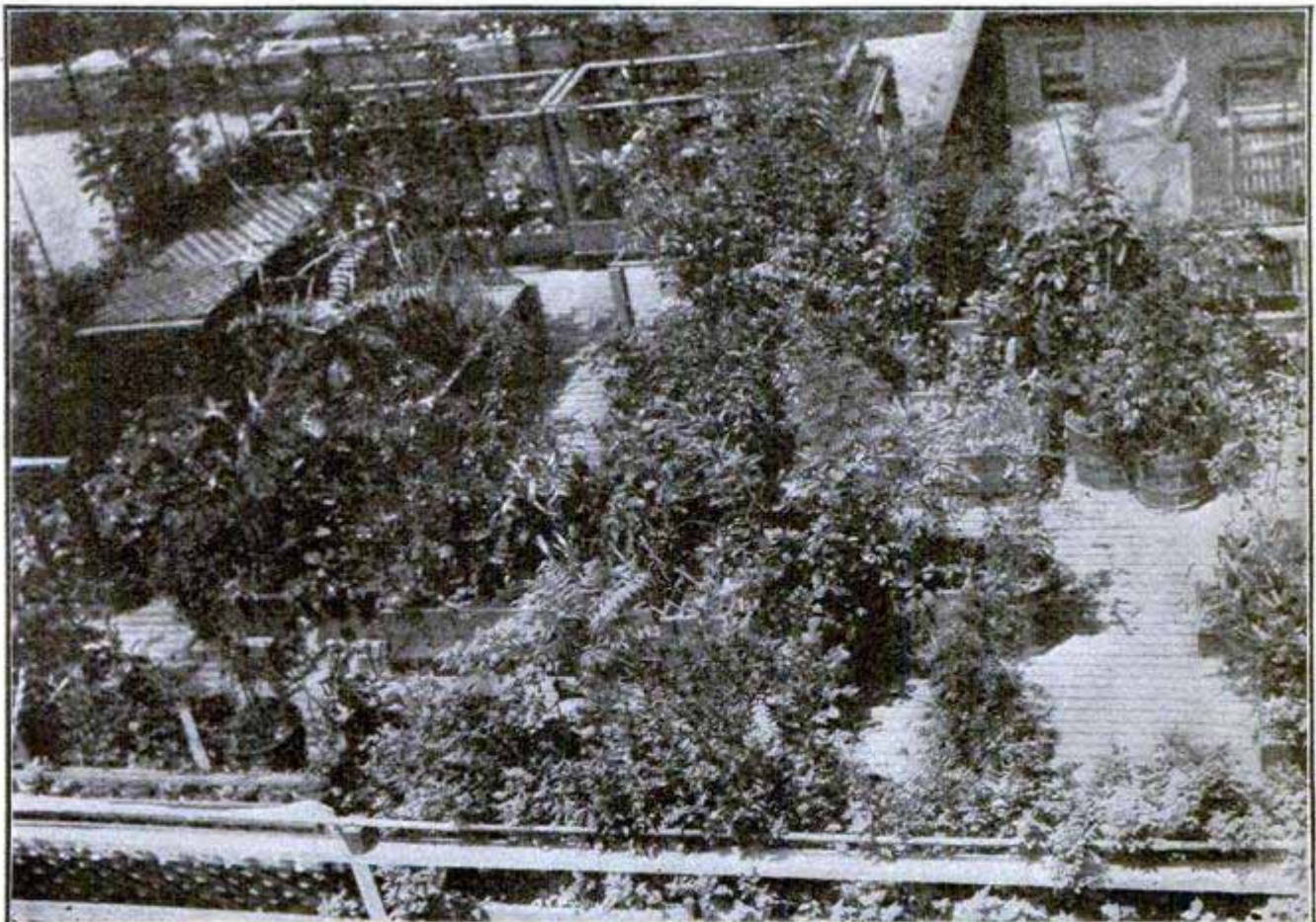
In another part of the garden is growing a specimen of the original licorice plant brought from Spain by the late Henry R. Rittenhouse, who made a fortune by cultivating this commercial product. That the plants can be grown in the United States with

of flowers by means of the drug treatment, Dr. Kraemer says:

"Various soils have been experimented with, including an artificial soil, and sand to which a special nutrient was added. The chemicals used to modify the color principles were supplied to the plants in the form of solutions of varying strength, or added to the soil in the solid form, the solution gradually taking place. Probably the most striking result which I obtained by the use of chemicals was the production of a red color in the petals of the white rose, Kaiserine. The red color occurred in the basal portion of



Several Plants to Which Chemicals Are Administered Daily



A General View of the Roof Garden

the petals and was produced in the flowers of plants which were supplied with potassium hydrate, potassium carbonate, calcium hydrate and lead acetate. The Kaiserine rose tends to yellowish, but not to pink or red, and therefore the red color produced in the petals is a new character.

"As to the explanation for the change I can only suggest two reasons: Either the added chemical reacts directly with a compound already present in the petals, or has induced the formation of an entirely new substance; or the color substance formed in other parts of the plants, as in the leaves, has been transported to the petals through the influence of the chemical."

About 30 chemicals were used as

color control agents. These were supplied to the soil in which the plants grew in both solid form and in solution. Some experiments were also made with hypodermic injections of the solutions into the flower stalks and by inserting tubes containing solutions into the stems. These two methods, however, only gave negative results.

The small menagerie which forms an important auxiliary to the garden is also of great interest. It contains cats, guinea pigs, 'possums, and fowl, upon which he tests the effect of his experimental drugs by inoculation before applying them to the plants.

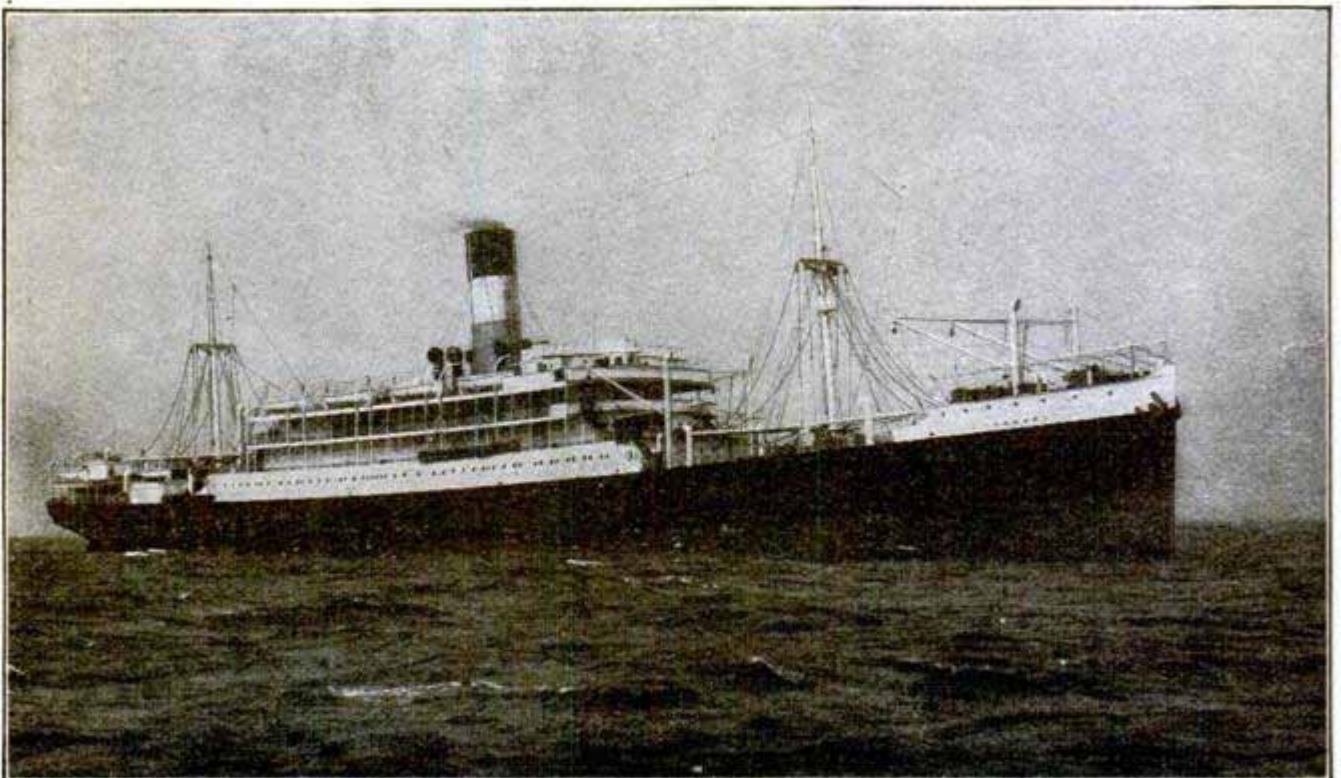
It may be years before the result of some of the experiments can be definitely known.

BRITISH STEAMER FOR SOUTH AMERICAN ROUTE

The new South American line steamer "Vasari" built in England for mail and passenger service between New York, Brazil and the Argentine Republic, is as palatial in many respects as the trans-Atlantic liners.

A little over 500 ft. long, and with a beam of 59 ft., she has accommoda-

tion for a large number of first-class passengers as well as excellent quarters for second-class. The main saloon is panelled and furnished in light oak, beautifully carved, and lighted with many electric lights in the decorated ceilings and silver sconces around the walls. The upholstery is of red



Connecting Link Between North and South America

morocco. A large and lofty ladies' cabin or music hall and a smoking room are also provided. The former is painted white and ornamented with delicate raised work of Adams or Wedgewood design. At the after end of the smoking room, which is done in walnut and provided with an open fireplace, is a sheltered alcove which forms an open-air cafe. This is for use when voyaging in the tropics.

The accommodation for second-class passengers is on the shelter deck aft, and this is also provided with an open-air cafe. During her trial trips the vessel made a speed of 18 miles an hour.

WEATHER KIOSK TAKEN FOR MAIL BOX

The postal authorities of St. Louis experienced much trouble in keeping people, especially the foreign element, from cramming their letters into the curved framework of the new weather kiosk placed in front of the postoffice and federal building. It became necessary to attach a sign to the instrument which foretells the weather, winds,

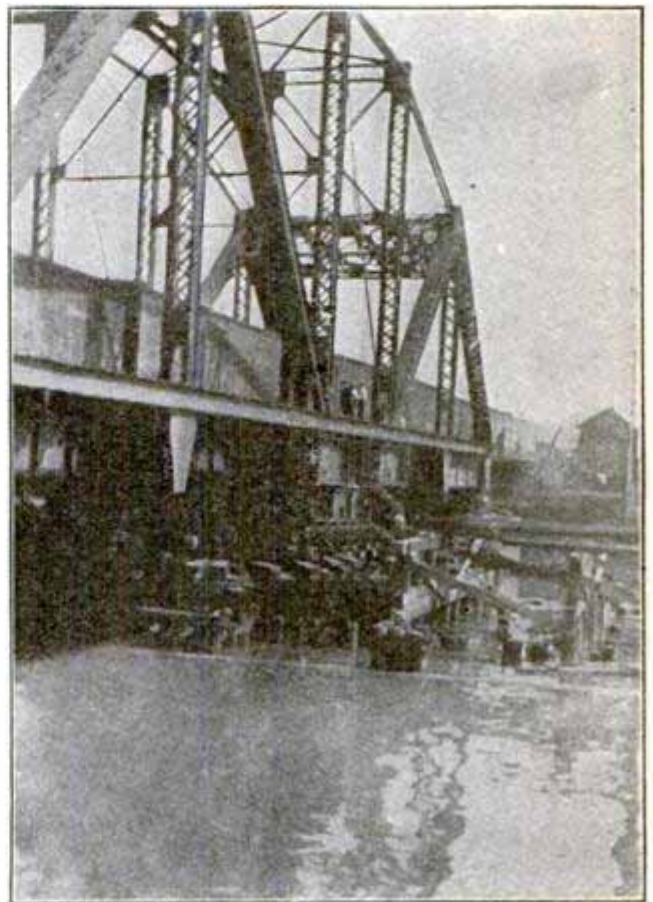


U. S. Weather Kiosk

and vagaries of the elements, setting forth that it was not a letter box.

ANOTHER BRIDGE-RAISING FEAT

This illustration shows the Chicago, Milwaukee & St. Paul railway bridge



Train Crossing Bridge As It Is Being Raised

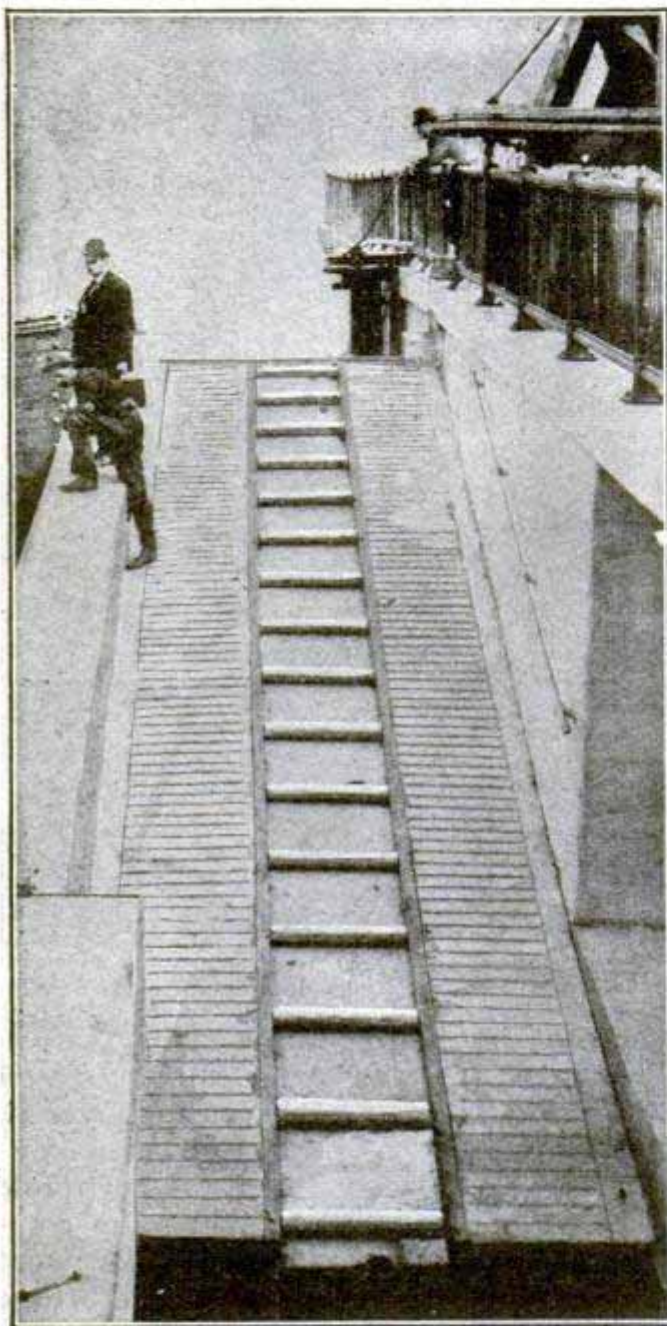
across the Kinnickinnic river at Milwaukee as it was being raised 7 ft. 11 in. while trains were crossing over it. More than 60 hydraulic and "whiskey" jacks were placed under the turntable and at both ends, and when the command was given all the jacks were worked at once, thus raising the bridge evenly. The bridge was raised 21 in. a day.

HOSPITAL CHILDREN SEE OUTDOORS THROUGH MIRRORS

The little children who are confined to beds in the Orthopedic hospitals in Seattle, Wash., are now able to watch their more favored companions at play on the surrounding lawns and enjoy the outdoor scenes because of a thoughtful provision of large hand mirrors. These the children hold in a position to reflect the out-of-doors.

INGENIOUS LOCK FOR CANOES

In improving the waterways under its control, the Metropolitan park com-



Waterless Canoe Lock

mission of Boston has just completed a concrete dam, with locks for power boats and canoes at the Old Craddock bridge over the Mystic river at Medford. The lock for motorboats is the same as other locks for small boats, but the waterless canoe lock, shown in the illustration, is of ingenious construction. It is a concrete runway with a gradual incline which runs to a peak and then down the other side. The center of the runway is set with rollers and the concrete space on each side is grilled to provide steady footing for the

canoe owners, who, in making the portage, step out of their canoes and drag them up the incline on the rollers.

"LUSITANIA" BREAKS THREE RECORDS

Hardly a month passes that the "Lusitania" or "Mauretania" does not break a previous record, but on a westward trip that ended Sept. 2 the "Lusitania" broke three records. She made the passage from Queenstown in 4 days, 11 hr., and 42 min., clipping 3 hr. and 18 min. from its previous fastest time. It maintained an average speed of 29.70 miles an hour for the entire voyage, beating the "Mauretania's" record of 29.63, and finally, by landing its passengers before 8 o'clock on the night of its arrival, it became the first liner to dock on the fourth day out from Queenstown. Both ships before have left Queenstown on Sunday and reached the Ambrose channel lightship too late to dock before Friday morning, but on this trip of the "Lusitania," the first in the new schedule, it was possible to get to New York before the 8-o'clock hour after which all ships must wait entrance until the following morning.

Before this is read by the public either boat may have beaten even this record.

DISPLAYING HOSE IN FORM OF BELL

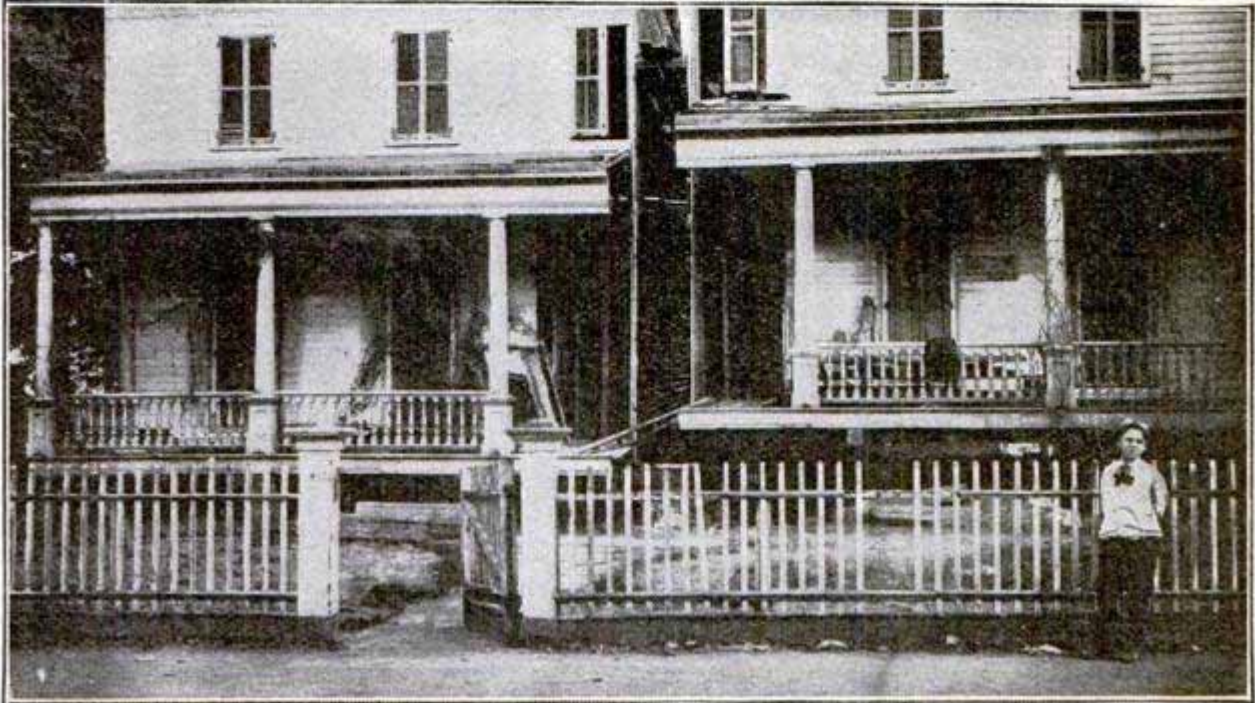
Displaying garden hose, rope, chain, or wire in the form of a bell is a simple and effective method of bringing these articles to the attention of customers. The frame which forms the bell after any one of the above mentioned articles is wound around it is composed of six pieces of wood, the outer edges of which are toothed, put together as shown in the illustration. A chain, knotted at the end, forms the clapper.



TWO HOUSES FROM ONE HOUSE

This large farmhouse stood in a section of Long Island where there is nothing but farms, and where at pres-

a red light on the left, and a white headlight in front on top. The green and red lights must be visible in front and laterally, and the headlight must project its rays forwards and downwards.



House Sawed Through Center to Make Two

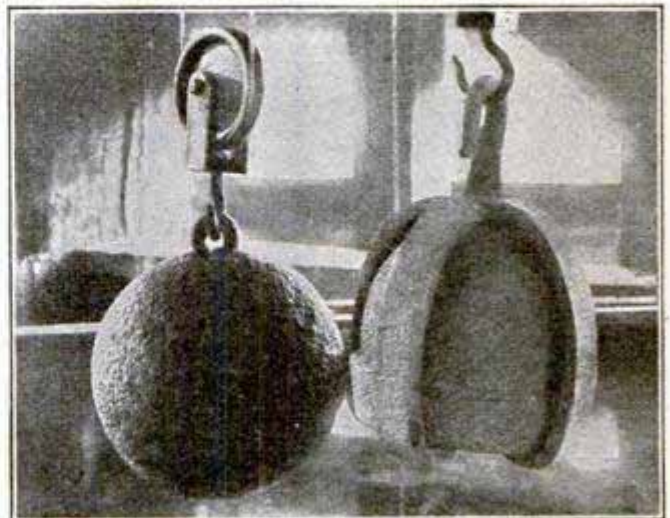
ent smaller houses are largely in demand. Therefore it was sawed in two with hand saws; one half was left standing in its original position, and the other half was moved to another location, making two dwellings out of the one.

CANNON BALL AS CLOCK WEIGHT

An extraordinary old clock in the church of St. George, Esher, England, has been started again after being silent for 30 years. The clock is at least 300 years old, and its weights are can-

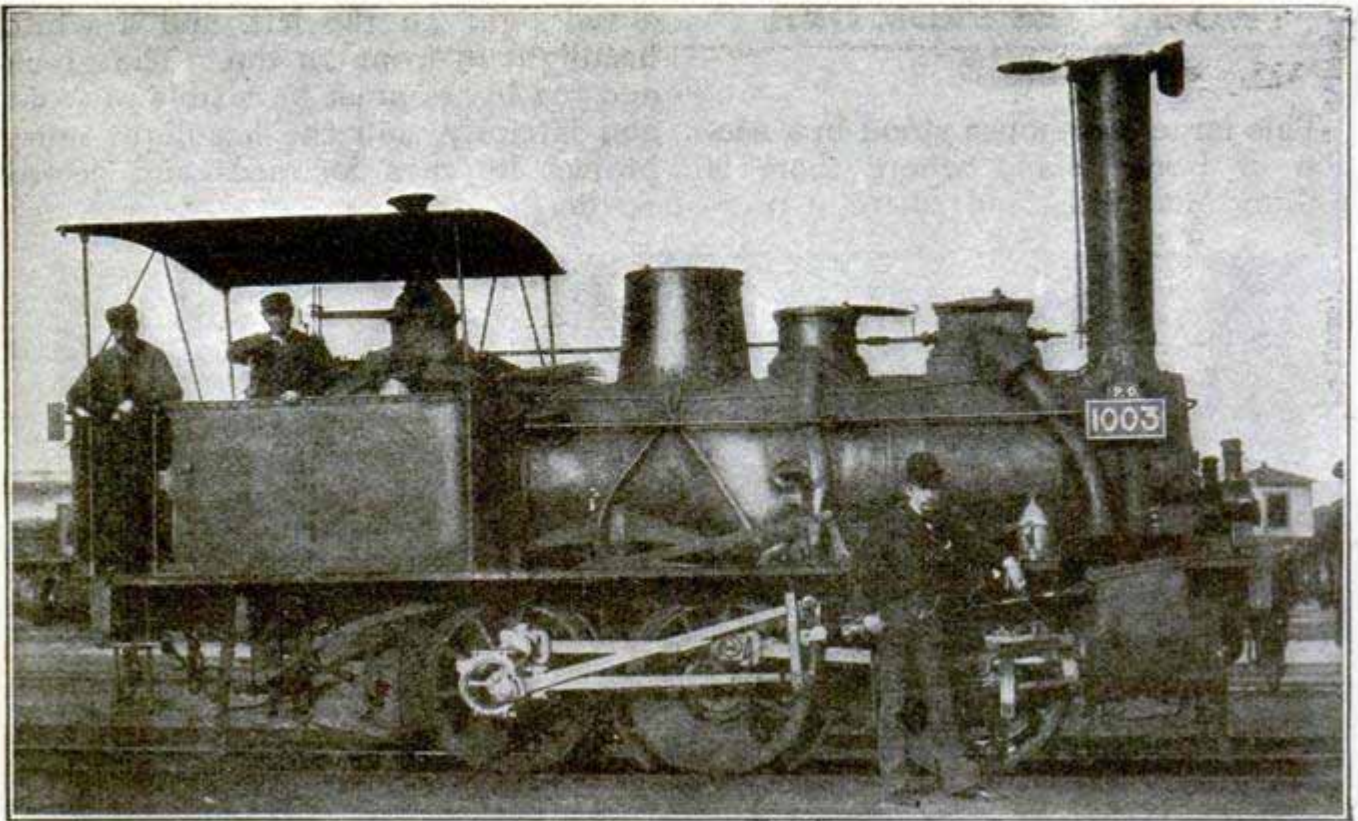
RULES OF THE AIR

The commission "Aerienne Mixte," which is the ruling body of France in matters aeronautical, has issued the following rules relating to travel in the air: Two flying machines, which, in approaching one another, seem likely to collide must both keep to the right. They must pass one another at a distance of at least 150 ft. apart, unless they are flying at altitudes differing by more than 90 ft. Dirigible airships must avoid each other by a distance of at least 1,500 ft., but are free from this condition if at altitudes differing by at least 450 ft. Every machine flying at night or during foggy weather must carry a green light on the right,



Cannon-Ball Weight of 300-Year-Old Clock

non balls, one of which is shown in the illustration.



Old Tank Locomotive Used on the Paris-Orleans Railway

HOW TO MAKE A TABLE FOR THE DEN

The accompanying table is especially appropriate for the den; it might be used in any other part of the house as well. It may be built of plain sawed red oak, or of quarter sawed white oak.

Order the material as follows:

- 1 top piece, $\frac{3}{4}$ in. thick by 36 in. square, S-2-S.
- 4 legs, $2\frac{1}{2}$ in. square by 3 in. long, S-4-S.
- 2 upper horizontals, $1\frac{1}{4}$ by 2 by 36 in., S-4-S.
- 2 lower horizontals, $\frac{3}{4}$ by $2\frac{1}{2}$ by 35 in., S-4-S.
- 4 keys, $\frac{1}{2}$ by 1 by 5 in., S-2-S.

Lay out and cut the circular top first. Next cut the four legs to length. To get the slopes for the ends of the legs and the shoulders of the tenons, lay out a full sized drawing in pencil and lay the bevel along these lines, adjusting the parts to the lines.

The top horizontals have grooves cut on either side to allow the posts to "set in." This is to give the frame more rigidity. The lower horizontals or stretchers are to be tenoned through the posts and keyed. That the keys may be alike in size, a good plan is to make them first, then make the mortises in the stretchers to correspond. Work the keys to the proper thickness, unless they were ordered so, then to length and joint one edge straight and square. Next lay off across the key the lines A and B of the drawing so that A shall measure $\frac{1}{2}$ in. and B $\frac{3}{8}$ in. Draw a sloping line through these



Table Completed

The wood should be thoroughly seasoned and devoid of imperfections.

points and work this edge of the key to size and shape. Round the top of the key as shown. Then mortise in the tenon, for the key can then be laid out to $\frac{1}{2}$ in. for the top opening and $\frac{3}{8}$ in. for the bottom.

The most satisfactory finish for Mission designs, and the easiest to apply, is wax. It is an old finish that was superseded by varnish. Our ancestors used to make wax polish by "cutting" beeswax with turpentine. Cut up the beeswax and add to it about one-third its volume of turpentine. Heat to the boiling point in a double boiler. Or, melt a quantity of beeswax and to this add an equal volume of turpentine. Care must be taken that the turpentine shall not catch fire.

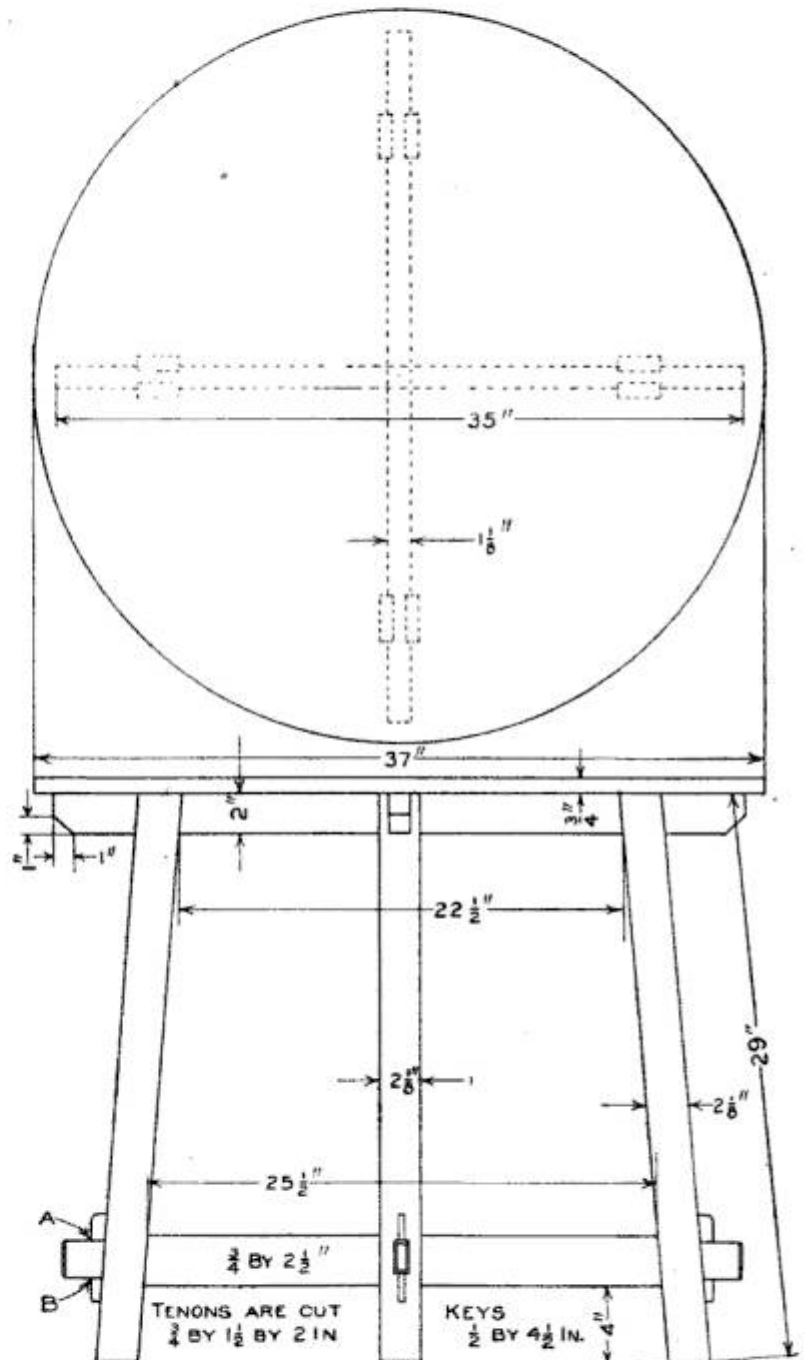
Rapid drying and hardening waxes can be purchased now-a-days. They require a smooth surface and a thin application for a successful result. Too much wax upon a rough surface will produce very ugly, white, chalk-like spottings as the wax dries. These are especially noticeable upon dark finishes. Waxes colored black overcome this, but are not necessary if the ordinary wax is properly applied. 1—Stain the wood, if a very dark finish is desired. 2—If the wood is coarse grained, put on one or two coats of paste filler and rub it off carefully, that a smooth surface may be prepared. Allow the stain 12 hours in which to dry, also each coat of filler. 3—With a soft cloth apply as thin a coating of wax as can be and still cover the wood. Wax is in paste form. 4—Allow this to stand five or ten minutes, then rub briskly with a soft dry cloth to polish. 5—Let stand 24 hours, then apply another coat.

A thin coat of shellac applied to the filler brings out the grain of the wood and makes an excellent base for the

wax. It should be allowed to harden well, then be sanded with No. 00 paper.

HINTS ON ROAD SIGNS

An English writer on questions concerning automobiles and automobilists suggests the designing of a few sym-



Details of Table Construction

bols for road signs to convey information concerning certain helpful little things. A few such symbols are readily learned and might indicate the presence of a telegraph office, a station, a blacksmith shop, garage, or hotel in nearby villages.

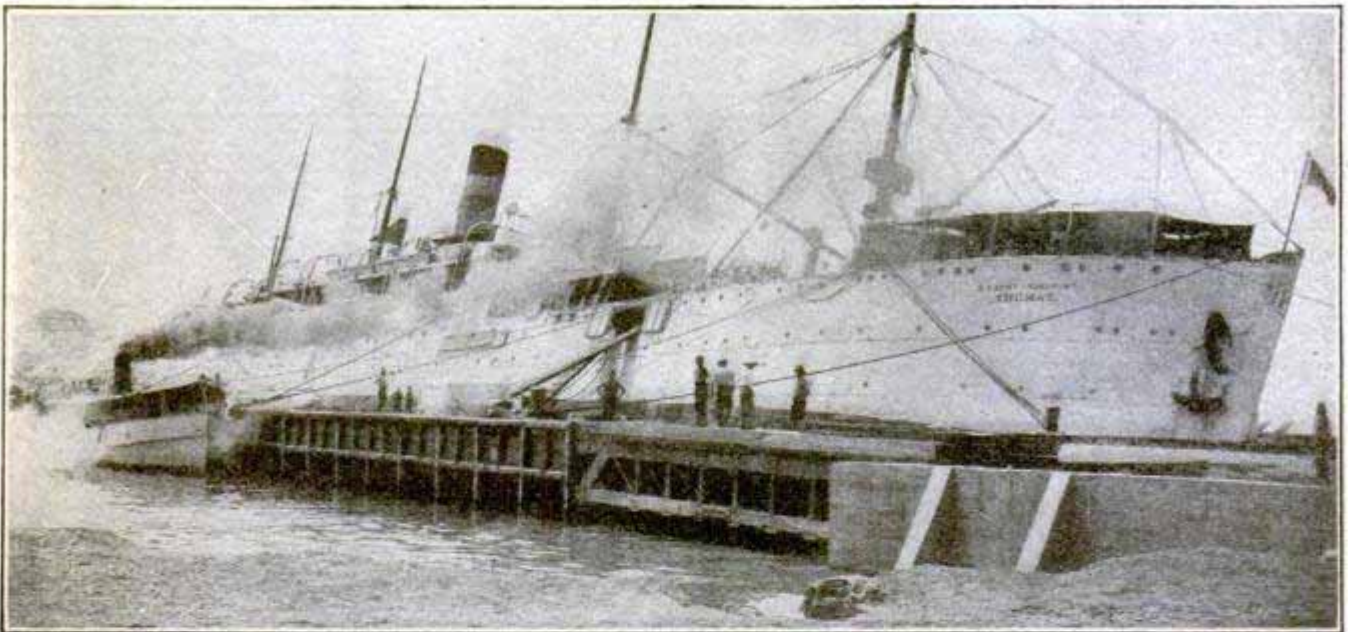
ELECTRIFYING THE U. S. ARMY

The Wonderful Achievements of the Army Signal Corps—Still Greater Opportunities in Future

By *Monro Woolley*

The importance of the signal corps of the United States army, Indian campaigns notwithstanding, was never quite fully appreciated until the Philippine insurrection furnished a fitting

of the men who compose this branch of the army, but their chief aid is electricity, and it can well be said that their task is the electrification of the U. S. fighting forces.



Wireless Antenna Hung from Smokestack—First U. S. Transport Equipped with Wireless (Vessel on Fire at Time Photograph Was Taken)

theatre for its exploits. In the Islands the organization, though small and but fairly well equipped, accomplished some really wonderful things, being instrumental in no small degree in making a success of that long and irksome campaign.

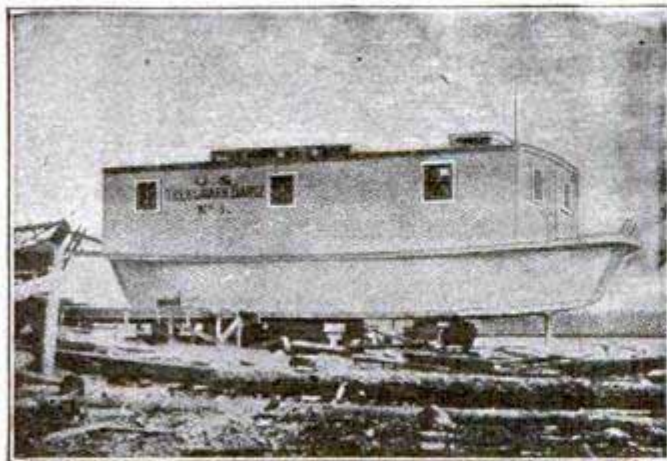
Credit is, of course, first due to the bravery and ability to suffer hardships

Almost in advance of the fighting troops in the Philippine campaign, the boys of the "lightning jerker's brigade" went undaunted to raise their poles and string wires. With nothing save a six-shooter and a "bunch" of nerve for protection, many a lineman met a horrible end as he wandered looking for "trouble" on the lines through the jungles.

In one short month the corps strung more wires and laid more cable than Spain strung and laid in all her years of possession. In four short years of American occupation the archipelago has become a network of wires which reach the farthest island and touch the most remote interiors. It is a system, at least in point of territory covered, which can be equalled in few places in the United States. Today, at a cent a word, a telegram can be sent from Aparri in the north to Zamboanga in the south, from Palawan in the east to Guam in the west, with the surety of a reply, not in a week or a month, but in a day or an hour. The system is now a part of the Bureau of Posts, under the civil government, embracing both telegraph and cable, and furnishing a large number of positions to ex-corporal men.

It is a long jump from the old wig-wag to the telegraph, and still another great jump from the ordinary telegraph to the wireless, but the signal corps of today, instead of campaigning 10,000 miles from home, is giving its undivided attention to experiments and improvements. It has its electrical laboratories, its wireless stations, its airships, flying-machines, and aerial and electrical experts. Nearly every coast post, and many of those on islands, are equipped with powerful wireless mechanism.

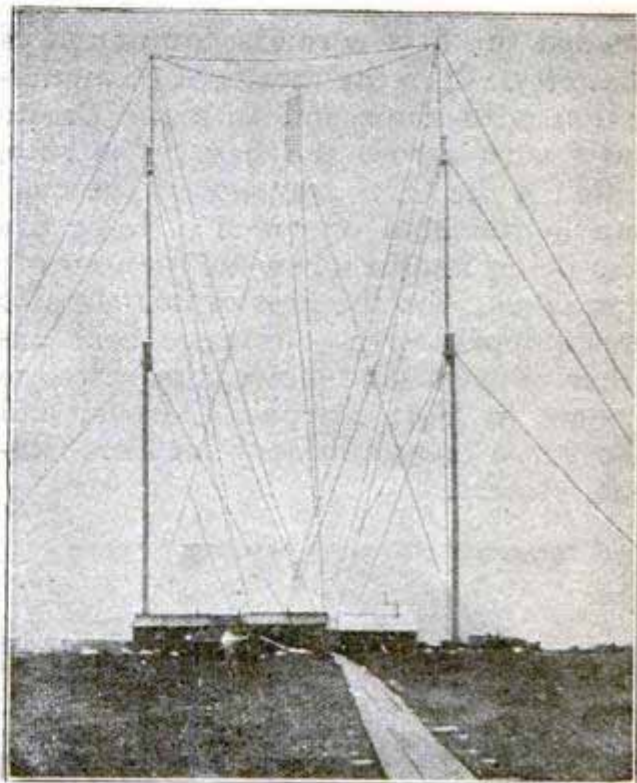
Possibly the greatest stations are



Telegraph Barge in Alaska

those in Alaska, where communication by ordinary means is difficult and uncertain. The Alaskan stations are

frequently in communication with the Puget Sound forts, the station at Fort Worden often picking up messages



Wireless Station in Alaska

from the Mare Island navy yard, and from Point Loma, near San Diego, many hundred miles away.

The army transports are now, with few exceptions, equipped with wireless instruments operated by signal-corps enlisted men, so that their arrival in port can be announced in advance.

The educational department of the corps includes several service schools for technical and practical study, having modern shops, plants, etc. These are now training electrical sergeants for the coast artillery, the largest school being located at Fortress Monroe, Va. The position of electrical sergeant pays from \$35 to \$60 a month, according to length of service, with rations, private quarters, clothing, and the other necessities furnished by the army.

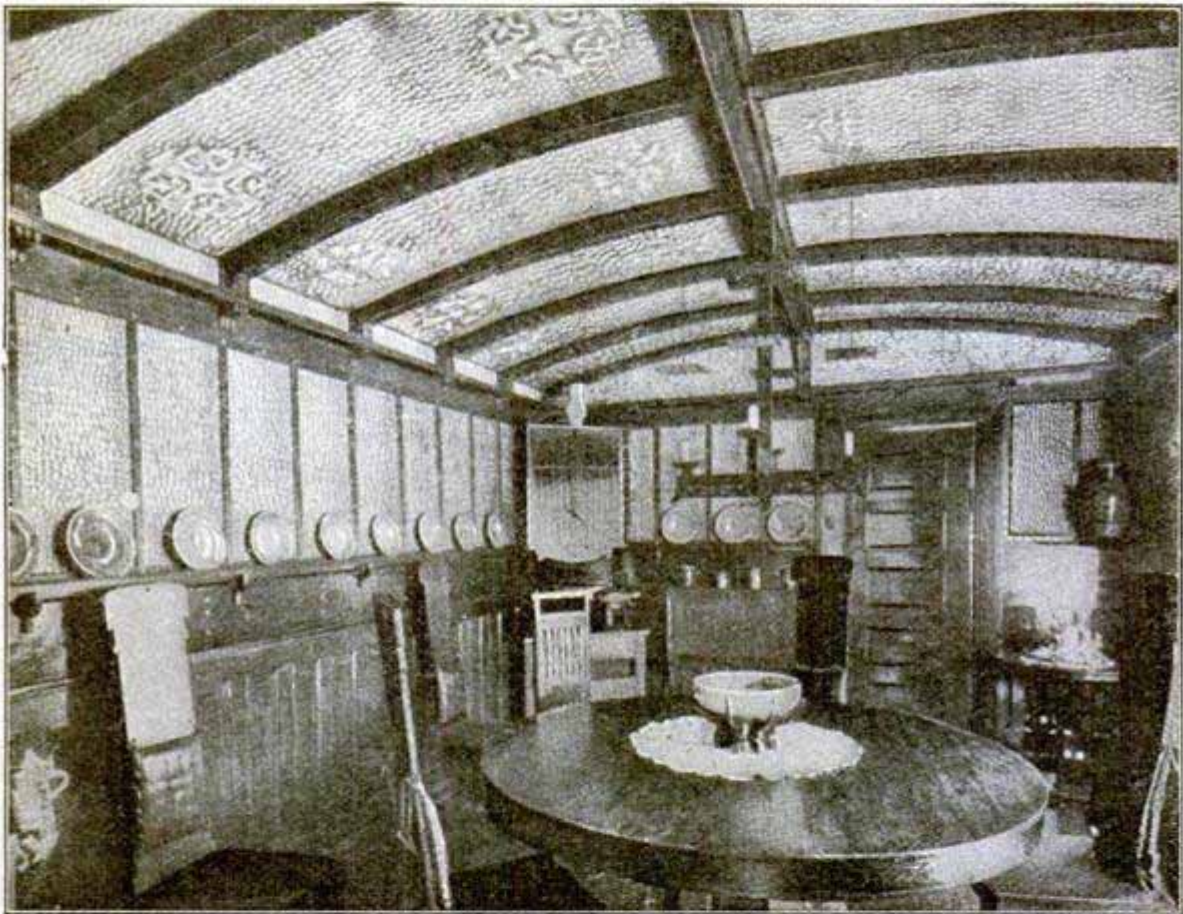
The signal corps, in fact, offers a large field for electrical students. A person of only ordinary electrical ability can with a little perseverance, rise from the grade of private to that of master signal electrician, which carries the highest pay obtainable in the ranks.

The illustrations show different types of wireless stations in charge of the

corps. From the stack of the ice plant, which is the \$1,000,000 project of the civil government in Manila, and one of the largest plants in the world, is suspended the first wireless equipment of that city. It is the means of communication with ships and with the Cavite navy yard across the bay. The ship, which is the U. S. transport "Thomas" and in the hold of which a fierce fire was being fought when the photograph was taken, was the first of her class to be equipped with wireless. Still another illustration shows the wireless system at Fort Michael, Alaska, and another, a telegraph barge at Fort Gibbon, Alaska.

The fibers used in the composition of the board are chemically treated and subject to great pressure. They are made in different sizes and are suitable for the interiors of offices, residences, summer cottages and buildings of a like nature. The boards in their natural color have the appearance of a cream color picture mat, but can be retinted in any color and stenciled.

An excellent idea of how the board is used is gained from this illustration of a dining room. The ceiling and upper part of the walls are finished with the wall-board. The beadings which cover the joints of the boarding on the walls, the beams of the ceiling, and the plate



Modern Room Finished with Shredded Wood-Fiber Boards

INTERIOR WALLS MADE OF SHREDDED WOOD FIBER

A wood composition, known as wall-board, and made of shredded wood fiber, pressed into boards with one embossed surface, is being used as a wall and ceiling covering. It takes the place of plaster and laths and can be very artistically arranged.

rail complete the construction of the room's interior and its decorative scheme at one and the same time.

The practice of drawing up checks on a typewriter, which has crept into usage recently in several large firms, is considered dangerous, inasmuch as typewritten words and figures may be erased and the amount easily raised.

A TELEPHONE TRICK

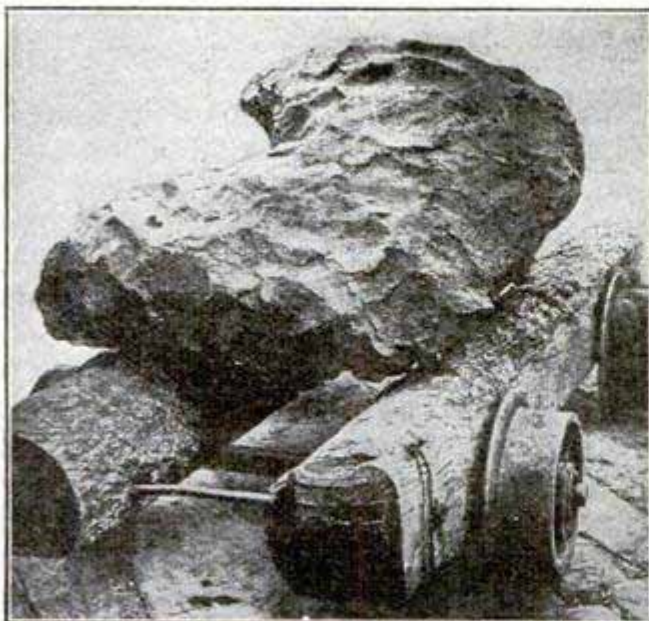
A collector for a telephone company, who makes his collections at the city pay stations and booths, states that it is an old trick for petty telephone swindlers to attach a piece of thread to a dime, drop it into the slot, and when their conversation is ended, attempt to draw back their dime.

But they don't succeed, the collector says, for the slot is so constructed that when the dime is dropped in, after the operator rings the bell, it is absolutely impossible for the dime to again enter, or be drawn back into the slot.

In his daily collections he finds numerous coins of that sort, and he thinks that if the "telephone tricksters" were only aware what a foolish scheme it really is, they would speedily discontinue it.—Contributed by James P. Gorman, Boston, Mass.

HUGE SINGLE MASS OF COPPER

This great mass of pure native copper, weighing 6,000 lb., was found in the Lake Superior copper country in the days when prospecting in that locality first commenced. It was taken from an ancient mine pit 16½ ft. deep, and had upon it the marks of a stone



Massive Nugget of Pure Copper

hammer, probably made hundreds of years previous.

SCENE IN DELFT, HOLLAND

Most Americans would associate a windmill with open fields and trees in



A Windmill in Delft

localities more or less rural. In Holland cities, windmills are as much a part of the structures that compose a community as are oil well derricks in an American or Canadian oil community.—Photo by Miss Beatrice Oliver.

RAILROAD HAS NEWS BULLETIN SERVICE

Three times a day, morning, noon, and night, the through trains on the Great Northern Railroad system are furnished with news bulletins containing the most important events of the day. The bulletins, flashed to the stations the trains are approaching, are handed to the sleeping-car conductors and distributed by them among the passengers. In this manner the people making long journeys are kept in touch with all that is happening of special interest.

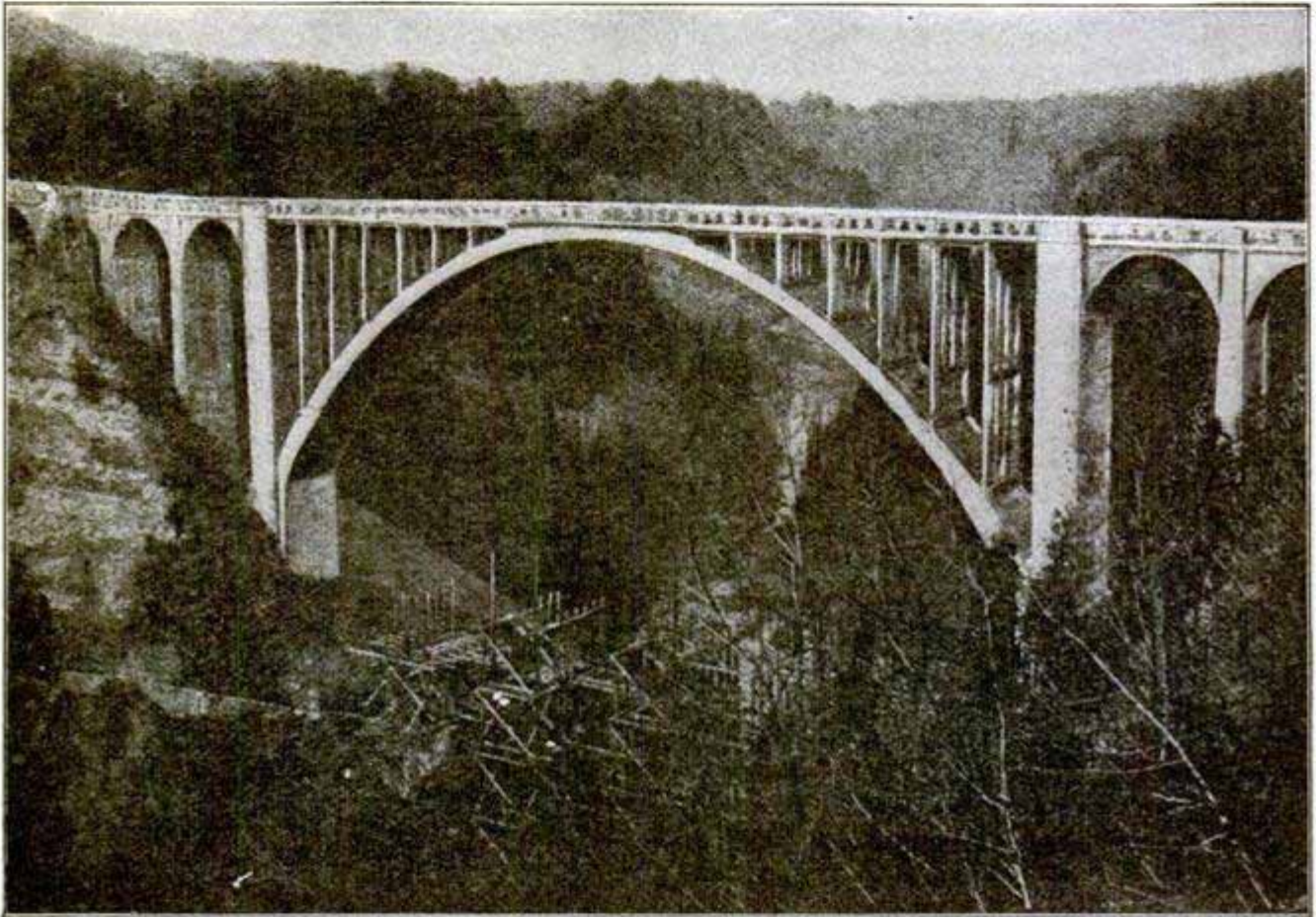
GREAT CONCRETE ARCH IN SWITZERLAND

Until the 280-ft. arch at Cleveland, Ohio, and the 281-ft. arch at Spokane, Wash., are completed, this great reinforced concrete arch of a bridge in Switzerland will have the distinction of being the largest in the world. It

THE MANUFACTURE OF WOOD ALCOHOL

By C. R. Angell

Wood alcohol is an article of commerce familiar to almost every household in the country, yet very few people are acquainted with its method of manufacture or know the localities from



Concrete Arch Has Clear Span of 259 Ft.

carries the highway between the villages of Stein and Teufen across the gorge of the Sitter river. The arch has a clear span of 259 ft., and the roadway it carries is 216 ft. above the level of the river bed.

