

(347) F. W. B. asks: I have a Julien storage battery consisting of 3 cells of 6 volts electro motive force; what is the strongest incandescent light that could be operated by it? A. About three candle power. Ask for a six volt lamp.

(348) C. E. W. asks if there is any fulminating or deflagrating substance which can be ignited by the passage of a spark from a frictional electric machine. A. With proper connections gunpowder or fulminating mercury can be ignited by the static discharge.

(349) J. O. N. writes: The cigar lighter consisting of two small nickel plated cylinders, through one a wick runs, which is ignited by the application of a chemical drawn from the other cylinder, has possibly attracted your attention. What is the substance that effects the ignition? A. We have no analysis of the substance, but believe it to be an amalgam of sodium and mercury. The wick, from the accumulation of caustic soda, is supposed to be always damp enough to ignite the sodium.

(350) H. H. F. asks: How may a battery of the cheapest, simplest kind be made and maintained that is capable of shocking a person to the extent that ordinary people generally care to stand? A. Use an induction coil, such as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 569.

(351) G. D. asks what is the most expansive metal suitable for an incubator regulator. A. Of solid metals, zinc. For heat regulator, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 629 and others.

(352) H. M. P. writes: Can you give me a receipt for bleaching human hair, removed from the head, which will leave it a pure white, without injuring its strength? A. Binoxide of hydrogen is used for the purpose, but artificially bleached hair is invariably of inferior quality.

(353) A. F. W. asks (1) how to put about forty 16 candle power lamps (incandescent) into a circuit so that one lamp can be shut off without interfering with the rest of them. A. If you work from a storage battery, arrange your lamps in parallel, and no further regulation is needed. If you use a dynamo, you should have a self-regulating one. For dynamo construction we refer you to Hering's "Principles of Dynamo Electric Machines," which we can send by mail for \$2.50. 2. Also can you tell me in what book or periodical I will find an explanation of the way of wiring a house or building of any kind for incandescent lighting? A. We refer you to SCIENTIFIC AMERICAN SUPPLEMENT, No. 603. 3. What kind and how many cells of battery will it take to run five 16 candle power incandescent lamps about four hours out of twenty-four to the best advantage? A. Use 25 cells of storage battery or 50 cells of quart Bunsen battery with 50 volt lamps. 4. Does the SUPPLEMENT give any information on the storage batteries and how they are made? A. Many storage batteries are described in the SUPPLEMENT.

(354) H. M. T.—You will find very complete tables of planetary elements in "Astronomy for High Schools and Colleges," by Newcomb and Holden, \$2.50, which we can mail for the price. From its tables we give you the orbital velocity in miles per second of each of the planets:

Table with 2 columns: Planet Name, Velocity (miles per second). Mercury 29.55, Venus 21.61, Earth 18.38, Mars 14.99, Jupiter 8.06, Saturn 5.95, Uranus 4.20, Neptune 3.36.

(355) J. V. D. asks: What would be the horse power represented by the tide raising a scow (say 100 ft. by 300 ft. bottom measurement, vertical sides) twelve feet high in five hours? A. If you load your scow so as to displace its area for one foot in depth, its lifting power will be equal to the weight of the water displaced, which is 100 x 300 x 62 lb. x 10 feet, available tide = 19,200,000 lb. for 5 hours' duration. This product divided by the minutes in five hours gives the value of the power for one minute, which is the unit of time for horse power. Thus: 19,200,000 / 64,000 = 300 mins. = 64,000 and 300 / 64,000 = 1.94 horse power, or nearly two horse power, without deducting the friction of machinery for operating the power. We allow 10 ft. travel, because the scow must draw two feet for the full power in rising and just touch the water in falling to make the full power available. This system is expensive for the machinery required for the small power. A far more efficient system is to impound a large volume of water and use a submerged turbine for utilizing the power, allowing the water to flush each way at the turn of the tide.

