

water is used in South Dakota wells. A. This is the most reliable record that we have had of the condition of the flow under different heads and nozzle sizes from the artesian wells of South Dakota, and we give with pleasure our deductions. The standard wrought iron pipe of the sizes used for the streams are about 2 per cent larger than their nominal diameter, which will nearly equalize their flow to the coefficient of properly formed nozzles of the stated sizes. We find that the water head for the closed pipe is 299 feet, the static pressure of the well. With the 2 inch stream the head is 184 feet with a flow of 135 cubic feet per minute, equal to 47 gross horse power, or 40 developed horse power from a Pelton wheel. With the 2 1/2 inch stream the head fell to 165 1/2 feet with a flow of 307 1/2 cubic feet per minute, with 65 gross horse power, or 55 horse power developed. For the 3 inch stream the head fell to 142 1/2 feet and 277 cubic feet per m. with 74 gross horse power=62 developed horse power. For the 4 inch stream the head fell to 133 1/2 feet, with a flow of 480 cubic feet per m., with 121 gross horse power=102 developed horse power. These ranges of variation in head and flow go to show the almost perfect freedom of inflow at the bottom of the 7 inch tube, as in some wells the head falls very fast under the enlarged flow. For the power used in the flour mill the pressure head is probably 250 feet, having a nozzle velocity of 7,600 feet per minute; and with the 1 inch nozzle and a flow of only 41 1/2 cubic feet per minute, the 3 feet Pelton wheel is equal to 17 horse power, developed, and sufficient for the 150 barrel flour mill as stated. The figures show that the present use of this well is far below its capacity.

(4420) C. V. S. asks (1) for a corn salve. A. Dried carbonate of soda, 1/2 ounce; lard, 1 ounce; smalts (to color), q. s. Mix. The above are applied on a piece of rag, and renewed night and morning. Use for corns only. 2. How to clean carpets. A. If brooms are wet with boiling suds once a week, they will become very tough, will not cut a carpet, and will last much longer. A handful or so of salt sprinkled on a carpet will carry the dust along with it and make the carpet look bright and clean. A very dusty carpet may be cleaned by dipping the broom in cold water, shaking off all the drops, and sweeping a yard or so at a time. Wash the broom and repeat until the entire carpet has been swept. 3. For a fiber that would make a good letter that would look like the enameled white signs. A. Nothing better than white cloth or white enameled leather.

(4421) W. M. asks: Will you kindly explain to me in the columns of your valuable paper the meaning of the term "radius of gyration," that is the radius of gyration of an iron column, I beams, or an angle iron, etc.? Kindly explain fully and clearly. Have been studying for quite a long time, but cannot solve it. A. The radius of gyration of a column or a beam is such distance from its central line or axis that, if all the material in the section across the axis were concentrated there, its moment of inertia would equal that of the section. The moment of inertia is the product of the mass of the beam by the square of its radius of gyration. This is the basis upon which the strain due to the whole section under flexure is computed. For details of various forms of columns and beams, see Trautwine's "Engineer's Pocket Book," \$5 mailed.

(4422) D. M. asks how to make an electric bell work from each end of the line of the telephone described in the SCIENTIFIC AMERICAN of December 14, 1889. A. To make a signal work at opposite ends of a single line wire you require a closed circuit. With two wires and the ground, you can work your signals on an open circuit.

(4423) T. M. R. writes: I am going to build a small motor, and wish to know if there is any way in which I can make it run slowly without waste of power, and also the best size of wire to use for the field and armature. A. By making your armature of large diameter, you can produce a slow speed motor that will operate without loss of power.

