

RECENTLY PATENTED INVENTIONS.

Engineering.

VESSEL TRANSPORTING APPARATUS.

—Christopher Bruhl, Brooklyn, N. Y. This invention provides, in suitable connection with a land railway, a dock carriage for receiving and floating a vessel, a pneumatic float or platform beneath the carriage, pumps to empty the float of water, and auxiliary mechanism to adjust the float and carriage to the level of the railway. The apparatus is designed to afford the means of transporting vessels overland from one water way to another, lifting them bodily and moving them while afloat, without injurious strains on the vessel or its cargo, the dock carriage being large enough to hold water sufficient to float the largest vessel.

**CUT-OFF VALVE.**—Daniel B. Kenney, Detroit, Mich. This is designed to be a simple and durable device, very effective and automatic in operation, and more especially designed for use on natural gas mains and pipes to automatically shut off the gas supply after the pressure has once gone down. The casing has inlet and outlet ports and a valve therefor, set and released by cam projections, in connection with a diaphragm having a stem with a head on its lower end separately engaged by the upper end of the valve when the latter is raised, whereby when the diaphragm moves the stem downward the valve will be disconnected from the head by the cam projections and will fall, means being also provided for raising the valve to engage it with the stem.

**ELECTRIC INSULATOR FOR BOILERS.**—Peter Decker, Norwalk, Conn. Excessive oxidation of the interior of boilers, with which quick-speed engines are directly connected by the steam and feed water pipes, is frequently attributed to currents of electricity pervading the water, and generated by the friction of the working parts of the engine. This invention is designed to provide a thorough insulation for the prevention of such action, an insulating joint being located between opposing coupling flanges on the pipe sections, a sleeve of non-conducting material on each bolt body, and a washer of non-conducting material under each head and nut on the bolts.

Railway Appliances.

**FREIGHT SHIFTING BUFFER.**—Clayland Tilden, Jersey City, N. J. This is an improved device for shifting freight upon gondola and flat cars, as in cases of beams of wood or iron which have been shifted out of place. In connection with a framework is a butting block with which a buffing head has a hinged or pivotal connection, there being means for elevating the buffing head, while a fixed buffing surface is attached to the block above the head. In operation the car is pushed toward the butting block arranged in its path, and the load is brought into gradual engagement with a buffing surface, whereby the load will be trued up without having to be handled by laborers for this purpose.

Mechanical Appliances.

**CHAIN POWER.**—Milo E. Smith, Brady Island, Neb. This is a simple and convenient device for transmitting a continuous motion to an endless chain to adapt it for driving any sort of machinery. A reciprocating bar is held to move parallel with the chain members, a sliding frame moving in the same plane with the bar, the frame having flanged pulleys arranged opposite the chain, and oppositely arranged elbow latches pivoted in the sliding frame having notched ends to engage the chain, there being a link connection between the elbow latches and the bar.

**TUBE SCRAPER.**—Philip Eckenroth, Jr., Philadelphia, Pa. The body of this scraper has shoulders on its opposite edges near its front end, cutters having bent arms being pivoted at their bends to the body, with their inner ends abutting against the shoulders, while a lever pivoted to the body in the rear of the pivotal points engages the arms to simultaneously operate them. In use the scraper is secured to a handle and pushed through a boiler tube in the ordinary way, the cutters being adjustable to fit any tube, and means being provided for increasing the power of the scraper at particular points where heavy scale is met with, where a sudden shock or blow may be made to loosen the scale, and enable it to be readily removed.

**MECHANICAL MOVEMENT.**—Russel C. Lee, Ham, Trinidad, Col. This invention relates to mechanical movements in which a reciprocating motion is changed to a rotary one, and is designed to be simple and durable in construction, avoiding dead center positions and reducing friction to a minimum, while being readily applicable to all kinds of machines. The invention consists of arms secured on a driving shaft and adapted to be engaged by an upper and lower set of abutments held on the reciprocating crosshead, there being also a reversible double lug arranged between the abutments of the crosshead.

**HAIR TREATING MACHINE.**—Junius A. Murphy, New Orleans, La. Machinery for treating horse hair and similar fibers is greatly improved by this invention, the machine picking and forming the hair into a lap with uniformity and economy, the lap being in proper form to enable the combing frames, to which the air is subsequently subjected, to effectively tease and comb it. The invention provides a novel feed mechanism and feed regulator for the picker, and a novel arrangement of the picker cylinder and the hopper to which it delivers, while there is also introduced a novel improvement in the forming of the lap and in the reeling of it.