FROGS EXTERMINATE COCKROACHES

A resident in a suburban district of an American community found his home overrun with cockroaches. He tried all kinds of cockroach remedies without absolute success, then his children made pets of two frogs and brought them into the kitchen. The result was a complete extermination of roaches and other bugs.

which a great proportion of it comes. The manufacture of wood alcohol is one of the greatest industries of the hardwood forests of Michigan, and one of its largest plants is near Pine lake, in the northern part of the state. This plant turns out 600,000 gal. of wood alcohol each year from about 75,000 cords of hard wood, but this is not all. From the same wood is yielded 2,000,000 bu. of charcoal, and, with the addition of limestone, 7,500,000 lb. of acetate of lime. A number of inflammable gases of no commercial value are also secured, and these are burned in the furnaces which heat the huge ovens.

The plant consists of more than a dozen buildings and covers some 40

acres of ground. In the cutting of the wood more than 150 men and 50 teams are employed, while in the wood yards more than four miles of narrow gauge railway are used to carry the wood to the ovens.

The process of securing the wood alcohol from the wood is interesting. In the first place the wood is cut into uniform lengths and is loaded into cars with steel skeleton bodies. These cars are then pushed into the ovens on tracks that branch from the yard railway system, and in these ovens, which are airtight, the wood is subjected to a high temperature for 24 hours, the absence of air allowing it to smoulder but not to catch fire.

The smoke from the smouldering wood passes from the ovens through metal pipes, one for each oven, into tanks containing water. In passing through the water the smoke does not become cooled sufficiently to condense, but loses its tar. Then it passes through a half mile more of pipe to allow it to cool gradually. In this part of the process the lighter gas is separated from the smoke and passes to the furnaces to be used as fuel. The smoke then enters a condenser, consisting of two cylinders, one within the other, and between which water is kept running. After being condensed, the liquor obtained from the smoke is subjected to three distinct distillations, being heated to a gas and then cooled to a liquid in each. After the first distillation the liquor is mixed with limestone, 25 tons of which are used each week. This absorbs the acetic acid, forming the salt known as acetate of lime. The result of the last distillation is wood alcohol of a superior quality.

The wood alcohol is shipped away to be refined into higher chemicals, while the acetate of lime, which is simply a carrier for the acetic acid, is shipped to Europe, where the acid is separated by an exceedingly complicated process. The charcoal is sold for fuel.

A special train between Chicago and St. Paul, Minn., a distance of 407 miles, made the trip in 7 hr., 24 min.

LOCATING WILD BEES' NESTS

This illustration shows the method adopted by many lovers of wild bees' honey in locating a bee tree in the autumn.

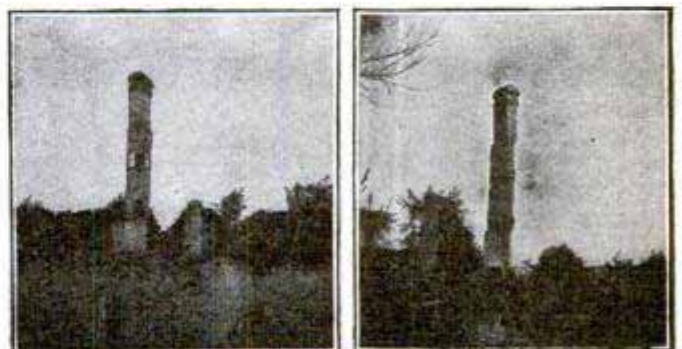


Two pill boxes are baited with sweet water and placed on sticks some distance apart. A couple of bees are caught in these boxes and watched when released. As a result two lines of bees are established between the boxes and the tree in which the nest is located. These bees, flying on a

direct line between the nest and the boxes, indicate the distance of the nest by the degree of angle the lines form.

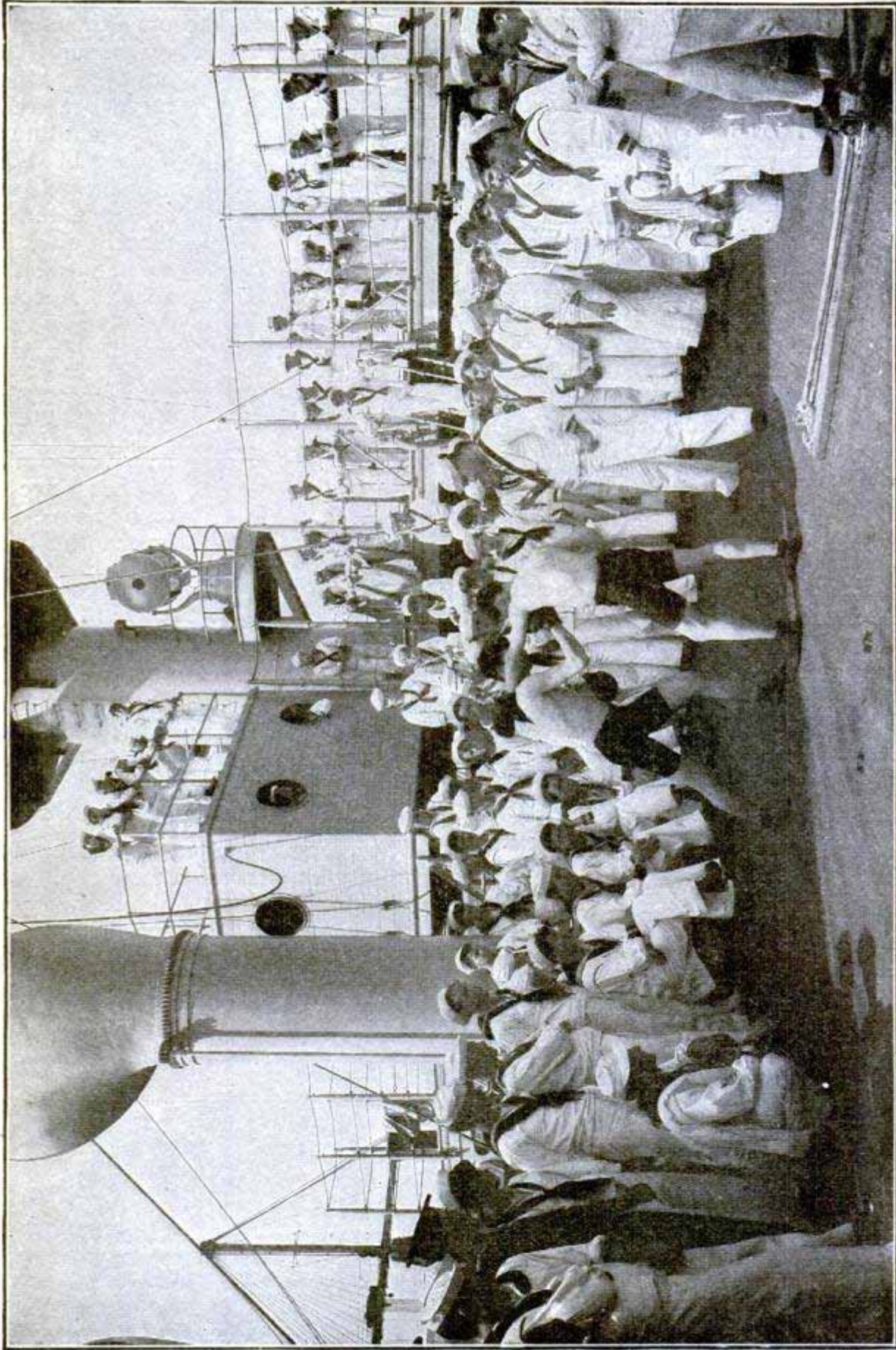
CHIMNEY TWISTED BY STORM

The chimney shown in these photographs was part of a house on Long Island burned down about two years ago. Some time after, as shown in one of the views, attention was drawn to the fact that in some manner the upper part of the chimney had become turned part way around, but still seemed solidly in place. It is believed that this



Extraordinary "Freak" of a Storm

somewhat extraordinary feat of juggling was the result of a wind storm.



Copyright, 1908, by Enrique Muller

LIFE IN OUR NAVY—No. 4, Athletic Sports on Board Ship

EDITORIAL

The daily press is indulging in its annual spasm over the announcement of the deficit in the operation of the Postoffice Department. As the amount of expenses over earnings is \$20,000,000—several millions greater than ever before—the spasm is relatively more severe. Nothing is said about the deficit of \$100,000,000 in the War Department, or the \$115,000,000 in the Navy, or the \$160,000,000 spent in pensions.

While the Postoffice Department is not a model of economic management compared to that of almost any large corporation or firm, yet it is free from scandals, and the alleged "deficit" is in reality fictitious. If all the other departments paid postage on their mail matter, the annual "loss" would be insignificant; and, in any event, the mail service is the one governmental branch which is of most immediate and personal service to the people, and whatever the loss, real or apparent, the service should be steadily enlarged and improved and the rate on letters reduced to one cent.

* * *

The announcement of the double discovery of the North Pole by Dr. Cook and Peary gives to the United States one more territorial possession. It becomes ours without intention or desire by Government, just as the Philippines became ours by an accident of war. In these days it is difficult to imagine any possible commercial value in those frigid, and for the most part, lifeless lands and waters—a desert of snow and ice. Yet the time may come, unlikely as it now appears, that some good use may be found for the north polar region. It will be recalled that Alaska was purchased chiefly as a whaling and sealing ground, and both these industries are already nearly extinct, while the mineral and agricultural value of Alaska has proven to be of very great value.

When Alaska was bought, a railroad in that country was no more improbable than that tourists will some day include the trip to the pole as one of the essentials to the well traveled. With few exceptions history reminds us that where one man has gone and returned others are found to do likewise, and each additional successful journey makes others easier and safer, as routes are selected and provision made for shelter. However, there is no likelihood of any uncomfortably large rush of tourists in that direction for some time to come.

* * *

While the honor of discovery still remains ours, should either one of the two explorers fail to make good to the satisfaction of the geographical tribunal, to which the controversy will doubtless be submitted, it is regrettable that any contest should arise. The one possible recompense to the hundreds who have gone into the icy darkness of the mysterious North, has been the hope of winning a place among the world's few great discoverers.

No hope of buried treasure or mines of gold, of valleys filled with precious stones, has led them on, as tempted the mariners of the 17th century. Fame alone was their aim, and only two have reported success after more than seven hundred had lost their lives in fruitless efforts.

The practically simultaneous discovery of great things is, however, nothing new. The Washington Post calls attention to the almost simultaneous discovery of the law of gravitation by Newton in England and LeBuet in France; of the reciprocating steam engine by Watt and Stephenson; of the planet Neptune at the same hour by Adams at Greenwich, England, and, Jean Leverrier at Paris, France. Two patents for the telephone, both identical in specifications, were filed at the office in Washington within fifteen minutes by men total strangers to each other. The litigation subsequent to this event cost millions of dollars.

The steady increase by fire departments in the use of motor-driven apparatus is another reminder of the passing of the horse, at least in cities. This season has witnessed a much smaller number of horses on the streets and boulevards; in fact, a horse-drawn pleasure vehicle is hardly safe when driven on streets used by motors, and has become positively unattractive to those who have once used a car. The elements of time, speed, reliability, and control are all in favor of the motor car, while the relative cost of operation is not much in favor of the horse, and soon will be against him. Taxicabs are driving out the horse cabs, and delivery and heavy team trucks are putting on engines. The increase in the number of this type from now on will be rapid.

* * *

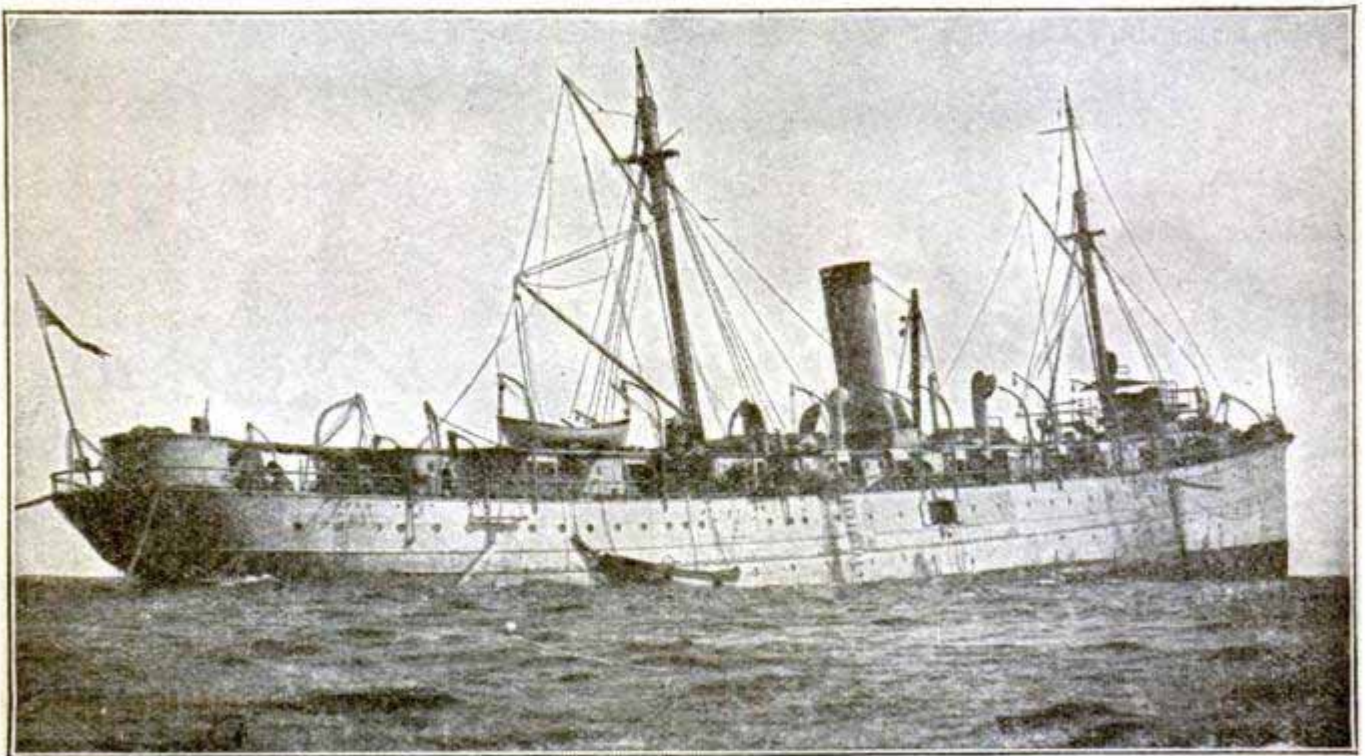
On September 1st a unique but useful law went into effect in the State of Kansas. The public drinking cup is now unlawful there. In railroad trains, schools, theatres, parks and all places of public resort drinking cups must not be used promiscuously. It is a great sanitary reform which deserves to be taken up and copied in every state.

Of all the unclean, offensive and danger-laden objects with which people come in contact, the public drinking cup is the worst. It is handled by all classes of people, the clean and the filthy. One minute it serves as a washbowl, the next a little child has it pressed to its lips. Contemplation of the subject is repulsive in the extreme, but to some things we are so careless and hardened that it is necessary to mention disgusting details. The public drinking cup spreads more disease in an hour than a board of health can control in a week or month. There should be a national awakening on the subject and Kansas deserves credit for having blazed the way.

THE ILL-FATED U. S. S. "YANKEE"

This illustration shows the U. S. S. cruiser "Yankee" as she appeared after

striking a rock near the mouth of Buzzard's bay, Mass., late last winter. After being released from the rock she again sank while being towed to New Bedford.



The "Yankee" Raised After the First Disaster

EXPERIMENT LABORATORY ON MOUNT WHITNEY

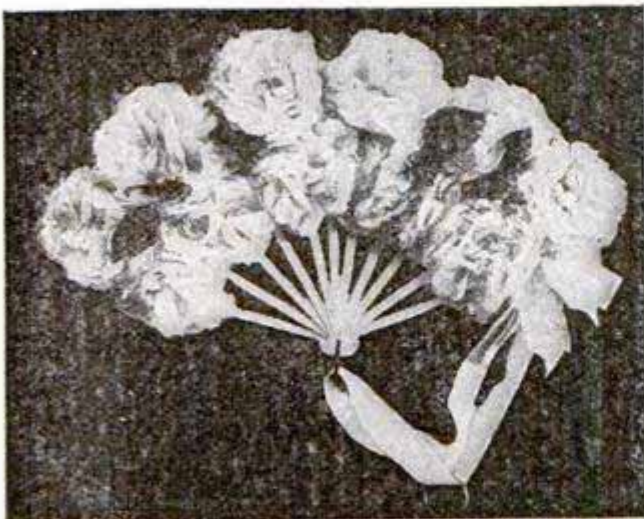
Reports from the west announce that the Smithsonian Institute will soon build a small but fully equipped experimental laboratory on the pinnacle of Mount Whitney's vast snow peak. This mountain is located in southwestern California, is part of the Sierra Nevada range, and reaches an altitude of 14,000 ft. above sea level. It will become the highest scientific station on the western continent.

CURTISS WINS IN ITALY

Glenn Curtiss, not content with carrying away the chief honor at the Rheims aviation meet, repeated this performance at the International aviation meet at Brescia, Italy, in September. In his flight for the grand prize he covered 31.05 miles in 49 min. 24 sec., carrying away \$6,000 as his share of the \$10,000 prize. He also won the prize for quick starting, his time being $8 \frac{1}{5}$ seconds.

FANS OF IMITATION FLOWERS

One of the most popular novelties of the past season abroad were the floral fans, made in imitation of all kinds of flowers, and scented according to the flower they represent. When open the

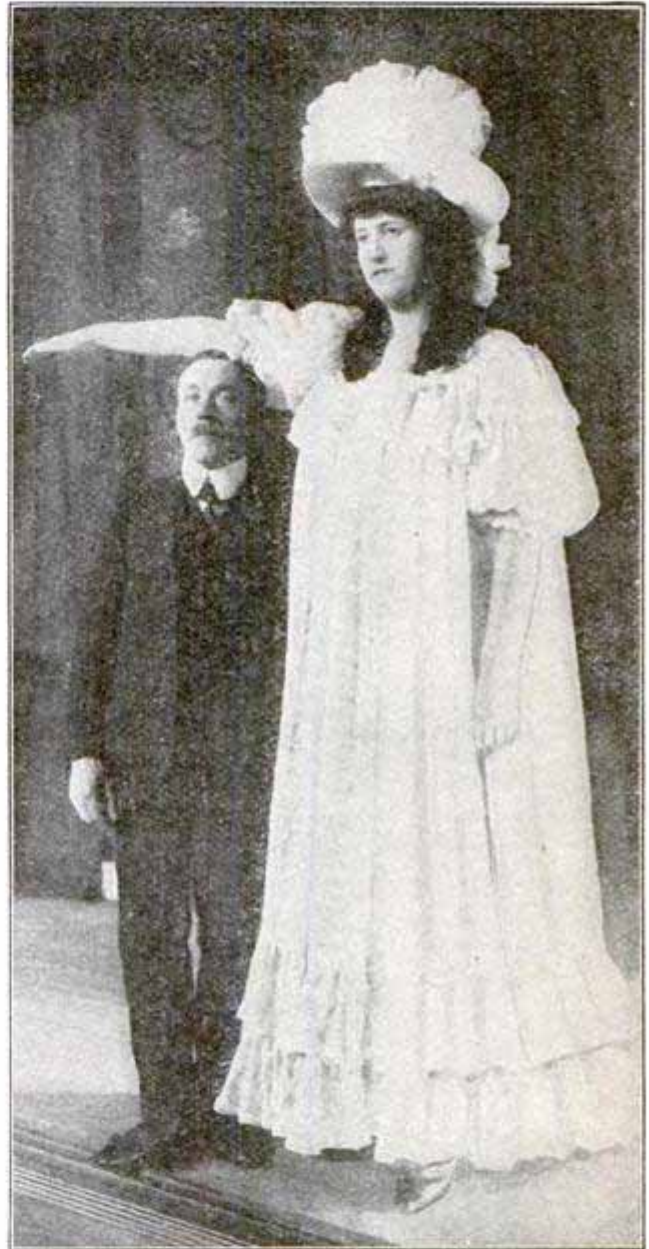


Imitation Rose Fan

fans show single blossoms, and when closed represent a bunch of flowers.

WOMAN 8 FT. 6 IN. TALL

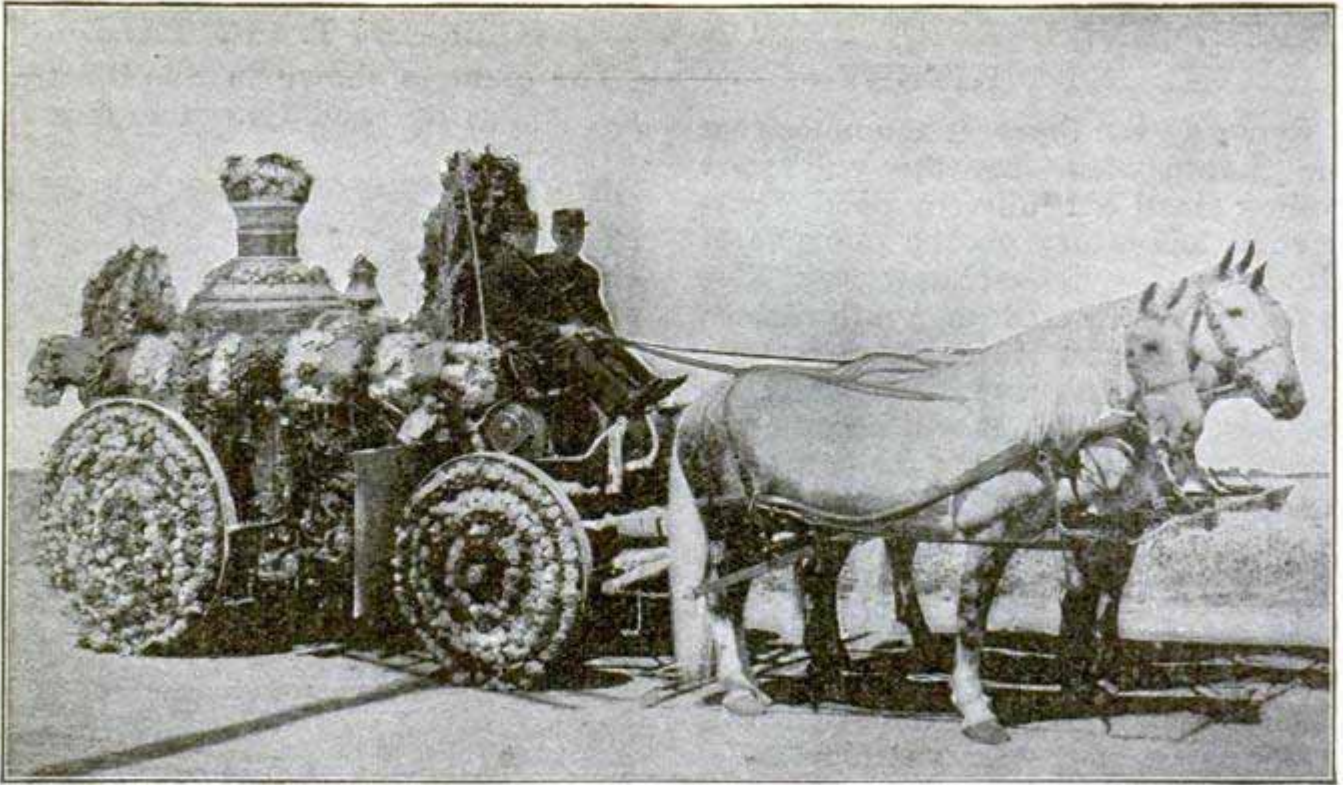
The giantess shown in this illustration is now on exhibition in France as



Tallest Woman in the World

the tallest woman in the world. Her height is 8 ft. 6 in., and her build is in proportion to her height. The man standing under her outstretched arm would be considered a tall man if he were not dwarfed by his surroundings.

An attempt at blackmail by the aid of carrier pigeons has been made in Paris. A pigeon was sent to the threatened man along with instructions to place a French note of \$200 value in a little box beneath its wing, under penalty of having secrets exposed.



Fire Engine Transformed Into Thing of Beauty

FIRE APPARATUS DECORATED WITH 10,000 ROSES

Two of the most beautiful displays in the Rose Carnival at Portland, Ore., were the fire engine and hose wagon of Co. 15, shown in these illustrations. Nearly 10,000 roses were used in the



Hose Wagon Buried in Roses

scheme, and the result was unusually artistic.

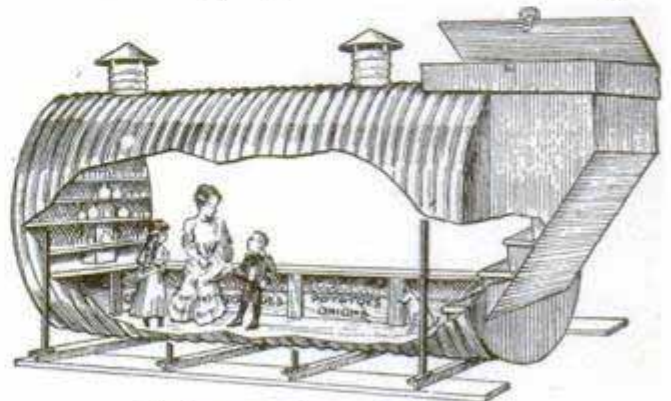
STEAMSHIPS DIRECT FROM MEMPHIS TO NEW YORK

A body of men in Memphis, Tenn., are agitating a steamship line between that port and New York direct without breaking bulk. Light draught steamers have been tried on this ocean route before, according to one of the marine authorities, and were failures because of the tossing they received. The same

authority insists that as the steamers that go up the river to Memphis could not draw above 10 ft. of water they would be sorry sea boats in the winter time in the Gulf and the South Atlantic ocean.

IRON CYCLONE CELLAR

A metal concern in one of the cyclone states of the west is manufacturing a cyclone cellar of extra heavy galvanized corrugated iron. The cellar has a cylindrical shape, and is provided with stairway, seats, shelves, and bins. Under ordinary conditions it is used for the keeping of fruits and vege-



Cyclone and Storm Cellar of Iron

tables. The whole is anchored solidly in the ground and thoroughly braced.

TIME AND ITS MEASUREMENT

By James Arthur

PART IV

In which the author unfolds a plan for universal time and describes the watch and clock of the future, which will be absolutely correct, without the use of springs, gears, or pinions.

The mystery of time encloses all things in its folds, and our grasp of its infinite bearings is measured by our limitations. As there are no isolated facts in the Universe, we can never get to the end of our subject; so we know only what we have capacity to absorb. In considering the foundation on which all our time measuring is based, we are led into the fringe of that Elysian field of science—astronomy. A science more poetical than poetry—more charming than the optimistic phantasies of youth. That science which leaves our imagination helpless; for its facts are more wonderful than our extremest mental flights. The science of vastness and interminable distances which our puny figures fail to express. "The stars sang together for joy," might almost be placed in the category of facts; while the music of the spheres may now be considered a mathematical reality. Our time keeping is inevitably associated with these motions, and we must select one which has periods not too long. That is, no *continuous* motion could be used, unless it passed some species of milestones which we could observe. Consequently, our clocks do not—in the strict sense—measure time; but are adjusted to *divide* periods which they do not determine. We are constantly correcting their errors and never entirely succeed in getting them to run accurately to *periods of time* which exist entirely outside of such little things as men and clocks. So a clock is better as it approximates or bears a regular *relation* to some motion in nature. The sidereal clock of the astronomer *does* run to a regular motion; but our 24-hour clocks *do not*, as we shall see later. Now consider the year, or the sun's apparent motion in the Zodiac, from any given star around to the same one again. This is altogether

too long to be divided by clocks, as we cannot make a clock which could be depended on for anywhere near a year. The next shorter period is that of a "moon." This is also a little too long, is not easily observed, and requires all sorts of corrections. Observations of the moon at sea are so difficult and subject to error that mariners use them only as a last resort. If a little freedom of language is permissible, I would say that the moon has a bad character all around, largely on account of her long association with superstition, false theology and heathen feasts. She has not purged herself even to this day! The ancients were probably right when they called erratic and ill-balanced persons "lunatic." Now we come to the day and find that it is about the right practical length—but what kind of a day? As there are five kinds we ought to be able to select one good enough. They are:—

1st. The solar day, or noon to noon by the sun.

2nd. An imaginary sun moving uniformly in the ecliptic.

3rd. A second imaginary sun moving uniformly parallel to the equator at all seasons of the year.

4th. One absolute rotation of the earth.

5th. One rotation of the earth measured from the node, or point, of the spring equinox.

The difference between 1st and 2nd is that part of the sun's error due to the elliptical orbit of the earth.

The other part of the sun's error—and the larger—between 2nd and 3rd is that due to the obliquity of the ecliptic to the equator.

The whole error between 1st and 3rd is the "equation of time" as shown for even minutes in the first chapter under the heading, "Sun on Noon Mark 1909."

Stated simply, for our present purpose, 1st is sundial time, and 3rd our 24-hour clock time.

This 2nd day is therefore a refinement of the astronomers to separate

the two principal causes of the sun's error, and I think we ought to handle it cautiously, or my friend, Professor Todd, might rap us over the knuckles for being presumptuous.

This 5th day is the sidereal day of the astronomers and is the basis of our time, so it is entitled to a little attention. I shall confine "sidereal day" to this 5th to avoid confusion with 4th. If you will extend the plane of the equator into the star sphere, you have the celestial equator. When the center of the sun passes through this plane on his journey north, in the Spring, we say, "the sun has crossed the line." This is a distant point in the Zodiac which can be determined for any given year by reference to the fixed stars. To avoid technicalities as much as possible we will call it the point of the Spring equinox. This is really the point which determines the common year, or year of the seasons. Using popular language, the seasons are marked by four points,—Spring equinox—longest day; Autumnal equinox—shortest day. This would be very simple if the equinoctial points would stay in the same places in the star sphere; but we find that they creep westward each year to the extent of 50 seconds of arc in the great celestial circle of the Zodiac. This is called the precession of the equinoxes. The year is measured from Spring equinox to Spring equinox again; but each year it comes 50 seconds of arc less than a full revolution of the earth around the sun. Therefore *if we measured our year by a full revolution* we would displace the months with reference to the seasons till the hot weather would come in January and the cold weather in July in about 13,000 years; or a complete revolution of the seasons back to where we are, in 26,000 years. Leaving out fractions to make the illustration plain, we have:—

(1)	$\frac{360 \text{ degrees of Zodiac}}{50 \text{ seconds of arc}}$	= 26,000 years	}	All Approximate
(2)	$\frac{1 \text{ day of time}}{3\frac{1}{2} \text{ seconds}}$	= 26,000 years		
(3)	$\frac{1 \text{ year of time}}{20\frac{1}{2} \text{ minutes}}$	= 26,000 years		
(4)	$\frac{3\frac{1}{2} \text{ seconds}}{\text{days in a year}}$	= $\frac{1}{110}$ of a second		

In (1) we see that a "precession" of 50 seconds of arc will bring the Spring equinox around in 26,000 years.

In (2) we see, as 50 seconds of arc represents the distance the earth will rotate in $3\frac{1}{3}$ seconds, a difference of one day will result in 26,000 years. That is since the clock regulated by the stars, or absolute rotations of the earth, would get behind $3\frac{1}{3}$ seconds per year, it would be behind a day in 26,000 years, as compared with a sidereal clock regulated by the Spring equinoctial point.

In (3) we see that as 50 seconds of arc is traversed by the earth, in its annual revolution, in $20\frac{1}{3}$ minutes, a complete circle of the Zodiac will be made in 26,000 years.

In (4) we see that as the difference between the year of the seasons and the Zodiacal year is $3\frac{1}{3}$ seconds of the earth's rotation, it follows that if this is divided by the number of days in a year we have the amount which a sidereal day is less than 4th, or an absolute rotation of the earth. That is, any meridian passes the Spring equinoctial point $\frac{1}{110}$ of a second sooner than the time of one absolute rotation. These four equations are all founded on the precession of the equinoxes, and are simply different methods of stating it. Absolutely and finally, our time is regulated by the earth's rotation; but strange as it may appear, we do not take one rotation as a unit. As shown above, we take a rotation to a *movable point* which creeps the $\frac{1}{110}$ of a second daily. But after all, it is the *uniform* rotation which governs. This is the one "dependable" motion which has not been found variable, and is the most easily observed. When we remember that the earth is not far from being as heavy as a ball of iron, and that its surface velocity at the equator is about 17 miles per minute, it is easy to form a conception of its uniform motion. Against this, however, we may place the friction of the tides, forcing up of mountain ranges, as well as mining and building skyscrapers—all tending to slow it. Mathematicians moving in the ethereal regions of astronomy lead us

to conclude that it *must* become gradually slower, and that *it is* slowing; but the amount may be considered a vanishing quantity even compared with the smallest errors of our finest clocks; so for uncounted generations past—and to come—we may consider the earth's rotation uniform. Having now found a uniform motion easily observed and of convenient period, why not adopt it as our time unit? The answer has been partially given above in the fact that we are compelled to use a year, measured from the Spring equinoctial point, so as to keep our seasons in order; and therefore as we must have some point where the sidereal clocks and the meantime clocks coincide, we take the same point, and that point is the Spring equinox. Now we have three days:—

1st. A sidereal day $1/110$ of a second less than one rotation of the earth.

2nd. One rotation of the earth in 23 hours, 56 minutes and 4 seconds, nearly, of clock time.

3rd. One mean time clock day of 24 hours, which has been explained previously.

Now, isn't it remarkable that our 24-hour day is purely artificial, and that nothing in nature corresponds to it? Our real day of 24 hours is a *theoretical* day. Still more remarkable, this theoretical day is the unit by which we express motions in the solar system. A lunar month is days—hours—minutes—and seconds of this theoretical day, and so for planetary motions. And still more remarkable, the earth's rotation which is *itself* the foundation is expressed in this imaginary time! This looks like involution involved, yet our 24-hour day is as real as reality; and the man has not yet spoken who can tell whether a mathematical conception, sustained in practical life, is less real than a physical fact. Our legal day of practical life is therefore deduced from the day of a fraction *less* than one earth rotation. In practice, however, the small difference between this and a rotation is often ignored, because as the tenth of a second is about as near as observations can be made it is evi-

dent that for single observations $1/110$ of a second does not count, but for a whole year it does, and amounts to $3\frac{1}{3}$ seconds. Now as to the setting of our clocks. While the time measured by the point of the Spring equinox is what we must find it is found by noting the transits of fixed stars, because *the relation* of star time to equinoctial time is known and tabulated. Remember we cannot take a transit of the equinoctial point, because there is nothing to see, and that *nothing* is moving! But it can be observed yearly and astronomers can tell where it is, at any time of the year, by calculation. The stars which are preferred for observation are called "time stars" and are selected as near the celestial equator as possible. The earth's axis has a little wobbling motion called "nutation" which influences the *apparent* motion of the stars near the pole; but this motion almost disappears as they come near the equator, because nutation gives the plane of the equator only a little "swashplate" motion. The positions of a number of "time stars" with reference to the equinoctial point, are known, and these are observed and the observations averaged. The distance of any time star from the equinoctial point, *in time*, is called its "right ascension." Astronomers claim an accuracy to the twentieth part of a second when such transits are carefully taken, but over a long period, greater exactness is obtained. Really, the time at which any given star passes the meridian is taken, *in practical life*, from astronomical tables in the Nautical Almanacs. Those tables are the result of the labors of generations of mathematicians, are constantly subject to correction, and cannot be made simple. Remember, the Earth's rotation is the only uniform motion, all the others being subject to variations and even compound variations. This very subject is the best example of the broad fact that science is a constant series of approximations; therefore, nothing is exact, and nothing is permanent but change. But you say that mathematics is an exact science. Yes, but it is a *logical abstraction*, and is therefore only

the universal solvent in physical science.

With our imaginary—but real—time unit of 24 hours we are now ready to consider “local time.” Keeping the above explanation in mind, we may use the usual language and speak of the earth rotating in 24 hours clock time; and since motion is relative, it is permissible to speak of the motion of the sun. In the matter of the sun’s apparent motion we are compelled to speak of his “rising,” “setting,” etc., because language to express the motion in terms of the earth’s rotation has not been invented yet. For these reasons we will assume that in Fig. 47 the sun is moving as per large arrow and also that the annulus, half black and half white, giving the 24 hours, is fastened to the sun by a rigid bar, as shown, and moves around the earth along with him. In such illustrations the sun must always be made small in proportion, but this rather tends to plainness. For simplicity, we assume that the illustration represents an equinox when the sun is on the celestial equator. Imagine your eye in the center of the sun’s face at A, and you would be looking on the meridian of Greenwich at 12 noon; then in one hour you would be looking on 15° west at 12 noon; but this would bring 13 o’clock to Greenwich. Continue till you look down on New York at 12 noon, then it is 17 o’clock at Greenwich (leaving out fractions for simplicity) etc. If you will make a simple drawing like Fig. 47 and cut the earth separate, just around the inside of the annulus, and stick a pin at the North Pole for a center, you may rotate the earth as per small arrow and get the actual motion, but the result will be just the same as if you went by the big arrow. We thus see that every instant of the 24 hours is represented, at some point, on the earth. That is, the earth has an infinity of local times; so it has every conceivable instant of the 24 hours at some place on the circle. Suppose we set up 1,440 clocks at uniform distances on the equator, then they would be about 17 miles apart and differ by min-

utes. Now make it 86,400 clocks, they would be 1,500 feet apart and differ by seconds. With 864,000 clocks they would be 150 feet apart and vary by tenths of seconds. It is useless to extend this, since you could always imagine more clocks in the circle; thus establishing the fact that there are an infinity of times at an infinity of places always on the earth. It is necessary to ask a little patience here as I shall use this local time and its failure later in our talk. Strictly, local time has never been used, because it has been found impracticable in the affairs of life. This will be plain when we draw attention to the uniform time of London, which is Greenwich time; yet the British Museum is 30 seconds slow of Greenwich, and other places in London even more. This is railroad time for Great Britain; but it is 20 minutes too fast for the west of England. This led to no end of confusion and clocks were often seen with two minute hands, one to local and the other to railroad time. This mixed up method was followed by “standard time,” with which we are all pretty well acquainted. Simply, standard time consists in a uniform time for each 15° of longitude, but this is theoretical to the extreme, and is not even approached in practice. The first zone commences at Greenwich and as that is near the eastern edge of the British Islands, their single zone time is fast at nearly all places, especially the west coast of Ireland. When we follow these zones over to the United States we find an attempt to make the middle of each zone correct to local time, so at the hour jumping points, we pass from half an hour slow to half an hour fast, or the reverse. We thus see that towns about the middle of these four United States zones have sunrise and sunset and their local day correct, but those at the eastern and western edges average half an hour wrong. As a consequence of this disturbance of the working hours depending on the light of the day, many places keep two sets of clocks and great confusion results. Even this is comprehensible; but it is a mere fraction of the trouble and com-

plication, because the hour zones are not separated by meridians in practice, but by zig-zag lines of great irregularity. Look at a time map of the United States and you will see the zones divided by lines of the wildest irregularity. Now question one of the brightest "scientific chaps" you can find in one of the great railroad offices whose lines touch, or enter, Canada and Mexico. Please do not tell me what he said to you! So great is the confusion that no man understands it all. The amount of wealth destroyed in printing time tables, and failing to explain them, is immense. The amount of human life destroyed by premature death, as a result of wear and tear of brain cells is too sad to contemplate. And all by attempting the impossible; for local time, even if it was reduced to hourly periods is not compatible with any continental system of time and matters can only get worse while the attempt continues. For the present, banish this zone system from your mind and let us consider the beginning and ending of a day, using strictly local time.

A civil, or legal, day ends at the instant of 24 o'clock, midnight, and the next day commences. The time is continuous, the last instant of a day touching the first instant of the next. This is true for all parts of the earth; but something *in addition* to this happens at a certain meridian called the "date line." Refer again to Fig. 47 which is drawn with 24 meridians representing hours. As we are taking Greenwich for our time, the meridians are numbered from 0°, on which the observatory of Greenwich stands. When you visit Greenwich you can have the pleasure of putting your foot on "the first meridian," as it is cut plainly across the pavement. Degrees of longitude are numbered east and west, meeting just

opposite at 180°, which is the "date line." Our day begins at this line, so far as *dates* are concerned; but the *local day* begins everywhere at midnight. Let us start to go around the world from the date line, westward. When we arrive at 90° we are one quarter

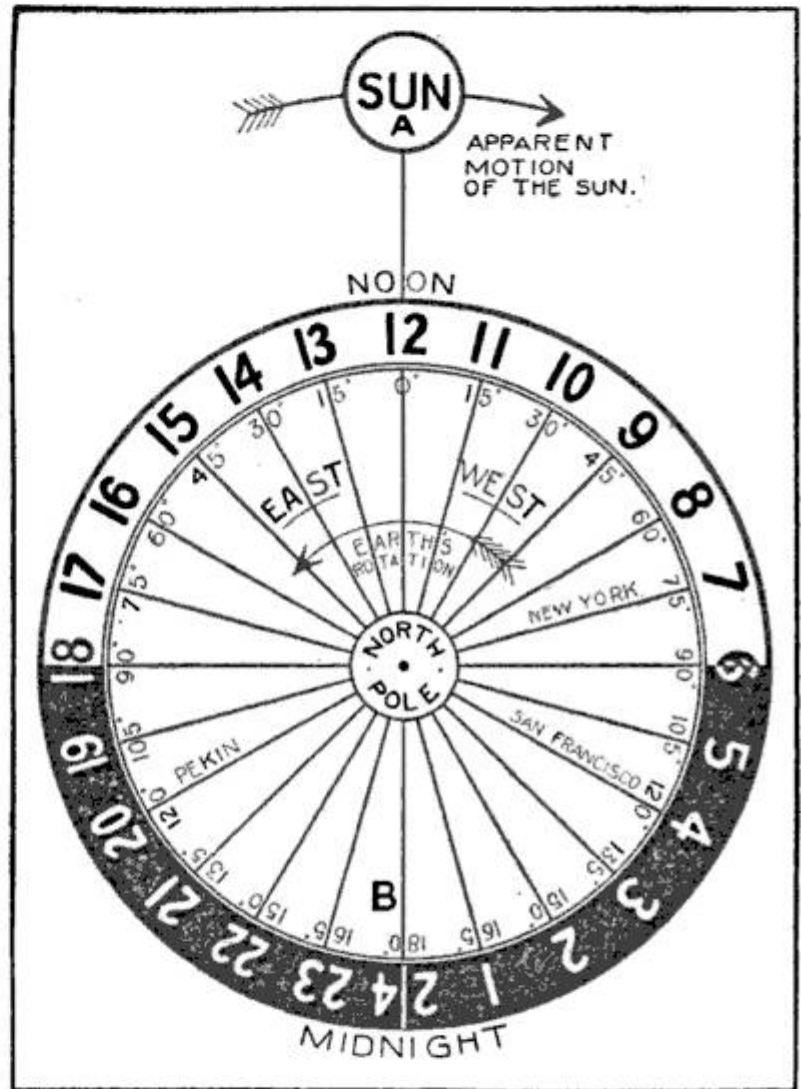


Fig. 47—Local Time—Standard Time—Beginning and Ending of the Day

around and it takes the sun 6 hours longer to reach us. At 0° (Greenwich) we are half around and 12 hours ahead of the sun motion. At 90° west, three quarters, or 18 hours, and when back to 180° we have *added* to the length of all days of our journey enough to make one day; therefore our date must be one day behind. Try this example to change the wording:—Let us start from an island B, just west of the date line. These islanders have their 24-hour days, commencing at midnight, like all other places. As we move westward our day commences later and

later than theirs, as shown above. Suppose we arrive at the eastern edge of the 180° line on Saturday at 12 o'clock, but before we cross it we call over to the islanders,—what day is it? We would get answer, "Sunday;" because all our days have been longer, totalling one day in the circuit of the globe. So if we step over the line at 12 o'clock Saturday, presto, it is 12 o'clock Sunday. It looks like throwing out 24 hours, but this is not so, since we have lived exactly the same number of hours and seconds as the islanders. In this supposition we have all the *dates*, however, but have jumped half of Saturday and half of Sunday, which equals one day. In practice this would not have been the method, for if the ship was to call at the island, the captain would have changed date on Friday night and thrown Saturday out, all in one piece, and would have arrived on their Sunday; so his log for that week would have contained only 6 days. It is not necessary to go over the same ground for a circuit of the globe eastward, but if you do so you will find that you *shorten* your days and on arriving at the date line would have a day too much; so in this case you would *double* a date and have 8 days in that week. In both cases this is caused by compounding your motion with that of the sun; going with him westward and lengthening your days, or eastward meeting him and shortening them. Figure 47 shows Greenwich noon, we will say on Monday, and at that instant, Monday only, exists from 0 to 24 o'clock on the earth; but the next instant, Tuesday begins at 180° B. In one hour it is noon of Monday at 15° West, and midnight at 165° East; so Tuesday is one hour old and there is left 23 hours of Monday. Monday steadily declines to 0 as Tuesday steadily grows to 24 hours; so that, except at the instant of Greenwich noon, there are always two days on the world at once. If we said that there are *always* two days on the world at once, we could not be contradicted; since there is no conceivable time between Monday and Tuesday; it is an

instantaneous change. As we cannot conceive of *no time*, the statement that there is only one day on the earth at Greenwich noon is not strictly permissible. Since there are always two days on the world at once let us suppose that these two are December 31st and January 1st; then we have *two years* on the world at once for a period of 24 hours. Nine years ago we had the 19th and 20th centuries on the world at once, etc. As a mental exercise, you may carry this as far as you please. Suppose there was an impassable sea wall built on the 180° meridian, then there would be two days on the world, just as explained above; but, *practically*, there would be no date line, since in sailing west to this wall we would "lengthen our days," and then shorten them the same amount coming around east to the other side of the wall, but would never jump or double a date. This explanation is founded, as it ought to be, on uniform local time, and is the simplest I can give. The date line is fundamentally simple, but is difficult to explain. When it is complicated by the standard time—or jumping hour system—and also with the fact that some islands count their dates from the wrong side of the line for their longitudes, scientific paradoxes arise, such as having three dates on the world at once, etc.; but as these things are of no more value than wasting time solving Chinese puzzles, they are left out. Ships change date on the nearest night to the date line; but if they are to call at some island port in the Pacific, they may change either sooner or later to correspond with its date. Here is a little Irish date line wit printed for the first time,—I was telling my bright friend about turning in on Saturday night and getting up for breakfast on Monday morning. "Oh," said he, "I have known gentlemen to do as good as that without leaving New York City!"

As what is to follow relates to the growing difficulties of local time and a proposed method of overcoming them, let us recapitulate:—

1st. Local time has never been kept,

and the difficulties of using it have increased as man advanced, reaching a climax of absurdity on the advent of the railroad; so it broke down and became impractical.

2nd. To make the irregular disorder of local time an orderly confusion, the "standard time"—jumping by hours—has helped a little, but only because we can tell how much it is wrong at any given place. This is its only advantage over the first method, where we had no means of knowing what to expect on entering any new territory. That is, we have improved things by throwing out local time to the extent of an hour.

My proposal is to throw local time out *totally* and establish one, invariable, *universal time*. Greenwich time being most in use now, and meridians numbered from it, may be taken in preference to any other. Still another reason is that the most important time-keepers in modern life—ship's chronometers—are set to Greenwich time. Universal time—no local time—only local day and night. Our 24-hour system is all right, so do not disturb it, as it gets rid of A.M. and P.M. and makes the day our unit of time. Our railroad time now throws out local time to the extent of one hour; but I propose to throw it out entirely and never change the clock hands from Greenwich time. The chronometers do that now, so let us conduct all business to that time.

Now refer to Fig. 46, in which Greenwich is taken as universal time. The annulus, half white and half black, indicates the average day and night, and is a separate ring in the dial which can be set so that "noon" is on the meridian of the place, as shown for four places in the illustration. It is the same dial in all four cases set to local day and night. Strictly, the local time conception is dropped and the local day left for regulating working and sleeping time. All business would have the same time. In traveling east we would not have the short hours; or west, the long hours. All clocks and watches would show the same time as ship's chronometers do now. The only change would be the names of the hours

for the parts of the local day. This is just the difficulty, for we are so accustomed to *associate* a certain number, as seven, with the morning and breakfast time. Suppose breakfast time in London is 7 o'clock, then according to the local day it would be 12 o'clock breakfast time in New York; but in both cases it would be the same time with reference to the *local daylight*. Let it be distinctly understood that our association of 12 o'clock with *noon* is not necessary. The Japanese called it "horse" and "nine"—the ancient Romans, the New Testament writers, and the Turks called it the "sixth hour"—the astronomers now call it 24 o'clock, and the Chinese represent it by several characters; but, in all cases, it is simply the middle of the day at any place. By the proposed universal time, morning, noon, and evening would be—at any given place—the same hours. There would be no necessity of establishing legal noon with exactness to the meridian, because that would only regulate labor, meals, etc., and would not touch universal time. This is an important part of the proposal and is worth elaborating a little. Sections in manufacturing districts could make their working hours correspond at pleasure and no confusion would result. That is, local working hours to convenience but by the same universal time. Note how perfectly this would work in traveling,—you arrive in Chicago from the effete east and your watch corresponds all along with the railroad clocks. As you leave the station you glance up at the clock and see that Chicago noon is 17.30, so you set the day and night ring of your watch to match the same ring on the clock, but no disturbance of the hands. As you register at the hotel you ask,—dinner? and get answer, 24.30—then breakfast, 12.30. These questions are necessary now, so I do not add complication here. When you arrive in a strange city you must ask about meals, business hours, theater hours, "doors open" hours, etc., etc.; so all this remains the same. Let us put the matter forcibly,—while we count days, or *dates*, *something* must

vary with east and west; I propose the fixing of hours for business and sleep to suit each locality, but an invariable time. Get rid of the idea that a certain number, as 7 o'clock, represents the age of the day *at all places*. See how this would wipe out the silly proposal to "save daylight" by setting the clock back and forward. Suppose workmen commenced at 12.30 in New York; for the long summer days make it 11.30, but no change in universal time. As this is the only difference from our present time system, keep the central conception, firmly,—universal time—local day and night.