(4424) O. W. C. asks (1) how to polish walnut with shellac. A. Orange shellac, 2 ounces; wood naphtha, 1/2 pint; benzoin, 2 drachms. Mix and put in warm place for a week and keep the materials from settling by shaking it up. To apply it, make a rubber of cotton wool and put some old calico over the face, and till you have a good body on your wood keep the rubber well saturated with polish. When your rubber sticks, put a very little linseed oil on and rub your polish up. Allow it to stand a few hours and give it another coat, using rather more linseed oil on your rubber, so as to get a finer polish. Then let it stand again, and finish off with spirits of naphtha; if not, add a small quantity of polish to your spirit. 2. For a walnut stain. A. Water, 1 quart; sal soda, 1/2 ounce; Vandyke brown, 2 1/2 ounces; potassium bichromate, 1/4 to 1/2 ounce; boil for ten minutes, replacing water lost by evaporation. Use hot and allow the work to dry thoroughly before oiling or varnishing. Another reliable walnut stain for furniture, mostly hard wood: Spirits of turpentine, 1 gallon; pulverized asphaltum, 2 pounds; dissolve in an iron kettle on a stove, stirring constantly.

(4425) C. B. S. ask for an ink eraser. A. 1. Mix equal parts of oxalic and tartaric acids in powder. When to be used, dissolve a little in water. It is poisonous. 2. Oxalic acid mixed with citric acid may be used. 3. Equal parts of cream of tartar and citric acid in solution with water.

(4426) D. L. N. asks for a sticky fly paper. A. 1. Melt resin and add thereto, while soft, sufficient sweet oil, lard, or lamp oil to make it, when cold, about the consistency of honey. Spread on writing paper, and place in a convenient spot. It will soon be filled with ants, flies, and other vermin. 2. Boiled linseed oil and resin, melt and add honey. Soak the paper in a strong solution of alum and then dry before applying the above.

(4427) H. W. asks how the dolls of a chess game are called? A. The chessmen are called kings, queens, castles, knights and pawns. 2. How much is an ounce chloride of platinum worth? A. Chloride of platinum is worth \$90 a pound.

(4428) Reader asks: 1. What is the length of a pendulum making one vibration in five seconds? A. 64.666 feet. 2. Power of eighty pounds applied to a wheel whose diameter is five feet, balances four hundred pounds. What is the diameter of the axle? A. One foot.

(4429) W. J. C. asks (1) how to remove rust from finely polished steel, such as drawing instruments, etc. A. Polish the rust from fine steel articles with flour of emery paper and gloss with crocus on leather. 2. How to remove dandruff? A. Fordandruff wash the head once a week with weak borax water, an ounce to a quart of water. 3. How to prevent excessive perspiration of the feet? A. For sweating feet bathe them often in salt water.

(4430) H. E. T. writes: I have one of those electric cigar lighters, and I cannot seem to make it work any more. At one time it worked all right. There is a thin spiral of some kind of wire which when upon pushing the zinc in the solution becomes a white heat, and lighting a small alcohol lamp. Of late, the wire will only get warm. What can I do to remedy that and repair the concern? A. Apparently your battery has run down and needs renewal. As we do not know the style of the battery, we cannot give a formula for the solution. Better write the makers of the apparatus.

(4431) D. W. McG. asks: In transmitting motion by friction gears at right angles, using a flat disk for the driver and a square-faced wheel for the driving wheel, what percentage of power will be lost by friction? Is it practicable to use this style of gearing to transmit 8 horse power, and what is the relative efficiency of this style of gear, and ordinary bevel gear? Is the perpetual screw or worm wheel a practical method of transmitting 8 horse power, and what percentage of power will be lost by friction? A. The transmission of power as above described is not admissible for continuous action or for large quantities of power. The system is not economical, but may be very convenient for variable motion. The friction depends so much upon the width of the bearing surface and its distance from the center of the driving wheel that no definite percentage can be given. It should only be used for light and variable motion. If definite speed only is required, there is but little loss of power by friction transmission to angular lines with bevel wheels faced with leather, such being in use on centrifugal driers. The transmission by worm screw gear is practical and very useful for great reduction in speed, and is fully as economical in friction as the same reduction of speed by toothed gear.

