

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—John P. Kirwan and James E. Kirwan, Jr., Pittsfield, Mass. This is a coupler of the knuckle type, the body portion of the pivoted knuckle having a downwardly inclined or beveled surface in combination with a coupling pin having at its lower end an inclined or beveled surface corresponding to that of the knuckle, whereby when the pin is raised the knuckle will be forced outward to the uncoupled position. The construction is very simple and durable, and the coupling pin is so formed that the knuckle will have more of a bearing on it than has been heretofore obtained, while it may be manipulated with the least possible risk to the operator.

METALLIC TIE.—Edward S. Moffat and Theodore G. Wolf, Scranton, Pa. The body portion of this tie is formed of a section of ordinary track rail, which is given an oblique bend in the middle and placed with its bottom flange uppermost. The end portions of the tie are re-enforced by short rail sections, with their flanges uppermost, the two parts being separated by space blocks opposite their web portions and firmly bolted together. The bearing heads thus formed for the track rails are provided with clips, held thereon by bolts, the clips being adapted to clasp the flanges of the track rails.

Electrical.

TELEGRAPH RELAY.—Charles M. Dyer, Cloverdale, Ind. According to this invention the armature in the relay is supported yieldingly on the front of a swinging armature lever, while a belt secured to the armature extends over a guide pulley to connect with the armature lever, the belt being arranged so that the movement of the armature will impart an opposite movement to the lever, the improvement providing a nicely balanced armature which will be held in proper adjustment without regard to the variations of the electric current.

Mining, Etc.

ORE WASHER.—Samuel C. McLanahan and William F. Kirk, Hollidaysburg, Pa. This is an improvement in that class of ore washers in which one or more shafts having radial blades revolve in a box or tank, the blades serving to agitate and carry the ore forward to the discharge. The stirrer shaft is formed with longitudinal sections of angle iron or steel, the radial flanges extended throughout their length, and the sections secured at their ends to cap plates. The blades or paddles are preferably formed of flat steel plates with twisted shanks connected with the flanges by bolts, the same bolts connecting the blades with the shaft sections and uniting such sections, while the arrangement of the bolt heads and nuts is such that they are but slightly acted on by the ore in the operation of the machine.

SAFETY KEEPER FOR MINING CARS.—Inkerman Bailey and Louis Feger, Madisonville, Ky. This is a device for locking a car upon the hoisting cage automatically, and releasing it at the top and bottom of the shaft. A shaft is mounted to rock on the platform of the cage, there being keeper arms on the ends of the shaft, and a pendent weighted rock arm adapted to rock the keepers into an upright position, a device in the mine shaft rocking the arm when the cage is lowered upon it. The improvement is for use on mine cages, whereby coal and other material mined is brought to the top of the shaft in cars, which are transferred from the hoisting cage to a surface track and moved to a point of discharge for their load, or are dumped directly from the cage.

SMELTING FURNACE.—Adam J. Schumacher, Butte City, Montana. This invention provides an improved discharge trough, readily applied, to automatically discharge and separate the products of fusion from the furnace, whereby the furnace may be run with greater continuity and less attention. The invention consists of a pipe formed into a trough and connected with a water supply to pass water through the pipe. The pipe is continuous, and bent so as to form the bottom, sides and ends, the bottom having an inlet opening, while one end is somewhat less in height than the sides, so as to form a discharge opening.

CAR DUMPING APPARATUS.—Maurice M. Neames, St. Patrick's, La. This invention relates to improvements in inclined railways and cars, providing means whereby cars may be drawn up such railways and automatically dumped at a certain point, being then placed in position to travel down the incline of its own accord. The construction is simple, durable, and inexpensive, and means are provided whereby the car may be quickly and conveniently loaded, and its contents readily delivered.

Mechanical Appliances.

SCREW CUTTING LATHE FREED MECHANISM.—Wendell P. Norton, Mount Vernon, N. Y. To conveniently and rapidly change the speed of the feed screw on screw-cutting engine lathes, according to the requirements of the screw to be cut, an improved feed is provided forming the subject of this patent. The shaft is driven from a series of interchangeable gear wheels, a pinion turning with and sliding on the shaft, and a driving gear wheel in mesh with the pinion, while a second series of gear wheels of various diameters is arranged step-like on the feed shaft and adapted to be engaged by the driving gear wheel.

