

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"U. S." metal polish. Indianapolis. Samples free. For Sale—Patent No. 406517. G. R. Chittenden, Mendon, Ill.

Handle turning machinery. Trevor Mfg. Co., Lockport, N. Y.

Air compressors for every possible duty. Clayton Air Compressor Works, 26 Cortlandt Street, New York.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Nickel-in-slot machines perfected and manufactured Electrical supplies, Waite Mfg. Co., Bridgeport, Conn.

Centrifugal Pumps for paper and pulp mills. Irrigating and sand pumping plants. Irvia Van Wie, Syracuse, N. Y.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Emerson Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

The Fulton Foundry and Machine Works, No. 21 Furman St., Brooklyn, N. Y., have resumed operations in all their departments, and request a renewal of custom from former patrons. E. B. Wilcox.

Wanted, Bridge Salesmen—one for each State in the Union, competent to make sales of bridges and superintend erection when necessary. Address, stating age, experience, salary expected, etc., L. B. 1107, Chicago, Ill.

To Manufacturers and Importers.—A man of energy and business qualifications, who has been in the hotel business for twenty years, intends establishing, in a live and growing city of over 100,000 inhabitants, an agency for several lines of trade which will not conflict. Correspondence solicited from manufacturers, importers, and jobbers. Satisfactory references or bond will be given. Address M. A. B., 111 Liberty St., New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.



HINTS TO CORRESPONDENTS. Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication. References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn. Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same. Special Written Information on matters of personal rather than general interest cannot be expected without remuneration. Scientific American Supplements referred to may be had at the office. Price 10 cents each. Books referred to promptly supplied on receipt of price. Minerals sent for examination should be distinctly marked or labeled.

(5927) Littleton asks the correct solution to "the reason that a top stands up while spinning." A gyroscopic force is the cause. A rotating body always tends to rotate about the axis giving the highest moment of inertia. The mathematical investigation is difficult. If you consider that a high moment of inertia means high centrifugal force, you can reach some conception of the subject.

(5928) S. S. G. asks what quicksilver is and what it is used for. A. Quicksilver is a metal that is fluid at ordinary temperatures. It is solid and ductile when frozen. 2. And is there any fluid that can be permanently magnetized? A. No. 3. How can I make a good battery out of carbon sticks, trimmings of the electric light? A. If the carbons are copper, the copper should be removed by means of nitric acid, and the carbons washed and dried. The upper ends of the carbons are to be heated sufficiently to melt paraffine. Paraffine is applied to the ends and allowed to saturate them for a distance of about an inch. Upon these saturated ends of the carbons are cast lead caps. Use about 8 or 10 rods to each battery and connect the carbons to the wire. Insert the rods in a glass or glazed earthenware vessel. They should be arranged in the outer part of the vessel, and in the center of the series of carbon rods insert an amalgamated zinc rod or plate. The cell used in this battery is the bichromate formed by making a saturated solution of bichromate of soda in water, and slowly adding to it one-fifth its weight of commercial sulphuric acid. It is used in the manufacturing of thermometers and barometers, in silvering looking glasses, in amalgamating precious metals in mining. A so for mercurial air pumps and in batteries. Its salts are used in medicine and in the arts. 4. What makes a compass needle stand north and south? A. The earth may be considered a great magnet, having north and south poles. It acts upon a magnetized needle in the same manner as any magnet. 5. What would be a good work for me to get on electrometallurgy? "Electro-Deposition of Metals," by A. W. Watt, price \$3.50.

(5929) L. D. G. asks: 1. What is the smallest size boiler that will, in the most economical way and without noise, raise the temperature of 40,000 gallons of sea water from about 40° to 70° and keep it at that temperature, notwithstanding 10,000 gallons of water are pumped in and out every twenty-four hours? The sides and bottom of the tank to be bricked and ce-

mented, and the whole inclosed in a brick building. A. You will require a twenty horse power boiler to heat the 40,000 gallons in a day or a 10 horse power boiler to heat in two days and keepup the supply. The only way without noise is to connect the top and bottom of the boiler directly to the tank in the same manner as a kitchen hot water boiler, and heat by circulating the water. 2. How does aluminum rank as an electrical conductor? A. The electric conductivity of aluminum is 0.51, copper 1.00, or 0.33, silver 1.00. 3. Can either temporary or permanent magnet be made out of aluminum? If not, what percentage of iron or steel would be necessary to use with it? A. Aluminum is very feebly magnetic. Have no data as to alloys. It will probably decrease the efficiency of iron or steel in magnetic force. 4. Does electricity travel on the exterior or center of a conductor? A. Electricity is supposed to travel on the surface of metals. 5. Is there any difference in the resistance between bare copper wire and either annealed iron, lead, or steel wire, each of the last three to be heavily plated, and of the same size as the copper wire? If so, how do they compare, also in cost? A. There is probably no perceptible difference in the conductivity of a solid copper wire and any other metal heavily plated with copper. We judge that the plated wire will cost more than solid copper wire. 6. Where can I get a catalogue of amateurs' chemical apparatus? A. Address Elmer & Amend, New York, for chemical apparatus.

