

together. Wash with hot water. A strong blue background may be produced as follows: Dissolve in 2 ozs. of pure water 120 grains of red prussiate of potash (potassium ferrocyanide), and separately 140 grains double citrate of iron and ammonium in 2 ozs. of water; mix the solutions, filter, float the paper for a few minutes on the filtrate; print from the dried paper as before, and wash thoroughly in water. By adding a little phosphoric acid to the bichromate solution and exposing the print before washing to the vapor of a hot solution of aniline in alcohol, a blackish-green or red positive is obtained. Or, prepare the paper with solution of iron sesqui-chloride, and develop after exposure with a very dilute solution of silver nitrate. Use plain photographic paper.

(30) J. B. N. asks: What is the method of proportioning pulleys of different sizes, so that the same belt can run on all without change of length? A. Draw vertical lines parallel to each other and an equal distance apart; these will represent the center lines of the width of the steps upon the cone. Draw at a right angle to these lines and passing through about the center of their lengths a horizontal line, representing the axis of the cone pulley. Set the compasses to the radius of the largest step of the cone, and from the intersection of the end vertical line and the horizontal line used as a center, place on that vertical line a mark above and below the horizontal one. These two lines will represent the diameter of the largest step. Set the compasses to the radius of the smallest step required on the cone, and mark off in a similar manner the diameter of the smallest step required on the cone. Take a straight edge and place one edge even with the intersections of the vertical lines at each end with the lines marked by the compasses, and then draw a line intersecting the intermediate vertical lines, and the intersections of the lines drawn from the straight edge with the vertical lines will show the required diameter for each step of the cone.

(31) C. W. writes: A lubricant which I have been using, when it comes in contact with brass, turns it green. What is the cause? A. Probably the presence of a certain amount of moisture in the lubricating oil, causing the brass to oxidize.

How can I make a conductor to draw off frictional electricity? A. Brush some gum water over the outside of a base ball. When this is almost dry, roll the ball on gold leaf so that the ball will be covered with a smooth layer of gold; then mount the ball on a stick of sealing wax, set in a little wooden disk or base. Then on one side of the equator of the ball insert five or six cambric sewing needles, so that they will be about 1/8 inch apart; these needles act as a comb to conduct the electricity to the gold leaf on the ball, from which the electric sparks may be drawn. In some establishments where leather belts are run at a very high speed, electricity is produced on the belts. If the conductor that we have just described be placed with its row of needles near to, but not touching, one of these belts, the electricity of the belt will be accumulated, and will manifest itself in the form of the bright blue sparks, several inches in length, that pass from the conductor to the knuckle of the hand that is presented to it.

(32) D. J. K. asks: With what shall I oil a black walnut case? A. Raw linseed oil. Sometimes a little turpentine is added, in the proportion of 1 gill to 1 quart of the oil.

(33) L. H. wishes to know what to line wooden battery tubs with, to make them water-tight and protect them from acid. A. Use paraffin wax, applied hot.

(34) F. C. S. asks: What is the rule for calculating the change wheels for a compound screw cutting lathe? A. Divide the pitch of the thread to be cut by the pitch of the lathe feed screw, and the product will be a proportional number. Then multiply the number of teeth in the lathe mandrel gear by the number of teeth on the smallest gear of the compounded pair, and the product by the proportional number; then divide the last product by the number of teeth in the largest wheel of the compounded pair, and the product is the number of teeth for the wheel to be placed on the feed screw. Or, if the sizes of two wheels are to be found, divide the number of threads you wish to cut by the pitch of the feed screw, and multiply the quotient by the number of teeth on one of the driving wheels, and the product by the number of teeth on the other of the driving wheels; then any divisor that will leave no remainder to the last product is the number of teeth for one of the wheels driven, and the product is the number of teeth for the other wheel driven.

