RECENTLY PATENTED INVENTIONS.

Engineering.

TO REDUCE AND SMELT SULPHIDE ORES.—Augustus L. Engelbach and Sidney E. Bretherton, Leadville, Col. A specially designed furnace is provided by these inventors for carrying out a method of reducing and smelting by which air is forced through a series of retorts heated by the matte and slag discharged from the blast furnace, and hydrocarbon gas injected into the heated air to produce an oxidizing flame which is forced into the blast furnace to reduce the ore. A channel in the wall of the crucible of the blast furnace is connected by tuyeres with the interior of the furnace, and connected with the channel is a combustion chamber connected with an oven containing retorts, the oven heating the air passing through the retorts, while through a nozzle extending into the combustion chamber passes a mixture of steam and oil.

Railway Appliances.

CAR COUPLING.—Valentine Erbach, Scranton, Pa. According to this invention a flat gravity coupling pin baving a transverse concavity in its lower end is combined with a gravity locking and tripping dog in the drawhead, the dog being adapted to be acted upon by an entering link, and having a bearing surface to receive the lower end of the pin. The pin is held in elevated position to admit a link, the entry of which operates to trip the pin and cause it to be guided downward in the link. The pin may also be brought into such engagement with a link as to give the latter an upwardly inclined position, and thus hold it until readjustment or until a coupling has been effected.

CAR BRAKE.—Thaddeus J. Barrow, Duluth, Minn. This is a brake especially designed for use on street railway cars, occupying but little space beneath the car, and having a series of independent shoes. It comprises three-armed levers pivoted on opposite sides of the car truck, brake shoes pivotally connected with opposite arms of the levers, and operating levers connected with one arm of the three-armed levers. The shoes are operated independently, and if one or more of them should break, the others would do the work, while the lever mechanism allows the shoes to be set with great rigidity upon the wheels.

ELEVATED RAILWAY BRAKE.—John N. Valley, Jersey City, N. J. This is a brake for use on a railway in which the cars are suspended from an overhead track or stringer, and the invention consists of a mechanism in the form of a clamp, formed by the brake jaws or shoes, to clamp the rail or stringer. The brake is easily applied or released by an operating lever within the car.

Electrical.

ELECTRIC PROGRAM CLOCK.—Henry C. Hain, Booneville, Mo. This invention provides a clock attachment for giving calls at different times in the day and different days in the week, as a reminder of engagements, etc. An auxiliary dial has a series of openings and equidistant electrical contacts in a circle on the inside of the dial, there being also a contact arm adapted to inclose an electric circuit, mechanism between the clock and arm, and removable pins to be inserted in the openings in the dial.

ELECTRIC RAILWAY TROLLEY.—Wesley W. Pritchett, Ogden, Utah Ter. This invention provides a simple and cheap trolley mechanism to be carried on the top of a car, designed to hold the trolley wheels always in contact with the wire, and to guide the wheels to the wire when the trolley is to be applied. A shifting weight holds the trolley wheel in contact with the line wire, means being provided for shifting the weight and trolleys when the car is to be reversed or switched, which may be quickly done from the platform in such a way that the lights on the car will be but momentarily put out.

Mechanical.

ANTI-FRICTION BEARING.—Charles W. Wynn, Asheville, N. C. This bearing may be used on a revolving as well as on a fixed axle, and consists of a number of cages each containing longitudinally arranged rollers, and provided at their meeting ends with interlocking projections, whereby the rollers of each cage will be in line between those of the next cage, the rollers bearing evenly within a cylindrical bore. By the cages revolving on the spindle and istributing the wear, it is designed to avoid the wearing of the spindle flat on one side.

LUBRICATOR.—Benjamin F. Howard, Sheep Ranch, Cal. This is a device more especially designed for use on engine cylinders to automatically and positively feed the proper amount of lubricant into the cylinder. It has a large oil reservoir into which passes a limited amount of condensation water, and a sight feed tube so arranged that the oil bubble passing through the tube can be seen and the amount closely regulated, being also indicated by a pointer on a graduated dial.

WRENCH AND CUTTER.—Theodore Fletcher, Macdona, Texas. This is a strong, simple, and inexpensive tool, adapted for use for ordinary purposes as a wrench, to turn a nut, or as a pipe wrench, the clamp or pressure being applied in both cases with a power proportioned to the strength of the pull, while it may also be used as a powerful pipe cutter. Its construction also allows it to be used very rapidly, somewhat as a ratchet wrench.

Miscellaneous.

REFRIGERATOR.—George A. Bowen, Fond du Lac, Wis. The box or casing of this device consists of two hinged sections, the lower one forming a provision chamber, supporting in its upper portion an open-top ice receiver, while the hinged upper section has an opening in its top closed by a cover, and registering with the open end of the ice receiver. The construction insures the keeping of the interior of the refrigerator at a uniform temperature, and permits of conveniently removing the several parts for thoroughly cleaning the interior.