Agricultural.

**FERTILIZER DISTRIBUTER.**—Thaddeus N. L. Anderson and Willie Boatner, Centerville, Miss. The distributing hopper, suspended by a strap from the shoulder, has a screen located near its upper end, and a slide valve where the spout joins the hopper below, a stirrer journaled in the hopper extending below the slide valve, while a handle lever extends up-

ward from a spring-pressed lever fulcrumed on the outer face of the hopper and connected with the valve, a gauge bar secured to the lever limiting the throw of the valve. The fertilizer is dropped by pulling upward on the handle rod as one walks over the ground with the device, the valve being set to distribute a certain amount to the acre, the fertilizer being practically sifted and prevented from clogging.

**CULTIVATOR AND HARROW.**—James S. Hickman, Hickman, Ill. This is a combination machine which may be used to cultivate one, two, three, four or more rows, the invention providing a simple, novel and easily operated construction of supporting and guiding devices and parts to be removed and replaced to convert the machine into a harrow or cultivator frame. It has adjustable front and rear axle sections and separate devices for operating them, with locking devices for their connection, so that they may be operated together or separately, while the cultivator teeth are partly supported to run close to the row, other teeth running centrally between the rows and, in use as a harrow, such of the teeth as would interfere with the growing rows are removable.

Miscellaneous.

**CASH REGISTER.**—Charles Gibbs, New York City. Within a suitable casing a shaft carries two loosely mounted disks, one having a scale in cents and the other a scale in dollars, there being teeth on the periphery of the dollar disk and pins on the periphery of both disks, in combination with a laterally shifting pinion meshing with the teeth of the dollar disk and adapted for engagement with the pin of the cent disk, while an actuating mechanism connects one disk with the key. The machine also has various other novel features, all the movements being positive and there being no springs in the actuating mechanism, the machine being designed to afford an accurate account of receipts in dollars and cents, while cards of information or advertisement may be conveniently displayed in the casing.

**AIR SHIP.**—James C. Walker, Waco, Texas. This ship has stationary vertical cylinders opening entirely through it and provided with lifting wind wheels in their upper ends, while horizontal cylinders provided with propeller wind wheels are arranged in a horizontal framework having pointed ends. The ends and sides of the cabin are to be covered with canvas, woven wire, or wood wicker work, and a light tubular construction is to be used throughout, to afford the greatest possible strength consistent with the least weight, any suitable motor being employed which furnishes high power with little weight.

**INKSTAND.**—William J. Sawyer, London, England. This inkstand has a horizontal closed collapsible containing vessel connected by a flexible tube with an open dipping well, in combination with a supporting cradle carried and rendered vertically adjustable by pairs of levers, the dipping well and reservoir being adjustable relatively as to height. The improvement prevents contact of the air with the bulk of the ink, preventing the thickening of the ink and the taking place of physical changes, while maintaining a practically constant quantity of ink in a small well in which the pen is dipped.

**EYEGLASSES.**—Charles Lembke, New York City. Combined with the eyeglass frame are clips supported by it and nose pieces secured to the clips by a pivotal connection, clamping screws being provided in addition to the pivots for maintaining the nose pieces in adjusted position. The invention relates to eyeglasses in which the nose pieces are pivotally supported from the frame to adjust themselves to the nose of the wearer, and provides for readily securing the nose pieces in the adjusted position, thus maintaining them permanently in proper adjustment.

**MEASURING VESSEL.**—William C. Hocking, Sheffield, Iowa. This is a measure open at top and bottom, its interior capacity equal to the standard measure it represents, and only to be filled when its open bottom rests on an independent surface, as the bottom of a paper bag or sack resting on a floor or table. It has on its upper end a fixed shelving or inclined side handle of feed board character, the outer end of which forms a hand grip.

**INVALID BED.**—Carl Olsen, Long Island City, N. Y. The frame of the bedstead provided by this invention may be easily taken apart and packed into a small compass, or the bed frame may be removed from the head board and foot board and applied to a bedstead of any other form, the bed being extremely convenient for use in a sick room and also adapted for use as an ordinary bed. The bed is provided with different adjustments to fit it for its especial use and the invention covers various novel combinations and arrangements of parts.