BUSH HAMMER.—Clark Holden, Barre, Vt. This hammer is composed of oppositely arranged body plates having central bosses and transverse gibs fitted between the plates on the ends of the bosses, each gib having a tongue fitting into a longitudinal groove formed in the bosses, while bolts pass through the body plates and through the gibs to hold them in position. The construction is simple, and the blades are securely held in position, while the parts may be conveniently separated to take out the blades for sharpening or other purposes.

NUT LOCK.—Ira J. Griffin, Sing Sing, N. Y. Combined with a bolt having a longitudinal groove in one side, and a nut furnished with radial slots or recesses in its outer face, is a spring key fitted to the groove of the bolt and adapted to enter into the recesses of the nut. There is also a series of ratchet teeth in the bottom of the groove in the bolt, the key being adapted to engage the ratchet teeth. The device is very simple and effective, quickly locking the nut upon a bolt, with means for readily releasing the nut.

BEADING MACHINE.—James P. Howe, Cass City, Mich. The making of beads on eaves troughs and similar articles, the work being done accurately and rapidly, while the machine is easily operated, is the object of this invention, the machine being so constructed that it will not warp if made of wood and will not easily get out of repair. It consists of a fixed and a movable jaw hinged together and having registering grooves, a roller with a longitudinal groove being held to turn in the jaw grooves, while a block sliding along the outer side of the movable jaw has its outer face inclined, and a transverse bolt or bar extends from the fixed jaw into engagement with the inclined face.

CAN CAPPING AND CRIMPING MACHINE.—Mathias Jensen, Astoria, Oregon. This invention relates to former patented inventions of the same inventor, and provides an improved method of capping both ends of the can bodies with rapidity and certainty. This is accomplished principally by arranging two sets of jaws opposite each other, each adapted to close and form a tapered hole, the caps being conveyed one at a time to the narrow end of each hole, and the can bodies presented first one end through one of the holes into a cap and afterward the opposite end through the other hole into another cap, the can bodies following each other, so that the end of one can body is forced into one cap while the opposite end of another is at the same time forced into another cap, the capped cans being released to roll off one after another.

Agricultural.

CORN HARVESTER.—John N. Reimers and Wilhelm M. Schneekloth, Calumet, Iowa. This machine has infold rolls provided with spiral flutes having their front sides inclined upward toward the rear, the rolls being geared to revolve toward each other on their under sides, and having their flutes inclined to diverge rearwardly to feed the stalks rearwardly without tending to crush them to the ground. Combined with the traveling harvester is a husker, having gathering devices for stripping the ears from the stalks, the husking devices having troughs pivoted at their upper ends to the main frame, and mechanism by which the opposite ends of the troughs may be adjusted vertically, as may be desired, according to the grade of the ground traversed by the machine, the troughs being provided with rolls adapted to tear the husks from the ears.

HOP PRESS.—Pierce Riggs, Crowley, Oregon. This is an improvement in that class of presses in which the follower operates horizontally within a press box similarly arranged. Combined with the press box and follower sliding in it are two sprocket wheels arranged one above the other, one of the wheels being keyed on the operating shaft, while a chain attached to the ends of the follower passes between the sprocket wheels, there being means for rotating the shaft. Another wheel is provided having a ratchet rim and a rim for receiving a rope, a lever and a pawl acting on the ratchet wheel to produce the initial and finishing movements of the plunger, the operation being practically continuous.

LAWN MOWER.—Edward Z. Kidd, Deadwood, South Dakota. To a plate rigidly connected to the front ends of the arms or handles, in front of the main axles, are secured forwardly projecting spear-shaped knives, and a plate fitted to slide transversely over this plate carries other V-shaped knives. The latter plate is attached to a lever pivoted on top of the axle, the rear end of the lever being pivotally connected by a pitman with a crank disk on a shaft whose forward end is rotated by a bevel gear in mesh with a bevel pinion operated from the main driving wheels. The power of the driving wheels is readily transmitted to the cutting mechanism, so that the grass is cut with great ease, and the sets of knives may be readily raised or lowered to cut long or short grass.