(4432) F. W. J. asks: What is meant by the pass-over valve on a triple-expansion marine engine? Also, how can I find the north and south poles of a dynamo when in motion? How can I tell which is the positive or negative brush? Does the fan of a centrifugal pump force the water through the discharge or does it form a vacuum? A. The pass over valve is used in the steam pipe connection to the receiver of the low pressure cylinder for starting the engine. You can find polarity of the dynamo by placing a compass needle centrally over it. The north pole will point to the south pole of the dynamo. Then trace the wiring to find the polarity of the brush. A centrifugal pump derives its power, over both force and suction side, from the centrifugal force of the revolving water between the blades of the pump.

(4433) E. J. G. says: I wish to put in closets and bath rooms. We have no sewerage system. Would there be any objection to using a well for the sewer pipe to discharge into if properly covered? It being about 30 feet deep and not closer than 300 feet from any other wells? A. It would be dangerous to use the well as a receptacle for sewage. It would be likely to poison the neighboring wells, perhaps within a radius of half a mile or more. The safer way will be to make a tight cistern, for the sewage contents, to be emptied and taken away periodically.

(4434) C. H. B. asks: Will you kindly inform a constant reader, which is the proper way to lay a bell joint water pipe? Should the bell point toward the pump and against the pressure or point the opposite way. There is a right and a wrong way. Will you kindly give me the correct way? A. The practice in long lines is to lay the spigot end down stream or down hill. The bell end against the direction of flow or toward the pump. This is not always practicable in short lines with tees and crosses. Hence convenience of making joints is first considered. In vertical lines the bell end must always be up.

(4435) H. P. L. asks: 1. Give formula by which I may use certain chemicals which will gradually develop a steady pressure when confined, and not in a sudden or energetic manner. A. Magnesium, limestone, and hydrochloric acid or a very compact marble may be used instead of the limestone. 2. Also a solution which will impart a bright, silver-like appearance to metals, and which will cause it to remain so for some time. A. A solution of nitrate of mercury in water will work on brass or copper, but will ruin the metal. 3. What sort of battery would be best for a small necktie pin light as regards, power, size, and expense? A. A pocket storage battery. It is best to buy one rather than to attempt to make one.

(4436) T. E. R. asks: What is the difference between momentum and inertia? Is it proper to say, "The trick rider in a circus finds it easy to jump from his horse through a ring and back to the horse again, as his inertia carries him along in the same direction as his horse?" A. The proper word is momentum, which indicates weight under motion. Inertia is from inert—motionless, and in physics means the condition of a body as to its weight and volume for receiving or resisting motion.

(4437) "Inventor" asks: 1. What acids have the effect of acting upon or softening granite or other stone, or what tools would give the best results besides the ordinary drills? A. No acid has this effect to a sufficient extent to be of any practical value. The sand blast and McCoy's pneumatic tool are of value. For the former, see SUPPLEMENT 416; latter, see SCIENTIFIC AMERICAN, No. 9, vol. 61. 2. Would aquafortis act upon cast steel? If so, to what extent? What so-

lution should be used to give the best results? A. Yes; dilute strong acid with five volumes of water.

(4438) T. B. W. writes: 1. Give a simple method of determining the purity of the so-called dry white lead and lead in oil now on the market. A. Drywhitelead should be completely soluble in nitric acid. If ground in oil, the oil may be removed by benzene before treatment with acid. 2. Will heat applied to white lead in oil restore the lead to its former metallic state? A. It will more or less completely, depending on the percentage of the oil present? 3. If so, what proportion of lead should be gotten from same? A. No exact proportion can be given. White lead itself varies in composition, and the oil may be of different proportions.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

E. F. H.—The United States public debt, less cash in the Treasury, has decreased each year for the last five years, and each year since 1871. The 1st of July, 1887, it was \$1,175,168,075. The 1st of June, this year, it was \$843,353,356.

TO INVENTORS.

An experience of forty 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 unequalled facilities for procuring patents everywhere. A synopsis of the patent laws 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 excellent 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

June 14, 1892,

AND EACH BEARING THAT DATE.