Suppose Chicago decided that "early to bed and early to rise" was desirable; then it could establish its legal noon as 17.30, which would be about 20 minutes early for its meridian. You could do business with Chicago for a lifetime and not find this out, unless you looked up the meridian of Chicago and found that it was 17.50 o'clock. None of the railroads or steamship lines of the city would need to know this, except as a matter of scientific curiosity, for the time tables would all be printed in universal time. For hiring labor, receiving and delivering goods, etc., they would only need to know Chicago *business hours*. To state the matter in different words,—Chicago would only need to decide what portion of the universal 24 hours would suit it best for its day and which for its night, and if it decided, as supposed above, to place its working day forward a little to give some daylight after labor, nothing would be disturbed and only the scientific would ever know. Certainly, "save daylight," but do not make a fool of the clock! Having shown the great liberty which localities could take without touching the working of the system, the same remarks apply to ultra-scientific localities. A city might establish its noon to the instant; so it is possible—even if a little improbable—that the brilliant and scientific aldermen of New York might appoint a commission with proper campfollowers and instrument bearers to determine the longitude of the city to the Nth of a second and tell

us where we "are at." The glory of this achievement—and especially its total cost—would be all our own and incorruptible time would be untouched! We thus see that great local freedom and great accuracy are alike possible. With our present system, accuracy in local time is impracticable and has never even been attempted, and is confusion confused since we added the railroad hour jumps. Why did we nurse this confusion till it has become almost intolerable? Because man has always been a slave to *mental associations, and habits*. Primitive man divided the local day into parts and gave them names and this mental attitude sticks to us after it has served its day. The advantages of universal time could hardly be enumerated, yet we can have them all by dropping our childish association of 7 o'clock with breakfast time! Another example,—you visit a friend for a few days and on retiring the first night you ask "what is your breakfast hour"—"8 o'clock." You have to ask this question and recollect the answer. Now tell me what difference it would make if the answer had been 13 o'clock? None whatever, unless, perhaps, that is, you do not like thirteen! You ask, how about ships? Ships now carry universal time and only change the clock on deck to please the simple minded passengers. How about the date line? No change whatever, so long as we use *dates* which means numbering local days. It is useless multiplying examples; all difficulties disappear, as if by magic, the moment we can free our minds of local time and the association of the *same hour* with the *same portion* of the day *at all places*. The great interest at present manifested in the attempts to reach the North Pole calls for some consideration of universal time in the extreme north. Commencing at the equator, it is easy to see that the day and night ring, Fig. 46, would represent the days and nights of 12 hours at all seasons. As we go north, however, this ring represents the *average* day and night. When we reach the Polar Circle, still going north, the *daily* rising and setting of the sun grad-

ually ceases till we reach the great one-year day at the Pole, consisting of six months darkness and six months light. Let us now assume that an astronomical observatory is established here and the great equatorial placed precisely on the pole. At this point, *local time, day and night, and the date line*, almost cease to have a meaning. For this very reason universal time would be the only practical method; there-

hours within five seconds! At the pole the day would commence at the same instant as at some assumed place, and the day and night ring would represent working and sleeping as at that place. Suppose this observatory to be in telegraphic communication with New York, then it would be best for the attendants to set their day and night to New York, so as to correspond with its business hours. Many curious supposi-

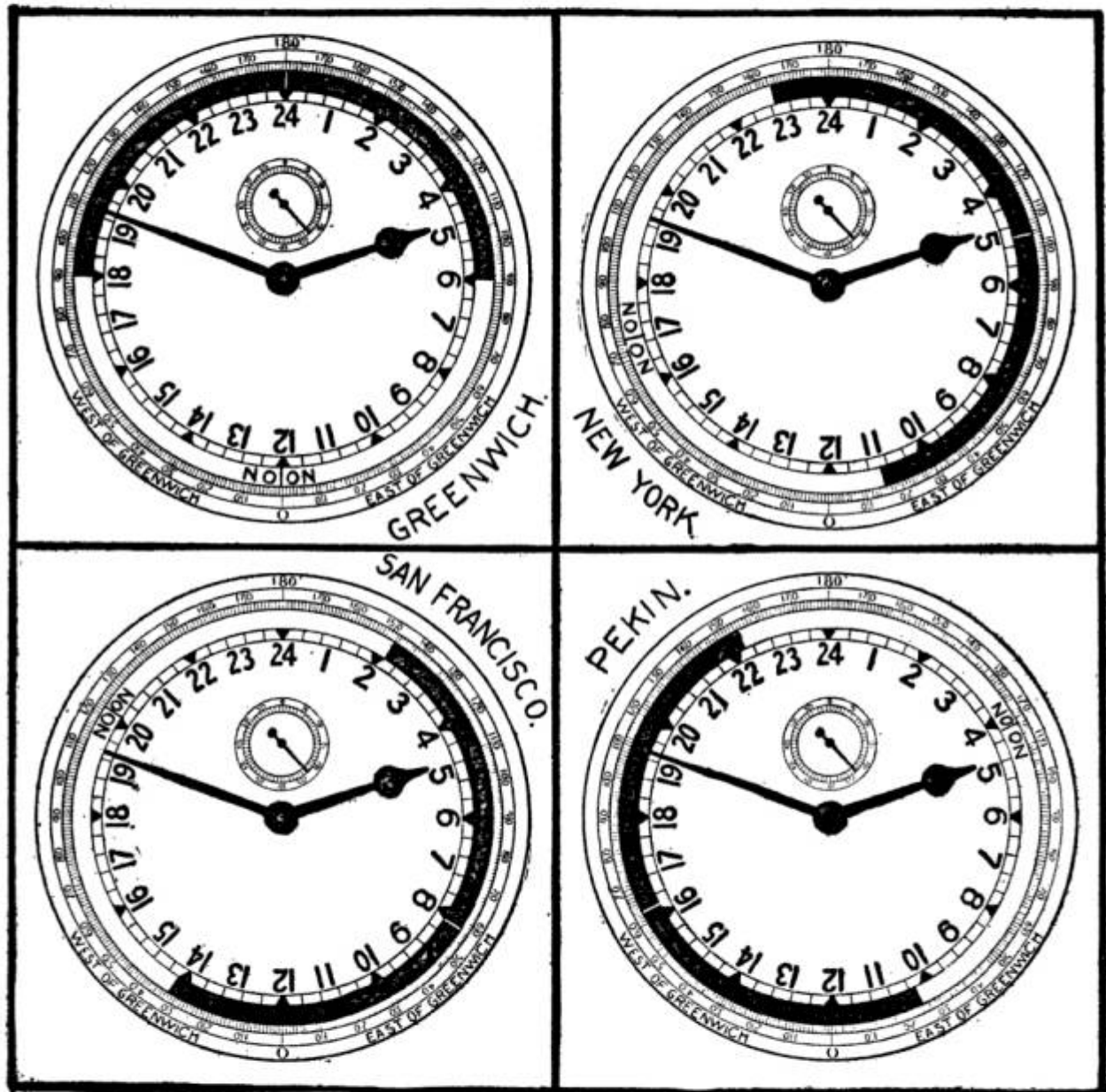


Fig. 46—Universal Time Dial Set for Four Places

fore, it *more* than stands the test of being carried to the extreme. Universal time would regulate working and sleeping here the same as at all other places. Strictly local time in this observatory would be an absurdity, because in walking around the telescope (pole) you would be in all instants of the 24

tions might be made about this polar observatory with its "great night" and equally "great day." It is evident that to keep count of itself it would be compelled to note *dates* and 24-hour *days* to keep in touch with us; so it would be forced to adopt the local day of some place like New York. This choice

would be free, because a polar observatory would stand on all the meridians of the earth at once.

We are now in a position to consider the next possible—and even probable—improvement in our clocks and watches. To minimize the next step it might be well to see what we can do now. Clocks are often regulated by electric impulses over wires. Electricians inform me that they can do this by wireless; but that owing to the rapid attenuation of the impulses it cannot be done commercially, over great distances. In the history of invention the first step was *to do something* and then find a way of doing it cheaply enough for general use. So far as I know, the watch in the wearer's pocket has not yet been regulated by wireless; but I am willing to risk the statement that the editor of Popular Mechanics can name more than one electrician who can do this. A watch to take these impulses might be larger than our present watches, but it would not stay larger and would ultimately become much smaller. You know what has happened since the days of the big "onions" described in the third chapter, Fig. 34; so get your electric watch and make it smaller at your leisure. We have made many things commercially practicable, which looked more revolutionary than this. Now throw out the mainspring, wheels, pinions, etc., of our watches and reduce the machinery part to little more than dial and hands and do the driving by wireless, say, once every minute. I feel certain that I am restraining the scientific imagination in saying that the man lives among us who can do this. I repeat, that we now possess the elementary knowledge—which if collated and applied—would produce such a watch.

Now I have a big question to ask—the central note of interrogation in this little scientific conversation with you,—does the man live who can make the earth automatically record its rotation? Do not be alarmed, for I am prepared to make a guess as to this possibility. A *direct* mechanical record of the earth's rotation seems hopeless, but let us see

what can be done. You are aware that some of the fixed stars have a distinct spectrum. It is not unreasonable to suppose that an instrument could be made to record the passage of such a star over the meridian. Ah, but you say, there is no mechanical force in this. Do not hurry, for we have long been acquainted with the fact that things which, apparently, have no force can be made to liberate something which manifests mechanical force. We could now start or stop the greatest steam engine by a gleam of sunlight, and some day we might be able to do as much by the lately discovered pressure of light. That is, we can now liberate the greatest forces by the most infinitesimal, by steps; the little force liberating one greater than itself, and that one another still greater. A good example is the stopping of an electric train, from a distance, by wireless. The standard clock in Philadelphia, previously referred to, is a delicate instrument and its most delicate part, having the least force, moves a little valve every minute, and by several steps liberates the air pressure, 200 feet higher in the tower, to move the four sets of great hands. I am not traveling beyond the record when I say that the invisible actinic rays could be used to liberate a great force; therefore what is there unreasonable in the supposition that the displacement of the sodium line in the spectrum of a star might be made to record the earth's rotation? So I say to the electrician—the optician—the photographer—the chemist and the mechanic,—get together and produce this watch. Permit me, with conventional and intentional modesty, to name the new timepiece *Chroncosmic*. For pocket use, it would be *Cosmic watch*. In the first chapter I allowed to the year 2,000 for the production of this watch, but it is likely we will not need to wait so long.

Having stated my proposal for universal time as fully as space will permit and given my guess as to the coming cosmic watch, let us in this closing paragraph indulge in a little mental exercise. Suppose we copy the old time

lecturer on astronomy and "allow our minds to penetrate into space." Blessed be his memory, he was a doer of good. How impressive as he repeatedly dropped his wooden pointer, and lo! It always moved straight to the floor; thus triumphantly vindicating universal gravitation!!!

We can think of a time system which would discard months, weeks and days. What is the meaning of the financial almanac in which the days are numbered from 1 to 365 or 366? Simply a step in the right direction, *away from the months and weeks*, so that the distance between any two dates may be seen at a glance. We would really be better without months and weeks. Now let us consider the year of the seasons as a unit—long since proposed by the astronomers—and divide it into 3,000 chrons. Clocks regulated by star transits, as at present, would divide this decimally, the fourth place being near enough to make the new pendulums of convenient length. This would throw out months, weeks and days, local time and the date line. Each of these chrons would represent the same time in the year, permanently. For example, 464.6731 would mark to a *dixmillieme-chron* (a little more than one second) the point reached in the year; while the date does not, as I have shown in the first chapter. But you still object that this is a great number of figures to use in fixing a point in the year. Let us see what it takes to fix a point in the year now, *August 24th, 11-16-32 P. M., New York standard time*. A pretty long story, but it does not fix the point of the year even then; for it would require the assistance of an astronomer to fix such a point in *any given year*, say 1909. But 464.6731 would be eternally right in *absolute time* of the seasons, and has only one meaning, with no qualifications for any year whatever. I believe the astronomers should use a method something like this. Ah, but there is a difficulty in applying this to the affairs of daily life which looks insurmountable. This is caused by the fact that the *day* and *year* are incommensurable. One of them

cannot be exactly expressed in terms of the other. They are like the diagonal and side of a square. The day is now the unit and therefore the year has an interminable fraction; conversely, if we make the year the unit, then the day becomes an endless fraction. This brings us face to face with the local day which we ignored in our scientific year unit. We *must* regulate our labors, in this world, to day and night and, with the year unit, the chrons would bear no fixed relation to day and night, even for two days in succession. So the year unit and absolute time must be left to the astronomers; but the *day unit* and the uniform world day of *universal time* as explained in connection with Fig. 46 I offer as a practical system.

I am satisfied that all attempts to measure the year and the day by the same *time yard stick* must fail and keep us in our present confusion. Therefore separate them once for all time. Brought down to its lowest terms my final proposal is:—

1st. An equinoctial year unit for the astronomers, divided somewhat as suggested, but no attempt to make the divisions even approximate to days and hours. This would fix all astronomical events, absolutely. A variation in the length of the year would not disturb this system, since the year *itself* would be the unit. In translating this astronomical, or year unit time, into clock time, no difficulties would be added, as compared with our present translation of sidereal time into clock time. Deal with the *year unit* and *day unit* separately and convert them mutually when necessary.

2nd. A universal mean time day of 24 hours, as now kept at Greenwich, all human business being regulated by this time. Dates and the date line as well as leap years all being retained as at present.

3rd. Weight and spring clocks and watches to be superseded by the cosmic clocks and watches regulated by wireless impulses from central time stations, all impulses giving the same invariable time for all places.

4th. Automatic recording of the earth's rotations to determine this time.

To avoid any possibility of misunderstanding, I would advise never counting a unit till it is completed. We do this correctly with our hours, as we understand 24 o'clock to be the same as 0 o'clock. But we do not carry this out logically, for we say 24.30. How can this be so, since there is nothing more than 24 o'clock? It ought to be simply 30 minutes, or 0 hour 30 minutes. How can there be any *hour* when a new day is only 30 minutes old? This brings up the acrimonious controversy, of some years ago, as to whether there was any "year one." One side insisted that till one year was completed there could only be months and days. The other side argued that the "year one" commenced at 0 and that the month and date showed how much of it had passed. Test yourself,—is this the year 1909, of which only 8 months have passed; or is it 1909 and 8 months more? Regarding the centuries there appears to be no difference of opinion that 1900 is completed, and that we are in the 20th century. But can you tell

whether we are 8 years and 8 months into the 20th century or 9 years and 8 months? It ought to be, logically 1909 years *complete* and 8 months of the next year, which we must not count till it is completed. Take a carpenter's rule, we say $\frac{1}{4}$ in.— $\frac{1}{2}$ in.— $\frac{3}{4}$ in., but do not count an inch till we complete it. When the ancients are quoted,—"about the middle of the third hour" there is no mistake, because that means $2\frac{1}{2}$ hours since sunrise. If we said the 1909th year that would be definite too, and mean some distance into that year. Popular language states that Greenwich is on the "first meridian"; strictly, it is on the zero meridian, or 0° . These matters are largely academic and I do not look on them as serious subjects of discussion; but they are good thought producers. Bidding you good-bye, for the present, it might be permissible to state that this conversational article on Time was intended to be readable and somewhat instructive; but especially to indicate the infinity of the subject, that thought and investigation might be encouraged.

THE END



A Saw of the Early Days

ANCIENT SAW STILL IN USE

This ancient, straight saw, operated by water power and far antedating the circular saw now used, is still in use in a mill at Foster, Rhode Island. The men shown sharpening the saw are the partner-proprietors of the enterprise.

IRON BEDSTEADS AS CONCRETE REINFORCEMENT

The walls of a new concrete business building in Nampa, Idaho, are reinforced with iron bedsteads. During a big fire in July, a furniture concern in Nampa was damaged by the flames, and 300 iron bedsteads in the basement were twisted beyond repair. It was considered that these would be of far more value as reinforcement than as scrap iron, consequently the walls of the new building, as high as the second story, are a network of beds buried in concrete.

TORPEDO BOAT RUNS NEARLY 40 MILES AN HOUR

The torpedo boat destroyer here shown is the British "Nubian," a long, rakish little sea-fighter that can show her heels to any vessel in the world. She is the first one of the 38-mile-an-hour type of English destroyers to complete her trials, and it is claimed that she greatly exceeded even this wonderful contract speed.

Her length is 280 ft., beam, 26½ ft., and displacement about 1,000 tons. She has a raised forecastle which provides accommodation for the seamen and improves her sea-going qualities, enabling her to keep up a high speed in bad weather. Just aft of the fore-castle deck is the bridge, under which is a comfortable chart house. The chief officers are each provided with separate cabins and there is a commodious ward room for general use.

The boilers of this flier are of the water-tube type, the engines are turbines, and the fuel burned is oil. The consumption of oil fuel is claimed to be very low at high speed and the best obtained with this class of vessel.

The armament consists of two 3.4-in. guns and two 18-in. torpedo tubes, all of which are located on deck.

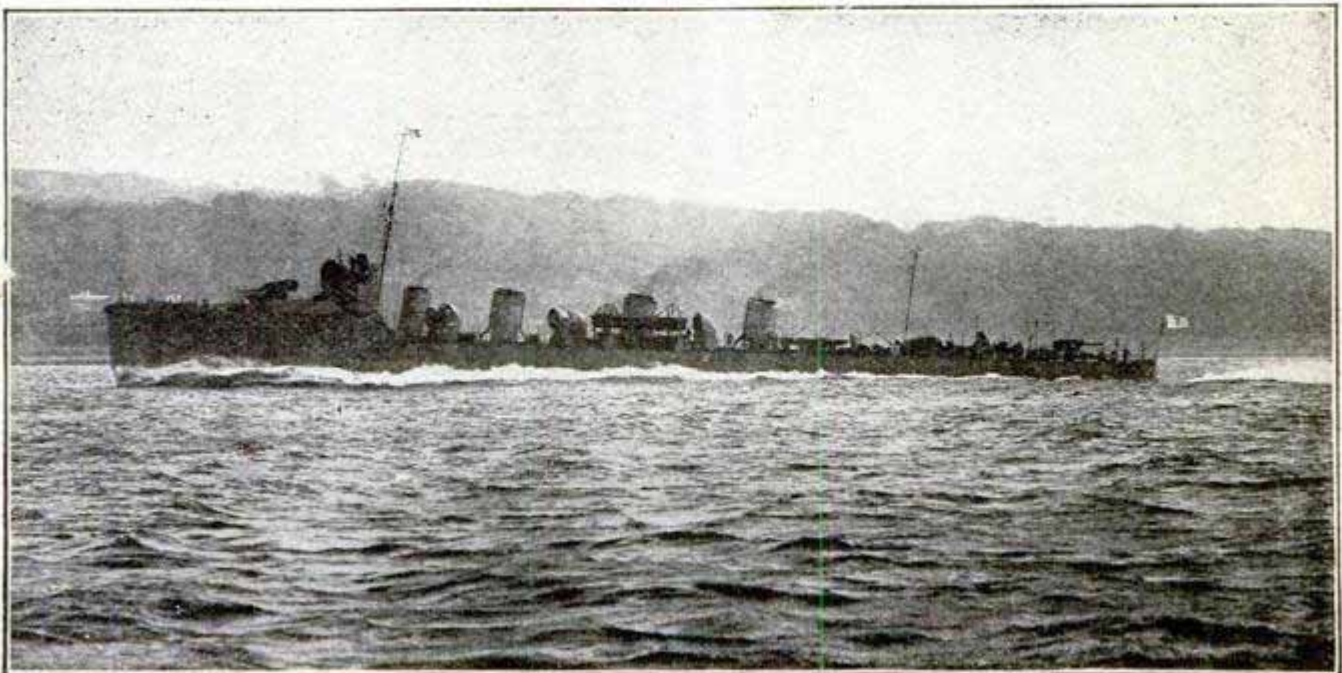
HEAD OF HUMBOLDT IN CURIOUS POSITION

This head, apparently buried up to its ears in a San Francisco street, was



"Up to His Ears" in a Street

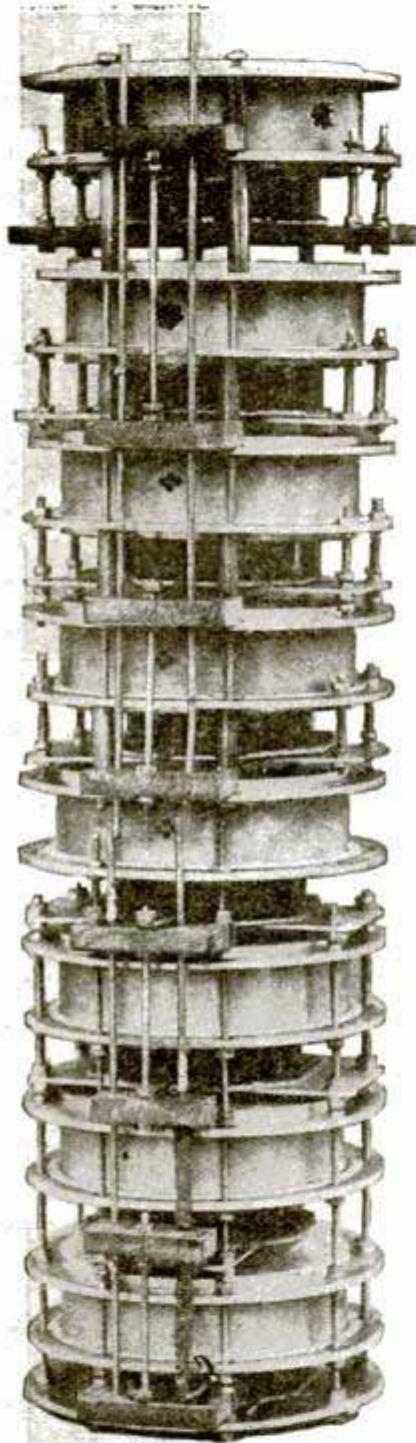
taken by an amateur photographer in search of views of extraordinary and interesting subjects. It is, or was at least, the upper part of a signboard which bore the features of Alexander von Humboldt, one of Germany's foremost scientists.



Fastest Ship in the World—British Torpedo Boat Destroyer, "Nubian"—
Speed, 38 Miles an Hour

NEW ELECTRIC FIRE WHISTLE

Everett, Mass., boasts of a fireman-inventor, Capt. Obed De Champ, who by his ingenuity has saved the city considerable



money, besides making possible several important mechanical devices. His latest addition to the fire-alarm system is an electric whistle. The whistle works somewhat upon the plan of a telephone receiver. A diaphragm of considerable size is caused to vibrate rapidly by the use of 16 small coils placed inside the framework. The volume of sound may be increased or decreased either by increasing or decreasing the size

of the diaphragm, or by adding to or taking from the number of sections which compose the whistle. The one prepared by Capt. De Champ for use in Everett uses diaphragms about 10 in. in diameter and is made up of eight sections, as shown in the illustration. Each section contains a diaphragm and is a complete whistle of itself, only giving less volume than the whole eight

sections together. When in position the working parts are encased in a cylindrical galvanized iron covering open at the top, which will concentrate the sound in great volume at the top. It is the only whistle of the kind in the country. It was invented by Capt. De Champ at the request of the city authorities, who found that other whistles that had been depended upon, connected with some large factory buildings, had been put out of commission. They found that a compressed air whistle would cost about \$2,500 and would take up a large space for the four storage tanks required. Capt. De Champ's invention cost \$10 to make complete, thus saving the city \$2,490. He gave it to the city at cost. Should other communities want one, they would have to pay considerably more. Capt. De Champ has also invented a device for automatically opening the doors of the new central fire station, to be all operated at once, enabling the horses to leave their stalls immediately upon the first stroke of an alarm. It is operated electrically, with a magnet control, and may be switched off so that the doors can be opened by hand. Another invention is an arrangement to automatically turn on all the lights in the building at the first stroke of an alarm, permitting them to remain lighted until the apparatus leaves the building, when they are automatically extinguished. The device is adapted to electric lighting or for gas lighting.

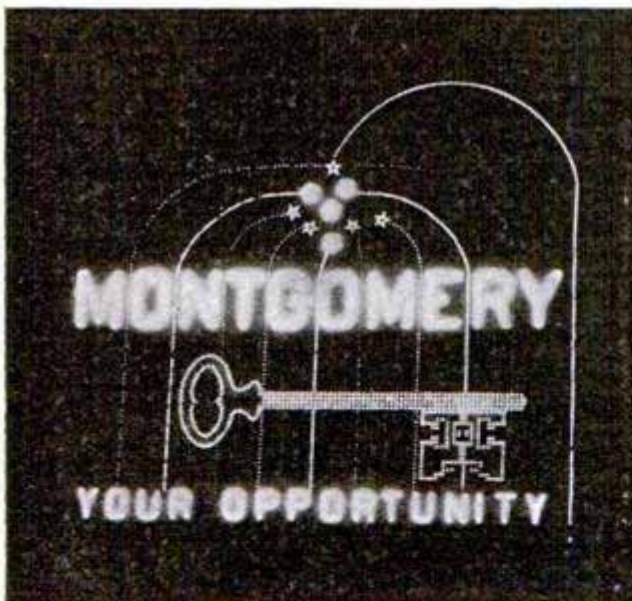
AERIAL PRIZES IN ENGLAND

A large number of money prizes are awaiting winning in England by aerial flights of different distances and under different conditions, but the one great condition attending nearly all the prizes is that either the machine or the aviator, or both, must be English. The most important prize is the \$50,000 offer of the Daily Mail for an aeroplane flight from London to Manchester. The same newspaper also offers a \$5,000 prize for the first circular mile flight on an all-British aeroplane. Other prizes are: Baron De Forrest's

prize of \$20,000 for a flight across the English Channel by an Englishman in an English-built aeroplane; Sir William Hartley's \$5,000 prize for a flight from Manchester to Liverpool; a prize for the winner of the London to Manchester prize if he uses a British engine, and a prize of \$1,250 for a 15-mile flight near Orpington. The Daily Mail also offers a \$500 cup for the second cross-Channel flight by an aeroplane of any country.

ELECTRIC SIGN ADVERTISES CITY

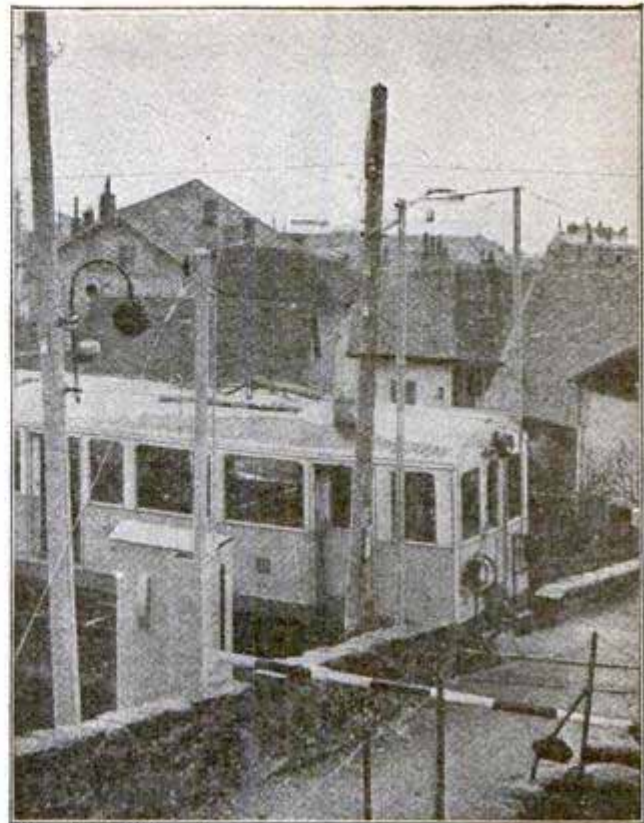
Montgomery, Ala., advertises its opportunities by a big electric sign, claimed to be the largest in the south. "Montgomery" is in letters 10 ft. high, while the key, which is in red, is 35 ft. long. Under the key, which tells all who see it of a welcome to the city, are the words "Your Opportunity." The



complete sign is 85 ft. long by 75 ft. wide.

AUTOMATIC ELECTRIC CROSSING GATE

All the grade crossings on the Montreux-Berne-Oberland electric railway in Switzerland are guarded by ingenious automatic gates or bars which close when a train approaches and lift when it has passed. This is accomplished by an auxiliary wire running



Courtesy Railway Age
Protected by Automatic Electric Gates

parallel to the trolley wire and connecting with the electric mechanism of the gate. The auxiliary wire extends along the trolley wire far enough back from the crossing to assure the closing of the gates before the car reaches it. There is ordinarily no connection, of course, between the auxiliary wire and the trolley wire, but when a car approaches, the trolley, brushing along the auxiliary wire, connects it with the line, and the resultant current operates the motor attachment of the gates. When the car has passed the crossing, the contact of the auxiliary wire with the trolley wire is broken and the gates are lifted back to a vertical position by counterweights.

Incandescent lamps are lighted and warning bells rung by the same current that operates the gate motors. The illustration shows a car about to cross, and the gates in position.

The tall timber that forms the centerpiece of the Nome Circle at the Alaska-Yukon-Pacific exposition has a total length of 197 ft., and is 30 in. in diameter at the butt and 4 in. at the top.

GOVERNMENT POSTS BURNED

While 4,800 large cedar posts were being creosoted for use in the new fed-



Burning of 4,800 Cedar Posts

eral buffalo reserve being fenced off near Ravalli, a little trading-post of the Flathead reservation in Montana, fire from the creosote tanks in some manner extended to them and all were destroyed. Only a chance change of wind saved the little Indian village from being wiped off the map. The fire occurred in July.

FIGHTING OIL FIRES WITH CANNON

An oil company in Indiana has adopted a novel fire-fighting apparatus in the form of a 6-lb. cannon mounted on a freight car and ever ready to be rushed to any point at which its services are required. Its ammunition is 50 cannon balls and a sufficient store of powder to discharge them, and its purpose is to fight oil tank fires by scattering the burning fluid instead of extinguishing it.

Around each of the company's tanks is a concrete basin or moat filled with

water. In case a tank catches fire, the oil, if allowed to escape into the moat, soon crowds to the top of the water and burns out, but the heat is usually so intense that no one can get near enough to open the valves so this can happen. This, therefore, is the mission of the cannon. It fires several balls into the bottom of the tank, and the oil runs into the moat through the apertures thus made.

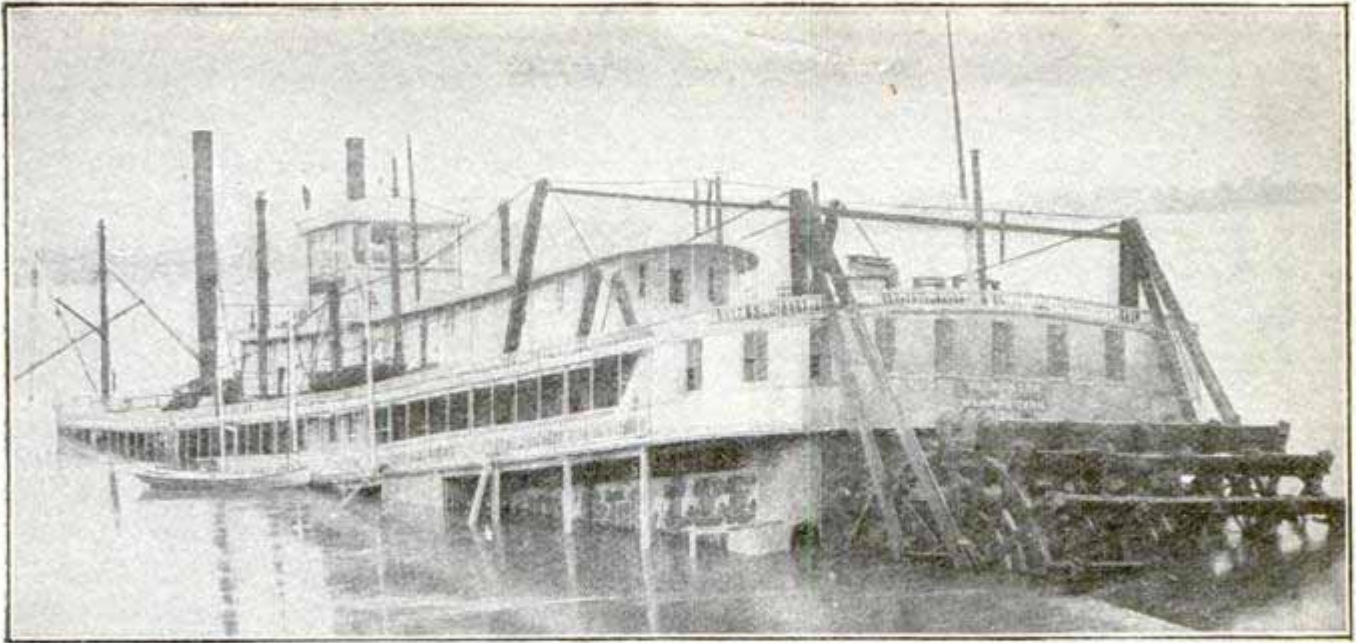
FOUR MILES OF CABLE ON A SPOOL

This illustration shows a spool, containing 4 miles, or 21,120 ft., of cable, at the moment it was being lowered onto the lighter which was used in laying it across Long Island Sound from the mainland to Fisher's Island. The task was under the direction of the life-saving service, and the cable completes the bringing into communication of five isolated life-saving stations on a 30-mile stretch of coast where marine



Connecting Life-Saving Stations

disasters are frequent. In case of need, the crews can now be massed by telephone calls.



Weak Cable Caused This Accident

WRECK OF A TENNESSEE STEAMBOAT

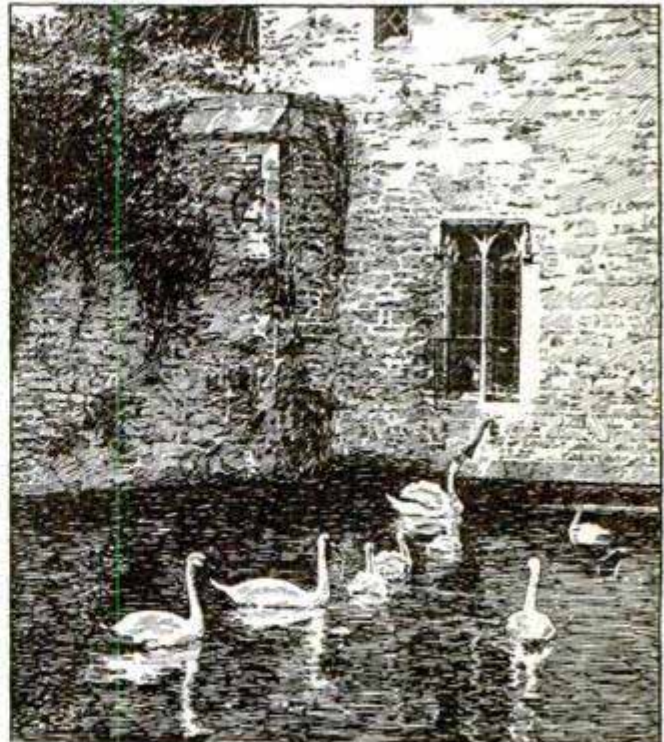
This photograph of the "Georgia Lee," one of the steamboats of the famous Lee line plying on the Ohio and Tennessee rivers, was taken just after she was wrecked at Paducah, Ky. She was being drawn up on the ways to receive repairs when one of the cables broke, letting her slide back into the water. Her bow struck a number of heavy timbers and was torn partially off.

SWANS RING BELL WHEN HUNGRY

The swans that swim on the moat surrounding the Bishop's palace at Wells, in England, call for food when hungry, by ringing the bell shown just under the window in the illustration. They were first taught this trick by the daughter of Lord Auckland about 1854, and have always continued the practice,

PAINTING IMMENSE GAS TANK

Painting the great expanse of outer surface of a huge gas tank is a task of considerable magnitude. The great gas tank in Los Angeles, said to be the second largest in the world, is 230 ft. high—which is 56 ft. higher than the tallest building of that city—and 195 ft. in diameter. The amount of paint upon its surface is 1,485 gal., and the cost of painting it was \$5,000. Had the work been left to one man, his services would have been required nearly two years.



Swan Ordering Dinner

The Cunard line will build a sub-ship to take the place of the "Mauretania" and "Lusitania" should either of them have to miss trips.

the younger generations of swans learning from the elder.

TOWER OF VEGETABLES AND GREENS

Florists are often called upon to do extraordinary decorative designs, but



Courtesy Florists' Review

Vegetables Enough to Stock a Village

the 50-ft. monument shown in the illustration is an exception of exceptions. It is composed entirely of vegetables and greens, and was the center of a decorative scheme in a Chicago German garden during the annual picnic of the Schwaben Verein.

An Illinois inventor has devised a piano box that can be taken apart and put together again with ease, the back, sides, top, and bottom being in sections.

MACHINE TO STERILIZE AIR

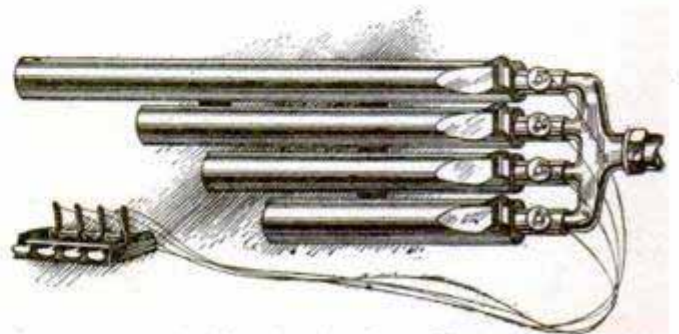
Working upon the principle adopted by certain physiologists in France to determine the number of germs contained in air, Prof. Charles Richet, of the French academy of medicine, has invented an air sterilizer which uses glycerine as its main factor.

His apparatus, which he speaks of as a filter, consists of a small electric ventilator which displaces 7,000 sq. ft. of air per hour, beneath the fans of which is a reservoir of glycerine. The rotation of these fans scatters the glycerine in very fine drops along the walls of the cylinder containing the ventilator, and the air particles constantly coming in contact with these particles of glycerine are purified, as the glycerine catches and retains all dust, germs, microbes and spores always found in the air.

This mechanical sterilization of air is practically a laboratory imitation of the vast purification of the atmosphere by a heavy rainfall, and the inventor believes it will materially diminish the risk of contagion from germs.

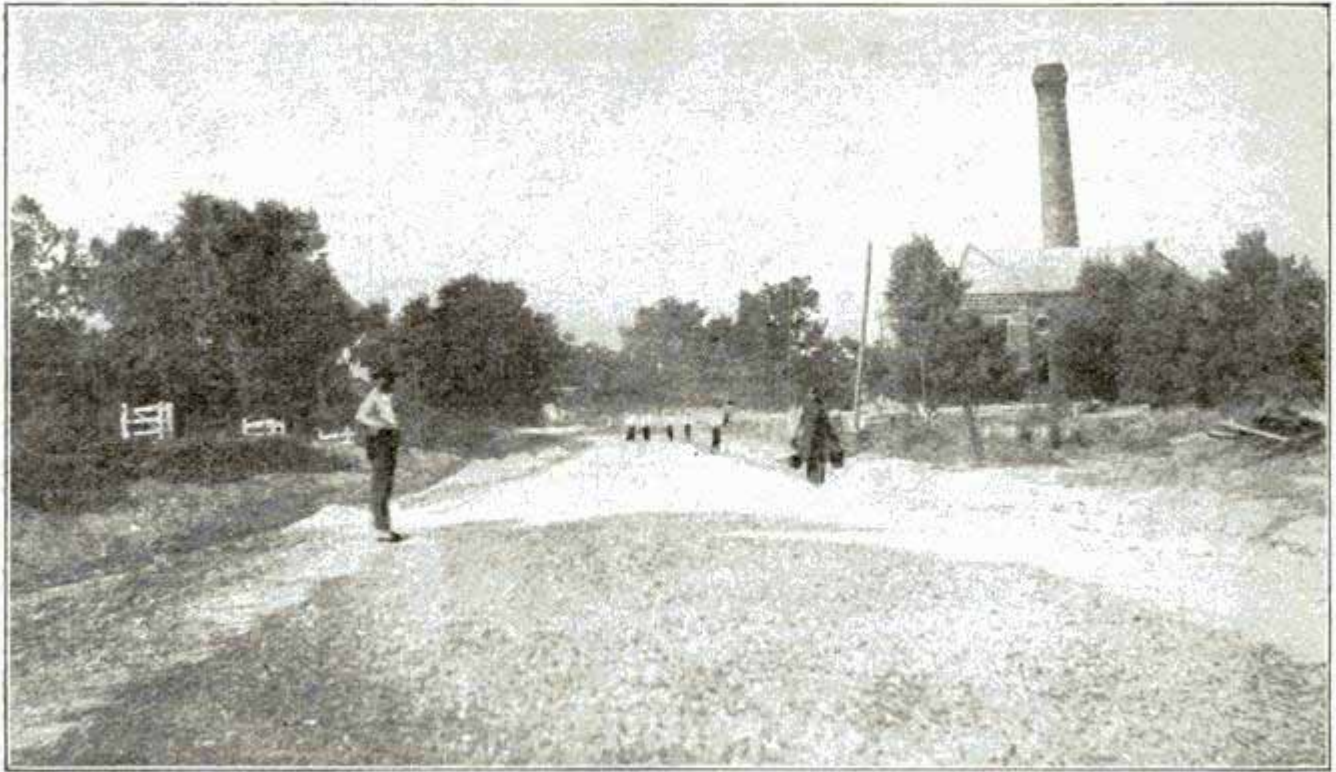
AUTO MULTI-HORN PLAYED BY KEY

The latest novelty in automobile horns in England is a 4-note type that is operated by depressing keys, these being fitted on a small board at any convenient position on the car and connecting with the tubes of the horn by battery-charged wires. One key can be pressed down to obtain a single note, or all may be pressed in unison or one after another, as in playing a scale on a



A Novelty in Auto Horns

piano. In fact, with a little practice, a 4-note tune may be played.



Two Sections of Experimental Road

VALUE OF WATERWAYS

A few figures concerning freight transportation on the lakes are sufficient to demonstrate to the country what a saving would result if more great waterways were available, such, for instance, as the contemplated lakes-to-the-gulf project.

The loss in a single year, borne out by government figures, of the discontinuance of the operation of the canals and locks at Sault Ste. Marie, Michigan and Ontario, would amount to between \$300,000,000 and \$400,000,000, in freight alone. The freight that passes through these locks would, should such a disturbance occur, have to go by rail and would cost, according to government figures of 1907, \$364,000,000, whereas by water the cost would be but \$38,000,000.

These actual figures show that freight hauled by rail in 1907 cost $9\frac{1}{2}$ times as much as that handled by boat on the lakes.

It is claimed that there is danger of blood poisoning in the use of blue blotters because of the chemicals used in preparing them.

A "CRAZY-QUILT" ROAD

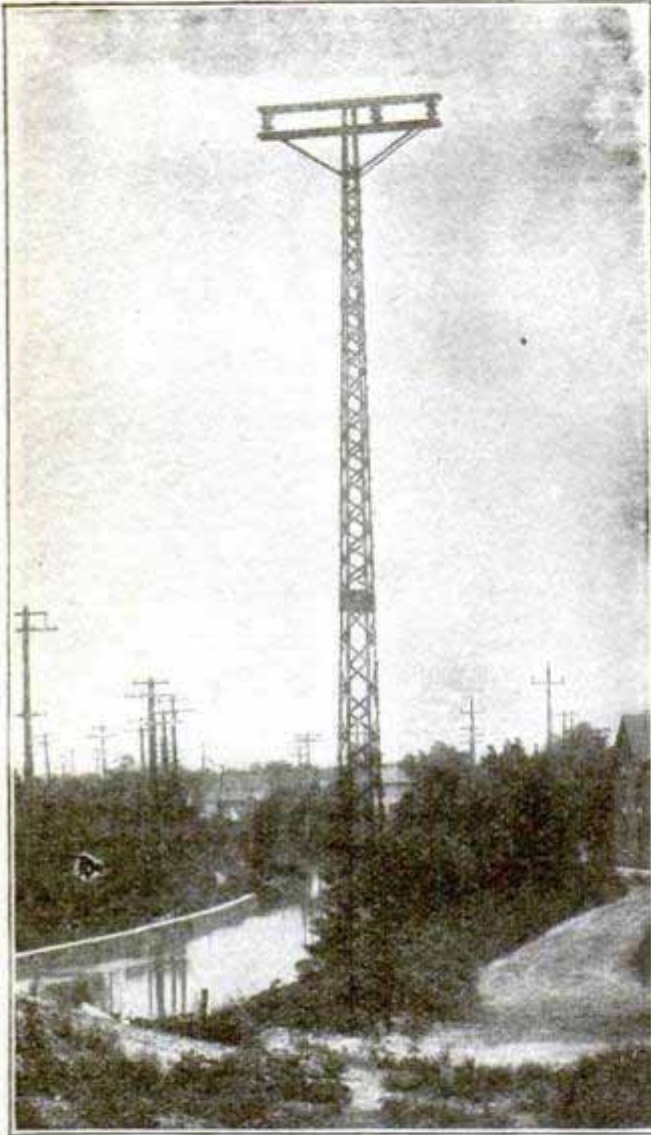
The Ohio legislature recently appropriated \$10,000 for the building of a state highway experimental road that reminds one of the bed covering known as a crazy quilt, except that the stretches of different kinds of road extend clear across the roadway instead of being patched side by side.

The unique idea embodies sections 400 ft. long and 16 ft. wide of different kinds of road, the number of sections and the number of companies competing being limited only to how far the \$10,000 appropriation will go. The first section is of concrete macadam, the second of common macadam, and the others are of asphaltum, tarvia, impervious products, petrolithic paving, etc., as prepared and laid by different companies and methods. A sign at the side of each section will notify passing traffic of the kind of pavement they are riding over and its cost per mile.

If permissible the highway commission intends when all the sections are completed to invite automobile drivers to run their cars over the sections as fast as they desire, so as to thoroughly test the different types of paving.

BOY MEETS DEATH ON HIGH VOLTAGE POLE

The steel lattice-work pole shown in this illustration recently caused the death of a 19-year-old boy on the east



This Pole Called Boy to Death

bank of the Miami and Erie canal. After sounding a warning to his companions to keep away from the pole, the ease of climbing it, due to its construction, seemed too much of an appeal to his boyish love of adventure. He attempted to reach the top cross arm, and in doing so had to pass between three wires, each one of which carried 33,000 volts. As he passed his head and shoulders between two of the wires he called down to his companions, "this is the nearest I'll ever get to heaven." He then tried to throw his right leg over one wire, but by a fatal misstep the leg struck the pole

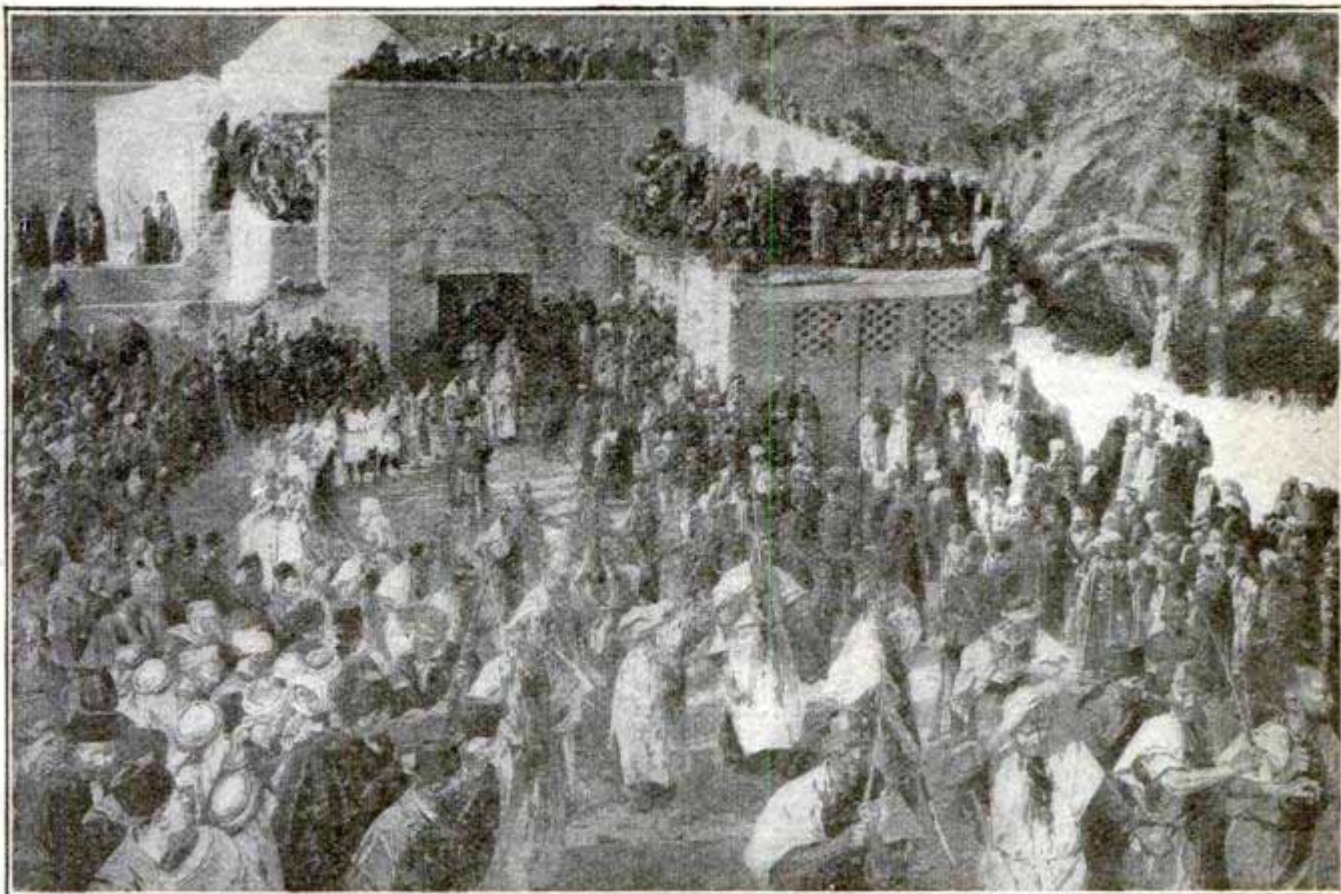
and was drawn over the wire. Death was instant, but his left hand clung to the cross arm in a death embrace.

RELIGIOUS FANATICISM IN KERBELA

The origin of the Chiite sect of the Mohammedan religion, the pilgrimage of which is made every year to Kerbela, which is upon a branch of the Euphrates river in Turkey in Asia, is traced back to Hessien, the second son of Ali, son-in-law of Mohammed, and a bloody drama which occurred in the year 680 A. D. At the disappearance of Ali, Hessien claimed the rulership of the entire spiritual domain and proposed to remove himself from Medina to the capital of Irak, Arabia. At Kerbela he and his devoted followers were hemmed in by an opposing army and all were slaughtered. Therefore Kerbela is for the modern followers of these martyrs, a sacred city, only second to Mecca, and more zealously prohibited to the heretics, more fanatically defended than it is. It existed for centuries unviolated by a Christian foot, and until the beginning of 1908 very little was known of it.

Kerbela is a city of perhaps 50,000 people. On approaching it from afar, one sees rising from among date trees, poplars and willows, the cupolas scintillating with brilliancy and the minaret casques with helmets of gold of its two beautiful mosques. It is to these mosques that the thousands of faithful ones make pilgrimage each year, coming from the Caucasus, from India and from Central Asia, and at the very portals atrocious scenes, almost too frightful to describe, take place.