PRUNING IMPLEMENT.—Jesse M. Morgan, Chetopa, Kansas. This implement has a hook and a reciprocating knife, the shank of the hook having a longitudinal groove in which the back of the knife is fitted, and the hook proper having a slot through which the knife moves in the forward or cutting movement. The construction is such that the knife is guided and braced against being diverted by the resistance of the branch being severed, the knife also, when desired, making a shearing cut while itself having a straight path of movement.

Miscellaneous.

PNEUMATIC GRAIN CONVEYERS.—Frederic E. Duckham, Millwall Docks, London, England. This invention relates to a delivery apparatus for conveyers, for use in unloading or conveying grain, etc., between ships, barges, warehouses and granaries, by the carrying power of a current of air. The hopper-like chamber into which the suction pipe leads is provided with exhausting apparatus by which a partial vacuum is maintained, and beneath this chamber a twin receiver rocks upon a horizontal axis, the upper part of the receiver being curved to an arc to make a comparatively air-tight joint with the mouth of the hopper. The oscillating motion of the receiver is controlled by mechanism whereby a filled receiver is disconnected from the exhaust and falls over to discharge, bringing the other chamber into position to be filled. With this apparatus the grain is transported and deposited by the air current without the admission of sufficient air to destroy the necessary partial vacuum.

EVAPORATING PAN.—Jay B. Copeland, Punta Gorda, Honduras. This invention relates to an

apparatus for purifying saccharine juices in the manufacture of sugars and sirup, the purifier consisting of a vessel divided by partitions into a series of longitudinal compartments ranging side, by side, the juice being partially heated in one compartment, highly heated in the next compartment, and so on, the temperature increasing until it finally escapes at the outlet. The scum is automatically removed, and the tendency to mix with the purified juice is overcome, the sediment being detained in the several compartments, to be removed as it accumulates, whereby the juice is brought to as clear and pure a condition as is possible without the first treatment with bone black, etc.

SUBMARINE BOAT.—John F. Auer, Nyack, N. Y. This boat has a tubular keel section with an opening in its bottom, and valved air supply and exhaust pipes, whereby the admission of water to the keel and its discharge are controlled by the air pressure in the keel section. The arrangement is such that the boat may be quickly submerged by compressed air and a water ballast, and raised directly to the surface through the medium of compressed air, the water ballast and the action of the air on it being so regulated that either the bow or the stern may be dipped or elevated at will. The storage of sufficient compressed air is provided for in the vessel to meet all emergencies, and entirely dispense with the use of pumps.

PIPE COUPLING.—William D. P. Aims, Jr., Philadelphia, Pa. This coupling comprises a case having a thickened end which is externally and internally screw-threaded, the exterior edge of the thickened end being beveled, a cap having its flange internally screw-threaded and with an aperture in its top and an annular space around the top, with an apertured packing. A simple form of coupling is thus provided, for use in connection with air, steam, water, or gas pipes, and one which is designed to make an absolutely tight joint.

SAMPLE CASE.—John E. Hitch, Wilmington, Ohio. This case comprises connected end pieces having interior shoulders, a flexible wall pivoted between the end pieces and adapted to be rolled upon the shoulders, supports on the interior of the wall, and catches to fasten the wall in a closed position, with a suitable handle. The case is especially adapted to exhibit anger bits, cutlery, jewelry, and various articles of hardware, holding the articles in a very small compass, and so arranged as to exhibit the goods to great advantage without the necessity of handling them.

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SCIENTIFIC AMERICAN
BUILDING EDITION.

MARCH NUMBER.—(No. 77.)

