RECENTLY PATENTED INVENTIONS.

Engineering.

VALVE GEAR.—Edwin Garst, Dayton, Ohio. Combined with a rotary cam is a longitudinally sliding valve-operating frame, and a transversely sliding frame thereon embracing a cam, with other novel features, the valve being simple and durable in construction, using steam expansively, and automatic in its operation.

BOILER.—George F. Spencer, Thompson, Pa. This invention provides a boiler designed to be economical in fuel, and in which provision is made for the settlement of all waste in the base of the boiler, thereby preventing incrustation of the tubes, the object being also to increase the area of the heating surface, and provide for the rapid circulation of the water and steam.

Railway Appliances.

AIR BRAKE.—Joseph S. Lapish, American Fork, Utah Ter. Combined with two auxiliary reservoirs on each car, connected by a pipe, is an operating pipe connected with the reservoirs, a valve, and a coupling connected by a rod with the valve, with other novel features, the pipes being connected in the usual way with the main reservoir on the locomotive.

CAR STOVES.—Robert H Gilmour and Fortunatus G. Kellogg, Huntington, Ind This invention covers an apparatus to be located in each car and connected with the engine and the stove in the car, so that the engineer can extinguish at will the fire in the stoves on a train by causing water or chemicals to be discharged into the stoves.

Agricultural.

SULKY PLOW.—John H. Zinn, Gettysburg, Pa. The plow frame has slotted cross pieces to which the beams are adjustably secured, that they may be raised and lowered as required, and the plows or shovels have a socket connection with the beam, also adjustable according to the work to be done, while the driver's seat is so arranged that it may be moved either forward or backward on the frame.

Mechanical.

FRICTION CLUTCH.—Daniel T. Denton, Soudan, Minn. This invention covers a construction in which the clutch wheel is pivotally connected by toggle links with a collar secured on the main shaft, with other novel features, the clutch being especially adapted to hoisting machinery, in which a powerful friction and large bearing surface are required.

COTTON PRESS.—August Schkade, Giddings, Texas. This invention covers a tramper attachment for cotton presses which may be readily applied to any press, and is designed to be operated by steam, the attachment being simple and durable, and the invention covering various novel features of construction and combinations of parts.

CONVERTING MOTION.—Edward Burke, Le Mars, Iowa, This is a mechanism for converting reciprocating motion into rotary motion, or the reverse, employing a rectilinearly reciprocating rod, a shaft with rigid crank arm, a small traveling gear wheel mounted on the outer end of the crank and having a crank connecting with the rectilinearly moving rod, a stationary concentric gear being connected with the traveling gear wheel.

Miscellaneous.

SAD IRON.—Julius J. Czepull, Charleston, S. C. This is a self-heating sad iron which has a hollow body connected by pipes, and so constructed that when the reservoirs are once filled with gasoline, and the gases issuing from the burner are ignited, the sad iron will be continually heated for about six hours before the reservoirs need to be refilled with gasoline.

BOTTLE STOPPER.—William P. Crary, New York City. In this stopper the cork is covered with cloth or other tissue, which is tied above the cork, and extends above the binding cord to furnish a grasp or handle for withdrawing the cork from the bottle, this covering being also adapted to be tied down over the neck of the bottle to protect the cork and neck.

WATCH CASE PENDANT.—Frank G. Faxon, Mount Morris, N. Y. This invention covers a construction of a pendant set in which the watch bow will retain the winding and setting stem within the pendant when in its normal position, but which will release the stem-holding springs when the bow is in a particular position.

BRICK TRUCK.—James C. Steele, Statesville, S. C. This is a wheeled truck, with a pair of rests or lifting arms arranged between the wheels and near the ground, with lifting mechanism for both the front and rear ends of the arms to raise and lower them in level position, the arms being designed to be pushed under a platform carrying a load of bricks.

VEHICLE BRAKE.—John Fraser, Simcoe, Ontario, Canada. This invention covers novel details and combinations of parts in a brake designed to be simple and durable, and which will not only lock the wheels when the vehicle is descending a hill, but which will also lock the wheels should the vehicle be stopped in ascending a hill.

LETTER SHEET AND ENVELOPE.—Henry A. Ditzell, Romulus, N. Y. This is a sheet with gummed projecting portions adapted to make a combined letter sheet and envelope, and also having a projection adapted to bear the return address on the front of the envelope.

