

each of the 24 coils. The same field can be used with an external resistance of 75 ohms as a regulator. 4. I have also made one cell of storage battery, called a practical storage battery by P. B. Warwick; made it just as described by the writer. Used asbestos between the plates about three-sixteenths inch. The battery is to have passed through it a current of 10 amperes for 48 hours, then to be finished. Have only had chance to pass that current through for a few hours, in which time enough was accumulated to ring a bell even two hours after I stopped, but finally it would disappear. Now, is there something wrong with the battery or is it likely to do that as long as it has not the forty eight hour treatment, or will it do it even after that? A. You have not yet formed the plates of your storage cell. This is done by charging for a long time and then discharging. This repeated several times brings the material into a condition for use. Follow carefully the directions given in the book you are using. You cannot otherwise expect success.

(7396) L. G. S. writes: 1. In reading the directions for making motor, No. 641 SCIENTIFIC AMERICAN SUPPLEMENT, it says in one place to use No. 18 cotton covered copper magnet wire for armature coils and in the dimension list it says No. 16 for both armature and field coils. Which is right? A. No. 18 is the correct size for armature of motor No. 641. The same size of wire is not employed on both field and armature. That of the armature is the finer, so as to get more turns in the spaces for the coils. 2. Can this motor be made or transformed into a dynamo, and how? A. Such a motor is a dynamo. If run by power up to the speed at which it turns as a motor, it will yield a current about the same as turns it as a motor. 3. I have a copy of "Experimental Science," by Hopkins, at hand, or, at least, in the public library. Is there a battery described in this book that will run the motor? A. The plunging bichromate battery is intended for this purpose. It is fully described in "Experimental Science" and in SCIENTIFIC AMERICAN SUPPLEMENT, No. 792, price 10 cents by mail. 4. Can you give me the number of any SCIENTIFIC AMERICAN or SCIENTIFIC AMERICAN SUPPLEMENT describing and with directions for constructing an electroplating outfit or process? A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 310, 1032, 1078; Watts' "Electrometallurgy," \$1; Bonney's "Electroplater's Handbook," \$1.20.

(7397) R. S. C. asks: Which conveys the most electricity, a tube or a rod, provided the diameters are the same? Our text books state that electricity resides merely on the surface of a body. According to that theory, the teacher holds that the quantity would be the same, while some of the pupils think that, as there is an outer and an inner surface to a common tube, the tube would convey the most. Would not a tube be the same, if cut and rolled out, as a plate, it having two surfaces? Or is the theory given in our text books (Wells and Coolies) false? A. Your people seem to be talking about different things without knowing it. An electric current, as from a battery, or electric light dynamo, flowing through a wire uses all the metal inside and outside. A tube will not carry this as well as a solid rod of same size. Far from it. But an electric charge, as from rubbed paper, cat skin or a Holtz machine, is only on the surface of the metallic conductor, where it is held by the insulation, since it is self-repellent, and therefore only a thin layer of metal is needed to hold it. Cover a non-conductor with tin foil and it will hold as heavy a charge as if it were a solid ball. Lightning acts in the same way, and in its awful speed does not penetrate the metal rod over which it rushes. A tube or small wire is usually better than a heavy rod for a lightning conductor, though this is not the whole reason why.

(7398) J. T. C. asks: 1. What is ebonite? A. It is the same as hard rubber. 2. Is ebonite better than plate glass to use for plates of machine? I wish to use two plates 16 inches diameter. A. It may be rotated more rapidly than glass without breaking. 3. Would 1/4 inch thick, 16 inches diameter hard rubber plates be the best kind I could get to construct this machine? A. It would be strong enough.

(7399) C. C. A. asks: 1. How much wire would it take to wind field core, also armature? A. For field use No. 26 A. W. G. single cotton covered wire, 700 feet, about 5 1/2 pounds. For armature use No. 18 A. W. G., 100 feet, about 1/2 pound. 2. In the small 20 light Edison dynamo armature are the end washes (or flanges) to be of brass or iron? A. The end washes or flanges for armatures should not be of iron, in order to prevent the eddy currents from completing a circuit through them.