**CHILDREN'S CARRIAGE BRAKE.**—Augustus E. Scharff, Tacoma, Washington. This improved brake mechanism is applicable to any hand-pushed vehicle, and particularly to baby coaches having four wheels. Combined with a brake beam carrying brake shoes is a retractile spring normally maintaining the beam out of contact with the carriage wheels, a chain or cord connected with a rotatable handle bar and winding thereon being connected with the brake beam, to apply the brake by the turning of the handle bar.

**KNITTED FABRIC.**—Max Gernshym, Brooklyn, N. Y. This fabric is formed with a series of tubular knitted courses, each partly formed by plain loops to form a ribbed back and partly by transferred loops to produce an ornamental front, the fabric being made in continuous tubular form and afterward cut up and trimmed to form jackets and other garments, of which part is plain and the rest in design, making fine goods of a rich appearance at the same cost as ordinary plain goods. The invention relates to a former patented invention of the same inventor.

**PAPER BAG.**—Charles W. Fishel, Aspen, Col. This is a cheap and easily fastened bag, to hold groceries, fruits, and other articles which do not

sift. It is formed of a rectangular paper sheet, two of whose diagonally opposite corners are folded on converging lines and lapped and pasted, another corner being folded and parted over the lapped portion to form the narrow end of the bag, while the extremity of the remaining corner portion is folded and pasted upon a transverse string, which is thus made a permanent attachment of the mouth-closing flap.

**CUFF HOLDER.**—James J. Culley, San Francisco, Cal. A plate having a keeper is adapted to be secured in a sleeve, a base plate with an offset projecting over the keeper, while a plate or strip pivoted to the base plate has a cuff stud at one end and at its other end a tongue engaging the keeper, a spring having one end secured to the pivoted strip and its other end engaging the offset of the base plate. This device is designed to secure the cuff to the coat sleeve, so that it may always be held in the right position.

**GARMENT DRAUGHTING PATTERN.**—Bertha Musse, New York City. This is an adjustable pattern of simple and convenient style which may be accurately fitted to people of different sizes in the making of sacks, basques, waists, and analogous garments. The various parts of the pattern are preferably made of sheet metal, and the pattern may be given any desired contour, according to the garment to be cut, the different pieces being sectionally formed, overlapping, and having a sliding connection with each other.

**BREECH LOADING BOLT GUN.**—William D. Forbes, Morristown, N. J. This improvement has more particular reference to the devices for imparting motion to and locking the breech block, and for locking the extractor upon the cartridge shell in withdrawing the latter. Combined with the frame or receiver and breech bolt with a rotary handle having a crank pin is a connecting rod connecting the crank pin with the breech bolt, a laterally moving cartridge extractor, and a device carried by the connecting rod to lock the extractor upon the cartridge shell during the rearward movement of the breech bolt.

**SKATE.**—Thomas H. McQuown, Biggsville, Ill. This skate has a sole plate whose rear end is secured to the runner, while an adjusting device is arranged between the front end of the sole plate and the runner, whereby provision is made for adjusting the sole plate to fit differently shaped shoe soles, in such manner as to give the toe a firm rest, at the same time preventing pulling on the heel.

**BOTTLING APPARATUS.**—Amalia M. Donally, New York City. Combined with a compression mechanism is a flexible filling tube adapted to enter a cask or like receptacle independent of the apparatus, a vent tube connected with the filling tube also entering the cask, with other novel features, the machine being designed for manipulation by a single attendant, and its construction being such that a series of bottles of irregular size may be filled as readily as a series of regular sizes, the supply of liquid being cut off from any one or from the entire number of bottles being filled, at the option of the operator.

**FORMER FOR BERRY CRATES.**—Charles S. Andrews, Wilmington, N. C. This crate former consists of a crate-shaped skeleton metallic frame with a hollow spindle, whereby the body is adapted to be mounted on and revolved by a shaft, seats or recesses being formed in the outer face of the body adapted to form seats for the slat sections of the crate, with means for holding these sections to the body. By the use of this improvement crates are designed to be made at a small cost and very much quicker than they can ordinarily be produced. The entire crate may be made on the former, the longitudinal and transverse slats being nailed together and the brads or nails clinched on the former.

**WEATHER BOARD.**—Robert Sword, Kenney, Manitoba, Canada. This is an improved drop siding weather boarding strip or plank, having its upper and outside edge chamfered in a concave plane, with the curve of the chamfer approaching the inner side of the board more closely at a line some distance from the edge than it does at the edge, and having its lower edge recessed upon the inside, whereby the shrinkage of the boards is made to tighten the joint between them, and preventing the opening of cracks from the shrinkage of the lumber.

