

with, laid in a wooden box? A. Yes. Use the fine light ashes from behind the bridge wall. It is the best. If not enough, sift the ashes under the grate, using the fine ash.

(12) A. P.—A method of making malleable iron casting is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 399, and a very complete account in Spons' Workshop Receipts, third series, which we can mail for \$2.00.

(13) W. T.—The finishing cuts on the ends of pencils are made with a pair of sharp knives that work like scissors, but do not meet. The knives are in a machine, the pencils being passed through automatically.

(14) C. E. L.—There are several telescopic comets within or near the solar system now. The one recently discovered at the Lick Observatory can be seen with small telescopes as a small star with a faint tail about half a degree long. Its position on the 17th November was R. A. 3 h. 57 m., dec. south 2° 30'. It is computed to be visible during one year, in the evening, until March, 1889, then in the morning and evening until November, 1889.

(15) A. McC.—The steepest railway grades are said to be in Switzerland, 369 feet to a mile. Many railways have short grades of 200 or more feet to a mile. The momentum of a locomotive and train will enable the ascent of very steep grades that are short. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 395.

(16) G. W. H.—The expansion of steam pipe for a rise of temperature of 200° is 1 1/4 inches per 100 feet or 1.97 inches for 130 feet. This is for a change from 60° to steam heat of 20 pounds pressure. For a pressure of 50 pounds add three-tenths of an inch per 100 feet. All sizes of pipes expand alike with equal change in temperature.

(17) G. C. S.—The outer planets take their apparent retrograde motion from their position in opposition to the earth, when the earth, moving faster in its orbit than the motion of the planets, makes their motion apparently backward among the stars. You will notice this only by close observation when an outer planet is near opposition. The time and amount varies for the different planets. See "Popular Astronomy," by Newcomb, \$2.50, which we can mail.

(18) A. O. asks: Does a horse travel with less fatigue over a flat than a hilly country? A. The theory that the ease of down hill travel compensates for the difficulty of going up hill is a great mistake. Holding back is not natural for a horse; it often worries him more than an uphill pull.

(19) R. C. G. asks the way to line a shaft. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 190.

(20) W. A. asks: What sizes of wire will be required to supply currents for separate plants of three, six, and twelve arc lamps? A. In general terms, the larger the wire, the better. No. 8 or 10 wire suffices.

(21) C. G. writes: 1. What causes a show window to "perspire," as they say? A. The condensation of moisture from the air, largely due to the gas burners and presence of people. 2. How can it be prevented? A. By ventilating at the top thoroughly.

(22) J. C. S. writes: A owes B \$500.00, all of which he is unable to pay at once, and B agrees to extend the time twelve months, provided A will pay him part of the principal and interest in advance on the unpaid part at the rate of 8 per cent. A accepts this proposition and pays B \$200.00, which is part principal and interest on the unpaid part. How much will A owe B at the expiration of twelve months? A. Let x = unpaid portion of principal, then 500 - x = paid portion. We then have the equation—

500 - x x 0.08 x = 200.

Solving this, we find:

x = \$326.09.

This is the portion of the principal that is to be paid at the end of twelve months. In addition to this, 8 per cent has to be paid on the rest of the principal, or on 500 - 326.09 = 173.91. Eight per cent on 173.91 is 13.91. Adding this to 326.09 we have 340.00 as the total to be paid at end of twelve months.

(23) W. J. L.—The piston of a moving engine travels forward and backward in its relation to the cylinder. It always moves forward in its relation to the roadbed or track when the engine is running forward, and always backward when the engine is running back.

(24) M. S. asks if a good grafting wax can be made sufficiently soft in consistency to be applied when grafting without requiring heat. A. Mix equal parts of beeswax and resin; add tallow until a proper consistency is attained.

(25) A. W. asks: About what is the market value of attar of roses? A. From \$40 to \$100 per ounce is given as the range of price.