(5930) W. D. F. asks: 1. Is a license that has been issued to an engineer in Missouri good for this State? A. No, unless issued by a United States inspector, when it is good for the district. 2. Where shall I apply to obtain an engineer's license, either first or second class, and what are the necessary requisites? A. If a marine license, apply to United States inspector at Chicago. If for stationary engine, apply to local inspectors where inspection laws are in force. Otherwise no license is required. 3. Do I need a different license to run a locomotive from a steamboat, or to run a stationary engine? A. Where a license is required, the kind of engine is specified. 4. What are the best books for an engineer to study for good solid information on steam? A. Among the many excellent works on steam engineering in our catalogue, which we mail free, are "Locomotive Engine Running and Management," by Sinclair, \$2; "Locomotive Catechism," by Grimshaw \$2; A larger catechism, by Forney, \$5; "Stationary Engine Driving," by Reynolds, \$1.75; "The Modern Steam Engine," by Colyer, \$5; "The Triple Expansion Engine," by Wingate, \$1; "Marine Engines, Boilers, and Propellers," by Edwards, \$5; "Manual of Marine Engineering," by Seaton, \$5, by mail. 5. Is the examination for a second class license difficult, that is, will it involve technical points not easily understood by experience and not book knowledge? A. You will require some experience, together with a study of the catechism and familiarity with engineering names, to give you a passable license.

(5931) R. W. asks: 1. Will a tank of water empty as fast through a simple hole in the bottom of the tank one inch in diameter as through another hole in bottom of the same diameter with 20 feet of pipe attached perpendicularly of exactly the same area as hole? A. The tank will empty fastest through the 1 inch pipe by the force of gravity through the additional head. 2. Will a basin at the top of a perpendicular pipe with only 1/4 inch opening into 2 inch pipe discharge as quickly as if the discharge pipe was all 1/4 inch, both pipes open at bottom? A. The basin will empty fastest through the 1/4 inch pipe for the above reason. The stream is broken in the 2 inch pipe and has very little pull due to gravity as in the solid column of the 1/4 inch pipe. 3. Will a tank empty more quickly through the same opening 1 foot from the ground than if it was raised 6 feet, free discharge in both cases? A. The difference in gravity is too small in a difference of feet, in elevation to be observed, although there is a difference in favor of the lower position.

(5932) C. A. W. writes: 1. I have a shunt-wound dynamo which gives 10 volts and 43 amperes, which it was built for. Can I reduce it in any way so it can be used for nickel plating? I mean, connect it with bath, so I can reduce the current down to say 1 to 4 volts, and still have current enough to nickel plate with in a bath of about 20 gallons. I have tried it with reduced speed, but the minute I connect the bath up the current runs down to nothing. A. It is possible by changing the strength of your field to plate small articles with your dynamo; but it will be at a great disadvantage. It should be rewound. If you try to use it without rewinding, work your system by ampere meter, not by volt meter. 2. What voltage and current is required for nickel plating? A. At starting, use 0-1 ampere per square inch of electrode, at 5 volts. Reduce 0-02 ampere at 2 volts. 3. What battery would plate well? A. A large plunge, or, better, porous cup bichromate battery. For plating dynamo, we refer you to our SUPPLEMENT, Nos. 720 and 729.

(5933) R. W. says: Will you kindly print in your "Notes and Queries" column a formula for writing fluid? A. 1. Black Writing Fluid.—Digest 1/4 pound logwood in fine chips for twelve hours in 3 pints boiling water, then simmer down gently to 1 quart, carefully avoiding dust, grease, and smoke. When cold, decant the decoction and dissolve in it by agitation 20 grains yellow chromate of potash; it will then be fit for use. 2. Blue Writing Fluid (Mohr).—Pure Prussian blue, 9 parts; oxalic acid, 1 1/2 parts. Triturate to a smooth paste with little water. Dilute with sufficient soft water to make it fluid.

(5934) W. C. V. asks: 1. Will the electric motors described in No. 641, SCIENTIFIC AMERICAN SUPPLEMENT, develop as much power from a given battery as any kind of motor manufactured? A. No; this is designed as a simply constructed motor, and is not supposed to give the highest efficiency. 2. Do the motors that have compound winding develop greater power than others? A. The efficiency of a motor is independent of this. 3. Is it more economical to use a primary battery directly with a motor or to charge a secondary battery with a primary and then use the secondary battery with the motor where it is only necessary to use a motor a few hours at a time? A. It is better to use the primary battery directly.

(5935) M. S. P. asks: Will two cells of storage battery be sufficient to run the motor described in SUPPLEMENT, No. 641, each cell having six plates, 8 by 10;

also if the same cells can be formed and charged by using 4 cells of gravity battery to one of storage battery? A. Yes. For charging use at least 5 gravity cells. The charging with them will be very slow.

(5936) G. F. H. asks: Why is it that the wire with which an electric light (incandescent) is suspended is made up of two insulated bunches of very fine wires, of about 15 wires in a bunch? Would not two solid wires of same size as each bunch be just as good? A. The construction is adopted to secure flexibility. Solid wires would be just as good otherwise.

(5937) A. E. S. writes: 1. In the office where I work there is a slow-moving belt, which when running is charged with electricity, so that I can draw sparks from it with my knuckles. I out of curiosity placed the bulb of an incandescent electric light near it. To my surprise I had the northern lights in miniature, but when I placed the light back in the socket it immediately burned out; still, when placed back near the belt, the same phenomena would occur. A. The phenomena displayed by the incandescent lamp have no connection with the presence or absence of the carbon. 2. If black is the absence of color, what is the color of a small quantity of air? A. Black is better defined as the absence of light. Air is without color or transparent in small quantity.