(7400) F. J. H. asks: 1. Will you kindly say what I can use as most impervious insulation of magnetism? A. The only substance which will act as a screen for magnetism is iron. Surround a space with a thick shield of iron and magnetism cannot penetrate it. 2. An ordinary horse shoe magnet made from 1/2 x 1 inch bar, if, beginning 1/2 inch from the ends of the prongs, they are tapered to 1/8 x 1 inch, will the magnetic power remain unchanged? A. A magnet is stronger, that is, will hold up more, when it is tapered to its ends.

(7401) P. K. & Company write: Kindly furnish us with a recipe or formula for making a cement suitable for use in an aquarium. A. Linseed oil, 3 ounces; tar, 4 ounces; resin, 1 pound; melt together over a gentle fire. If too much oil is used, the cement will run down the angles of the aquarium; to obviate this it should be tested before using by allowing a small quantity to cool under water; if not found sufficiently firm, allow it to simmer longer or add more tar and resin. The cement should be poured in the corners of the aquarium while warm (not hot). This cement is pliable, and is not poisonous.

(7402) J. B. asks: If I run electric wires through trees, and the limbs rub the covering off the wires, and when it rains the water lies on the wire on the bark, will it injure the tree, or will it reduce the power in the electric light in the lamps? A. Electric light wires should not be allowed to rub against any tree, post or anything else so as to remove the insulation. The leakage is a loss, even if no other harm is done. In wet weather, if the line is an arc light line of high potential, or carries an alternating current, a person coming in contact with such a tree or post might receive a severe shock.

Advertisements.

ORDINARY RATES. Inside Page, each insertion. - 75 cents a line Back Page, each insertion, - \$1.00 a line For some classes of Advertisements, Special and Higher rates are required. The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may be had at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Star Screw... cutting Lathes Automatic Cross feed 9 and 11-inch Swing. New and Original Features. Send for Catalogue B. Seneca Falls Mfg. Company, 695 Water St., Seneca Falls, N. Y.

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHÉ CO. 120 CULVERT ST. CINCINNATI, O.

A College Education for 7 Cents a Day. Improve your condition. Thorough courses, by mail, in Mechanical, Steam, Electrical, Civil, and Sanitary Engineering, Mechanical Drawing and Machine Design easily learned by our methods. Small tuition fees—cash or monthly installments to suit your convenience. Courses in the Home Schools of Art, Architecture and Trades. Write for free S. A. Circular, containing sample instruction and question pages, list and prices of courses, sample of mechanical drawing plate, etc. State subjects interested in. Special inducements to those enrolling now.

THE UNITED CORRESPONDENCE SCHOOLS, F. W. EWALD, Gen. Mgr. 154, 156, 158 5th Ave., New York

HAVE THE LATEST IMPROVEMENTS. No machine shop can be thoroughly up-to-date unless it has the most modern perfected tools. For instance, the

ASHLEY PATENT NIPPLE HOLDERS hold nipples for cutting either right or left hand threads. They hold the sleeve from turning and take the strain off both the sleeve and shank thread. Made of best quality cast steel, carefully fitted. Long or short nipples cut with equal facility. The Ashley Holders are of light weight and compact form. WALWORTH MFG. CO., 20 Oliver St., Boston, Mass.

THE FORBES PATENT DIE STOCKS. Two and three inch pipe can be threaded by a boy using only one hand on a crank. Send for illustrated catalogue CURTIS & CURTIS, No. 30 Hand Machine, Range 1/2 to 2" R. & L. 6 Garden St., Bridgeport, Conn.

BARNES' UPRIGHT DRILLS. Complete line, ranging from Light Friction Drill to 42" Back Geared Self-Feed. Send for New Catalogue. W. F. & JOHN BARNES CO. 1999 Ruby Street, ROCKFORD, ILL.