WARM AIR INHALER.—Louis Weigert, Berlin, Germany. This invention relates to an apparatus for supplying heated air of a suitable temperature for inhalation by persons suffering from diseases of the throat or lungs, the apparatus having a chamber heated by a burner, with outlets for the escape of the products of combustion, and an outer chamber to heat air by contact with the central chamber.

FLYING MACHINE.—Reuben J. Spalding, Rosita, Cal. This machine consists of a jacket adapted to the body of the aeronaut, right and left wings and a tail held to the jacket, and a balloon from which the aeronaut is suspended by connections to the jacket and to straps or bands encircling his legs.

PAPER BOX.—Emil L. Meyer, Brooklyn, N. Y. This invention covers a blank of novel form and a box set up from such blank, which will be strong and inexpensive, and which may be mailed or shipped cheaply in flat or unfolded condition, and will keep its shape when set up, without the use of glue or other adhesive at the joints.

TRUNK.—Henry W. Rountree, Richmond, Va. This improvement is designed to give access to the body of the trunk without the necessity of lifting the tray out, the arrangement being such that the tray may be slid back on a horizontal line into the hinged lid or top when open without lifting the tray off its supporting strips.

EYEGLASS POLISHER.—Edward E. Thorpe, New York City. This polisher consists of an outer backing or body of flexible material and an inner sheet of polishing material, the latter being connected to the backing or body, the polisher being preferably made in a form convenient to fold and carry in the pocket.

CASH CARRIER.—Nelson Weeks, Jr., Long Island City, N. Y. This invention is designed to so improve cash carrier apparatus as to effect the complete independence of the several sales stations, conveying the cash pockets to and from each station by a single carriage without the interference with or dependence on the cash pockets of the other stations.

SHIPPING RECEIPTS.—Daniel K. Howe, Portland, Oregon. This invention provides a safe and convenient receptacle for a large number of receipts or papers, without the necessity of binding them between covers, and where also duplicate receipts or stubs may be safely and conveniently kept prior to filing them away.

TAG HOLDER AND TAG.—Martin L. Fogel, Superior, Neb This is adapted to be readily attached to and detached from packages of goods to be marked without injury to the goods, to remain securely upon the package until the package is consumed, while the tag holder can be used over and over again until worn out.

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Notes & Queries

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.

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.

(538) A. W. P. K. asks for (1) method of cutting glass by means of fire. A. File a notch in the glass and touch with a red hot iron. This may be repeated until a crack is started. A drop of water may be placed on the spot to start it, if it fails to appear. Then by moving a hot iron a little in advance, the crack can be led in any desired direction. 2. Recipe for making an invisible chemical substance which makes a snapping noise when stepped upon. A. Mix 2 parts chlorate of potash and 1 part red phosphorus with a little gum water, and apply drops of it to paper. It is very dangerous to work with. 3. Candle power and voltage of a 4 quart Bunsen battery. A. Such a cell will give nearly 2 volts and 10 watts, equivalent to two or three candle powers. 4. How many 4 quart Bunsen cells are required in operating a 2 gallon nickel plating solution? A. One or two cells.

(539) W. H. C. writes: 1. What is the difference between an electrical and a steam horse power? A. There is no difference, properly speaking. One horse power second of mechanical energy converted without loss into electrical energy would generate 746 volt-coulombs. The rate of one mechanical horse power is 33,000 foot pounds per minute; the rate of one electrical horse power is 746 volt-amperes But as in the conversion there is inevitably a loss, ten per cent may safely be subtracted from the electrical H. P. to get a practical figure. 2. How many storage batteries would it take, of 300 ampere hours and 2 volts, to run a motor of four electrical horse power? A. If we assume a discharge rate of 30 amperes, then 50 cells would be needed. 3. About what would be the cost of storage batteries of the above capacity? A. For prices address any reliable firm of electrical supply dealers.

(540) R. H. B. writes: In SUPPLEMENT, No. 633, p. 10110, you describe Prof. Low's incandescent gas burner. Would you please inform us through your columns what is the incandescent cone made of, and how is it made? Please tell us of some cheap composition that will stand incandescence for five or six hundred hours, over a Bunsen burner. A. The composition of the cones of incandescent burners is secret. Zirconia forms a prominent constituent. Platinum wire is sometimes used. A mixture of zirconia and magnesia or lime would answer, but it is doubtful if it would last 600 hours.

(541) G. W. R. writes: Will you inform me what effect about 2,000° Fah. will have on graphite in its powdered state, also whether it is considered a good non-conductor of heat? A. The heat mentioned will have no effect on graphite. It is a conductor of heat if compressed, but only a poor one; if in loose powder, it is a still worse conductor.