The exaltation of the pilgrims attains its zenith at the fete of the sacrifices. Those who are actors in the horrible ceremony are the blessed faithful, who, in order to obtain some favor, have made vows to sacrifice themselves. They shave the hair from the middle of their heads, and dressed in white robes—which will be their shroud if they succumb from the self-inflicted wounds—they march through



Fanaticism That Leads to Glorified Death

the applauding crowds, gashing their heads and bodies with sharp swords. Excited by the pious chants, the murmur of prayers, and the encouragement of the onlookers, they strike with fury as the procession moves onward. The blood blinds their eyes and discolors the white gowns, but they continue to strike until the hands refuse longer to hold the swords. It becomes absolutely necessary to halt them, nearly dead, in order that they may not accomplish their vows to the letter. Many succumb to the awful anguish.

MOTORBOATS IN TASMANIA

Motorboats are rapidly coming into general use in the harbors and navigable streams in Tasmania, just off the coast of Australia. Most of the population reside around waterways that can be safely navigated by the smallest types of such craft. In the recreations of the people, boating in one form or another holds foremost place. The city of Hobart has one of the finest harbors in the world, and the River Derwent is navigable 30 miles inland. This

river is connected to Huon river by a channel, furnishing miles and miles of additional waterway for water enthusiasts.

CURIOUS COCOANUT RAFT

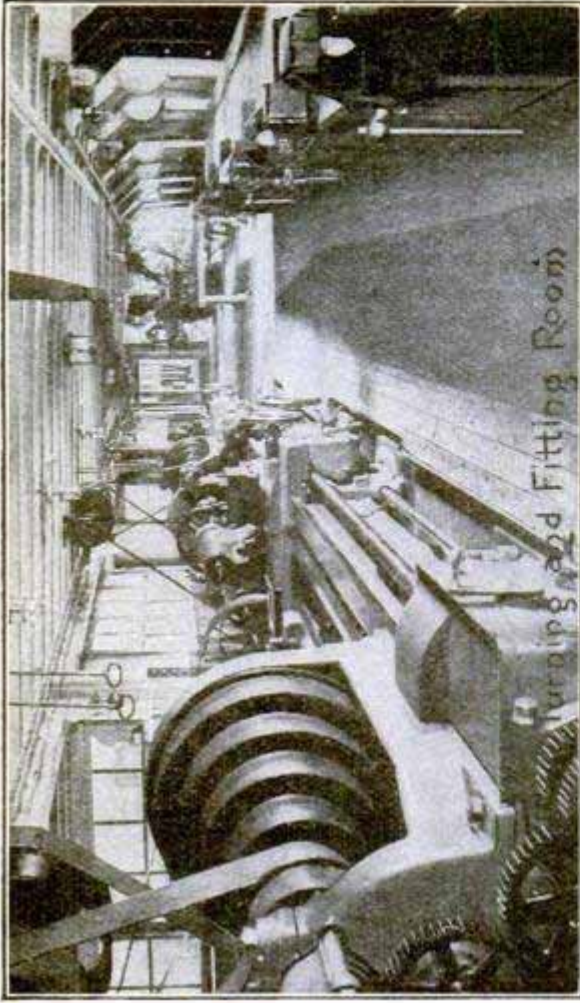
Rafts are usually easy of construction, but this ingenious and remarkable raft of the Philippine Islands would seem to be too complicated to make its building worth the while. It is com-



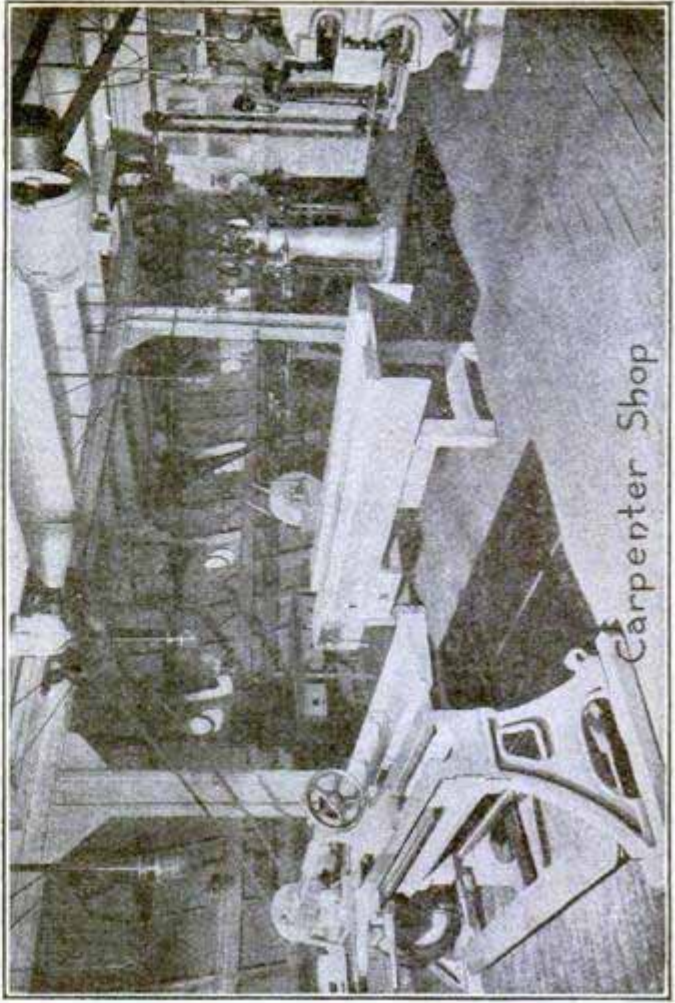
Courtesy London Sketch

Cocoanut Raft of the Philippines

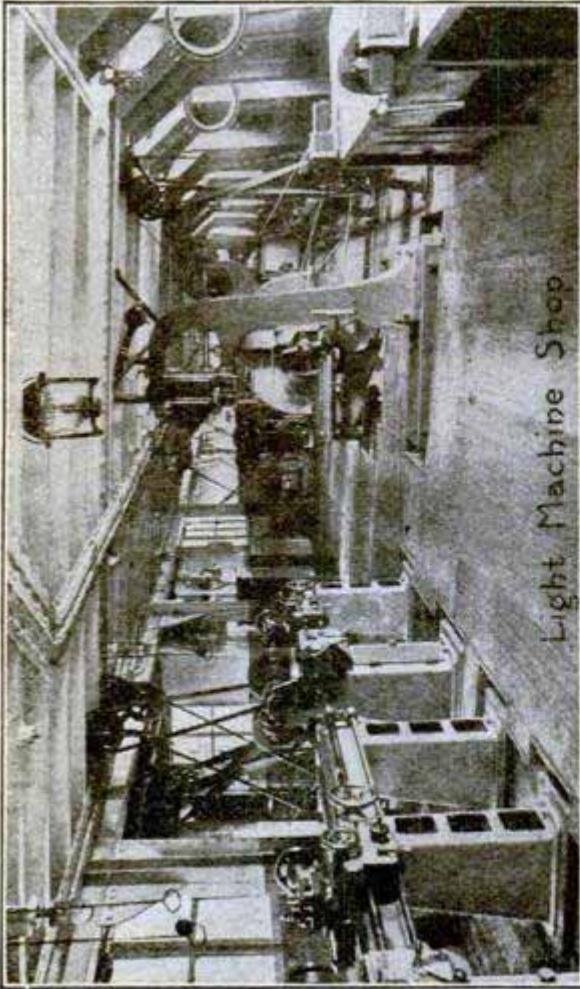
posed of hundreds of cocoanuts fastened together in a circle.



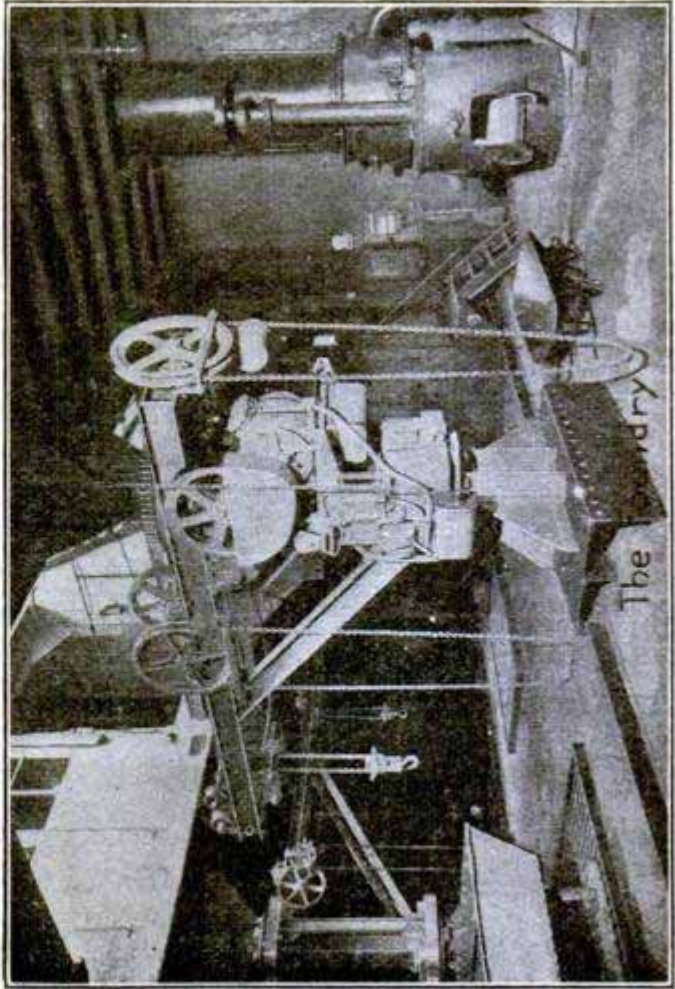
Turning and Fitting Room



Carpenter Shop



Light Machine Shop



The Laundry

GREAT REPAIR SHIP OF BRITISH NAVY

The H. M. S. "Cyclops," the great repair ship just added to the British navy, is considered the most wonderful ship of its kind in the world. It embodies many of the most important details of all the shops that go to make a naval shipyard complete, and through its services an injured fighting ship can have almost anything done from the making of engine parts to the rolling of new plates.

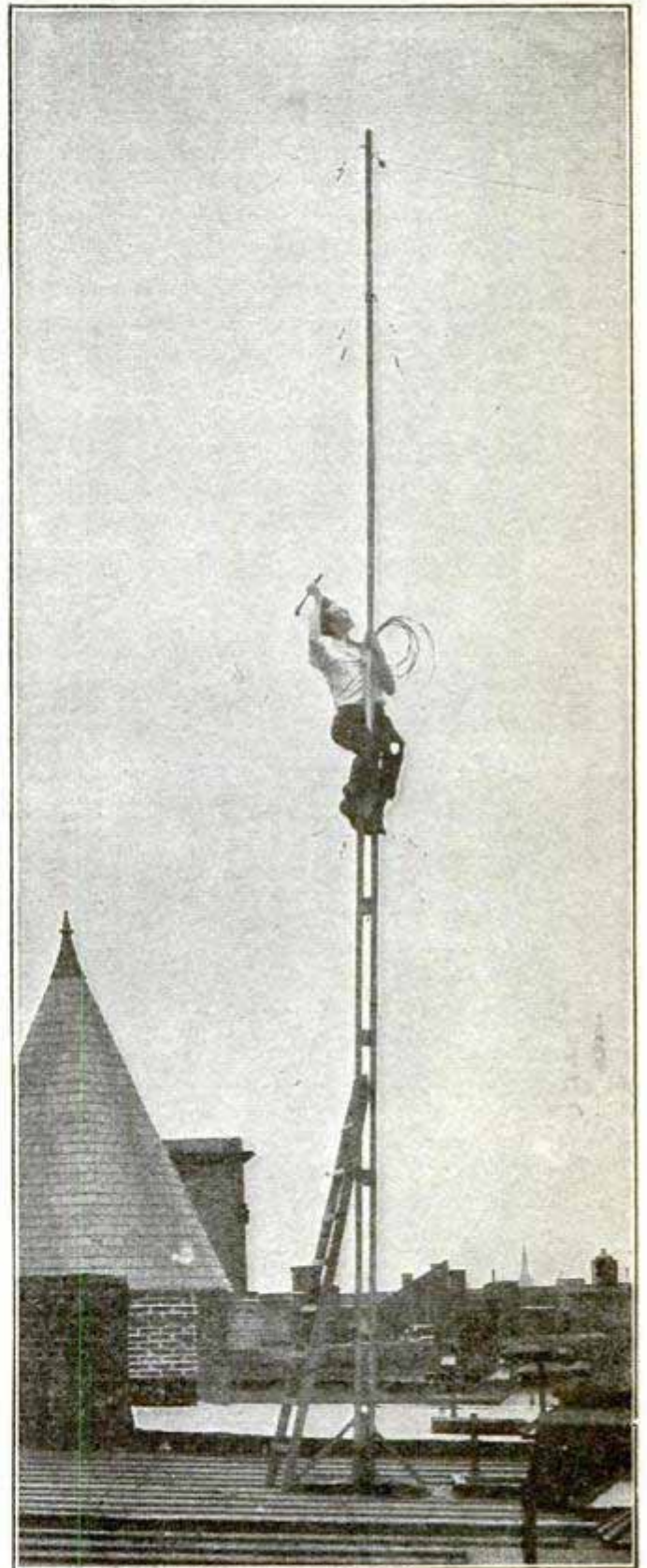
On the port side amidships is an armorers' shop, 26 ft. by 10 ft. Adjoining is the electricians' workshop, 36 ft. by 10 ft. Then comes a number of light machine shops, where all classes of machines suited for light engineering work are installed. A complete pattern shop comes next, and in another part of the ship is a boiler shop, 38 ft. long by 53 ft. wide, with a loft affording about 11 ft. headroom. The smithy, covering a space of 140 ft. by 55 ft., is of these unusually large dimensions because of the amount of iron that is required for large-sized forgings. The plate furnace will take a plate 8 ft. by 4 ft.

The heavy machine shop is also of great importance. This is 38 ft. by 55 ft. in dimensions. A foundry, situated close to the engine room, is fully equipped to deal with brass and iron castings of considerable size. On the starboard side of this shop is a cupola for iron capable of running one ton of molten metal at one charging. A carpenters' shop and coppersmiths' shop complete the list. All the machines are run by electric motors, and air compressors and smoke exhaust fans are important items in the maintenance of proper working conditions.

The ship is 460 ft. long, 55 ft. in breadth, 41 ft. in depth, and has a displacement of about 11,500 tons. Aside from the shops, it is interesting to note that the officers' quarters are heated by electric radiators, that the bakery of the ship is electric, that all the wash basins for men and officers alike are fitted with fresh water taps, and that the bathrooms are provided with salt water shower baths.

AMATEUR WIRELESS INSTAL- LATIONS

Wireless telegraphy has a fascination for the young mechanical or



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At Work on His Aerials

scientific mind that is so easy of gratification that hundreds of young men

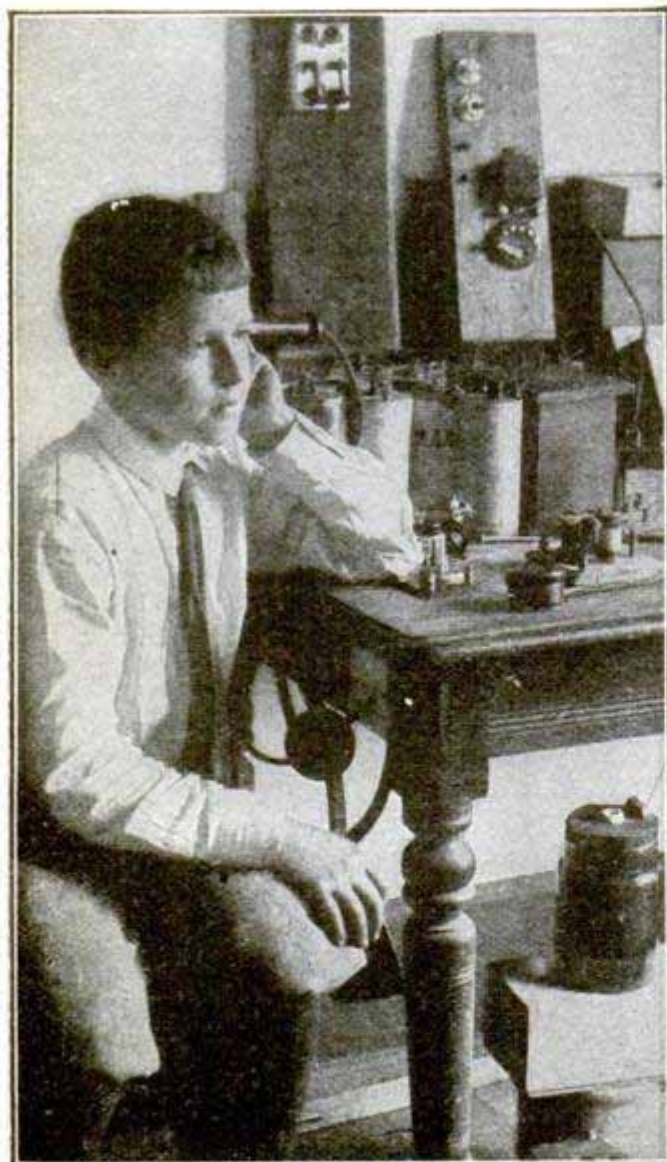
in the larger cities of the country are making it a study and installing their own apparatus. Listening to a conversation over a telephone wire would be considered ungentlemanly, to say the least, but wireless messages flying through the air are considered as free to be listened to as is air to breathe, and it is probably this pleasure, always uncertain as to the source from which it comes and what it contains, that holds the greatest fascination.

The first illustration shows a New York boy at work on the 20-ft. pole for his aerials on the roof of his home.

One of the illustrations shows a 17-year-old boy of Brooklyn and a station entirely of his own making. He has a coil which will receive messages 300 miles, and his apparatus occupies about two-thirds of his bedroom. He



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17-Year-Old Boy and His Apparatus



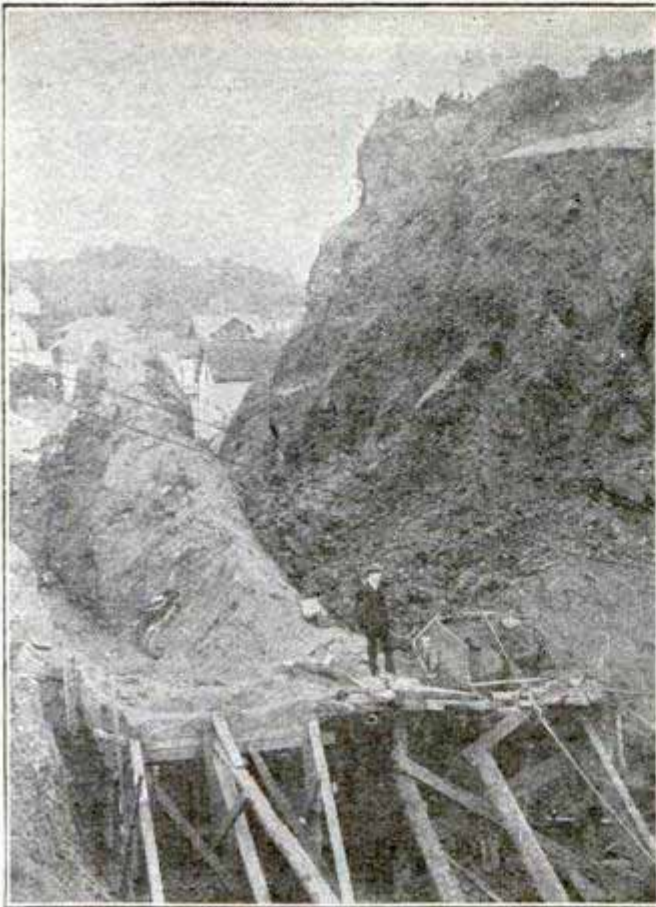
Copyright, 1909, by Underwood & Underwood, N. Y.
13-Year-Old Boy and His Apparatus

is so deeply interested in wireless, that he studies his lessons in the evening with a receiver to his ear, listening to whatever messages may be flying through the air.

Another illustration shows a 13-year-old boy of Maplewood, N. J., and his home-made receiving station. The apparatus, completely his own, will receive messages four miles and can send about a mile.

TACK HAMMER DRAWS SPLINTER FROM EYE

Press reports from St. Louis tell of a most delicate operation, in which a doctor of that city used a magnetized tack hammer of the 10-cent variety to draw a steel splinter from a patient's eye. The steel splinter, $\frac{1}{8}$ -in. long, was removed by simply skimming over the surface of the eyeball with the blunt end of the hammer, the splinter clinging to its magnetized head when it was drawn away.



Grading with Donkey Engines

GRADING A STREET IN OREGON

Grading a street in hilly country often means cutting through hills a hundred or so feet high, as is shown in this illustration of the method of grading adopted in Astoria, Oregon. The work is being done by two donkey engines, one of which pulls the scrapers to the framework dump and back again, while the other pulls the cars. These cars run on a track which runs under the dump and are connected to the donkey engine by cables.

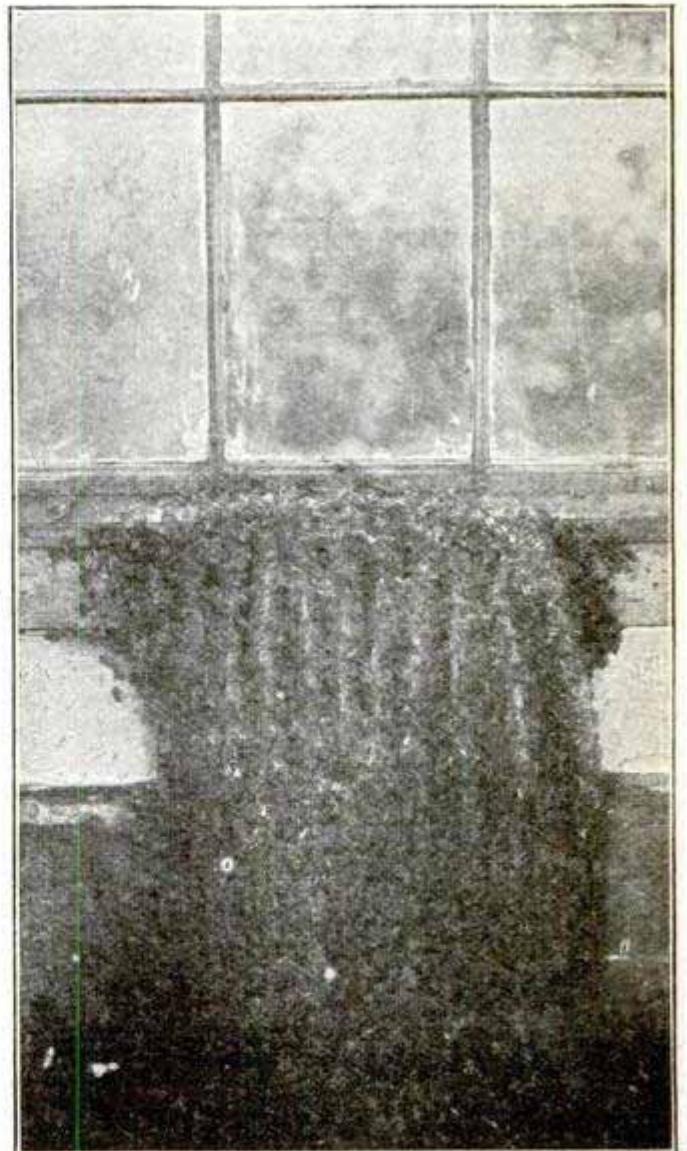
WALES CITY OBJECTS TO AUTO TRAPS

The city officials of Llangollen, one of the communities in Wales most frequented by tourists, have protested against the auto traps maintained by the county officials on the Holyhead road. The protest sprang from solid business considerations, the trades people in the "trapped" region insisting that their business suffered a decline because motorists avoided fines by taking other roads.

BEES OCCUPY VACANT HOUSE

The accompanying illustration shows a window of an upper room in a two-story house, of good condition, situated just outside of the city limits of Santa Cruz, Calif., and below the window is a bushel or more of fine honey reaching from the sill to the floor and put up in wonderful tiers by the only inhabitants of the house, the "busy bee."

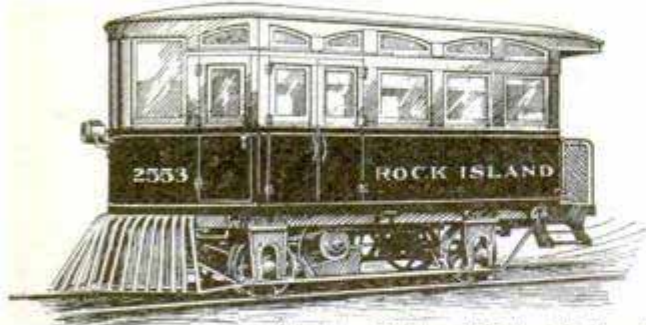
There are thousands of bee workmen all over the honey mass enlarging their already mammoth structure of provision. This creation of the bees is such a curiosity that many people go out to the empty house purposely to see it, but as yet no one has had the heart or the courage to disturb it.—Contributed by F. Cole.



A Bushel or More of Fine Honey

MOTOR CARS IN PLACE OF COMBINATION TRAINS

On many small railroads or on branches of large systems primarily



Courtesy Railroad Master Mechanic

Runs Nine Miles on Gallon of Gasoline

built for freight, the passenger traffic is so light that it cannot be handled at a profit with a steam locomotive and coach. Consequently it has been the habit of the companies to attach a passenger coach to a slow freight train, a practice so unsatisfactory to those who have to patronize them that several

roads have placed self-contained motor cars in service.

The most attractive feature of the motor car proposition to the railroads is the low cost for operating. Records show that the average consumption of gasoline is approximately 1 gal. to eight or ten miles for a 6-cylinder car of 60 hp., which means that a 25-passenger car can be actually operated for about two cents a mile for fuel and lubrication. The entire cost of operation per mile depends on the amount of wages paid conductor and motor-man and the mileage made per day. There are cars in service making as many as 110 miles a day, and the total operating cost, including gasoline, lubricating oil, repairs, wages, and maintenance charges, is less than seven cents per mile.

The car shown in the illustration seats 25 persons and is driven by a 60-hp. engine.

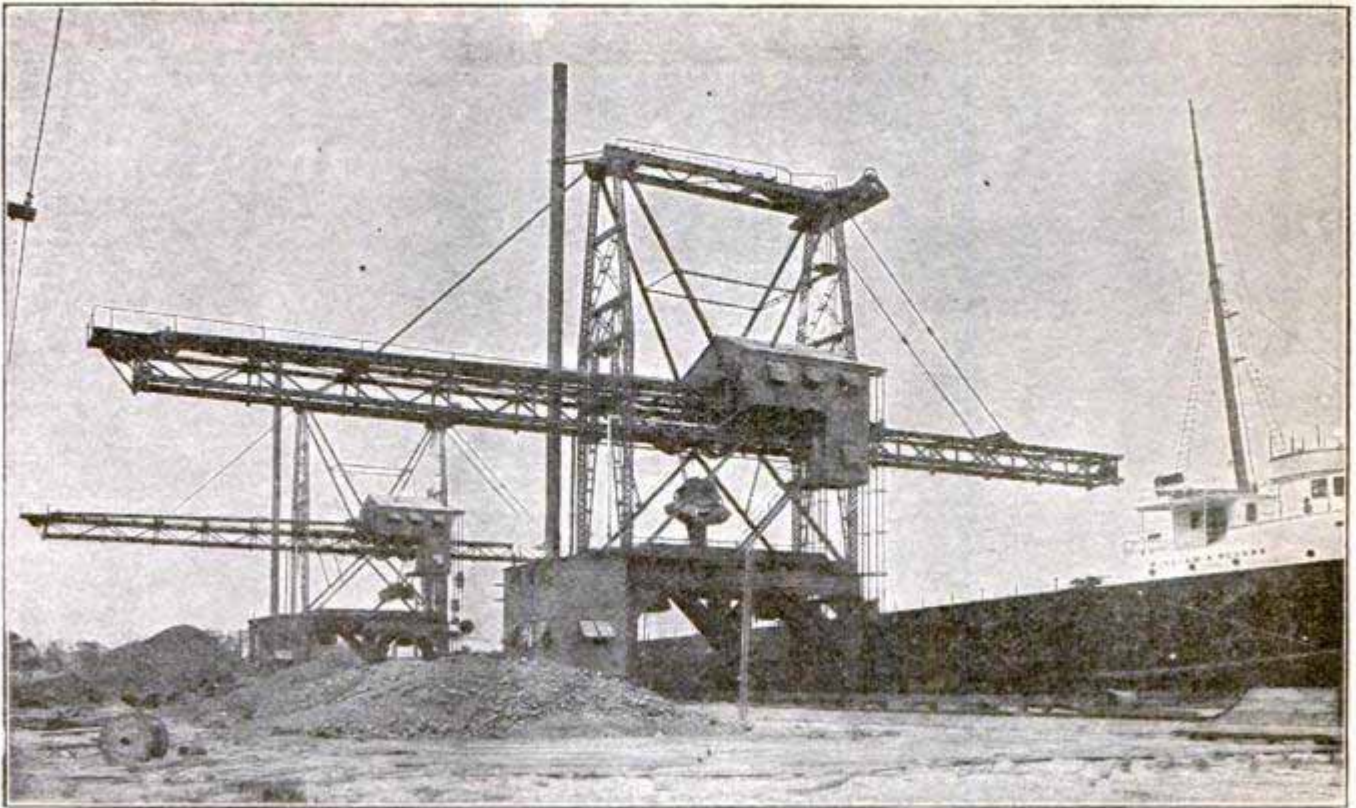
A LARGE COAL STORING GANTRY CRANE

One of the largest traveling gantry stocking bridges for conveying coal and coke is used by the By-Product Coke Corporation of South Chicago. This bridge is equipped with a belt conveyor which receives the coal at any point along the track from another

belt conveyor located at the base and running at right angles to the bridge conveyor. The capacity of storage is 600 tons per hour. The bridge travels on tracks, as shown in the illustration, by means of an electric motor attached to each truck. This bridge operates in



The Bridge Travels on Tracks



Two Large Hoisting Towers Take Coal from Vessels

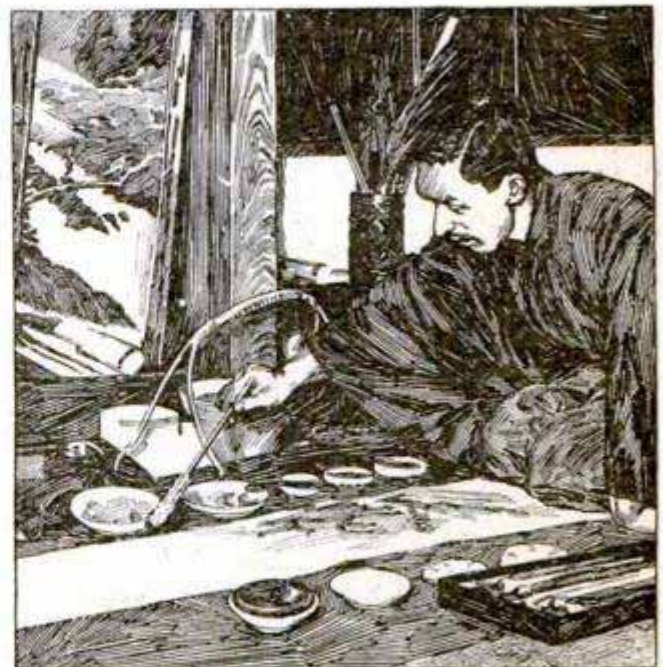
connection with two large hoisting towers which take the coal from the vessels and discharge same to belt conveyors which in turn deliver the coal to the conveyor running at right angles to the bridge. The coal is reclaimed from the storage pile by means of a 6-ton grab bucket and discharged to a hopper under which is located a weighing scale; then onto the belt conveyor running to the storage bin. The reclaiming capacity by means of the bucket is 200 tons per hour.

FOREIGN AUTOS IN ENGLAND

The foreign motorist in England is put to much trouble and expense, under the present laws, before he can drive a car in that country. He may not desire to stay in the country longer than three weeks or a month, yet he cannot escape a minimum outlay of \$17, and a maximum of \$32.75. First, he must procure a driving license at a cost of \$1.25; then car registration at \$5.25, followed by a carriage tax of \$10.50 if his car does not exceed a ton; \$21, if his car is over that weight and under two tons, or \$26.25, if his car exceeds two tons.

ONE THOUSAND PAINTINGS AS SOUVENIRS OF TRIP

Kinsen Kubota, a Japanese painter of considerable note and one of the best amateur actors in Tokyo, has planned to make a trip round the world, and as souvenirs of this trip, he has set to



Courtesy Tokyo Graphic

Painting 1,000 Pictures

work to paint 1,000 copies of one of his pictures. The illustration shows him busily carrying out this task.

WHAT THE ENGINES SAID

(At Promontory Point, May 10, 1869)

What was it the Engines said,
Pilots touching—head to head,
Facing on the single track,
Half a world behind each back?
This is what the Engines said,
Unreported and unread.

With a prefatory screech,
In a florid western speech,
Said the Engine from the West,
“I am from Sierra’s crest;
And, if altitude’s a test,
Why, I reckon, it’s confessed,
That I’ve done my level best.”

Said the Engine from the East,
“They who work best talk the least,
S’pose you whistle down your brakes;
What you’ve done is no great shakes,
Pretty fair—but let our meeting
Be a different kind of greeting.
Let these folks with champagne stuffing,
Not their Engines, do the puffing.

“Listen! Where Atlantic beats
Shores of snow and summer heats;
Where the Indian autumn skies
Paint the woods with wampum dyes,
I have chased the flying sun,
Seeing all he looked upon,
Blessing all that he has blest,

Nursing in my iron breast
All his vivifying heat,
All his clouds about my crest;
And before my flying feet
Every shadow must retreat.”

Said the Western Engine, “Phew!”
And a long, low whistle blew,
“Come now, really that’s the oddest
Talk for one so very modest.
You brag of your East! You do?
Why, I bring the East to you!
All the Orient, all Cathay,
Find through me the shortest way;
And the sun you follow here
Rises in my hemisphere.
Really—if one must be rude—
Length, my friend, ain’t longitude.”

Said the Union, “Don’t reflect, or
I’ll run over some Director.”
Said the Central, “I’m Pacific,
But, when riled, I’m quite terrific.
Yet today we shall not quarrel.
Just to show these folks this moral,
How two Engines—in their vision—
Once have met without collision.”
That is what the Engines said
Unreported and unread;
Spoken slightly through the nose,
With a whistle at the close.

—BRET HARTE.

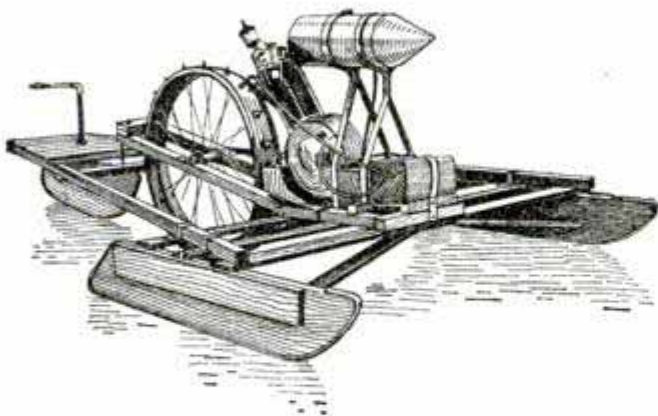
SHOP NOTES

Home-Made Motor Iceboat

This motor-driven iceboat was constructed to take the place of the regular sail iceboat, and the one from which the accompanying sketch was made was used with success all last winter.

The boat is 4½ ft. wide at the widest part and 10 ft. long. The runners are about 10 in. high, shod with steel ground concave the same as a skate runner. The motor is a 3-hp. air-cooled engine which was taken from an old motorcycle. The power is transmitted by a belt to a spiked driving wheel, giving a reduction of about 7½ to 1. The rear wheel of the motorcycle was also taken and an iron band shrunk on for a tire, and steel horseshoe calks attached at 4-in. intervals for the spikes. The two pieces that support the spiked driving wheel are hinged so as to allow the wheel to rise and fall over any bumps on the ice and to let the engine run free when desired. The entire boat with its propelling equipment weighs 120 lb.

The boat is operated from the rear with one lever for controlling the spark, another for the throttle and the

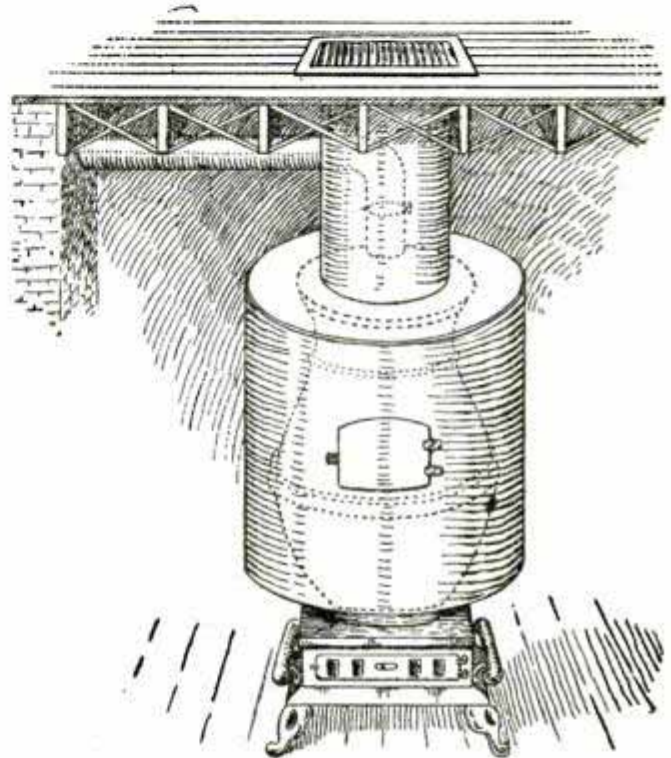


Iceboat Propelled by an Engine

third for directing the course of the boat.—Contributed by Phillip E. Taft, Springfield, Mass.

A Home-Made Furnace

This furnace was constructed from an ordinary pot stove and an old 6-gal.



Old Stove in the Tank

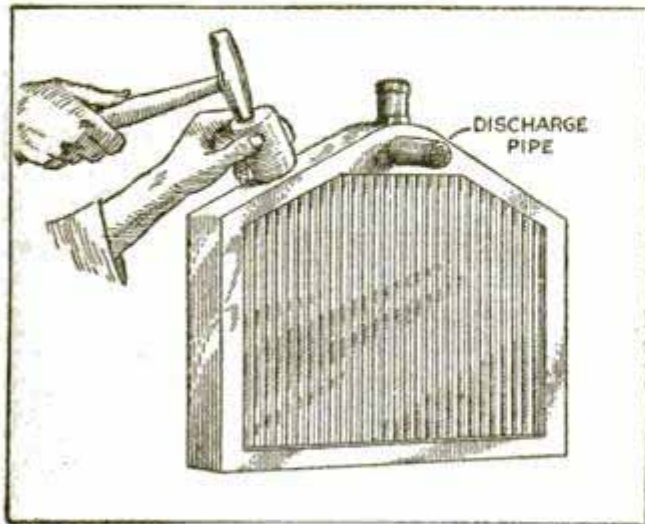
galvanized oil tank turned upside down over the stove. Holes were cut in the bottom of the tank for the stove and the hot air pipe. The tank was supported about 1 ft. from the floor so as to let the cold air in from the cellar to take the place of the hot air as it passed through the air pipe into the room above. A hole was cut in the side of the tank opposite the stove door and another door attached to provide an opening for feeding fuel into the stove.

This stove was made to heat a store and was used with entire satisfaction. Very little coal was used during the winter and plenty of heat was produced at all times.—Contributed by C. A. DeVor, Newark, N. J.

Water boils in a vacuum at 98 deg. F.

Removing Dents from an Automobile Radiator

Taking the dents and uneven places out of radiators is no easy task, unless



Hammering Out Dents

done by the following method: Stop all openings except the discharge pipe and then fill the radiator entirely full of water. Put a cork in the pipe and drive it in so as to put a slight pressure on the water. Take a smooth block of wood and a hammer and proceed as shown in the sketch, lightly hammering around the edges of the dent, allowing the water pressure to force out the dent.—Contributed by M. Kakora, Manville, Ill.

Steel Lighter Than Wood in Construction Work

This illustration gives a graphic comparison of the strength, as compared to weight, of steel and wood sills, showing that, strength for strength, steel is lighter than wood. The first two drawings give the comparative size of a 6-in. I-beam and a hard pine timber, 6 in. high, of the same strength. The wooden beam is 15.6 in. wide, and weighs 29.2 lb. per foot against 12.5 per foot for the I-beam. The third drawing shows a common floor framing construction of a steel beam with wood fillers. The wood adds 80



6" x 15.6" H. Pine
29.2 lbs. per ft



Wood 10 lbs. per ft.
Steel 125 " " "
Wood adds 80% Weight
Steel " 35% Strength

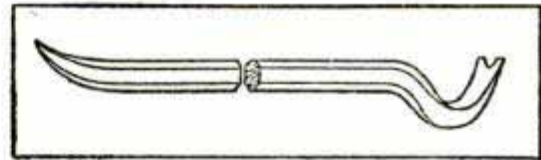


H. Pine 4.8" x 18" 27 lbs.

per cent to the weight and only 35 per cent to the strength. The fourth drawing compares a $\frac{3}{8}$ -in. by 18-in. steel plate with a hard pine timber 4.8 in. by 18 in., both being of the same strength when used as beams on edge. The wood weighs 27 lb. per foot and the steel 23 lb. One-tenth of an inch of steel has about the same weight as an inch of wood, and about 20 per cent more strength.

Claw Bar for Removing Concrete Forms

Among the small tools required for carrying on reinforced concrete work none comes in more useful for a variety of purposes than a supply of crowbars, claw bars and chisel bars. As a rule such bars can be worked up on the job or by a local blacksmith from reinforcing material and need not be purchased at all. For chisel bars the steel need only be cut to length and sharpened to a chisel edge at one end, says Engineering-Contracting. Bars so



Claw Bar Made from Steel

made can be used in an emergency for crowbars, and they have numerous uses such as chipping concrete, prying reinforcement into position, knocking out keys and spacers. Claw bars for removing forms and drawing nails can be made in the same manner. A good

shape of claw bar for removing forms is shown by the accompanying sketch.

This bar can be made of round or square iron as well as of the section sketched, and any ordinary blacksmith can do the work. Being made of reinforcing steel these various bars, if it is not desired to keep them, can, toward the end of the work, be used as reinforcement.

A Kangaroo Bicycle

This bicycle does not differ materially from an ordinary bicycle, yet it is not propelled by the feet. The wheels are so constructed as to have



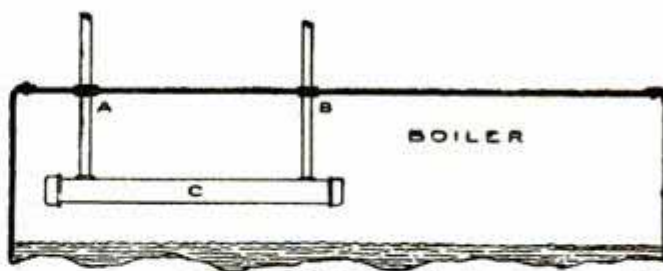
Positions for Propelling

the hubs out of center, making them turn like an eccentric. The propelling of the wheel is done by the weight of the body, which is shifted backward and forward on each half turn of the wheels. In starting, the wheels must be set with the rear hub up and the front hub down.—Contributed by W. S. Jacobs, Malden, Mass.

Temporary Water Heater in an Apartment Building

A large water heater in an apartment building gave out, and, as there were a number of baths continually in use, it presented a serious problem for the engineer. There were several low pressure tubular boilers used for heating the building, and the engineer decided to put a pipe in the steam space in one of the boilers to heat the water. Holes

were drilled in the top of the boiler and each hole fitted with a $2\frac{1}{4}$ -in. pipe as

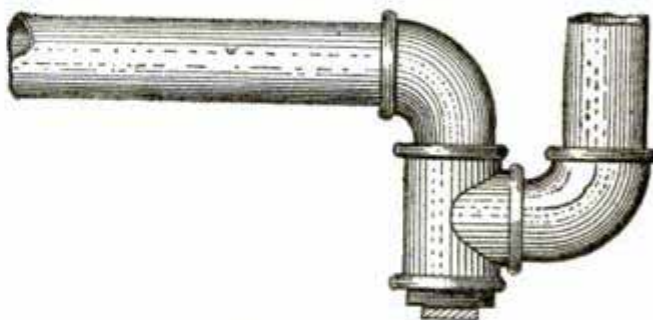


Heater Pipe in Boiler

shown at A and B in the sketch. These pipes were attached to a $2\frac{1}{2}$ -in. pipe, C, running horizontal in the steam space of the boiler. The $2\frac{1}{2}$ -in. pipe was capped on both ends. The city water supply was connected to the pipe A and the outlet to the hot water supply pipes at B. This gave an abundant supply of clean hot water for several weeks and apparently did not affect the steaming of the boiler to any great extent.—Contributed by J. E. Noble, Toronto, Can.

Home-Made Sink Trap

A cheap and serviceable trap can be made from galvanized pipe fittings as shown in the accompanying illustration. Two $1\frac{1}{4}$ -in. street ells and a $1\frac{1}{4}$ -in. tee are connected in the pipes leading from the sink to the sewer. The $1\frac{1}{4}$ -in. plug turned in the lower opening in the tee gives access to the trap, should it become clogged or frozen. The size of the fittings can be ar-



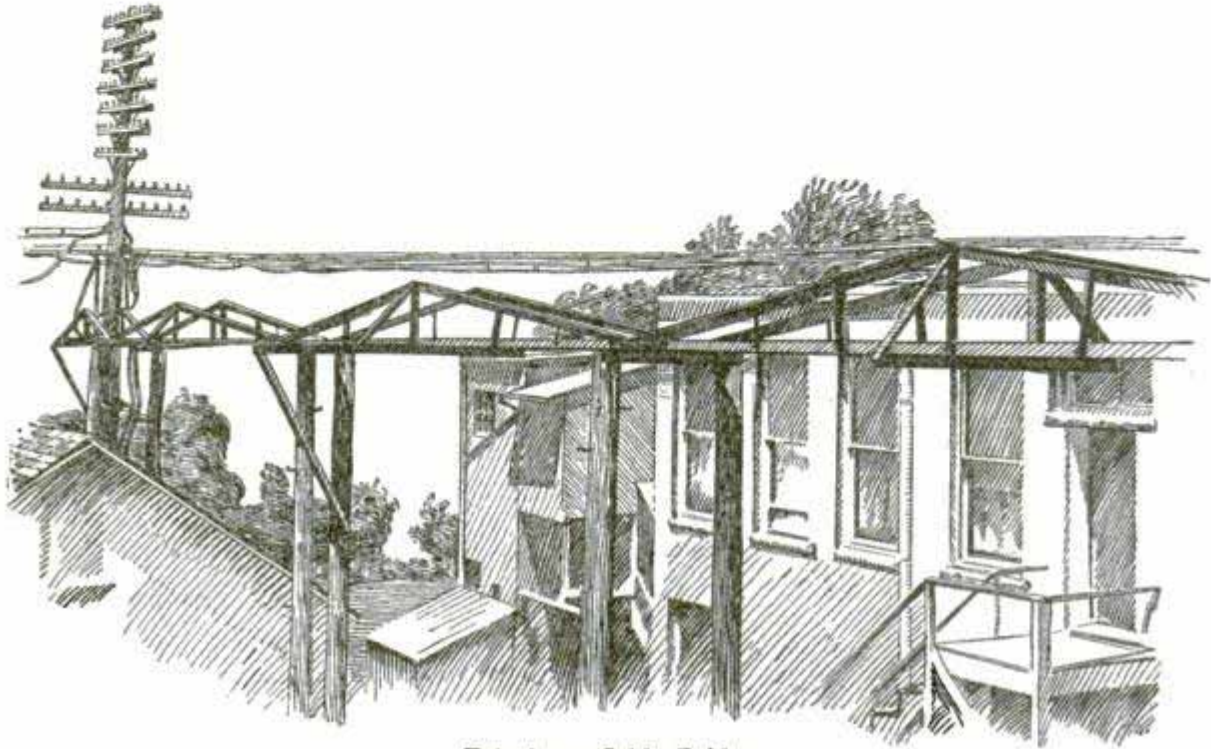
Trap Made of Pipe Fittings

ranged to suit conditions.—Contributed by Jesse L. Miller, Wabash, Ind.

To produce 1 hp. requires the evaporation of 2.66 lb. of water.

Steel Trestle for Telephone Cables

A telephone station was situated where the rear entrance joined an alleyway belonging to private parties and the city's property and the cables could not be put in the ground as that



Telephone Cable Bridge

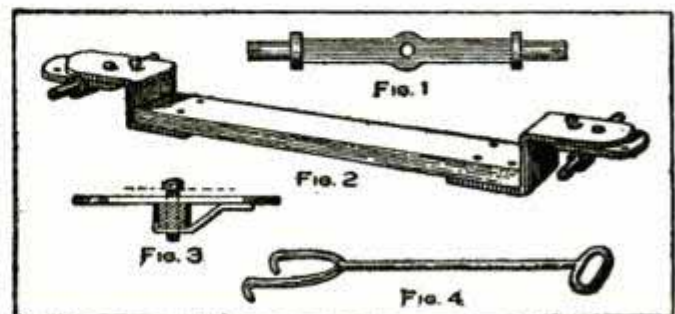
contained private and public sewerage systems. Both city and private owners objected vigorously to the placing of poles and anchors necessary to properly guy the cable poles to carry the weight of the cables, which is about 2 tons. This presented a problem that had to be worked out and the wire chief decided to construct a steel bridgeway to carry the four large cables, each containing 50 wires, for a distance of 92 ft. from the cable pole to the building. Four spans of the steel structure were supported 30 ft. high on three pairs of poles, the cable poles and the building. The bridge was made from 3-in. angle iron. The whole structure was designed and built by a person having no knowledge of bridge building.—Contributed by C. S. Rex, Bowling Green, O.

Adjust a bearing after taking up the wear so the strain of the bolts does not come on the journal, but on the faces of the bearing lines.

Truck for a Garage

There is one thing that the automobile industry has made manifest and that is, the lightest car cannot be handled half as easily by hand in a garage as can the heaviest horse vehi-

cle in the salesroom or carriage house, says the Automobile Dealer and Repairer. The fact that the construction prevents the cramping or turning beyond a circumscribed space because of the chassis necessitates the use of a handy truck, especially when the garage is of limited space. This difficulty may be overcome by the use of a truck made up of parts as shown in the sketch. The wheels are not shown in the sketch but they should be of cast iron without spokes and having about



Details of a Garage Truck

a 2-in. tread. These are fitted on an axle as shown in Fig. 1. Figure 2 shows

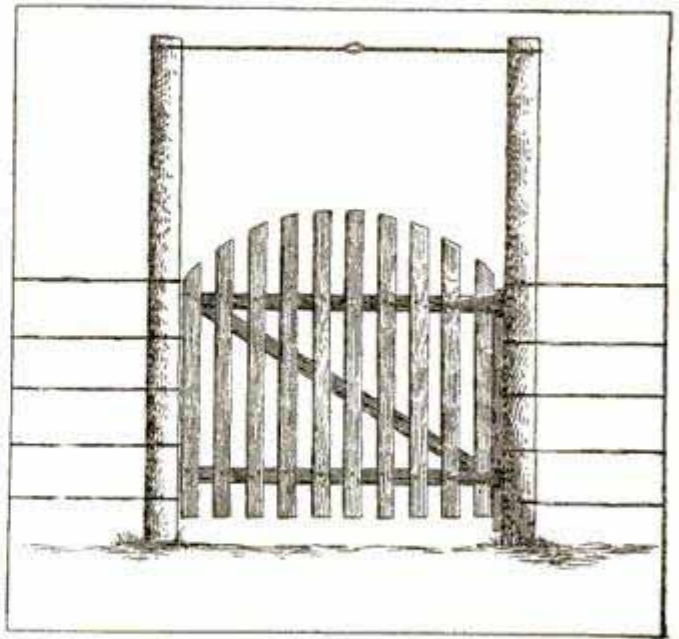
the truck, the center of which is a hardwood plank 2 or more inches thick, according to the weight of the car, and 12 or more inches wide, according to the size of the wheels, so as to permit of blocking the same when on the plank to prevent rolling off when moving. The plank must be long enough to give clearance for the wheels between the vertical parts of the end plates. The outer and upper ends of the end plates turn upon the axle plates which are secured to the axles as shown in Fig. 3. Two holes are drilled in the outer ends of the axle plates, as shown, to insert the ends of a guiding tongue or drawing rod, Fig. 4. A locking pin is used in both ends whereby the axle may be held rigid or allowed to turn at will. The plates are made of $\frac{1}{2}$ -in. boiler plate with a king bolt in each pair as shown. The axle bolt is made the same thickness as the plank plates and the same width. These bolts should be made large enough to serve as the fifth wheel and make the outer end long enough so when drilling the holes for the king bolts they will be far enough ahead so that when the draft hook is inserted it will clear the upper plate. The axle is shown with a swell to make it strong enough for drilling the hole to receive the king bolts.