COBURN PATENT TRACK Trolley, Barn and Fire Door Hangers. All Styles. Latest Improvements. Send for Book. Coburn Trolley Track Mfg. Co. Holyoke, Mass.

PHYSICAL AND SCHOOL APPARATUS. INDUCTION COILS for experiments in X rays and other electrical work. Catalogue Free. E. S. RITCHIE & SONS, BROOKLINE, MASS

Tools for Fine or Rough Work. Tools that are common and Tools that are rare, costly and cheap Tools, and every other kind of Tool used in any trade you will find described and illustrated in MONTGOMERY'S TOOL CATALOGUE FOR 1898. A handsome book containing 510 pages and copious index. Pocket size 6 1/4 x 4 1/4 inches, with rounded edges and stitched covers. Every workshop and factory in the country should have one. Sent by mail for 25 cents by MONTGOMERY & CO. 105 Fulton Street, New York.

QUEEN'S NEW AUTOMATIC LAMP. Its Six Points of Superiority: 1. It keeps in focus constantly. 2. Regulates and runs silently. 3. No attention required to help it regulate. 4. The full crater is projected. 5. The negative carbon is non-luminous. The adjustments are all outside. Send for circular to QUEEN & CO., Inc. 1011 Chestnut St., Philadelphia

DEFIANCE MACHINE WORKS. DEFENCE, OHIO, U.S.A. BUILDERS OF HUB, SPOKE, WHEEL, BENDING, WAGON, CARRIAGE AND HOOP MACHINERY. SEND FOR CATALOGUE

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted APRIL 5, 1898, AND EACH BEARING THAT DATE. (See note at end of list about copies of these patents.)