(5938) R. E. W. asks: 1. Will cotton-covered wire (No. 34) answer nearly as well as silk-covered for a small induction cell? A. Yes. 2. Would best quality tool steel be fine enough to make the compound magnet in Bell telephone receiver? A. Tool steel will answer very well. Shear steel is better. 3. I have a Kidder magneto machine which does not generate as powerful a current as when it was new. Is there any way to increase the current? A. Better send the machine to the manufacturers. Without a personal examination of it we will be unable to suggest any remedy for the difficulty. 4. Will No. 12 galvanized iron wire be the right kind for a two or three mile telephone line? A. Yes.

TO INVENTORS. An experience of forty-four years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unique facilities for procuring patents everywhere. A synopsis of the Patents of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted March 27, 1894,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Table listing inventions with patent numbers, including items like Acid, making concentrated nitric, H. A. Frasch, 517,038; Air brake apparatus, J. B. Stewart, 517,250; Appareil baigneur, wearing, G. Buch, 517,235; Asphalte machine, for crushing and grinding, J. H. Tabler, 517,311; Axle, vehicle, G. H. Westinghouse, 517,203; Baby walker, Bradish & Wilcox, 517,403; Bank pocket savings, N. A. Shigon, 517,175; Barometer, compound tri-liquid, O. H. Woodworth, 517,089; Barrel filler, G. R. Babbitt, 517,136; Barrel washer, F. E. Anderson, 517,091; Barrels to stocks, detachably securing, A. Bur-