(35) M. D. V. asks: What is the best method of calculating the speed of pulleys, from large to small, and from small to large? A. The speeds of two given wheels are in the proportions or ratios of their diameters. To find the sizes of wheels for a required speed, multiply the speed of the driving wheel by its diameter and divide by the speed required by the driven wheel. The answer is the diameter of the driven wheel. If two pairs of wheels are concerned, divide the speed you require the wheel to run by the speed (in revolutions) of the driving shaft, and the quotient will be the proportion between the revolutions of the driving shaft and the revolutions required. Then take any two numbers that will when multiplied together form a sum equal to that proportion, and one of such numbers will form the relative sizes of one pair of pulleys, and the other of such numbers will form the relative sizes for the other pair of pulleys.

(36) F. K. R. asks: What is the composition used for melting brass to make it retain the size of mould when cooling? I wish to cast the brass in an iron mould, and if it should shrink I could not get it out. A. We know of no composition in use for such a purpose.

(37) C. E. C. asks: What metal or combination of metals should be used for making joints in a sheet lead tank to be used for storing oil of vitriol (66%)? A. Use a solder of 1 part lead and 2 parts tin.

(38) R. H. writes: I wish to make a small boiler for a little engine (cylinder 1 x 1 1/2 inches) which I have constructed. I propose to make it 10 inches high

and 6 1/2 inches diameter, and containing 5 one inch flues; it is to be made of cast iron, flues and all. Metal is to be 3/4 inch thick. Do you think such a boiler would answer my purpose? I wish to generate steam with a lamp, and I have been thinking that the metal is too thick to do so. Can you tell me of a better way to build a boiler? A. We are not favorably impressed with your plan, and think it would be better for you to build the boiler of wrought iron or copper. You could not conveniently use a lamp for generating steam in the proposed boiler.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. E. A.—It is a zinc blende; silver is present in small quantities.—Package marked Santa Fé contains dogtooth spar and agate pebbles.—F. J. R.—No. 1.—The quartz looks well and may be metalliferous; the sample is not notably so. No. 2.—The powder consists principally of magnesium, calcium, and alkaline chlorides, sulphates, carbonates and silica. It contains also organic matter, ammonia salts, phosphates, iron, and a trace of fluorides. It is not of much value. It is probably the residue from the evaporation of spring water—mineral water.—F. C. B.—The marked sample is an amorphous sand—principally silicic acid. The other is an impure clay—silicate of alumina.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

- Cuca or Coca. By C. H. E.
A New Source of Power.
The Use of Petroleum as Fuel. By H. B.
Centering for Arches. By P. I. O.
A New Vehicle. By R. B. F.
The Use of Fuel for Steam Boilers. By W. S. C.
The Electric Light. By W. E. S.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

OFFICIAL.

INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States were Granted in the Week Ending February 5, 1878, AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished for this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Table listing various inventions and their patent numbers, including items like Advertiser, clock, J. F. Werner; Album, J. C. Koch, Jr.; Animal trap, D. McGuire; Apple paring machine, Goodchild & Hay; Bale tying machine, F. S. Heath; Bed clothes clamp, C. M. Bryson; Bee hive, J. Palmer; Bee hive, J. P. Stroope; Binder, Shoemaker & Dodsworth; Binder, E. H. Thompson (r); Blind slats, J. G. Wilson; Blind stop, W. B. Surdam; Book binding, J. S. Lever; Boot jack, M. Ross; Boring or broaching apparatus, J. J. Love; Bottle stopper, W. H. Kelley; Brake coupling, F. W. Eames; Brake, wagon, S. Gorr; Buildings, facing for, G. B. Field; Buildings, steam apparatus for, J. W. Faxon; Burglar alarm, S. D. Lauffer; Button fastening, C. E. Bates; Button or stud fastening, R. Boussard; Caddy, measuring, J. C. Reed; Can, metallic, C. P. Maxfield; Car registering apparatus, R. McCully; Car registering apparatus, R. McCully; Cars, safety guard for, Harding & Towell; Carbureter, Shea & Hamilton; Carbureting apparatus, M. D. Nelson; Carriage, canopy top, C. E. Fosburgh (r); Cell case, J. L. Stevens; Celluloid, etc., J. W. Hyatt; Chair, folding, E. G. Stanley; Chimney cow, C. E. Soelke; Cigar machine, F. Haehnel; Cigar support, F. L. Oviatt; Cigar wrapper cutter, F. Haehnel; Cloth shearing machine, A. A. Forbes; Clothes drier, L. C. Cattell; Clothes pounder, F. A. Sumner; Clothes pounder, H. Trumbull; Clothes pounder, G. W. Wood; Cock and faucet, C. Verniaud; Coin, detecting counterfeit, J. W. Meaker; Colter, rolling, E. A. Sanders; Combs, celluloid, J. W. Hyatt; Compass, A. P. Freshman; Condenser, mercury, C. E. Livermore; Copper, tinning and finishing sheet, R. McManus; Corset clasp, L. F. McNett; Cotton, stowing, D. Hayes; Culinary utensil, J. W. Steele; Cultivator, J. M. Graves; Cultivator, D. R. Raymond; Curtain fixture, E. G. Stanley; Cut-off for flexible pipes, C. Weed; Door, sliding, S. Smith; Drains, trap for, J. Sargent; Engine, rotary, G. Evans; Engine, steam, J. G. Cooper