TEACHING BOTANY.—William H. Gibson, Washington, Conn. A mechanical educational appliance, for use by lecturers and in schools, colleges, etc., is provided by this invention, to facilitate explanations of the construction of plants and the means employed for fertilization or fecundation, and cross fertilization and dissemination or dispersion of seed and fruit. The invention consists principally of a mechanical plant and means for actuating the floral parts and the seed receptacle and seed, different mechanisms being necessary for the demonstrations called for of different plants, and these mechanisms being provided for the different typical plants chosen by the illustrator.

LOCK BRAKE.—Volney W. Mason, Providence, R. I. This is a brake for hoisting machines, with which any required amount of pressure may be applied to the wheel, which may be securely locked so that it will not turn under any load the machine is likely to carry. The brake lever, attached to the brake, is moved and locked by an adjustable toggle joint, an operating cord and counterweight being arranged in convenient position to facilitate applying and releasing the brake.

PAINT FILLING COMPOSITION.—Richard J. Parke and Isaac Goodman, New York City. These inventors provide a composition consisting of cotton, wool, or silk flock, and pulverized stone, with varnish, japan, and oil, to be applied to wood preparatory to varnishing, the coating being susceptible of polishing and smoothing with pumice stone or other material, after which varnish may be applied in the usual manner, the paint or varnish then not penetrating into the wood.

WATER GATE.—Christopher H. Watson, Riverside, Cal. This invention provides a gate of simple and durable construction, easily opened and closed, and designed to prevent all leakage by firmly seating and locking the gate over the opening. A gasket of rubber or similar material is held on the inner face of the gate proper, the gate being monnted to slide, and being carried by a stem which may be turned, the gasket not being injured while the gate is partly or wholly open, and being used only when the gate is entirely closed. The gate, when pulled up, can be locked in any desired position by turning its stem.

TOBACCO AND CIGAR BOX.—Theodore V. Smith, New York City. The storing and preserving of cigars and tobacco, to keep them in good condition, is the object of this invention, the box having a lining of water and moisture proof material, and being designed to receive absorbent pads for keeping the cigars and tobacco at a certain degree of moisture. The construction is durable and inexpensive, and all the parts can be readily removed to clean when needed.

CANVAS COT.—Camille Poirier, Duluth, Minn. This cot is more especially adapted for use in steel prison cells, the body of the cot being so connected with the hanging devices that the latter may be readily removed from the canvas, and all may be easily and thoroughly cleaned. The construction of the cot and hangers is such that nothing pertaining to them can be used by a prisoner as a weapon.

TAILOR'S INSEAM GAUGE.—Harry M. Cloud, Cincinnati, Ohio. This is a device for taking the inseam length, from the crotch to the feet, in measuring for trousers. It is a form of measure in which a standard, supported on a suitable base, is provided with a sliding and vertically adjustable section marked with graduations, and having a horizontal arm to be lifted between the legs as far as the crotch. It is designed that by this means the work may be more accurately and conveniently done, while a man may therewith correctly take his own measure.

GAS BURNER.—Daniel Daly, Maysville, Ky. According to this invention two approximately parallel tubes or sections have in their adjacent faces opposite slots, so that the gas issuing therefrom will come together and merge in a single flame. The commotion and suction produced by the currents of gas coming together are designed to serve to mix air with the gas to produce a hot, heating flame, the amount of air drawn in being varied by varying the distance between the tubes and changing the angle at which the gas flames impinge on each other.

MATCH BOX.—Edward J. Hill, London, England. This box, which is also adapted to hold cigarettes, cigars, lozenges, and other small articles, is preferably made of a single sheet of stamped or cut sheet metal, foldable in such a manner as to form a complete self-closing spring box. It has a movable part forming a container and a discharge orifice with which the movable part does not normally communicate, but with which, by reason of the spring action, it may be made to communicate for the discharge of the articles one at a time.

Designs.

TEA POT.—Charles Osborne, New York City. The leading features of this design are the heavy leaf-like borders of the upper and lower portions of the pot, the ornamentation at the base of the spout and at the points where the handle connects with the pot, and its faceted sides.

POCKET BOOK CASE, OR WALLET.—Charles Scheuer, New York City. The article made after this design is intended to present the appearance of a letter, one side showing the lines of joining of the tabs and the other showing simulations of a canceled stamp, postmark, and address.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ART OUT OF DOORS; OR, HINTS ON GOOD TASTE IN GARDENING. By Mrs. Schuyler Van Rensselaer. New York: Charles Scribner's Sons. Pp. 398.

This is an exquisitely beautiful book typographically. It is not a practical treatise on gardening, but a series of essays on different kinds of gardening and other means of beautifying grounds, pleading for the more general recognition of this class of work as one of the high arts. It seeks to impress upon the reader the importance of "aim and method" in the art of gardening, now "practiced much more often than any other in ignorant, impulsive ways, by people who never stop to think that it is an art at all." The impressions gained by extensive observation are here noted with a refined taste and with an orderly arrangement of widely different branches of the subject which make the book excedingly attractive.

