RECENTLY PATENTED INVENTIONS.

Railway Appliances.

ELECTRIC RAILROAD. — Ira Robbins, Sheffield, Ala. This invention provides a special construction and arrangement of parts for roads which employ a continuous insulated underground conductor for the supply of the current to the motor on the car. Spring-actuated drums, in boxes a proper distance apart beneath the roadbed, each carry a given length of conducting wire connected at one end to a carrier to be drawn along by the car, and connected at the other end to the main conductor, laid the full length of the line, the carrier being disconnected from the car when its section of wire is unwound, when it is drawn back and wound up on the drum by the spring, the car at the same time entering upon another section, and taking its current from the next carrier.

SNOW REMOVING APPARATUS.—James F. Seery, Kingsbridge, N. Y. This apparatus for clearing railway tracks and roadbeds of snow is mounted on a platform car, and consists of rotary brushes arranged to sweep the snow upon heated pipes or into a heated chamber, the snow that is piled on the pipes being carried along by auxiliary brushes and distributed over lower pipes, or thrown against pipes located above the lower coils. The snow is thus converted into heated water, which is delivered upon the roadbed in a manner designed to dispose of any snow which may have been left by the brushes.

CAR COUPLING.—Jeremiah W. Kirby, Great Falls, Montana. This coupler is of the "hook and catch" class, and is designed to be simple and durable in construction, and easy and efficient in operation. The drawhead has longitudinal recesses in its upper face, separated by a partition, and a transverse rock shaft carries lifting arms resting in the recesses, a coupling hook being pivoted at the rear end of one of the recesses and a catch bar arranged in the other recess. The coupling hooks have beveled heads whereby the cars will be automatically coupled as they come together.

Mechanical Appliances.

BLAST FURNACE BELL AND HOPPER.—Benjamin F. Conner, Columbia, Pa. This is an improved mechanism of simple and durable construction adapted to evenly distribute the charging material in the furnace, or to throw portions of it to the center only or to the walls as desired. An upper or outer bell closes the mouth of the hopper, and this bell has a central opening closed by a lower or inner bell, a counterbalanced beam above the hopper supporting the outer bell, while a lever connected with the inner bell is connected with the piston of a steam cylinder, an adjustable arm on the piston rod being adapted to engage the beam, the mechanism supporting and operating the bells independently of each other.

DRUM SHIFTER FOR HOISTS. — Jefferson U. Elwood, McKeesport, Pa. This device is adapted to slide the hoisting drum on the main driving shaft of a hoisting machine, to engage the drum with a friction pulley or other device for rotating it. It consists of a frame fitted to slide and having end plates, one of which engages the drum while the other has pins extending from its face and engaged by cam grooves in the face of a collar mounted to turn. The device is simple and durable, does not weaken the shaft in any way, and permits the operator to shift the collar either to the right or left to engage the drum with the friction pulley.

Miscellaneous.

FRUIT PICKER.—John H. Woodward, Rochester, N. Y. This is a simple and convenient device designed especially to facilitate the picking of grapes, by means of which the clusters may be readily separated from the vine, and will not be dropped, but will be held until they can be deposited in a suitable receptacle. It consists of a handled bar having a pointed end, a spring-pressed knife sliding on the upper side of the bar and a spring-pressed plate on the under side of the bar, the plate forming a stem clamp adapted to operate in unison with the knife.

PNEUMATIC GAME BOARD.—Edwin L. McConaughy, Philadelphia, Pa. This board, which is designed to be held in one hand in playing, is practically triangular in shape, and has a circular central depression, the level surface of the board sloping upward to the edge of the depression. Around the center are shallow cupped depressions, adapted to form resting places for a light ball of cork or other material used in playing the game these depressions being connected by channels cut to form a track. In each of the depressions is a perforation extending obliquely downward through the board, and the ball is propelled by a jet of air from a simple form of bulb or other jet blower, the game requiring that the force of the jet shall be just sufficient to move the ball from one station to another till the central station is reached.

PNEUMATIC BILLIARD TABLE.—This is another patented invention of the same inventor, providing a game board with pockets or cavities consisting of cupped depressions formed in its surface, while the balls, of cork or similar material, colored as may be desired, are propelled by air jets from a jet blower. The blower is formed with a small nozzle adapted to fit in one of a series of apertures formed in the cushion wall around the board, and the game consists in propelling the balls to obtain the highest number of pockets with a certain number of air puffs.

METAL LATHING.—Charles H. Curtis, Niles, Ohio. This lathing is constructed of sheet metal having a series of openings running laterally and obliquely through it, leaving oppositely arranged hoods on reverse sides of the sheet, whereby a large body of mortar connects the outer surface portion of the plaster with the clinching portion, and but a small portion will pass through and fall behind the lath. The construction is designed to give special stiffness to the lath, on account of the corrugations being reversed, while the lath has superior locking qualities and is easily handled without cutting the hands, a sheet being adapted for putting on in any position, having no up or down, right or left, or front or back. The inventor has associated himself with the Niles Iron and Steel Roofing Co., of Niles, Ohio, who will manufacture this lath in addition to their line of roofing, corrugated and V-crimp iron, etc.

DUMPING WAGON. — Thomas Hill, Jersey City, N. J. Two patents have been granted this inventor for improved dumping wagons. In one of these wagons, on each of the side pieces of the wagon frame is secured a supporting rail of novel shape, the rail having a front and rear downward incline, with a higher central level portion in which are two recesses or sockets. On each side of the body of the wagon are two straps, each carrying a roller which rests and rides on the rail, their position being such that, when the body is at rest on a level, the forward rollers will be at the bottom of the front incline of the side rails, while the other rollers will rest in the sockets on the higher level of the rail, but when the body is pushed back the rear rollers roll down the rear incline and the forward rollers roll up and become seated in the sockets of the central higher portion of the side rails, whereby the wagon body is tilted rearward. According to the construction provided for by the other patent, the frame of the wagon curves downward at its back end, and on each side is a plate or rail forming a track, having a projection or stop at the rear end of its curved or inclined portion. On each side of the wagon body, somewhat nearer the front than the rear, is a strap to which is pivoted a roller carrier or carriage, the rollers running upon the side rails and carrying the body, which is tilted for dumping by being pushed backward till the rollers are arrested by the stop at the lower back end of the curved or inclined portions of the rails.

PLATFORM WAGON. — This improvement is covered by another patent to the same inventor, for a wagon more especially adapted for carrying heavy goods, the object being to lessen the cost of construction of such wagons, while making them lighter and better fitted to withstand the roughest usage. The main frame of the platform consists of two independent sections of angle iron, one of which, having opposite upper and lower flanges, forms the front and sides, and the other forms the back, which is bolted to the under side of the former. There is boarding in and between the flanges of the angle iron sections forming the front and sides, and re-enforcing strips within the channel between the boarding and the upper flange.

DISPLAY STAND.—Ernest A. G. Kurth, New York City. This stand can be readily taken apart and packed in a small space, and quickly built up, and is preferably adapted for the display of toys and other small articles, being also suitable for use as an ornamental center piece for a table. In the center of a circular base a polished brass disk is located, spanned by a yoke, and in apertures arranged in a circle around the base are inserted rods attached at their upper ends to a central connecting sleeve, and forming a cage-like figure, in which is a central vertical shaft, the lower pivot point of which turns on the polished disk. The shaft extends above the cage, where it has a hub with apertures in which are inserted curved arms adapted to receive articles for display, and the shaft also carries a fan wheel adapted to be rotated by currents of warm air ascending from lighted candles held in light rod brackets on the sides of the cage, whereby a portion of the stand will be kept constantly revolving.

KNIFE GUARD. — Charles S. Wright, Skaneateles, N. Y. This is a device especially designed for the use of retail dealers in cutting cheese. A circular plate or table, of sufficient size to hold the cheese, is pivoted on a suitable support, and centrally over the plate is secured an inverted U-shaped frame, adapted to extend centrally over the cheese. This frame is centrally connected with a bent and slotted knife guard extending at right angles from it, and having a suitable foot by which it is secured to the base. When the cheese is in position on the central plate it may be easily brought into position to cut a slice of any desired size, and when the cut is made the knife is guided at both ends to cut evenly through the cheese, so that there will be no crumbling or waste.