Table listing various inventions and their patent numbers, including items like Engine, steam, J. Holub; Engines, bed plate for, A. A. Simonds; Exercising machine, J. Preiss; Fence, barbed, W. Warden; Fence bars, applying, J. W. Edwards; Fence post, W. H. H. Youngs; Fence post, H. L. Gockley; Fence, wire, W. Warden; Fence wire, barbed, M. P. Mighell; Fence wires, tool for stretching, A. Green; Fire alarm, G. S. Shute (r); Fire alarm, R. F. Bartel; Fire arm, breech-loading, W. Field; Fire arm, breech-loading, W. R. Finch; Fire escape, C. Richards; Fire extinguisher, F. C. Zapfe; Fish catching device, J. A. Mitchell; Flask for cooling liquids, Kloczewski & Klobassa; Fruit, drying, J. Hyder; Furnace, C. Bennett; Gas, manufacture of, E. J. Jerzmanowski; Gate and door fastener, C. T. Sweet; Glove fastening, G. Havell; Governor, meter, W. N. Milsted; Grate, basket, H. T. Simons; Griddle greaser and holder, M. Nichols; Gun, machine, E. A. Leland; Hair crimper, I. Kann; Harrow, L. Norton; Harrow, D. Rhodes; Harrow, G. M. Titus; Harrow and clod crusher, J. W. Haggard; Harvester cutter, A. J. Bigelow; Harvester cutter bar, E. R. Whitney; Hat blocking and banding machine, R. Eickemeyer; Hat pouncing machine, G. Yule; Hatchet, J. C. Chapman; Heater and steamer, meal, Curtis & Andrews; Hides, etc., machine for scouring, J. W. McDonald; Hoistways, J. B. Waring; Horn cutting machine, M. M. Goldsmith et al.; Horseshoe, E. Murrain; Hub attaching device, S. Kepner; Hub, M. D. Golder; Hydrant and street washer, J. B. Fish; Ironing machine, W. & J. Coutie; Ironing machine, T. S. Wiles; Key for locks, G. Finley; Knife cleaner and sharpener, C. A. Heegaard; Knife, A. E. Elmer; Knitting machines, H. M. Mellor; Ladder, step, M. Medart; Ladder, wire rope, A. Elton; Lamp bracket, J. J. Nolan; Lamp burner, L. J. Atwood; Lamp reflector, P. Cavalier; Lamp wick, W. D. Smith; Last, T. Dann; Latch, M. Davenport; Lathe chuck for turning stone, E. Rogers; Level, S. Gissing; Lifting jack, F. S. Yinger; Liquid measure, S. D. & C. F. Rigby; Locks, tumbler for permutation, J. Loch; Loom temple, R. P. Pearson; Lubricating compound, C. Johnston; Lubricator, steam engine, Guild & Clark; Mandrel, forging, J. H. Alker; Mill, grinding, S. C. Schofield; Millstone pick, H. D. Coleman; Mower, G. S. Peck; Musical instruments, mouth piece for, J. G. True; Neck tie, J. H. Fleisch; Observatory, aerial, N. C. Lombard; Oils, storing, etc., T. J. McGarry (r); Ozone generator, A. W. Sangster; Pan, frying, Edgar & Bardell; Paper box, J. W. Sproules; Paper pulp, wood, W. R. Patrick; Pavement W. H. & H. M. Stow; Pen holder, Hoffman & Boman; Piston, W. Sprague; Plane, J. B. Boyce; Planter, W. M. Carrier; Planter, J. V. Cloyd; Planter, J. D. Pope; Plotting instrument, D. F. Hitt; Plow attachment, W. R. Fowler; Plow, P. Bouchet; Plow, S. T. Ferguson; Plow, W. H. Parlin; Pole sweep for vehicles, J. Ives; Postal card, M. Lee; Press for compressing cigars, F. X. Osburg; Pressure gauge, O. W. Bayley; Projectile for heavy guns, R. Hadfield; Propeller, steering, T. F. Levens; Pulley apparatus, A. Box; Pump, air, W. S. Burgess; Pump, steam, J. Evans; Punch, conductor's, R. McCully; Railway cattle guard, J. W. Street; Railway rail joint, J. B. Allen; Railway switches, signaling, S. C. Hendrickson; Railway tube, wire rope, W. Eppelsheimer; Railways, tube for wire rope, W. Eppelsheimer; Rake, horse hay, W. Iteno; Ram, hydraulic, I. B. Millington; Refrigerator, G. E. Acklom; Refrigerator, J. D. Rasey; Rock-boring machine, A. Brandt; Roofing, J. L. Boyer; Rule for making lines, W. V. Marshall; Sash fastener, A. W. Lozier; Sash fastener, M. McComb; Saw, circular, J. K. Lockwood (r); Saw set, J. F. Fields; Saw teeth, swage for, N. W. Spaulding; Saws, hardening and tempering, S. E. Farmer; Screw, wood, H. C. Stone; Seed dropper, A. Vannorman; Sewing machine attachments, G. Rehffuss; Sewing machine castor, B. F. Ryder; Sewing machine, straw, Blackburn & Moeslein; Sewing machine, wax thread, J. H. Walker; Sewing machine, waxing device, M. H. Pearson; Shears, E. Van Noorden; Shingle-packing machine, W. A. Bennett; Shingle-sawing machine, W. J. Sherburne; Shirt and drawers, E. S. Bennett (r); Shoe, W. H. Land; Shoe, felt, Palmer & Houghton (r); Sinks, grease arrester for, W. T. Aikins; Skate, S. Horsford; Slate frame, J. W. Hyatt; Sled, boys', J. Y. Chapman; Spice box, T. W. Burger; Spinning machinery, H. M. Williams; Spring, door, L. Threlfall; Spring, spiral, R. Vose; Spring, vehicle, W. McCord; Steaming table, Shaw & Menz