A thin washer is placed on the axle outside of each wheel and held in place with a $\frac{3}{8}$ -in. cotter pin. Also, a thin washer is placed on each king bolt between the plates. The tongue or drawing rod is shown in Fig. 4 which is made from $\frac{7}{8}$ -in. iron, 4 ft. long, with the forks and hooks not less than $\frac{3}{4}$ in. in diameter. When ready for use the car may be run upon the truck and turned in any desired direction, care being taken to block the wheels when on the truck.

Bracing Gate Posts of a Wire Fence

The posts of a gate placed in a straight line of wire fence requires just as much bracing as a corner post. A very effective way, and one that will not require much extra material, is shown in the accompanying sketch.

The two posts of the gate will need to be extra long and well set in the



No Wood Braces Are Used

ground. The tops of the posts are then tied with wire so as to hold them in a parallel position with the right width between for the gate. The fence wires are twisted tight and held to the posts with staples.—Contributed by Vincent Whitman, Lyons, N. Y.

An Oiler for Hand Tools

An oiler for oiling saws, planes and other bench tools to keep them from

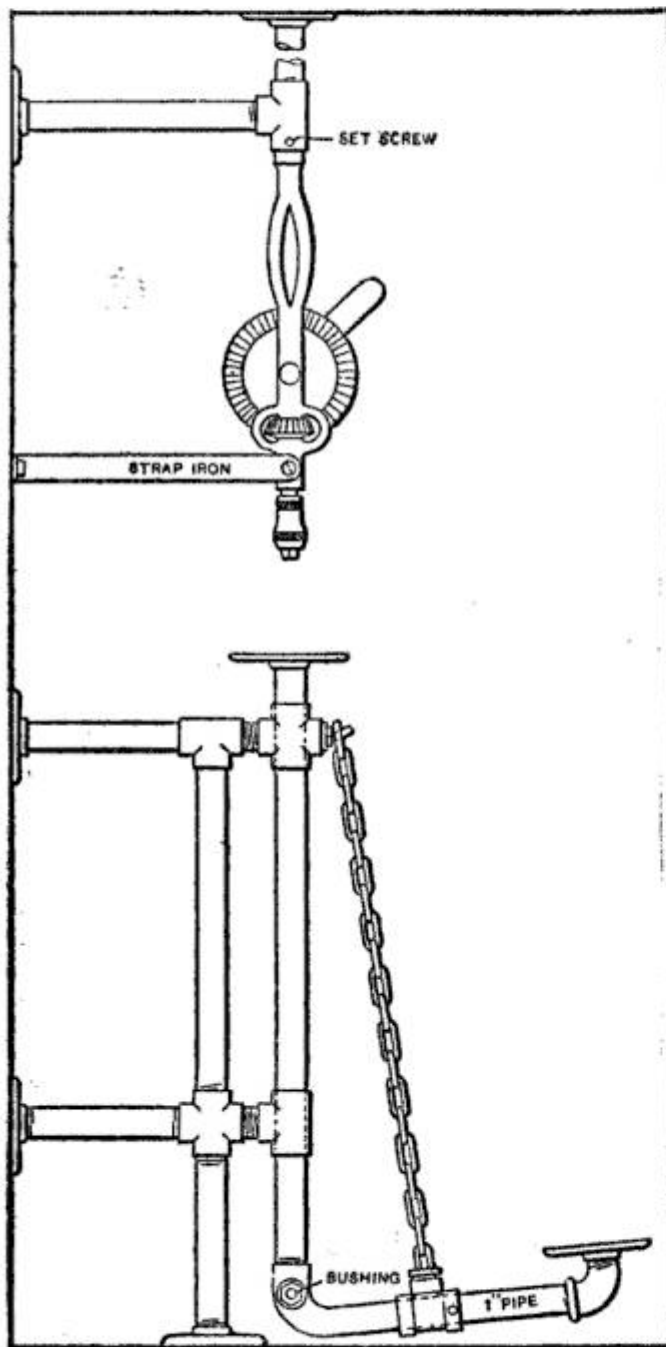


rusting when not in use can be made by filling a blacking box or other small tin box with felt, allowing a small portion to extend above the top of the box. Saturate the felt with oil and the oiler is ready for use. This is a very handy oiler which can be made in a few minutes' time. Keep the cover on the box when not in use and there will be no waste of oil.—Contributed by W. F. Smith, Maryville, Mo.

Do not turn a spark plug into a hot cylinder very tight or you will experience considerable difficulty in removing it later when the engine is cold.

Foot-Power Feed for a Breast Drill

The accompanying illustration shows how a common breast drill was rigged up by a correspondent of the Hub, so it could be fed by foot power; the crank turned with one hand and the work to be drilled was held in the other. The bottom frame is made from $\frac{3}{4}$ -in. pipe and fittings, except the treadle, which is 1-in. pipe. The pipes holding the drill may be $\frac{1}{2}$ in. and the strap iron fastened with screws as shown. The whole is fastened to the ceiling, side wall, and floor.



Parts Made of Pipe Fittings

The tee and cross connections in the lower part of the frame are bored out

so the $\frac{3}{4}$ -in. pipe will slide through them. The plug turned into the cross has a $\frac{1}{4}$ -in. pin fastened into it on which to hook the chain. A flange is screwed on the upper end of the $\frac{3}{4}$ -in. pipe for a faceplate. The bottom end of the $\frac{3}{4}$ -in. pipe is fitted with a $\frac{1}{2}$ -by- $\frac{3}{4}$ -in. tee which has a bushing turned into each end for a $\frac{3}{8}$ -in. rod. The 1-in. pipe forming the treadle must have one end flattened down to about $\frac{1}{2}$ in. thick, then given a short right angle bend, and drilled for a $\frac{3}{8}$ -in. rod. The tee on the bottom end of the $\frac{3}{4}$ -in. pipe is cut out in the center to receive the turned end of the 1-in. treadle pipe. The tee at the bottom end of the chain has the thread bored out so that it will slide along the 1-in. pipe and be placed in any desired position and held with set screws. Any desired depth of hole or different sized pieces can be drilled by raising or lowering the chain on the pin.

How to Make Britannia Metal

(Condensed Article from Brass World)

Britannia metal, fifty years ago, was used without plating and was known and sold as such. A britannia metal teapot or sugar bowl was considered one of the luxuries of the household. Today we have the same teapot or sugar bowl, more elaborately adorned, but made of the same metal. The surface of this metal instead of being exposed as in former years is now silver plated. The fact that these articles are silver plated prevents the knowledge that they are actually britannia metal. Although practically no ware is now sold under the name of britannia metal, the mixture which is used for making the silver plated goods has not changed at all and is the same as that employed when all articles were left with the bare surface of the metal exposed. While the name is not used, the actual consumption of the metal in the shape of silver-plated goods is greater than ever before. Britannia metal is an outgrowth of pewter. At one time pewter was extensively used, but as this metal contained a large portion of lead, man-

ufacturers desired to eliminate the poisonous elements contained therein and sought another metal that would not have lead in its composition. Consequently britannia metal was adopted. Experience has taught the maker that it is dangerous for the person using goods made from a composition in which lead is used, even though the articles are plated. If the plate should wear off in time and the base metal be exposed, this would contaminate foods to a greater or less extent. Britannia metal has no corrosive properties. Tin is the principal metal and the small quantities of antimony and copper added to harden the metal do not affect the non-corrosive properties. All makers of britannia metal have their own formula for mixing, yet the difference is very slight. They all consist of tin, antimony and copper. The antimony and copper harden the tin for practical service. The desired quality is that it should be of sufficient hardness to hold its shape and yet not be refractory in rolling or spinning. A very good composition is as follows:

Tin	150 lb.	=	92.0%
Antimony	10 lb.	=	6.2%
Copper	3 lb.	=	1.8%

Pure tin, the best antimony, and a highly refined copper should be used. The best and usual method of making the mixture is first to make a "hardening" of the tin and copper which can be melted with the tin and antimony. The melting point of copper is so high that it cannot be melted in the iron kettle used for the tin. A plumbago crucible is necessary. To make the "hardening," equal parts of tin and copper are melted together in a crucible and poured into small bars so that they may be easily broken. This mixture will readily melt with the tin. We must then change the foregoing formula to the following:

Tin	147 lb.
Antimony	10 lb.
Hardening	6 lb.

The "hardening" can be made in quantities so that it will be unnecessary to make a copper melt every time a heat of metal is mixed.

In making the britannia metal, the

antimony and hardening are placed in the bottom of the kettle and the tin on top. When the whole is melted, it is thoroughly stirred and scrap added



Britannia Metal Tray

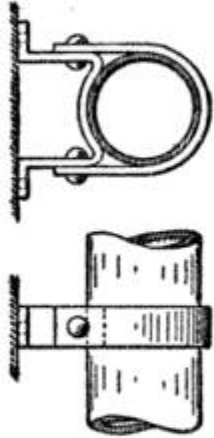
to cool it. The cooling is necessary for the reason that in order to melt the hardening and antimony, it is necessary to heat the metal hotter than the temperature used for casting it. In fact, the pouring temperature should be as low as possible or the metal will crack in rolling.

Harder or softer britannia metal mixtures may be made by increasing or decreasing the quantities of tin and copper. Too great an excess of copper will render the metal too hard to roll and increase its melting point so that it is not easily cast. For both casting in metal molds and for rolling into sheet to be afterwards spun or stamped the preceding mixtures will be found satisfactory as they are in daily use, and are the result of many years' experience on the part of the leading makers of hollow ware.

The pressure is the same at all points on any given level of a liquid.

Vertical Pipe Supports

A simple and neat appearing support for attaching vertical pipes to walls is shown in the accompanying sketch. This support consists of two wrought-iron bars, one bent in the shape of the letter U to fit the outside diameter of the pipe and riveted to the other bar, which is bent to form a saddle for the pipe and with both ends



turned up for feet. The support is fastened to the wall with bolts or lag screws put through drilled holes in the feet.—Contributed by I. G. Bayley, Cape May Point, N. J.

Home-Made Engine Stop

An ingenious device in the way of a home-made engine stop used in the engine room of a manufacturing plant attracted the attention of a correspondent of Power and he made inquiry in regard to it. The engineer explained that from some cause the engine had run away several times and in each instance disaster was narrowly averted. Accordingly he had set about to produce an automatic engine stop. The accompanying sketch gives an idea of the apparatus. This has fulfilled its function faithfully several times.

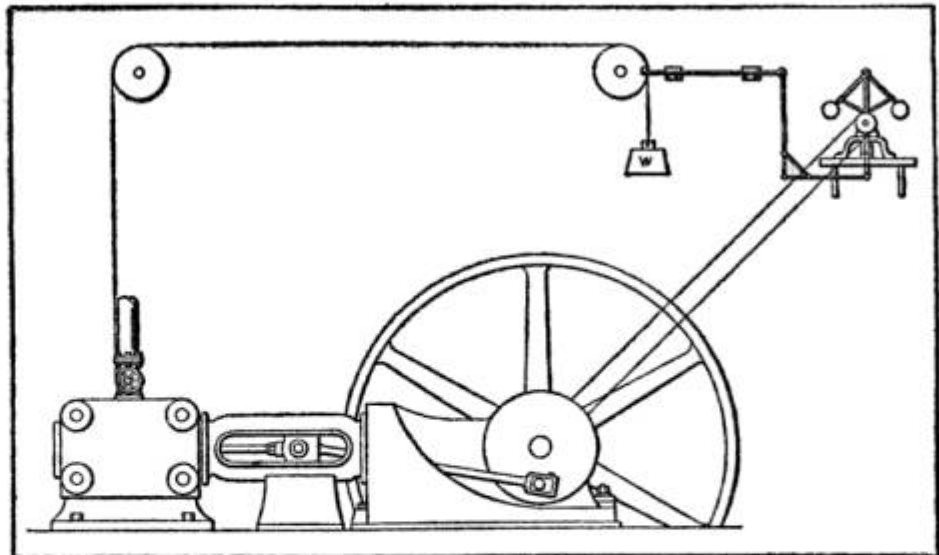
There is a detachable drum fastened to the throttle of the engine with enough sash cord wound on it to correspond with the threads on the stem of the valve. The cord is run over pulleys and connected with a weight of sufficient size to unwind the cord from the drum as it descends, thus

closing the throttle. Ordinarily the cord is wound on the drum and the weight suspended at sufficient height entirely to shut off steam in its descent. The drum comes off for starting and stopping and is placed on a hook out of the way.

The scheme for releasing the weight is that of a sliding bar, one end of which is caught under a pin in one edge of the pulley directly over the weight. As it is barely caught, an endwise movement of $\frac{1}{2}$ in. will release the weight. The other end of the bar is connected to the upper end of a bell crank which is hinged at the elbow. The longitudinal arm of the bell crank is in contact with the stem of an ordinary flyball governor, which in turn is connected by a belt to the engine shaft. The stud of this governor is adjusted so that it will not act until the engine has reached a speed beyond the range of the regular governor, at which time the stem is passed downward, causing the weight to be released and a prompt shutdown is the result.

Anti-Freezing Mixtures

The following are rules for avoiding freezing of water in the cylinders,



The Stop As Applied to the Engine

pipes, radiators, etc., of the cooling system of water-cooled automobile engines and stationary explosive engines. As soon as freezing weather approaches or when the temperature drops as low as 40 deg. F. all water

should be drained from the radiator, cylinders and pump, says Gas Review, and the radiator filled with one of the solutions given.

1. A mixture of glycerine and water in the proportion, by weight of 25 per cent. of the former and 70 per cent. of the latter, to which is added 2 per cent. of sodium carbonate.

2. Chemically pure calcium chloride dissolved in hot water in the proportion of 4 lb. to 1 gal. of water.

3. Sodium chloride (common salt) or magnesium chloride dissolved in water in the proportion of 1½ to 2 lb. to the gallon.

4. Wood alcohol in the proportion of 20 per cent. alcohol to 80 of water. This solution has the advantage of being sufficient for average winter weather, and it has no ill effect of any kind on metals nor does it leave any sediment.

Should the thermometer reach as low as 15 deg. F., a solution of about 25 per cent. alcohol and 75 per cent. water should be used. For temperatures below zero, use 30 per cent. alcohol and 70 per cent. water.

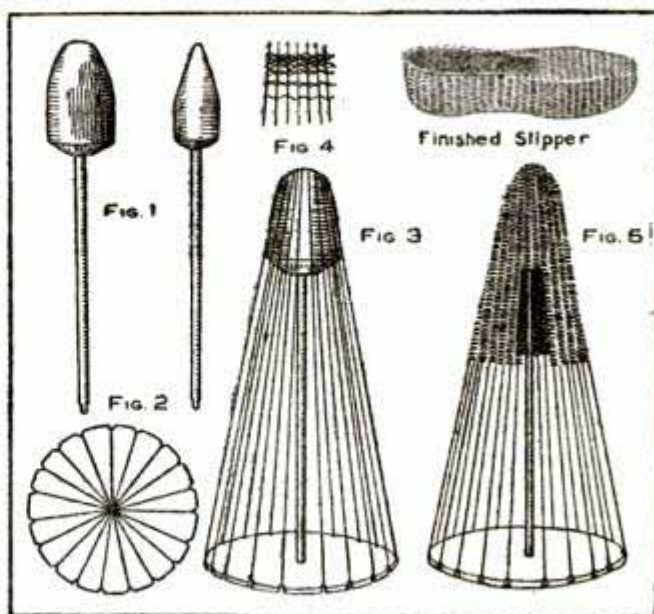
Home-Made Slipper

The material for making the slippers as described herein can be of wool or carpet yarn. The stand on which the slippers are formed may be made from any kind of wood that is easy to work and readily obtained.

The first part to be made is a piece of wood 18 in. long, shaped as shown in the two views, Fig. 1. The other piece on the base is made as shown in Fig. 2, 10 in. in diameter and a hole bored in the center to receive a tenon cut on the end of the stick, Fig. 1. This joint should fit tightly and is fastened with glue or nailed.

After the stand is completed put on 15 to 20 strings, as shown in Fig. 3, which are sufficient to have at one time. Start at the top and weave strings horizontal around the stick and in the vertical strings (Fig. 4). Be sure to pass one horizontal string over and the next under each vertical string.

When you have the size desired, cut the horizontal strings as shown in

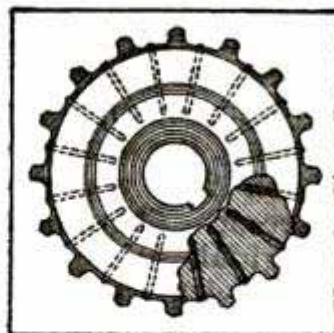


Forming the Slipper

Fig. 5. The lower ends of the vertical strings are cut from the stand and tied together close to the last horizontal string, or at the heel of the slipper. If a little care is taken in forming and tying the heel, a very neat slipper can be made.—Contributed by W. P. Stevens, Calumet, Mich.

Oiling the Links of a Chain Drive

Lubricating a chain on a chain drive can be easily accomplished by the



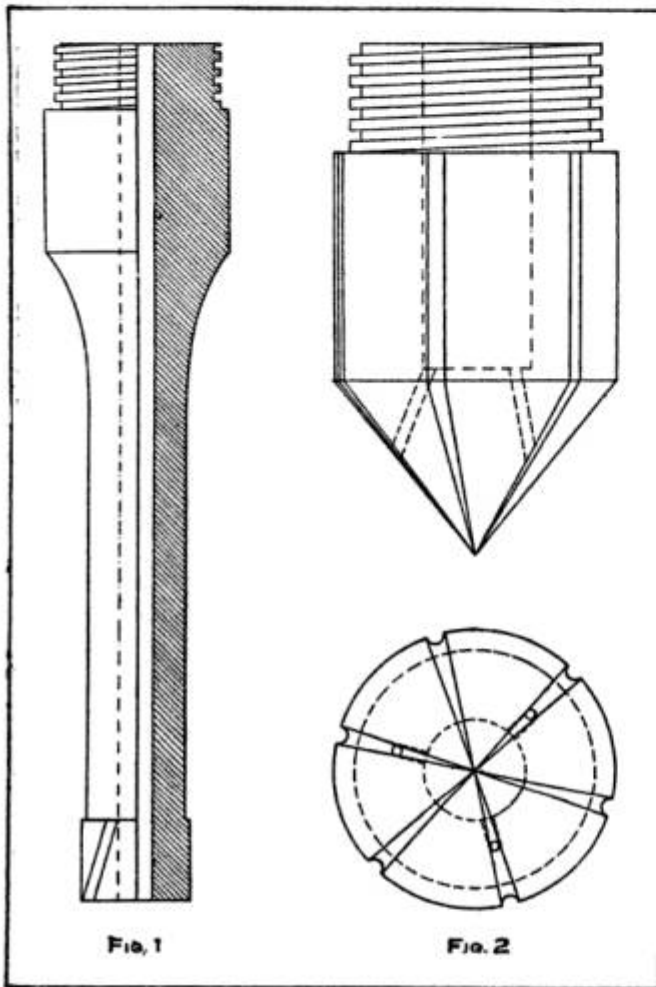
method shown in the accompanying sketch. Holes are drilled in the face of the sprocket wheels between each sprocket and filled with a piece of round wick that will fit

tightly. These wicks are thoroughly saturated with oil which will keep the chain properly lubricated for a long time.—Contributed by W. S. Jacobs, Malden, Mass.

If a painter's brush is too short for bridling and yet too long for convenient use, put a rubber band around the bristles.

A Method of Recovering a Diamond Drill

Recently in putting in a diamond drill hole on the property of a mining



Tools for Removing a Diamond Drill

company at Rockland, Michigan, a breakage occurred that was dealt with in a peculiar manner and, in view of the importance of diamond drilling as a means of prospecting, the description of how the broken drill was recovered will be of interest. The mode of procedure was original, in so far that no one connected with the drill work at the mine had ever seen or heard of a similar solution of the problem.

A nearly horizontal prospecting hole was being drilled from a point in one of the underground workings, says the School of Mines Quarterly. A core shell had become worn thin by use, so that, at a length of 460 ft., it buckled under the working pressure of the rods and jammed in the hole.

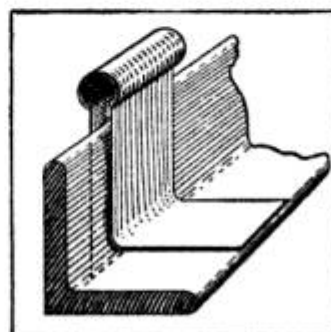
The first step was to get the drill

rods out of the hole. Jack-screws were applied at the mouth of the hole to a gland bolted on the rods, sufficient strain being applied to break off the core shell close to the core lifter. It was found that the force required for this stretched the 460 ft. of rods 6 in. Next, the stump of the core left in the hole had to be removed. As a chopping bit could not be used for this purpose, without great risk of injuring the diamonds, a special tapering bit was made, as shown by Fig. 1. The larger end of this bit fitted closely enough in the hole to center and guide the boring end in grinding out the core. This done, the bit was replaced by a taper tap, with which the core lifter was recovered.

Finally, a pointed drill, Fig. 2, was made of tool steel, properly tempered, and put on the rods. With this the remains of the broken core shell, together with a portion of the original diamond bit, were cut away until the bit itself was loosened in the hole. What was left of the bit, though only 1 in. long, was then easily recovered by a tap, and the diamonds were found to be uninjured. In using the pointed drill, Fig. 2, great care had to be taken to avoid running into the diamonds. To this end, the feed of the drill was accurately measured while the cutting was in progress. On recovering the bit, it was found that there was still a margin of $3/8$ in. of steel above the first diamond.

Reversing Marks on Angle Iron

When laying out steel for construction work, the shearing lines are



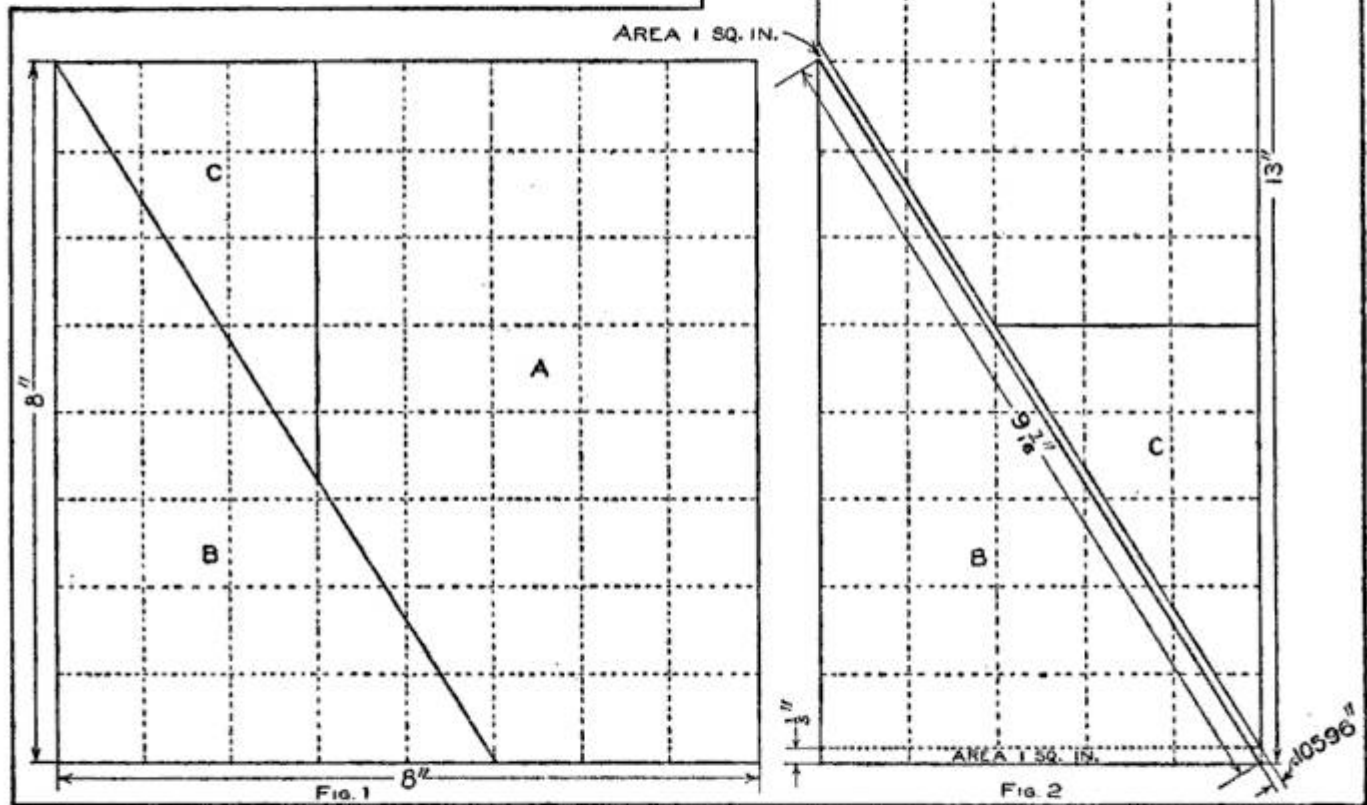
marked on the outside of angle iron, and, as they are always sheared from the inside, the marks must be reversed. The illustration shows a simple instrument for reversing the marks. The tool is made from

a piece of sheet iron, No. 16 or 20 gauge, 2 in. in width and bent in the shape shown in the sketch. The circular part on top serves as a spring to keep the marking edges close to the angle iron.—Contributed by Wm. S. Dowley, Norfolk, Va.

will be that part of 1 in. short on one end of the rectangle that will contain the extra 1 sq. in.—Contributed by Claude M. Padgett.

Area of a Square Not Increased in a Rectangle

A surface 8 in. square and containing 64 sq. in., cut as shown in Fig. 1 and the pieces placed as shown in Fig. 2, will not make 65 sq. in. in the form of a rectangle. The question of "where



The Combined Area of the Parts Remains the Same

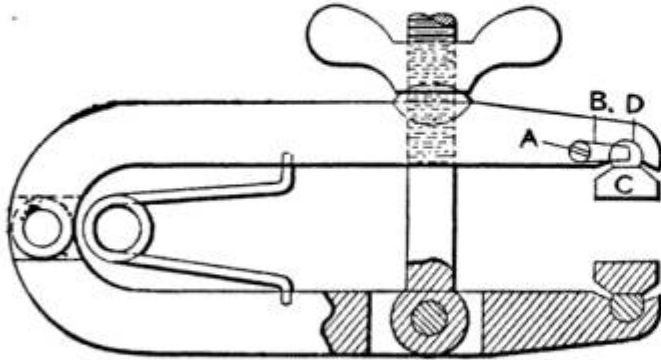
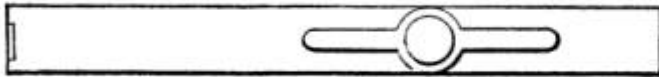
does the extra square come from?" can easily be answered by marking and cutting out a square as shown in Fig. 1, 8 in. each way, and on the heavy lines. These pieces when placed in the form of a rectangle, as shown in Fig. 2, will not make 13 in. long as the squares would indicate. If the lines forming the squares are made to match, as shown in Fig. 2, there will be an open space having an area of 1 sq. in. If the piece B is joined closely to the pieces A and C, the lines forming the squares will not match and then there

Removing Gasoline from a Punctured Float

Nearly immerse the punctured float in hot water and the heat will volatilize the liquid which will pass out in a steady stream of bubbles. The float should be kept immersed until all the gasoline has evaporated, and, of course, great care should be taken that no water gains access. The float should then be allowed to cool, during which time any remaining vapor will have escaped, when the puncture may be sealed with solder.

A Toolmaker's Clamp

The accompanying sketch shows a toolmaker's clamp that will be found

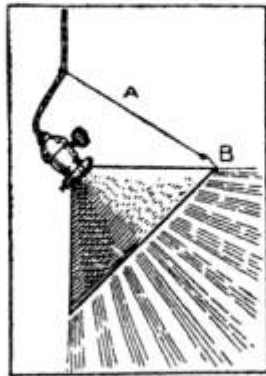


Clamp Details

very effective. A fillister head screw, A, and a flat spring, B, holds the hardened jaws, C, in place. A $\frac{1}{4}$ -in. round piece of soft steel, D, is joined to the hardened jaw, C, by a small counter-sunk head rivet. The special feature of this clamp is that the jaws conform to any taper and always have a full bearing on the work, says a correspondent of *American Machinist*. The general arrangement of the pivoted arms, clamp nut, etc., is shown clearly and needs no explanation.

How to Make an Angle Drop Light

Some time ago I saw a method of tilting an incandescent lamp at an angle described in *Popular Mechanics*. It was simple enough, but I do not think it as simple as this method. An ordinary piece of string, A, is tied to the lamp wire and any piece of wire (a pin, a paper clip, or copper wire, B) that will make a suitable hook is attached to the string and arranged as shown, the length of the string varying with the angle desired. The light may be turned in a different direction by simply sliding the hook, B, around on the



rim of the shade. The hook can be detached from the rim easily when the light is required in the normal position. —Contributed by Jos. C. Wilson, Lynn, Mass.

Starting the New Furnace Right

The first few days a new furnace is in operation is apt to determine its character, if furnaces have a character. If the furnace starts off well, as a good furnace should, the members of the household will be convinced that their furnace is a good one, and it will require a number of furnace misfortunes to remove the favorable impression after it has once been formed, says the *Metal Worker*. On the other hand, if the furnace behaves in an improper manner at first, doubts may be entertained regarding its future warming abilities. It is supposed the dampers in the hot air pipes have been turned in the proper direction to allow the heat to pass, and that the damper rods were put in the proper way, so the handle or ring will indicate whether the damper is closed or open. A mistake made in putting in a damper rod may cause much trouble, as the damper will appear to be open when it is closed, and much furnace talk may be required to explain why heat does not come up the register. If the cold air box is provided with a slide or damper, such appliance may have been left closed, so the furnace does not receive a supply of fresh air. There may be a wide crack under the hall door so the outer air may enter and quietly run down the hall register, thus preventing any warm air from coming up. Thus the hall pipe may be acting as a cold air box.

It has been known for several years that the human eyes and nose are not pleased with smoke. On this account if for no other, the chimney should be examined before connecting the smoke pipe. The chimney flue is liable to become stopped up by soot, mortar or even bricks which may have been dropped by the mason or fallen from the top. By building a small bonfire

in the bottom of the chimney the draft can be tested. It may be well to attach a piece of iron to a rope, then proceed to the top of the chimney and lower the iron. If it arrives safely at the bottom of the chimney without encountering any obstruction, one may infer the flue is clear. If there are any openings in the furnace chimney other than the one used by the furnace, they should be closed. While it may be supposed that all smoke pipe fits tight at each joint, it is well to be certain that a tight joint has been made where the smoke pipe joins the furnace and also where it enters the chimney.

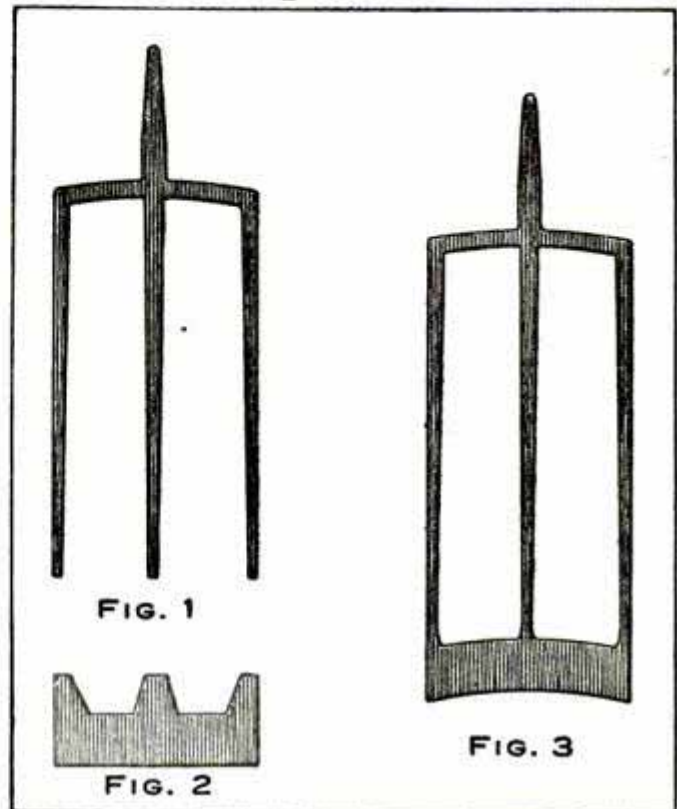
If the attendant is not accustomed to the management of a furnace, or does not take sufficient interest, ashes and clinkers may be allowed to accumulate in the firepot to such an extent that a good fire is impossible. Some houses are so constructed that grates are placed in a number of rooms, and if these grates are not in use, too much air may be carried up the various flues, resulting in a great loss of heat. If there is not a good fire in the furnace the air may pass through without being properly heated, and then the furnace may be blamed for not warming the house, or the grate flues may be taking away the heat as fast as it is produced.

In some houses there are one or more rooms that require long pipes to convey the heat to them, and on this account the rooms do not receive the required amount of heat. A remedy may be found by incasing the pipes with tin or some of the various pipe coverings that are nonconductors of heat. If a certain room does not receive the proper amount of heat, it may be on account of there being no escape provided for air. If a room is closed tight it can hardly be expected that a supply of hot air can enter, there being no provision made for the escape of the cool air.

Mill bins fitted with a narrow strip of glass running from top to bottom provide a way to inspect the stock at a glance and also to note the quantity contained therein without climbing.

How to Refit Tiling Spades

The old bit is first cut from the spade as shown in Fig. 1 and the ends of the

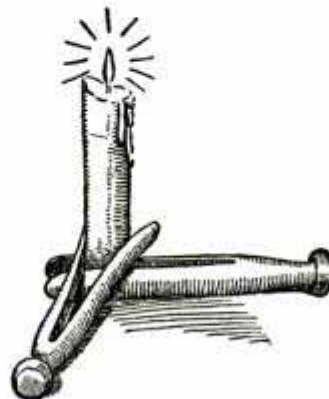


Attaching a New Bit

tines upset so as to have sufficient metal to make a weld. A new blade is made from an old harrow disk as shown in Fig. 2, with prongs long enough to get a good weld above the bit. Scarf and weld the bit on the tines. Sharpen and polish and you will have a good spade as shown in Fig. 3.

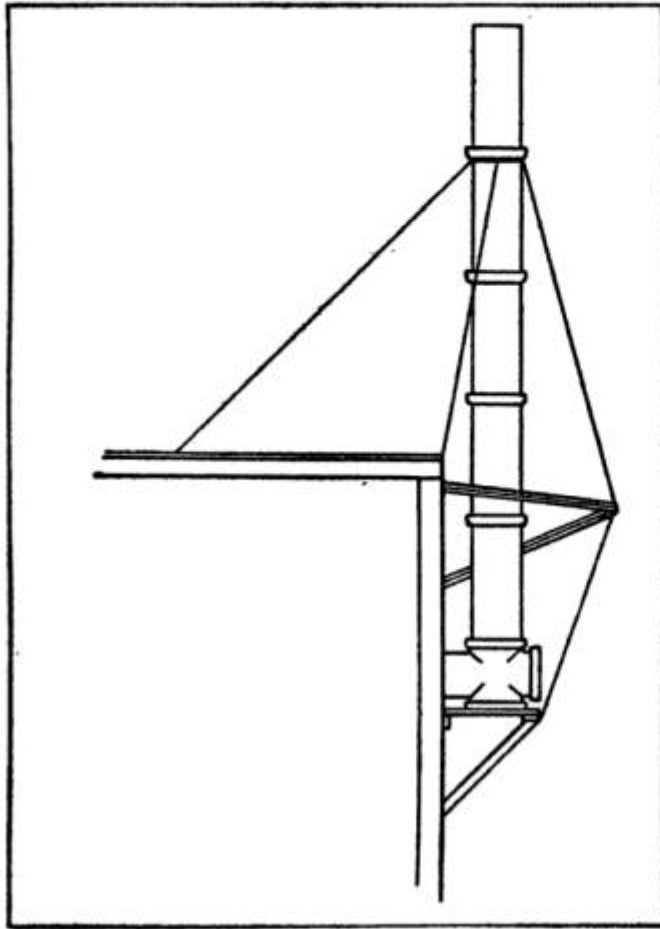
A Convenient Candle Holder

Various methods are used for holding candles where they are used. A cap for a $\frac{1}{2}$ -in. gas pipe makes a good holder and is extensively used in shops. Herewith is illustrated a new way of using clothespins for a holder. The candle can be easily carried by taking hold of a pin, and when it is set down the candle will not fall over.—Contributed by Maurice Baudier, New Orleans, La.



Guying a Smoke Pipe

Where a temporary chimney is put up on the side of a house, kitchen or



The Guy Wires as Attached

shop, the way to attach the guy wires is shown in the accompanying illustration. Three wires are fastened to the roof and the fourth one taken over the end of the V-shaped brace or bracket and down to the shelf on which the tile chimney rests, says the Industrial Magazine, or it can be fastened to the side of the building.

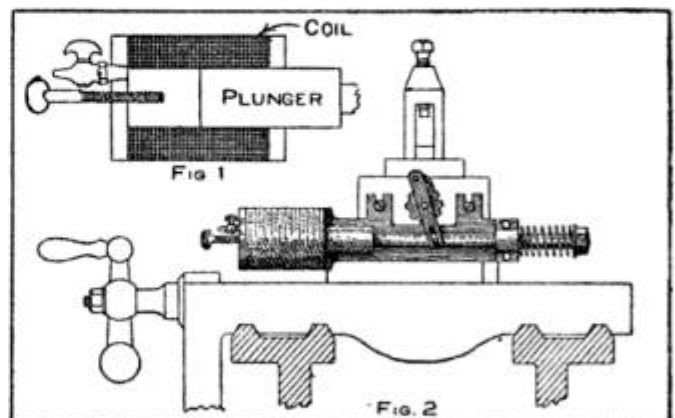
Magnetic Feed for the Compound Rest of a Lathe

The compound rest of an engine lathe does not have any self feed, except on very large sizes, and I constructed a device to obviate the necessity of feeding by hand when turning parts that had a bevel similar to friction clutches used on automobiles.

The handle of the compound rest was removed and a ratchet wheel and pawl placed on the screw in its stead. A strip of iron was placed across the rear

end of the rest which was attached with screws in slots for adjustment. The magnet, plunger and spring were fastened to this iron. The magnet was made as shown in Fig. 1 with the magnet wire wound on a piece of soft steel tubing, one end of which was closed and a small petcock attached, also a thumb-screw for adjusting the stroke of the plunger. The plunger was turned from soft iron to a sliding fit in the magnet core with a smaller extension that passed through a bearing at the opposite end of the support which carries an open spring on the projecting end. This spring would draw the plunger from the coil when the current was broken. The completed device as attached to the compound rest is shown in Fig. 2.

A fiber finger was fastened behind the chuck on the lathe that operated the switch at every revolution of the lathe spindle and sent a current of electricity through the magnet wire. After suitable connections were made from a lamp socket to the switch and magnet, the cut was started in the metal by hand with the regular handle which was then slipped off and the ratchet wheel with the pawl put on in its place. The magnet would draw in the plunger at every revolution of the chuck where the fiber finger would make the connections on the switch and turn the compound screw through the intermedium of the lever, ratchet and pawl. When the current connections were broken, the spring at the end of



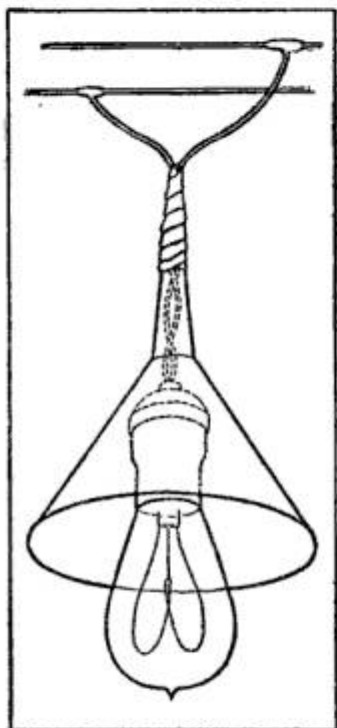
Method of Attaching to a Lathe

the plunger shaft would draw the plunger and pawl back for another

operation. In order to prevent too quick an action the petcock was so adjusted as to allow only a gradual escape of the air compressed by the plunger. The thumbscrew regulated the travel of the plunger and thereby the amount of feed.—Contributed by Chas. Chaffner, Maywood, Ill.

Waterproofing a Common Electric Socket

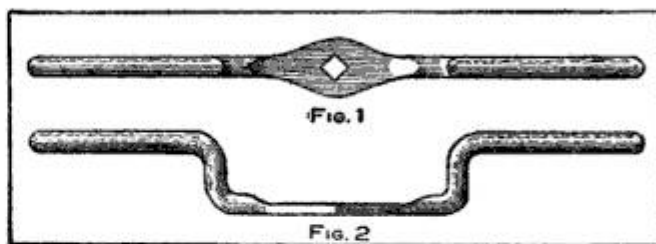
Several electric lights had to be placed out in the open and we did not have the weatherproof sockets at hand so a substitute waterproof device was used, which we made as follows: The right number of common tin funnels were purchased and each socket and globe protected by putting a funnel upside down on the supply wire as shown in the sketch. The wire and small end of the funnel were well taped to make it waterproof. This not only served well the purpose for which it was intended, but the funnel made a good reflector.—Contributed by H. D. Harkins, St. Louis, Mo.



An Offset Tap Wrench

Occasion may demand the tapping or reaming of a hole that is so located as to cause the handle of the holder to strike some projecting part before the tool cuts through the metal. In such a case, procedure is impossible, unless a part of a turn is taken and the wrench then changed. The accompanying sketch illustrates a wrench that is quickly made from $\frac{5}{8}$ -in. round steel which can have sufficient offset for the handles to be out of the way when turning taps or reamers in re-

cesses. Figure 1 illustrates the plan and Fig. 2 the elevation of the wrench.

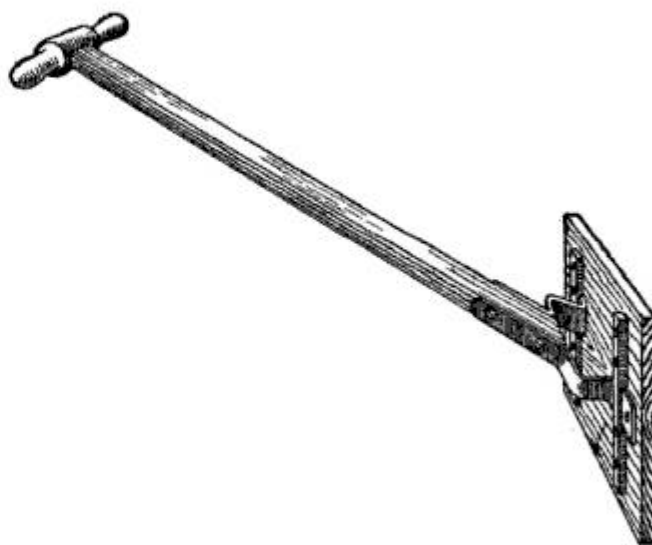


The Wrench with Offset

The edges of the $\frac{3}{4}$ -in. square hole can be hardened and a set of bushings made from sheet metal to place in the hole that will hold taps in sizes from $\frac{1}{4}$ to $\frac{3}{4}$ in. A mechanic will find this a very useful addition to his kit of tools.—Contributed by Donald A. Hampson, Middletown, N. Y.

Home-Made Snow Plow for Sidewalks

This is one instance where a lawn mower can be used in the winter as well as the summer time. The handle and braces are taken from the lawn mower and attached to a board 1 in. thick, 12 in. wide and 18 in. long. Two strips of wood 1 by 2 and 10 in. long used as battens over the handle braces and fastened with screws complete the snow plow, as shown in the illustration. A piece of tin tacked over the face of the board will greatly assist

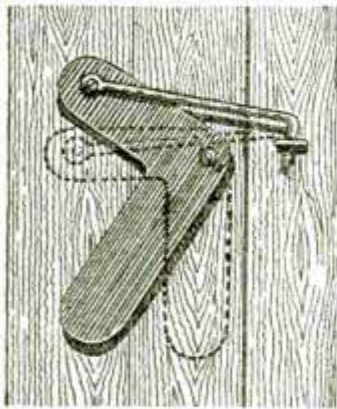


Sidewalk Snow Plow

the snow in sliding from the plow.—Contributed by J. Gordon Dempsey, Patterson, N. J.

A Barn Door Latch

The regular hook and staple placed on a sliding door does not always close the joint tightly. The accompanying



sketch shows the construction of an attachment for a common door hook that will draw the door close to the door jam. The L-shaped piece is made from sheet metal and fastened to the

door with a small bolt or large wood screw. After the hook is placed in the staple, the sheet metal handle is drawn in the position shown by the dotted lines, which draws the door closed. The position of the bolt in the sheet metal and screw of the hook are so arranged that the pull will have a tendency to keep the parts closed.—Contributed by H. H. Nelson, Rose Lawn, Ind.

A Clamp to Hold Long Work

Many of the handy tools are constructed by the mechanic when a particular job requires something out of the ordinary. Such a case comes to light in an article given by a correspondent of Wood Craft describing a new clamp originated by a workman who was making a screen frame of unusual proportions. As the clamps on hand were not long enough, he constructed some that could be used for almost any size of work.

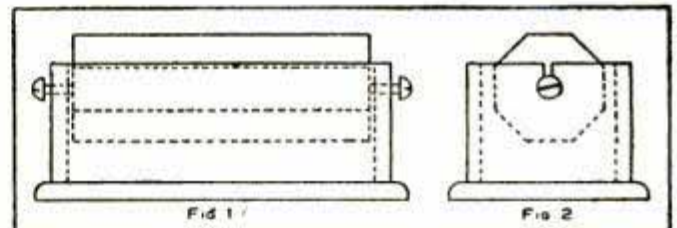
For the material he took a piece of $\frac{1}{2}$ -in. round iron and bent it into a crank, A, as shown in the sketch. Two holes were drilled through this crank close together as shown at G. A $\frac{1}{2}$ -in. hole

was bored into a block of wood a little thicker than the stock to be clamped. This block was placed against one side of the work and the block F against the other. The wire B was drawn around the frame and blocks and the ends put through the holes G from opposite sides. Turning the crank would wind the wire around A. A washer, D, with its edges bent a trifle, was placed under the wire to keep it from cutting into the wood.

The same wire cannot be used on many jobs of the same size as the ends will not stand very much of such short bending. The device was intended only as a makeshift for extra long jobs. The clamp is capable of considerable variation and of a wide range of use.

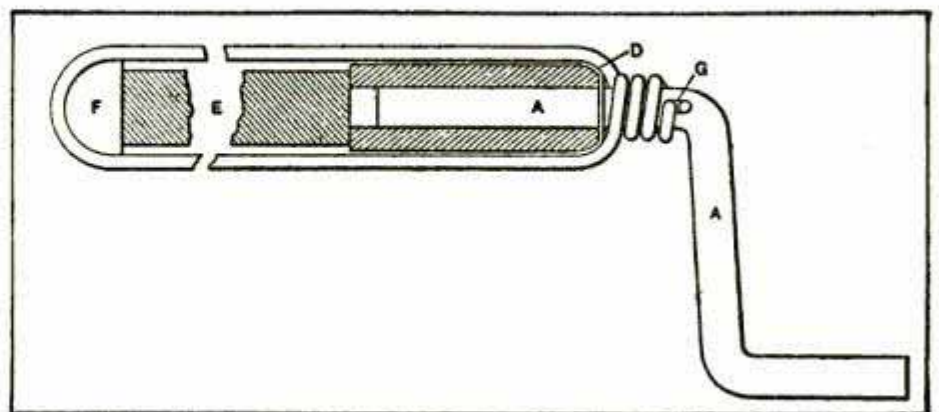
Another Pencil Sharpener

This sharpener can be handled without getting the hands, drawings and



All Dirt Drops into the Box

clothes covered with lead. The device consists of a hexagonal piece of wood covered with sandpaper and supported on an axle that fits into the ends of a small box. The box will catch all the lead and wood removed from the



Details of the Clamp

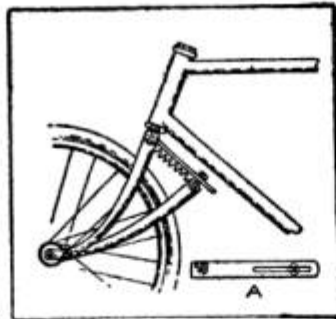
pencil. Figure 1 shows a side elevation and Fig. 2 the end.—Contributed by J. H. Crawford, Schenectady, N. Y.

Metal Melts in a Cupola Quicker in Cold Weather

The reason why metal can be melted in a cupola quicker on a cold day is because the draft from the blower usually comes from the outside where the moisture has been frozen out of the air, says Castings. When cold, the air is more dense, and with each revolution of the blower the cupola gets an increased number of pounds of oxygen with less than the usual amount of moisture, conditions which tend to produce a hotter fire and more uniform working.

Home-Made Spring Fork for a Bicycle

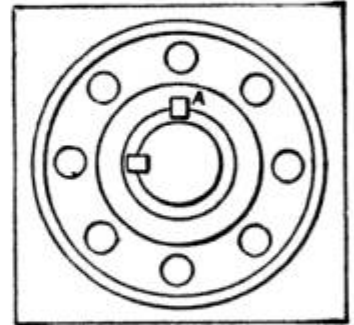
Cushion forks attached to a bicycle eliminate the jar on the rider's hands and arms. Old types of bicycles were not equipped with this special feature and as I had one of these wheels, I determined to have a spring fork of my own make. A fork was secured from another old bicycle and the stem cut off close to the crown forging.



Two extra holes were drilled in the fork ends about 2 in. up from the regular holes for the front wheel axle. The old fork was then put on the front wheel in the usual way and the fork for the bicycle fastened with bolts put through the two extra holes as shown. A strap of iron is fastened with a bolt to the under side of the fork crown on the bicycle. The strap of iron has a slot cut 3 in. long in the other end as shown at A in the drawing. Another bolt is loosely fitted in the slot of the strap iron and fastened in the crown of the extra fork. The ends of a coil spring are fastened to each bolt. A suitable spring coil can be purchased from almost any hardware merchant.—Contributed by V. L. Beeman, Cleveland, O.

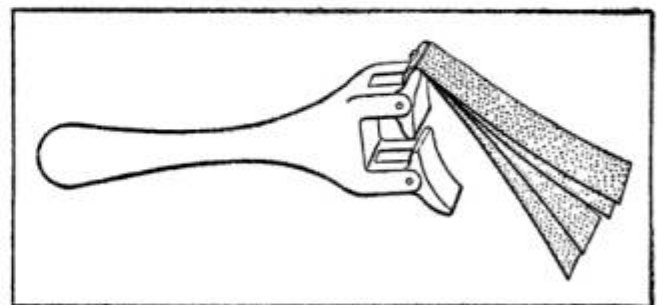
Bushing a Flange Coupling

The accompanying sketch shows a method for reducing the bore of a shaft coupling. A correspondent of Southern Machinery had to use a coupling with the hole too large, as there was no other in stock with the right sized hole. The coupling was chucked in a lathe and a cut taken to make the bore true again, and as the old keyseat could not be removed altogether, a cast-iron bushing was made to fit the coupling and the shaft. A keyseat was cut into the bushing, A, to correspond with the old keyseat, and another keyseat cut to tighten the coupling on the shaft. After the coupling was placed on the shaft, the bushing key was driven first to tighten the bushing, then the key to hold the coupling on the shaft.



