

RECENTLY PATENTED INVENTIONS.

Engineering.

SMOKE ARRESTER.—William P. Shank, Cairo, Ill. This invention comprises a water tank and collecting chamber, with nozzles leading from the chamber to the tank, and blast devices discharging into the tank for the separation of the soot, the nozzles opening below the surface of the water and having contracted discharge openings. The invention is designed to effectually stop the emission of heavy products usually discharged in smoke from furnaces.

COAL CHUTE.—John Scully, South Amboy, N. J. This invention relates to chutes for discharging coal from cars into vessels, coal bins, etc., and provided with screens over which the coal passes. The chute is supported on the usual framework, with tracks and openings between the rails for dumping the coal into pockets, in connection with which is an adjustable sliding gate, arranged below which is a screen bottom, while a lower or swinging chute is hinged to the fixed chute. The pitch of the swinging chute may be arranged as desired, and the stream of coal is somewhat retarded, so that while an even and not too large quantity of coal will be run steadily over the screen, the coal will be kept and delivered in good condition.

Railway Appliances.

CAR BRAKE.—John Mayer, Amsterdam, N. Y. According to this improvement peculiarly constructed frictional contact blocks are supported above the track rails near the car wheels, and means are provided to rock the blocks to cause them to have more or less bearing on the top faces of the rails, the faces of the blocks acting in a measure as cams to lift the car body from the track, and, in cases of extreme urgency, thus lifting the entire weight of the car upon the brakes.

FREIGHT CAR.—John J. McClimont and Peter Marron, Aspen, Col. A simple device applicable to the roof of a box car has been provided by these inventors, so that openings in the roof may be easily made when necessary to facilitate loading and unloading, but such openings may not be made from the exterior of the car. The covers of these openings are so arranged that in connection with an ordinary chute they will form a hopper through which grain, ore or other freight may be loaded on the car, and a simple lock is provided for fastening the covers to the openings on the inside of the car.

RAILROAD RAIL OR TIE DISTRIBUTER.—Caleb C. Gates, Forsyth, Montana. This is an attachment for a car adapted to carry rails or ties, consisting of a series of roller sections and supports adjustably and removably connected, whereby the distributor may be made in any desired number of sections, readily coupled together and rigidly held at the desired angle. The speed of the material passed over the distributor may also be regulated, and the rails be directed either to the right or the left in discharging them.

Mechanical.

WRENCH.—Archibald McCallum, Conrad, Pa. This is a quickly adjusted and convenient tool in which the handle and head are adjustably connected to enable the handle to be placed at the desired angle to the head. This adjustment of the handle may be easily effected, and provision is made for working the wrench as a ratchet wrench in either direction, the head being locked at any angle in fixed relation to the handle, against movement in either direction.

CLEAT.—John C. Steelman, Linwood, N. J. This inventor has provided a clamp consisting of a body with a recess or mouth in one of its ends and inclined lower roughened wall, a jaw eccentrically pivoted in the mouth having a concave ribbed lower face. The improvement forms a simple, strong and inexpensive device adapted for use wherever the clamping of a rope is required, the cleat biting the rope or cable forced in contact with it.

LEATHER STRIPPING MACHINE.—Michael J. Ryan, New Orleans, La. This machine is adapted to cut an entire side of leather into a series of strips of a desired width at one time, the leather being properly fed and guided and the strips smoothly and rapidly cut. The machine has a pair of feed rollers, the upper one with projecting bearing faces, and mounted above it is a swinging bar, to which is secured a number of downwardly projecting and laterally adjustable knives. The leather as cut is delivered in parallel strips at the rear end of the table.

MATCH MAKING MACHINE.—Henry A. La Chicotte and Walter B. La Chicotte, New York City. The veneers of wood fed to this machine are cut into splints of the desired cross section, and the splints are fed to an apparatus which cuts them of a uniform length, the splints before being cut being engaged by gripping devices which carry the splints after being cut to an oil or paraffine bath, and next to a bath of an ignitable compound, finally removing them to be dried and delivered to a suitable receptacle, the operation being continuous and automatic after the veneers have been once fed into the machine.

Agricultural.

POTATO DIGGER.—Nathan Sturdy, Chicago, Ill. In this machine an elevator frame and a draught frame are pivoted on the axle on which the two supporting wheels are loosely mounted. An adjustable shovel removes the potatoes from the ground, to be received, together with the vines or roots that may cling to them, by the elevator, which has vibratory motion, designed to free the potatoes from dirt, etc., and deliver them to a hopper, whence they are directed to receptacles on a platform at the rear of the machine.