(See note at end of list about copies of these patents.)

Table listing inventions with patent numbers, including: Air brake, D. Hanney; Alarm, See Burglar alarm; Alloys of iron or steel and nickel, manufacturer; Aluminum process, and apparatus for the extraction of M. & E. Bernard; Amalgamator, W. J. Gard; Ammonia purifying, H. Von Strumbeck; Animal trap, Klar & Hall; Annular roller, J. L. P. Kordis; Apparatus, limiting stop for, R. Varley, Jr.; Axes, manufacture of, E. Thomson; Axle washer, vehicle, W. Richard et al.; Axles, anti-friction bearing for car, H. B. Williams; Badge and rosette, emblematic society, B. S. White; Bag, See Feed bag; Bag fastening, J. Baumach; Baling press, H. Deltz; Balloon, captive, L. Payn; Bank note, W. W. Wood; Barber's chair, G. W. Archer; Bathroom, J. T. Watson; Beading and turning machine, J. E. Brown; Bearing, ball, F. A. Grunberg; Bed, cabinet, Hayton & Swift; Bed, folding, M. K. English; Bed spring, J. Sims et al.; Beer or other liquids, apparatus for use in barreling, W. Albach; Belt and pulley gear, J. F. Fisher; Berths, car seats, etc., spring for ships, S. L. Berns; Bicycle, L. P. Halladay; Bicycle, S. Wilson; Bicycle frame, F. H. Bolte; Bicycle saddle, support, W. S. Beeland; Bicycle seat and luggage carrier attachment, W. I. Calver; Billet loop, E. T. Kirkpatrick; Bit, See Bridge bit; Block, See Stegauer's work clamping block; Boiler, See Steam boiler; Book, bla k, J. W. Burris; Book, scrap, F. Bowman; Book support, D. H. McPherson; Bottle filling machine, A. L. Hatfield; Bottle cap for mustard, M. Ams; Bottle, See Filling or knockdown box. Junction box. Letter box; Bracket, See Extension bracket. Shelf bracket. Towel rack; Brake, See Air brake, Car brake; Breathe strap slide, H. Stoddard; Brick or fuel press, M. Nirdlinger; Brick pressing machine, C. W. Raymond; Bride bit, O. Combs; Broiler, L. L. Briggs; Brush, fine, L. B. Shultz; Buckle, D. L. Smith; Bundle shifter, J. J. Courtney; Burglar alarm, B. F. Kraft; Burner, See Lamp burner; Butter c tter, C. Neustadt; Gutton machine, F. H. Hardman; Calendar, A. Sachs; Candy, See Confection; Can forming and soldering machine, L. Keller; Car brake, T. F. Clark; Car brake, J. W. Fisher; Car coupling, J. Acuf; Car coupling, B. Bernstein; Car coupling, F. L. Ryan; Car coupling, W. P. Clark; Car coupling, O. P. Conley; Car coupling, A. J. Cover; Car coupling, I. David; Car coupling, Goode & Anthony; Car door, grain, J. C. Wanda; Car, dumping, C. W. Bridgegum; Car heater, W. C. Baker; Car railleantur attachment, P. Wardman; Car, safety, W. Skyttner; Car, See Car; Cars, means for propelling electric, T. A. Edison; Carpet stretcher, A. H. Moore; Carrier, See Bundle carrier. Hay carrier; Case, See Compositor's case. Piano case; Cash recorder, C. H. Morford; Cash register, J. F. Scharrerberger; Centrifugal apparatus, G. L. Cairns; Chair, See Barber's chair; Chair, C. E. Davis; Check receiptable, H. W. Mathies; Churn, D. H. Parner; Clasp, H. E. Quid; Claw, W. P. Seymour; Clevis, G. Sarby; Clock synchronizer, electric, J. W. & C. F. Du Laney; Closet, See Water closet; Clutch, See Hammer combined, Johnson & Clayton; Cock and coupling combined, Johnson & Clayton; Column building, H. F. Stuhr; Combination lock, J. E. Riddick; Commutator, detachable, C. H. Gaylord; Compositor's case, G. White; Compound, See Compound; Conveyor, blank, F. H. H.; Coples, apparatus for producing manifold, W. M. Gor on; Cork and corkscrew combined, M. Bueat.