THE STATISTICIAN AND ECONOMIST—1893, 1894. San Francisco: L. P. McCarty. Pp. 672. Price, cloth, $4.

This is the seventeenth issue of a volume which has been successively enlarged year by year, and which gives a great deal of very many kinds of curious and useful information. Its topics include population, election returns, important laws, historical data, trade statistics, geographical information, useful facts in mechanics and engineering and numerous other subjects. A full index facilitates reference to the contents.

OUT DOORS is the title of a neat little paper-covered book, sent by mail for ten cents, and published by the Pope Manufacturing Company, of Boston. Lawn tennis, yachting, foot ball, base ball, horsemanship, rowing, canoeing, and cycling, are each treated in a most interesting manner, by a writer of reputation. The primary object of the book is to give added interest to all kin s of outdoor exercise, thereby naturally drawing more attention to bicycling, and for this reason the book is issued. The book is calculated to effectively preach the gospel of outdoors—fresh air.

Received.

CONFLICT OF THE NINETEENTH CENTURY: THE BIBLE AND FREE THOUGHT. By Rev. Thomas Mitchell. New York: The Universal Book Company.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

MAY, 1893.—(No. 91.)

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3. A handsome dwelling at Plainfield, N. J. Perspective views and floor plans. A model design. Messrs. Hartwell & Richardson, architects, Boston, Mass.
4. A dwelling at Utica, N. Y., erected at a cost of $4,700 complete. Floor plans, perspective view, etc. Mr. W. H. Symonds, architect, New York. An Old Colonial style of architecture.
5. Engravings and floor plan of the Fairfield Congregational Church at Fairfield, Conn., erected at a cost of $52,000. Messrs. J. C. Cady & Co., architects, New York City.
6. A stable erected at Plainfield, N. J. A model design. Messrs. Hartwell & Richardson, architects, Boston, Mass.
7. An excellent design for a modern stable at Bridgeport, Conn. Messrs. Longstaff & Hurd, architects, Bridgeport, Conn.
8. A residence at Belle Haven, Conn. A very picturesque design, perspective elevation and floor plans. Cost $6,000 complete. Mr. Frank W. Beal, architect, New York City.
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Notes & Queries

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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.

(4982) J. E. D. asks how a well that has not been used for some time can be cleaned, and if the water can be made drinkable without drawing it all off. A. It is not safe to use the water of a well that has not been recently used until a thorough examination has been made as to the possibility of its containing dead animals. If you are assured of this by examination, or by the smell of the water as drawn and by heating, then a thorough pumping will remove so much of the water that the fresh incoming water will make the well safe for household use for washing and finally for cooking; but we do not recommend it for drinking for some time after it has been in use for other purposes.

(4983) J. G. H. asks: Is a cantilever bridge a truss bridge? How long a span has ever been built constructed on similar plan to one on front page of recent number of SCIENTIFIC AMERICAN? A. A cantilever bridge is a truss bridge of a particular type or construction of truss. The Forth Bridge in Scotland has the longest cantilever spans yet made. In this bridge there are two spans of 1,710 feet each. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 478, for illustrated details and description.

(4984) J. G. R. says: Can you give me any points on tempering springs made of cast steel wire, No. 8 gauge, about 6 inches long? A. For tempering steel springs as described, heat the springs in a fire that is only moderately hot and large enough to heat the whole spring evenly. A muffle is preferred where many are to be done. When the springs are at a cherry red heat, they are to be plunged endwise into an oil bath (lard oil); then heated with the oil on them in the muffle or a slow fire until the oil takes fire; then plunge them into the oil bath. A plain, straight spring is very easy to

manage. Coiled springs of a helix or volute form are more difficult to temper, and require much care in heating evenly. In establishments where quantities are required, special ovens are built for heating and drawing the temper. Red hot lead in a crucible is also much used for heating evenly.

(4985) E. P. M. writes again: Thank you very much for the answer to my question, No. 4742, E. P. W., in the SCIENTIFIC AMERICAN of March 18. You say it would take 16 horse power to maintain the 1,000 pounds pressure with a ½ inch discharge. Now would you be kind enough to tell me how you worked the example, and give me the exact diameter and stroke of both the steam cylinder and of the water plunger, and how many strokes per minute it would require to maintain the above pressure with the ½ inch discharge? Also, what boiler pressure of steam and how much water it would discharge per minute? A. The theoretical velocity of water from a nozzle is equal to the square root of the height in feet due to the pressure multiplied by square root of twice gravity ($\sqrt{2g.h.}$) = feet per second. Then 1,000 pounds × 2·3 = 2,300 feet as the head due to 1,000 pounds pressure. The square root of twice gravity (64·33) = 8·02, and the square root of 2,300 = 47·95. Then 47·95 × 8·02 = 383·55 feet per second, or 23,013 feet per minute. The friction of a nozzle may reduce this to 20,000 feet per minute. The area of a ½ inch hole is 0·1963 of a square inch. Then 0·1963 × 20,000 feet × 12 inches = 47,112 cubic inches of water delivered per minute. If a pump makes 100 strokes or 50 revolutions per minute, then $\frac{47,112}{100}$ = 471+ cubic inches as the capacity of the water cylinder. Assuming 10 inches for the length of the stroke, then $\frac{471}{10}$ = 47+ square inches as the area of the piston. Adding a small percentage for leakage, an 8 inch piston will be the proper size. The area of the 8 inch piston = 50+ square inches and the pressure 1,000 pounds, the total pressure will be 50,000 pounds. If you intend to carry 100 pounds steam pressure, then $\frac{50,000}{100}$ = 500 square inches as the area of the steam piston. To this you should add 25 per cent for pump friction, or a piston area of 625 square inches, which is equal to 28¾ inches as the diameter of the steam piston. Then for the horse power, 625 square inches × 100 pounds × 83·3 feet piston travel = $\frac{5,206,250}{33,000}$ = 157·6 horse power. A decimal error made us say 16 instead of 160 horse power in former answer.