(356) S. B. M. asks if there is a motor of any kind in use or manufactured which will run 2,300 revolutions per minute and develop 30 horse power. A. We know of none. The velocity is too great for a practical motive power of any kind. A dynamo may run up to 1,500 revolutions per minute, and develop 30 H. P., without heating journals, with care. Rotary engines of the Avery type have run at 1,000 to 1,200 revolutions per minute, developing 30 to 40 horse power. Turbines are made to run 1,500 revolutions per minute, developing 30 or more horse power, with pressure of 100 feet waterhead. Water motors of the hurdy-gurdy type may have very high speed under great pressures from the jet nozzle, possibly reaching the figures that you name.

(357) C. E. M. asks: I intend to put a keel condenser on a small steam launch. Can I proportion my independent feed pump so as to give a vacuum without an air pump, and if so, how perfect if all joints are tight? A. You cannot obtain a vacuum with an ordinary feed pump. Possibly a partial vacuum of 3 to 4 lb. may be obtained under favorable arrangements, provided the condenser is large enough.

(358) J. K. F. says: Please inform me, through your Notes and Queries, the largest gun made, where and by whom made, the weight of gun and projectile, caliber, the weight of charge of powder, and the

greatest distance the projectile has been thrown. A. The largest gun was made by Krupp, weighs 118 tons, is 45 feet long, 16 inch bore, rifled, and throws a projectile of nearly one ton, eight miles, with a charge of 600 lb. prismatic powder. Others of still larger dimensions are in course of manufacture. The greatest range claimed is 12 miles, from a 9 inch gun in England, with an elevation of 37°.

(359) C. E. says: The State of California is about to enact a law requiring all engineers to procure a license. I have been a mechanical engineer for nearly twenty-five years, yet probably could not answer the theoretical questions necessary for me to pass the examination. Will you please inform me what books to procure in order to post myself? A. You will find the desired information in "Questions and Answers for Engineers," by Roper, which we can send you by mail for \$3.

(360) R. S. B. asks for information on the following queries: 1. A short and simple formula for ascertaining capacity of cisterns. A. For capacity of cisterns, square the diameter in feet and decimals; multiply the product by 0.7854, which gives the area in cubic feet for one foot in depth; multiply this product by the depth in feet and decimals, and the last product by 7.48 for the number of gallons. 2. Dimensions of 100 barrel cistern. A. A 100 barrel cistern should be 8 feet diameter, and 8 feet deep from the spring of the arch. 3. Formula for ascertaining area of ellipse. A. For the area of an ellipse, multiply the diameters together, and the product by 0.7854. 4. It is stated that the cruiser Vesuvius, which has shown a speed of 21.65 knots, is the fleetest vessel in our navy. Is not the Stiletto the fleetest? A. The Stiletto is the fleetest vessel, but does not rank as a war vessel. She is only 90 feet on the water line, and displaces but 28 tons. She is used as a dispatch boat. 5. Is the table on inclosed slip, giving method of ascertaining number of gallons in cistern, and which is copied from a mathematical work, correct and reliable? A. The table is correct to a fraction of a gallon.

(361) C. V. H. asks: 1. How the Leclanche disk battery is made, giving proportion of the ingredients? A. The porous cup is filled with a mixture of graphite and clean sifted binoxide of manganese in about equal parts. The carbon prism is embedded in this mixture. 2. Suppose a rubber cell be used, and the cell sealed, is there anything in the rubber that would interfere with the proper working of the battery? A. No; but gas may be given off in the reactions in the cell, for which in some combinations an outlet should be provided.

(362) E. M. La B. asks (1) how pocket batteries are made, such as are used in connection with the small incandescent scarf-pin lamps? A. While a carbon zinc couple with bichromate exciting fluid would give good results, a metal plate—silver or platinum—is generally used for the negative electrode, to save room. Then an exciting fluid a mixture of sulphate of mercury and water may be used. 2. Also how many cells of simple plunge battery will it take to run one two-candle power incandescent lamp? A. Three or four cells.