CANE JUICE STRAINER. — Walter C. Hazlip, Brusly Landing, La. This strainer may be operated by hand or power to effectually separate fragments of sugar cane and other refuse from the cane juice as it flows from the crushing rolls of a sugar mill. It consists essentially of an oblong juice-receiving box, on which is mounted a main strainer frame apertured at one side for the discharge of surplus juice, a reciprocating rake being actuated in the strainer, while a screen frame receives the overflow, and there is another screen frame lower down in the box.

WIRE STRETCHER. — John W. Peterson, Slater, Iowa. This is a simple and inexpensive device for stretching barbed or other wire, and facilitate the proper fastening of the wire to the fence posts. It consists of a bar having a fixed head at one end and a clamp and a fixed head at the other end, a lever and a hook sliding on the bar, with another clamp working oppositely to that of the fixed head, and other novel features, whereby the wire may be quickly and thoroughly stretched and held for attachment to the post, the device being also adapted for splicing wire.

CIGAR BOX TRIMMING MACHINE. — Henry Leiman, New York City. In this machine saw shafts are journaled in upper and lower adjustable brackets, the saws mounted on the shafts having lateral and vertical inclinations, in combination with a gauge bar, carrier, and other novel features, whereby the operation of trimming cigar boxes will be almost completely automatic, the mechanism of such machines being so simplified that the services of two unskilled laborers will be all the help required, their work being to feed the boxes to the machine, from which the box passes having all of its projecting edges made flush with its top, bottom and sides.

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.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

For Sale—One 15 H. P. double cylinder, double drum, friction horizontal hoisting engine, with boiler and fixtures. New. Address W. P. Davis, Rochester, N. Y.

Patent Dealers. Street & Fishburn, Dallas, Texas.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

For best hoisting engine. J. S. Mundy, Newark, N. J.

Wanted—Reliable firm to manufacture stamped metal novelty for cash. Address Box 1001, Bay City, Mich.

The price of the Brown & Sharpe No. 3 Universal Cutter and Reamer Grinder is $200. Former price, $260. Brown & Sharpe Mfg. Co., Providence, R. I.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 112 Liberty St., N. Y.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps for paper and pulp mills. Irrigating and sand pumping plants. Irvin Van Wie, Syracuse, N. Y.

Rubber Belting, all sizes, 77½ per cent from regular list. All kinds of rubber goods at low prices. John W. Buckley, 156 South Street, New York.

Wanted—A copper vacuum pan, 5 to 8 feet diameter. Address, giving full particulars and lowest price, Cash, box 773, New York.

For Sale—All rights for tested stairs climbing wheel chair for people who cannot walk. Patent allowed. Address J. B. Bray, Waverly, N. Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

For Sale—Wrought iron flume racks, cast iron pulleys from 6 to 80 inches in diameter, gears, all 2 cents per pound. Cotton looms, $15; tin roping cans, fliers, 10 cents each. Other supplies cheap. Mill burned. Send for circular. Baltic Mill estate, Baltic, Ct.

Magic Lanterns and Stereopticons of all prices. Views illustrating every subject for public exhibitions, etc. ☞ *A profitable business for a man with small capital.* Also lanterns for home amusement. 220 page catalogue *free.* McAllister, Optician, 49 Nassau St., N. Y.

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.

(3497) W. F. E. asks: Can a practical and temporary storer or preserver of power be made with compressed air? If so, is there any limit to the amount of force that can be thus stored and used again at will? Are there any successful working appliances on this cold-pressed air plan? At what, and where? If not practical, why? Also are there any practical means of storing for a short time great quantities of mechanically developed electricity? A. Air under pressure can be stored for future use and is used in this way for mine haulage. It is limited to the size of storage tanks. Electricity is also, practically speaking, stored in the storage battery system. Has been described and illustrated in SCIENTIFIC AMERICAN and SUPPLEMENT.

(3498) F. J. S. asks: What pressure will a two by three foot upright boiler safely stand, one-half inch iron? What horse power and what size propeller will a boat five feet by twelve require to make a speed of four miles an hour? At what speed should a screw propeller (12 inch) be run for the best results? A. Small engines should have 22 cubic inches of cylinder space to a nominal horse power. Boilers should have not less than 14 square feet of heating surface to a horse power. Your boiler should be good for 100 pounds steam pressure. The boat requires 2 horse power engine and boiler. 12 inch screw should run 300 revolutions per minute.

(3499) S. A. K. asks: Can you tell me how to melt pure rubber and how to harden it again? A. You can soften rubber by heat and then it can be pressed into shape. It cannot be melted and hardened again. We recommend "Rubber Hand Stamps and the Manipulation of India Rubber," $1 by mail.

(3500) J. A. S.—For violin varnish.—Dissolve 12 parts sandarac gum, 6 parts shellac, 6 parts mastic, 3 parts elemi in 150 parts 95 per cent alcohol, in a bottle heated in a water bath. Then add 6 parts Venice turpentine. Stir and allow the contents to settle in the corked bottle. Then pour off the clear varnish for use.

(3501) W. P. asks: Can you inform me where I can find a magnetic needle for finding gold or silver deposits, and if there is such a thing? If so, the probable cost of one? A. There is no needle or other device for finding gold and silver. The ordinary dipping magnetic needle is used to indicate bodies of iron ore in the ground near the surface.

(3502) F. F. S. asks what the laundry people use to give the collars, shirts, etc., the gloss that is on them. A. 1. Starch, 1 ounce; paraffine, about 3 drachms; white sugar, tablespoonful; table salt, tablespoonful; water q. s. Rub up the starch with soft water into a thick smooth paste. Add nearly or quite a pint of boiling water, with the salt and sugar dissolved in it, and having dropped in the paraffin, boil for at least half an hour, stirring to prevent burning. Strain the starch and use while hot. Sufficient bluing may be added to the water, previous to the boiling, to overcome the yellowish cast of the starch, if necessary. Spermaceti may be used in place of paraffin. Starched linen can only be properly finished by hard pressure applied to the iron. 2. Glossed shirt bosoms.—Take 2 ounces of fine white gum arabic powder, put it in a pitcher and pour on a pint or more of water, and then, having covered it, let it stand all night. In the morning, pour it carefully from the dregs into a clean bottle, cork and keep it for use. A teaspoonful of gum water stirred in a pint of starch, made in the usual way, will give to lawns, white or printed, a look of newness, when nothing else can restore them, after they have been washed.

(3503) G. B. asks how to color leather black. A. Patent leather black.—Mix together ½ pound each of ivory black, purified lampblack and pulverized indigo, 3 ounces dissolved gum arabic, 4 ounces brown sugar and ¼ ounce glue, dissolved in 1 pint water; heat the whole to boil over a slow fire, then remove and stir until cool, and roll into balls. 2. Vinegar black.—This is the most simple and useful coloring liquid for the trimming shop for blacking leather straps. To make the simplest, and without doubt the best, procure shavings from an iron turner, and cover them with pure cider vinegar, heat up and set aside for a week or two, then heat again and set in a cool place for two weeks, pour off the vinegar, allow it to stand for a few days, drain off and cork up in bottles. This will keep a long time, and while producing a deep black on leather, it will not stain the hands. 3. 4·02 ounces bruised gallnuts and 17·5 ounces green nutshells are boiled in 26·25 ounces rainwater; when the mixture has boiled one hour; the liquor is strained through a cloth; the leather to be colored is first stained with the solution of iron filings, common salt and vinegar, as given under purple, before the above decoction is applied.—From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3504) A. J. B. asks for a harmless hair dye. A. The following is a receipt for hair dyes taken from the "Scientific American Cyclopedia of Receipts, Notes and Queries." In press. Walnut skins beaten to a pulp, 4 ounces; rectified alcohol, 16 ounces. For a black dye the following is excellent. Iron sulphate, 10 grains; glycerin, 1 ounce; water, 1 pint. The hair must be thoroughly washed with this, dried and brushed once daily for three days, then the following should be applied on a small tooth comb, but it should not be allowed to touch the skin if the other preparation has done so, as a temporary stain would result. Gallic acid, 4 grains; tannic acid, 4 grains; water 1½ ounces. After the application of the first preparation the hair should be allowed to dry, and then be brushed. Subsequently both formulas may be used once daily, at an interval of an hour or so, until a black color is produced.