Table listing inventions with patent numbers, including items like Bolt receptacle, H. Russell, 517,071; Collar and hamp horse, D. K. Bill, 517,021; Commode, D. H. Murphy (7), 517,410; Compass deviation apparatus for determining, 517,029; Conduits, for compensating, C. T. E. Clausen, 517,345; Core box, G. A. Lambert, 517,287; Corn cribbing machine, L. M. Millen, 517,355; Corn cutting machine, M. L. Hyldorn, 517,132; Corset stiffener, J. Wolff, 517,296; Coupling, See Car coupling, Hose coupling, 517,296; Crane, overhead traveling, G. A. Frue, 517,078; Crane, knockdown, S. F. Sherman, 517,413; Cuff fastener, J. V. Washburne, 517,084; Cultivator, E. R. Maine, 517,227; Cultivator, O. L. Neisler, 517,288; Cultivator, J. W. Norton, 517,231; Curb bar, G. H. Biers, 517,107; Curry comb, R. Biers, 517,259; Cutter, See Bolt cutter, Meat cutter, Dead centers, device for overcoming, C. M. Currey, 517,264; Delivering goods, apparatus for automatically, A. F. Martel, 517,412; Dental chair, J. H. H. H., 517,219; Dental handpiece angle attachment, R. G. Stambrough, 517,243; Dental plates, manufacturing, G. A. Tompkins, 517,174; Deburrer, E. E. Gullings, 517,271; Diamond setting, F. P. D'Arcy, 517,295; Door fastener, H. G. Selleck, 517,173; Door hardware, K. Davidson, 517,243; Dovetailing machine, H. F. Farnham, 517,236; Drilling machine, L. Reichert, 517,238; Driving gear, T. C. Robinson, Jr., 517,303; Dumbwaiters, electrical appliance for, J. H. Roberts, 517,169; Dynamite and making same, Rochester & McArthur, 517,396; Elbow, metal covered, E. T. Greenfield, 517,276; Electric calling apparatus, D. H. Rice, 517,239; Electric elevator, F. E. Herdman (7), 517,408; Electric beater, L. B. Rowley, 517,170; Electric motor or dynamo-electric machine, J. W. Henderson, 517,105; Electric saw, J. S. Gibbs, 517,100; Electrical apparatus, safety cut-out for, Lem & Wightman, 517,120; Electrical indicator, A. E. Kennelly, 517,163; Electrical keyboard, C. E. Allen, 517,402; Electrically-operated elevator, F. E. Herdman (7), 517,409; Elevated carrier, G. W. Keen, 517,243; Elevator, See Electric elevator; Elevator gate-operating device, G. C. Hawkins, 517,117; Elliptical spring, E. & J. J. Laas, 517,106; Engine, See Gas engine; Eraser, slate or blackboard, D. E. Dempsey, 517,034; Exhibiting machine, combined card and dice, J. J. Watson, 517,316; Extension box, J. Dreyer, 517,088; Extractor, See Stump extractor; Fan, electric ventilating, C. W. De Mott, 517,234; Fence machine, hand, E. Warner, 517,252; Fence post, A. Stoner, 517,200; Fence wire, S. C. Bowen, 517,298; Fencing wire, G. C. Wright, 517,256; Filter, See Electric elevator, 517,240; Fire escape, Ellison & Pellias, 517,335; Fire escape or lifter, W. Wellens, 517,318; Fire extinguisher, D. F. Prosser, 517,294; Fire kindler, P. Peschong, 517,090; Folding machine, W. Mendham, 517,064; Fruit picker, W. H. Haw, 517,041; Fur, from pelts, machine for cutting, C. E. Sackett, 517,397; Furnace, See Smoke consuming furnace; Furnace grate, boiler, H. C. Wiggins, 517,130; Furnace or other fuel, still, Chamberlain & Agan, 517,404; Furnace, traveling grate, F. H. Richards, 517,067; Furniture, device for fastening slip covers on up-to-leather, J. Heibel, 517,306; Furniture, office, W. J. McGrath, 517,122; Gauge, See Caliper gauge, Ring gauge; Galvanometer, E. G. Willyoung, 517,253; Game apparatus, E. L. Coffin, 517,262; Game machine, disk-operated, J. A. Hunt, 517,046; Game of curling, device for playing the, J. B. Hamilton, 517,103; Garbage burning apparatus, W. Risley, 517,301; Garbage crematory, McKay & Delaney, 517,288; Garment supporter, W. C. Hoyt, 517,278; Gas engine, R. Thayer, 517,077; Gas generator, H. F. Smith, 517,334; Gas machine, hydrogen, H. R. Tomeroy, 517,062; Gas manufacturing, G. M. Westman, 517,282; Gas meter, H. H. Sprague, 517,368; Gas meters, etc., register for, H. B. Goodwin, 517,406; Gas producer, E. J. Duff, 517,271; Gasometer, W. Wood, 517,254; Gate, A. Cronkrite, 517,331; Gate, Russell & Mattoon, 517,070; Gate, S. J. Smith, 517,330; Generator, See Gas generator; Glass bottles, apparatus for manufacturing, H. M. Ashley, 517,016; Glass finishing machine, A. J. Nellis, 517,359; Governor, marine engine, J. W. Winters, 517,087; Grain shoving machine, R. Connell, 517,095; Grille, E. T. A. Howard, 517,240; Guide and fish plate, combined, H. W. Cramer, 517,330; Gun lock, breakdown, J. Conner, 517,182; Hair curler, S. K. Matthews, 517,350; Hammer, steam, T. M. Shearer, 517,150; Handles and covers to vessels, attaching, G. W. Niedringhaus, 517,230; Hanger, See Appareil baigneur, Doorhanger, Picture hanger; Hanging or swinging chair, S. F. Purinton, 517,290; Harrow, A. Brockschmidt, 517,137; Harrow, revolving, S. Shoemaker, 517,265; Harrow, track, H. Baker, 517,206; Harvesting, cotton, G. Lispenard, 517,409; Harvesting implement, hay, Smith & Lloyd, 517,339; Hat bodies with hair, machine for covering, P. P. Aries, 517,257; Hay rake, B. F. Smith, 517,245; Hay stacker, J. L. Funkbauer, 517,049; Headlight, W. Prescott, 517,287; Heater, See Electric heater; Heating and cooking device, J. Allingham, 517,231; Heating system, R. M. Dixon, 517,036; Heel, A. P. Gotham, 517,157; Hinge, J. Nichols, 517,124; Hobby horse, R. A. Horning, 517,142; Hog trough, C. F. Haigler, 517,101; Hook, See Check hook; Hook, J. D. Kellogg, 517,221; Horseshoe, A. W. Smith, 517,176; Hose coupling, J. M. Prior, 517,192; Hose coupling clamp, F. D. Taylor, 517,128; Hose cutting and mounting machine, Nolan & Connell, 517,057; Hub, wheel, T. S. Field, 517,217; Hub, wheel, I. N. Rothrock, 517,241; Humidifier, J. Taylor, 517,110; Hydrant, J. H. Pierce, 517,021; Hydrocarbon burner, D. M. Souers, 517,247; Ice cream freezer, C. H. A. Gerdung, 517,114; Indicator, See Electrical indicator; Ink feeder, M. J. Dolphin, 517,096; Ink making device, Walker & Nienstaedt, 517,324; Inkstand, C. E. Jewell, 517,384; Ironing machine, garment, W. Choen, 517,328; Jar fastener, fruit, N. H. Long, 517,410; Jar rack or holder, fruit, A. F. Frost, 517,280; Key, See Extension key; Knitting machines, stopping mechanism for circular, 517,045; Ladder, serial, J. D. Alexander, 517,320; Ladder, fire, R. Brayton, 517,375; Ladle support, L. L. Powell, 517,283; Lamp, J. U. Pomeroy, 517,361; Lamp, carburetting gas, A. Kitson, 517,396; Lamp, electric, F. C. Rockwell, 517,089; Lamp, electric, arc, S. Helman, 517,042; Lamp, incandescent electric, Ashwell & Tuttle, 517,017; Land presser, C. C. Maxwell, 517,352; Last, Mobbs & Lewis, 517,165; Latch, M. S. Millard, 517,353; Lifting or hoisting tool, D. Kirkbride, 517,281; Locomotive, W. E. Worthen, 517,138; Locomotive, W. E. Worthen, 517,292; Loom, W. F. Draper, 517,229; Loom shedding mechanism, C. H. Thomas, 517,122; Loom, slat and wire fabric, Parks & Mollart, 517,058; Lounge or couch, folding, T. Q. Hall, 517,102; Lubricator, C. A. Delaney, 517,286; Lubricator, J. B. Purvis, 517,127; Lumber jack, C. D. Clarke, 517,211; Lumber trimmings for boxes, etc., preparing, A. T. Linderman, 517,348; Measure, tailor's adjustable, W. Veitch, 517,079; Measuring instrument, electrical, R. M. Hunter, 517,162; Meat chub, W. Scheffel, 517,449; Meat cutter, C. Broeg, 517,377; Metal sheets, machine for joining and rolling, W. S. Grafton, 517,116; Metal tapping or drilling machine, T. I. Browne, 517,023; Meter, See Gas meter; Milk inspecting apparatus, W. G. Spence, 517,367; Mill, R. Hart, 517,104; Milling machine, F. Meyers, 517,287; Mirror frame, J. F. Wilmot, 517,131; Mix & machine, R. Hartmann, 517,168, 517,169