Table listing various inventions and their patent numbers, including items like Stone-cutting tool, R. L. Arendell; Stone, artificial, A. S. Johnson; Stove, coal oil, S. D. Baldwin; Stove door, G. S. S. Jr.; Stove, heating, J. M. Sycks; Stove leg, Pope & Anthony; Stove, oil, Hall & Whitney; Stove, oil, A. F. Kibbe; Stove pipe shelf, G. McAdams; Strawcutter, J. Baron; Table, W. W. Hart; Tanning, C. J. Tinnerholm; Telegraph, movement for, T. A. Edison; Thill coupling, C. L. Alexander et al.; Tobacco, labeling, H. W. Hunt; Tobacco pipe, W. Demuth; Tobacco, plug, R. W. Oliver; Tub ear, T. & W. M. Dunham; Type, J. R. Bettis; Umbrella rib tip, Valentine & Morrison (r); Undersuit, C. L. Bradley (r); Universal joint, J. L. Follett; Valve, universal globe, T. F. Rowland; Vest, chest protecting, G. F. Jackson; Vise, W. Starkey; Wagon jack, M. C. Flanders; Wagon top, G. E. Whitaker; Wagons, device for propelling, E. Baker; Washing machine, J. T. Greenwood, Jr.; Wheel, vehicle, J. Raddin; Whiffletree, R. R. Beavers; Windmill wheel, A. Klotz

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