TRANSPLANTING MACHINE.—August Willner, Germantown, Ohio. This is an improvement in

machines having furrow openers and liquid discharging tanks, with means for closing and smoothing the furrow, whereby the furrow is opened to place a plant therein, the soil is moistened, and the loose earth carried around the roots of the plant and pressed down by a covering or pressure wheel. This machine is adapted to rise and fall according to the inequalities of the ground or to pass an obstruction, being fitted for work on a hill side or on rough ground as well as upon a level.

Miscellaneous.

PHOTOGRAPHIC LENS, ETC.—Henry Vander Weyde, London, England. This invention relates to portrait photography and consists essentially in interposing in the pencil of rays lens-like media of peculiar form, convex or concave, whereby the rays of light will be so refracted as to produce the effect desired, and yet the parts modified will flow into and merge with the surroundings. The media may be interposed either within or without the camera, the curvature and form of the lens-like medium varying according to the desired effect, whereby different portions of a picture may be made larger or smaller, or otherwise artistically modified.

TRIGGER FOR DOUBLE-BARRELED GUNS.—William Fleming, Newberry, Pa. In this firearm a single trigger is combined with two sears, the trigger carrying an adjustable shoulder, adjustable laterally, in connection with a spring for throwing it to a middle position, and locking devices for holding it to either side. The invention is designed to dispense with the necessity for more than one trigger for double-barreled guns, and provide a trigger by which either barrel may be fired independently or both barrels together, or either one in sequence after the other.

SAFETY MATCH.—William Barnhurst, New York City. According to this invention the match splint is detachably connected with a sleeve or envelope, the sleeve having a rubbing compound and the splint an igniting compound, each held normally out of engagement with the other, and yet located one in the path of the other, ignition being effected when the splint is separated and drawn from the sleeve. The two parts are combined in one article forming the match, which is ignited as the splint is withdrawn from the casing.

GATE LATCH.—Gabriel Rohrbach, Del Rio, Texas. This improvement relates especially to latch attachments for swinging gates which move the lock latch vertically as they are swung. The gate has a pivoted latch arranged to engage a catch consisting of oppositely arranged pairs of converging flanges separated to receive the latch, swinging detents being pivoted inside the entrance slots, and a keeper being placed below the lower flanges. The device is very simple, durable, and easily applied.

STOPPER.—Max Rubin, New York City. This device comprises a shell having an inlet in its bottom and a spout leading from one side near the bottom, while a plug valve fitted to travel up and down in the shell has at its upper end a lip closing over the outer end of the spout when the valve is seated in the shell. The improvement is adapted for use with bottles of any description, cans, or other receptacles, the stopper automatically and perfectly sealing the outlet when seated in its shell.

DISPLAY BOX.—Nicholas Schroder, New York City. A box to conveniently hold scarfs and similar articles in position for shipment and display in stores has been provided by this inventor, the box being strong, simply made, and inexpensive. A flanged holder is secured to the bottom of the box, while triangular projections between the flanges form notches for the reception of the article, tongues extending from one flange nearly to the other.

PENDULUM ESCAPEMENT.—Charles E. Buckbee, Flushing, Mich. The escapement wheel, according to this invention, has on one surface a series of inclined planes extending from near the center to the periphery, the planes being located at stated intervals, and friction rollers on the ends of a crosshead secured on the pendulum rod are adapted for alternate engagement with the inclined planes on the wheel. The construction is durable and simple, and the escape wheel has no recoil.

ICE CREAM FREEZER.—Joseph B. Butler, Brooklyn, N. Y. This is an inexpensive and easily operated machine for readily and quickly freezing individual creams in numerous compartments, creams of dissimilar flavors being thus simultaneously frozen. The several compartments or cups are so arranged that they may be readily removed, and each is hermetically sealed by a cover which prevents contact with the brine or water of the freezer.

CHECKREIN SUPPORT.—Joseph Carter, Blyth, Canada. This is a combined checkrein support and winker stay, the support for the overdraw check effectually preventing the checkrein from wearing upon or rubbing against the head of the horse, while the winker stay is adapted for attachment to the winkers or blinds, which may be held at any desired angle to the animal's head, and be quickly and conveniently adjusted in the required position.