A Sandpaper Holder for Dressing Commutators

The handle of the holder has two blocks with an arc of a circle on each face 2 by 2½ in. These blocks are pivoted and adjust themselves to fit any sized commutator. If the commutator has four brushes, the lower

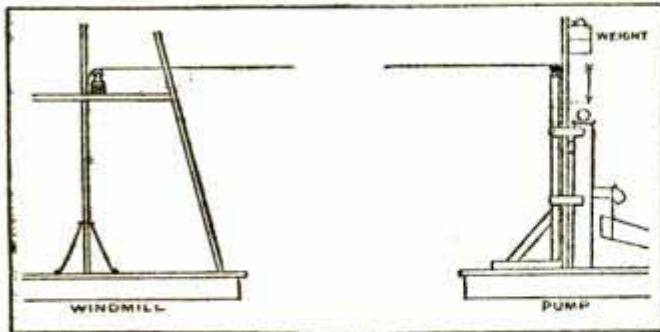


Will Fit Any Sized Commutator

block will go in between the brush holder, says a correspondent of Power. A commutator may be kept level and smooth with this device.

Substitute for a Windmill Quadrant

The usual device for transmitting power from a windmill to a pump



Single Wire Operates the Pump

where there is a distance between them is the quadrant. The wires of the quadrant will stretch, and with that of the expansion, cause a jerk in driving the pump rod. The accompanying sketch shows how a windmill was connected to pump water from two wells which were dug several rods apart. A single wire was fastened to the windmill rod, run over two pulleys and attached to the pump rod of the second well pump. A box weighted with pieces of iron was bolted to the pump rod to produce the down stroke and the windmill furnished the power to make the up stroke. The weight kept the wire taut at all times and caused no jerky motion.—S. R. W.

Chamois Strainer for Gasoline

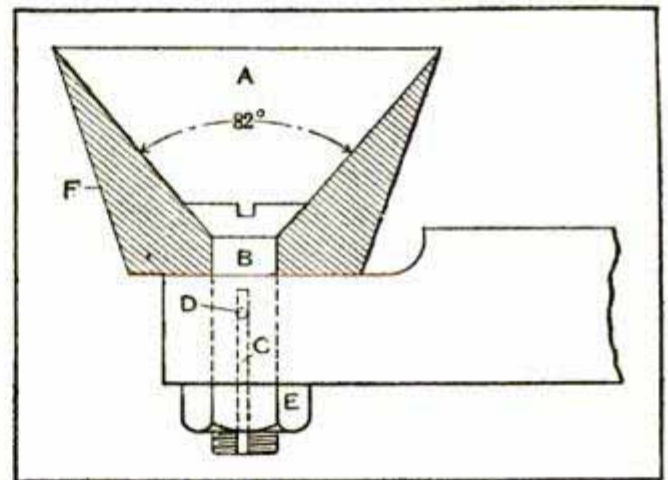
All dirt and particles of water should be removed from gasoline that is placed in the tank for use of an automobile or motorcycle engine. About the best method is to strain the gasoline through chamois. A good strainer can be made from two 5- or 6-in. funnels by cutting about 2 in. from the top of one funnel to be used as a band on the other. Procure a 9- or 10-in. square of chamois and trim the piece round.



Stretch the round chamois over the top of the funnel and then slip the band over the bottom end and up over the edge of the chamois. Push the chamois down slightly in the center and the strainer is ready for use. This kind of a strainer will remove all dirt and water from gasoline which will save considerable trouble for the autoist.—Contributed by Riley Lucas, Carrollton, Ohio.

Turning Tool for Wood

A new kind of wood-turning tool for turning wooden rolls is shown in the accompanying sketch. The cutter, A, is made of either carbon or high speed steel. When turning fiber, the latter



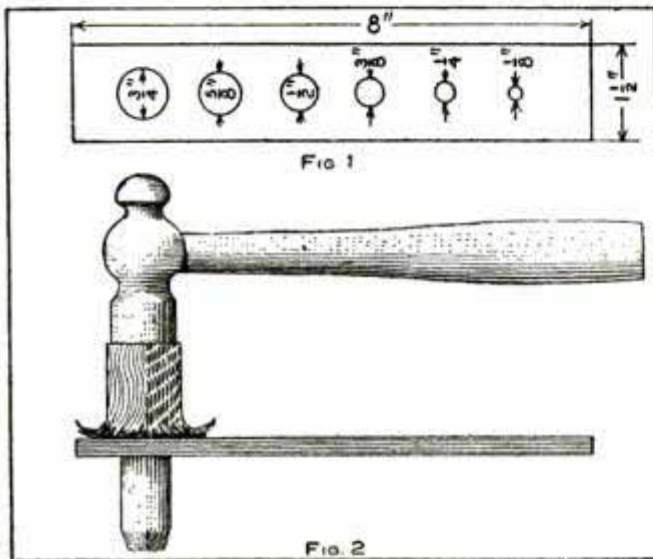
A Full Circle-Cutting Edge

would be much better, says American Machinist. The cutter is bored at an angle of 82 deg. so as to accommodate the head of a regulation flathead machine screw, B, which has a spline, C, on its body in which the pin, D, slides; this keeps it from turning when the nut, E, is tightened. The main body of the tool holder is made of machine steel. The face angle, F, can be made to suit the material being turned. The one illustrated has about 40 deg. angle, which would be about right for maple and similar hard woods. Softer woods might require a more acute angle both inside and out. A cutter, A, 1½ in. in diameter, would have nearly 5 in. of cutting edge. When dull at one point the nut, E, is slackened and the cutter turned so as to present a new cutting edge to the work. When the whole

cutting edge is dull the cutter is removed and ground on the face.

How to Make a Dowel-Cutting Tool

Secure a piece of steel about $\frac{1}{4}$ in. thick, $1\frac{3}{4}$ in. wide and 8 in. long. Drill various sized holes through the steel as shown in Fig. 1, leaving the edge of each hole as sharp as the drill will make them. Cut off a block of wood the length necessary for the dowels and split it up into pieces about the size for the particular dowel to be used. Lay the steel on something flat, over a hole of some kind, then

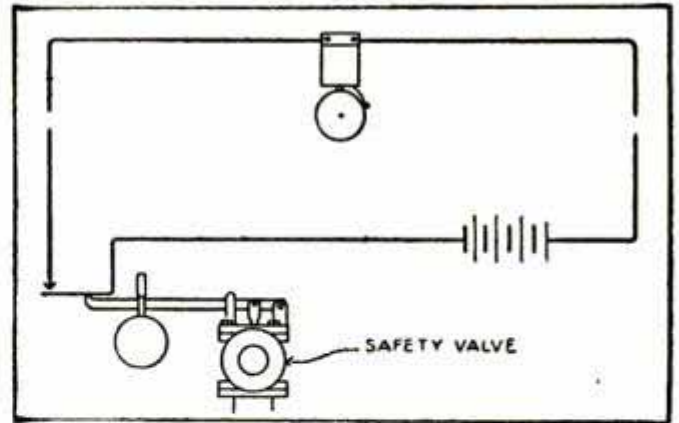


Easy Way to Make Dowels

start one of the pieces of wood in the proper size hole for the dowel and drive it through with a hammer, as shown in Fig. 2. The sharp edges on the steel will cut the dowel as smooth and round as if it were turned in a lathe.

Safety Alarm for a Steam Heater

Some persons taking care of steam heaters will retire at night and leave the draft open, which is liable to cause an explosion. The accompanying sketch shows how I connected up a bell that would ring when the safety valve rose. The valve could not be heard in the bedrooms, so the bell was placed in my room and connected to the safety valve on the boiler. When the valve would rise it would make the

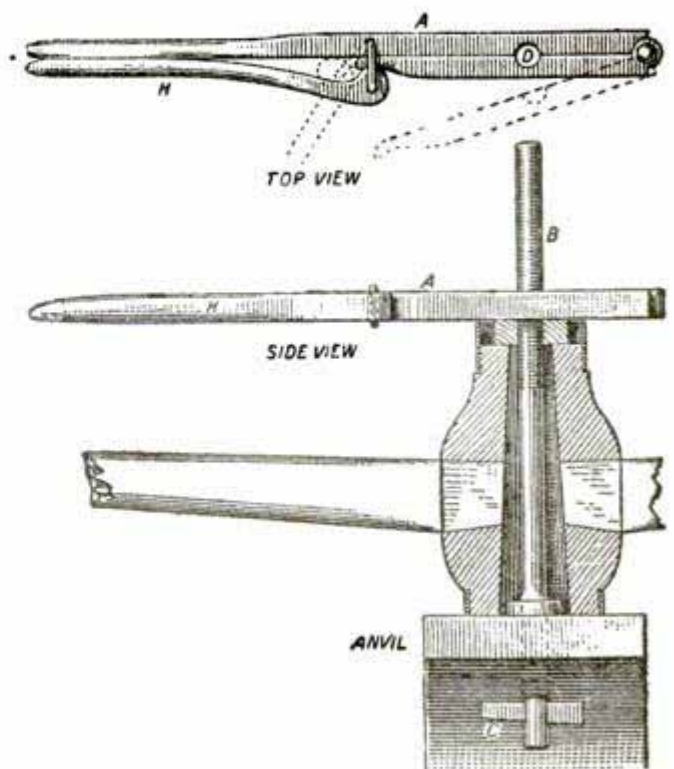


The Wiring Diagram

connection and ring the bell.—Contributed by Albert P. Carr, Anthony, R. I.

A Wheelwright's Holding Tool

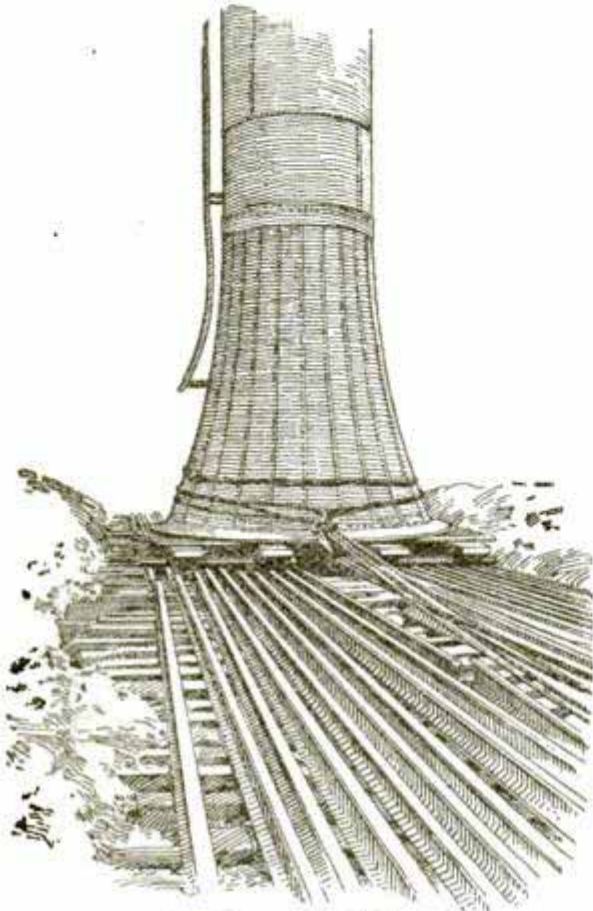
This tool is to be used on the anvil to hold wheels while taking out bolts and to bolt them. The wheel can be fastened in a few seconds. The lever, A, is made from an old buggy top joint. The joint is closed and a $\frac{1}{2}$ -in. hole, D, drilled and a thread cut to fit the rod B. The rod B has a hole in the end for a pin to go through to hold it to the anvil. The handle H operates the lever A so it can be put on or taken off quickly. One turn of the lever will tighten the wheel.



Clamping a Wheel to an Anvil

Moving Large Steel Furnaces

While remodeling a large steel plant it became necessary to move three



Moving a Steel Stack

large stacks, each 16 ft. in diameter, 150 ft. high and weighing approximately 200 tons. Each stack was lined throughout with firebrick. The stacks were moved 150 ft. without taking them down. As the new foundations were 15 ft. below the level of the old ones, a trench was dug with a steam shovel to make the intervening distance on an incline. Ties were placed on the bottom of the trench and steel rails fastened close together on top of them. Hydraulic jacks were used to lift each stack to make a space to extend the rails beneath and place the structure on steel bars and rollers. Each stack, while being moved, was held vertical with eight guy ropes. Block and tackle was used in pulling the stacks down inclined tracks.—Contributed by J. W. Beddow, Ensley, Ala.

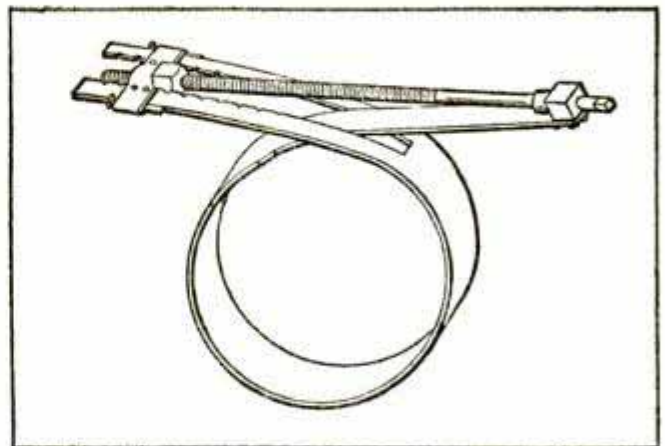
Bell metal composed of copper and tin may be improved by adding a small quantity of iron.

Making Use of Scrap Paint

A little economy which is practiced in the paint shop of the Nashville Railway & Light Company is the saving of all scrap paint, says Electric Traction Weekly. A large "slush barrel" is located in the paint shop and each evening a man cleans up the brushes, gathers up the odds and ends, and carefully scrapes out the cans that have been used during the day and mixes it in this tank. A little oil and green coloring matter are added to bring it to the standard color of the company, and after thoroughly straining, the mixture is put up in cans for use as floor paint, roof paint, truck paint, pole paint, etc. A great deal of paint is accumulated in this way and the master mechanic finds that it is well worth the trouble.

A Commutator Clamp

The end rings of a commutator must be taken out when it is necessary to look for internal grounds. The accompanying sketch shows the construction of a commutator clamp for use in holding the segments in place while the rings are removed. The clamp is made of $\frac{1}{8}$ by 2-in. sheet steel with a $\frac{1}{2}$ -in. screw. The drawing clearly shows the adjustable fastening. The notches fit around rivets on one side of each fastening, which can be



Made of Sheet Metal

moved by removing two cotters, says Power. The clamp is made loose or tight by screwing the bolt in the nut.

AMATEUR MECHANICS

HOW TO MAKE A WHISK BROOM HOLDER OF SHEET METAL

A whisk broom holder such as is shown in the accompanying picture may be easily made by the amateur. The tools needed are few: a pair of tin shears, a metal block of some kind upon which to pound when riveting, a hammer or mallet, several large nails, and a stout board upon which to work up the design. A rivet punch is desirable though not absolutely necessary.

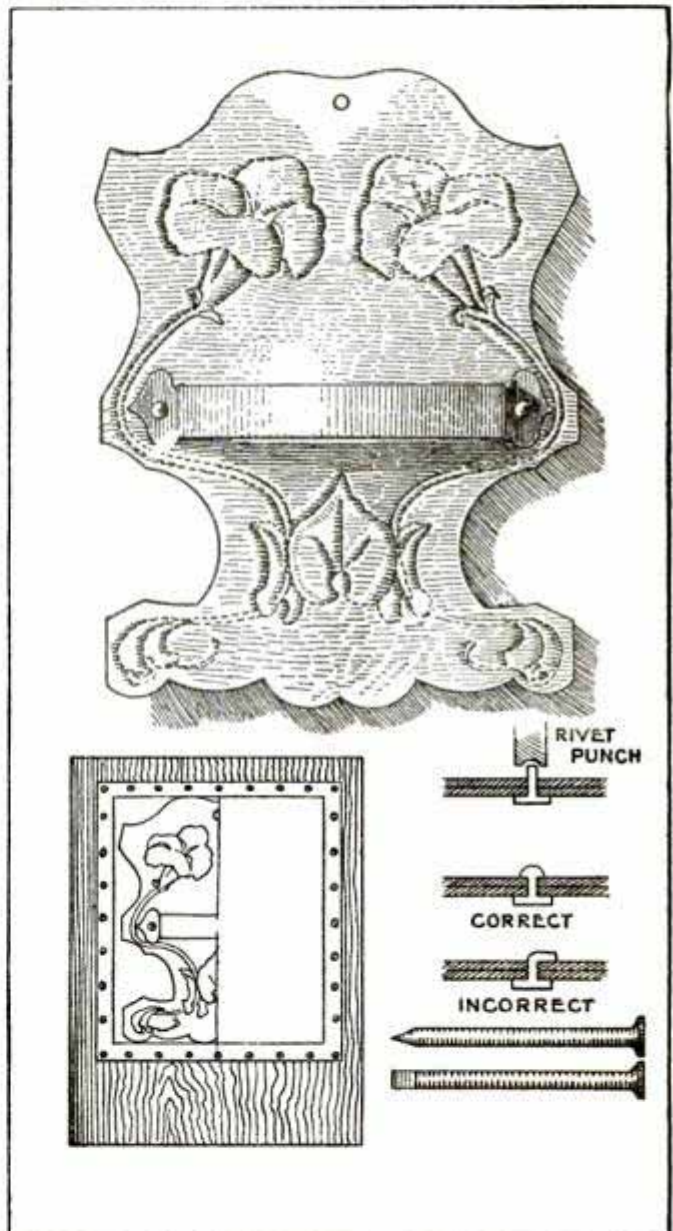
The material required will be a sheet of copper or brass of No. 24 gauge of a size equal to that of the proposed holder, plus a $\frac{3}{8}$ -in. border all around into which to place the screws that are to be used to hold the metal to the board while pounding it. The design shown in the picture is 6 by 8 in. at the widest parts and has proven a satisfactory holder for a small sized broom.

Carefully work out the design desired on a piece of drawing paper, both outline and decoration, being careful to avoid sharp curves in the outline for they are hard to follow with the shears when cutting the metal. If the design is to be of two-part symmetry, like the one shown, draw one part then fold on a center line and duplicate this by inserting double surfaced carbon paper and tracing the part already drawn. With this same carbon paper transfer the design to the metal. Fasten the metal to the board firmly, using $\frac{1}{2}$ -in. screws placed about 1 in. apart in holes previously punched in the margin with a nail set or nail.

To flatten the metal preparatory to fastening it to the board place a block of wood upon it and pound on this block, never upon the metal directly, or the surface will be dented so as to look bad in the finished piece.

Take the nail, a ten or twenty-penny wire or cut, and file it to a chisel edge,

rounding it just enough to take the sharpness off so that it will not cut the metal.



Completed Holder
Brass Fastened to Board—Method of Riveting

There are several ways of working up the design; some have been suggested in this department in previous numbers. The simplest way is to take the nail and merely "chase" the outline of the holder and the design. Remove the screws, cut off the surplus metal

and file the edges until they are smooth. Make a paper pattern for the metal band that is to hold the broom. Trace around this pattern on the metal and cut out the shape. Punch rivet holes in holder and band, also a hole by which to hang the whole upon the wall.

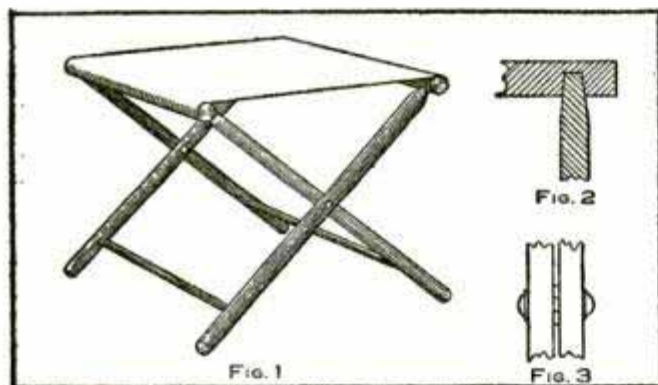
Rivet the band to the holder. Punch the rivet holes with a nail set and make the holes considerably larger than the diameter of the rivet, for in flattening the raised edges the holes will close. Do the riveting on a metal block and keep the head of the rivet on the back

of the holder. Round up the "upset" end of the riveted part as shown in the picture. Do not bend it over or flatten it. This rounding is done by pounding around the outer edge of the rivet end and not flat upon the top as in driving a nail.

Clean the metal by scrubbing it off with a solution composed of one-half water and one-half nitric acid. Use a rag tied to a stick and do not allow the acid to touch either your hands or clothes. A metal lacquer may next be applied to keep the metal from early corrosion.

How to Make a Camp Stool

The stool, as shown in Fig. 1, is made of beech or any suitable wood



Camp Stool Details

with a canvas or carpet top. Provide four lengths for the legs, each 1 in. square and 18½ in. long; two lengths, 1½ in. square and 11 in. long, for the top, and two lengths, ¾ in. square, one 8½ and the other 10½ in. long, for the lower rails.

The legs are shaped at the ends to fit into a ⅝-*in.* hole bored in the top pieces as shown in Fig. 2, the distance between the centers of the holes being 7⅝ in. in one piece and 9⅝ in. in the other. The lower rails are fitted in the same way, using a ½-*in.* hole bored into each leg 2½ in. up from the lower end.

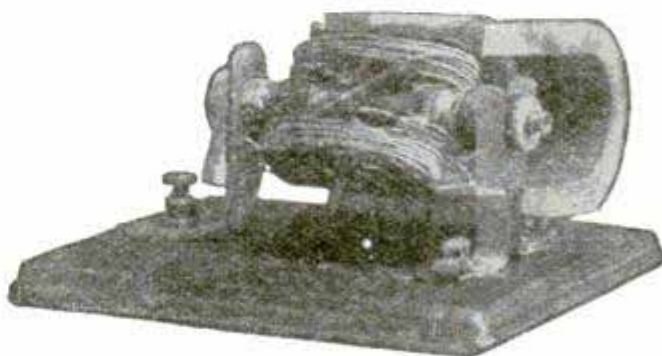
Each pair of legs has a joint for folding and this joint is made by boring a hole in the middle of each leg, inserting a bolt and riveting it over washers with a washer placed between the legs as shown in Fig. 3. The

entire length of each part is rounded off for the sake of neatness as well as lightness.

About ½ yd. of 11-*in.* wide material will be required for the seat and each end of this is nailed securely on the under side of the top pieces. The woodwork may be stained and varnished or plain varnished and the cloth may be made to have a pleasing effect by stencilling in some neat pattern.

A Small Home-Made Electric Motor

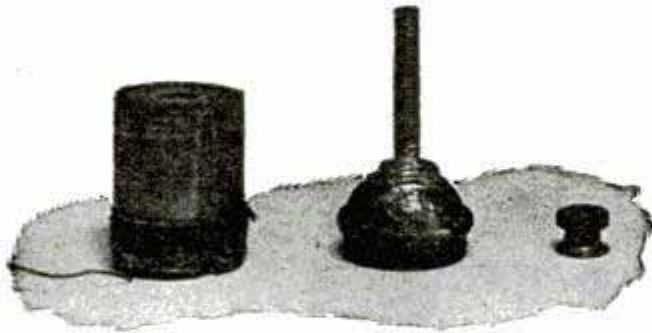
The accompanying photographs show the construction of a very unique electric motor, the parts consisting of the frame from an old bicycle pedal wrapped with insulated wire to make the armature and three permanent magnets taken from an old telephone magneto. The pedal, being ball bearing, rotated with very little friction and at a surprisingly high rate of speed.



The Motor Complete

The dust cap on the end of the pedal was removed and a battery connection, having quite a length of threads, was

soldered to it as shown in the photograph. The flanges were removed from an ordinary spool and two strips of brass fastened on its circumference for the commutator. The spool was held in position by a small binding



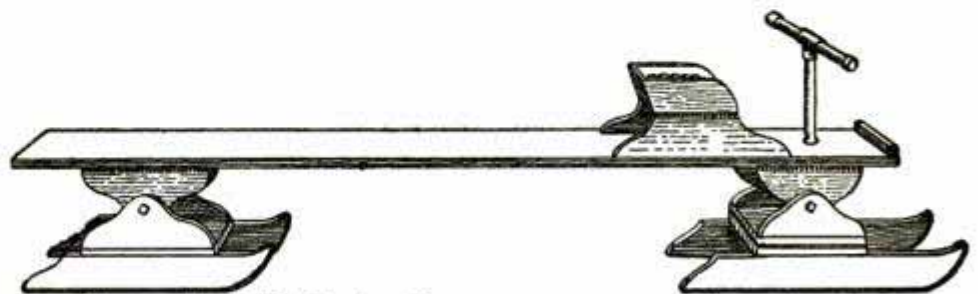
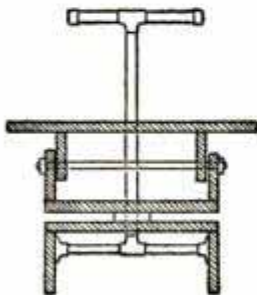
Commutator Parts

post nut. The shape of this nut made a good pulley for a cord belt.—Contributed by John Shahan, Attalla, Ala.

Rocker Blocks on Coaster Sleds

The accompanying sketch shows a coasting sled with rocker blocks attached on both front and rear runners. The runners and the other parts of the sled are made in the usual way, but instead of fastening the rear runners solid to the top board and the front runners to turn on a solid plane fifth wheel, they are pivoted so each pair of runners will rock when going over bumps.

The illustration will explain this construction without going into detail and giving dimensions for a certain size, as these rocker blocks can be attached to any coaster or toboggan sled. It will be noticed that the top board may bend as much as it will under the load without causing the front ends of the rear runners and the



Coaster Sled with Rocker Runners

rear ends of the front runners gouging into the snow or ice.—Contributed by W. F. Quackenbush, New York City.

How to Make a Watch Fob

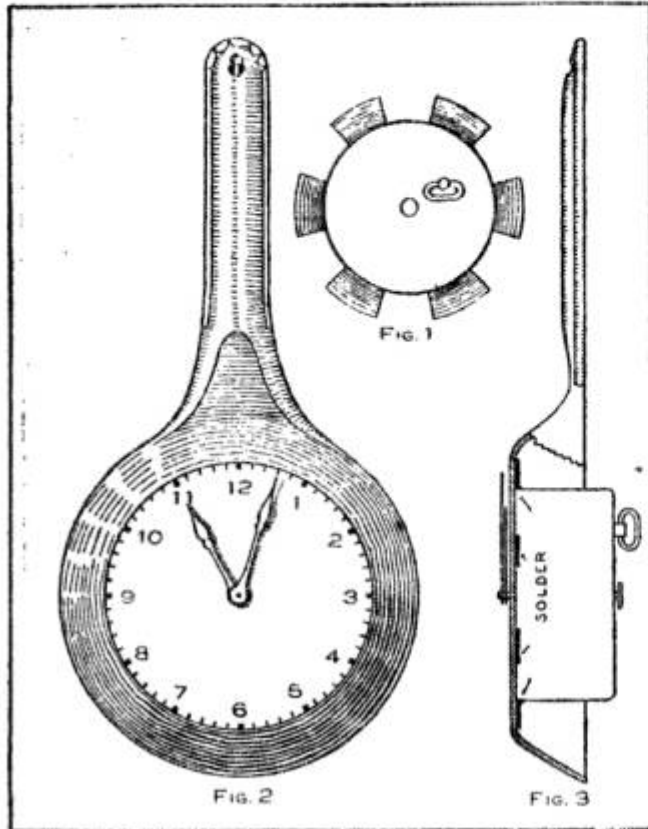
This novelty watch fob is made from felt, using class, college or lodge colors combined in the making with emblems or initials colored on the texture. Two pieces of felt, each $1\frac{1}{4}$ in. wide and $4\frac{1}{4}$ in. long, are cut V-shaped on one end of each piece about 1 in. in depth, and $\frac{3}{8}$ in. in from the other end of one piece cut a slit $\frac{1}{2}$ in. long; the end of the other piece is folded over, making a lap of about 1 in., and a slit is cut through the double thickness to match the one cut in the first piece. The desired emblem, initial, or pennant is stenciled on the outside of the folded piece with class, college or lodge colors. The strap is made from a strip of felt 3-16 in. wide and $8\frac{1}{4}$ in. long; stitched on both edges for appearance. Make a hole with a punch $1\frac{1}{4}$ in. from one end, and two holes in the other, one about 1 in. and the other $2\frac{3}{4}$ in. from the end. Purchase a $\frac{1}{2}$ -in. buckle from a harness maker and you will have all the parts necessary for the fob. Assemble as shown in the sketch. The end of the strap having the two holes is put through the slots cut in the wide pieces and the tongue of the buckle is run through both holes. The other end is passed through the ring of the watch and fastened in the buckle as in an ordinary belt.—Contributed by C. D. Luther, Ironwood, Mich.



A good lubricant for drilling is made by dissolving $\frac{3}{4}$ to 1 lb. of sal-soda in one pailful of water.

Novelty Clock for the Kitchen

An inexpensive and easy way to make an unique ornament of a clock



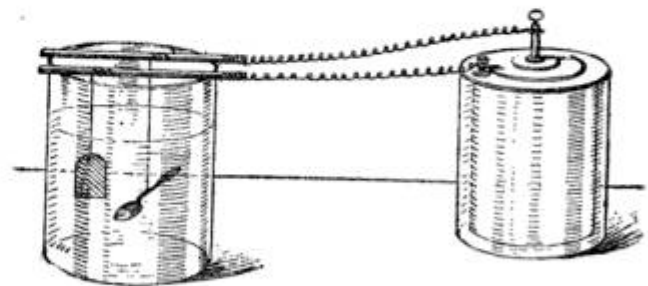
The Clock with Holder

for kitchen use is to take an old alarm clock or a new one if preferred, and make it into a clock to hang on the wall. Take the glass, dial and works out of the shell and cut some pieces out of the metal so that when the pieces left are turned back it will have the appearance as in Fig. 1. Then get a 10-cent frying pan, 6 in. in diameter, and drill a hole in the center so the shaft for the hands will easily pass through and extend out far enough to replace the two hands. Put the works back in the metal shell and solder it to the frying pan by the pieces turned out as in Fig. 2. Gild the pan all over, including the handle, and print black figures in the small circles. Calendar figures can be pasted on small circles and these pasted on the frying pan. The parts can be divided into minutes with small lines the same as shown in the drawing. Make new hands that are long enough to reach the figures from sheet brass or tin and paint them black.—Contributed by Carl P. Herd, Davenport, Iowa.

How to Make a Small Silver Plating Outfit

Take an ordinary glass fruit jar or any other receptacle in glass, not metal, which will hold 1 qt. of liquid and fill it with rain or distilled water and then add $\frac{3}{4}$ oz. of silver chloride and $1\frac{1}{2}$ oz. of c. p. potassium cyanide. Let this dissolve and incorporate well with the water before using. Take an ordinary wet battery and fasten two copper wires to the terminals and fasten the other ends of the wires to two pieces of heavy copper wire or $\frac{1}{4}$ -in. brass pipe. The wires must be well soldered to the brass pipe to make a good connection. When the solution is made up and entirely dissolved the outfit is ready for plating.

Procure a small piece of silver, a silver button, ring, chain or anything made entirely of silver and fasten a small copper wire to it and hang on the brass pipe with connections to the carbon of the battery. Clean the article to be plated well with pumice and a brush saturated in water. When cleaning any article there should be a copper wire attached to it. Do not touch the article after you once start to clean it, or the places touched by your fingers will cause the silver plate to peel off when finished. When well scoured, run clear, cold water over the article and if it appears greasy, place in hot water. When well cleaned place in the plating bath and carefully watch the results. If small bubbles come to the surface you will know that you have too much of the anode or the piece of silver hanging in the solution and you



Plating Jar and Battery

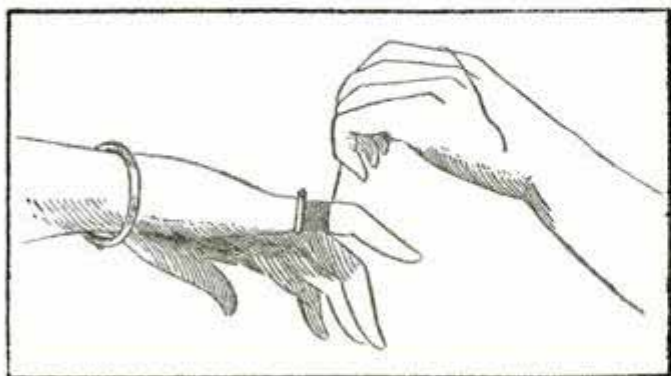
must draw out enough of the piece until you can see no more bubbles. Leave the piece to be plated in the solution

for about one-half hour, then take the article out and with a tooth brush and some pumice, clean the yellowish scum off, rinse in clear water and dry in sawdust. When thoroughly dry, take a cotton flannel rag and some polishing powder and polish the article. The article must have a fine polish before plating if it is desired to have a finely polished surface after the plate is put on.

In order to see if your battery is working, take a small copper wire and touch one end to the anode pipe and the other end to the pipe holding the article to be plated. When these two parts touch there will be a small spark. Always take the zincs out of the solution when not in use and the batteries will last longer. This description applies only to silver plating. Articles of lead, pewter, tin or any soft metal cannot be silver plated unless the article is first copper plated.

Removing a Tight-Fitting Ring from a Finger

When a ring cannot be removed easily from the finger, take a string or thread and draw one end through between the ring and the flesh. Coil the other end of the string around the finger covering the part from the ring to and over the finger joint. Uncoil the string by taking the end placed through the ring and at the same time keep the ring close up to the string. In this way the ring can be easily slip-

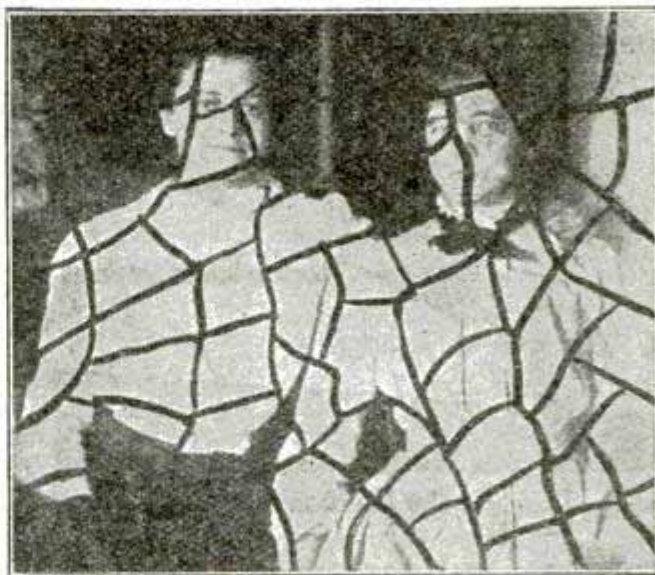


Wrapping the Finger

ped over the knuckle and off from the finger.—Contributed by J. K. Miller, Marietta, Penn.

A Photographic Jig-Saw Puzzle

Take any photographic print and mount it on heavy cardboard, or, if you



Picture Marked for Cutting

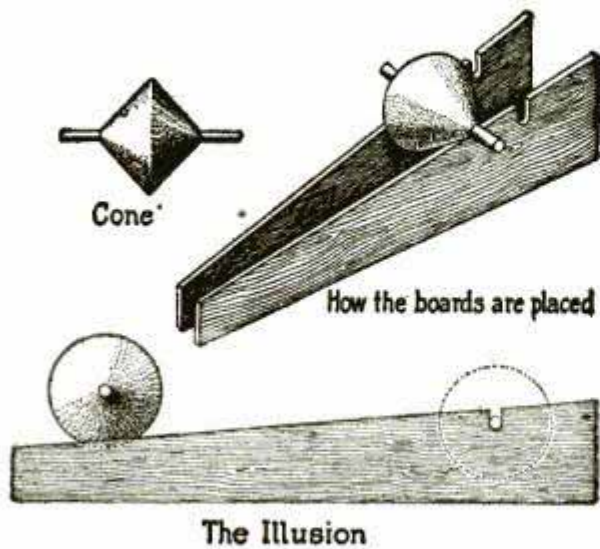
have a jig saw, a thin smooth wood board and mark out various shaped pieces as shown in the accompanying cut. If the picture is mounted on cardboard, the lines can be cut through with a sharp pointed knife. If you have a jig saw, you can make a bromide enlargement from the negative you have selected and mount the print on a smooth board that is not too thick. This wood-mounted picture can be sawed out making all shapes of blocks, which forms a perfect jig-saw puzzle.—Contributed by Erich Lehmann, New York City.

Rolling Uphill Illusion

This interesting as well as entertaining illusion, can be made by anyone having a wood-turning lathe. A solid, similar to two cones placed base to base, is accurately turned in a lathe, the sides sloping to an angle of 45 deg. The spindle can be turned out of the solid at the same time as the cone; or, after turning the cone, drive an iron or wood shaft through the center making a tight fit.

The boards for the track are made with a sloping edge on which the cone is to roll. This slope will depend on the diameter of the cone, which can be

any size from 3 to 12 in. The slope should not be too flat, or the cone will not roll, and it should be such that the



one end will be higher than the other by a little less than half the diameter of the cone. Thus it will be seen that the diameter of the cone determines the length of the slope of the tracks. A notch should be cut in the tracks, as indicated, for the shaft to drop into at the end of the course.

The lower end of the tracks are closed until the high edge of the cone rests upon the inside edges of the tracks and the high end spread sufficiently to take the full width of the cone and to allow the shaft to fall into the notches. When the cone and tracks are viewed from the broadside the deception will be more perfect, and will not be discovered until the construction of the model is seen from all sides. Should it be difficult to make the cone from wood, a good substitute can be made from two funnels.—Contributed by I. G. Bayley, Cape May Point, N. J.

Annealing Chisel Steel

Persons who have occasion to use tool or carbon steel now and then and do not have access to an assorted stock of this material find that the kind most readily obtained at the hardware store is the unannealed steel known as chisel steel. Machining or filing such steel is exceedingly slow and difficult, besides the destruction of tools; as a matter of fact this steel is intended for

chisels, drills, and like tools which require only forging and filing. If this steel is annealed, it can be worked as easily as the more expensive annealed steel.

Annealing may be done by heating the steel to a cherry red, not any more, and burying it in a box of slaked lime, where it is allowed to remain until all the heat is gone. If well done, the metal will be comparatively soft and in a condition to machine easily and rapidly. In lieu of lime, bury in ashes, sand, loam, or any substance not inflammable, but fine enough to closely surround the steel and exclude the air so that the steel cools very slowly.

If possible, keep the steel red hot in the fire several hours, the longer the better. In certain processes, like that of file manufacturing, the steel blanks are kept hot for 48 hours or more. Where it is impossible to wait so long as the foregoing method takes, then a cold water anneal may be used with less time. This method consists of heating the work as slowly and thoroughly as the time will permit, then



The above photograph was made by first printing a maple leaf on the paper, not too dark, then printing on top the picture from the negative, and finished in the usual way.

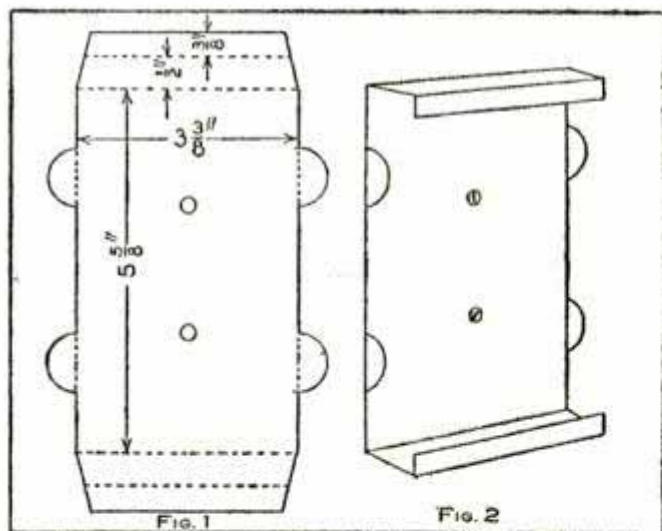
removing the steel from the fire and allowing it to cool in the air until black and then quenching in water.

In addition to softening the steel, annealing benefits the metal by relieving strains in the piece. Should a particularly accurate job be called for, the steel should be annealed again after the roughing cuts have been taken and before machining to the final size. This will insure a true job and diminishes the danger of spring in the final hardening.—Contributed by Donald A. Hampson, Middletown, N. Y.

How to Make a Post Card Holder

This holder is designed to lay flat on the counter or to stack one on top of the other, keeping each variety of cards separate, or a number of them can be fastened on any upright surface to display either horizontal or vertical cards.

The holders can be made from sheet tin, zinc, brass or aluminum. The dimensions for the right size are given in Fig. 1; the dotted line showing where the bends are made. The com-



Pattern for Cutting the Metal

pleted holder is shown in Fig. 2 as fastened to a wall.—Contributed by John F. Williamson, Daytona, Fla.

Do not allow paint that is left over from a job to stand uncovered. The can should be tightly sealed and the paint will be found suitable for use for several days.

Perfume-Making Outfit

The real perfume from the flowers is not always contained in the liquid purchased for perfume. The most expensive perfume can be made at home for less than 10 cents an ounce. The outfit necessary is a large bottle or glass jar with a smaller bottle to fit snugly into the open mouth of the large one. Secure a small piece of very fine sponge and wash it clean to thoroughly remove all grit and sand.



Saturate the sponge with pure olive oil, do not use strong oil, and place it inside of the smaller bottle.

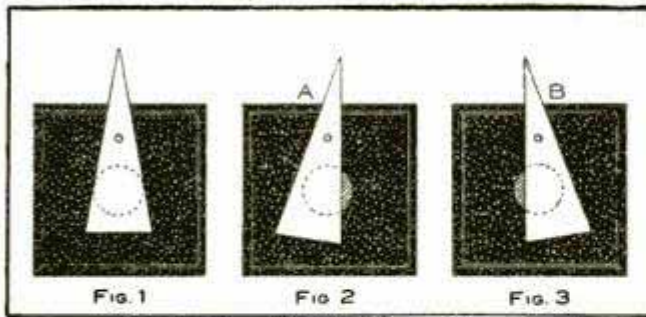
Fill the large bottle or jar with flowers, such as roses, carnations, pansies, honeysuckles or any flower having a strong and sweet odor. Place the small bottle containing the sponge upside down in the large one, as shown in the illustration.

The bottle is now placed in the sun and kept there for a day and then the flowers are removed and fresh ones put in. Change the flowers each day as long as they bloom. Remove the sponge and squeeze out the oil. For each drop of oil add 2 oz. of grain alcohol. If stronger perfume is desired add only 1 oz. alcohol to each drop of oil.

Home-Made Duplicator for Box Cameras

The projecting tube of the lens on a hand camera can be easily fitted with a duplicator while the box camera with its lens set on the inside and nothing but a hole in the box does not have such advantages. A small piece of heavy cardboard can be made to

produce the same results on a box camera as a first-class duplicator applied to a hand camera. The card-

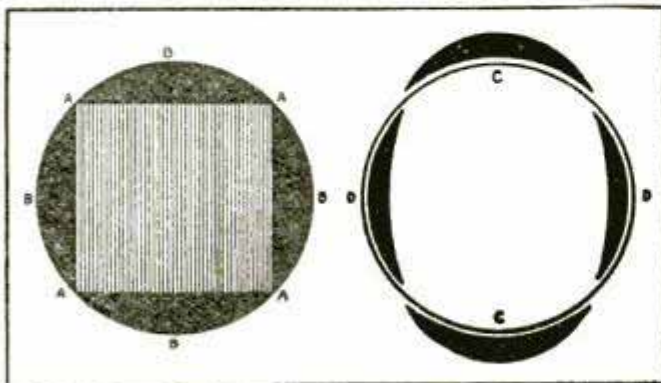


Duplicator Attached to a Camera

board is cut triangular and attached to the front end of the camera as shown in Fig. 1 with a pin about 1 in. above the lens opening. A rubber band placed around the lower end of the cardboard and camera holds the former at any position it is placed. A slight pressure of the finger on the point A, Fig. 2, will push the cardboard over and expose one-half of the plate and the same pressure at B, Fig. 3, will reverse the operation and expose the other one-half. Pins can be stuck in the end of the camera on each side of the lens opening at the right place to stop the cardboard for the exposure. With this device one can duplicate the picture of a person on the same negative.—Contributed by Maurice Baudier, New Orleans, La.

Optical Illusions

The accompanying sketch shows two optical illusions, the first having a perfect circle on the outside edge ap-



The Two Illusions

pears to be flattened at the points A, and the arcs of the circle, B, appear to be more rounding. In the second fig-

ure the circle appears to have an oval form with the distance from C to C greater than from D to D. A compass applied to the circles in either figures will show that they are perfectly round.—Contributed by Norman S. Brown, Chippewa Falls, Wis.

Use of Kerosene in Polishing Metals

Anyone who has polished a flat iron or steel surface with emery cloth knows how soon the cloth gums and fills up. The cloth in this condition will do little or no cutting. A simple remedy for this trouble is to use kerosene on the surface. The oil floats away a large part of the gumming substance and leaves the emery cloth sharp and clean to do the best work, also, it seems to act as a lubricant to keep particles of metal from collecting on the cloth and scratching or digging in the surface of the metal. A very light lard oil is equally good for this purpose, but not always easily obtained. A surface polished where oil or kerosene is used does not rust so easily as one polished dry, for the reason that a little oil remains on the metal.

Kerosene is the best to use on oil stones, being better than heavier oil. This oil readily floats away all particles of the feather edge that are liable to become loosened and forced into the stone. These particles of metal when stuck to the stone are the cause of spoiling it, as well as nicking the tools that are being sharpened. Keep the surface of the stone well oiled at all times to make the cutting free.—Contributed by Donald A. Hampson, Middletown, N. Y.

How to Make Lamps Burn Brightly

For a good, steady light there is nothing better than a lamp, but like most everything it must have attention. After cleaning well and fitting it, place a small lump of camphor in the oil vessel. This will greatly improve the light and make the flame clearer and brighter. If there is no camphor at hand add a few drops of vinegar occasionally.

TWO INTERESTING BALLOON FLIGHTS

The balloon "Albatross," piloted by Lieut. Mina, broke all records for height in an ascension near Milan,



SLEEPING SLINGS FOR RAILROAD COACHES

If the railroad traveler has a section in a Pullman car he can be made comfortable no matter how long the jour-



Discomfort and the Sling That Prevents It

Italy, on Aug. 10. The altitude reached was over 38,000 ft., which is more than 1,000 ft. higher than seven miles. The previous record for height was made by two Englishmen who ascended to a height of 37,000 ft. in 1862.

On Aug. 10, the balloon "Sirius," piloted by M. Spelterine, and carrying three passengers, rose from Chamonix, France, in a successful attempt to fly over the Alps. The descent was made at a point near Locarno at an altitude of 5,400 ft., from which a perilous descent on foot was made to that place. The highest altitude reached was 18,373 ft.

Edward Silvey, clerk in the department of civil administration in the Panama canal zone, walked across the Isthmus on Decoration Day in 12 hr., 15 min.

ney, but if he is an ordinary traveler who cannot afford to ride in other than ordinary accommodation coaches, and such are in the majority, the trip, if a long one, is a period of great discomfort.

The illustrations show a passenger trying to sleep in an ordinary railroad car seat, and the new English idea that, if adopted, would make such a journey far more comfortable. It is true that the sling shown is not as comfortable as a reclining chair or a berth, but its great advantage over nothing at all is obvious to anyone who studies the two illustrations. The sling is of canvas, and is hooked to a rack above the seat when its services are required. Bands at the lower part of it form arm rests, and the head of the sleeper finds a resting-place against its folds and is prevented from disagreeable nodding.

RECENT

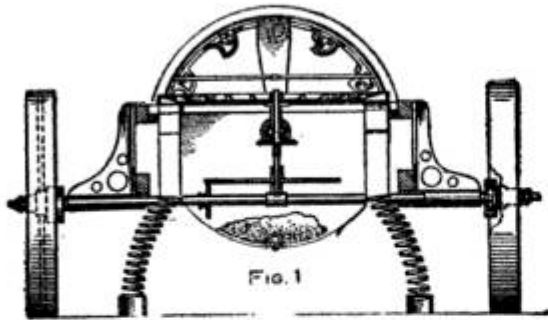


FIG. 1



FIG. 2.

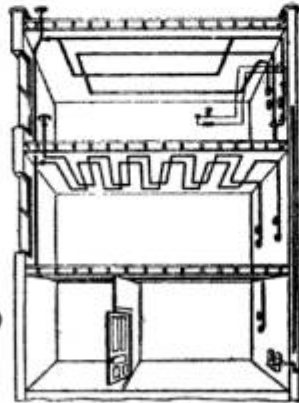


FIG. 3



FIG. 4

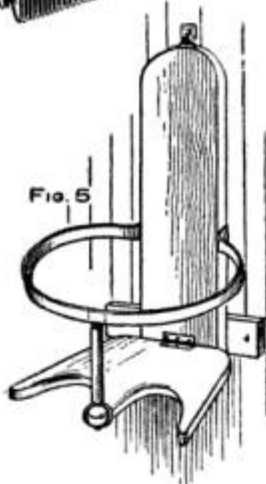


FIG. 5

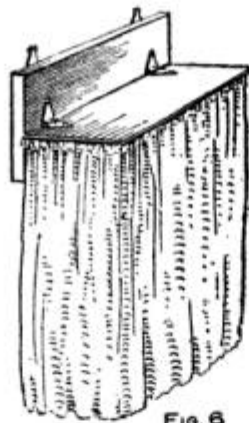


FIG. 6



FIG. 7

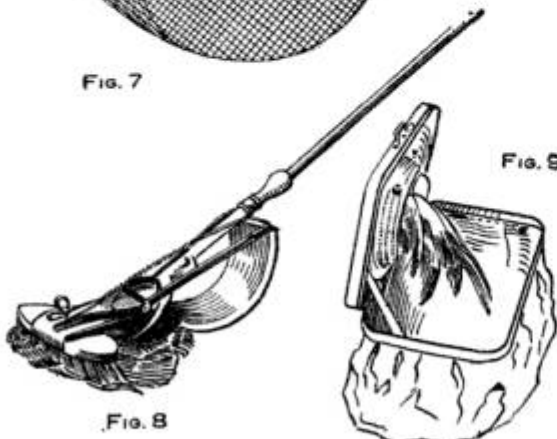


FIG. 8

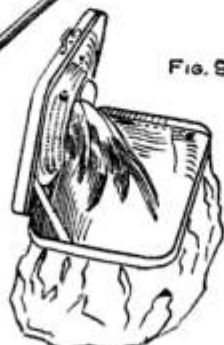


FIG. 9

POTATO PLANTING MACHINE—Figure 1 is a machine for planting potatoes. The cylinder in the center contains the seed potatoes, and a wheel, provided with pockets, picks them up and carries them to the spring tubes underneath. The tubes deposit the potatoes in the ground.

HANDY TELEPHONE STANDARD.—The telephone standard shown in Fig. 2 is adapted to the needs of busy people. By this arrangement both hands are left free while telephoning, the transmitter and receiver being so arranged that they are in proper position for ear and mouth at all times.

AUTOMATIC FIRE-ALARM SYSTEM.—The automatic fire-alarm system illustrated in Fig. 3 comprises a piping system sufficiently inflexible to remain intact at a danger temperature. This piping contains a fluid that will expand under the influence of heat and exert a pressure in the pipes that will operate a fire-alarm signal, thus announcing that a dangerous heat is present in a certain part of the structure. Such a system might be used profitably in grain pits or where coal is stored to warn of conditions that end in instantaneous combustion.