Mouldings, corner piece for room, A. Simon..... 517,307
 Motor springs and coil, H. Ramey..... 517,363
 Motor. See Electric motor.
 Musical instrument, W. A. Seifert..... 517,196
 Nut lock, P. E. Bourgeois..... 517,022
 Nut lock, E. S. Carpenter..... 517,185
 Nut lock, J. D. Tyne..... 517,370
 Oil burner, C. A. Aldridge..... 517,341
 Oil burner, crane, M. Lynch..... 517,411
 Oilier for elevator guides, automatic, W. J. Ferguson..... 517,272
 Ordnance, automatically-operated breech mechanism for, Noble & Murray..... 517,391
 Oven, baker, J. J. Frenniger..... 517,125
 Oven, baker's, F. Stolz..... 514,257
 Packing case, P. Grubbe..... 517,407
 Paper making machine, G. Lind..... 517,109
 Paper pulp making machine, A. Sheldon..... 517,149
 Pavements, method of and apparatus for repairing asphalt, A. H. Perkins..... 517,191
 Phonograph, H. L. Sanborn..... 517,072
 Photograph background holder, C. O. Johnson..... 517,119
 Photographic camera shutter, W. L. Lightford..... 517,168
 Photographic gallery skylight, W. Shaw et al..... 517,364
 Piano, zither, A. Marberger..... 517,285
 Pianos, music desk for upright, J. P. Richardson..... 517,239
 Picker. See Fruit picker.
 Picture hanger, adjustable, M. Schwartz..... 517,195
 Pipe. See Tobacco pipe.
 Pitman hand, W. R. Dunn..... 517,177
 Planer, felly, W. R. Dunn..... 517,334
 Planter, corn, B. F. Smith..... 517,245
 Platform, step, A. G. Leonard..... 517,282
 Plow, J. T. & J. A. Drummond..... 517,333
 Plow, J. S. Edge..... 517,215
 Post, C. F. Johnson..... 517,047
 Post. See Ferrule post.
 Precious metal, ornamenting and etching, H. Goodwin..... 517,275
 Preserving vegetables, G. Dupont-Dennis..... 517,267
 Press. See Toggie press.
 Printing machine, platen, Harrild & Buckland..... 517,040
 Propeller, screw, A. W. Chase..... 517,323
 Propeller, screw, F. Otto..... 517,385
 Pruning implement, J. L. Joyce..... 517,138
 Pulverizer, A. Fiscus..... 517,381
 Pulverizing machine, W. M. Fuller..... 517,357
 Pump, compression or exhaust, H. A. Fleuss..... 517,229
 Pumping apparatus, W. B. Nevill..... 517,053
 Punch, stamping, Saitzkorn & Nicolai..... 517,242
 Punch ticket, G. F. Matteson..... 517,053
 Rack. See Jar rack.
 Radiator, oil, H. Ruppel..... 517,242
 Rail clamping or fastening device, M. A. Possons..... 517,236
 Railway cross tie, Temple & Ward..... 517,368
 Railway crossing danger signal, Eyer & Smeitzer..... 517,097
 Railway electrical, Bidwell..... 517,255
 Railway fastener, Curtis D. M. Bailey..... 517,111
 Railway rail and chair uniting same, M. M. Suppes..... 517,075
 Railway switch, H. Elliot..... 517,379
 Railway switch, J. C. Wolverton..... 517,030
 Railway switch and signal apparatus, Norton & Devine..... 517,392
 Railway terminal transfer and switch yard, J. D. Millar..... 517,110
 Railway tie, metal, A. E. Roberts..... 517,302
 Railway track structure, P. Hevner..... 517,277
 Railway trolley, electric, F. S. Church..... 517,028
 Rake. See Hay rake.
 Refrigerator, L. Block..... 517,154
 Registering mechanism, C. P. Gott..... 517,115
 Revolver, swinging cylinder and triggerlock for, D. B. Wesson..... 517,152
 Ring gauge, W. F. Doll..... 517,096
 Riveting machine, Saitzkorn & Nicolai..... 517,172
 Roasting coffee, cocoa, etc., apparatus for, C. A. Otto..... 517,189
 Rod mill floor, G. Leberger..... 517,224
 Rolling mill, taper, C. B. Andrews..... 517,322
 Safe, C. E. Clark..... 517,261
 Sail for vessels, T. W. Ratsey..... 517,193
 Sand distributor, H. Moorhouse..... 517,055
 Sash securing device, A. Little..... 517,226
 Screen. See Window screen.
 Secondary battery, G. L. Ballard..... 517,018
 Separator. See Centrifugal separator.
 Sewing machine, D. Brown..... 517,376
 Sewing machine, J. C. Goodwin..... 517,141
 Sewing machine, buttonhole, W. V. Miller..... 517,354
 Sewing machine trimmer, J. C. Goodwin..... 517,140
 Shears, H. T. Seymour..... 517,324
 Sheet metal cans, manufacturing, J. Lee..... 517,223
 Sheet metal spinning, machinery for, F. Haberman..... 517,382
 Sheet shackle, F. Robinson..... 517,068