CIGARETTE WRAPPER HOLDER.—José R. Hernandez, Havana, Cuba. This is an improvement on a formerly patented invention of the same inventor for a device for holding and smoothing the wrappers before they are rolled around the filler. A lever is pivotally connected with uprights in a table on which the wrappers are laid, a pedal being connected with the rear arm of the lever and a plunger with its front arm, with which also is pivotally connected a ring, in connection with a guide secured to the table, and a spring bearing on the front arm.

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SCIENTIFIC AMERICAN BUILDING EDITION.

JUNE, 1894. (No. 104.)

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- Elegant plate in colors showing a cottage at Rochelle Park, recently completed for Dr. N. M. Beckwith. Floor plans and two perspective elevations. Cost complete \$11,000. Mr. G. K. Thompson, architect, New York. A very unique design in the old Dutch style of architecture.
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- A residence in the colonial style recently erected at Ashbourne, Pa., for Addison Foster, Esq. Perspective elevation and floor plans. Estimated cost \$5,500. Mr. Samuel Milligan, architect, Philadelphia, Pa.
- A residence at Freeport, L. I., recently completed for J. E. Brown, Esq. Perspective elevations and floor plans. Cost complete \$6,950. An attractive design.
- The dwelling of J. S. Benner, Esq., at Reading, Pa. Three perspective views and floor plans. Mr. Geo. P. Barber, architect, Knoxville, Tenn.
- A colonial cottage recently completed for Howell E. Beane, Esq., at Ashbourne, Pa. Cost \$4,000. Perspective elevation and floor plans. Mr. Horace Trumbauer, architect, Philadelphia, Pa.
- Perspective elevations and floor plans of a cottage recently erected for A. P. Dunn, Esq., at Lowere, N. Y. An elegant and attractive design. Cost complete \$3,800. Mr. R. H. Duryea, architect, New York.
- California Midwinter Fair. Half page engraving, showing a bird's eye view, the Mechanic Arts Building; also a view of the Fine Arts Building.
- Miscellaneous Contents: Damage to water pipes by electrolytic action.—Red slate.—Treating stones for construction.—Metal plated lumber.—Damage by lightning.—Gas from wood.—The steel-clad bathtub, illustrated.—An attractive greenhouse, illustrated.—The band saw.—The "Grand" fire-place heater, illustrated.—Fly screens, illustrated.—The Norris patent sash pulley, illustrated.—Glu-tol.—The Ives sash lock, illustrated.—Interior finish of the home.—The Peerless steam and hot water heater, illustrated.—Reproducing architects' drawings.—Cortright metal roofing shingles, illustrated.—A fine metalwork arch, illustrated.

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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. Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same. 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.

(6098) R. B. asks: 1. What is the specific gravity of the vapor of benzine? Is it heavier than air. A. The vapor of benzine or naphtha is heavier than air. Its specific gravity being from 2.0 to 2.5. 2. Mercury boils at 682° Fah. How high a temperature will it record reliably? A. Mercurial thermometers are made for temperatures up to 600° Fah. 3. What are the temperatures required for distilling of benzine, gasoline, kerosene, lubricating oils, and paraffine, and what is the greatest heat required in any process of distilling crude American oil? A. Light benzine boils and distills at from 180° to 200° Fah. Naphtha and gasoline at 250° to 300° Fah. Kerosene, 300° to 380°. Paraffine is separated after the last distillate. About 400° Fah. is the highest heat. 4. What is the difference between paraffine and vaseline? A. Vaseline is the residue from the oil stills purified by filtration. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 429, 485, for details of the process, 10 cents mailed. It is virtually a soft paraffine. 5. In distilling crude oil there is a very poisonous gas comes out of the tail pipes. What is it chemically? When there is sulphur and arsenic in the crude oil, do they make the escaping gas any more deleterious? A. There are lighter hydrocarbon gases distilling under 170° Fah. that may carry off vapors of sulphur and other poisonous substances constituting the first gases from the tail pipes. 6. About what proportion of air and benzine vapor is explosive? A. Any proportion of air and benzine or gasoline vapor between equal parts and 1 of vapor to 12 of air is explosive.