Table listing inventions with patent numbers, including: Cornice press, F. M. Leavitt; Couch, adjustable, C. Geertz; Coupling, See Car coupling, Thill coupling; Cruppers, crimping machine for, H. Leibe; Cultivator, Brown & Johnson; Cultivator, J. Simons; Cultivator, ding, R. F. Biele; Current alternator, H. L. Tyler; Cutter, See Butter cutter; Cylinder lock, J. B. Price; Cylinder lock, C. D. Williams; Dandy roll, A. J. Tucker; Decor, F. A. & Thort; Dental engine, R. M. Hunter; Dental engine attachment, H. E. Spencer; Derrick, G. L. Laughton; Desk, hotel, J. D. Mortimer; Distillation of hydrocarbon or other oils, C. M. Felschler; Williams; Distilling and rectifying apparatus, J. Schafhaus; Door check, C. T. Wells; Door check and closer, pneumatic, J. S. Schrawder; Draught equalizer, F. A. Polka; Drawer, furniture, C. O. Allen; Drum, heating, Grimm & Williard; Dynamo, compensating alternating current, O. B. Schullenberger; Far drum, artificial, G. H. Wilson; Farring, M. Stern; Electric converter, G. & A. Pfannkuche; Electric elevator, J. H. Clark; Electric machines, magnetic inductor for dynamo, Pyke & Harris; Electric meter, T. A. Edison; Electric switch, F. Broadnax; Electric switch, W. M. Goodridge; Electric switch, A. P. Seymour; Electric wire pole, Meyer & Binder; Elevator, See Electric elevator; Elevator door operating device, G. W. Archer; Embossing machine, T. C. Orndorff; Embroidering machines, fabric holding frame for, J. J. Wiegand; Emery wheels, process of and machine for making, A. Johnston; End gate, Leavitt & Bryson; Engine, See Dental engine. Rotary engine; Steam engine. Traction engine. Valveless engine; Engraver's work clamping block, C. E. Van Norman; Engraving tool, C. F. Pratt; Evaporator, E. Stillwell; Extension bracket, T. Morris; Feed hoppers, J. Williams; Feed trough, Mitchell & Deal; Fence post, E. S. Wood; Fence wire, machine for spooling and unspooling, M. M. Culver; Fence wire twister, M. R. Tates; Fences, tool for operating on wires of, J. Heard; Fire alarm system, L. G. Rowand; Fire escape, C. A. Smith; Fire escape and fireman's ladder, W. F. Loyd; Fire, extinguishing, H. S. Mills; Fireplace heater, J. J. Richardson; Fishing apparatus, F. Williams; Fishing reel, C. N. Wilcox; Flavoring powder, S. E. McIntosh; Floor or sidewalk, light transmitting, G. W. Parker; Floor or roof for buildings, G. W. Parker; Fluid meter, See Meter; Folding or knockdown box, Gordon & Perkins; Frame, See Bicycle frame. Satchel or bag frame; Funnel, L. Kirchner; Funnel for filling lamps, T. W. Griffin; Funnel, meter, T. W. Scoley; Furnace, See Hot air furnace. Smelting furnace; Furniture, library, L. C. Taylor; Gauge, See Surface gauge; Gas cap, Williams & Davies; Gate, See Sluice gate; Gears or pinions, machine for making, D. H. Church; Generator, See Pyromagnetic generator; Gill faller, E. Clarkson; Glass articles, apparatus for moulding curved hollow, A. Applegate; Glass polishing machine, F. K. Maximilian; Gluing table, W. E. Brock; Grate, J. A. Price; Grater, G. Thurn; Grinder, tool, J. M. Cook; Grinding machine, See Grinding machine; Grinding the blades of rotary cylinders, device