**PORTABLE SCAFFOLD.**—John Harper, London, England. In an upright framing, with corner posts erected on a wheeled base and braced together, the posts having racks and guides, is a cage or platform adapted to be moved up and down the guides, toothed gearing engaging with the racks and coupled by worm gear, the whole being operated by a single hand lever. This scaffolding is entirely self-contained, and is made in sections, being more particularly adapted for use in repairing and decorating or cleaning buildings, as well as for construction purposes.

**SIDE APRON FOR VEHICLES.**—Thomas H. Joyce, Unionville, N. Y. This invention provides an apron at each side of the seat, and extending to the body of the vehicle, to protect the occupants from side draughts, the aprons being so hung as to be independent of the lap robe, etc., and capable of being conveniently and quickly carried rearward, so as not to interfere with getting in or out. The frame for attaching the apron consists of an attaching bar and a supporting bar having a lower flexible end and a spring-controlled upper end, the frames being designed to be lengthened or shortened as desired.

**NOB ATTACHMENT.**—Johan Matheson, Christiania, Norway. A divisible handle is provided by this invention, both parts of which, when connected, will reach through the catch for the latch bolt, whereby a more solid connection and a better guide for the handle may be obtained, an internally-threaded sleeve fitting upon the outer part of the handle and bearing against a shoulder on the inner part of the handle, there being a detachable connection between the sleeve and the inner part of the handle.

**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.

**THE SCIENTIFIC AMERICAN CYCLOPEDIA OF RECEIPTS, NOTES AND QUERIES.** Pp. 680. 8vo. Munn & Co., New York. 1892. Price \$5 cloth, \$6 sheep, \$6.50 half roan.

This splendid work contains a careful compilation of the most useful receipts and replies given in the Notes and Queries of correspondents as published in the SCIENTIFIC AMERICAN during the past fifty years; together with many valuable and important additions. Over twelve thousand selected receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public. The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form, convenient for ready use. Almost every inquiry that can be thought of, relating to formulae used in the various manufacturing industries, will here be found answered. Instructions for working many different processes in the arts are given. Many of the principal substances and raw materials used in manufacturing operations are defined and described. No pains have been spared to render this collateral information trustworthy. Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings. Those who are in search of independent business or employment relating to the home manufacture of salable articles will find in it hundreds of most excellent suggestions.

**THE ARCHITECT'S AND BUILDER'S POCKET BOOK.** By Frank Eugene Kidder, C.E. Pp. 900. 500 illustrations. New York. 1892. John Wiley & Sons. Full leather, gilt. Price \$4.

The original aim of the author was to produce a reference pocket book which should be to the architect and builder what Trautwine is to the engineer or Haswell to the mechanic. The author has succeeded admirably, and it would be a difficult matter to find as much useful information in the same compass. The work treats of mensuration, geometry, trigonometry, the strength and stability of foundations, walls, buttresses, arches, beams, floors, roofs, etc. The present or ninth edition will doubtless be well received by the profession, owing to the great development of the use of steel in building construction. Great attention is given to the strength of steel and the methods of using it. A glossary of technical terms, ancient and modern, adds greatly to the usefulness of the work. The arrangement of the book is admirable and hundreds of illustrations serve to make the book an indispensable companion for the architect.

**SYSTEMATIC MINERALOGY BASED ON A NATURAL CLASSIFICATION.** By Thomas Sterry Hunt, M.A., LL.D. The Scientific Publishing Co., New York. 1891. Pp. xvii, 391. Price \$6.

Prof. Hunt, in his preface, states that forty-six years ago he began the study of mineralogy under Charles Upham Shepard. This work is the outcome of a long lifework in chemistry, mineralogy, and geology. The author has won a wide reputation for possessing opinions of his own and the courage of those opinions. His division of the whole mineral world into orders, families, genera, and species, as in natural history proper, is ingenious and plausible. The book is well worthy of study, and indicates the mind of a thoroughly independent thinker, but it must be also remembered it is the work of a thoroughly equipped scientist of recognized standing.

**THE WORKING AND MANAGEMENT OF AN ENGLISH RAILWAY.** By George Findlay. London: Whittaker & Co. and George Bell & Sons. New York: Macmillan & Co. 1891. Pp. viii, 354. Price \$1.50.