(542) J. R. B. asks in what manner the alternating current differs from other currents in electricity. A. As its name denotes, it changes its direction continually, sometimes many hundred times a second.

(543) H. D. W. writes: In Greensburg, Pa., is located a house which often is the scene of peculiar electrical phenomena. Everything therein in the way of metal becomes charged with electricity, such as gas fixtures, door knobs, etc., and even the occupants in passing each other in rooms or halls who touch hands can experience a shock. In turning on a gas light the shock is often very pronounced. The house is located in the natural gas region, which is burned in fireplaces and ranges, but is not used for illuminating, and there are no electric wires attached to the house at any point. One or two other houses in the same place have been charged with electricity, but not to such an extent as the one under consideration, and the disturbance can be noticed only on clear days. Can you throw any light on this subject? Will you please, if it can be done, explain why this electricity is in the house and where it comes from? A. The air of the house and the materials composing it, we presume, are very dry, so that the friction of a person's shoes upon the carpet is enough to excite electricity.

(544) H. C. writes: I am making a small electric motor. The magnet is made of ten pieces of Russia iron, each 13½ in. long, 2 in. wide, and about 1-40 of an inch thick, bent in the form of a circle about 4½ in. in diameter. The armature is a gray iron casting for an H armature, 2 in. long, 1½ in. diameter, with a groove 1 in. × ⅜ in. for the wire. I should like to run the motor with three Crowdus Universal batteries, each having an advertised E. M. F. of 2·5 volts, an internal resistance of 0·4 ohm, and a current through its own resistance of 5 amperes. 1. Please tell me how much and what size wire I should put on each magnet pole and armature to obtain best results with my battery? A. Your results will be very inferior on account of the material and construction of your armature. It should be built up of sheet iron punchings with shellacked tissue paper between them. Wind field and magnet with No. 20 wire, using altogether 200 feet. 2. How much power should you think the motor ought to give? A. The motor will not give over 1-100 H. P.

(545) H. P. writes: I would like to ask you how to make a battery to run a small or toy motor. I have a jar 6 in. × 8 in. Is there any way of constructing it to run the motor? Or is there any battery that will run a small motor for months without recharging the same? If so, how are they made? A. For batteries see SCIENTIFIC AMERICAN, December 17, 1887, and for a battery plate made from electric light carbons see SCIENTIFIC AMERICAN, October 27, 1888. A large gravity battery is most constant for long periods. See SUPPLEMENT, Nos. 157, 158, and 159, for description of all prominent batteries.

(546) M. L. asks the relative loss by friction on a common steel shaft running in: 1. Ice boxes (theoretically)? A. The friction of steel on ice journals has no record. On runners it is very low, probably not exceeding one per cent of the load. 2. Steel boxes? A. Steel shaft in steel boxes, continuous lubrication, 3 to 3½ per cent. 3. Babbitt metal boxes? A. Steel shaft in Babbitt, 4 to 4½ per cent. 4. Brass boxes? A. Steel shaft in brass, 4 to 5 per cent. 5. Graphite boxes? A. Steel shaft in graphite boxes dry, 5 to 6 per cent of the load. The friction of journals varies very much with the quality and kind of lubricants.

(547) F. S.—You will find the red mulberry tree growing in Central Park, on the Bloomingdale road (this side of the Asylum), on Hoboken Heights, N. J., and at Glen Cove, L. I.; and the white mulberry you will find rather common in cultivation about the city, and in Astoria, Hoboken, etc. As regards distribution, the red mulberry (our native species) is found in rich woods from New England to Illinois and southward.

(548) F. H. S. writes: I have a steam fruit evaporator, which is a horizontal shaft of the following dimensions: Length 46 feet 8 inches, height 7 feet, width 4 feet. The heat is obtained by five horizontal coils of 1 inch steam pipes. Horizontally the pipes are 4 inches apart, and vertically 12 inches apart. One end of the shaft is raised 4 inches to give drainage to the pipes. The drying is done on eleven rows of gal-