 Shelf, metallic, C. W. Marquardt..... 517,349
 Shoe nailing machine, E. D. Childs..... 517,027
 Show case, W. G. Irwin..... 517,342
 Sieve, ash, J. Goldman..... 517,139
 Signal. See Railway crossing danger signal.
 Signal, electrical apparatus for controlling, M. B. Leonard..... 517,419
 Sleigh knee socket, B. F. Sweet..... 517,076
 Smoke and spark arrester, E. R. Jones..... 517,220
 Smoke, apparatus for removing impurities from, E. V. Reiss..... 517,237
 Smoke consumer, G. Rhoden..... 517,238
 Smoke consuming furnace, S. T. Armstrong..... 517,324
 Soap pressing and stamping machine, D. C. Ralston..... 517,064
 Spindle bearing, J. Northrop..... 517,232
 Spinning mule safety attachment, E. G. Varney..... 517,314
 Spinning spindles, device for adjusting bearings of, G. O. Draper..... 517,270
 Spring. See Elliptical spring.
 Stair rod, A. Jones..... 517,279
 Stamp canceling and postmarking letters, machine for, M. F. Dolbin..... 517,147
 Steam boiler, G. F. Nilsson..... 517,174
 Steam boiler, water tube, M. H. C. Shann..... 517,174
 Steamer, fruit or vegetable, M. Fuller..... 517,217
 Stool and cane, camp, M. R. Mathewson..... 517,351
 Store fixture bracket, R. P. Palmenberg..... 517,190
 Straw stacker, automatic, L. W. Nethery..... 517,230
 Stump extra, G. B. Pulley..... 517,362
 Switch. See Electric switch.
 Telephone switch.
 Tablet forming machine, J. Beddow..... 517,153
 Tanning, process of and apparatus for, C. B. Warhand..... 517,093
 Telephone system, single-line, Sablin & Hampton..... 517,243
 Tension device, H. Hibbert et al..... 517,043
 Testing machine clamp, C. C. Miller..... 517,356
 Thermocauter, H. Wilson..... 517,180
 Thermometer, E. A. Linder..... 517,388
 Tile and constructing same, illuminating, P. M. Bruner..... 517,156
 Tile placing device, T. C. Cook..... 517,329
 Tire, C. Kehr..... 517,417
 Tire, pneumatic, C. L. Ames..... 517,414
 Tire, pneumatic, Tollner & Potter..... 517,312
 Tire protector, pneumatic, A. S. Davy..... 517,033
 Tire, wheel, C. L. Ames..... 517,415
 Tire, wheel, C. L. Ames..... 517,416
 Tires to wheel rims, means for securing pneumatic, P. Davies..... 517,113
 Tobacco pipe, E. G. Deloe..... 517,332
 Toggie press, W. E. Brock..... 517,062
 Tongues and grooves in ends of flooring boards, machine for forming interfitting, J. P. Burnham..... 517,326
 Tonguing and grooving ends of flooring boards, machine for, J. P. Burnham..... 517,327
 Tool holder, F. A. Pratt..... 517,167
 Torpedo launching tube, Lloyd & Hutchinson..... 517,390
 Transom opener, J. E. Anger..... 517,135
 Traveling bag, G. Willinghaus..... 517,181
 Tricycle, F. Benz..... 517,182
 Trimmer. See Sewing machine trimmer.
 Trolley catcher, L. G. Mowry..... 517,166
 Trough. See Hog trough.
 Truck, E. Hickman..... 517,219
 Truck, house moving, S. C. Maple..... 517,052
 Truss, C. B. Rostel..... 517,194
 Tug, home, E. Beckman..... 517,330
 Turnstile, B. P. Walsley..... 517,080
 Turntable, Pratt & Brunner..... 517,196
 Turntable, G. Rohrbach..... 517,304
 Turret mechanism, F. H. Richards..... 517,168
 Twisting machine stop motion, H. & J. W. Collins..... 517,030
 Typesetting apparatus, L. K. Johnson..... 517,144
 Typewriter cabinet, L. Conde..... 517,051
 Valve, J. A. Cattanaach..... 517,093
 Valve, D. McCormack..... 517,056
 Valve, J. E. Stannard..... 517,199
 Valve, air, D. E. Berry..... 517,154
 Vapor burner, J. A. Lampert et al..... 517,045
 Vehicle wheel, W. W. Valentine..... 517,261
 Vessel, sail, J. M. Boorman..... 517,155
 Vessels, self-regulating discharge for closed, A. H. & T. A. Schlueter..... 517,305
 Vise, J. M. Lewis..... 517,347
 Washboard, G. B. Lutomski..... 517,187
 Washing machine, Z. M. Lindley..... 517,225
 Washing machine, H. R. Ward..... 517,051
 Watchman's shot-proof box, S. E. White..... 517,036
 Wheel. See Vehicle wheel.
 Whirligig, W. J. McCarthy..... 517,228
 Windmill, W. A. Blank..... 517,374
 Windmill, G. B. Snow..... 517,196
 Window frame, stained glass, H. A. Lewie..... 517,049
 Window screen and attachment, C. H. Bartlett, Jr..... 517,133