The author of this book is the general manager of the London and Northwestern Railway, and is, therefore, eminently qualified as an authority of this subject. The treatment which the subject receives, as was to have been anticipated, is decidedly insular, but it is of much value as showing how our transatlantic neighbors conduct their great systems of crowded railroads. The interlocking and signaling system is given space, the perfection of which, at least as regards results, has long been conceded in the care of English roads. The use of the railroad for military defense is given at some length. The book is very good reading for all interested in railroads in this country as being suggestive of what may be done to improve our service and increase safety on our roads.

**ROBERT FULTON: HIS LIFE AND ITS RESULTS.** By Robert H. Thurston. New York: Dodd, Mead & Co. 1891. Pp. 194. Price 75 cents. Illustrated.

This book is of the series devoted to "Makers of America." Prof. Thurston tells in good style the oft-told tale of Fulton's work, his energy and perseverance under disappointment and discouragement. As opening, the story of steam in early times is told. The work closes with chapters of the advanced marine engineering of to-day and the outlook. This is affirmed to be slow and gradual improvement in speed and accommodation. The limit of speed for vessels of ordinary sizes he believes is nearly reached.

**THE ENGINE RUNNER'S CATECHISM. A SEQUEL TO THE STEAM ENGINE CATECHISM.** By Robert Grimshaw, M.E. New York: John Wiley & Sons. 1891. Illustrated. Pp. 366. Price \$2.

This very practical little work, written in the author's well known vein, attacks the problems of the working engineer's occupation. It tells of the features, erecting, and adjusting of special makes of engines by prominent makers, the adjustment of the cut-off, shipping and receiving, erecting foundations, valve setting, and many other details of the running of stationary engines. It contains a number of very pertinent and useful cuts.

A B C OF THE SWEDISH SYSTEM OF EDUCATIONAL GYMNASTICS. By Hartvig Nissen. Philadelphia and London: F. A. Davis, 1891. Pp. vii, 107. Illustrated. Price 75 cents.

This manual opens with a short treatise in question and answer form, upon the end and objects of this simple system of calisthenics. The meanings of the different words of command are included also. Then come five days' order of work, designed to be so repeated as to cover a course of thirty-three weeks. Numerous illustrations of the positions are given. The work is intended for school use, but it is obvious that there is room in the household for such work.

ANNUAL REPORT OF THE NEW YORK FOREST COMMISSION FOR THE YEAR ENDING DEC. 31, 1890. Albany, 1891. Pp. 324.

To those interested in forestry and the preservation of our woods, and notably of the Adirondack forest, this report will be very welcome. It contains, besides the interesting general report of the commission, notes of court decisions and a catalogue of land papers in general, referring to forest preserves of the State of New York.

TABLES FOR THE DETERMINATION OF MINERALS BY PHYSICAL PROPERTIES, ASCERTAINABLE WITH THE AID OF A FEW FIELD INSTRUMENTS. By Persifer Frazer. Philadelphia: J. B. Lippincott Co. Pp. ix, 115. Price \$2.

These tables are based upon Prof. Dr. Abin Welsbach's system of determinative mineralogy. The minerals are classified into three groups: I. Those with metallic luster, II. those with submetallic and non-metallic luster, but colored streak, and III. those with non-metallic luster and white or light gray streak. These are next subdivided by color of mineral, color of streak, and hardness, and the final distinctions are based, in addition to the above, on hardness, tenacity, crystalline system, etc. The general blowpipe and acid tests of each mineral are given in concise form. The work will be of use and interest to many students of this fascinating science.

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SCIENTIFIC AMERICAN BUILDING EDITION. JANUARY NUMBER.—(No. 75.)