THREE COMBS IN ONE.—Figure 4 is a hair-dressing comb that is expected to do in one stroke the amount of work that requires three strokes with an ordinary comb. It comprises three combs arranged on a handle not unlike that of a brush. These combs act one after the other. The teeth of each comb are of a different coarseness, and those of one are opposite the spaces between the teeth of the other.

COLLAPSIBLE AND SUSPENSIBLE BABY CHAIR.—The collapsible baby chair illustrated in Fig. 5 is supposed to be suspended from a hook or nail in a wall when in use. It has a plain board seat and back hinged together, and a wooden loop to hold the child within it. It is designed for use in the more unsettled parts of the country where homes are plain and for traveling in new country.

PORTABLE WARDROBE.—The portable wardrobe illustrated in Fig. 6 is probably designed as a useful article for summer cottages or camps. It comprises a shelf hinged to a bracket and a canvas bag which hangs from it. The clothing is hung from hooks fastened to the bottom side of the shelf, and the canvas bag protects them from dust.

CLOTHES-PIN HOLDER.—The wire gauze basket shown in Fig. 7 is devised for holding clothes pins in a position easily accessible when hanging out clothes. Its suspending rods are fitted with wheels that convert the basket into a trolley when it is hung from a clothes line.

LONG-HANDLED SCRUBBER.—Any scrub woman will insist that the only way to properly scrub a floor is to kneel to the task, but it is claimed that the arrangement shown in Fig. 8 accomplishes the same result without the back-breaking labor. It is a scrubbing handle to which any cloth or scrub brush can be attached.

COLLAPSIBLE BOX FOR HATS.—The hat container shown in Fig. 9 is a bag, the top of which is of such nature that the hat within it is as well protected as in a box. The bag part being flexible, the container can be stowed in a very small space when not in use, a feature which the ordinary hat box lacks.

HANDY FORK CLEANER.—The difficulty of cleaning between the prongs of forks is known to every housekeeper, but this is now made simple by the little implement shown in Fig. 10. It consists of

PATENTS

a handle with bristles set in one end in such manner that the prongs may be run through them, and a cord button on the other end through which a prong may be run to straighten it.

FIRELESS CHICKEN BROODER.—Incubator chicks, having no mother, must naturally be provided with a brooder to keep them warm. The ordinary device is artificially heated, but the device illustrated in Fig. 11 is of a fireless type. On the inner side of its top are arranged bunches of feathers. The chicks nestle into these feathers in the same way that they would nestle into the feathers of a mother hen, the warmth of their bodies thus shut in sufficing to keep them comfortable.

ARM-WORKED HUSKING DEVICE.—Inventions that have to do with the harvesting of crops are always of interest and this corn husking device (Fig. 12) is no exception. It consists of a husking hook operating in a short tube in somewhat the same manner as a plunger in a pump. It is strapped to the arm just below the shoulder and at the wrist and is worked by extending and closing the arm.

SPOON DESIGNED FOR BEATING.—Figure 13 shows a spoon for beating eggs, cream, and other materials. It is provided with an agitator which whirls as the spoon is worked.

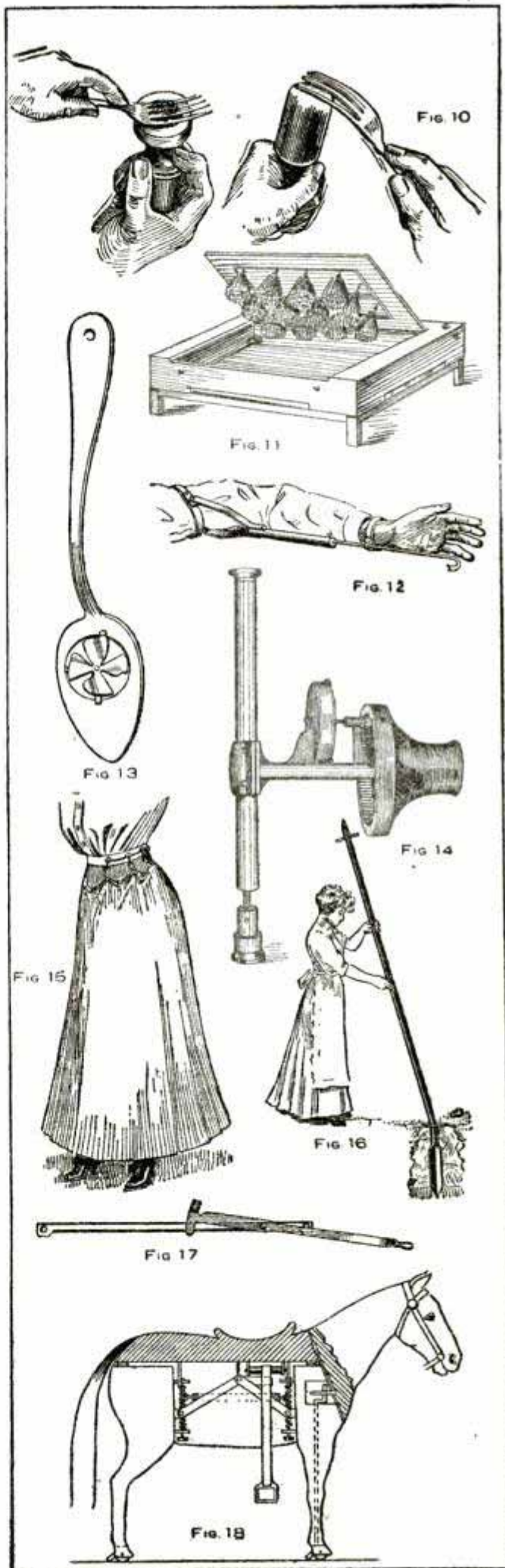
PORTABLE WINCH FOR MINES.—The transfer of heavy material along the low, narrow drifts of mines is made simple by the portable winch shown in Fig. 14. It has an extension standard that can be raised and lowered in the same manner as a lifting jack so that the winch can be solidly secured between the floor and roof. A windlass drum and a motor are mounted on the arm of this post, and power is provided by means of a flexible connection. Such a windlass may be provided with means of propulsion to be run by steam, compressed air, or electricity.

SKIRT-LIFTING DEVICE.—Holding up a skirt in wet weather and at the same time carrying a number of bundles is far from being a simple task. This is made easy, however, by the reefing belt shown in Fig. 15. The belt is provided with a number of cords at the ends of which are clamps to fasten to the skirt. The skirt is lifted as high as desired, the clamps made fast, and the wearer proceeds across muddy streets without the necessity of paying any more attention to them.

REMOVABLE STEEL CLOTHES POSTS.—Figure 16 illustrates a steel clothes pole that is easily set up when required and removed when not in use. It has a base $2\frac{1}{2}$ ft. in length which is driven into the ground and left there. The pole proper, which is of tubing $6\frac{1}{2}$ ft. long and about $1\frac{1}{3}$ -in. in diameter, is screwed into and out of this base.

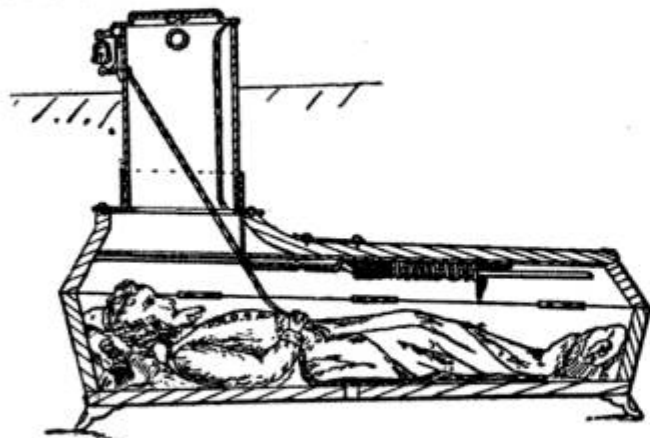
ERASING DEVICE FOR TYPEWRITERS.—The keyboard of a modern typewriter is provided with everything required for the work it is designed for, and, if one inventor has his way, it is to be provided with a unit for use when it does work wrong. This unit, shown in Fig. 17, is an erasing device to be attached to the keyboard. The handle pushes the eraser up against the impression to be erased, and working it up and down accomplishes the desired result.

A HOBBY-HORSE THAT MOVES.—Toy manufacturers are already at work preparing new novelties for the coming Christmas trade, one of which is illustrated in Fig. 18. It is a hobby horse that moves forward with the weight of the rider upon its back. The interior of the horse is provided with springs, and, as the rider transfers his weight from the saddle to the stirrups, a forward movement is caused.



PATENT OFFICE RELICS

BURIAL CASE FROM WHICH A PREMATURELY BURIED PERSON CAN ESCAPE.—The horror of being buried alive is responsible for the unique form of burial casket shown in the illustration. The casket had a vertical tubular shaft at



If Buried Alive, Pull the Cord

the head leading up above ground. This shaft had a glass door at the top and within it was a ladder by which the person could climb out, or if too weak, this contingency was provided for by a bell at the top of the shaft and a cord leading therefrom to the hand of the person, by which he could ring and summon help. If after a reasonable time, it was ascertained through the glass door that life was really extinct, the tubular shaft was pulled up and this released a spring door which automatically slid over and closed the opening in the top of the casket. This invention was patented Aug. 25, 1868, No. 81,437, by Franz Vester of Newark, N. J. and is now public property by the expiration of the patent.

GOLD IN DUTCH GUIANA

By J. B. Percival

[The following report is from a subscriber of this magazine, and is dated July 25, 1900. Mr. Percival's address is 31 Graven St., Paramaribo, Dutch Guiana, South America.—Editor's note.]

The district known as the Lawa is situated on the left bank of the Maroni river and commences from the mouth of the Tappanahony river at the Pori Goedoe rapids. The Lawa river is the divide between Dutch and French Guiana.

Exploration. Owing to the rapid state of the Maroni with its numerous waterfalls not much exploring has been done; it is impossible to take a boat up without the aid of Bush negroes, whose charges are so exorbitant that the man of small means finds it utterly impossible to get there. This district has been much neglected owing to the above facts. Gold exists to pay the modest investor as well as the big company. All that is required is quick and cheap transportation, it is beyond a doubt the best in the Colony of D. G. The prospector is quite in his element here, the very high altitudes renders deep mining quite an advantage and sinking operations can be undertaken without much fear as to water trouble.

Formation. Around the placers of the Compagnie des Mines d'or of Paris is chiefly diorite or green stone, the prevailing rock is intrusive or eruptive, the district has undoubtedly passed through an eruptive period many centuries ago. The quartz reefs are numerous, and in many cases large outcroppings may be seen on the hill tops, but in the majority of cases all the reefs are broken up at the outcrop line, which renders prospecting tedious. The amount of decomposed matter lying on the surface, is also a great drawback to the prospector. That rich bodies of ore exist there is no question, but careful prospecting is necessary to unearth these ore bodies. As I have said, the surface is so decomposed that sinking to a good depth is absolutely necessary to strike solid formation. Traces of coal have been found and in my opinion some valuable discovery may be made in the near

future. In some instances diamondiferous gravel has been found in the tailings of the sluices; there is no doubt that coal, diamonds and platinum exist in paying quantities in the Lawa. One is continually brought face to face with traces of these minerals. Thorough exploration and arduous prospecting is the only essential to make this district a South Africa.

Mountains. The mountains are all more or less auriferous. In one particular instance I came across the side of a mountain that prospected as much as one gram pure gold to the pan. This was at an altitude of nearly 100 ft. from the level of creek. It is considered rich when the prospector strikes pay dirt that will average one dollar per cubic yard, or one cent American to the pan. This latter average could be secured in almost every instance here. The hydraulic man would be quite in his element; with an up-to-date plant, 500 or more cubic yards per day of 10 hours, could be handled. I have seen where 5 men working a hillside with pick and shovel and spading in a little 5-box sluice, made as much as 300 grams gold per day. This is enormously rich. The amount of material handled could not have been more than 20 cu. yd.

Creeks. The creeks are numerous and more or less payable. There are many good creeks on the concession of the Cie. des mines d'or. But the transportation absorbs so much, that only the very rich ones are worked. By the old style of working, still in vogue here, a loss of 50 per cent. in the tailings is no uncommon thing. I have tested tailings that would go as high as \$20 per ton, and thousands of tons are lying round. And with all this waste and bad work the returns are handsome.

Cost of labour. The present cost per man per day with wage and board, etc. is \$1.50, of frs. 6.60. This high average comes from the exorbitant price paid for transport of men, provisions, etc. It is clear to be seen, that with a light railway from Paramaribo, this cost will be very much reduced, and the investor would be in a position to work places that now only give very small profits. It would be the making of this colony. It is to be anticipated that the Dutch Government will see its way clear to start up the railway as quickly as possible. The Railway from Paramaribo is now in course of construction toward the Lawa and all along the route there is good prospecting ground.

Dutch Guiana, or Surinam, is situated on the north coast of South America, between British and French Guiana. Its coast line is 240 miles long, from the mouth of the Corentyne to that of the Maroni. Inland the colony extends to the Arcara mountains, nearly 500 miles from the coast. In the southeast the Tumuc-Humac mountains run northwest from the south border of French Guiana. The rivers, besides those mentioned, are the Nickerie, entering the mouth of the Corentyne, and the Coppename and Saramacca, entering the sea by the same mouth, and the Surinam. Like the rivers of British Guiana, they form falls and rapids, and are navigable for comparatively short distances—the Coppename for 90 and the Saramacca for 100 miles.

The population is composed of much the same constituents as that of British Guiana, for here, too, Indian coolies are imported. A peculiar element are the Bush negroes, the descendants of runaway slaves. The settlements are spread over the coast zone on the river banks. Sugar has largely given place to cocoa and coffee. Gold is found in all the river valleys, chiefly the Surinam, Saramacca, and Maroni, and about \$500,000 worth is exported. Timber also and balata, a kind of guttapercha, are shipped. These goods are exported mostly from Paramaribo, the only town in the colony, to the value of about \$1,750,000, the imports being valued at \$2,577,500. The rivers are the chief means of communication.

The colony is administered by a governor, resident at Paramaribo, assisted by a council. A legislative body is composed of four members, chosen every year by the governor, and members elected by the colonists in the proportion of one to every two hundred electors. Justice is administered by a superior court and circuit courts. All religions are tolerated, the Reformed Lutheran, Moravian, and Roman Catholic churches having most adherents. The colony is well provided with schools, and education is compulsory. Surinam was first colonized by Lord Willoughby, governor of Barbados, in 1665, and was ceded to the Dutch in 1667. It was again in the hands of the British (1799-1802, 1804-15). Area, 24,060 sq. m. Population (1901) 75,016.

THE POLAR CONTROVERSY

Sept. 1, 1909—"We have at last succeeded. The flag has been raised to the coveted breezes of the North Pole. The day was April 21, 1908."

COOK.

Sept. 6, 1909—"Have made good at last. Have the old pole. I reached it on April 6, 1909. Stars and Stripes nailed to the North Pole."

PEARY.

The Polar controversy, which has interested the entire civilized world and is destined to continue to do so for

When, with the suddenness of a flash from an aurora borealis, came the announcement, on Sept. 1, from Dr. Frederick A. Cook, that the discovery had been made by him, the world at large was disposed to accept the statement. Scientific men and bodies naturally and properly were more cautious in their expressions, but comparatively

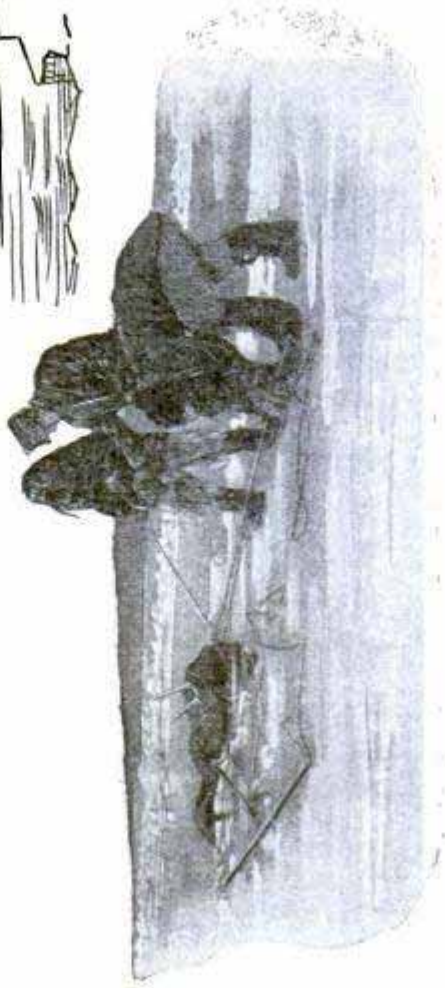
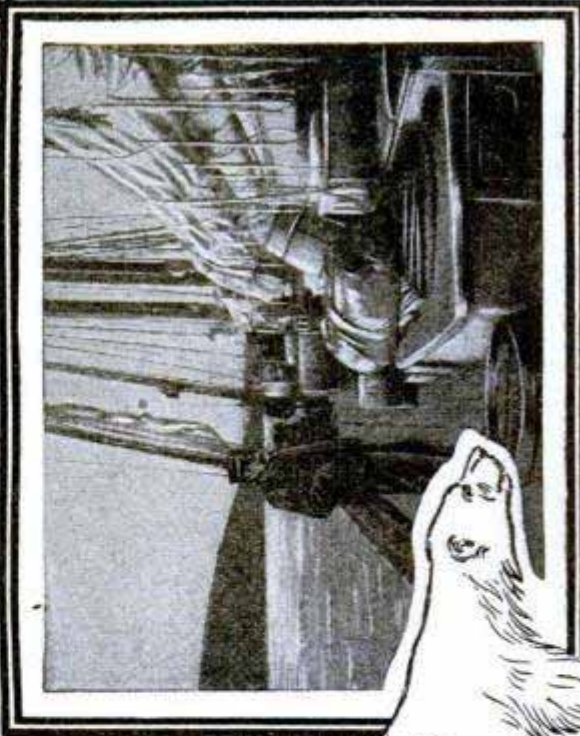
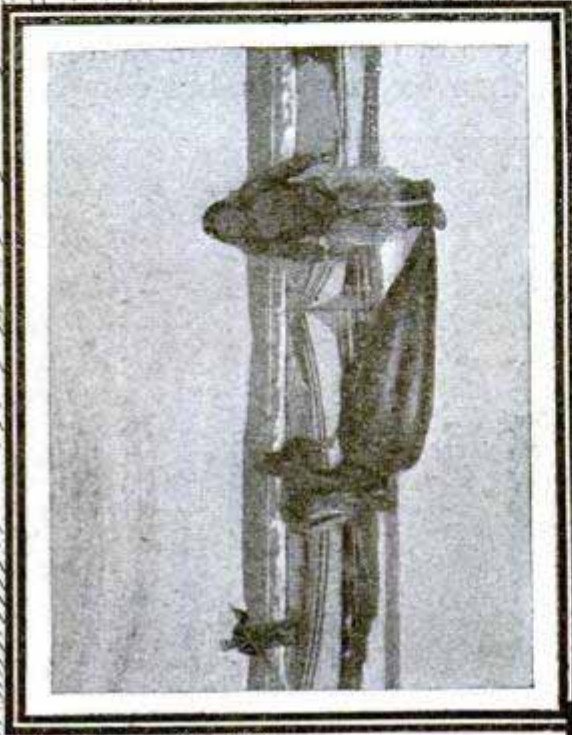
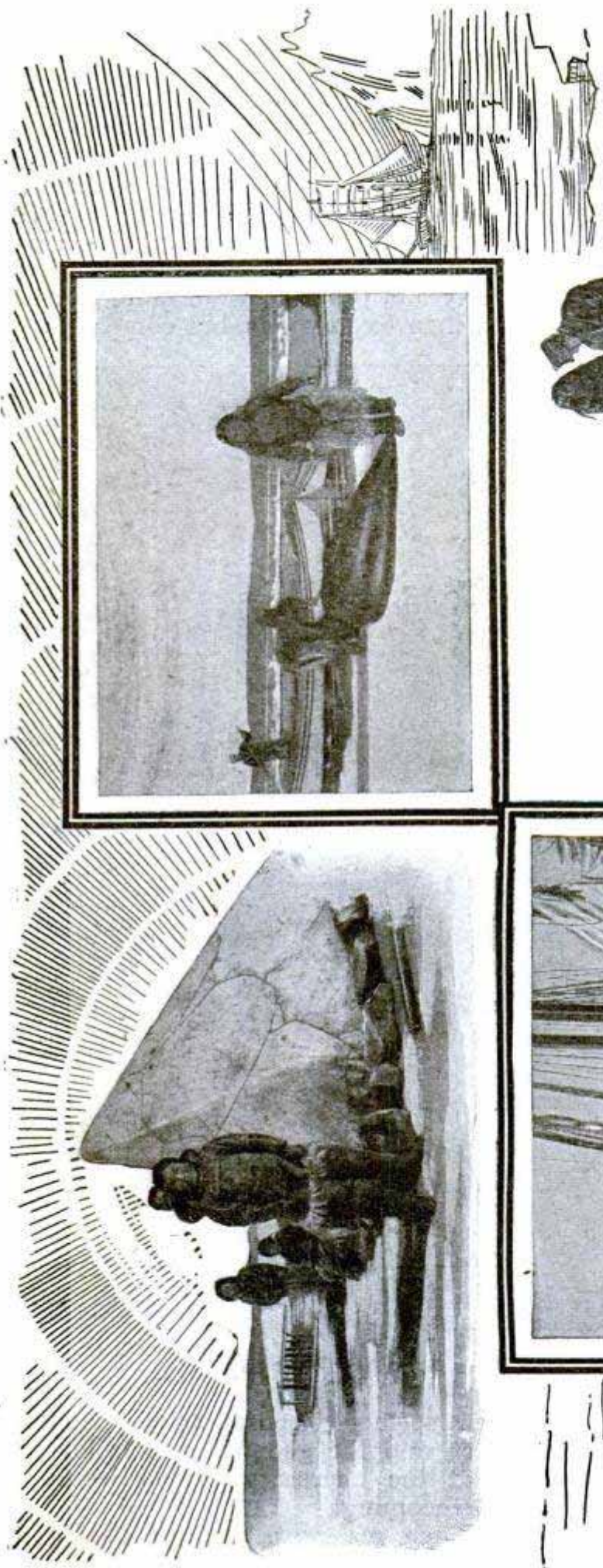


Commander Peary in Arctic Costume on Board the "Roosevelt"

some months to come, if, indeed it is ever satisfactorily settled beyond all question of a doubt, had not developed sufficiently at the time of going to press to make advisable more than the simple recording of the claims of the two contestants.

few seemed disposed to question the fact, and the general expectation was that the necessary proofs would be forthcoming.

Then on Sept. 6 came the volley from Commander Peary heralding his discovery, to be followed in a few



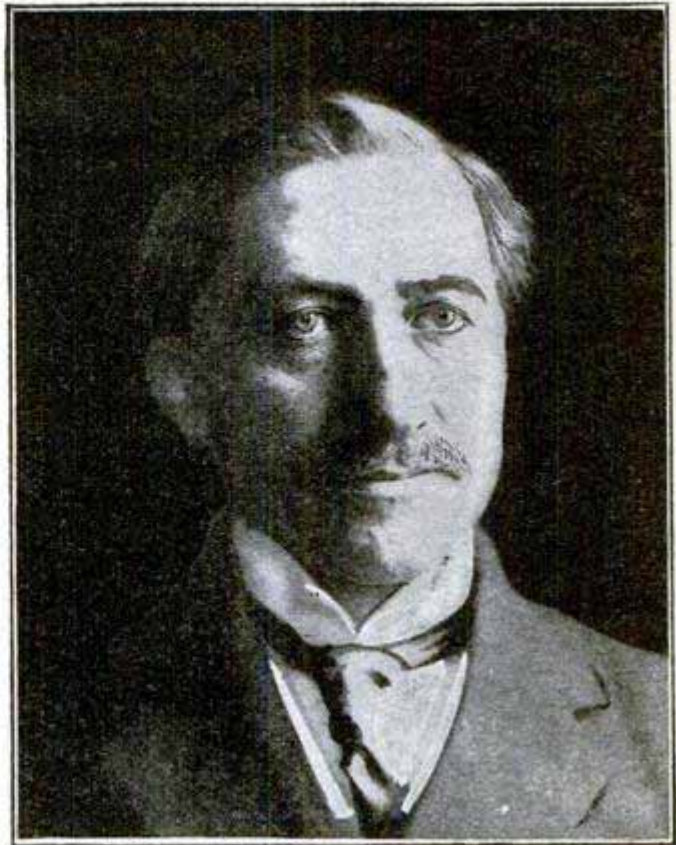
Scenes from Cook-Bradley Expedition to the Arctic, 1907-'08:—Eskimo Mother, Child and Tent—Eskimo and Walrus; Bradley Killed 10 Walrus a Day, Weighing 1,200 Lb. Each, for Food Supply—On Board the "John R. Bradley"—Hauling Out a Dead Walrus.

hours by his broadside attack on Dr. Cook.

It is a matter of regret that Cook should have for a moment parted with his original records which must ever be the most valued possessions of his life, and that Peary, even though smarting under the intense disappointment of temporary or permanent loss of first place, should have allowed himself the expressions used toward his rival.

What occurred is familiar to the reading public. Each gave his story to a newspaper as a copyrighted "scoop," and each story was criticised for its lack of scientific foundation. Peary wired that Cook's story should not be taken too seriously, as the latter had gone no great distance north, and never out of sight of land.

To this attack Cook answered that he would not degrade himself so far as to answer the message, and the battle commenced, Peary attacking and Cook remaining calm. As a result, the world, to a considerable extent, has become divided into two hostile camps, one of which resents the implications against Dr. Cook while the other discredits him, but between the two is a neutral body which takes great satisfaction that at least one, if not both, planted the American flag at a point that other flags have never reached, and whose motto is "wait."



Dr. Frederick A. Cook

The controversy so far has been more journalistic than scientific in its nature. When the two contestants have submitted their records, instruments, and what testimony they can gather, to an international commission, composed of the foremost scientists of the world, and when that body has made its decision, bestowing honor or dishonor upon both, or upon one, the world may criticise or acclaim. Until then "wait."

ELECTRIC STORM AFFECTS WHOLE WORLD

For the entire day of Sept. 25 a powerful electric disturbance, caused by the magnetic influence of the Northern lights, swept over practically the whole world, paralyzing all telegraphic service. The first break came early in the morning and for five hours telegraphers as far west as Chicago wrestled with the strange influence. Wires went "dead" one after another, and registers showed a pressure on the wires of 500 volts of electric current from the mysterious source. Brilliant sparks flashed when the keys were

opened. San Francisco and Seattle also felt the disturbance, and the systems in England and Continental countries were also seriously affected.

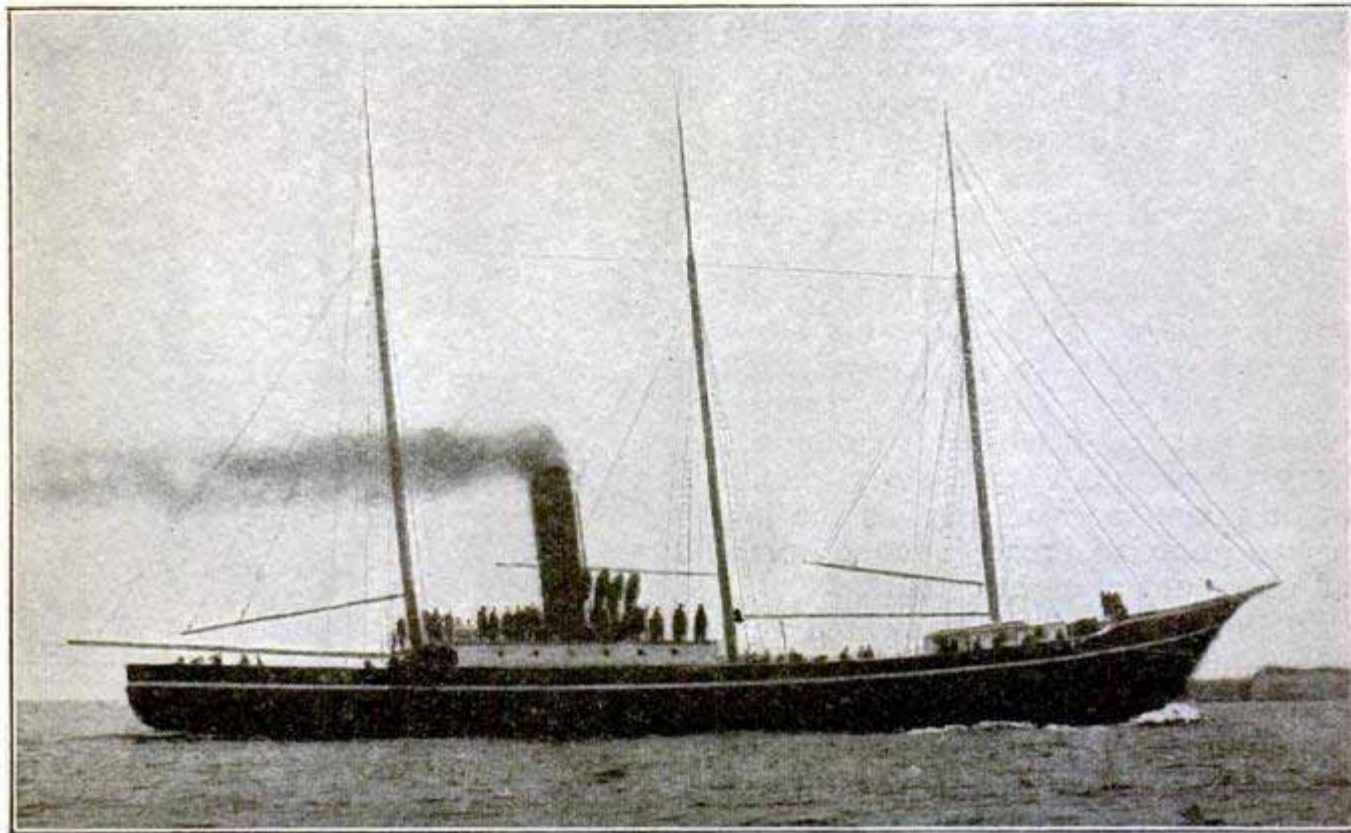
PEARY'S ARCTIC SHIP

The "Roosevelt", the ship in which Peary traversed the first stages of his dash to the Pole, was built by the Peary Arctic club for his attempt in 1905. She is a 3-masted fore and aft schooner-rigged steamship, with a length of 182 ft., a depth of 16.3 ft., and a beam of 35.5 ft., built entirely of white oak, with treble frames, close together

and double planked. Her walls are from 24 to 36 in. thick, and her bow is backed by 12 ft. of solid deadwood, while her stern is reinforced by iron.

"Zeppelins" or 5,000,000 aeroplanes would have to sail unopposed over the city. The idea is unthinkable."

Other scientists in England agree



The "Roosevelt"—Ship That Started Peary for the Pole

The staunch, ice-resisting little vessel was designed after Peary's own ideas, gained after years of struggling against the ice of the North.

AERIAL BOMBARDMENT COSTLY

A member of the English parliament, desirous of allaying the senseless panic of the London public, has made a series of calculations that seem to show that to destroy London with explosives carried in aeroplanes or dirigible airships would cost the attacking nation \$20,000,000,000.

"An aeroplane as at present constructed," says the M. P., "could not carry more than 200 lb. of dynamite. It would need 10,000 lb. of this explosive to destroy the bank of England, and therefore 50 aeroplanes would be required for that exploit alone. To effect the destruction of all of London 2,000,000 bombs of 50 lb. each would be required, and to carry these explosives a fleet of 200,000

with the member of parliament that the idea, as he sees it, is unthinkable, but they also agree that the destruction of London by aerial craft need not require the complete blowing to pieces of every building in it. A thousand or so bombs dropped into the vital parts of London would be sufficient, some believe, to send its people hurrying to other parts of the English Isle, while fire might be depended upon to aid in the destruction.

SALVAGE EXPEDITION TO ICELAND

During the past ten years \$750,000 worth of property has been cast ashore on the coast of Iceland, including 26 Hull steam trawlers. The majority of the wrecks are practically at one part of the southwest corner of the island, and a Hull insurance company, which has lost heavily, has fitted out a powerful salvage steamer to attempt recovery of some portion of the property.

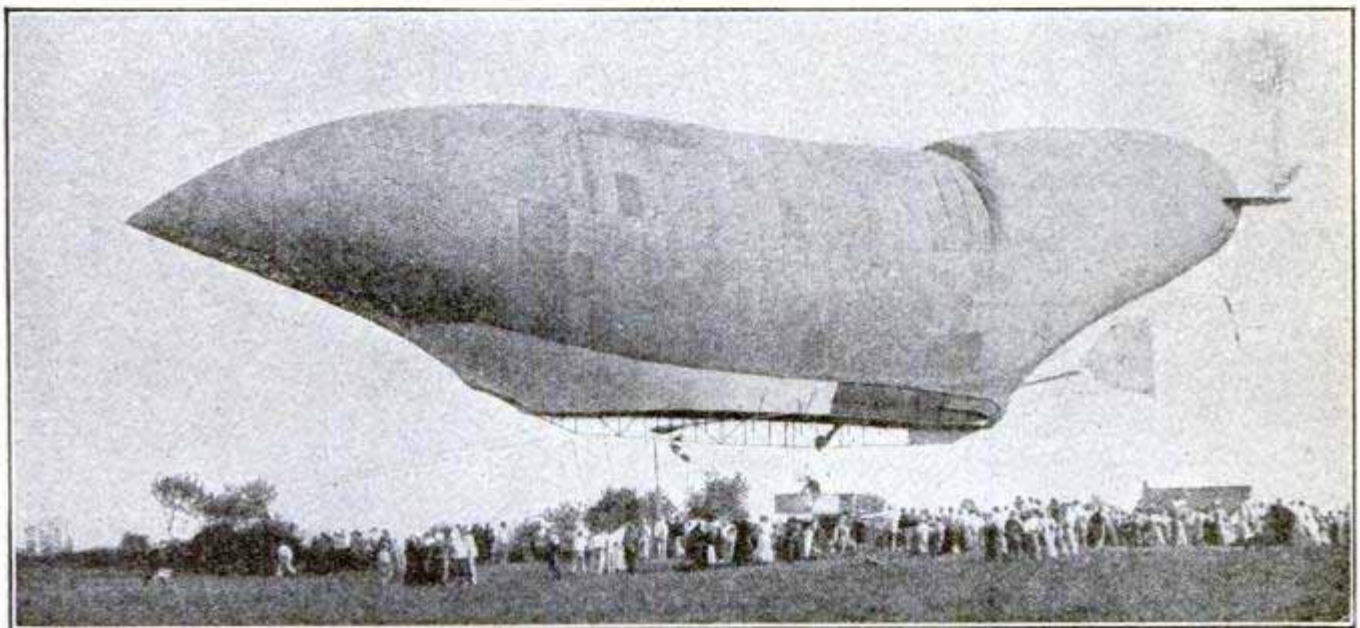
FRENCH MILITARY DIRIGIBLE KILLS FOUR

By the explosion of the dirigible airship "Republique," the pride of all France, on Sept. 26 at La Palisse, killing four officers, the French army, already mourning the death of Captain Ferber, who fell in an army aeroplane of his own design a few days before, received a shock that cast a gloom over the entire country.

The cause of the "Republique" disaster was the breaking of a blade of the propeller, a fragment of which tore

and the flight through the air at the time was close to 30 miles an hour.

France has done more to push forward the science of aerial navigation than any other country, and, although the last disaster assumed the magnitude of a national calamity, will continue to do so with as much enthusiasm and faith as before, yet the death list in the past year has found France the sufferer in every instance but one. Of the seven killed during that period



Airship in Which Four French Officers Met Death

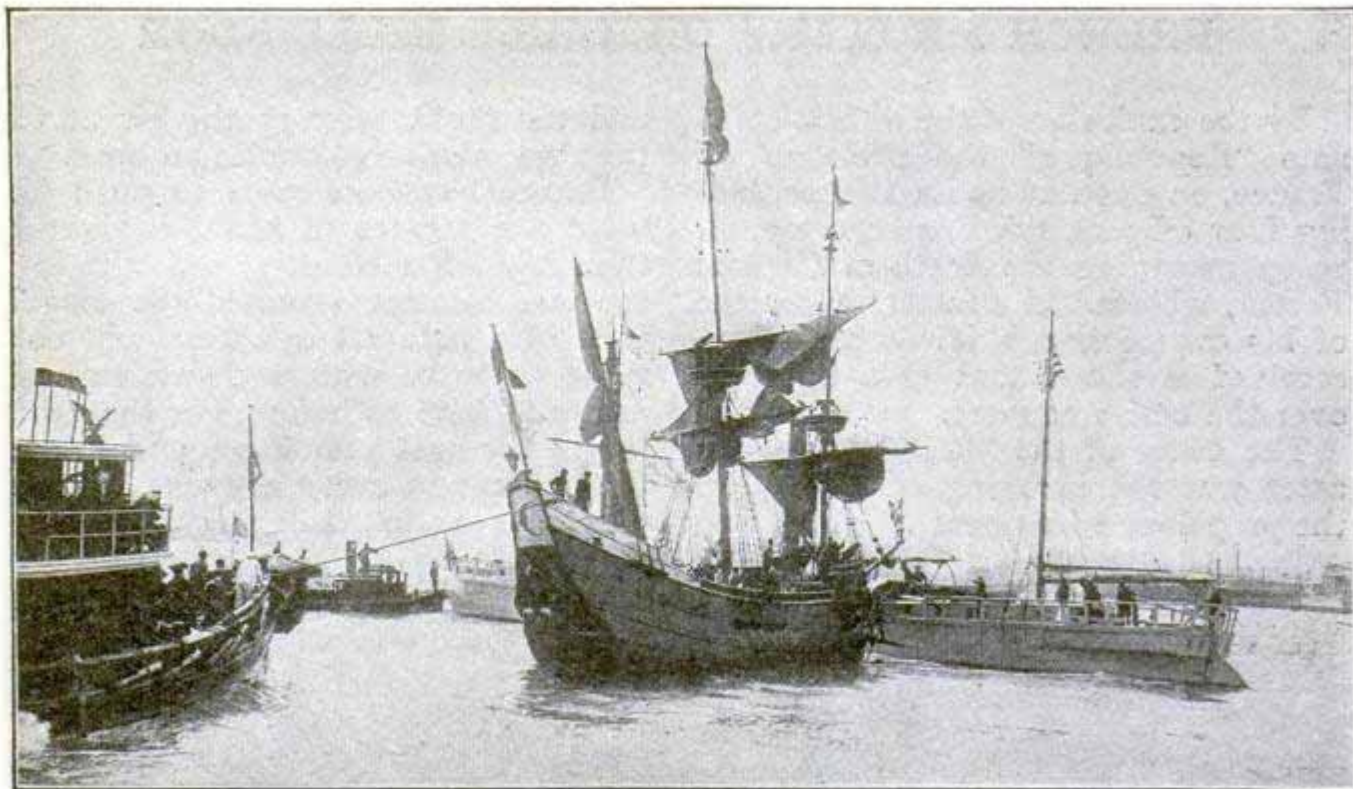
through the immense gas bag causing it to explode. Like the stick of an exploded rocket the tangled mass of debris shot straight down toward the 500 people who witnessed the accident, and although the dash to the earth only took a few seconds, the bravery of the four officers in the airship car was apparent to the onlookers. Warned by the noise of the explosion that the airship was a wreck and that nothing could save them, they firmly gripped the framework of the car, and with set faces and without a cry, fell gamely. When the spectators reached the piled up ruin there was nothing to drag from it but the lifeless bodies of Captain Marchal, Lieut. Chaure, and Sublieutenants Vincenot and Beux. The fall had occurred from a height of 350 ft.

six were Frenchmen, flying over French soil, and all, commencing with M. Lefebvre in a Wright aeroplane, were killed during the month of September.

Captain Ferber's death occurred in a somewhat similar manner to that of M. Lefebvre, the account of whose death is published on a preceding page of this issue.

The photograph of the "Republique" was taken while she was in a disabled condition a short time previous to the fatal accident.

An extraordinary record for the handling of baggage is announced by the Alton Railroad, which claims only four pieces damaged out of the 500,000 handled from Jan. 1 to Sept. 1, 1909.



During the Naval Parade the "Half Moon" Rammed the "Clermont"

HUDSON-FULTON CELEBRATION

The Hudson-Fulton celebration, one of the greatest historical pageants ever held in any country, was in full swing when this issue went to press. It opened with a great naval parade on Saturday, Sept. 25, in which the quaint reproductions of Robert Fulton's "Clermont" and Henry Hudson's "Half Moon" passed in review before the battleships of the great navies of the world, while countless thousands of people looked on.

In the train of the resurrected ships, around which so much American history clings, were 15 miles of official boats, tugs, yachts, excursion steamers, torpedo-boat destroyers, and submarines. During the passage before the assembled warships of the United States, England, Germany, France, Italy, Holland, Belgium, and several other European as well as South American countries, the guns spoke royal salutes in thunderous tones.

Hardly had the naval parade finished before darkness fell, and then New York and its hundreds of thousands of guests witnessed a fireworks and electrical display of magnificent pro-

portions. It commenced with the lighting of the miles of fighting ships. Like a burning trail of powder ship after ship flashed out in the darkness, while jets of illumination from the great batteries of searchlights up the river flashed into the sky like a vivid display of boreal lights. Then up and down the river from the Jersey shore burst a stupendous display of fireworks, making, all in all, the finest pyrotechnic display that New York has ever seen.

ROOSEVELT SKINS DECLARED GERMLESS

Following the unpacking of the skins sent to the Smithsonian institute by Theodore Roosevelt many persons in Washington feared the spread to this country of "sleeping sickness," the disease that has ravaged parts of Africa, and the germs of which were alleged to have been found on certain of the skins.

In the first place no such germs were found, and in the second, the skins were packed in an arsenated solution of brine that would destroy germs or anything else of a living nature.



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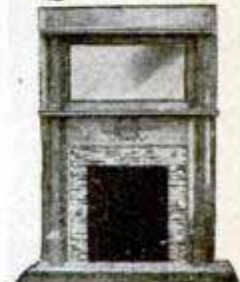
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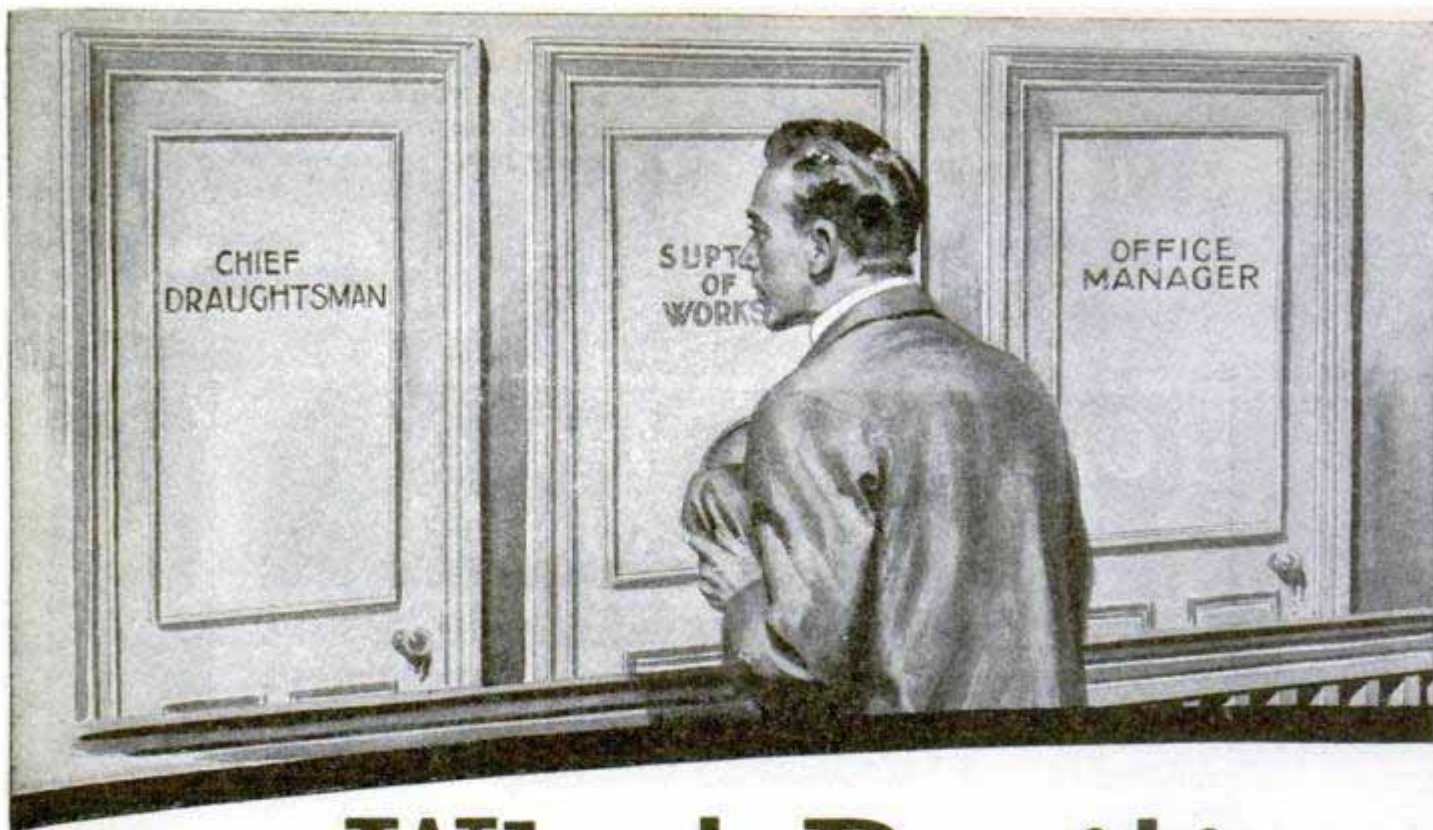
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Mark the attached coupon and learn **how the I. C. S. can advance you**. Marking it costs you nothing and yet brings you information and advice that **will help you shape your career**—information and advice that you cannot get elsewhere at any price?

Men Who Have Won

With the help of your Course in Chemistry, I was able to gain a sufficient knowledge of Sugar Chemistry while working as electrician, afterwards getting a position of Assistant Chemist, and have now advanced to the position of Assistant Chemical Superintendent in a Sugar House making 300,000 bags of sugar each crop.

HERBERT W. ANDEM,
Preston, Oriente, Cuba.

When enrolling in the I. C. S. I was engaged as a common laborer with no regular employment. Some time after enrolling I was offered a position as Fireman in the Union Utility Company, in which I am employed as 8th engineer, to which position I was promoted in six months. The Chief Engineer, 2nd Engineer and one of the two Foremen are I. C. S. students, and other I. C. S. students have gone from this plant to take up better jobs.

I can thank the I. C. S. for the advancement I have made and can heartily recommend it to anyone.

EUGENE C. BOWMAN, 33 Kingwood St., Morgantown, W. Va.

I took a Course with your Schools for about four months before taking an examination on May 11, 1908, and on Feb. 8, 1909, I commenced my work as Clerk to the Cashier of Customs with a salary of \$1,000.00 a year.

I have a very pleasant position in contrast with my former position, which was a teacher in the Public Schools, with an increase of over 100 per cent in salary.

JOHN M. SNOOK,
Care of Custom House, Baltimore, Md.

A Course in the I. C. S. is well worth its study. I know the price of my Course has been returned to me many fold.

When I started this Course I was employed as wireman for the Pennsylvania Railroad Company, in Jersey City. In January, 1906, I was appointed Chief Electrician of Greenville Power Plant, with an additional \$25.00 per month in pay. I am sure that it is only on account of I. C. S. training that I am able to fill this position satisfactorily. I am, therefore, glad I started to study and will recommend the Schools to any one.

J. P. APELDORN,
24 Garrison Ave., Jersey City, N. J.

I held the position of second-hand to overseer in a Cotton Mill when I first began with the International Correspondence Schools. I now hold the position of Superintendent in the Cotton Mills of the Courtenay Manufacturing Company.

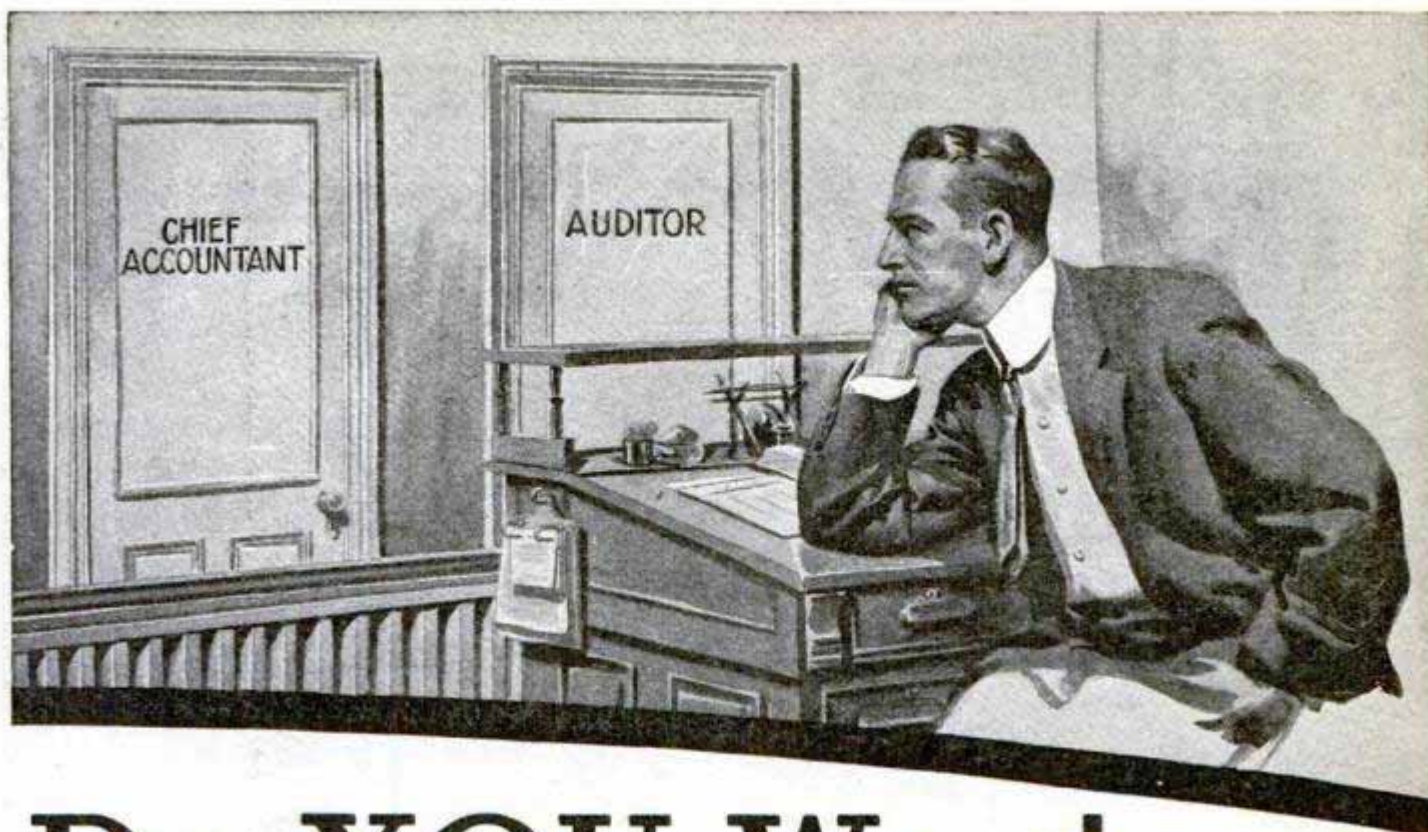
The I. C. S. have been a great aid to me.