(3505) E. K. asks for the general method of tanning fur skins. A. After cutting off the useless parts, and softening the skins by soaking in warm water, take away the fatty part from the inside, after which soak the skins in tepid water for two hours. Mix equal parts of borax, saltpeter, and Glauber salts (sulphate of soda) in the proportion of about ⅛ ounce of each, for each skin, with water q. s. to make a thin paste. Spread with a brush over the inside of the skin, applying more on the thicker parts than on the thinner. Double the skin together, flesh side inward, and place in a cool place. After standing twenty-four hours wash the skin clean, and apply the following mixture in the same manner as before: 1 ounce sal soda, ¼ ounce borax, 2 ounces hard white soap, melted slowly together without being allowed to boil; fold together again and put in a warm place 24 hours. After this dissolve 3 ounces alum, 7 ounces salt, 1½ ounces saleratus, in sufficient hot rain water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for 12 hours, wring out and hang up to dry. When dry, repeat the soaking and drying 2 or 3 times, till the skin is sufficiently soft. Lastly, smooth the inside with fine sand paper and pumice stone.—From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press; ready December 1, 1891.

(3506) A. L. N. writes: Please inform me through your valuable paper the difference between open and closed circuits, also the difference in battery for open and closed circuits? A. In an open circuit the current flows over the wire only when the circuit is closed temporarily, as in ringing a bell or in operating a telegraph sounder, whereas in a closed circuit the current flows continuously over the wire except in the intervals produced in the regular signaling or telegraphing. For an open circuit, a battery which will not deteriorate under the conditions of use is employed, such as the Leclanche and many of its modifications. For a closed circuit a battery is employed which will maintain a continuous current so long as the battery is supplied with materials and kept in order. The gravity battery is the most generally used on circuits of this class.

(3507) J. F. C. asks: Give a practical receipt for keeping beef from spoiling for a long time in warm weather, without drying it. A. Canning and cold storage are the only means of preserving meat that we can recommend. The use of preservatives, such as salicylic acid, sulphites, boric acid, etc., is to be deprecated. The short article you refer to is not very accurate, but presents rather the popular aspect of the case.

(3508) C. M. H. asks: 1. Give rule for obtaining any desired speed with and without counter shaft. A. Rules for speed.—Multiply the diameter of the driving pulley by its speed and divide the product by the diameter of the driven pulley for its speed, or the required speed for the diameter. If a counter shaft is used, proceed in the same manner for its speed, and use its driving pulley as above for the final speed, or size of last pulley. 2. Give rule for obtaining any desired speed by gears. A. For gearing use the principle as above stated, but measure the gears by the number

of their teeth. 3. Can carbon after being burnt out of steel be brought back? If so, how? A. Steel can be decarbonized at a red heat, inclosed in an iron box and packed with pulverized hematite or iron anvil scales, and recarbonized by the same process, but packed in charred bone dust or hoof parings.

(3509) G. E. E. says: In crushing coke for furnace work there is a great deal of waste that passes through our one-half inch sieve. This is too fine to burn on a grate, as it chokes and will not allow the air to pass through. Will you kindly tell me through the SCIENTIFIC AMERICAN of some cheap way to stick this fine fuel together in lumps or bricks, so that I can burn it in a stove or furnace with draught not blast? A. You will find in SCIENTIFIC AMERICAN SUPPLEMENT, No. 360, description and illustration of a machine for compressing coal refuse into bricks or balls. A machine such as is used in making hard pressed brick would answer the purpose for the soft Illinois coal dust. A slight sprinkling of coal tar and heat with pressure will make solid fuel.

(3510) C. K. asks: 1. How far is it possible to hear thunder under favorable circumstances? A. Thunder is seldom heard over 12 miles, unless under very favorable conditions, when 15 miles is a probable limit. At this distance there would be a lapse of 72 seconds between the flash and the thunder. 2. Does a bullet fall at the instant it leaves the barrel, or does it rise before it begins to fall? A. The fall of a bullet is controlled by gravity, and it commences its downward curve at the instant of leaving the gun. The line of sight is not parallel with the bore, which gives the appearance of rising, which it does as referred to the line of sight.

(3511) T. T. E. asks: Will air getting into a small water service pipe prevent the water from flowing through it when the fall is at least 100 feet? The owner of my cottage claims it as a reason for my water supply stopping. I say I think if there was more air, that we should get more water. The water is caught from the spring in a large barrel and then conveyed through ¾ inch lead pipes to several cottages then in small tanks with an overflow pipe. I am on the highest ground and am the first to be shut off. A. Air in the pipe is probably not your trouble. The supply pipe from the barrel is too small, so that when the water is running in the lower house tanks it weakens the pressure at your house, and stops the flow.

(3512) W. R. P. writes: Please give a receipt for a varnish to be used on gun stocks. A. Use shellac varnish and rub to a fine finish with French polish.

(3513) J. C. R. writes: We have a 50 horse power engine which we wish to increase to a 60 horse power. The cylinder is 12×18 and is making 180 revolutions per minute. How fast will it have to run to gain the desired power (10 horse power)? A. In the absence of full information concerning your plant, we can only advise an increase of steam pressure about 15 per cent, which will increase the speed to 200 revolutions and to the required power If the boiler will not bear the increase in pressure and is large enough for additional supply, a change in the cut-off would be in order. Not knowing anything of the make of your boiler and engine, we advise that you address the makers as to the safest way of increasing its power.

(3514) L. F. writes: Will you kindly answer the following questions: 1. What is bisulphuret of tin? An old Olmstead's Natural Philosophy states that it is superior to amalgam for exciting the rubbers of a friction electric machine. I have inquired for it at several wholesale and retail drug stores, but they know of no such substance. Has it any other name? A. It is a compound of one atom of tin with two atoms of sulphur. Its formula is $Sn3_2$. It is sometimes called mosaic gold. It may be made by heating a mixture of 12 parts tin, 6 mercury, 6 sal ammoniac and 7 of flowers of sulphur. It is sometimes used as a substitute for gold powder. 2. At what collegiate institutions in the United States is the doctrine of evolution taught? A. The doctrine is treated in the leading colleges, and in their biological courses quite fully.

(3515) R. B. W. asks: 1. What are the salts used in gold, silver, nickel and copper plating? A. In gold plating, the cyanide of gold, produced from chloride; in silver plating, cyanide of silver, produced from chloride; in nickel plating, double sulphate of silver and ammonia; in copper plating, cyanide of copper; and in electrotyping, sulphate of copper. 2. What kinds of anodes are used? A. Anodes of pure gold, silver, nickel and copper. 3. Can you inform me of some practical volume on plating? A. We refer you to Watt's "Electro-Deposition of Metals," price $3.50, also Urquhart's "Electro-Plating," price $2. 4. What numbers of the SUPPLEMENT contain articles on this subject? A. We refer you to SUPPLEMENT, Nos. 310 and 160. 5. In what numbers of the SUPPLEMENT can I find descriptions of various kinds of batteries? A. For information on batteries we refer you to SUPPLEMENT, Nos. 157, 158, 159, and 792.

(3516) J. W. K. says: Have you any articles on construction of shallow wells? Want to make a well for irrigation. Distance to water, 10 feet. The water is in gravel and sand. Can more water be taken from the ground by driven or open wells? A. The open well when properly constructed will give the most water, but the driven well system is the cheapest for obtaining a large supply. By driving a number of tubes some distance apart and connecting all together below frost line, a single pump will operate the whole system. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 107—110, for valuable illustrated articles on the drive well for small and large water supply.

(3517) F. B. W.—There is no process whereby cast iron can be toughened or made more lasting for car brake shoes. By partial chilling or by converting them into low steel.

(3518) N. B. D. says: I want some material of which to make moulds so that I can cast stereotypes of small jobs and lines of type. I want something in which I can make an impression of the type. Plaster of Paris cracks and sticks in the type, and I have no facilities for using stereotypers' paper. What can you suggest? A. We call to mind nothing better than paper or plaster. The latter will not crack if properly manipulated.

(3519) F. M. K. writes: Please give receipt for preserving wood from the effects of the weather and sun and rain, so as not to crack or absorb moisture. A. Use raw linseed oil for wood that is exposed to the weather. Oil and dry in the sun, two coats, and finish with boiled oil.