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2. Plate in colors of a colonial house erected at Portland, Maine. Perspective elevation and floor plans. Cost \$3,800 complete.
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4. A cottage at Richmond, Mo., erected at a cost of \$1,600. Perspective elevation and floor plans.
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6. View of the Drexel Institute of Art, Science, and Industry, recently erected at Philadelphia, at a cost of \$600,000.
7. The Parsonage of the First Baptist Church at Gardner, Maine. Cost \$2,500 complete. Perspective and floor plans.
8. Ground plan and perspective view of the First Baptist Church recently erected at Gardner, Me. Cost complete, \$8,000.
9. A residence at Bridgeport, Conn. Cost complete \$3,400. Perspective and plans.
10. View of the German House in Chicago.
11. A church recently built at Oneida, N. Y. Cost \$2,400. Floor plan and perspective.
12. The beautiful residence of Gen. C. Hollister, Esq., at Rochester, N. Y. Mr. James Cutler, architect.
13. The World's Columbian Exposition—making of staff decorations.
14. Miscellaneous contents: Durability of redwood.—Is iron rust a cause of fire?—Types of chairs, old and modern, illustrated.—How to build a rain water cistern and filter, illustrated.—Bird tracks in stone.—Reparation of zinc castings.—Still water mains in Toronto.—The builder of the White House.—What constitutes the best paint.—World's Fair notes.—A heavy standard moulder, illustrated.—A staircase and hall design, illustrated.—Hot water vs. steam heating.—Schmidt's improved window frame, illustrated.—Value of thoroughness.—Improved Warner door hanger, illustrated.—An improved band scroll and resaw, illustrated.—Artificial stone.—An improved flour bin and sieve, illustrated.

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Business and Personal.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

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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.

(3940) M. R. C. asks: Will any article that will float placed in a running stream travel any faster than the water it is placed in, provided there is nothing to impede the travel of either? A. The water does not move with the same velocity in all parts of its section, in a running stream, the central portion always running the fastest. This produces a whirling or rolling motion, caused by friction on the bottom and sides, that extends to the surface and center. This inequality of motion may accelerate or retard any particles of matter floating upon the surface, according to their location from the center of the stream, but will generally have a less velocity than the mean velocity of the stream, although apparently moving faster than the water nearer the sides. If the article sets deep in the water, it will move faster than the surface water, being pushed ahead by the greater velocity of the water beneath.

(3941) F. C. F. asks: What form of boiler is best adapted with ordinary firing to burn (pine) cord wood, boiler 35 horse power? Is electricity considered more economical as a power conveyor than other methods where the bulk of power will be used not further than 500 feet from stations? What is next in economy? A. A flue boiler or one with very large tubes is best for wood fire. From a power plant already in operation a wire rope cable is the cheapest method of transmission for 500 feet. Electric transmission is the cheapest for long distance, and is also cheapest where a plant is to be located for transmission only, and is so used to a considerable extent for the utilization of water power otherwise not available.

(3942) J. D. asks: 1. In building a dynamo or motor, is it necessary to have the iron disks of the armature insulated from the shaft if they are insulated from each other? A. They should be insulated from the shaft. 2. Are not some dynamo armature cores made by running the disks on a thread on the shaft? A. We think not.

(3943) W. S. writes: I have a resistance column similar to the one described in Scientific American of September 14, 1889. I now want to make

a galvanometer like the one described in Scientific American of September 21, 1889. Now I wish to know if I could wind it with two coils, one of no resistance and one of ten ohms, and use the resistance column with it if more resistance be required. A. Galvanometers are frequently made and used in the way mentioned.

(3944) Ring Temper says: Can you tell of any method to test the heat of lead used for tempering small steel rings? The best way to heat the lead kettle so as to get uniform heat, said kettle about 14 inches diameter and 16 inches deep? A good practical treatise on case-hardening and tempering? (I already have Brandt's.) A. A pyrometer may be used, but, for the temperature required for hardening, it is less reliable than the eye. For best work with the eye, the furnace should be placed in a moderately dark place, or so shaded that the eye can judge with uniformity of the degree of heat required. The lead pot should be set in brick work in a recess so as to exclude any light from the furnace coming to the eyes. Furnace should be large enough to insure a uniformity of heat without frequent disturbance of the fire by redressing. Have no special work on lead bath.

(3945) J. H. J. asks: How is phosphoric acid H3PO4 made? How is sulphurous anhydride SO2 in a liquid state best prepared? If crystallized boracic acid H3BO3 be heated, boracic anhydride B2O3 will be obtained. What is the reaction? Can you tell me how blackboard crayons for school use are prepared? A. Phosphoric acid is prepared by burning phosphorus in a current of air, dissolving the phosphoric oxide in water and evaporating to dryness. Liquid sulphurous oxide is made by pumping the perfectly dry gas into a receiver. It liquefies also at 0° F., at the atmospheric pressure. The reaction you ask for is this: 2 (H2BO3) = B2O3 + 3 H2O. For blackboard slating use 1 gallon alcohol (95 per cent), 1 pound shellac, 8 ounces ivory black, 5 ounces flour emery, 4 ounces ultramarine blue. Make perfect solution of the alcohol and shellac before adding the other articles. Shake thoroughly. Apply rapidly. Three coats.