(4986) W. E. C. says: 1. In the use of a steam boiler for furnishing steam for a 100 horse power engine, dry kiln, and heating buildings, to maintain a pressure of 80 pounds during the day and 30 pounds during the night, which will be the safest, best, and most economical way of feeding the boiler with water from a well 12 feet deep? A. The proper way to feed your boiler from a well is through a steam pump with pistons proportionate for the work. You cannot trust the boiler to the tender mercies of the pump acting automatically. Nothing but the care of the engineer will do for steaming at night, even under low steam. The water gauge should be connected direct to the boiler, and not through the feed pipe. 2. Will a water column on a steam boiler show correctly the amount of water in the boiler if I connect it with the water with 1¼ inch pipe and with the steam with 2 inch pipe? A. One inch pipe is large enough for water gauge connections, unless the water is hard, when 1¼ inch for both connections is preferred. It will not show water height correctly when connected with feed or blow-off pipe.

(4987) D. S. W. writes: 1. I want to make a small storage battery. Will you kindly give me a "point" or two? How shall I prepare the red lead and litharge? A. Mix the red lead and litharge with dilute sulphuric acid; acid 1 part, water 9 parts. 2. How much of the surface of the plates should be covered with same? A. As much of the plate as is exposed to the electrolyte. 3. What proportions of c. p. sulphuric acid and water for the fluid? A. Acid 1 part, water 11 parts. 4. I intend using lead plates, 5 × 6 × ¼, four plates to each cell, and I want to make four cells. What E. M. F. should I get from it? A. Two volts per cell.

(4988) W. Y. asks: Do you know of a good cement for bedding brass inlaying in wood? I find that ordinary glue does not hold it well when the furniture is subjected to hot air furnace heat, whereas some very old furniture that I have with brass inlaying in it appears to stand perfectly well. A. For metal inlaying the toughest glue, which may be known by bending in the hands, should be used. Make the glue in the ordinary way, and to each pint add a half ounce of glycerine and a half ounce of fine whiting or pulverized chalk. Thoroughly incorporate and use hot and rather stiff. The metal should also be treated by dipping in weak nitric acid for a half minute, rinsing, and drying. This will give it a suitable roughness for holding the glue.

(4989) E. L. K. asks: Will you please give me your judgment in the matter as to whether you consider open hearth bar steel to be superior in quality, toughness, and uuiformity over that of Bessemer steel, and whether you would consider a tool made from open hearth steel as giving better and more satisfaction than that of one made from Bessemer? A. The open hearth steel is becoming a favorite where extreme toughness is required, as for boilers and structural work subject to great stress. The actual difference is not great, and it is only in the extreme tests of doubling a plate two ways and hammering flat without a flaw that open hearth takes the lead. Neither steel is used for cutting tools.

(4990) A. B. M. writes: I have a new electro-magnet for striking a bell and it does not demagnetize quick enough. Please inform me what iron should be used, what treatment it should have, if any, if it should be devoid of carbon, or what its constituents should be. A. The cores of electro-magnets should be made of the finest and softest wrought iron. Possibly you may be able to correct your magnet by thoroughly annealing the cores; this you can do by heating them red hot and placing them in ashes or powdered lime to cool. The armature should not be allowed to touch the magnet core; if it does, it will stick. You can prevent this by limiting the movement of the armature, by inserting a short copper pin in the end of the core, or by pasting a piece of paper to the face of the armature.

(4991) L. E. K. asks: 1. What is the resistance of a 16 C. P. 50 volt lamp in ohms? A. About 50 ohms. 2. What should be the thickness of mica between commutator segments in 8 light dynamo? A. One thirty-second of an inch. 3. How to remedy heating of field magnets. A. If it is a shunt machine, increase the resistance of the field magnet and add outside resistance. 4. Will it injure storage battery to take elements out of acid and dry and lay away for future use after it has been used a short time? A. No.