Wire cloth holder, W. Lesar..... 517,408
 Wire netting machine, G. M. Wright..... 517,304
 Wrench, O. C. Stanley..... 517,074
 Wrench, combination, H. A. Post..... 517,393
 Wringer. See Mop wringer.

DESIGNS.
 Bicycle clip holding block, G. E. Curtis..... 23,190
 Brushes, etc., back for, C. Graf..... 23,151
 Carpet fastener, star, J. Day..... 23,158
 Coin receiver case, C. C. Clawson..... 23,155
 Dish, cover, C. E. Haviland..... 23,149
 Electrical instruments, supporting frame for, E. Weston..... 23,156
 Picture frame moulding, A. H. Durbin..... 23,153
 Stove or range, cooking, Magee & Osborne..... 23,182
 Stovepipe section, J. Spear..... 23,161
 Toothpicks, etc., holder for, J. Ludwig..... 23,150

TRADE MARKS.
 Baking powder, C. T. Long..... 24,423
 Bed springs, Smith & Davis Manufacturing Company..... 24,451
 Candy..... 24,424
 Canned fish, fruit, and vegetables, Moos & Company..... 24,424
 Chemical and pharmaceutical preparations, Actien-Gesellschaft fur Anilin-Fabrikation..... 24,418
 Cigars, J. M. Goldstein..... 24,413
 Cigars, H. B. Kelly & Company..... 24,414
 Cord, braided cotton, window or sash, Samson Cordage Works..... 24,411
 Eider-down cloth, Henry H. Bells Sons Company..... 24,409
 Electrical charge or current, apparatus for the measurement of, European Western Electrical Instrument Company..... 24,430
 Fertilizers, J. J. Allen's Sons..... 24,420
 Iron and cast steel and articles manufactured therefrom, wrought, Jonas & Colver..... 24,432
 Lamp chimneys, Jones, McDuffee & Stratton..... 24,425
 Leather, White Brothers & Company..... 24,412
 Lime for disinfecting and whitewashing purposes, W. H. Phillips Collins Company..... 24,433
 Machinists' tools, Collins Company..... 24,434
 Medicinal tonic preparation, Billings, Clapp & Company..... 24,416
 Mineral waters, M. Hirschler..... 24,415
 Pool balls, Albany Billiard Ball Company..... 24,428
 Radiators, steam and hot water, A. A. Griffing Iron Company..... 24,429
 Remedies for coughs, colds, and throat and lung affections, A. Walker..... 24,417
 Soap for manufacturing and domestic purposes, oil, Buzby & Bickley Company..... 24,422
 Soap paste, toilet, Buzby & Bickley Company..... 24,421
 Watchcases, gold-filled, Boss Watch Case Company..... 24,408
 Woodworking machines, Bentel & Mergand Company..... 24,435
 Yarns, threads, braids, and twist, silk Strohl, Schwartz & Cie..... 24,410

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of \$40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

INSTRUCTION BY MAIL
 In Architecture, Architectural Drawing, Plumbing, Heating and Ventilation, Bridge Engineering, Surveying and Mapping, Mechanics, Mechanical Drawing, Mining, English Branches, and
ELECTRICITY.
 Diplomas awarded. To begin students need only know how to read and write. Send for FREE Circular of information stating the subject you think of studying to The Correspondence School of Mechanics and Industrial Sciences, Scranton, Pa.

4000 STUDENTS

CARBORUNDUM
 HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER. SUBSTITUTE IN FLOUR, POWDER-CRYSTAL-WHEEL-SLAB & HONE FORM. CARBORUNDUM CO. MIDDLETOWN, N. Y., U. S. A.

Fertilizers are Unprofitable
 Unless they contain sufficient Potash. Complete fertilizers should contain at least 6 per cent of Potash. Fertilizers for Potatoes, Tobacco, Fruits and Vegetables should contain from 10 to 15 per cent of Potash. To obtain best results use fertilizers containing enough Potash or apply Potash salts, such as Muricite of Potash, Sulphate of Potash and Kainit. Instructive pamphlets and information free. Address,
GERMAN KALI WORKS, BENNETT BUILDING, NEW YORK CITY.

"OTTO" GAS AND GASOLINE ENGINES.
 1/2 to 10 h. p. Can be used in cities or in country independent of gas works or gas machines. No Boiler, No Danger.
OTTO GAS ENGINE WORKS, PHILADELPHIA.

Parsons Horological Institute. Learn the Watch Trade
 Engraving and Jewelry Work.
PARSONS, IDE & CO. Circular free. 302 Bradley Ave., PEORIA, ILL.

Criterion and Parabolon MAGIC LANTERNS
 and Stereopticons, Oil, Lime, or Electric Light, Views of World's Fair, Scripture, Temperance and other subjects for profitable public lectures or private talks.
Catalogues J. B. COLT & CO. 189 La Salle St., Chicago, Ill. free.