(3946) L. O. W. asks: What is the kallitype developer, its composition? I have a receipt for the production of the kallitype process of photography, but it is, however (to my mental conception), very obscure. The developer given is such: No. 1 arg. nitr.—Natrium. cit.—Potassa bichrom., water ammo.

No. 2. Kallitype developer. 3 ss Natrium. cit. 3 jj Water. 3 xx

The printed paper is to be developed in solution No. 1. What, then, is No. 2 for? Then again a third solution is applied, i. e.:

Soda citr. 3 j Aqua ammon. 3 jj Water. 3 jj

A. No. 1 is the silver developing solution, No. 2 is a clearing solution, to dissolve out the iron salts unacted upon by light. No. 3 is used also as a clearing solution to dissolve out the unacted upon silver salts. The process has been modified by combining in the sensitizing solution the silver salt and developing the image with a solution of borax and water. See particularly in Scientific American Supplement, No. 615, page 13023.

(3947) J. C. A. asks whether more coal will be required to heat a greenhouse 245 feet long, by steam, with the boiler at one end than if it is at the center of house. A. There should be no difference as to the gross amount of heat imparted to the greenhouse, but it might make a great difference in the uniformity of distribution of the heat. The position of the greenhouse in regard to the direction of the cold winds, in a house as long as stated, will make a great difference in reference to the position of the boiler, which, for best effect, should be placed at the end most exposed to cold winds. Otherwise a central position on the northerly side is the best practice.

(3948) D. D. D. asks: Is bituminous coal or anthracite penetrable by air under heavy pressure? If so, under what pressure? Will air under pressure escape through where hydrogen gas will? What rocks and minerals are airproof under very heavy pressure, say one to two thousand pounds to the square inch, and what natural or chemical preparations or compounds, such as paints and varnishes, are impervious to air under very heavy pressure? A. There are very few rocks or minerals that if solid, are not practically impervious. The solid coal beds hold gas and water. The sandstone and limestones pass air and water under various pressures. Even cast iron is not gas proof under 2,000 pounds pressure per square inch. Rubber and varnishes will go far to render the surface of porous stone impervious to air, gases and water, but will finally flow into the stone and become porous under great pressure.

(3949) J. R. S. asks: What is the best material to use in repairing fire boxes of locomotive boilers, copper or steel plate, where the fire box is made of steel? Please tell me which is the best to use and your reasons, also what is the idea in putting copper liners under the tubes in the fire box. Would they not do as well without copper liners? A. Always use the same material that the boiler is made from for patches. Soft steel plate is the best. The difference in expansion and contraction by change of temperature will make copper patches leaky. Copper ferules or liners are but little used. They were supposed to make a more perfect joint and preserve the end of the tube from burning out by their better conductivity of heat from the end of the tube to the water inside.

(3950) W. C. G. writes: 1. I am trying to coat corks to make them acid proof. What can I use in liquid form that will penetrate enough and will not be removed when putting in the bottle. Must not be injurious or poisonous. A. Heat the corks in melted paraffin wax. The only objection to this process is that it makes them slippery, and if the neck of the bottle is not cylindrical, they will sometimes rise and fall out. 2. Also how can I make a cheap hard grease-proof article resembling marble, or earthenware, not requiring heat, to mould in forms? There is a cheap composition and have a smooth surface. A. Hydraulic cement and water, plaster of Paris and water, or a mix-

ture of oxide of zinc and strong solution of zinc chloride might answer your purpose.

(3951) E. T. S. asks how to clean wall paper. I have a large hall that I wish to clean. The hall is 100 by 50 feet. The paper is in good shape, only soiled by dust. A. There is no better way of cleaning papered walls than to wipe them down with soft cotton cloths, better by hand, but can be done with a long handled brush to remove the loose dust and then go over with a cloth tied over the brush. For stains use fresh bread crumbs.

(3952) J. B. M. asks: Can you give any information respecting the manufacture of aerated bread? I believe it is a patent process, if so, could you give the address of the patentee? A. Aerated bread was made by a patented process, but the patent has expired. It consisted in charging the dough with carbonic acid gas under pressure and then baking. The use of yeast or ferment was thus avoided.