Table listing inventions with patent numbers. Includes: Agricultural implement, H. C. Milburn; Air and steam brake coupling, automatic, W. J. Pugh; Albumen preparation soluble in water, Bauer & Busch; Ash receiver, safety, S. M. Smith; Axle lubricator, car, S. Austin; Baling press, cotton, F. L. Dyer; Ball and cone wine baler, F. E. Holt; Band cutter and feeder, J. F. Hodgen; Banjo, J. Brandt; Barrel cleaner, C. Kaestner; Barrel filling apparatus, W. Hartmann; Barrel lining, J. Berg; Basket making machine, R. E. Reed; Bath cabinet, portable, R. M. Irwin; Bath gown, H. & H. E. Law; Bathing suit, M. M. Shepard; Bearing, antifriction, C. B. Hobron; Bearing for cycles or velocipedes, ball, W. W. Tucker; Beef roaster, F. Michel; Beeves, machine for splitting, H. H. Young; Bicycle, R. C. Fay; Bicycle, J. F. Murphy; Bicycle, etc., H. N. Will; Bicycle canopy, W. McDonald; Bicycle chain driving device, automatic, E. Fay; Bicycle fork side, E. Ivins; Bicycle handle bar, H. H. Johnson; Bicycle handle bar, E. W. McCreedy; Bicycle handle bar, adjustable, G. M. Beard; Bicycle handle bar, adjustable, F. Johnson; Bicycle lock, F. C. McDonald; Bicycle luggage carrier, C. J. Brown; Bicycle package carrier, G. G. Clapham; Bicycle saddle clamp, J. A. Hunt; Bicycles, etc., mechanism for indicating travel of, W. E. Stubbs; Billiard cue tip fastener, P. B. Tarver; Binder, temporary, J. R. Barrett; Block. See Pillow block; Boiler for steam heating apparatus, H. J. Spencer; Boiler furnace, F. F. Parsons; Boiler signal, steam, Bechtel & Fritz; Bolt. See Seal bolt; Bottle, H. Weil; Bottle, W. Wilson; Bottle attachment, A. C. Smalley; Bottle holder adjustable nursing, G. W. McCollom; Bottle stopper, A. Backhaus; Bottles, etc., means for preventing fraud in connection with contents of, G. H. Grapes; Bowling alley, E. Brooks; Box, separator, for fruit and lunch box; Brace. See Frame brace; Bracket. See Trip prop bracket; Brake. See Dumb waiter brake. Sewing machine brake. Wagon brake; Brake gear slack adjuster, G. M. Watson; Brass electric, J. Vanerbrook; Brick cleaning machine, S. A. Prescott; Burial casket, O. M. Allen; Burner. See Vapor burner; Butter printer and weighing machine, A. C. Dodge; Button cutting machine, W. A. Penry; Button remover, S. E. Burke; Cabinet, grocer's, R. H. Whitted; Cake beater, A. W. Custer; Calendar, M. Cowen; Camera, kinetographic, W. B. Davis; Car. See Motor car; Candle holder and extinguisher, J. W. Kynast; Car buffer platform, railway, T. L. McKeen; Car coupling, J. W. Fawcett; Car coupling, G. J. Forrey; Car coupling, T. L. McKeen; Car coupling, C. A. Power; Car door, E. S. Marshall; Car fender, Hayward & Totten; Car fender, J. Keller; Car fender lowering mechanism, Harris & Goldsmith; Car running gear, A. J. Lodriguss; Car, vestibule, T. L. McKeen; Car wheel and axle, Graham & Kile; Carbonating and bottling malt liquids, apparatus for, C. Saw; Carpet cleaner, A. T. Gue; Carpet sweeper, E. Browne; Cart, hand, G. A. Dahlberg; Cart, refreshment, C. S. Arnold; Carton, F. P. Tucker; Cartridge case and making same, F. W. Oliver; Case. See Egg case, Eyeglass case, File case, Cash register, Rosander & Pearson; Casks or barrels from veneers, manufacturing, C. Wittkowsky; Caster, ball, G. L. Boveroux; Chain, power transmitting, Dundas & Senior; Chair. See Music chair; Chair holder, G. P. Roberts; Chatelaine, S. Zeugschmidt; Circuit breaker, electromagnetic, G. S. Dunn; Clevis, W. H. Lightcap; Clip. See Drop light wire clip; Clock, programme, E. F. Burrill; Cloth, apparatus for detecting wrinkles in, T. Rowe; Clothes line pulley, H. Ecker; Cock or faucet, Cotter & Tager; Cock, rotary plug, W. F. Harrison; Confectioner's moulding machine, J. S. Crowell; Conveying apparatus, T. S. Miller; Cork cutting machine, J. Jonson; Cork protector, C. W. Mackey; Corn header, Kafir, J. B. Tilley et al.; Corn husker, J. M. Carlisle; Corset, L. S. Walker; Corset maker, E. McLooney-Playter; Counter, J. F. McNutt; Coupling. See Air and steam brake coupling, Car coupling, Hose coupling, Thill couplink, Vehicle coupling; Crate, collapsible, G. H. Grove; Crutch, folding, W. G. White; Cultivator, D. M. Motherwell; Cultivator and harrow, combined, J. A. Webber; Curtain pole, A. F. Henderson; Cutter. See Band cutter, Milling cutter; Cutter head, G. R. Boyd; Cutting machine, manufacturing, F. E. Lang; Cutting machine, D. Brooks; Cutting machine, J. H. Taylor; Cycle handle bar, Gardner & Hartley; Deborner, B. A. Bullock; Denture, artificial, E. L. Chaffin; Desk school, A. H. Kennedy; Digging machine, beet, L. Pike; Diving apparatus, W. R. Faisey; Door check, C. F. Hanington; Draught equalizer, G. F. Hillegas; Drop light wire clip, C. Schuetz; Dumb waiter brake, C. W. Hoffman; Dump for ore buckets, H. Pepin; Dye and making same, black, R. Vidal (reissue); Dye, blue azo, C. Rudolph; Eaves troughs, machine for folding slip joints for, R. F. Fowler; Egg case, metal, H. H. Knight; Egg, pondy; Electric circuits, solenoid blow out for dispersing arcs formed in breaking, S. H. Short; Elevator. See Water elevator; Elevator, R. C. Smith; Engine. See Rotary engine, Rotary steam engine; Extractor. See Spike extractor; Eyeglass case, C. E. White; Fastening device, A. Currier; Faucet, hot and cold water, G. A. Soderlund; Feed for boilers, water, A. B. Willoughby; Fence, W. E. Royer; Fence stay, wire, Neil & Bissell; Fence, wire, P. J. Schild; Fences, device for applying stay wires to, H. Withey; Fender. See Car fender; File case, H. E. Clark; Filter, J. F. Wireback; Filter, centrifugal, J. A. Lombas; Filter press, E. E. Hendrick; Fire alarm systems, heat detector for electric, J. D. Gould; Firearm, breech loading, R. T. Torkelson