Enquiries to be Answered.

The following enquiries have been sent in by some of our subscribers, and doubtless others of our readers will take pleasure in answering them. The number of the enquiry should head the reply.

(363) G. W. writes: Will you please inform me through Notes and Queries of the SCIENTIFIC AMERICAN what the rule is in regard to the size or area of smoke stacks for stationary boilers (using natural draught)? I frequently have work of this kind to make, and I think there is a rule in proportion to the area of grate, but do not know what it is.

(364) M. S. O'K. says: We would like your opinion in regard to the following: Does the piston of an engine in theory come to a stop after completing its stroke, or does it immediately start in the opposite direction? It is controlled by the crank pin, which is in continuous motion. We can easily understand that it stops going in one direction, but the question is, does it pause or does it immediately take the opposite direction? In practice, of course, the lost motion of the parts would allow it to pause, but theoretically does it?

(365) S. S. S. asks: Would you kindly inform me through the columns of your paper what are the ingredients of the composition used for making bass-relief signs, used for advertising purposes mostly?

(366) G. T. asks: Will you please find space in your valuable paper to inform me what good, if any, a dome is to a steam boiler?

(367) J. P. W. asks: On a street cable railway one mile long, grade level, the rope (1 1/4 diameter, weighing 2 1/2 lb. per ft.) was at a speed of 880 ft. per minute; on the incoming rope are nine cars at equal distances, the same number on the outgoing rope, weight of each car and passengers 14,500 lb. What is the pulling strain upon the rope?

Replies to Enquiries.

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

(172) A. D. C.—Safety Valve, etc.—For method of computing safety valve, see answers to enquiries, No. 60, January 26. For removing paint, use strong caustic potash solution in water.

(175) C. S. B.—Air Brakes.—The principles involved in the construction of various air or vacuum brakes are illustrated and described in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 392, 523, 642, which we mail at 10 cents each.

(177) G. H. A.—Clean and Whiten Piano Keys.—Wipe the keys occasionally with a solution of alum. Coal tar varnish is much used for sheet iron, or for a fine varnish thin than the japan varnish of the trade with turpentine.

(178) H. M.—Dyeing Clothing.—See a book on the "Dyeing of Fabrics" by Hummel, \$2.00 mailed. For eye glasses use dark blue or smoke color.

(180) W. B. D.—Cleaning Shells.—The only safe way is to file, scrape or cut off the outside coat. For cutting, use a chisel or a draw knife, holding the shell with a strap looped through holes in a bench. The acid process is sometimes used where the bright parts can be protected with wax, but it is uncertain in the hands of amateurs. Use oxide of tin to polish.

(181) O. K.—Bicycle Enamel.—Hard baking japan, as sold by the varnish makers, is used for bicycles. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 316, for description of jappanning and manufacture of japans.

(182) Student.—Phosphorized Oil is made by dissolving six-tenths of one per cent of phosphorus in cod liver oil. It is called phosphorole, used in phthisis. Consult the Pharmacopoeia.

(183) W. J. S.—Green on Pickled Gold.—You will find a variety of receipts in the "Goldsmith's Hand Book," which we can send by mail for \$1.20.

(184) C. V. A.—Telescopic Camera.—You do not state the kind of object glass, achromatic or plain, and as you say that the eye piece is a single lens, we are led to suppose that the object glass is also single. With such a telescope we fear that you will have little satisfaction in photographic work. You need an achromatic object glass of excellent definition with a low power Huyghenian eye piece. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 399, for illustrated forms of eye pieces, and Nos. 581, 582, 583 for a series of papers on astronomical telescopes and their object glasses.

(186) E. F. C.—You will be able to do much in the way of theoretical knowledge of electricity and the methods of practical adaptation to light and power. The experience required will be more readily attained in practice after your book studies. Read "Electric Lighting," by Du Moncel, \$1.25, and "Electric Motors," by Du Moncel, \$3.00, both of which we can mail at the price.