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1. Elegant plate in colors of a residence in the Queen Anne style of architecture, erected for F. S. Andrews, at Seaside Park, Bridgeport, Conn. Perspective view, floor plans, etc. Longstaff & Hurd architects, Bridgeport, Conn. Cost \$7,000 complete.
 2. Plate in colors of a cottage at Richmond, Mo. Perspective elevation and floor plans. Cost \$1,500.
 3. A residence at Cleveland, O. An admirable design. Floor plans and perspective elevation. Cost about \$6,000.
 4. A cottage at Gardner, Me., erected at a cost of \$1,900. Perspective elevation and floor plans.
 5. Floor plans and perspective view of a Colonial house at Portland, Me. Cost \$3,800 complete.
 6. Design for an ornamental chimney piece.
 7. A cottage at Portland, Me. Cost \$3,500 complete. Perspective and floor plans.
 8. Floor plans and perspective view of a very attractive Queen Anne cottage erected at Babylon, L. I. Cost complete, \$2,800.
 9. View of the proposed Odd Fellows' Temple at Chicago. To be the most imposing structure of its kind in the United States, and the tallest building in the world. Height 556 feet.
 10. Sketches of an English cottage.
 11. An attractive residence recently erected at Belle Haven Park, Greenwich, Conn., at a cost of \$11,000 complete. Floor plans and perspective elevation.
 12. A residence at East Park, McKeesport, Pa. An attractive design. Plans and perspective. Cost about \$4,000.
 13. A cottage at Asbury Park, N. J. An excellent design. Cost \$5,300 complete. Floor plans and perspective elevation.
 14. Miscellaneous contents: Lawn planting; how to do it and what to avoid, with an illustration.—A suggestion for inventors.—Acoustics.—They bought burning houses.—Timber in damp places.—The taper of chimneys.—Stained cypress.—Low ceilings.—An improved woodworking machine, illustrated.—A fine machine for cabinet shops, illustrated.—Swezey's dumb waiter.—Graphic representation of strains.—An improved door hanger, illustrated.—A new woodworking machine, illustrated.—The baths of Diocletian.—The Stanley plumb and level, illustrated.—The Diamond Match Company.
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Notes & Queries

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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.

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(4152) G. F. writes: I made the eight light dynamo according to description of SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, except I made the yokes (bearings) of cast iron; has that any reducing effect on the dynamo? I made the armature core of ironwire. The dynamo started all right, but the magnet wire on armature becomes so hot as to melt the shellac varnish; what is the cause? I cannot light two carbons between brush and magnet (or a and b on cut); it only gives a large spark and a shock by holding carbons in bare hands by 25 to 30 ohms R. Is there any way to light a 16 candle power 50 volt light on that dynamo? How can I increase the current? I was careful in connecting the coils with the commutator. A. It was a mistake to make the yokes of cast iron as this short circuits the magnets, to some extent. In making anything from carefully prepared directions, you should not depart from the instruction given. However, your machine seems to work very well, and when you learn how to use it, you will doubtless find it quite satisfactory. By placing the carbons in contact in the circuit, you have practically short circuited the armature, thus causing too much current to pass through the armature. Place 15 to 20 ohms resistance in the circuit, then touch the carbons together, and instantly separate them one-sixteenth inch. You will then have the arc, and the machine will run easily. With the carbons long in contact, you are liable to burn out the armature. You should provide some means for separating the carbons one thirty-second or one-sixteenth inch and no more. By connecting from three to eight incandescent lamps in parallel you will have no difficulty in running them. You do not need an increased current. Learn how to use the current you have.

(4153) W. P. asks: 1. If the voltage of an induction coil can be reduced, and the amperage increased after it has been constructed, and how if it can be done? A. Only by using an inverted induction coil corresponding to the converter in the alternating system of electric lighting, the coil being worked by secondary

current. 2. What is the voltage of and amperage of an eight light dynamo? A. 10 amperes at 50 volts E. M. F. 3. How much lead ought a vertical engine have that takes steam only on one end? The engine runs an exhaust fan. A. Only enough to take up the inertia of the piston and piston rod.

(4154) J. O. F. asks (1) how to color incandescent lamp bulbs a red, white, or blue color, also how to frost them, all by some chemical preparation. A. For permanent colors the bulbs are made from colored glass. To color them for temporary use dip them in thin collodion to which has been added aniline color. For frosting use vapor of hydrofluoric acid. See query 4142, taking care to protect all brass parts with vaseline or beeswax. 2. Can I light up a 6 candle power lamp for ten seconds at intervals of 3 to 5 minutes, with some form of dry battery without an excessive strain on the battery? How many cells approximate? A. Possibly 10 or 12 cells of one of the best forms of dry battery might answer.