(4992) W. K. writes: I have made an induction coil, something in the style of the one described in Hopkins' "Experimental Science." Core 12 inches, consisting of 500 No. 20 soft iron wires. Primary of two layers No. 16 (B. and S. gauge) double cotton-covered copper wire. Secondary consists of 3 inches silk-covered copper wire, No. 36 (B. and S. gauge), closely wound and very carefully insulated throughout with paraffine and paraffine paper. Sections separated by about 1 inch solid paraffine, with 6 cells Fuller battery. It gives 3 inch to 3½ inch sparks. Since making this coil I have noticed that in nearly all the descriptions of coils that I have seen, heavier wire for the primary is advised. Is No. 16 (Am. gauge) sufficiently heavy to carry the current of above battery? A. Yes. Would I be likely to get a much stronger spark if I should wind on say 2 inches more of No. 36 on secondary? As there is plenty of space for it on the bobbin, I would put it on, if it would increase the spark materially. A. Your coil yields remarkably good results. We would not advise making any change in its construction.

(4993) G. E. F. writes: In reply to H. D. (4873), I have had occasion to replace broken teeth in small cast iron gears, and find the most effective way to be by drilling holes and tapping them for a screw thread, then screwing in strong iron bolts till the thread binds sufficiently to hold the tooth, and then cutting off and shaping with the file. If the tooth must be of perfect form, shape one out and fasten it by a sufficient number of set screws, with countersunk head, the square part of screw being cut off after fastening.

(4994) J. H. asks the manner by which nail hammers are tempered in large hammer factories. Also, is the grinding and polishing done on wheels or belts, or both? Is there an automatic machine for grinding hammers? If you could not inform me on this, kindly refer me to parties that could. A. Hammers in quantities are heated in large slow-burning fires or muffle ovens, and dipped in water either singly or in nests, strung on rods through the eyes. The grinding is done on large grindstones as to the plane parts, and angles and corners are ground on emery wheels. The finish is made on fine emery wheels and polishing belts of leather. Do not know of automatic machinery for hammer grinding. Possibly some of our readers may know of such.

(4995) W. T. asks: Can a clear-cut casting of Babbitt metal be made in a sand mould, and, if so, how can the casting be cleaned without marring or injuring the design? Can a clear-cut casting of medal or coin bronze be made in a sand mould, and, if so, how can it be cleaned without marring or injuring the design? Can such bronze be melted in a forge, and does it melt as easily as iron? A. Clean-cut or smooth castings cannot be made in sand. Babbitt and type metal can be cast in metal moulds clean and bright. Medal bronze of copper and tin alloy can be melted in a forge fire in a black lead or Hessian crucible to the extent of two or three pounds very easily, by banking the fire by placing bricks around it. It melts much easier than iron. By using fine moulding sand, such as used by brass founders, a fair casting may be made in moulds of medallion work that can be finished with but little work.

(4996) A Printer asks: Will you kindly tell how engraving and plate printing is done? I refer to that which is seen on statements and calling cards. A. Plates for plate printing are cut by means of gravers. The ink, which is very thick, is rubbed into the grooves or lines made by the graver. Any surplus ink that remains on the plate is removed by a cloth. The printing is effected in a roller press by pressing the paper into the inked lines.

(4997) S. B. asks: Will you please tell me how they make calcium lights burn that they use in the theater, and how much they cost? A. A calcium lamp costs about ten dollars. The light is produced by directing a jet of hydrogen or of coal gas and a jet of oxygen gas against a stick of lime. The lime is thus heated very hot and becomes luminous.

(4998) F. S. K. writes: 1. I should like to ask whether there will be an archeological exhibit at Chicago, especially of Grecian, Roman, and Babylonian carving. A. We have not yet received the lists of the Columbian exhibit. 2. How much is the pressure caused by water freezing? A. Water exerts an immense force by freezing when confined in an unyielding vessel, probably many thousand pounds per square inch. It has burst bombshells when plugged full of water. 3. Would a greater quantity of water cause greater pressure? A. The pressure per square inch would be increased with the increase in volume in an unyielding vessel. 4. How could I make a simple instrument for measuring the humidity of the atmosphere? A. The simplest hygrometer is a strip of strong paper, ½ inch wide, fastened at the top of a plastered wall or on a strip of wood, with a small weight hung at the bottom to keep the paper straight. It will expand and contract with the changes in the atmospheric moisture. A piece of catgut, a few inches long, hung with a weight to keep it straight, and a pointer attached, has a large range of motion, due to change of moisture in the air.

(4999) G. C. asks: Are lightning rods of any use in protecting a building during an electrical storm? If so, how many are needed on a building 36 by 72; 30 feet high? How are they to be put on? Are they manufactured or for sale in any of our Western cities, and if so, by whom? A. Lightning rods are of use. It requires a rod to every 225 square feet, or to every area 15 feet square. They may be nailed directly to the building if the rods are made of strips of copper. The points should be about 5 or 6 feet above the roof. We presume almost any dealer in electrical supplies in your State could furnish you with lightning rods. We advise you, however, to have your lightning rods put up by some one who understands the business. The rod is of no value unless it has a good ground connection.