(3520) L. A. V. writes: A solid iron cylinder about 9 inches in diameter propelled by geared machinery runs on a solid iron track at each end. A cogged band driven on each end of the cylinder runs in a cogged track, the band being about an inch greater in its diameter to the outer edge of the cogs than the diameter of cylinder, and the cogged track being correspondingly lower than the face of the iron track on which the cylinder rolls. Since putting on the cogs they cause the cylinder to creep about 2 inches in moving 22 inches. Cogs work close. Now can this be remedied by dressing out the cogs on both band and track so they would work loose? A. You cannot stop the creeping by dressing the cogs. The cog band is too large; its pitch line should be of the same diameter as the cylinder, and the rack raised so that its pitch line shall be level with the bed plate face. The pitch line is a little larger than the center line of the teeth, so that the teeth will not bind.

(3521) J. W. H. says: I write to ask the composition of the material of rubber streets that are being put down in Berlin. Also if it would be suitable material for a race course for trotting horses, and what it would cost per square yard? A. We have no information as to the detail or composition used in the Berlin streets. Rubber is a very expensive material for such composition. The cheapest rubber mixtures made here cost about 20 cents per pound, or, if one inch thick, would cost about $8 per square yard. As to value for a race course, experiment would be necessary to determine.

(3522) E. P. and F. W. asks for a dressing to freshen up patent leather when it has become dull. A. Use common vaseline. Allow the vaseline to remain on the shoe for half an hour, then remove with Canton flannel.

(3523) G. H. asks: 1. When steaming wood for bending, can there be anything put into the water that will make the wood more pliable? A. We think of nothing better than the steam. 2. Is there anything that will take out stains and make the wood whiter A. Chloride of lime, also oxalic acid for stains. Oxalic acid is a poison.

(3524) D. C. G. writes: I wish to make lead harder without losing any of its weight or ductility. Can I fuse together 1 part copper to 20 parts lead? How much heat would be required to melt the composition? Would remelting change the nature of the metal alloys? A. You can make an alloy as proposed. A small portion of copper will be taken up by lead when added in thin strips to the lead at a red heat. Tin will also make it a little harder. A little antimony will also harden, but makes it less ductile. The composition named will melt at 800° Fah.

(3525) R. A. J. writes: I wish to build a small water motor about nine inches in diameter. Have water pressure of 35 pounds and in using a three-sixteenths inch jet it reduces the pressure to twenty pounds. Is the jet too large? How many buckets should I put in such wheel, and about what size should they be? Will this motor give me sufficient power to run a sewing machine? A You lose power by friction in the pipe; pipe should be larger; if not possible, the jet may be a little smaller. If the motor is well made, you can drive a sewing machine with it. You will require 30 buckets.

(3526) N. L. D. asks: What is the hardest composition which will adhere to wood firmly? I suppose cement would be the proper word to use. Is there any way of using iron filings, mixing with any substance which when pressed into a hole or groove in wood will make a surface as hard as sheet iron? A. Iron filings 3 parts, ground white lead and red oxide of iron paint 1 part each, and enough boiled linseed oil to make a stiff putty. Drive it into the hole or crack. It will become very hard when dry.

(3527) W. F. D. asks: What start or time allowance do you give a 14 foot sail boat over a 20 foot sail boat in a five mile race? A. The time allowance used by one of the New York yacht clubs for racing is as follows: Rule.—Time allowed in minutes per mile of course sailed equals the difference of the square roots of the lengths of the boats in feet, on the water line, and in favor of the smaller boat. In your case the longer boat equals $\sqrt{20}=4{\cdot}472$

shorter boat $\sqrt{14}=3{\cdot}741$

minutes per mile $0{\cdot}731$

course in miles 5

Time allowance $3{\cdot}655$

3 minutes 39·3 seconds.

(3528) L. S. C. says: I would like to know if there is any substance to put into a dip of acid water and blue vitriol that will make iron goods have a red color. A. The scale must be removed from the goods by dipping in a warm bath of muriatic acid 1 part, water 4 parts, then dip in a saturated hot solution of sulphate of copper, or they may be tumbled in saw dust wet with the sulphate. This will give them a thin coat of copper.

(3529) F. P. B. asks: How much water will a ¼ inch pipe carry per hour 2,000 feet long with 250 feet of head? A. If the pipe is in good order, it should deliver 120 gallons per hour.

(3530) W. A. R. says: 1. Please inform me of some quick and cheap drier for paint. We use boiled oil, turpentine and oxide of iron. Would like some other receipt for making a cheap red paint. A. Use litharge, one-sixth the bulk of the iron oxide, as a drier. The cheapest red paint is Prince's metallic paint, composed mostly of oxide of iron. Mix with boiled oil and turpentine. Requires no drier for outside work. Is an excellent paint for iron work. 2. What is the horse power of an engine 10 inches by 12 inches, 150 revolutions at 60 pounds pressure? A. Your engine is 36 horse power, indicated, assuming that the cut-off is ⅝.

(3531) G. W. C. writes: 1. Please tell me the composition of celluloid and the process of manufacturing it? A. You will find a description of celluloid and its manufacture in SCIENTIFIC AMERICAN SUPPLEMENT, No. 227. 2. What is the best flux for welding cast steel? A. Use borax with 10 per cent sal ammoniac, pulverized, for welding steel. 3. What is the best to clean old paint from a carriage, so that it may be painted again and look like it was painted on new wood? A. You can blister the old paint off with blowpipe lamp such as used by painters and plumbers. Or you may rub down the old paint with pumice stone and water.

(3532) T. J. W. writes: Can you give me a formula for a cement of some kind that would fasten together rubber hose so that it would stand a water pressure of 40 lb.? What I am after is something strong enough so that you could taper one end and hollow out the other, so as to have it all uniform size and make a smooth job. A. The job you propose is difficult. You might try the experiment of wrapping two or three folds of gutta percha tissue around the tapered part, put the parts together and apply heat, pressing the parts together when the percha is well softened, clamp them and remove the heat. This would cement the parts, and if well done, the joint might stand. The heat need not exceed 200° F. Perhaps hot water within and without might be used as heating agent.

(3533) M. B. R. asks: Can you inform me if there is anything on the market which will remove type writing from paper without damaging the paper? A. Caustic soda, or some hydrocarbon such as turpentine or benzine, would be the only substances we would suggest for ordinary type writing. Hydrocarbons would be least likely to injure the paper.

(3534) H. B. W. writes: 1. What would you advise me to do to become a civil or mechanical engineer? A. Study hard. 2. Is a college education necessary to become a good engineer? A. In general, yes. 3. How much could be made at either of the above professions per year by a first class man? A. From $2,000 to $10,000.

(3535) L. A. F. writes: I desire to become an expert electrician. I have a good grammar school education. Can you inform me of a school where I can learn the practical part as well as the theory of electricity? A. You might write Cornell University, Ithaca, N. Y.; Stevens Institute of Technology, Hoboken, New Jersey; Rensselaer Polytechnic Institute, Troy, N. Y.; Mass. Institute of Technology, Boston, Mass.

(3536) J. P. writes: 1. As we have in this city a hydrant pressure of 80 pounds to the inch, I would like to make a small hydraulic motor, say 18 inches diameter fed by a one inch pipe. What form of motor will give me the greatest amount of power; what would be the horse power of such a motor with the size of wheel and feed pipe given above, and where can I get a description of or directions for making such? A. The value of your proposed motor would be about three horse power. You cannot do better than to look over the illustrated description of the impact wheels in SCIENTIFIC AMERICAN SUPPLEMENT, No. 454. 2. What power will be required to work a small pressure pump throwing a continual stream through a 5/8 inch pipe at a pressure of 400 pounds to the inch? Where can I find instructions for making such a pump of simple construction? What books have you which treat of hydraulics, especially as applied to motors and pumps, which would be suitable for an amateur who wishes to study the subject? A. It will require about 6 h. p. to run your pumps. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 788, 789, 791, 792, 793, 799, 805, for a complete series of illustrated articles on hydraulics or the power of water. We can also mail you "The Practical Hand Book of Pump Construction," by Bjorling, $1.50.