(26) F. P. asks: 1. How can I mix kerosene and lard for a lubricating oil, so that it will not separate? A. Wash the lard well with hot water, have perfectly dry, and it will mix with kerosene. 2. Would it injure drinking water to use a copper pail? A. Not if the pail is kept bright. For Vesuvium, see SCIENTIFIC AMERICAN, Dec. 8, 1888, query No. 9.

(27) F. S. M. writes: I have an electric bell arrangement in my house, and the zinc rod in the battery gets coated with a kind of salt, and occasionally the battery refuses to work until I scrape the zinc. How can I prevent it? A. Add a little hydrochloric acid to your solution. The porous cell is probably exhausted and needs replacing.

(28) A. C. M. asks: Could I not charge a storage battery by means of a dynamo run by a windmill, by using an automatic arrangement that would complete the circuit only when energy greater than that in the storage battery was being developed by the windmill? A. You could construct an automatic arrangement based on the gas evolved when the battery is fully charged. A single cell could be sealed, and the pressure of gas in it could be made to actuate a mechanical

cut-off when the pressure reached a definite point. This would provide for cutting off the current. It might be arranged to do the whole work of throwing in and out of circuit.

(29) G. F. writes: I have a mixture of white castile soap and eggs, which looks like soft soap. Could you tell me of something that would "cut" the soap, i. e., take the greasy look out of it, and make it so it will not be stringy, but be in separate particles? A. A little salt solution will tend to make the soap curdle and form in clots.

(30) J. B. asks: 1. Is not hot air a better supporter of combustion than cold air? A. It tends to increase the energy of combustion, and to produce a much higher temperature. 2. Give a scientific explanation of how sparks get out of the fire box of a locomotive. Is not the creation of a vacuum in front end the cause? A. The creation of what is termed a "partial vacuum" is the cause.

(31) R. A. R. asks: Can you give me a recipe for making a preparation that will keep the frost off windows? A. Ventilate the window casing at the top. Sponge the windows with glycerine and water.

(32) A. S. writes: I have read somewhere that you can extend the carbon surface of a porous cup battery by packing powdered coke around the porous cup. Will you please tell me if the coke should be just poured around loose or be packed in tight. A. Break coke to size of beans, screen out dust, and pack loosely. For description of telephone, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 142.

(33) S. M. D. asks: 1. Have not inventors in the United States done more to develop modern practical scientific appliances than inventors in any other single country in the world? A. United States patents exceed in number those of any other country. 2. Have scientific men in Great Britain or France done more to develop theoretical and technical science than the same class of men in any other single country? A. It is impossible to answer your second query.

(34) Carpenter asks: 1. About what year were "cut" nails first introduced? A. The first patent for a machine for "cutting nails" was issued to Josiah G. Peerson, of New York, March 23, 1794. As early as 1606 Sir Davis Bulmer obtained a patent for cutting nails from a rod by water power. 2. What is the name of the wood from which Cuban cigar boxes are made? It much resembles mahogany, but lighter and softer. A. Spanish cedar.

(35) Reader writes: In your paper of November 24, 1888, page 325, appears a table of the number of gallons of water in cylindrical cisterns. The estimates given in this table differ from a table on page 695 of Moore's "Universal Assistant." I would like to know which is correct. Please answer in your next paper. A. The Sanitary News table refers to the imperial gallon of 277.274 cubic inches. Moore's table refers to the American gallon of 231 cubic inches.

(36) R. D. asks: 1. How long will an open circuit battery (best make) ring a bell continuously before it becomes polarized, and how long will a closed circuit battery do the same before it runs down? A. It depends on the resistance of the bell magnet and on the general features of its construction and on the size of battery. Ten minutes to one hour for the open circuit, and ten hours and upward for closed circuit. 2. Which line will a battery run the longest on ringing a bell continuously, one a mile long or one 1 foot long, using the same size wire and the same bell in each case? A. If the bell and battery are properly proportioned, it will run longest on the short line.