(4155) E. H. C. asks: 1. A definition of the term "block system." A. A system of signaling on railroads. The road is divided into sections or blocks. At the beginning of each block is a signal post or station. When a train enters a block the danger signal is kept displayed until it leaves it. The system may be automatic and worked by pneumatic, hydraulic, and electric agency, or may be worked by operatives. 2. Whether telegraph stations at intervals along a railroad are essential to such a system? A. To some systems; not to the automatic. 3. Whether there is any automatic system in use whereby trains running on the same track may be kept a certain distance apart? A. The block system and the telegraph are used to keep trains at a proper distance. 4. Some receipt for the gilding of picture frames? A. For gilding receipts see "Encyclopedia of Receipts."

(4156) H. L. B. says: I saw some time ago in the SCIENTIFIC AMERICAN a description, and I think an advertisement, of what is known as a "mineral rod" for locating gold, silver, and other metals, buried in the ground. While I am writing to you let me ask for a solution of something that has puzzled me for some time. Parties around here report having seen, at night, a ball of fire suspended in air about four feet from the ground, with flame going down to about one foot from the ground and returning to the ball, which is stationary. I have not been able to see it as yet, or I would investigate. Will you please tell me what it is and the cause of its being in one particular spot. A. There is no known device for locating any minerals or ores, except iron, which is indicated by the magnetic needle when in large quantity. We think such a device may have been described as the work of a crank. What you describe seems to be the "Will-o'-the-Wisp," or "Jack-a-Lantern." What it is due to is uncertain. It has been attributed to spontaneously inflammable phosphureted hydrogen, and also to marsh gas. The latter not being spontaneously inflammable leaves the question of ignition unanswered.

(4157) L. N. D. asks for the best way to work with oil painting on white silk and satin. A. Partly remove the oil from the paint by spreading it on a cloth or a piece of blotting paper, then thin it slightly with turpentine.

(4158) J. E. H. asks: What metals are of more money value than gold? A. Caesium, calcium, barium, cerium, didymium, gallium, indium, iridium, lanthanum, lithium, niobium, palladium, rhodium, ruthenium, strontium, terbium, titanium, uranium, yttrium, zirconium.

(4159) O. O. E. says: From a spring 110 rods distant and 40 ft. fall, few bends, what size pipe would I have to lay down to get four horse power from the motors that are made for such purpose? For two horse power? A. You will require a 6 inch pipe, supplying 66 cubic feet of water per minute, 4½ inch pipe for two horse power, 33 cubic feet per minute. You should know the flow from the spring for the power that it will produce. A 3 foot diameter motor will give you four horse power and a 24 inch motor Pelton style will give you two horse power with the quantities of flow as above stated.

(4160) G. H. C. writes: I made myself a cycloidotrope not long since, which draws elegant figures on smoked glass. Can you tell me how to transfer them to paper? A. Coat the glass with collodion made granular by the addition of water and stained orange with aniline. Make the tracings on the collodion surface, or you can print the smoke tracings by means of a camera after the manner of lantern slides. Then print on sensitized paper, using the tracing as a negative.

(4161) W. A. V. says: I have been taught from scientific books that motion can be produced from heat, and that heat can also be produced from motion. Now I cannot see how heat can be obtained from motion, other than mere friction. But this is not the heat that I want. I want useful heat, heat that will heat my house and cook my food. Now I would like to know how any scientist can obtain this kind of heat from the motion of a water wheel. Here we have motion without cost of coal; but I cannot see how heat is to be obtained from it. Can the SCIENTIFIC AMERICAN enlighten me on the subject? A. We are as much in the dark as yourself in regard to cheap heat for domestic use. The abstract notions, as you state, are all right, but as yet we do not see the way clear to realize on the faint gleamings of scientific research. When coal gives out, future generations will find ample room for economy in utilizing the ways and means of living according to the new conditions, or in the most primitive ways of the early ages. Mechanical energy can be transformed into heat energy by electricity.