vanized wire sieves distributed between the coils of steam pipes. Air for drying is admitted at the bottom of this shaft along the floor by slide doors. And to carry off the moist air I now use natural draught, by a wooden stack, 4 feet square and 20 feet high; at one-third of the distance from each end of the shaft, two more moist air draughts, each 4 feet square, connect with the 20 foot high stack from the top of the center of the shaftor evaporator. When I run this evaporator up to its full capacity, it puffs up and sweats the fruit with only 150° of heat. If I should put an exhaust fan in the center of the moist air stack, would it stop this sweating and cooking process of the fruit that I am now troubled with? If it would, what kind and size of fan would it require to give the best results for this sized evaporator? A. It appears from your description that the ventilation of the evaporator is not equally distributed, or is weak at the ends. This should be tested by thermometers at points out of the direct current of air through the evaporator, to ascertain inequality of temperature, and if found, should be regulated by increasing the number of vents and lessening the size. The wire sieves should not be too close to the steam pipes, as the strong radiant heat would cook the fruit, when a thermometer hung up in the moving air would only indicate 150°. If you had only one row of steam pipe with the fruit above it, or in other words, spread the plant over a larger area with less height, the cumulative heat of air circulating through 5 rows of coils would be avoided. We apprehend (although you failed to state it) that the trouble is on the upper shelves at points of least circulation. A common fan blower of 2 feet diameter, blowing the air into a chamber under and along the bottom of the evaporator, with perforations to equally distribute the air, might prevent cooking in the hot parts, but would make the lower tier too cool for effective service. The most effective driers for fruit have all the heat below, so that air of the same temperature pervades the whole chamber. This arrangement is largely used in New York and other places for drying fruit.

(549) H. L. asks: 1. Would it cost any more to run the dynamo after it was set up and ready to run than it would cost to run oil lamps for the same amount of light? A. Oil lamps are more economical than incandescent electric lights. 2. In what SUPPLEMENT can I find it described in full? A. SUPPLEMENT, No. 600. 3. How are the magnet arms secured to the base and top, and of what kind of iron are all the castings made? A. This information is given in the SUPPLEMENT referred to. 4. What do you mean by the polar extremities? A. The extremities in which the magnetic poles are developed. 5. Would not copper bars do instead of the bronze bars of the commutator? A. Yes. 6. Where can I get copper or bronze? A. Consult our advertising columns. 7. Can I melt copper or bronze in a blacksmith's forge, and in what? A. You can melt it in a Hessian crucible. Heat the crucible and its contents gradually at first. 8. How can I mould the metal for the commutator cylinder. A. Use ordinary moulding sand. 9. Would it not do as well to solder the ends of the armature wire to the commutator cylinder as to screw them? A. Solder is apt to fail in such a place. 10. With what size wire shall I wrap the armature and magnet of a twelve-light machine, made on the same principle as the eight-light machine? A. Wrap the armature with No. 18 wire. Apply four extra layers of wire to the magnet, and increase the speed.

(550) A. V. asks: Would you be so kind as to let me know how many layers and how many turns in each layer of No. 10 copper wire will bring a magnet to its maximum point, the core of which is soft iron, being 1½ inches in diameter, 10 inches long, being in circuit with 250 16-candle power lamps connected in multiple arc, from a dynamo having 72 volts? A. We presume that your lamps are 70 volt; if so, their resistance is very slight, and you cannot afford to introduce more than a fraction of such resistance in series with them. Thus No. 4 wire would introduce a resistance of about one-tenth ohm, or nearly one-third that of your lamps, reducing their illuminating power seriously. Your proper method is to use heavy wire, and if necessary increase the size of the core, and as a last resource use lamps of lower voltage.

(551) O. T. H. writes: 1. In the SCIENTIFIC AMERICAN SUPPLEMENT, April 14, 1888, No. 641, page 10240, on the 31st line, about how to make a simple electric motor, it reads: "The size of the iron wire of the core is No. 18 American wire gauge," and on the next page, the 7th line from the last, it reads: "Size of wire on armature, Am. W. G. No. 16." Please tell me which one is right? A. Both. No. 18 iron wire is right for the core, and No. 16 is right for the coils of the conductor wound upon the core. 2. What is meant by a disk of vulcanized fiber? A. Vulcanized fiber is an insulating material used largely in electrical work. 3. How much will it cost to run the simple electric motor for eight hours? A. Seventy-five or eighty cents. 4. Which is the easiest way to make a cell of plunging bichromate battery, having one zinc plate 5×7 inches and two carbon plates of the same size? A. Place the zinc plate between two paraffined quarter inch bars of wood. Place the carbon plates outside of the strips, and clamp the carbon plates and the zinc plates together by means of a pair of paraffined bars of wood three-quarters of an inch thick, and extending beyond the edges of the plate.