If You Want the Best Lathe and Drill

CHUCKS. BUY WESTCOTT'S Strongest Grip, Greatest Capacity and Durability, Cheap and Accurate. Westcott Chuck Co., Oneida, N. Y., U. S. A. Ask for catalogue in English, French, Spanish or German. FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

IMPERIAL BELTING. MANUFACTURED BY BOSTON BELTING CO. Duck and rubber the very best. The stitches re-enforce the tough, strong friction in the belt, holding the plies firmly together. Especially adapted for medium and small size pulleys. Catalogue Free. Made by BOSTON BELTING CO., 256 Devonshire St., Boston, U. S. A.

WOODWORKING MACHINERY. For Planing Mills, Carpenters, Builders, Furniture, Chair, Vehicle, Wheel and Spoke Makers, etc. Correspondence Solicited. Illustrated 312-page Catalogue free to manufacturers and foremen. THE ECAN CO. 327 to 347 West Front Street, CINCINNATI, OHIO.

A Marvelous Machine! Watch the wonderful work done by our Apex Nipple and Pipe Mill Machine. Threads nipples of all sizes. So swiftd that it can be reversed and pipe cut off close to grippers. Vice can be opened or closed while machine is in motion. Send for Catalogue. THE MERRELL MFG. CO., 501 Curtiss Street, Toledo, Ohio.

Oster Pat. Adjustable Stocks & Dies. They are light in weight, dies made of the best tool steel, guaranteed just as strong and reliable as solid dies, cut the thread at one operation and release from the work without running back over finished threads. Each set of dies cuts two distinct sizes. THE OSTER MFG. CO. 55 Prospect Ave., Cleveland, Ohio, U.S.A.

ROCK DRILLS AIR COMPRESSORS. SIMPLEST, MOST EFFICIENT and DURABLE. RAND DRILL CO. Send for Catalogue 100 Broadway, New York.

NICKEL AND Electro-Plating Apparatus and Material. THE HANSON & VAN WINKLE CO., Newark, N. J. 136 Liberty St., N. Y. 35 & 37 S. Canal St., Chicago.

Gas Blast Furnaces GAS PRODUCERS AND PRESSURE BLOWERS. For Illustrated Pamphlets, apply to AMERICAN GAS FURNACE CO. 23 John Street, New York, N. Y.

EDISON PHONOGRAPHS, All Styles. TAITER GRAPHOPHONES, All Styles. Complete stock of records, and full line of supplies, for both machines. 36 Page Illustrated Catalogue, free. The Edison Phonograph Co., 427 Vine St., Cincinnati, O.

THE HARRINGTON & KING PERFORATING SHEET METAL MILLING & MINING MACHINERY. WE SUPPLY WHAT YOU WANT, ANY THICKNESS, METAL, SIZE & SHAPE OF HOLE. 225 NORTH UNION ST. CHICAGO, ILL. U.S.A.