(3537) A. B. M. writes: In Fownes' (Watts) Chemistry, p. 414, I read: "Ferric salts are thus characterized. . . . . Tincture or infusion of gall nuts strikes a deep bluish black with the most dilute solutions of ferric salts." Should not ferric be ferrous in the above? As I understand it, "green vitriol" is ferrous sulphate, and that certainly strikes a deep bluish black with tannin. A. Fownes' chemistry is correct. The dark color produced by "green vitriol" and gall nut infusion is due to some of the base being oxidized, which almost always occurs when the salt in question is dissolved in water exposed to the air.

(3538) J. M. S.—The paper is a chemical print or copy of a tracing from the original drawing. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 421, "How to Make Blue Prints." You can only keep grapes to best advantage in a cold room, at as low temperature as possible without freezing.

(3539) G. M. T. asks: How is the velocity of a bullet, as it leaves the gun or in any part of its course, determined? A. The velocity of projectile from cannon or rifle is measured by an electrical apparatus, one of which is illustrated and described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 177.

(3540) L. J. M. — A photophone is an instrument for transmitting speech by means of a beam of light. You speak against a thin mirror, causing it to vibrate; the light from the mirror is reflected and focused upon electrified selenium, which is sensitive to the light vibrations; and when a telephone is connected with such selenium, sounds are heard.

(3541) J. F. B. asks how to cleanse and whiten the bones of small animals. A. 1. The curators of the Anatomical Museum of the Jardin des Plantes, in Paris, have found that spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for three or four days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor which sinks to the bottom, and strongly attacks the ivory or bone if allowed to touch it. 2. Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean dry hard brush, adding one or two drops (not more) of sweet oil. 3. Take a piece of fresh lime, slake it by sprinkling it with water, then mix into a paste, which apply by means of a soft brush, brushing well into the interstices of the carving or skeleton; next set by in a warm place till perfectly dry, after which take another soft brush and remove the lime. Should it still remain discolored, repeat the process, but be careful neither to make it too wet nor too hot in drying off, or probably the article might come to pieces, being most likely glued or cemented together. If it would stand steeping in lime water for twenty-four hours, and afterward boiling in strong alum water for about an hour and then dried, it would turn out white and clean. Rubbing with oxide of tin (putty powder) and a chamois leather will restore a fine gloss afterward.—From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3542) C. A. asks for a remedy for excessive perspiration. A. The following receipt is from the "Scientific American Cyclopedia of Receipts, Notes and Queries." Carbolic acid, 1 part; burnt alum, 4 parts; starch, 200 parts; French chalk, 50 parts; oil of lemon, 2 parts; make a fine powder, to be applied to the hands and feet; or to be sprinkled inside of the gloves or stockings.

(3543) E. R. writes: Lately cooling apparatus have been made for using over again the condensation water of ice machines (economy of water). The arrangement consists of a structure 15 m. to 20 m. long, 7 m. to 8 m. high, and 1·5 m. wide at the bottom and 0·80 wide at the top, and has 10 compartments, one above the other, which are filled with thorn (white or black thorn) like the Saliene hedges. The condensation water, which has a temperature of 20 to 25 R., is brought in and trickles down through the thorns and is caught in a receptacle. The water is cooled to a temperature below that of the atmosphere. When the temperature of the atmosphere was 13 R.= 16·25 C. = 61·25 F., I found the water cooled to 10 R. On the warmest days, when the atmosphere is at 18 to 20 R., the water which has trickled through is not more than 12 R., the water being 8 R. = 10 C. = 18 F. cooler than the atmosphere. The structures are set up in the open air, without any roof, and exposed to the sun. Why does the water become so much cooler than the atmosphere? A. The water is cooled by evaporation from the large surface made by trickling over the brush.

(3544) J. L. W. asks how to give a black coating to brass. A. 1. The dead black on optical instruments is produced by dipping in a solution of chloride of platinum. To make this, take 2 parts hydrochloric acid, 1 part nitric acid, mix in a glass bottle and put in as much platinum foil as the acid will dissolve when placed in a warm sand bath, or to hasten the solution, heat to nearly the boiling point of the acids. One-half ounce nitric and 1 oz. hydrochloric acid will absorb about 30 grains platinum, but in order to neutralize the acid, it is better to have a surplus of platinum. Dip the article or brush in the chloride. 2. Optical and philosophical instruments made in France often have all their brass surfaces of a fine dead black color, very permanent and difficult to imitate. The following, obtained from a foreign source, is the process used by the French artisans: Make a strong solution of nitrate of silver in one dish, and of nitrate of copper in another. Mix the two together and plunge the brass into it. Remove and heat the brass evenly until the required degree of dead blackness is obtained. — From the "Scientific American Cyclopedia of Receipts, Notes and Queries."

(3545) W. S. asks: Is a vessel made of galvanized iron suitable for keeping water for drinking? A. This is a somewhat debated question. If kept clean and if the water was pure and not allowed to stand long in the vessel, we should consider it safe, but as neglect might result in making the water poisonous, we should recommend the use of tin in preference. Soluble compounds of zinc are poisonous. For a note on the subject we refer you to our SUPPLEMENT, No. 807.

(3546) W. B. K. writes: Please give me a receipt for bicycle enamel and tell me how to polish nickel and enamel. A. Use japan varnish on your bicycle. It should be heated in an oven to be dried. Polish nickel with chalk. Also see Query 3548. Rub the enamel with French polish.

(3547) D. W. says: Kindly inform me of a powder or paste for cleaning and polishing copper and brass. A. Tripoli, or rottenstone, mixed with a solution of oxalic acid in water makes a very good polishing material. The addition of a little glycerine will keep it soft as a paste. Also see Query 3548.

(3548) J. A. L. T. asks: 1. Give a receipt for cleaning mica that has been used for lights in the doors of stoves and become discolored by heat and smoke. A. Use hydrochloric acid with stiff brush. If the acid touches the iron of the stove, it will begin to dissolve it, and produce rust stains. You might try kerosene oil applied with a rag just moistened with it. 2. The composition of a substance which is used for polishing metal surfaces, such as plated table ware, which is now in use, and which has the odor of bitter almonds and which odor it is said cannot be got rid of. A. Oxalic acid, 1 part; iron peroxide, 15 parts; powdered rotten stone, 20 parts; palm oil, 60 parts; petrolatum, 4 parts. Pulverize the oxalic acid and add rouge and rotten stone, mixing thoroughly, and sift to remove all grit; then add gradually the palm oil and petrolatum, incorporating thoroughly. Add oil of myrbane or oil of lavender to suit. By substituting red ashes from stove coal, an inferior imitation of the foregoing paste will be produced. The original article is known as putz pomade.— From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press, ready December 1.

(3549) E. W. M. writes: We have several large plunge batteries for running a motor, and after the solution has been in the cells a long time, the salts settle in the bottom, and we find that it is very hard to remove without breaking the glass jar. Will you please give us a good way to clean the salts out without breaking the jar? A. By filling your cells with water and inverting them in a vessel of water, the salts in the bottom of the cells will be readily dissolved out.

(3550) C. H. C. writes: 1. I have 14 ft. boiler, 54 in. shell, sixty 3 in. flues, 24 in. diameter smoke stack, 60 ft. high; rocking grate 54 in. wide by 37 in. deep to bridge wall; engine 10 by 12, speed 180. The draught seems defective, combustion imperfect, consumption of fuel, mostly shavings (some soft coal), excessive, and very hard firing, boiler new. Can you tell me wherein lies the trouble or defect, and suggest a remedy? A. Your boiler and engine appear to be well balanced as to power, but the smoke stack is too small for burning shavings, and probably the fire chamber is too small and not arranged for burning shavings and soft coal. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 624, for illustrated lecture on boiler furnaces for various kinds of fuel. 2. Name one or two best works, in plain, simple language, on construction, setting, management, or firing modern steam boilers, with price. Several I have are too English and too algebraic for the simple mind of my engineer. A. "Useful Things to know about Steam Boilers," by Tower, $2 mailed; also "Steam Making or Boiler Practice," by Smith, $2.50 mailed.