(3953) C. W. C. says: I have heard it argued considerably whether ice freezes from the top or bottom. Which is correct? Also where can I get a chemical motor with sufficient power to run a sewing machine, or better two of them. A. Ice commences to form on the surface always in still water. Anchor ice is sometimes formed on the rough bottom in swift running water, in very cold weather. We have no information of the manufacture or sale of chemical motors.

(3954) G. E. S. says: We have more or less cold water pipes (iron) throughout the mill, used for hydraulic pulp machines, we are annoyed by the sweat and drip from these pipes. What can they be coated with on the outside to keep them from sweating and dripping? A. The sweating and dripping from the pipes is caused by the contact of the moist warm air in mill with the cold pipe. The only remedy is protection by a non-conducting substance, and may be any of the felting material in use. Hair felt 1 inch thick, covered with thick paper, is very effective; or if thought cheaper, box the pipes and fill with sawdust. Make the boxes to have not less than 1 inch clearance on inside between box and pipe.

(3955) F. S. B. asks how the valve or link motion of the English locomotives is operated. They do not have any reversing lever, and how is it locomotive-makers in this country do not adopt the same systems? A. The English locomotives have the regular link valve gear, with various modifications and reversing lever. The Stephenson valve gear is much used in England and the United States. Our locomotive builders do not go backward. The best valve gears are found on American locomotives.

(3956) G.—The duty on lenses is 45 per cent of their invoiced value. Goods are sold cheaper in England, because the expense of labor is less. A lens may be imported as a tool of trade by a photographer, he carrying it with him, without paying duty.

(3957) J. A. H. writes: On page 386 of December 19 number of Scientific American there is an article headed "Intense Cold." What is the meaning of absolute zero? A. Absolute zero is the point at which the kinetic motion of the molecules of matter, to which is due what is ordinarily termed heat, ceases, and when the molecules come into permanent contact with each other. It is placed at -273° C. or -459° F.

(3958) T. V. M. asks: 1. Could a submarine torpedo boat (100x20, cigar shape) be run 42 hours by an electric storage battery, there being fluid to fill the cells on board the ship? A. The boat could be run 42 hours with a sufficient number of cells. Extra fluid would not be required, as there is no sensible waste of the fluid. 2. What is the greatest speed and the longest time of an electric storage battery running a boat, and also what is the expense? A. We have no record of the longest time and greatest speed. The possible time would depend on the carrying capacity of the boat, while the speed would be subject to the same limitations as those of steam-propelled boats. The expense depends on the method of using the power, the cost of running the prime motor, and other conditions.

(3959) S. W. T. says: I have a steam gauge that comes back to the pin when steam is down, and when it is exposed to frost and a fire is started, the hand will gradually rise, sometimes to 20 lb., sometimes to 60 lb. Then in a few minutes after the frost is all gone the hand will come back to the pin, and start up all right when steam is up. Please give me a good arithmetical rule by which I can determine the distance apart for screwed stay bolts, and the diameter of stay bolts. A. The pipe connections to a steam gauge should never be allowed to freeze or have water in them when exposed to frost. When water is frozen in the connecting pipe, the gauge hand will move by the expansion of the air above or next to the diaphragm by the change of temperature in the boiler room before steam is made, and when the ice melts in the pipe the hand will move back as described. Sometimes when the water has accumulated to too great an amount, the gauge diaphragm or spring (if a Bourdon) will burst. An air cock should always be placed so as to draw off all water from the gauge when liable to freeze. The usual practice for water leg stay bolts is, for distance, 6 in. to 5 in., according to the pressure and thickness of the iron. For the size of the bolt, square of the distance multiplied by the pressure, and product divided by 4,000 equals the area of the bolt, and for a given sized bolt  $\sqrt{\frac{4,000 \text{ by area}}{\text{pressure}}}$  = distance apart center to center.

(3960) E. S. writes: 1. I wish to wind the dynamo described in Scientific American Supplement, No. 600, as a shunt machine. What size and how much should be used on F. M. to give the proper resistance? A. Consult the description of the Edison dynamo in Scientific American, vol. lxx., page 68, for points on shunt-wound machines. The field magnet should have 14 times the resistance of the armature. 2. Is not the core of iron wire more efficient than the one of iron washers? A. There is little or no difference. 3. To settle an argument, the meaning of the term ampere hour? A. A current of 1 ampere for 1 hour; 1/2 ampere