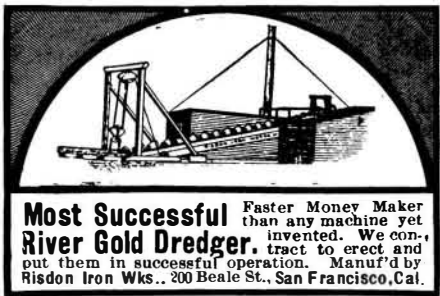
THE PRINCIPAL AND PECULIAR POINTS WHEREIN THE EDISON LALANDE CELLS are superior to others are below enumerated: 1. High and constant available electromotive force. 2. No local action, therefore no loss of energy while cell is idle. 3. Extremely low internal resistance. 4. Heavy current delivery, absolutely constant. 5. Cheap materials, easily obtained. 6. No attention required until all energy of elements is exhausted. 7. Convenience of form and freedom from noxious fumes. 8. No polarization. 9. Will not freeze at lowest temperature. 10. The Edison Lalande Battery is now made in seven different types, each one designed for special work. Send for Catalogue and Price List "S. A." THE EDISON MFG. CO., 112 East 23d St., New York. THOS. A. EDISON, PROPRIETOR.

WELL DRILLING MACHINES of all kinds and sizes, for drilling wells for house, farm, City and Village Water Works, Factories, Ice Plants, Breweries, Irrigation, Coal and Mineral Prospecting, Oil and Gas, etc. Latest and Best. 30 years experience. WRITE US WHAT YOU WANT. Mention this paper. LOOMIS & NYMAN, Timn, Ohio.

\$20 MOTOR on DYNAMO. Motor does one-fourth horse power of work and dynamo will operate four incandescent lamps. Have carbon brushes, self-oiling bearings and are made of best quality magnetic steel. Perfect machines in every way. Prices on other sizes in proportion. THE HOBART ELECTRIC MANUFACTURING CO., TROY, OHIO.

STEAM ENGINEERING

Learned by study at home in your spare time. Able instructors. Superior text-books free. Fees moderate. \$2 in ADVANCE and \$2 a MONTH Pays for a College Education at Home.



Most Successful River Gold Dredger. Faster Money Maker than any machine yet invented.

DOUBLE STEEL SQUARE. 2 1/2 inch for toolmakers. As shown, \$2.00. With either bevel or narrow blade, 2.30. Complete, 2.60.

Buy Telephones THAT ARE GOOD--NOT "CHEAP THINGS." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits.

As Cool as You Please Every hotel, restaurant, factory, theater, office, workshop and other public building, and every private family should possess a BARRON SANITARY COOLER.

ADJUSTABLE FIXTURES FOR INCANDESCENT LAMPS. EVERY REQUIREMENT. SEND FOR CATALOGUE'S.

FORMULAS FOR DEVELOPERS.—SCIENTIFIC AMERICAN SUPPLEMENT, No. 1152, contains a dozen formulas for standard photographic developers.

\$5 Printing Press Prints your own cards, labels, etc. Larger press for circulars or small newspaper, \$18. Everything easy by printed rules sent. Catalogue for stamp. KELSEY & COMPANY, Factory 4, MERIDEN, CONNECT. CUT.

HOLDS HOSE with a vise-like grip, and never ears the fabric. Lift the little lever and the jaws are released. No elastic band to bind the leg.

80 USE GRINDSTONES? If so, we can supply you. All sizes mounted and unmounted, all sizes kept in stock. Remember, we make a specialty of selecting stones for all special purposes.

Boards of Health will find our Bacteriological Apparatus complete, durable, accurately constructed and inexpensive.

BAUSCH & LOMB OPTICAL CO. 515 1/2 N. St Paul Street, Rochester, N. Y.