(187) W. S. B.—Fresh Water for Ocean Steamers.—Ocean steamers have surface condensers for utilizing the whole exhaust by condensation and return to the boilers, the deficiency being supplied from the sea. They are also supplied with condensing apparatus for supply of fresh water from steam, direct from the boilers, which with the fresh water carried in tanks make the equipment complete for ship's use.

(188) J. D. B.—Cementing Rubber.—Use rubber cement, which is made by dissolving pure rubber gum in benzine. See SUPPLEMENT, Nos. 249, 251, and 252.

(189) Demagnetizing Watch.—See SCIENTIFIC AMERICAN of October 2, 1886, for illustrated description of the process of demagnetizing watches.

(191) F. L. A. S.—The restoration of cracked oil paintings is the work of an artist. For well defined principles for a belief, see works on mental philosophy.

(196) G. C. H.—The answer to your last question should have been 0.3 or three-tenths of a H. P.

(239) W. M. H.—Firing Red Hot Shot.—The shot is heated red hot in a furnace. A sabot or thick wad made of wood is rammed down over powder. A bundle of damp straw moss or cloth is rammed down to sabot. The shot is then inserted, shoved home, and fired instantly. Not now used, bombs being safer to the gunners and more effective against the enemy.—P. H. L.

(239) W. H. M.—Hot Shot.—In your issue of January 26, query 239, a correspondent asks for the method of firing hot shot. A book prepared by a board of officers for instruction in heavy artillery, for the army of the United States, contains the following instructions for hot-shot firing. The cartridge bags are made of woolen stuff, and the cartridge is inserted choke foremost in a cartridge bag of the next higher caliber and the end folded under. The bags should be examined carefully, and great care should be taken to prevent the powder from spilling or sifting in the bore. The wads are made of clay or hay. Clay wads should consist of pure clay, or fuller's earth, free from sand or gravel, well kneaded, with just enough moisture to work well. They are cylindrical, and one caliber in length. Hay wads should be soaked for ten or fifteen minutes. Before using, the water is pressed out of them. When hay wads are used, vapor may be seen escaping from the vent, on the insertion of the ball, but this is only the effect of the heat of the ball on the water in the wad, so no danger need be apprehended from it. With proper precautions the ball may be permitted to cool in the gun without igniting the charge. The piece, however, should be fired with as little delay as possible, as the vapor diminishes the strength of the powder. In loading, the piece is sponged with great care, and the worm is frequently passed through the bore. As a precaution, a wet sponge should be inserted just before putting in the ball. The muzzle being sufficiently elevated to allow the ball to roll down the bore, the cartridge is inserted, the mouth of the outer bag being foremost, the fold down, and carefully pushed home without breaking it; a dry hay wad is placed in it and rammed once, then a clay or wet hay wad is placed upon it and rammed twice, and finally, if firing at angles of depression, a wad of clay a half caliber in length, or a wet hay wad, is placed on the ball.—L. E. P., Philadelphia.

(239) Hot Shot.—Insert powder cartridge in cannon, cut a sod or turf not less than 4 inches in thickness, fitting the bore of the gun, and ram tightly on cartridge and take aim; on entering red hot ball, roll or push same on the charge and fire immediately. If the aim is downward, add another sod with the ball.—E. S.

(240) Niagara Falls.—1. From the brink to 300 feet back of the Niagara Falls are rapids running over and between bowlders. 2. No level. 3. Velocity of current estimated at 25 miles per hour. 4. Not at the Falls, but at or near Buffalo, where the current is 8 to 9 miles per hour, and sorry to say that the \$100,000 premium is a booming humbug.—E. S.

(241) 50 and 75 horse power engine.—If the 50 horse power engine is properly constructed, and

more attention is given to the inside than the outside, it ought to do the work satisfactorily. A 75 horse power engine of the same pattern and make as the 50 horse power one would only increase the work of keeping up steam, except it would be of the most economical automatic cut-off make.—E. S.

Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

TO INVENTORS.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 29, 1889,

AND EACH BEARING THAT DATE.

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

Table listing inventions and their patent numbers. Items include: Abnormal supporter, B. St. John; Album, photograph, E. H. Hammann; Animal shears, V. Petherick; Armature winding for dynamo-electric machines, E. R. Knowles; Atomizers, face shield for, S. H. Jennings; Axle, C. H. Wilson; Axle box for cable car trucks, J. Stephenson; Axle nuts, die for making, Firth & Tompkins; Axle nuts, making, Firth & Tompkins; Axle, vehicle, A. Paterson; Back band hook, E. A. Isaacs; Barrel hoops, retaining device for, C. Verniaud; Battery, See Electric battery. Secondary battery; Bearing, anti-friction, A. W. Terry; Bed, spring, Caylor & McCreery; Beehive, Beeson & Hirschfeld; Bell, door, W. H. Fauber; Belt stretching machine, C. L. Tresson; Billiard scoring board, R. N. Montgomery; Binder, T. F. Bourne; Blacking, swab for liquid, G. S. Wolf; Blast, hot air, W. O. Miller; Blasting compound, R. Sjoberg; Board, See Billiard scoring board; Boat joint, H. M. Sprague; Boiler, See Range boiler. Steam boiler; Boiler, J. B. De Barthe; Bolt, See Flour bolt; Bolting reel, H. A. Hueffner; Book support, F. E. Healey; Boot or shoe heel, H. A. Webster; Bottling sodawater, etc., apparatus for, C. C. Haley; Box, See Axle box. Fare box. Journal box. Letter box; Brace, See Shoulder brace; Bracelet, T. King; Brake, See Sleigh brake. Wagon brake; Brake handle, J. W. Fowler; Brick kiln, F. W. Dennis; Brick kiln, J. Taber; Brush, cylindrical, G. S. Gladding; Brush, hatter's, W. A. Faber; Brush machine, E. W. Porter; Brush, tooth, W. H. Smith; Bung, automatic stop valve, L. F. Smith; Burner, R. P. Ambler; Butter tub, L. E. Tewksbury; Button, L. Sievert; Calendar, J. M. Moore; Can nozzle, oil, J. S. Peter; Car brake, G. O. Kane; Car coupling, Cael & Ogle; Car coupling, F. J. Hughes; Car coupling, I. Kling; Car coupling, J. B. Maas; Car coupling, W. Metcalf; Car coupling, G. Mock; Car coupling, J. Mutton; Car coupling link, F. F. Boyce; Car door, C. Trier; Car wheel, R. N. Allen; Cars, closet for railway, Kennard & Cory; Cars, electric lighting and heating, J. F. Shawhan; Cars, pipe coupling for railway, P. S. Wiseman; Cars, ventilating and warming railway, Murray & Harrison; Carpet beating machinery, W. H. Hankinson; Carpet sweeper, P. H. Wiedersum; Carrier, See Cash and parcel carrier; Cart, dumping, J. Cable; Case, See Latch case. Library case. Lock case. Type case; Cash or parcel carrier, E. B. Stocking; Casting steel pipes, apparatus for, W. E. Koch; Catheter, R. N. Mayfield; Cellars, apparatus for delivering ashes from, M. Foreman; Centrifugal machine, G. N. Downs; Chair, See Dental chair. Surgical chair; Check rowing attachment, G. L. Banks; Chimney protector, Brenner & Myers; Cigar bunching machine, A. K. Degood; Cigar perforating machine, E. Bernardt; Clasp, F. B. Spooner; Clevis, M. T. Cole; Clothes line frame, F. W. Hofele; Coal hod, E. Barrath; Collar, horse, R. Brownson; Conductor support, D. Steussy; Cork cutting machine, H. S. Larsen; Corn sheller and washboard, combined, Stokes & Reid; Counter, E. T. Harris; Coupling, See Car coupling.