(3551) E. S. asks: How to make a cement which will mend broken minerals, etc. A. 1. Use best fish glue (hot) and tie well. 2. Starch, ¼ oz.; white sugar, 1 oz.; gum arabic, ¼ oz. Dissolve the gum in a little hot water, and the sugar and starch, and boil until the starch is cooked.—From the new "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3552) H. A. A. asks: 1. In making the "Simple Electric Motor," described on page 497, "Experimental Science," does it matter if I use three or four pieces of wire for the armature core, the ends not being joined? A. It is immateral how many pieces of wire you use in the construction of the core of your armature. 2. Would not No. 20 or 22 wire do for winding the armature? A. Yes; provided you use a current adapted to such winding. 3. If the brush-holding disk is made so that the brushes may be placed in different positions, would it not make the motor run at different speed? A. Yes; but this method of regulating a motor is not economical.

(3553) A. M. asks what platinum silver is? Is it platinized silver? A. Platinum silver is an alloy consisting of platinum 1 part, silver 2 parts.

(3554) F. D. asks for a receipt for making a paste for bill posting and paper hanging of all kinds, that will not freeze or get thick in the winter, or tell me where I can get the prepared paste or the materials for making same. A. All ordinary paste will freeze when subjected to a freezing temperature. Make your paste of good flour mixed smoothly with cold water to a thin creamy consistency. Cook over a water bath until it thickens, but remove it from the water bath before it begins to look clear. When nearly cold add from five to ten per cent of alcohol. Also twenty drops of oil of cloves to every gallon of paste. The alcohol prevents freezing, and the oil of cloves prevents it from souring.

(3555) W. F. B. asks if there is any such thing as soluble beeswax, and if so, the formula for making it. If not, could you tell me how I could prepare beeswax, so that I could use it with a small brush to paint letters on brass to etch? A. Beeswax can be dissolved in turpentine, and the fixed and volatile oils. It dissolves in 35 parts of ether and 11 parts of chloroform. The last solution would be suitable for your purpose.

(3556) Librarian asks if there is an article which will restore the color to faded black book covers. I have heard that ether is useful, but hesitate to use it or anything else, except on authority. A. The agent to use, if any can be successfully employed, depends on the nature of the color. A solution of an iron salt in water might be of use, but any such application would tend to impair the finish of the leather. We should advise the use of nothing except bookbinder's varnish, which might be blackened by the addition of nigrosine or aniline black.

(3557) F. R. W. asks if there is any preparation or fluid that I can print or write with that will change its color on being moistened. Or is there any preparation that I can use to make a very delicate or invisible line with, and on being moistened will show up very plain? A. Write with an aqueous solution of tannin, using a gold or quill pen. Develop by moistening the writing with a weak solution of sulphate of iron. The writing when developed will be nearly black.

(3558) J. H. S. writes: I desire to know whether a cellar can be so constructed as to keep out the water; if so, how? The cellar in question is now built, but will not keep out water, though well cemented. A. A cellar can be constructed so as to be waterproof, if the bottom or floor is first covered with cement, the walls built thereon laid in cement, and the exterior of the wall covered with cement. This makes, practically, a watertight basin. The cement used must be the best Portland cement one part, clean sharp sand one part. After a cellar is built it is not so easy to make it waterproof. Still it can be done. Cover the exterior of the wall with the above cement, ditto the bottom, and work the cement in under the bottom of the wall. If these directions are followed, you will succeed. But if cheap materials are used and the work badly done, you will be sure to fail. A drain put around the outside of the wall or even inside below the cellar floor may be efficient in carrying off the water, if you can give it a good delivery.

(3559) G. A. asks: 1. How high a vacuum will the best piston air pump obtain? A. Within a very small fraction of an inch of a perfect vacuum, as measured by a mercurial gauge. 2. What kind of air pump is used to make the vacuum in incandescent lamps? A. A piston air pump driven by power is often used for the first exhaustion followed by a mercurial pump. 3. How long does it take to make the vacuum? A. No exact time can be given; it depends on the relative size of the lamp or lamps and pumps. 4. Is there any difference between an air pump and a vacuum pump? If so, what? A. No. 5. What motive power is generally used in large establishments, to work vacuum pumps? A. The descent of mercury. 6. Does salt dissolve more rapidly in cold than in warm water? A. No. 7. What is the ratio of relative brightness used in classifying stars into their different magnitudes? A. The relation of the brilliancy of a star of a certain magnitude and that of the magnitude immediately preceding has been variously determined from 0·346 to 0·464. Zollner (1865) from magnitudes 1 to 6 gives 0·363, and Rosen (1869) from magnitudes 5 to 9·5 gives 0·398. For an excellent and fully illustrated treatise on mercurial air pumps, we refer you to our SUPPLEMENT, Nos. 629, 630, 631.

(3560) H. W. B. asks: 1. What is the E. M. F. of the small dynamo described in SUPPLEMENT No. 161, when provided with the drum armature described in SUPPLEMENT, No. 599? Also what fraction of a horse power is required to drive it? A. The E. M. F. of the dynamo referred to is 12 volts. We do not know that the current from the armature described in SUPPLEMENT, No. 599, has been measured, but it is considerably higher than that of the armature described in SUPPLEMENT, No. 161. 2. What is the E. M. F. of the machine described on page 499 of "Experimental Science," when wound with finer wire and used as a dynamo? Also what fraction of a horse power is required to drive it? A. It would be impossible to tell what the E. M. F. would be without knowing what changes have been made. The difference of one size in the wire makes a great difference in the E. M. F. About ⅛ of a horse power will be required in each case.

(3561) H. B. M. writes: 1. Will you kindly inform me how a strong aqueous solution of tannin can be rendered colorless without detriment to its chemical properties? A. Use the purest tannic acid and pure water. If this is not satisfactory, agitate with ether, and on standing the etber will rise to the surface, carrying much of the coloring matter with it. Draw off the lower solution for use. 2. Also the same inquiry as to the sulphate of iron. A. Dissolve carefully scraped bright crystals of ferrous sulphate (copperas) in water, covered with a thin layer of olive oil. This will give a nearly colorless solution. In neither case must you expect a strong, absolutely colorless solution.

(3562) W. L. V. says: One candle is 8 feet in height and 1 foot in diameter. Another candle is 8 inches in height and 1 inch in diameter. Their wicks are proportionate. Will they both burn the same time, or will the larger one burn the longer time? Give reason with answer. Is the focal distance of a lens increased or diminished by the density of the atmosphere? A. The small candle contains 6¼ cubic inches. The large candle contains 10,848 cubic inches, and would require 1,735 wicks of the size of the small candle to consume it in the same time. The focus of a lens varies with the density of the atmosphere, but too small for observation.

(3563) J. E. B. asks whether the armature to motor described in SUPPLEMENT, No. 641, has to have 12 coils. Can I make it with 8 coils? What size wire required? A. An armature with 8 coils will work, but as a rule the more coils used, the better. The size of the wire depends on the current used. For a battery current such as is recommended, No. 18 wire will answer.

(3564) E. J. B. asks (1) how to cover wood pulleys for making polishing and emery wheels. A. The best plan for making an emery wheel with a wooden core is to cover the wood with sole leather which contains no oil. The leather can be fastened with glue and shoe pegs. After the glue becomes dry the leather should be turned off and made smooth with sandpaper. It should then be coated with the best white glue and immediately rolled in the emery, which should be warm. When the wheel is dry, brush off the surplus emery. 2. Also how to make a straight magnet, same as magnet used in Bell telephone receiver. A. Harden a bar of steel at the ends, draw it to a purple and magnetize in a coil through which a strong current is passing.

(3565) F. S. asks for a receipt for manufacturing soldering flux for tin. A. We give two receipts: *a*. Dissolve 1 part lactic acid and 1 part glycerine in 8 parts of water. *b*. Melt together 1 pound olive oil, 1 pound of tallow, and 8 ounces resin. While the mass is still fluid, but has cooled a little, add with constant stirring ¼ pint of water saturated with sal ammoniac.

(3566) W. S. M. asks: How many guns did the Monitor use in the engagement with the Merrimac? A. Two 11 inch guns.

(3567) F. D. S. writes: I want to pump up an elevation of six feet, at the rate of 8,200 cubic feet per minute. Would like to know how much power will be necessary, and the best kind of pump to use? A. You will need a pump indicating 125 horse power, and would require two water cylinders each 6 feet in diameter, and 8 feet stroke, if single acting.