(37) T. A. M. C. V. asks: 1. What is the pattern of Bunsen cell that may be used for charging accumulators, its size and capacity, and its intensity in amperes? A. The so-called Bunsen cell generally contains a carbon prism in the center, within a porous cup, which is surrounded by a plate of zinc, bent into a nearly complete circle. For the porous vessel, electro-pole fluid, often described by us, is used. For the outer cell, water or dilute sulphuric acid. Such cell gives about 2 volts electromotive force, and its resistance may vary from 0.200 to 1 ohm, according to size, strength of solution, etc. With low external resistance, therefore, it may give 10 amperes. 2. What is the rule to calculate the number of such Bunsen cells required to charge an accumulator or several of them of two volts E. M. F.? A. Always arrange storage batteries in series for charging. Then for intensity of current allow 18 amperes, and for electromotive force allow 2.25 volts, or about 40 watts, per cell. If charging with a battery, arrange it so as to produce this current. 3. Is it necessary that a dynamo should have the same voltage and amperage as the accumulator for the purpose of charging, provided the number of watts be the same? Or may the voltage of the dynamo be lower, provided the amperage be higher? Can a dynamo of 4 1/2 amperes and 100 volts charge an accumulator, as good as one of 6 amperes and 75 volts, or 10 amperes and 45 volts, and making all of them the same combination in watts? A. The dynamo should have 12 1/2 per cent more voltage, and should produce a current of 18 amperes intensity. The voltage and amperage cannot compensate, one for the other. The above rate is the correct one. More voltage would be uneconomical, and less amperage would be slow. Hence the third dynamo named would be the best, and should be given not less than 45 / 2.25, or 20 storage cells in series to charge.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 27, 1888,

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, manufacture of phosphoric, Giles & Shearer; Acids of phenols, etc., production of iodized sulpho, E. Ostermayer; Alarm, See Choke-up alarm; Arc light, D. B. Turner; Asphalt pavements, manufacture of, C. A. Case; Bag, See Mail bag. Moth proof bag; Bag holder, A. D. Wallace; Bailer, G. W. Rose; Baling press, J. H. Gardner; Barrel setting-up machine, M. E. Beasley et al.; Barrel, swing, C. C. Hiatt; Barrels, machine for setting up, G. M. Newhall; Batteries, porous cup for galvanic, H. J. Brewer; Battery, See Galvanic battery. Secondary battery. Storage battery; Bed bottom, S. J. Dickson; Bed, folding, M. F. Koch; Bell, electric, A. Lunzen; Bicycle, H. Brown; Blotting device or pad, S. S. Cole; Blower for boiler furnaces, T. H. Champion; Board, See Multiple switch board; Boiler furnace, J. A. Palmer; Book, J. M. Rose; Book, account, J. W. Horne; Book, blank, J. W. Horne; Book holder, E. H. Roys; Book support, J. W. Coultas; Book support or holder, R. S. Kirkpatrick; Boot or shoe shank stiffener, T. Green; Boot or shoe tree, S. Mawhinney; Boots or shoes, tool for