Table listing various mechanical parts and their prices, including items like Firearm magazine, Flour, Fluid pressure regulator, Fly trap, Frame brace, Furnace, Game apparatus, Garment clasp, Gas generating apparatus, Glass supply meter, Gun magazine bolt, Harvester, Hat fastener, Heater, Heel building machine, Hermetic fastening, Hides or skins, Hook, Hook and eye, Horse boot, Horseshoe, Hose clamp, Hose coupling, Hose rack, Hose reel, Hot air furnace, Hub, Hydrant, Identifying device, Incandescent light hanger, Incubator, Indicator, Ingots, Insulator, Insulated wire, Invalid table, Jaw wrench, Kettle, Kitchen rack, Knit mitten, Knob attachment, Ladder, Land roller, Lantern, Lasting machine, Leather and rubber substitute, Lecture room, Level and grading instrument, Life insurance table, Lifting device, Lighter, Liquid transporting, Loading or unloading apparatus, Lock, Loom, Lubricator, Marble, Match splint cutting, Measuring and cutting device, Measuring diameters, Meat can, Metal ware, Meter, Mill, Milling cutter, Mining machine, Mordanting, Motor, Moving way, Mowing machine, Music chair, Music or book holder, Music turner, Nail machine, Nailing apparatus, Nailing apparatus, Newspaper folding, Nora, Nut and pipe wrench, Nut lock, Nut lock, Nut lock, Oil can, Oiler, Ore separator, Ores containing gold, Padlock, Pail, Paint, Paper and compound, Paper bag cabinet, Partition, Permutation lock, Photographic printing apparatus, Pillow block, Pin, Pincers, Pipe thimble, Pipe wrench, Plant supporter, Planter, Pliers, Blow handle clamp, Plunger brake head, Pocket book, Pole step, Press, Propagator, Pulley, Pump, Pump, Puzzle, Rack, Radiator, Radiator, Rail, Rail, Rail, Railway bed, Railway signal, Railway switch, Railway switch, Reel, Reel, Refrigerating machines, Refrigerator, Register, Regulator, Road, Road, Road rollers, Roaster, Robe, Rocker attachment.

WEBSTER MFG. CO., 1074 West 15th St., CHICAGO. This beats Wind, Steam, or Horse Power. We offer the WEBSTER 2 1/2 actual horse power GAS ENGINE for \$150, less 10% discount for cash.

GASOLINE ENGINE CASTINGS. 2 TO 12 H.P. WE FURNISH CASTINGS AND WORKING DRAWINGS. VANDUZEY GASOLINE ENGINE CO. CINCINNATI, O.

KNIGHT GAS AND GASOLINE ENGINE. Excellency in mechanical design, simplicity in construction, sensitive governing, obtaining steady motion and more desirable results, are the superior points in our engines.

FRONTIER GAS ENGINES. Vertical, 1 to 10 H.P. Tandem, 10 to 100 H.P. Send for Catalogues. FRONTIER IRON WORKS, No. 6 Chene Street, Detroit, Mich.

DID YOU EVER CYCLE AFOOT? Get on a live wire. Ride the W. S. CLEVELAND Model. BUFFALO FOOT CYCLES. The swiftest thing on wheels! Rubber Tires, Ball-Bearings. The Correct Machine. Unexcelled for Asphalt Streets, Cement Courts, Sidewalks, Ball-rooms, Gymnasiums, Bicycle Schools, Halls, Foot Cycle Academies. Sure to be the fad at Seashore.

The Park Spring Saddle. built on scientific principles. See the Spring that makes all roads appear smooth; no jar, no vibration, no weariness or tired feeling after riding. Broad Seat, Narrow Pommel. Price reduced from \$5.00 to \$3.50.

The Christy Saddle. Anatomically correct. Medically indorsed. Injuries avoided. Comfortable, safe, handsome, lasting. High grade bicycle makers furnish it as a regular equipment or an option without additional charge at retail. Insist on the Christy. Avoid cheap imitations. Don't permit the substitution of cheap leather saddles. Once a Christy rider, always a Christy advocate. Christy Booklet free.

MANUFACTURE OF BICYCLES.—A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 908. Price 10 cents. To be had at this office and from all newsdealers.

WILLITS AUTOMATIC HUB BRAKE. Catalogue Free. HAY & WILLITS MFG. CO., INDIANAPOLIS, IND.

STERLING BICYCLES. "BUILT LIKE A WATCH." Art Catalogue Free. STERLING CYCLE WORKS, 274-276-278 Wabash Ave., Chicago.

BROKEN BICYCLES are expensive. We sell all necessary tools and materials, and can duplicate any part when piece is mailed to us. Will mail you for 25c in stamps a practical treatise, "How to Repair Bicycles," by competent authorities, and a fully illustrated catalogue embracing thousands of bargains in tools, fittings and repair parts.