(3568) Dr. A. D. asks the quantity in weight or in bulk of carbonate of ammonia used to raise one pound of flour. A. About one teaspoonful should suffice for one to one and a half pounds of flour. It is not generally used.

(3569) R. G. asks: Why do engineers multiply the square of the diameter of cylinder by the decimal 0·7854 to find the horse power of steam engine? If the steam pump will draw water 33 feet at sea level, how far will it draw when the elevation is 8,000 feet above sea level, and how much should the suction be shortened for every 500 feet from 8 000 to 13,000 H. H? A. The square of the diameter in inches multiplied by 0·7854 equals the area of the cylinder in square inches. At 8,000 feet the greatest height of pump lift is 23 feet. At 9,000 feet, 22 feet. At 10,000 feet, 21 feet. At 11,000 feet, 20 feet. At 12,000 feet, 19¼ feet. At 13,000 feet, 18½ feet.

(3570) J. W. M. writes: I would like to have you give a receipt for a paste for sticking labels on to tin. I have tried a number of receipts, but they are all a failure excepting I use an alkali or acid, either of which will injure colored labels. What I want is a glue, cement, or paste that will stick paper colored labels to highly polished tin and nickel. A. To 2 tablespoonfuls of the best flour add a tablespoonful of brown sugar and a few drops corrosive sublimate, the whole to be boiled and continually stirred, to prevent its getting lumpy, till of the right thickness. To prevent mouldiness add a few drops of some essential oil, as oil of cloves.

(3571) A. V. S. writes: A young student of mechanical engineering would like to know a few of the most common causes of boiler explosions, and if any other gas than steam is ever the cause of explosions, and if there is always an explosive increase of pressure at the moment of explosion. A. You will find interesting and valuable information on boiler explosions, their cause and remedy, in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 463, 456, 581, with illustrations.

(3572) R. M. asks: Please give me a preparation of white ink that will adhere to a glazed card and not be easily washed off? A. Use zinc white or white lead, rubbed up with gum water to the proper consistency.

(3573) J. M. B. asks whether land will become enriched or impoverished if kept bare of vegetation. A. Land becomes impoverished and leached of the necessary constituents to vegetable growth by being kept bare of vegetation. The soluble elements of vegetation, carbonic acid, ammonia, phosphoric acid, potash, soda, sulphuric and hydrochloric acids, forming part of the constituents of vegetable life, are kept in circulation by a constant growth of vegetation. An unfed soil becomes barren from exhaustion from leaching, as it will also from overcropping, without artificial restoration of the elements withdrawn, which are necessary to sustain vegetable life.

(3574) P. W. asks: What is the best preparation to cover wood, to prevent horse manure from rotting it? A. Two coats of hot coal tar put on when the wood is dry.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 13, 1891,

AND EACH BEARING THAT DATE.