(552) F. G. W., Denver, writes: On Sunday, February 3, there were three groups of spots on the sun in the form of a triangle. These groups seemed to be composed of minute spots. On Monday afternoon, February 4, we had a violent dust and wind storm. It continued through the night. On Tuesday afternoon, February 5, I observed the sun. The spots had disappeared. With my strongest eye piece, giving a power of 100, I could not detect a trace of the spots. I am almost certain that there was some connection between the storm and the spots. Would a solar cyclone, or something like it, produce such a storm? A. The past season has been a period of minimum sun spots, and any sudden outburst of spots upon the sun at such periods indicates abnormal conditions of activity at the solar surface, which at times heretofore have caused coincident magnetic storms upon the earth. These magnetic storms have been followed by wind storms. It seems to be pretty well established that there is an almost instantaneous coincidence of magnetic effect upon the earth derived from solar disturbance. This may also resolve itself into its electrical equivalent and become observant in corresponding meteorological phenomena.

(553) R. A. W., "Adams Co."—In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 182, and in others you will find many forms of electro-magnets described. In general terms the larger you make the magnet, the greater will be the power. You might try a one inch bar of iron, two feet long, bent into U shape, and wound with 1,000 feet of No. 15 wire. This with from five to fifteen cells of Fuller battery would give an excellent effect.

(554) G. E. T.—White military belts can be made to look as good as new by the following: Dissolve 1 ounce white tallow soap in ¾ pint of warm water and mix well therewith white of one egg and 3 ounces fine Paris white. Wipe in and rub down with a rag. White Castile soap may be used where the white tallow soap cannot be had.

(555) R. S. asks: 1. What size should I make the iron wire armature core of simple motor, March 17, 1887, if the whole armature was to be 5 inches diameter? What size iron wire would I have to use for the core, and how many layers of it would I have to wind? A. Use 12 layers of No. 18 wire. Make the core 3 inches wide. 2. What size wire would I have to use on armature, and how many layers on armature? A. Wind the core with No. 16 wire disposed in 20 coils of six layers each.

(556) J. S. S. writes: 1. I can get almost unlimited gravity battery power (nearly 300 cells), and would like to run a simple electric motor as described by you. How can I do it by this battery? A. If you wish to use all the cells, place 16 in series and as many as you wish in parallel, the more the better. A. Gravity battery, owing to its high resistance, is ill adapted to this work. 2. In the storage battery does the current decompose the water? A. Not unless the current is continued after the battery is fully charged. 3. (*a*) What is the amount of the dangerous alternating current? (*b*) Of the continuous? A. (*a*) 600 to 700 volts. (*b*) About the same.

(557) W. A. R. asks: Can you change the center of gravity of a dish by filling it with water, or in other words, can you make a hollow vessel or dish of such a shape that it will tip over by filling it with water? A. To a pipe inclined at an angle of 45° attach a small base of sufficient weight to support the pipe while empty. Such a vessel when filled with water will tip over.

(558) C. E. B. asks: 1. If five Leclanche cells were to be set up in one common solution without the glass jars, would such a battery be equal in power to one of the usual form of separate jars? A. No; its power will be scarcely more than that of a single cell. 2. How many electric light carbons six inches long should I use to each zinc in a sal-ammoniac battery to get the best results? A. 9 or 10. 3. For electric gas lighting should the zincs and carbons be connected one to the other, or should they be connected separately? A. For a single lamp the zinc of one cell should be connected with the carbon of the next, and so on. For a number of lamps the elements would have to be connected according to the voltage of the lamps. 4. Would such a battery as described above or a Leclanche battery work with a solution of salt (chloride of sodium)? A. You can get a current from a Leclanche battery charged with a solution of common salt, but it is not equal to sal-ammoniac, and it evolves chlorine, which is disagreeable. A Leclanche battery is very quickly polarized in active service, and takes time to recover.

(559) H. D. H. asks: Have ice boats been known ever to make 100 miles an hour, and about what rate of wind would be necessary for that speed under the most favorable circumstances? A. We have no record of so high a speed as 100 miles per hour for an ice boat. A 60 mile gale might produce the speed if the boat could preserve its leeway, or hold up to the wind, which is very doubtful. Probably from 50 to 60 is the highest speed ever attained. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54, 61, 214, and 220, for sailing faster than the wind.