(6099) R. M. G. asks: What is the longest distance a cannon has been known to throw a shot? What is the greatest range attained by modern guns? What is the greatest range of the guns (heaviest) of W. M. S. Blake? For what distance are the guns of the Blake sighted? Is there any truth in the statement that a gun is, or has been, chained to the rocks at Dover, England, which threw a shot across the English Channel to Calais? A. Seven or eight miles is probably the greatest range actually made. Twelve to thirteen miles is the computed range of the most powerful guns now made. To obtain this range an elevation of nearly 45° is required. The mounting of the guns of the Blake and other ships carrying heavy ordnance is not intended for the greatest possible range. They can be sighted for ranges up to 7 or 8 miles. Shooting across the English Channel has been commented upon in journals and military circles.

(6100) M. W. asks what kind of paper to put on pulleys to keep them from slipping. Also a recipe for making cement for putting it on. A. Use the toughest wrapping paper that can be obtained. If the pulley has been used and is polished, scratch the face with a coarse file and remove all grease or oil with a solution of sal soda. For the cement use the best glue, soaked and cooked quite thick. When ready to apply the paper, add a half gill of hot strong decoction of oak or hemlock bark to each pint of glue. Have the pulley warm and apply the glue to the paper in strips and wrap tightly on the pulley as many thicknesses as may be desired. Six to eight thicknesses make a good working pulley, durable, according to the severity of the work, from 6 months to 3 years.

(6102) M. L. R. asks: 1. Which is the better for use on a short telephone line, No. 16 hard drawn copper wire or No. 12 galvanized iron wire? A. The copper wire. 2. How many cells of the diamond carbon and how many cells of the Samson battery would it require to ring one bell through a line 1,000 feet length with earth return? A. Allow four to six cells. 3. How much does No. 12 galvanized iron wire weigh per mile? A. 327 pounds. 4. Can a common telephone receiver, such as was fully described in the SCIENTIFIC AMERICAN of February 3, 1894, be used successfully as both receiver and transmitter? A. Yes. 5. Will the receiver with the compound magnet give any more volume of sound over a given amount of wire than a receiver with a round bar magnet? A. The compound magnet telephone is the best. 6. What is the charging fluid of the Samson battery? A. Solution of chloride of ammonium. 7. Which is the better for open circuit work and which has the longer life, the Samson or the Diamond carbon battery? A. We cannot undertake to pronounce as to relative merit in such cases. 8. Will you please give me the address of some reliable company where I can get a good receiver at a low price? A. Consult our advertising columns.

(6103) W. A. asks how to determine the amount of current and number of volts necessary to run an electric motor, the size and number of feet of wire being known. I have a small motor; the armature is wound with twelve coils of No. 22 wire, twelve feet in each coil, 144 feet in all, and the fields are wound with 350 feet of No. 18 wire, and I wish to know the amount of current and number of volts it will require to run it to its full capacity. A. The current and voltage required depend on whether the motor is shunt or series wound. If shunt wound, allow all the current the field wire will stand, and calculate by Ohm's law the voltage for this current based on the resistance of the field. If series

wound, then give twice the current the armature wire would stand and apply Ohm's law as above. For electrical calculations we refer you to Sloane's "Arithmetic of Electricity," \$1 by mail.

(6104) W. S. E. asks: 1. Introducing a resistance into the field of the dynamo, are the E. M. F. alone reduced or is the E. M. F. and C. both reduced? A. If shunt wound, both are reduced. 2. Has aluminum ever been reduced directly from common clay? A. Not to any great extent. 3. Give chemical formula for the hydrated oxide of aluminum. A. Al(OH)₃. 4. In the electrolysis of a compound body, what advantage, if any, is there in employing an electromotive force greatly in excess of the E. M. F. necessary to effect the decomposition? A. None except perhaps wastefulness of energy. 5. What is the present market price of aluminum? A. About \$1 a pound.

(6105) H. G. K. asks: Kindly inform me of the method of obtaining the amount that a safety and high wheel is geared to. And supposing it is 60, what is the denomination of 60? A. For a safety count the teeth on the sprocket wheels, divide the number on the crank axle sprocket by the number on the driving wheel axle, and multiply the diameter of the driving wheel by the quotient. We do not understand what you mean by the other query about the high wheel. If you refer to a geared ordinary or front driver, try how many times the front wheel revolves for one revolution of the pedal and multiply the diameter thereby.

(6106) B. asks (1) how to construct a simple, long-lived, effective battery for bell work. A. Make a sal-ammoniac zinc carbon couple with large area of carbon. 2. How many cells and what number copper wire will be required to operate one bell, 50 foot circuit? A. Wind with No. 22 or 24 wire, using two or three ounces. 3. Where can I purchase shell, diaphragm, etc., for telephone described in SCIENTIFIC AMERICAN of February 3, current year? A. Address some of our advertisers who sell telephones.