burnishing, J. H. Busell; Bottle, E. Storm (r); Bottles, machine for washing lager beer, H. F. Ward; Box, See Letter box. Paper box. Post office box; Boxes, machine for making, J. R. Stout; Bracket, See Scaffold bracket; Brake, See Car brake. Pressure brake. Railway brake. Sled brake. Vehicle brake; Breastpin, A. Young, Jr.; Bretzel or cracker sizing and salting machine, D. R. & W. A. King; Brick kiln, W. L. Grege; Bridge connection truss, H. S. Hopkins; Bridle attachment, N. Edwards; Brides, blinder loop for, T. A. Pramhus; Brush, scrubbing, T. H. Saunders; Buckle, G. E. Schellinger; Burglar alarm indicator, electric light, Packer & Cochran, Jr.; Button setting machine, E. H. Taylor; Buttons, making lacing, E. Revol; Buttons to corsets or other garments, attaching, M. P. Bray; Calculating machine, C. Lorenz; Calendar stand and pad, H. H. Unz; Camera, See Photographic camera; Camera, E. W. Sweigard; Camera shutter, M. Burrows; Can, See Sheet metal can; Cant hook, D. Moran; Car brake, H. S. Hopper; Car brake, Reynolds & Gerdorn; Car brake, railway, J. E. Robinson; Car coupling, S. Cooley; Car coupling, Dawson & Cleveland; Car coupling, A. C. Howes; Car coupling, R. F. Osborn; Car coupling, W. A. Post; Car coupling, G. M. Robbins; Car coupling, H. W. Warner; Car, railway, A. M. Leinwather; Car wheel task, J. J. Carr; Cars, apparatus for heating and lighting railway, W. Wilson; Cars apparatus for propelling, L. Paget; Cards, book for holding playing, F. Hebbard; Carriage curtain fastener, A. G. Snell; Carriage, trick, J. F. Byrnes; Carriages, gear iron for, J. F. Fallon; Carving fork, W. W. Lee; Carving fork, M. W. Moakley; Case, See Cigar and cigarette case. Toilet case; Casting axle boxes, mould for, W. W. Ayres; Castings, making iron, G. G. Mullins; Catamenial sack, W. S. Watson; Chain, drive, J. A. Stone; Chart, garment, E. M. Goldsmith; Chlorine, apparatus for obtaining, E. Solway; Choke-up alarm, S. F. Wolf; Cigar bunches, making, J. E. Smith; Cigar fillers, blank for, J. E. Smith; Cigar or cigarette case, A. J. Needham et al.; Cigar rolling or wrapping machine, C. W. Bowman; Cigarette machine, Kjollerfeldt & Kolnotsch; Clamp, See Hose clamp; Cleaner, See Grain cleaner; Clippe, hair, J. K. Priest; Clock pendulum regulator J. H. Gerry; Clocks, electric striking attachments for, J. H. Gerry; Closet, See Earth closet. Water closet; Cloth cutting machine, C. A. Yost; Clover huller, H. Burfeind; Cold surface covering, C. B. Manville; Condenser, ejector, L. Schutte; Confections, machine for moulding, J. C. Ruby; Conveyers, machine for bending spiral, W. W. Green; Cotton gin, P. L. & W. Brady; Cotton press, Loyall & Moyers; Coupling, See Car coupling. Thill coupling. Whiffletree coupling; Crusher, See Rock crusher; Cultivator, C. M. & C. D. R. Sandberg; Cutter, See Paper cutter. Stalk cutter. Tobacco and cigar cutter. Weed cutter; Damper, pipe, R. Baile; Dash pot, J. D. Clite; Desk, folding, Eden & Guthrie; Digger, See Potato digger; Dish washer, L. Sloan; Door check, pneumatic, T. Goodenough; Door lock and attachment, W. D. Hughes; Door opener, electric, A. Lunzen;