(5000) P. C. W., H. N. G. and others ask how to make cheap filters. A. We give two forms of inexpensive filters, both taken from our new Cyclopedia of Receipts, Notes and Queries. To make a filter with a wine barrel, procure a piece of fine brass wire cloth of a size sufficient to make a partition across the barrel. Support this wire cloth with a coarser wire cloth under it and also a light frame of oak, to keep the wire cloth from sagging. Fill in upon the wire cloth about three inches in depth of clear sharp sand, then two inches of charcoal broken finely, but no dust. Then on the charcoal four inches of clear, sharp sand. Fill up the barrel with water and draw from the bottom.

Another form of filter using stone pots is given below; of course two barrels may be substituted for the stone pots if desired. Use two stone pots or jars, as shown in the accompanying engraving, the bottom one being a water jar with side hole, if it can be procured, otherwise, if no faucet can be used, the top jar can be removed to enable the water to be dipped out. The top jar must have a hole drilled or broken in the bottom, and a small flower pot saucer inverted over the hole. Then fill in a layer of sharp clean sand, rather coarse, a layer of finer sand, a layer of pulverized charcoal, with dust blown out, then a layer of sand, the whole occupying one-third of the jar.

(5001) W. F. C. asks: What is the expansion of railroad bar iron per foot for each degree Fahrenheit? I mean when exposed to the heat of heat the sun. A. The expansion of ordinary bar iron between the temperatures of 32° and 572° is 0·0000826 of an inch per foot for each degree of heat Fahrenheit. The greatest range of temperature in rails through the year in your climate is about 90°, amounting to a change in length for 100 feet of 0·7434 of an inch, or nearly 7½ inches to a thousand feet. The extreme difference for a 30 foot rail is 0·223 of an inch. Rails laid at mean temperature of 60° require 0·148 of an inch space for 30 foot rails. In ordinary practice a ⅛ inch gauge is used in summer.

(5002) F. P.—The following preparation is used to render starched goods pliable: Take of white wax 1 ounce, spermaceti 2 ounces, melt them together with a gentle heat. When you have prepared a sufficient amount of starch, in the usual way, for a dozen pieces, put into it a piece of the polish about the size of a large pea, using more or less according to large or small washings. Or thick gum solution (made by pouring boiling water upon gum arabic) may be used. One tablespoonful to a pint of starch gives clothes a beautiful gloss. Leclanche battery prism is composed of 40 parts granulated manganese dioxide, 52 parts granulated carbon, 5 parts gum shellac, 3 parts potassium bisulphate. Mix, heat to 212° Fah., and compress in moulds under a pressure of two tons, or press with moderate pressure in the porous cells.

(5003) P. J. L. says: I would like to know if there is any way of killing the odor of kerosene. That is to add something to it so that there will be no smell of the oil or what is added. Also how to make camphor oil cheaply. A. The odor of kerosene may be modified, if not entirely destroyed, by using the following following formula: Mix chloride of lime with petroleum in the proportion of three ounces for each gallon of the liquid to be purified. It is then introduced into a cask. Some muriatic acid is added and the mixture is well agitated, so as to bring the whole of the liquid into intimate contact with the chlorine gas. Finally the petroleum is passed into another vessel containing slaked lime, which absorbs the free chlorine and leaves the oil sufficiently deodorized and purified. Camphor oil is made by allowing the crude camphor to remain packed loosely over a wire grating, so that the oil may drain out. This method, which is crude and wasteful, is gradually giving place to hydraulic pressure.

(5004) C. W. H. asks: In what country was tempered copper found? What century was it supposed to have been done? Is it a fact that we have no tools now that will make an impression on said copper? Where can I get a history on such a subject? A. The so-called tempered copper tools are supposed to be of Egyptian or Hindoo origin, and were an alloy of copper and tin. Supposed to have been of the bronze age, one to two thousand years before the Christian era. The same kind of tools can be made now; they are inferior to steel, which will cut the copper. There is no special history. They are only alluded to in works on ancient Egypt.

(5005) H. E. N. asks: Will you please give me a receipt for a mucilage for mounting plants in a herbarium? Was there ever a book published giving the flora of Nebraska? If so, give name of publishers and price. A. Glycerine, 4½ parts; soft soap, 4½ parts; dissolve 1½ parts salicylic acid in 30 parts alcohol. Shake thoroughly, and add to a mucilage made of 139½ parts gum arabic and about 270 parts water. This mucilage remains elastic when dried, and does not have a tendency to crack. Make up formula, using parts by weight. Write to the State botanist of Nebraska for information in regard to the flora of the State.