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

Air brake, C. R. James ... 461,243
Alarm. See Boiler alarm.
Alloy, steel or metallic, R. A. Hadfield ... 461,333
Amalgamating gold, silver, or copper, steam silver plated plate for, G. H. Chick ... 460,946
Animal trap, Gragg & Wigger ... 461,079
Armature for electric motors, C. J. Van Depoele ... 461,296
Artist's color box, J. Bicknell ... 461,068
Atomizer, A. Leslie ... 461,349
Awning pole clasp, H. Caspar ... 461,069
Axle box lid, car, R. Soutter ... 461,203
Axle lubricator, car, F. J. Leibmann ... 461,265
Axle lubricator, car, A. P. Mitchell ... 461,151
Axle spindle and box, H. Wallace ... 461,226
Axle, vehicle, J. Lewis ... 461,266
Bag holder, J. D. Timmerman ... 461,291
Bale tie machine, wire, Laidlaw & Cowley ... 461,348
Baling press, A. H. Brickey ... 461,157
Baling press, J. H. Pickett ... 461,044
Bank, pocket savings, G. Van Zandt ... 461,176
Bar. See Bicycle handle bar. Linotype bar.
Batteries and preparing the same, compound for electric, D. M. Lamb ... 461,026
Batteries, composition for electric, D. M. Lamb ... 461,024
Battery. See Electric battery. Galvanic battery.
Bedstead, folding, E. S. Ticbenor ... 461,138
Belt, apron, Lang & Evans ... 461,128
Belts, slat fastener for, M. Arnold ... 461,177
Bicycle handle bar, W. J. Matern ... 461,356
Bicycles, spring fork for, W. E. Thompson ... 461,001
Binder, temporary, H. W. Scattergood ... 461,089
Boats, bow for transfer, M. H. Murch ... 461,119
Boiler. See Culinary boiler.
Boiler alarm, electric, M. Beckers ... 461,178
Boilers, crown sheet of steam, E. Heuer ... 461,180
Book leaf holder, H. C. Johnson ... 461,341
Book, time-record, H. W. Scattergood ... 461,008
Boot tree rest, J. F. O'Brien ... 461,369
Boring engine, A. D. Pentz ... 461,202
Bottle and stopper, combined, E. V. Clemens ... 461,259
Bottle seal stopper, E. V. Clemens ... 461,258
Box. See Artist's color box. Casting box. Christmas box. Fire alarm box. Knockdown box. Letter box. Post office box. Switch box.
Box fastener, W. Beck ... 461,091
Bracket. See Curtain pole bracket.
Brake. See Air brake. Carbrake. Electro-magnetic brake.
Bran duster, J. McGill ... 461,388
Brick machine, J. H. Konefes ... 461,022
Broom holder, E. M. Wright ... 461,252
Buckle, C. C. Benedict ... 461,009
Burner. See Vapor burner.
Butter printer, C. M. Buckingham ... 460,943
Camera roll holder, T. H. Blair ... 461,306
Camera roll holder, Blair & Kelley ... 461,308
Camera shutter, Blair & Crowell ... 461,307
Can. See Milk can.
Can bodies, former for, Clapp & Emery ... 460,947
Car body, G. J. Porter ... 461,173
Car brake, G. W. Turner ... 461,107
Car brake mechanism, Adams & Brill ... 461,008
Car coupling, P. Brown ... 461,312
Car coupling, Bugg & Loomis ... 461,314
Car coupling, A. F. Chandler ... 461,400
Car coupling, O. W. & L. A. Clement ... 461,071
Car coupling, P. F. Hutchison ... 460,970
Car coupling, T. A. McBride ... 461,035
Car coupling, Patten & Webber ... 461,043
Car coupling, H. G. Russell ... 461,380
Car coupling, C. Stilger ... 460,998
Car coupling, W. H. Violett ... 461,290
Car coupling, J. E. M. Yates ... 461,095
Car coupling attachment, W. H. B. Stout ... 461,288
Car, dumping, S. D. King ... 460,974, 460,975
Car heating apparatus, J. Q. C. Searle ... 461,280 to 461,283
Car motor, electric, G. Willett ... 461,228
Car, passenger, J. D. S. Reed ... 461,132
Car seat, E. L. Bushnell ... 461,179
Car seat, F. H. Henry ... 461,198
Car, stock, J. B. Meadley ... 460,977
Car vestibule and step therefor, A. J. Barber ... 461,156
Cars, trolley catcher for electric, W. L. Browne ... 460,942
Cars, ventilating device for railway, A. Minnick ... 461,361
Carding machine stopping mechanism, J. T. Meats ... 461,171
Carriage canopy holder, child's, A. G. Snell ... 461,373
Carrier. See Trace carrier.
Cart, road, W. Clucas ... 460,949
Cart, road, J. Donovan ... 461,158
Cart, road, H. & W. C. Smith ... 461,395
Cartridge loading machine, W. E. Phillips ... 461,273
Carving machine, C. J. Carlstrom ... 461,215
Case. See Pencil case.
Cash indicator and recorder, F. Kubec ... 461,386
Caster, furniture, E. G. Hoffmann ... 461,181
Caster socket, G. D. Clark ... 461,070
Casting box, stereotype, W. B. Lewis ... 461,141
Chains, die for making links for sprocket, W. A. McCool ... 461,268
Chair. See Opera chair. Rolling chair.
Chair, Cox & Keim ... 461,238
Chair seat of reed or similar material, J. A. Staples ... 461,136
Chenille or ornamental cord, tension device for machines for making, A. Urbahn ... 461,059
Chill mould, A. Cordingly ... 461,412
Christmas box, C. L. Lockwood ... 461,352
Churn, A. Coen ... 460,951
Churn, C. Mears ... 461,247
Churn dasher, A. J. Apgar ... 461,410
Cigar bunching machine, J. Dela Mar ... 461,072
Cigar or pipe mouth piece, A. J. Maloney ... 461,267
Clasp. See Awning pole clasp.
Cleaner. See Gun cleaner.
Clock and thermoscope system, combined electric, H. J. Haight ... 460,963
Clock striking mechanism, C. E. Burnham ... 461,315
Clothes pounder, W. H. Herrington ... 460,966
Clutch, friction, B. S. Lewis ... 461,081
Cock, R. N. Pratt ... 461,084
Collar and necktie holder, G. F. Carruthers ... 461,319
Commutator brushes, actuating device for moving, C. J. Van Depoele ... 461,297
Compasses for laying out stair curves, I. J. Palmer ... 461,367
Corking machine, A. Siebert ... 461,285
Coupling. See Car coupling.
Cow catcher, J. J. Smith ... 461,286
Cremation furnace, S. W. Dixon ... 461,327
Crushing machine, W. Schranz ... 461,050
Culinary boiler, F. McKinley ... 461,120
Cultivator, E. George ... 461,077
Cultivator, J. Porteous ... 461,172
Cultivator and plow, combined, H. P. Moore ... 460,983
Cultivator and scraper, Huneycutt & Moseley ... 461,115
Cultivator, sulky, J. F. Taylor ... 461,290
Cultivator, wheel, D. Z. Hunting ... 461,184
Curtain pole bracket, S. E. Bauder ... 460,939
Curtain pole socket, H. Taylor ... 461,377
Curtain pole support, H. Taylor ... 461,376
Cut-off, T. F. Crary ... 460,953
Cutter. See Feed cutter. Stalk cutter. Twine cutter.
Cutting blades, making, A. Kraatz ... 461,345
Cutting machine, J. Garvelek ... 461,159
Dater, ticket, O. Konigslow *et al.* ... 461,344
Decorticating machine, hemp or flax, A. E. Ellinwood ... 461,260
Dental engine, J. S. Campbell ... 461,146
Dinking block support, R. Bowden ... 461,165
Door operating device, electric, R. F. Troy ... 461,122
Doorways, electrical drop bar for, B. Lyons ... 461,355
Dough mixer, J. Repetti ... 460,992
Draught equalizer, H. H. Muller ... 461,248
Draught regulating and fire checking device, G. L. Shorey ... 460,995
Draw bar cushioning device, J. A. Hinson ... 461,339
Drawer guide and stop, combined, H. E. Spaunhorst ... 461,375
Dredging machine, F. Murphy ... 461,193
Drill. See Grain drill.
Drilling machine, W. F. Barnes ... 461,253
Dye, blue azo, G. Schultz ... 461,086
Easel, A. Graves ... 461,331
Eaves trough, C. C. Moore ... 460,982
Electric battery, D. M. Lamb ... 461,023, 461,025, 461,027
Electric conductor, F. A. Perret ... 461,272
Electric conductors, connection for, J. Dillon ... 461,195
Electric energy, system of distributing, R. Kennedy ... 461,139
Electric inductional transformer, W. Stanley, Jr. ... 461,135
Electric machine, dynamo, E. T. Gilliland ... 461,240
Electric machine, dynamo, R. Kennedy ... 461,140
Electric meter, G. R. Baldwin ... 461,229
Electric switch, S. P. Van Nort ... 461,298
Electro-magnetic brake, A. J. Shaw ... 461,052
Electro-magnetic separator, G. M. Gouyard ... 460,962
Elevator, J. B. Stoner ... 461,396
Elevator wells, device for operating doors to, Craig & Purcell ... 461,411
Engine. See Boring engine. Dental engine. Rotary engine. Steam engine.
Engraver's vise, W. Faustmann ... 461,216
Envelope, Thacher & Gifford ... 461,000
Envelope fastener, G. H. Randall ... 461,143
Envelope opener, L. H. Richardson ... 460,993
Erasive rubber holder, L. W. Faber ... 461,205
Extractor. See Jelly extractor.
Fans, attachment for exhaust or other, J. M. Seymour, Jr. ... 461,051
Farm gate, W. A. Jones ... 461,220
Faucet tool, T. Dottermann ... 460,956
Feed cutter and corn husker, combined, G. W. Crosby ... 461,405
Feed water heater and purifier, A. Krumholz ... 461,244
Fence, Z. Fowler ... 460,960
Fertilizer distributer, C. W. Fuller ... 460,961
Fertilizer from stick, making, J. Van Ruymbeke ... 461,164
File, bill, A. L. Purdy ... 461,046
Filter, L. P. Andrews ... 461,303
Filter, W. Birch ... 461,232
Filter, T. H. Butler ... 461,234
Filter, A. McCutcheon ... 460,984
Filter, W. W. Whiddit ... 461,004
Filters, device for feeding chemicals to, T. H. Butler ... 461,235
Fire alarm apparatus, W. C. Shaffer ... 461,371
Fire alarm box, non-interfering, F. F. Loomis ... 461,169
Firearm lock, F. A. Hollenbeck ... 461,182
Fire escape, C. J. Applequist ... 460,938
Fire extinguisher, Wolstencroft & Soley ... 461,089
Fire extinguisher for buildings, electrical automatic, W. H. Soley ... 461,087
Fish plate, H. W. Libbey ... 461,337
Fishing rod, C. Oberly ... 461,106
Flo & J. F. Gaid ... 46 393
Flood gate, J. Hirsch ... 461,114
Floor, fireproof, T. A. Lee ... 461,030
Floor or roof, fireproof, T. A. Lee ... 461,029
Floors or roofs, artificial fireproof joist for, T. A. Lee ... 461,028
Flushing tank, pneumatic, J. E. Boyle ... 461,218
Folding rack, W. W. Brinkerhoff ... 461,256
Fork. See Manure fork.
Fruit bud protector, J. E. Bourne ... 461,304
Furnace. See Cremation furnace. Welding furnace.
Furnace for heating and other purposes, G. T. Bruckmann ... 461,313
Galvanic battery, P. Hieronymus ... 461,262
Game apparatus, M. Howard ... 461,018
Game apparatus, E. Krebs ... 461,346
Game, electric parlor, W. L. Gates ... 461,076
Garment hook, J. M. Guilbert ... 461,332
Garment stays, apparatus for making, F. Crompton ... 461,012
Gas compressor, G. F. Knox ... 461,080
Gas, process of and apparatus for manufacturing, J. M. Rose ... 461,394
Gate. See Farm gate. Flood gate. Swinging gate. Vertically adjustable gate.
Gate, G. W. Bussey ... 461,317
Gate, A. H. Cleaveland ... 461,093
Gate, G. Hoskins ... 460,969
Generator. See Steam generator.
Glass polishing machine, A. De Boischevalier ... 460,941
Glove, baseball, A. Haegg ... 461,218
Gloves and for other uses, traverse warp fabric for making, T. W. Fletcher ... 461,015
Gong or bell, J. W. Grantland ... 461,241
Grain binder spreader, M. Patchin ... 461,271
Grain drill, D. C. & W. A. Van Brunt ... 461,292
Grain meter, H. E. Hawk ... 461,335, 461,336
Gun, air, M. F. Stanly ... 461,224
Gun cleaner, Odell & Ferris ... 460,986
Hame, C. H. Van Orthwick ... 461,003
Harness, J. H. Whitaker ... 461210
Harrow and roller, F. B. Harvey ... 461,334
Harvester, corn, G. Meader ... 461,246
Harvester raising and lowering device, C. A. A. Rand ... 461,249
Hay carrier track, H. L. Ferris ... 460,959
Hay loader, Hunter & Lakin ... 461,168
Hay loader, C. C. Jewett ... 461,340
Hay rack, folding, A. White ... 461,227
Hay raking and elevating machine, M. M. Sornborger ... 461,374
Heat regulating apparatus, G. L. Shorey ... 460,996
Heater. See Feed water heater.
Heater, G. W. Harris ... 461,017
Heating, method of and apparatus for producing from coal smokeless flame for, W. A. Koneman ... 461,343
Hides, removing lime from, C. W. Cooper ... 461,010