PALMER STATIONARY GAS ENGINES. LAUNCHES \$178.00 AND UP. BOAT FRAMES, PROPELLER WHEELS, ENGINE CASTINGS. SEND STAMP FOR CATALOGUE. MIANUS ELECTRIC CO. MIANUS, CONN.

SINZ GAS ENGINE CO. MARINE & STATIONARY GASOLINE ENGINES—LAUNCHES. GRAND RAPIDS, MICHIGAN.

ENGINEERING NOTES, ELECTRICAL Notes, Miscellaneous Notes and Selected Formulas, are published each week in the SCIENTIFIC AMERICAN SUPPLEMENT, forming an excellent review of the shorter matter which appears in the American and foreign press.

"KING" Gasoline Engines. No Oil Cups. Exhausts Under Water. Noiseless. COMPLETE LAUNCHES, YACHTS, and WORKING BOATS. THE CHARLES B. KING CO., Detroit, Mich.

ALCO VAPOR LAUNCH. Motor controlled from bow. Valve movement, 12 to 1.6 to 60 ft. Launches. Twin Screws a specialty. 1, 2, 3, 5, 7, 12, 14 and 20 H.P. No licensed engineer or pilot required. Speed and safety guaranteed. No dangerous Naptha or Gasoline used. No disagreeable vibration. Send 10 cents in stamps for 1897 Catalogue.

GAS AND GASOLINE ENGINES. Marine and Stationary. 3/4 h.p. upwards. ROGERS GAS ENGINE WORKS, 2605 Clarendon Avenue, CHICAGO.

THE TORPEDO BOAT TURBINE.—This article describes the construction of the Turbinia, which made such phenomenal speed. Detailed drawings showing arrangement of machinery. SCIENTIFIC AMERICAN SUPPLEMENT 1121. Price 10 cents. For sale by Munn & Co. and all newsdealers.

GAS AND GASOLINE ENGINES WATER MOTORS. BACKUS WATER MOTOR CO. NEWARK, N. J. U. S. A.

A Safety Revolver will ONLY GO OFF at the critical moment. A powerful Shooting Weapon. 32 calibre. Very short barrel. Therefore specially desirable for bicyclists, as it may be carried in the pocket without inconvenience. Descriptive catalogue free. SMITH & WESSON, 14 Stockbridge Street, Springfield, Mass.

PATTON'S Sun Proof PAINTS. are made to stand the severest trial the sun can give them. They neither blister, crack, nor chalk off. They keep their gloss and hold their colors, and give double the service that all-white-lead or any ordinary paints would give. Made in both liquid and paste forms. Patton's House Painting Model (20,000 combinations) sent postpaid for ten cents. Book "How to Increase the Size of Your House with Paint," and a Master Painter's Tinting Card for two-cent stamp. We want a dealer or painter in every town to handle Patton's Paints on liberal terms; it's a business in itself. JAS. E. PATTON CO., Milwaukee, Wis., U. S. A.

FAIRBANKS' INFALLIBLE SCALE CO. PATENT SCALE. For weighing and measuring. Catalogue free.

"MY OWN" CYCLES with Patent Combined Automatic Coaster and Brake. Coast with pedals stationary and feet on them. Nothing so fine an invention of pneumatics. From Factory straight to Rider below jobbing prices. No Trash, No Job Lots. Send for Catalogue and Special Offer. F. S. BEAVIS, 48 B St., PEORIA, ILL.

7000 BICYCLES carried over from 1897 must be sacrificed now. New High Grade, all styles, best equipment, guaranteed \$9.75 to \$17.00. Used wheels, late models, all makes, \$3 to \$12. We ship on approval without a cent payment. Write for bargain list and art catalogue of well 98 models. BICYCLE FREE for season to advertise them. Send for one. Rider agents wanted. Learn how to Earn a Bicycles and make money. MEAD CYCLE CO., 282 Avenue A, Chicago.