(5006) C. F. writes: I have a Climax burnisher which I purchased about three years ago. Scratches appearing on the burnishing iron are generally removed with finest emery cloth. I have frequently had occasion to apply this remedy with invariable satisfactory result. A short time ago, however, the steel surface of the burnishing iron seems to have become soft, and refuses to work without profuse scratches. I succeed in removing them and in polishing the surface again, but every trial at burnishing fills the instrument with scratches. I am positive that the fault is not with the photographs, as these burnish perfectly well with any other burnisher. Do you think that the softened steel is the cause of the trouble, and if so, how can I reharden it? A. Burnishing rolls are usually made of steel hardened or of chilled cast iron. In either case the repolishing of the surface would not make them soft. It may be possible the roll you have is case-hardened iron, which has only a thin hard skin, which when polished off leaves a soft surface. We advise you to address the makers of the burnisher.

(5007) G. M. S. ask how to melt gold and copper, and if an ordinary bellows will produce enough heat. I have a crucible and bellows, but when I tried to melt it I could not do it. Is there any chemical or anything I should put in it to keep it from oxidizing? A. You can melt a small quantity of gold or copper (1 pound) in any blacksmith forge by building a fire pot of loose brick to hold the fire close to the crucible. Use borax in the crucible to protect the metal.

(5008) W. K. writes: I have been experimenting considerably with primary batteries, and have experienced the usual quantum of disappointment and vexation with all of them. Have finally settled down to the Fuller as being on the whole as satisfactory as any, all things considered. I find that by placing in the porous cups one or two strips of zinc, the efficiency of the battery is vastly increased. I use two plates of carbon in each cell, 3 inches by 7 inches. Would it not be better to use in this battery cylinders of zinc, about the height of the porous cell, instead of the usual short cone or lump. I find that the strips of zinc keep well amalgamated. Would it be advantageous to further increase the carbon surface? A. In some forms of Fuller battery cylinders of zinc are used instead of conical pieces, but there is more or less waste in the use of pieces of this form. An increase of carbon surface adds to the depolarizing power of the battery.

(5009) J. K. says: 1. I wish to know what oil is best for fine leather shoes. Is castor oil good or injurious? Will oil keep rubber boots from cracking, and what kind? A. There is nothing better for softening shoe leather than neat's foot oil. Castor oil is much used, but is not the best. A very little neat's foot oil on rubber boots will soften the surface and make them less liable to crack. 2. Why do water pipes rarely burst when frozen under ground? A. Pipes partially protected in the ground freeze very slowly, which allows the water to move along the central line of the pipe and relieve the pressure, when the ice forming on the inside of the pipe can expand toward the center. If, even then, the pipe becomes frozen solid at two points, some distance apart, the intervening water upon freezing will burst the pipe. 3. What speed had a gang in a marble sawmill ought to run to do the best and most work? A. About 200 feet per minute. 4. In the marble quarry I work in there is a great pressure to the stone closing in on the drills of channeling machines and sometimes spoiling many dollars worth of marble. Can you give the cause? A. There is a constant compression in the rock crust of the earth, caused by the shrinkage of the earth through loss of heat—the same cause that has wrinkled its surface into hills and mountains, and caused even your marble quarries to become tilted in their stratified layers. When a channel is cut in the process, as with the channeling machine, where the drills cut a close-fitting channel, the pressure is relieved and the walls of the channel close in, although not enough to be readily seen, which can be measured and amounts to enough movement to pinch the gang drills.

(5010) M. & Son ask: 1. How to construct a cupola to melt about 200 pounds of cast iron, and what is put in cast iron to help melt it? A. A cupola to melt 200 pounds of iron should be about 24 inches external diameter, with a fire brick lining about 3 inches thick. It should be about 4 feet high. Cupolas of this size are generally suspended on trunnions, so that they can be turned down into a horizontal position for cleaning, etc. The bottom of the cupola should be hinged, so as to permit of dumping the contents. There should be a spout below the discharge opening, and upon each side of the cupola, about 10 or 12 inches above the bottom, there should be openings for receiving the blast pipes. We advise you to purchase a work on founding. We recommend "Founding of Metals," by E. Kirk, price $2.50; "Casting and Founding," by R. E. Spretzson, price $6; "Practical Iron Founding," price $1.50; "Iron and Steel Founding," by C. Wylie, price $2. Sometimes a little limestone or some oyster shells may be added to the coal and iron, to advantage, as a flux. This is generally done after the first charge. 2. How to construct a cupola to melt 200 pounds of wrought iron, and what is put in wrought iron to help melt it? A. Wrought iron cannot be melted and poured like cast iron. 3. What is the book to get on the manufacture of iron and steel? A. "Principles of the Manufacture of Iron and Steel," by I. L. Bell, price $8; "Chemistry of Iron and Steel Making," by W. M. Williams, price by mail $3.