Family Ice Machine
 Ice, etc., in a few minutes, \$10 and up. Filters, \$1.25 and up. Cookers, \$1. Seltzateure to prepare one's self soda water, \$4.50 and up. L. DERMIGNY, 126 W. 25th St., N. Y.

WORLD'S FAIR HIGHEST AWARDS
 Medal & Diploma on our INCUBATOR and BROODER combined. Medal on Hot Water Brooder. Old "Reliable" Leads Them All. If you are interested in Poultry, it will pay you to send 4c. in stamps for our 72-p. cat., giving valuable points on poultry culture.
Reliable Incubator & Brooder Co., Quincy, Ill.

AMMONIA MOTORS.—A DETAILED
 description of the apparatus devised by Mr. MacMahon for the recovery of the ammonia employed for the propulsion of cars in a motor of his invention. With 13 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 944. Price 10 cents. To be had at this office and from all newdealers.

Graduated Beam Calipers.
 For all Trade and Scientific purposes. Verifier and Metric System. All tools warranted accurate. Send for circular and price. Address E. G. SMITH, COLUMBIA, PA.

DO YOUR OWN CARD PRINTING.
 Card Press, \$3 Circular size \$ Small Newspaper, \$4 Money maker and saver. Stamp for catalogue, presses, type, paper, etc., to factory.
KELSEY & CO., MERIDEN, CONN.

EDGE TOOLS
 are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grinds suitable for grinding any tool. May we send you our Catalogue, which will give you some information?
GRAFTON STONE COMPANY, No. 80 River Street, GRAFTON, OHIO.

HYPNOTISM: its Uses and Abuses. The science easily acquired. Illustrated book, \$1. Prof. Anderson, S. A. 4, Masonic Temple, Chicago

The McCONNELL Germ Proof Filters
 REMOVE MICROBES —AND— All Kinds of Disease Germs. Is a Filter and Cooler Combined. The ice as it melts is filtered. No other gravity filter does this.
The McConnell Filter Co. BUFFALO, N. Y.

PIPE FRAME TRUCK BASKETS
 Wire Standard Truck Baskets STEEL and WOODEN TRUCKS PIPE FRAME SHOE RACKS WIRE LOOP SHOE RACKS
L. MURRAY MOORE, Rochester, N. Y.

HARRISON CONVEYOR!
 For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c. Send for Circular.
BORDEN, SELLECK & CO., Sole Manufacturers, Chicago, Ill.

BIT
 BORES SMOOTH, ROUND, OVAL, and SQUARE HOLES. Mortising Core Boxes, etc. Invaluable to Carpenters, Cabinet and Pattern Makers. Highest Award. Send \$3.00 for set (3 1/2 to 11-9), in neat case, or 50c. for sample bit, mailed free with illustrated list.
BRIDGEPORT GUN IMPLEMENT CO., 315 Broadway, New York.

12" DRILLS | D'AMOUR & LITTLEDALE,
 204-206 E. 43d Street, New York. Correct in Design, Workmanship, and Price.

TOWERS AND TANKS
 PATENT SECTIONAL ALL IRON TOWERS of 4 and 12 Columns, for Water Works, Cities, Towns and Manufacturing Factories.
PLAIN, ALL WOOD TOWERS. ELEVATED TANKS for Automatic Fire Sprinkler Plants. Manufacturers of Iron and Steel Tanks. Louisiana Red Cypress Wood Tanks a Specialty.
W. E. CALDWELL CO. 219 E. Main Street, LOUISVILLE, KY., U. S. A.

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. Our guarantee and instruments are BOTH GOOD.
WESTERN TELEPHONE CONSTRUCTION CO., 440 Monmouth Block, CHICAGO. Largest Manufacturers of Telephones in the United States.

IMPROVED CHARTER GAS ENGINES
 USING ONE OF GAS OR ALCOHOL OR COAL OIL. SAFE. RELIABLE. ECONOMICAL. SIMPLE PARTS. **W. E. CALDWELL & SON, SOLE IMPORTERS, WASHINGTON & UNION STS., CHICAGO, ILL.**

MATCH * MACHINERY.
 Latest improved. Complete plants furnished. **JOS. C. DONNELLY, 1299 Buttonwood Street, Philadelphia, Pa.**

Patent Electric VISE.
 What is claimed, is time saving; no turning of handle to bring jaws to the work, simply one sliding movement. The screw and nut is not used 1-10 as much as the old way, consequently will be that much less wear.
MANUFACTURED BY Capital Machine Tool Co., Auburn, N. Y.

ARTESIAN WELLS.—BY PROF. E. G. SMITH. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 944. Price 10 cents. To be had at this office and from all newdealers.

OIL WELL SUPPLY CO.
 91 & 92 WATER STREET, PITTSBURG, PA. Manufacturers of everything needed for ARTESIAN WELLS for either Gas, Oil, Water, or Mineral Tests. Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists, and discount sheets on request.

Useful Books!
 Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of authors. Persons desiring a copy have only to ask for it, and it will be mailed to them. Address,
MUNN & CO., 361 Broadway, New York.

KNITTING MACHINERY.
 Knitted underwear is in vogue. The best machinery for its manufacture, such as
SHIRT MACHINES, SLEEVERS, BAR STITCH MACHINES, etc., are made by **SCOTT & WILLIAMS, 2077 E. Cumberland Street, Philadelphia, Pa., U. S. A. Established 1865.**