for, A. E. Whitney; Guard, See Stallion guard; Gun indicating device, H. Elbe; Gun magazine, F. W. Lantz; Hair washer, See Hair brush; Hammer, power, Sweeney & Laird; Hammer, stone dressing, G. McDonald; Harness, W. A. Hunter; Harvester, corn, D. H. Glidden; Harvester, corn, C. L. White; Harvester, corn, Lewis & Williams; Harvester gearing, A. Stark; Harvesters and binders, vertical gearing for, G. Schubert; Harvesters, raising and lowering mechanism for, G. Schubert; Harvesting process of and apparatus for, W. P. Groom; Harvesting machine, corn, J. Clements et al.; Hat stiffening machine, W. H. Barnum; Hats, name plate for, J. G. Ward; Hay carrier, R. Gregg; Hay rake, W. Wallace; Hay rake, side delivery horse, H. McPherson; Headers, brake attachment for the steer wheels of, D. E. Mentzel; Heater, See Car heater. Fireplace heater; Heating apparatus for cars or buildings, W. C. Healy; Heel nailing machine, Brown & McCoy; Hitching device, J. E. Parkison; Holdback, vehicle, J. F. Talt; Humer, See Jarholder. Parcel holder. Pillow-sham holder. Rope holder. Sash holder; Spoon holder; Hoop coupling, Ford & Ferguson; Horseshoe, A. D. Jeffrey; Hose nozzle, C. Spencer; Hose to couplings, device for securing, Z. L. Chadbourne et al.; Hot air furnace, D. Babcock; Hot air furnace, F. Fridley; Ice cream freezer, L. P. Burdick; Ice making apparatus, T. Shipley; Indicator, See Valve indicator; Insulating tube for electric conductors, A. P. Seymour; Insulator, circuit breaking, A. P. Seymour; Insulator, porcelain, Pass & Seymour; Jar holder, fruit, A. F. Frost; Joint, See Ball joint. Wood joint; Junction box, C. A. Arnold; Kettles, corn, T. Burkholder; Knitting frames, needle rail for Cotton's, F. A. Ludwig; Labeling machine, can, C. L. Gorrell; Laces, machine for pointing and punching shoe; Ladder, G. Goldstein; Lamp, T. C. J. Thomas; Lamp burner, F. T. Williams; Lamp chimneys, machine for cutting, J. Lobet; Lamp, electric arc, T. A. Edison; Lamp, incandescent electric, T. A. Edison; Lamp socket switch, electric, G. E. Painter; Lamps and means for lighting and extinguishing the same, device for controlling the distribution of oils to, T. A. & E. Penn; Lamps, spark arrester for electric, W. M. Spencer; Last, M. J. Bagley; Latch and lock, combined, J. W. McKee; Lawn sprinkler, C. H. Baker; Letter box, W. F. Askam; Letter box, house door, F. H. Walker; Letter box, street, W. M. Fitzwater; Letters, files, etc., holder for, E. W. Woodruff; Lifter, See Transom lifter; Lightning arrester, T. A. Edison; Lightning arrester, A. Wurts; Lock, See Combination lock. Cylinderlock. Nut lock. Permutation lock; Locomotive, electric, T. A. Edison; Loom, T. J. Corcoran; Loom, H. Widmer; Loom, swivel, G. F. Hutchins; Low water alarm, J. T. Hayden; Lubricator, L. L. Malm; Magnet for dynamo-electric machines field, Pyke & Harris; Maltng drum, pneumatic, Gieseler & Smith; Mechanical movement, J. D. Westgate; Meter, See Electric meter. Fluid meter; Mower clutch, lawn, F. M. Waters; Mower, lawn, T. J. Tucker; Musical instrument, W. Carter; Nail arrangement, R. F. Biele; Nets, machine for making fish or other, H. W. Thurston.