(560) W. F. P. writes: 1. I find the battery described in the SCIENTIFIC AMERICAN for December 17, 1887, soon becomes polarized. Will you kindly inform me through your Notes and Queries how I may remedy this? Is it necessary to amalgamate the zincs often? A. All single-fluid bichromate batteries are unsatisfactory as regards constancy of current. You cannot remedy it. 2. Is there any hand dynamo described in your paper that may be constructed without castings? Is the simple electric motor suited for this purpose? A. The trouble with a dynamo having soft iron laminated magnet cores, such as used in the motor named, is that it is hard to start the current for want of residual magnetism. We advise you to adhere to cast iron cores for small machines.

(561) A. A. writes: With regard to the simple electric motor in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, of April 4, 1888, page 10240, will you be kind enough to inform me if a field magnet with the body made of cast iron would be as efficient as one made of strips of Russia iron, such as described in the article? A. The difference is slightly in favor of the Russia iron or wrought iron magnet, but if you use very soft gray cast iron, the difference will not be perceptible.

(562) Motor.—Any device which will keep the bars of the commutator smooth and clean would be worthy of a patent, and could be patented if new.

(563) A. P. asks for the value of coal gas for cooking purposes. Is it to be preferred to coal, and is it more economical than coal? Could you give me the address of a good maker of gas stoves? A. Coal gas for cooking saves the annoyance of ashes and dust, and if properly used, is in many cases not more expensive than coal, as it can be extinguished as soon as the cooking is over. For gas stoves apply to your gas company, or consult our advertising columns.

(564) W. J. H. asks: 1. Will the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, run lights enough to light a room 20×40×12? A. The dynamo will run eight to twelve 16 candle power lamps—hardly enough for room you mention. 2. What kind of lamps are the best to use with it? A. Use Edison or other incandescent lamp, 60 volt, arranged in parallel. 3. How much power does it require to run the dynamo, and what would be the running expense of the lamp per hour, when run from 4 to 6 hours a day? A. About one horse power. A lamp will last about 400 hours. From these data you can make your own calculations, based on expense of fuel, etc., in your locality.

(565) A. H. asks: 1. What is paraffine wax made from? A. It is made largely from distillation of coal at low temperatures. Ozocerite, a natural mineral, is also an extensive source. 2. At what temperature does it run best (to mould)? A. Different samples melt at different temperatures; such as requires 112° Fah. or more is adapted for casting. When well fused, you can pour it into the moulds. 3. Is oil proper to use? A. No. Generally you will require nothing on the mould. 4. How do you cleanse it? A. Melt it and keep in fusion until impurities either settle or rise to the top, when they can be removed. You can wash it with hot water or filter while hot through flannel. Chemical treatment involves heating with strong acids or alkali, according to the nature of the impurities, followed by washing.

(566) H. S. C.—For description and tests of the modern great guns see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 230, 256, 450, 510, 583, 600, 617, 615. For the great battles of the world, see Fisher's "Outlines of Universal History," which we can mail for $3.50. We know of no successful attempts at aerial navigation without balloons.

(567) F. V. B. asks how to temper drills to drill surface rocks and bowlders, some of the hardest granite, others more like flint, and what steel is best to make the drills of? A. Use what is called "drill steel" in the hardware trade. Make the cutting edge rather thick, and do not draw the temper. Any blacksmith can forge and harden such drills at the lowest heat without drawing the temper.

(568) H. W. G.—Belts that slip from overwork are benefited by lagging the pulleys. It is true that two cylinder engines at right angles have no dead center without a balance wheel.

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.

(569) C. P. T. writes: The months of January and March of this year have each two new moons on the first and thirty-first days, while February has none. Can you tell me how long it will be until another such event occurs?

Replies to Enquiries.

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

(404) H. R.—Water Power, etc.—For estimating the value of a water power, multiply the water flowing in the stream in cubic feet per minute by 62·4 (the weight per cubic foot) and by the fall in feet. Divide this product by 33,000 for the horsepower. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 616, on water power. 2. Set posts butt down. 3. Bark on, wet or dry as convenient. 4. Charred posts last 50 per cent longer than uncharred. 5. Winter is the best time to cut posts.

(405) C. A. A.—Roofs.—Water from a galvanized iron roof is not safe. The roof should be painted with iron oxide paint. Galvanized iron pipe is largely used for conveying water, and is considered safe if water is allowed to run constantly. Tin makes the best roof, all things considered. Water is safe to drink from a roof painted with oxide of iron paint.

☞ 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.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 12, 1889,

AND EACH BEARING THAT DATE.

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

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