(6107) R. W. R. asks: 1. What should be the voltage and amperage of a current to run 641 motor to best advantage, the armature being wound with No. 16 wire, having 4 layers of 7 convolutions each to each coil? A. Eight or ten amperes and seven volts. 2. What would be the resistance of water in a glass tube of half inch inside diameter for each inch between electrodes? A. It depends on size of electrodes and on the purity of water. 3. Would the armature core of 641 motor answer as well, made of No. 14 iron wire instead of No. 18, also would it make any difference if the wire was not all one piece, or must there be perfect connection through its entire length? A. Any wire will answer. It need not be continuous. 4. I notice in making the mixture of 4 parts resin, 1 part gutta percha, and a little boiled oil, for coating wooden battery cells, that unless the amount of boiled oil is extremely small, the solution will not harden; is this due to a bad sample oil, would not paraffine answer instead of oil? A. Use oil. Be sure it is boiled oil. You might add some liquid drier.

(6108) G. F. D. asks: 1. Which has relatively the most conductivity, viz., a No. 16 galvanized iron wire or a common fuse wire of exactly the same size as iron wire? A. If of lead, the fuse wire has least conductivity. 2. In building a metallic circuit telephone line with No. 16 galvanized iron wire, what size fuse wire should be used for safety cut-outs? A. Use fuse wire of the diameter of the copper house wire.

(6109) L. P. asks: 1. In what number of the SCIENTIFIC AMERICAN was the induction coil for alternating currents described? A. Vol. 68, No. 10. 2. Can the coil give an alternating induced current without stoppage while the primary circuit is closed? A. Yes. 3. What firm makes a transformer to change a low voltage to a high voltage? A. Address any of our advertisers of electrical goods, such as J. H. Bunnell & Co., 76 Cortlandt Street, New York. 4. Does the amperage of a transformed current rise with the voltage or not? A. Yes, if a circuit of low impedance is open for it.

(6110) R. W. S. asks: 1. Will you please inform me how to find the amperes of an incandescent lamp or an arc lamp, only knowing the candle power? A. You cannot unless you have also the voltage. Allowing 3 watts to the candle power, you can calculate the amperage if you have the candle power and voltage. 2. Will six cells sal-ammoniac battery charge a storage battery, 4 plates, 3x3 1/4? A. No. 3. What kind of acid would you use in a storage battery? A. Sulphuric acid. 4. Is there any kind of closed circuit batteries not using strong acids? A. The Daniell and similar combinations use copper sulphate and no acid.

(6111) E. F. B. asks: In your issue of May 26 I find an article on "Hard Water," from The Acetamid. To soften hard water, the addition of lime water is recommended. The water of this section is already surcharged with lime, and it would seem like "carrying coals to Newcastle," to add more. Does not the article refer specifically to Great Britain, with its chalk deposits? A. The softening process alluded to is designed for water charged with calcium bicarbonate. For gypsum-charged water it is ineffectual. We presume that your region has water of the latter type. See next query.

(6112) W. A. C. writes: In your issue of May 26 is an article by Sir B. W. Richardson, "How to soften Hard Water by the Use of Lime." I always supposed hard water was caused by its being already impregnated with lime. In one of your issues you kindly explain how this can be? A. Hard water may be charged with calcium sulphate (from gypsum rocks) or with calcium bicarbonate. If the latter is present, the addition of calcium hydrate or lime will produce calcium carbonate. The latter is insoluble and will be precipitated. The reaction is CaH₂(CO₃)₂ + Ca(OH)₂ = 2CaCO₃ + 2H₂O. The CaCO₃ is precipitated.

(6113) W. P. C. writes: What difference does it make if a receiver is wound to 75 ohms? Will it work as well on a short line as it does on a long line, and what does the resistance have to do with the working of the telephone? A. Resistance does not help, but injures the working of a telephone. The statement of "resistance 75 ohms" is merely a convenient way of prescribing how much wire shall be wound on it. The

working is due to the turns of wire; if the resistance could be zero, it would be all the better. The turns of the telephone coil are needed for short or long line connections.