(5011) E. B. C. writes: Does not a reducing valve always effect a waste of power? I have a boiler at 80 pounds and require to use a part of the steam at 40 pounds only. If I put in a reducing valve, do I not practically waste half the power of the steam so used? I have been told by several engineers, in whom I have confidence, that the waste under these conditions is very small—nothing like half; but it seems to me they are wrong. Substitute for the reducing valve an engine working on 80 pounds, with 40 pounds back pressure, and it would seem that a net gain equal to the work of the engine on 40 pounds should result. A. Either condition that you name is a most wasteful practice. If you have no use for the exhaust, make a reducing valve of the cut-off and use the whole boiler pressure on the piston for the shortest part of the stroke that will do the work. If you require as a necessity steam at half the boiler pressure for other purposes than power, it is proper to use a reducing valve for that purpose only, as where elevators have to be run with high pressure and the heating of buildings at low pressure. The running of engines with back pressure is also wasteful, only excepting that the exhaust steam can be used for its full value for heating or other purposes.

(5012) J. G.—You will improve the tin flux by adding 10 per cent of sal ammoniac to the muriate of zinc. Cover the surface of the tin with palm oil. You

can also make tin more fluid by adding 5 per cent of bismuth. We have no books on this subject.

(5013) R. P. J. says: I have a 15 light incandescent dynamo which I am running with windmill power for charging 26 cells storage battery. I have trouble with the heating of the armature when the speed runs above 2,700—the required speed. The dynamo is shunt wound. Can I remedy the heating by introducing resistance into the shunt by arranging an automatic switch, to act when the speed exceeds 2,700 revolutions. If this will not answer, please make any suggestions that you think will help me. A. You can probably remedy the heating by the method proposed. The only alternative is to provide means for securing a closer regulation of the windmill or opening the circuit of the dynamo.

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Planter marker, corn, G. E. McCune. 496,744
Planter, potato, N. Sturdy. 496,707
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Plow, T. J. & W. Rawls. 496,538
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Pocket guard, C. Thibodeau. 496,709
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Railway ferry, J. A. & J. E. Irons. 496,831
Railway rails, their joints and chairs, constructing and assembling, A. H. Emery. 496,555
Railway semaphore, street, L. E. Clawson. 496,639
Railway signal, automatic, Daves & Peddle. 496,473
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Railway switch, street, D. F. Doody. 496,725
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Stone planer, C. Biganess. 496,719
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Voltmeter, A. H. Armen. 496,678
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Window screen, D. P. Guest. 496,781
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Baking powder, D. S. Thompson. 22,914
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Bitters, orange, Les Heritiers de Marie Brizard & Roger, M. B. Glotin, Achard & Glotin. 22,922
Bleaching powder, United Alkali Company. ..... 22,939 to 22,941
Boilers, steam and hot water, A. Boyce. 22,963
Brandy, Les Heritiers de Marie Brizard & Roger, M. B. Glotin, Achard & Glotin. 22,926, 22,927
Brandy or cordial, cherry, P. N. Heering. 22,923
Buttons, tie holders, studs, and kindred jewelry, collar, Parks Bros. & Rogers 22,899
Canned corn, J. C. Michael & Sons 22,913
Cashmere, F. Probst & Co. 22,905
Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes, United Alkali Company. ..... 22,946 to 22,948
Coal, bituminous, Westmoreland Coal Company. 22,955
Coffee, T. H. Messenger & Co. 22,919
Cotton, chemical composition for softening or treating, Zellner Bros. 22,944
Cotton cloth with a silk finish for dresses and linings, Sharpless Bros. 22,904
Cotton fabrics, Amoskeag Manufacturing Company. 22,902
Cotton goods, bleached, brown, and printed, G. Willis 22,903
Cure, dandruff, Columbian Chemical Co. 22,936
Dyestuffs produced from logwood, William J. Matheson & Company. 22,950
Fertilizer, plant, J. Weber 22,945
Fish, preserved, J. Pew & Son. ..... 22,906 to 22,910
Fowling pieces and other small firearms, H. Keidel 22,965
Furnaces or agricultural boilers, caldron, T. Cascaden, Jr. 22,961
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Hair, preparation to remove superfluous, A. E. Oppenheimer. 22,937
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Kerosene, H. W. Peabody & Co. 22,951
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Lead, including dry, mixed in oil, and mixed in oil with colors, white, Walker Paint Company. 22,956
Liqueur creme de cacao-chouao a la vanille, Les Heritiers de Marie Brizard & Roger, M. B. Glotin, Achard & Glotin. 22,924
Meat extract, R. Crowell, Jr. 22,912
Metal, leaf or powder, L. Spiegelberger. 22,949
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Rails, switches, metal cars, wheels, and trucks, C. W. Hunt Company. 22,959
Remedies, certain named, L. A. B. Street & Co. 22,928
Remedies, dermal, J. Pobl. 22,933
Remedy and tonic, headache, E. A. Butts. 22,929
Remedy for diseases of the blood and excretory organs, T. W. Graydon. 22,930
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Sewing machines, White Sewing Machine Company. 22,957
Shoes, school, Giesecke Boot and Shoe Manufacturing Company. 22,901
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Tonic, nerve, J. P. Roark. 22,931
Toys, Alton Manufacturing Company. 22,960
Wine, brandy, spirits, and liqueur, E. Dupont & Co. 22,925

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