G. B. BYRD, Newry, Oconee Co., S. C.

At the beginning of my study for Architecture I was working as a Cow-Puncher, "Z-Y" Ranch. After receiving my diploma, I went into partnership with an Architect and was very successful, and later dissolved partnership and moved out here where I am running an office of my own.

I have good prospects ahead, and am already snowed under with work. It has increased my salary over 100 per cent since I enrolled with the I. C. S.

R. R. PAIGE, Blanca, Colorado.



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Positions "Higher Up"

When I first took up your Course I was a Machine Shop Clerk at Montreal Cotton Company, Valleyfield, P. Q., Canada. After finishing, I obtained a position of Draftsman there, opportunely just vacant, stayed there 18 months and then a change of management caused me to leave. I obtained a position as Draftsman in the engineering Department at Howard & Bullough's, Cotton Machinery Makers, Pawtucket, R. I. I kept my position all through the late time of depression and I know I am giving satisfaction.

CHARLES EDW. FOSTER, Chamber St., Valley Falls, R. I.

Within a few months after enrolling I started making show-cards for merchants. The business increased so much that a day did not have enough hours for the work I had on hand. When I was 16 years I was making regular card writer's wages on every card I made, and during the last two years my income increased to double. If my business continues to increase as it has in the last two months, I will be clearing \$100 a month by the end of the year.

J. KING FORREST, 305 E. Ruby St., Argentine, Kans.

I think the International Correspondence Schools is the greatest institution of its kind, and I would not hesitate to recommend any of its Courses of study to anyone who might be interested in the same. When I started to study through you I was earning \$9.25 per week, and in less than three years was earning almost three times that amount, and I hope to make still more in the near future.

I would also like to state that on May 1, 1908, another Architect and myself will open an office in New York City.

E. E. SEDILLE, 230 First St., Newark, N. J.

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Mechanical Draftsman
Telephone Engineer
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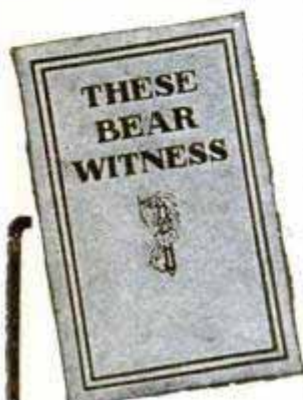
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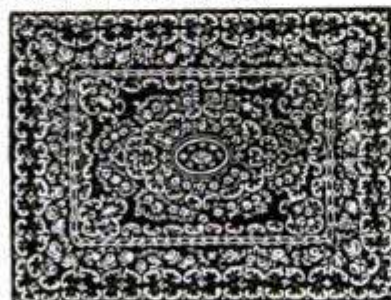
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This smaller picture shows mop on floor. It spreads out and is held down to floor at all points.

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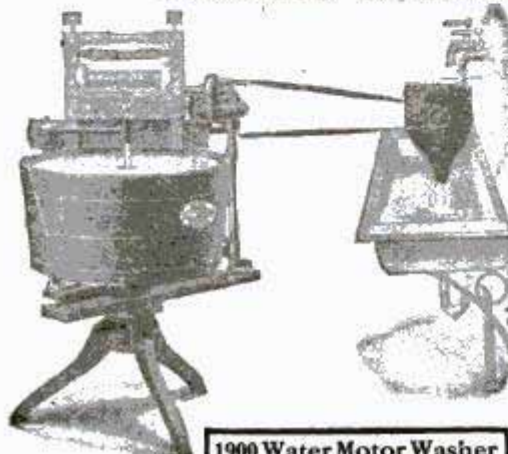
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700 A. D. According to Ridgeway, the metallurgy of iron must have originated in central Europe, especially in Noricum, which approximately represented modern Austria and Bavaria. Only at Hallsatt and in Bosnia and Transylvania, from which countries the Achaians and Dorians are supposed to have migrated to Greece, are found evidences of a gradual introduction of iron, at first as an ornament applied to the bronze which it ultimately displaced. Everywhere else, iron was introduced suddenly—a fact which implies a foreign origin. Of course, Ridgeway does not assert that iron was unknown outside of central Europe. On the contrary, he states that meteoric iron was known in Egypt in remote antiquity, but that it was worked as flints were worked, by cutting or chipping, and was not smelted. In other words, it was the metallurgy, not the knowledge of iron, that originated in central Europe.—Hardware and Metal.

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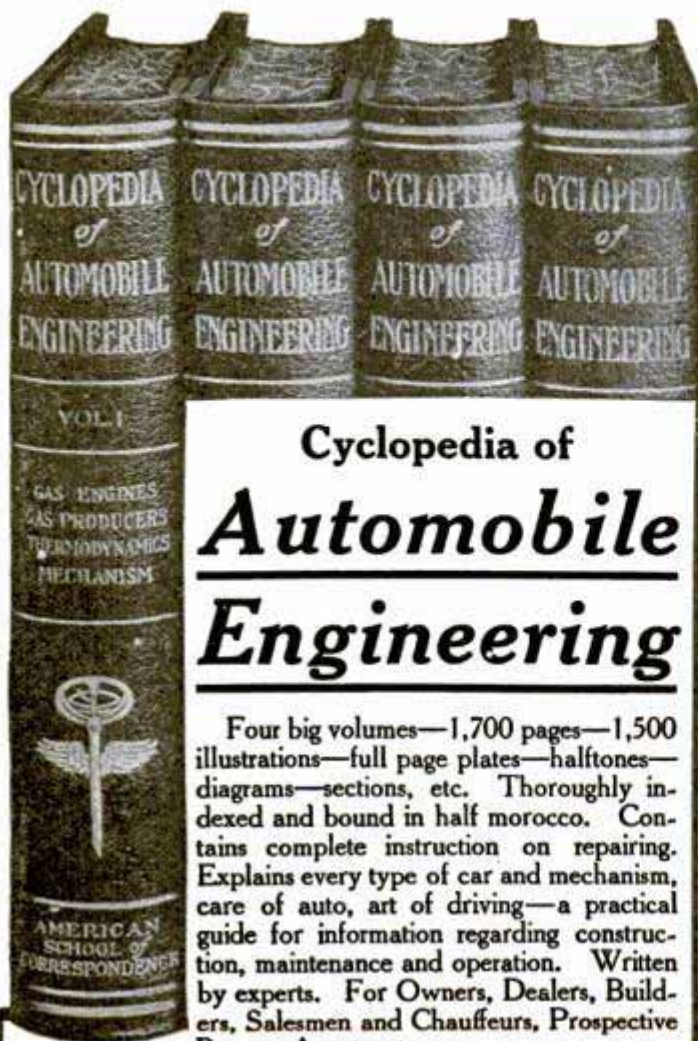
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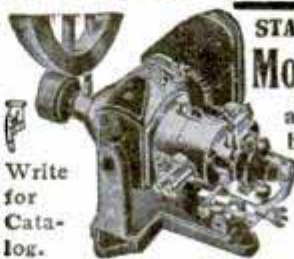
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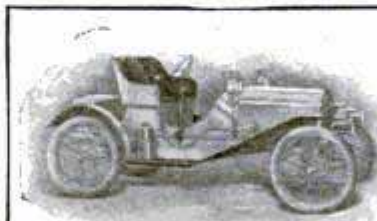
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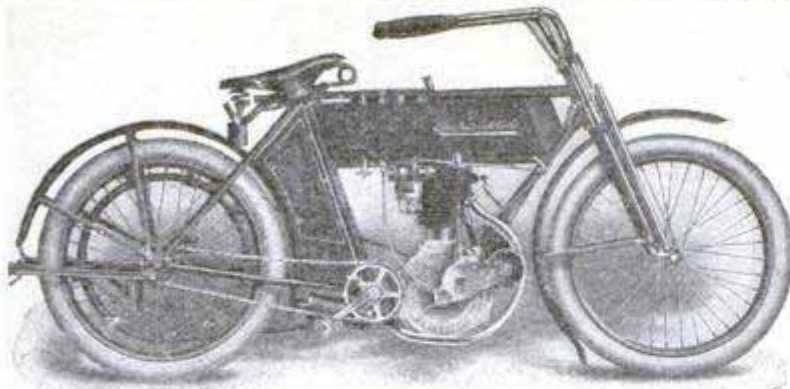
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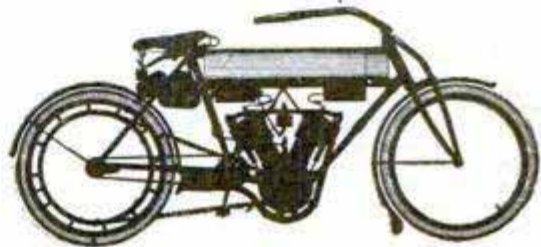


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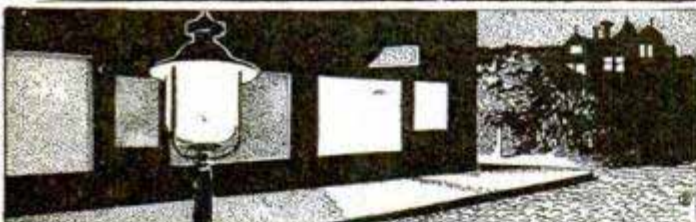
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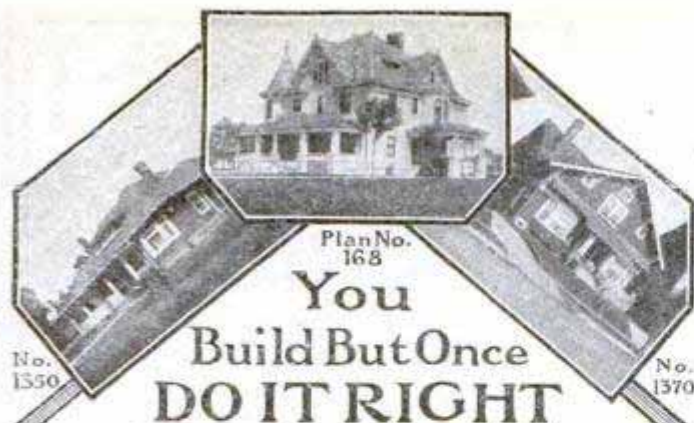
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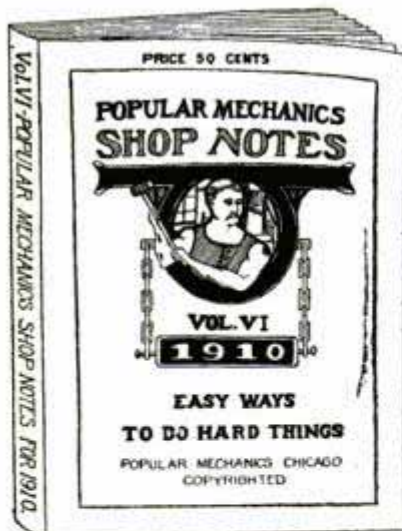
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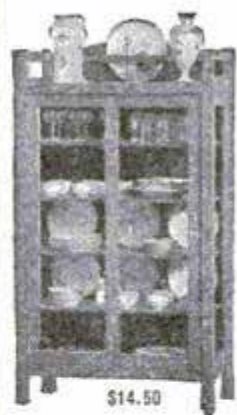
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4. Keep milk or cream covered until wanted, and in the bottle in which it is delivered; in open bowls or pitchers they will absorb odors from food and collect flies and dust.
5. Pour from the bottle only what milk or cream is needed for immediate use.
6. Milk or cream that has become warm should never be poured back into the bottle of cold milk.
7. Utensils used for milk should be cleansed with cold water and then with boiling water, thoroughly drained and allowed to become cold before being filled with milk.
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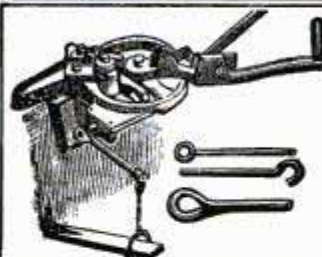
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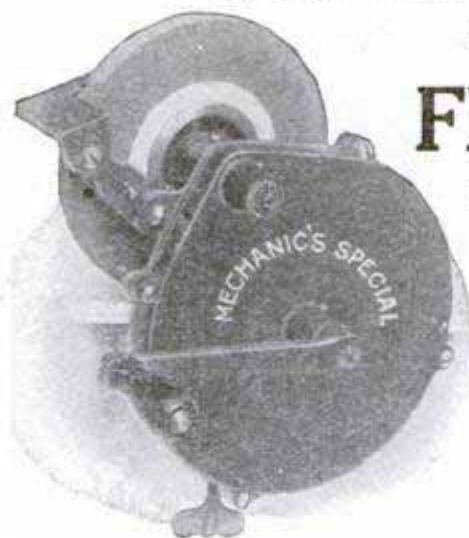
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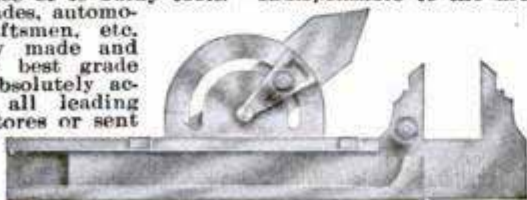
come from a point directly in front of, or behind, one and still he has no difficulty in judging from which direction it comes. The small phase difference caused by traveling around the outer ear undoubtedly has something to do in forming this judgment.

The outer ear is not necessary to hearing, however. So long as the auditory nerve and its endings are healthy, hearing is possible. When the ear drum, or the bones of the middle ear are defective, but the inner ear sound, the person can use a telephone nearly or quite as well as a person having normal ears. Experiment shows that very faint sounds are not heard. Here the bones of the head take the vibration from the receiver to the sensitive inner ear. A tuning fork, sounding so faintly that it cannot be heard, becomes audible if the stem is pressed against the teeth. Every one knows that the intensity of the sound in a receiver is increased if the receiver is pressed tightly to the head. All the components of the sound are intensified, and any "scratching" or other unpleasant side-tone is not relatively lessened by holding the receiver away from the ear. It is a mistake to suppose that a purer sound is obtained from a receiver having a soft rubber shield or pad over the end. The only effect of one of these pads is the weakening of the sound.—Telephony.

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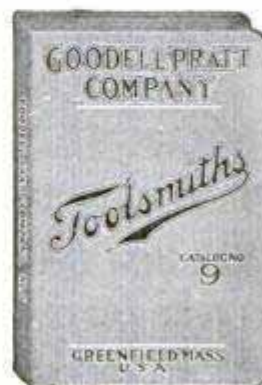
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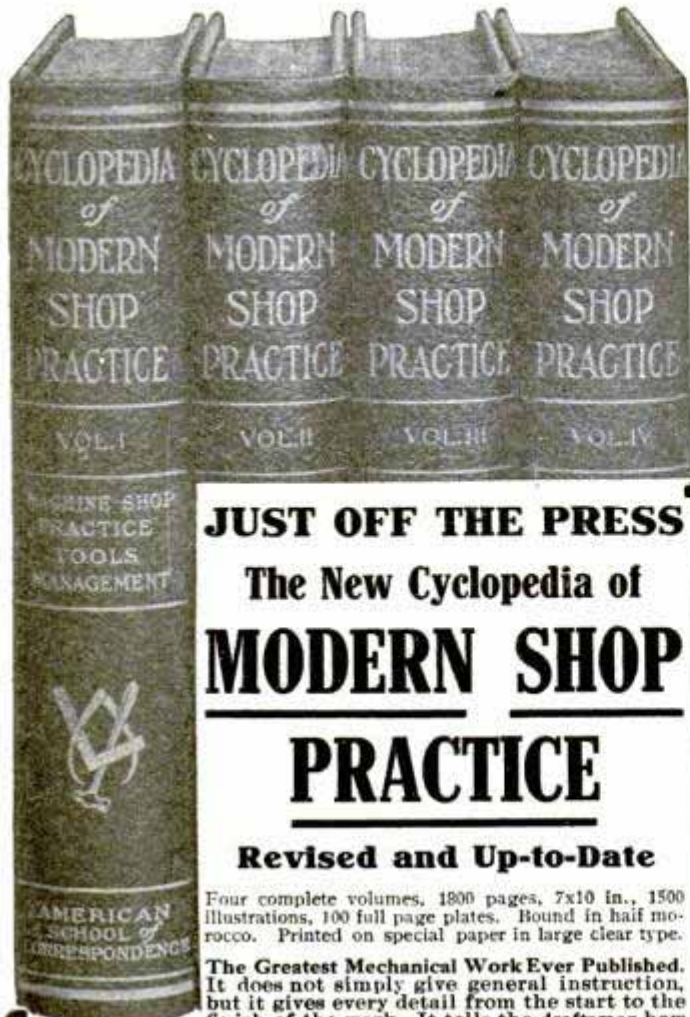
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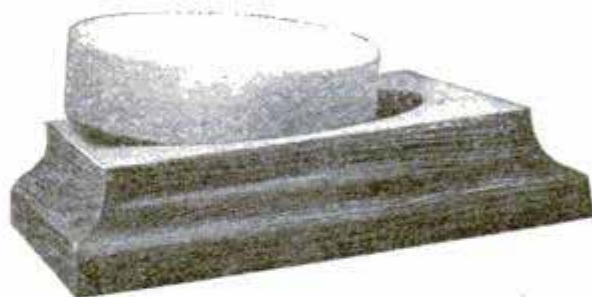
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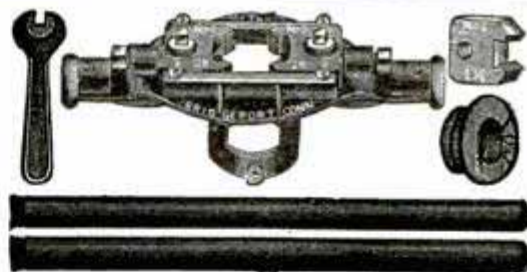
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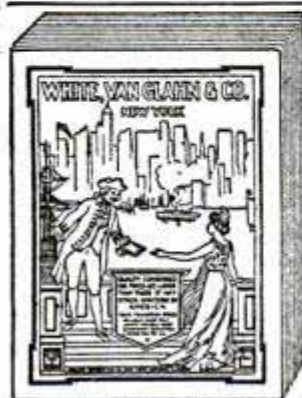


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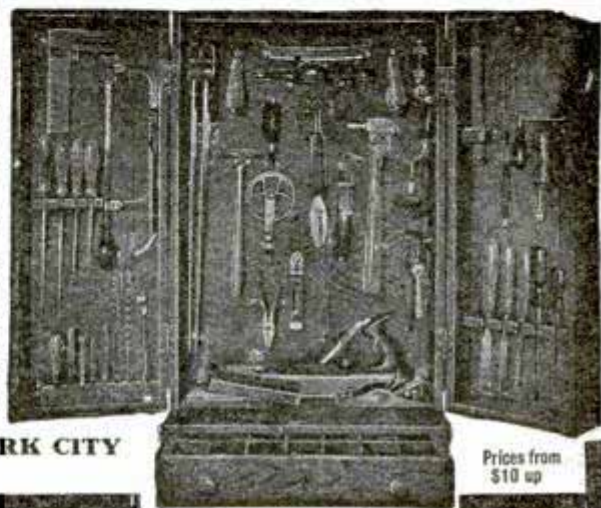
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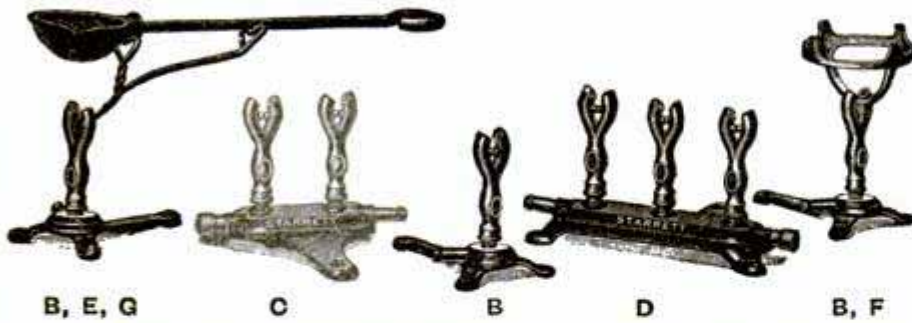
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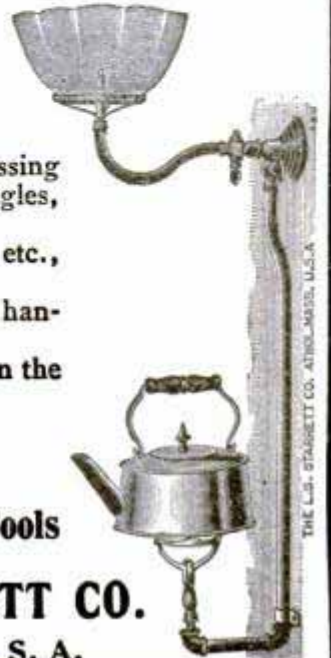
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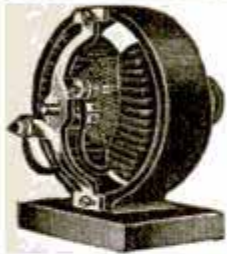
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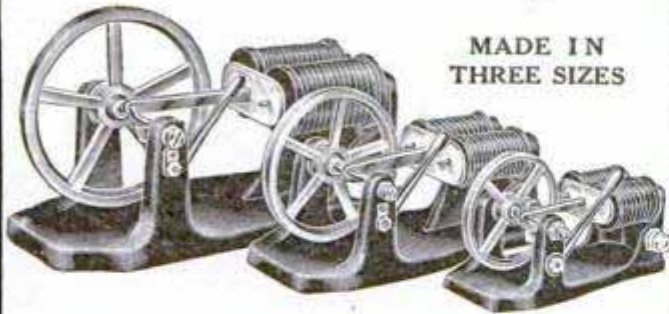


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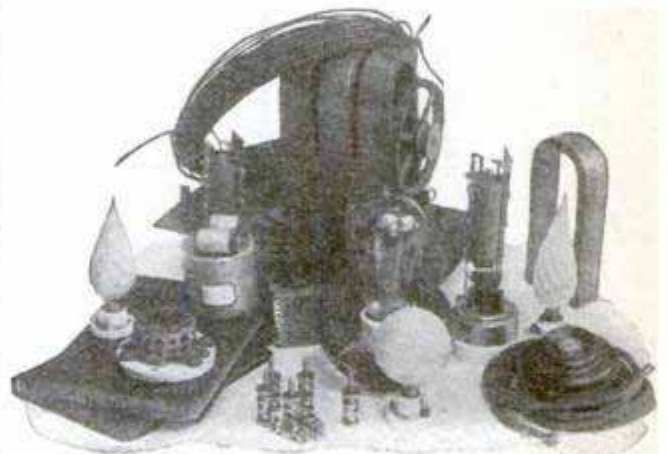
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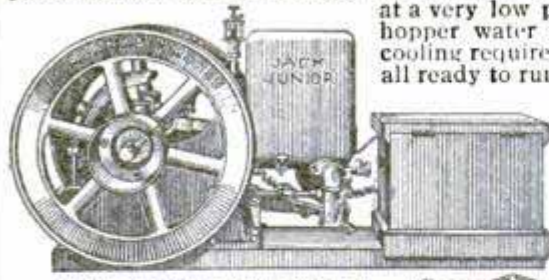
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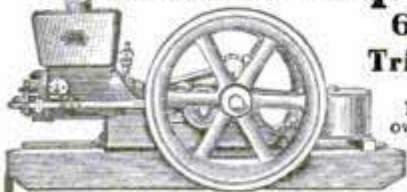
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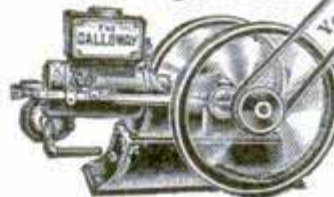
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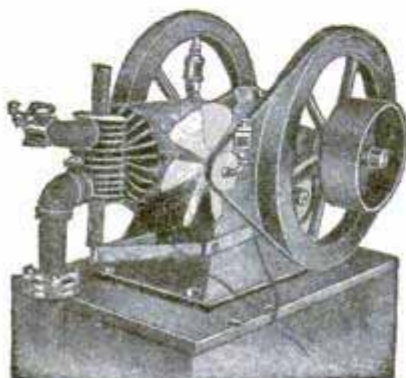
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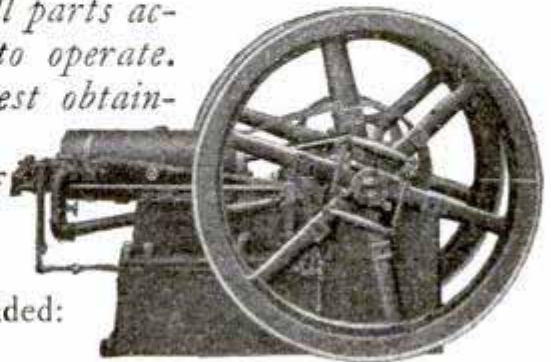
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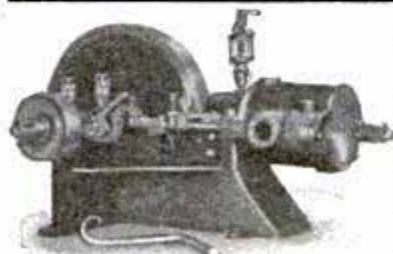
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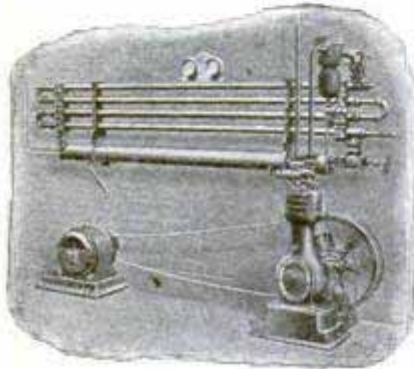
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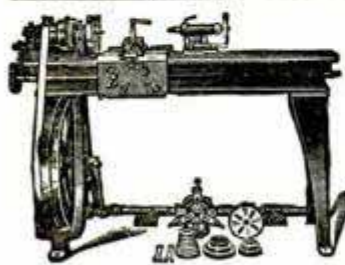
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That life has been a failure,
Some hasten to admit,
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Than strive a little bit.

That life has been a failure
They willing confess.
They'd rather shirk than go to work
And make it a success.

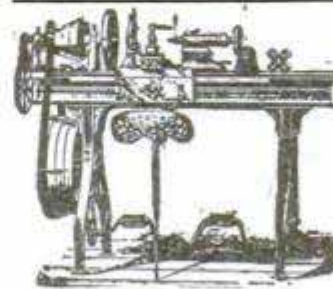
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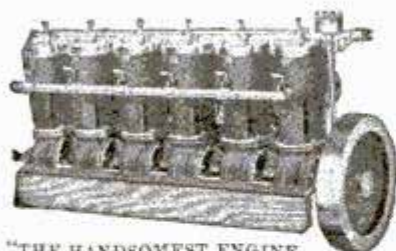
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"Yes, this is 300; is there something you wish?"

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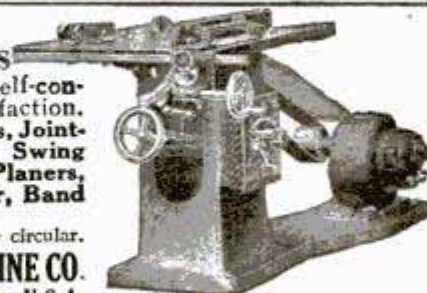
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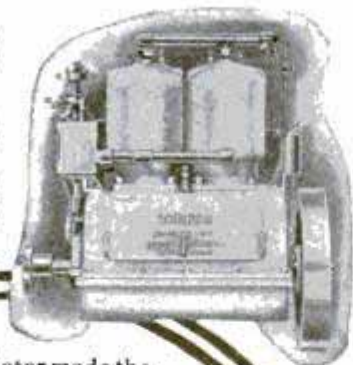
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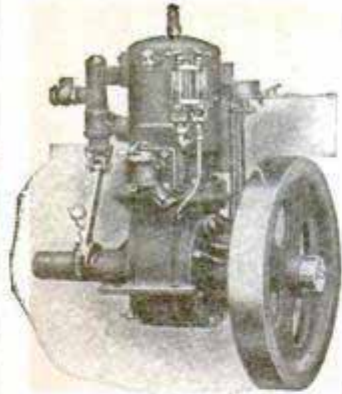
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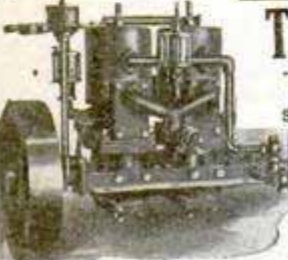
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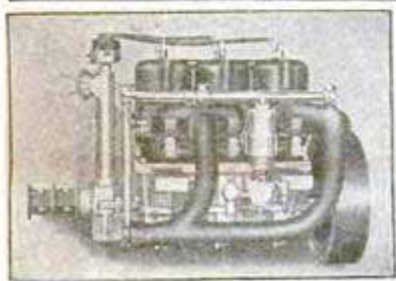
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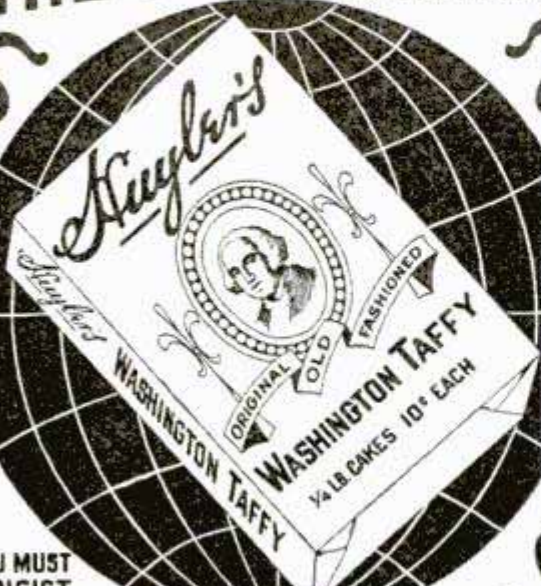
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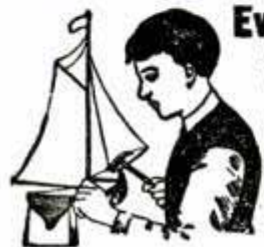


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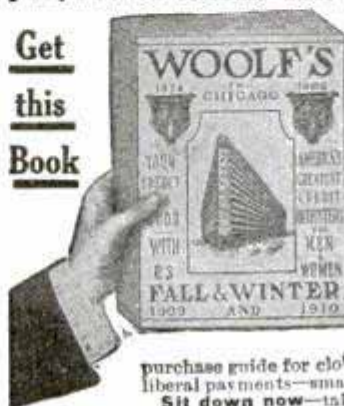
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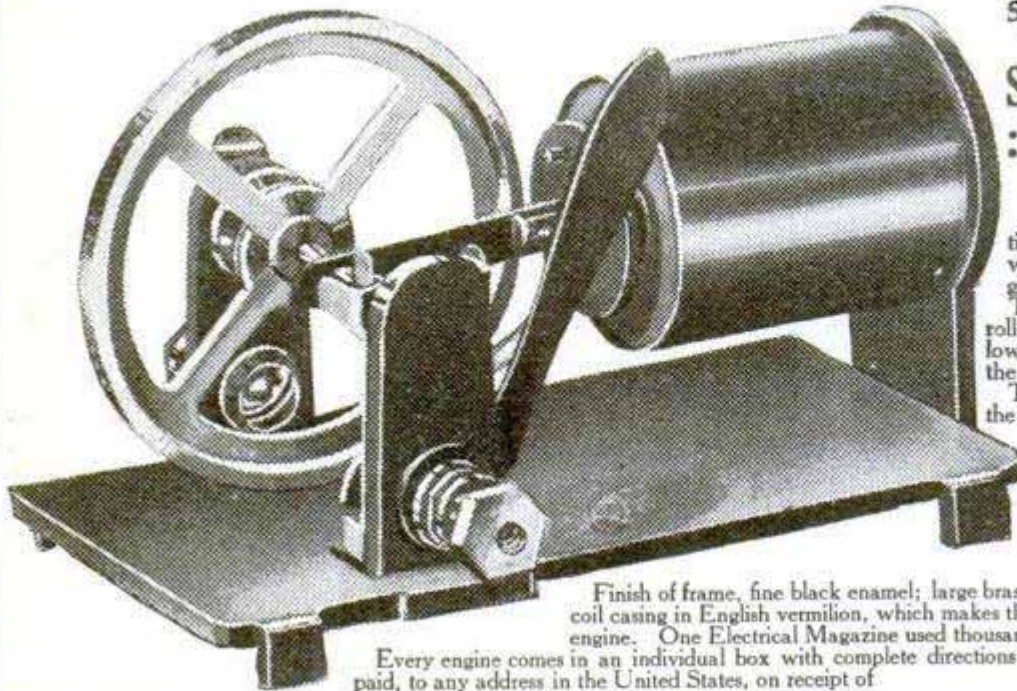
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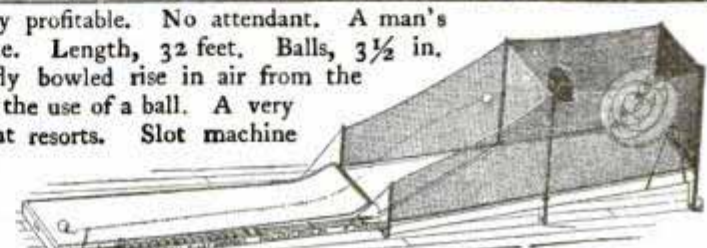
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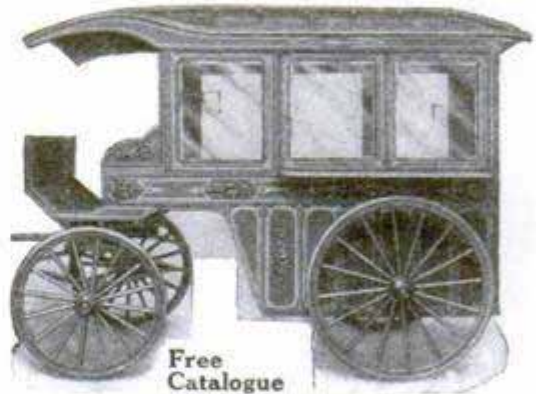
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(Continued on page 149)

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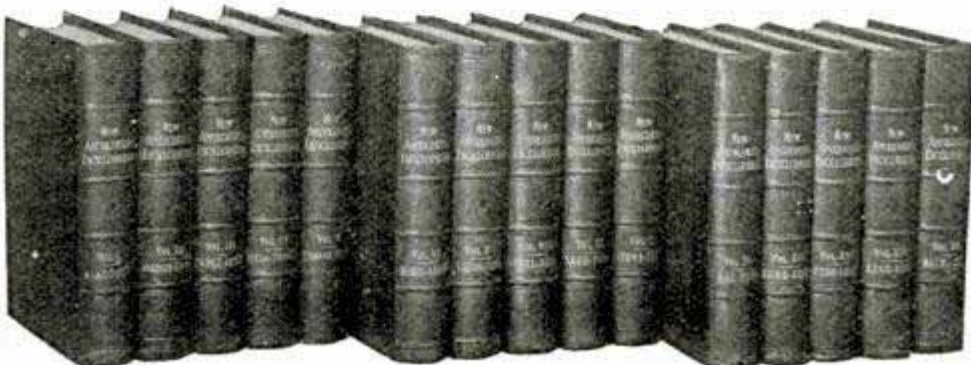
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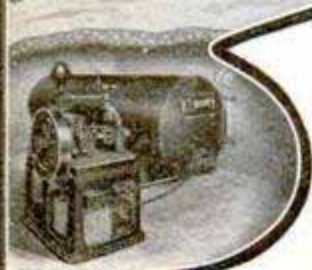
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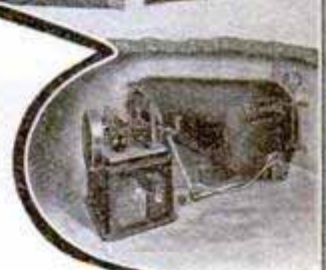
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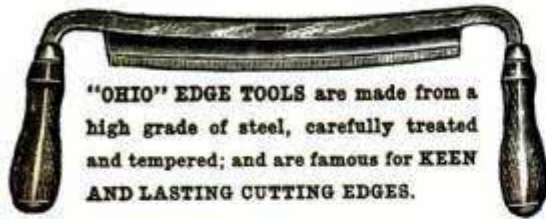
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"Good morning, sir," he said.

"Good morning," said the other, without taking his eyes off the sign.

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"No."

"Perhaps you've got some hides to sell?"

"No."

"Are you a farmer?"

"No."

"What are you then?"

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"That's a sign up there, daddy, what says, 'Don't blow out the gas.'"

"Well, who blowed it out? I jest hit it a lick with my britches an' I hain't seen nothin' er it since!"

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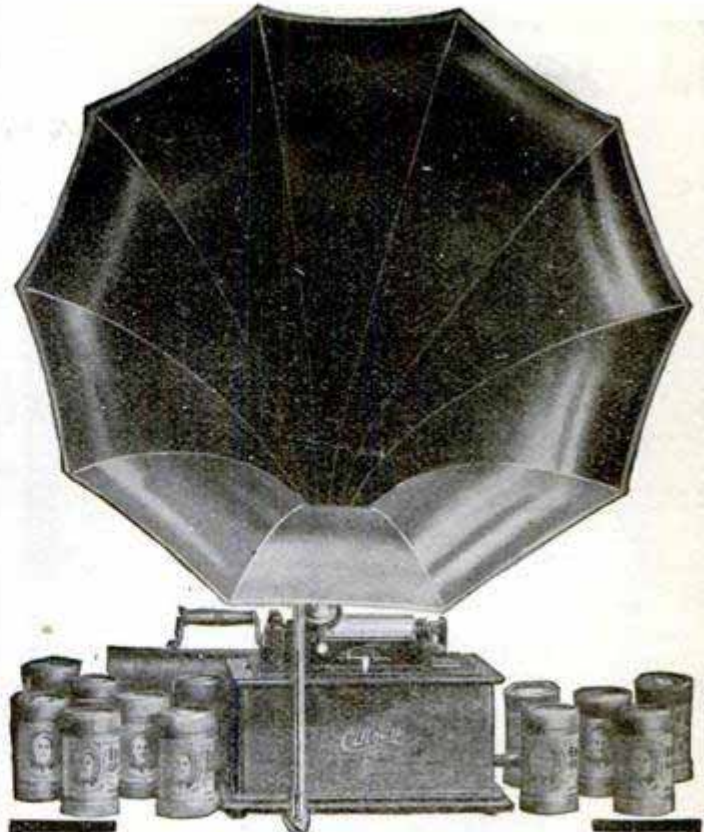


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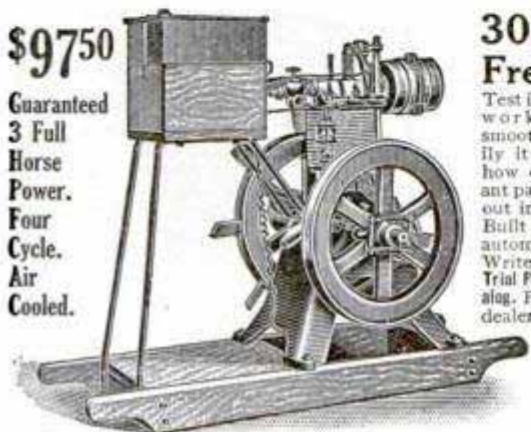
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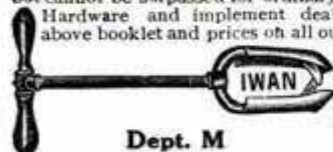
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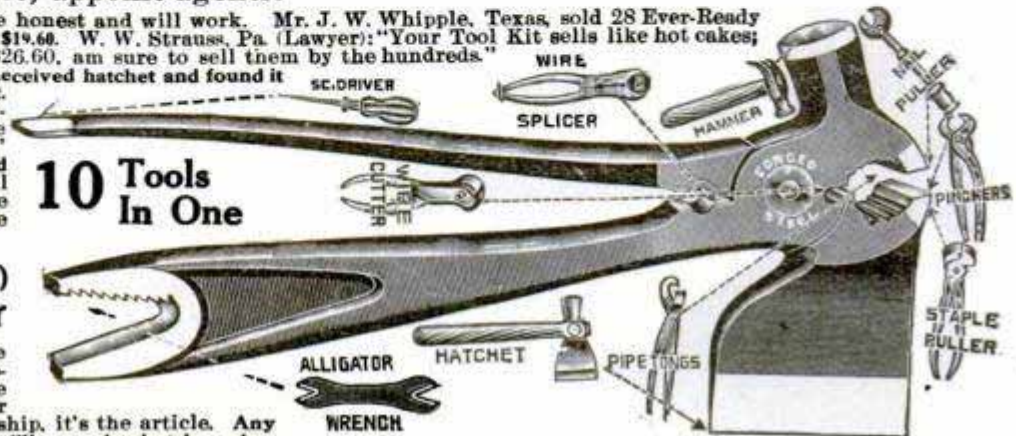
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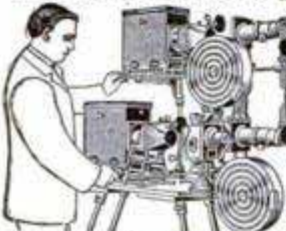
B. Brown, Atlanta, Mercantile Co., Atlanta, says, "Please accept many, many thanks for stropper." Karl Kalbe, Heyden Chemical Works, New York, N. Y., says, "It is a pleasure to shave with the Never Fail Stropper." W. E. Lawson, Fruit and Produce Merchant, Provo, Utah, says, "I wouldn't take \$50.00 for it." and W. A. Mayo, Treasurer Cass Co., N. D., "The Never Fail is the best ever; am now getting a clean, easy shave, before I only got a scrape." etc. Agents say the Never Fail is the *easiest article ever sold* and the same territory can be worked over and over again, for after only ONE trial each customer praises it to his neighbor.

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(Continued from page 148)

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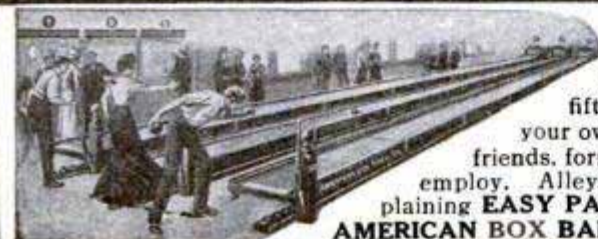
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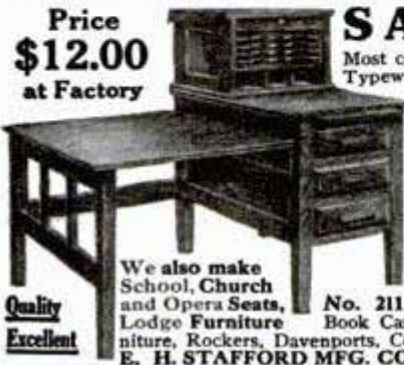
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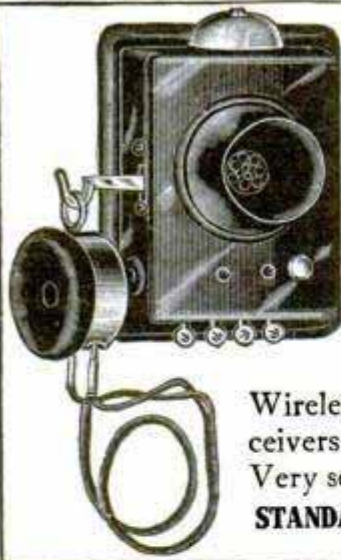
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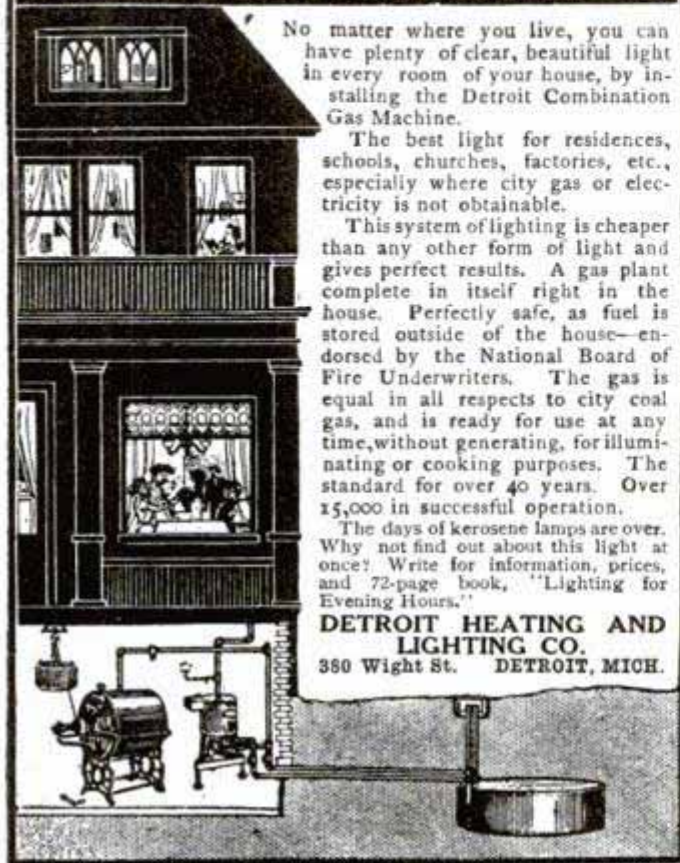
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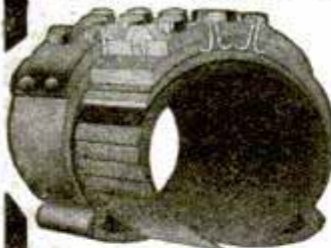
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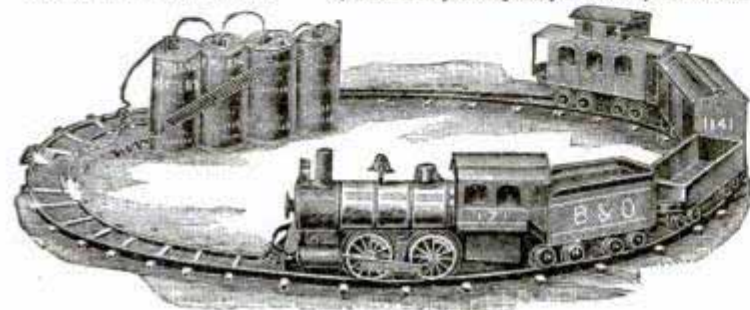
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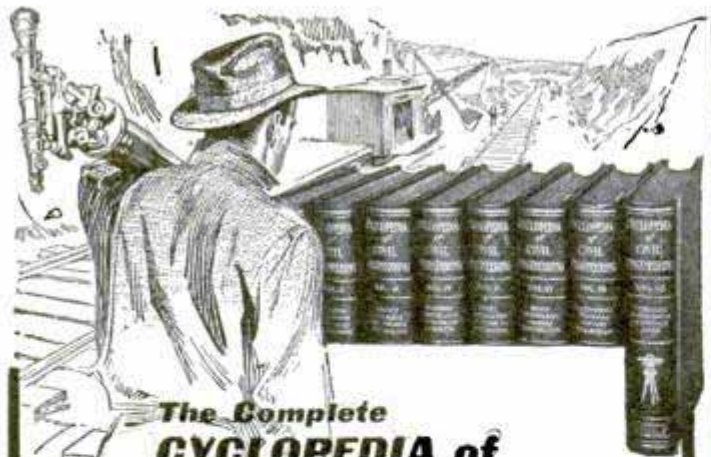
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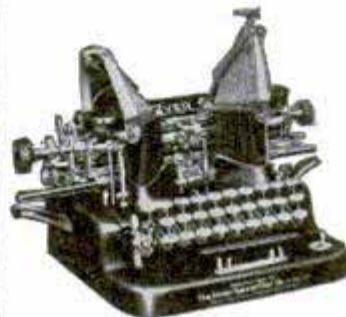
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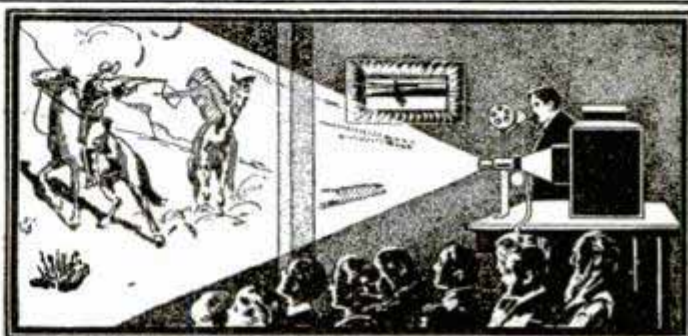
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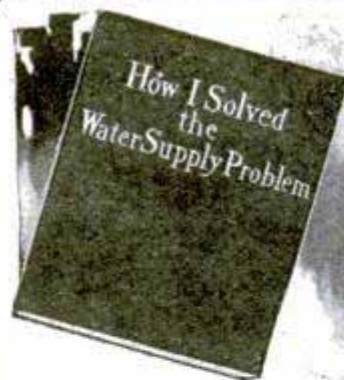
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C. L. PERRIN, Kerkhoven, Minn. \$5
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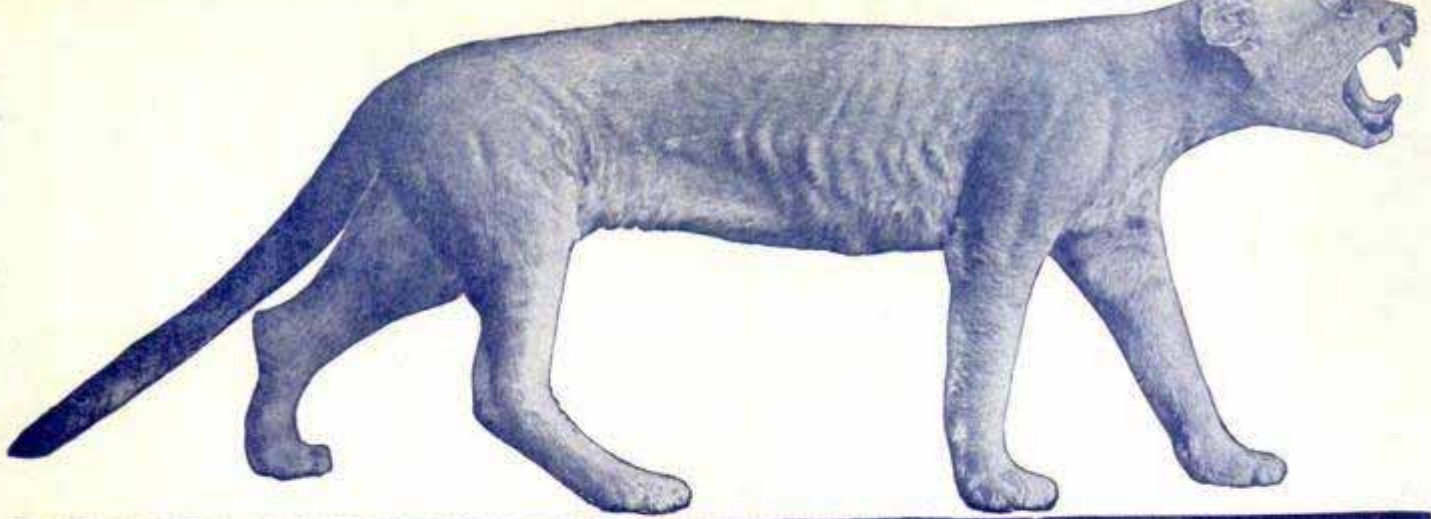


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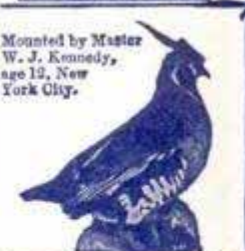
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