(6114) W. A. H. writes: If two electro-magnets are mounted on a base, each provided with an armature, connected to the same lever, the lever pivoted between the two magnets (walking beam style), and one pair of magnets excited by a battery to an attractive strength of 2, which will hold the seaway lever against it, or as close as an ordinary telegraph sounder armature is held? Now, if the other pair of magnets be excited to an attractive strength of 3, can it overcome the attractive force of the first pair, and draw the lever in the opposite direction? A. It is a question of relative distance. If the lever has any amount of play, it will stay attracted by the magnet whose poles it nearly touches.

(6115) E. S. asks what difference there is between an electric horsepower and the horse power relating to steam engines. A. The electric horse power is equal to 746 watts or volt-amperes, the steam horse power to 33,000 foot pounds per minute; one is convertible into the other.

(6116) H. R. E. asks: In purifying a mineral (clay) I am using hydrochloric acid. What will entirely remove the acid or neutralize its effect? A. Washing with water or neutralization with dilute caustic soda solution.

(6117) F. P. R. asks: By whom and when was the first piano made on this continent? A. Jonas Chickering was the pioneer maker, beginning in 1822, and exposing his first piano for sale in Boston April 15, 1823. Previous to this some unimportant attempts at piano making, it is said, were made.

(6118) J. W. B. asks how to obtain the gold from a solution of its alloys in nitro-hydrochloric acid. A. Ferrous sulphate, oxalic acid, and many other reducing agents will precipitate metallic gold from the solution of its chloride.

(6119) C. A. C. writes: I have just finished an 8 light dynamo described in SUPPLEMENT 600 and it works to perfection. 1. How can I make a nickel plating tank, and what is it painted with inside? A. Smear wooden cell, when perfectly dry, with a cement of 4 parts resin, 1 part gutta percha, and a little boiled oil, melted together. 2. What amperage should dynamo give for general plating? A. One tenth ampere per square inch of electrode at starting, dropping to one-fifth this amount after starting. 3. I have a sparking coil made with one inch core of fine wire wound with six or eight layers of No. 14 D. C. magnet wire and is 8 inches long. I run it with four large bichromate potash cells, but it does not give enough spark to run my gasoline engine. A. Your coil needs more turns of wire; simply add ten to twenty layers of No. 20 wire. The length of spark is due to number of turns of wire; a small wire is not as good as a coarser one. It might pay better to remove the large wire, and rewind with thirty or forty layers of No. 20. The latter is coarse enough.

(6120) J. C. P. and S. write: We have built the 8 light dynamo as described in SUPPLEMENT, No. 600, winding field magnets each leg with four layers No. 12 magnet wire. One leg of the magnet seems very soft, iron and the other appears harder, as though they were not both cast at the same time. It runs very nicely as a motor, but as a dynamo will run one 52 volt lamp at only about half its candle power, and when more lamps are connected it will not light them at all. Running at 2,600 per minute, one lamp and volt meter in circuit, meter shows 35 volts. Can you give us information that will help us out of our difficulty? A. You may have either too weak a field or too few turns on your armature. The relation between armature and field resistances depends on external resistance and on whether the connections are in shunt or series. The difference of hardness of the two arms may affect the working of the dynamo.

(6121) W. L. B. asks: Which would be the most economical to use as power, compressed air "dry" or a vacuum power? In producing vacuums, is there a loss corresponding to the heat generated in compressing dry air? A. Compressed air is more economical than a vacuum for power purposes. A larger range of pressure can be used with compressed air and with less loss from engine friction than with a vacuum. There is loss in heat by expansion and consequent shrinkage of pressure, alike in both systems; with the additional disadvantage of limited pressure practically below 12 pounds in the vacuum system.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted June 12, 1894.

AND EACH BEARING THAT DATE. [See note at end of list about copies of these patents.]

Table listing inventions and their patent numbers, including items like 'Adding machine, J. P. Royall', 'Alarm, See Boiler water alarm', 'Ammonia, process of and apparatus for manufacturing', etc.

Main index table listing inventions and their patent numbers, including items like 'Bevel, J. T. Langlais', 'Bicycle, A. H. Bishop', 'Binding and harvesting machines, sheaf carrier', etc.

Continuation of the main index table listing inventions and their patent numbers, including items like 'Measuring and recording electric currents, apparatus for, W. Thomson', 'Mechanical movement, R. Sterling', etc.

DESIGNS.

Table listing designs and their patent numbers, including items like 'Badge, W. C. Finck', 'Bath tub, W. C. Peet', 'Bottle, W. L. Jubring', etc.