Table listing inventions with patent numbers, including items like Dredger dipper, M. C. Lawton; Drilling or boring machines, friction feed for, G. S. Walker; Drums, apparatus for mechanically playing on, A. Foerster; Drying apparatus, E. Theisen; Earth closet, H. J. Behrens; Edge shave, A. Schillmoller; Egg package, A. S. Hoyt; Electric circuit controller, W. J. Paine; Electric depositing cell, L. L. Smith; Electric light regulator, L. Paget; Electric machine and electric motor, dynamo, W. P. Freeman; Electric machine, dynamo, W. W. Griscom; Electric motor, Keller & Carnes; Electricity by secondary batteries, distribution of, W. W. Griscom; Elevator safety device, J. W. Dustin; Elliptic spring, Morris & Lawrence; Engine, See Hot air engine. Pressure engine. Rotary engine. Steam engine. Steam or pneumatic engine; Evaporator, W. S. Gilmore; Explosive and making the same, A. Favler; Extension handle, J. P. Lybarger; Extractor, See Stump extractor; Fabric, See Knitted fabric; Feed water heater, J. T. Lee; Feed water heater, Pratt & Wainwright; Feed water regulator, Cook & Thoens; Feed water regulator, automatic, P. J. Duff; Fence, R. W. Fuller; Fence machine, S. J. White; Fence wire, machine for splicing, A. De Witt; Fences, machine for constructing, J. M. Mangold; Filing away printed clippings, etc., device for, C. W. Taylor; Filter press, L. A. Enzinger; Firearm, magazine, Von Stepki & Sterzinger; Firearms, safety holder for, C. C. B. Whyte; Fire extinguisher, W. P. Bending; Fire kindler, W. R. Myers; Fireman, life-saving harness for the use of, G. F. Griffin; Flask, See Car wheel flask; Food compound, H. T. Champney; Foot rest and kneeling stool, combined, E. W. Jeffries; Fork, See Carving fork; Frame, See Harvester frame; Fuel, artificial, J. A. Freeman; Furnace, See Boiler furnace. Hydrocarbon furnace; Furnace, W. D. Dickson; Furnace, F. Wild; Gauge, See Pressure gauge; Galvanic battery, J. L. Gethins; Galvanic battery, H. L. Roosevelt; Garment supporter, J. N. Faust; Gas apparatus, Rennyson & Burgess; Gas holder, T. F. Rowland; Gas lighting and extinguishing apparatus, automatic, N. H. Shaw; Gas protective extinguisher, natural, C. E. Scribner; Gas retort lid, Z. L. Chadbourne; Gate, See Railway safety gate; Generators, regulation of alternate current, G. Pfannkuche; Generators, regulator or cut-off for, D. W. Smith; Grading and ditching machine, W. J. Edwards; Grain cleaner, J. C. Fisher; Grain drill hoe, C. E. Patrie; Grain separator, P. S. Willis; Grapple, W. H. Wiley; Grinding machine for cutlery, H. A. Axtell; Guitar, Durkee & Becker; Guns, carriage for machine, T. Nordenfelt; Guns, indicator for magazines of, W. R. Miller; Handle, See Extension handle. Soldering iron handle; Harrow, sulky, T. G. Cook; Harvester, C. F. Search; Harvester frame, J. Miller; Hat or bonnet holder, N. E. Veatch; Heater, See Feed water heater; Heating air, steam, etc., apparatus for, W. H. Coleman; Hinge, spring, F. R. Bartlett; Hinge, spring, N. Linsley; Hoisting and traversing apparatus, N. C. Harris; Holder, See Bag holder. Book holder. Gas holder. Hat or bonnet holder. Pencil holder. Sash holder. Sponge and slate pencil holder. Tidy holder. Tool holder. Twine holder; Hook, See Cant hook. Sash lifting hook; Hook, J. C. Newey; Hose clamp, E. L. Sharpneck; Hot air engine, T. J. Rider; Huller, See Clover huller; Hydraulic transit, J. E. Robinson; Hydraulic transit apparatus, J. E. Robinson; Hydrocarbon furnace, J. S. Andrews; Indicator, See Burglar alarm indicator. Station indicator; Induction coil, coin-operated, C. Durieux; Iron ores, reducing, M. Graf; Ironing table, wash bench, and step and extension ladder, combined, A. Hawkins; Jack, See Lifting jack; Joint, See Pipe joint. Railway joint; Kiln, See Brick kiln; Knitted fabric, W. & R. N. Wrightson; Ladder and ironing board, combined step, P. Smith; Lamp, electric arc, G. Pfannkuche; Lamp globe, electric, S. Heimann; Lamp, incandescent electric, E. H. Johnson; Lamp socket, incandescent electric, Wollin & Werline; Lamps, filament for incandescent, G. S. Ram; Lantern, signal, Cogley & Kendig; Lathing machine, I. Frechette; Latch and lock, combined, J. Maynard; Leather graining machine, M. M. Scott; Leather staking machine, P. H. Daley; Letter box, electric, C. F. Harms; Level and straight edge, spirit, J. W. W. Clark; Lifter, See Transom lifter; Lifting jack, H. H. Clever; Lifting jack, W. O. Nease; Lifting jack, C. F. Sewell; Light, See Arc light; Lock, See Door lock. Nut lock. Safe lock. Seal lock; Loom for the manufacture of tufted pile fabrics, E. Buckley; Mail bag, C. C. Cook; Match blocks, machine for subdividing, Severlo & Case; Measure, tape, C. L. Bard;