(4162) O. A. C., Monte Vista, Col., says: 1. A day or two since I witnessed something quite unusual, I think. Time, 7:30 A. M.; mercury 10° above 0 F.; rising sun obscured by clouds, but shining on the mountains, northwest. Upon looking in that direction (northwest) a mirage was seen, together with what is commonly called "heat waves," and quite distinct or pronounced. Both mirage and heat waves seemed to be traveling west, and soon disappeared. A. There seems

to have been considerable disturbance in the atmosphere in Nebraska and Colorado on the 17th of February, causing halos and sun dogs in Nebraska and mirage in Colorado. We will be glad to hear from other observers of these phenomena on that day. 2. Does the rotation of the earth upon its axis influence materially either the tides, marine currents, or direction or velocity of the winds? A. The attraction of the moon principally and of the sun slightly are the forces that produce tidal action. The motion of the earth gives rise to marine currents and intensifies tidal flow. The unequal distribution of the heat of the sun, together with the motion of the earth on its axis, gives direction and velocity to the winds.

(4163) J. F. M. W. says: I am building a triple-expansion engine, size 3½ in. by 5½ in., and 9 in. by 6 in. stroke; boiler pressure, 80 lb.; 200 revolutions. What size surface condenser, and also what size air pump, will I require? A. Surface condenser, 12 square feet surface; air pump, one-fifth area of high pressure cylinder, or 2 in. by 6 in. stroke if single acting and direct connection, or 1½ in. diameter by 6 in. stroke if double acting.

(4164) C. B. S. writes: 1. I have constructed the "simple electric motor" described in SUPPLEMENT, No. 641, winding armature and fields with No. 18 wire, and would like to run it by storage batteries, charging them on a 50 volt incandescent light circuit. How many and what size cells should be used, and how long would they run the motor when fully charged? A. You will require four cells, with 17 plates 6 by 8 inches. 2. Is the way of covering storage battery plates with red lead, as described by C. L. Woolley in SCIENTIFIC AMERICAN of November 23, 1891, a good method? A. Yes. 3. How many gravity cells would be required to charge the storage battery, and how long would it take? A. Four to each cell of storage battery. The time required is 6 to 8 hours. 4. Would the motor run a 9 in. engine lathe or a small planer? A. It is too small. You will probably require one-half horse power. 5. In charging the battery on the incandescent light circuit, should resistance be put in the circuit? A. Yes. 6. How many amperes can be safely carried through Nos. 22, 24, 28, 30, and 36 copper wire? A. 1.08, 0.65, 0.25, 0.16 respectively.

(4165) W. M. C. asks: Can an electric light plant large enough to light five 20 candle power incandescent lamps at one time be operated by a weight power, practically speaking? Said power to run four hours without attention. If so, about how much labor would be necessary to wind it up? A. It is impracticable to accomplish what you propose. One horse power requires the fall of 33,000 pounds through the distance of 1 foot each minute, so that this weight would have to fall 240 feet in four hours—twice the weight half the distance, or half the weight twice the distance. It would take a 1 horse power steam engine something over four hours to wind it. A 2 horse power engine could do it in about two hours. A 4 horse power engine in about one hour. One man could wind it in about four days of ten hours each, but it would be constant and severe labor.

(4166) W. E. H. asks whether electricity has been applied with success to safety bicycles? A. It has not.

(4167) C. R. W. asks: What power prevents the bottom course of brick in our large structures from crushing with the tremendous weight above it? Please give me an explanatory reply as possible. What accepted theory is there as cause for the wind blowing? A. The resistance or crushing strength of brick and other building material is far greater than the weight of the superstructure. Architects and engineers understand this, and spread the foundation to meet the pressure from high buildings. A single common red brick, when properly laid in strong cement, is equal to a load of 12 tons, and it will require a column of cement-laid brick nearly 10,000 feet high to crush the bottom course. The heat of the sun and the rotation of the earth are the primary causes of the circulation of the atmosphere. See query 4162.

(4168) W. L. U. asks: 1. What is supposed to be the cause of aurora borealis, which is seen in the northern heavens? A. The aurora is a display of electricity in the upper atmosphere, and is supposed to be largely developed by disturbances in the sun. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 372, for theories and description—an interesting paper. 2. Why does the rainbow always appear in a semicircle? Why not appear in the whole eastern or western heavens, according to the time of the day, instead of in a semicircle, as it always appears? A. Rainbows derive their light from the sun as a radiant. The conditions of the reflection and refraction of the sunlight from rain drops require a circle or part of a circle to meet the radiant points of the sun and the eye of the observer. 3. Is there a limited sum which can be paid in copper or nickel currency? If so, what is the highest sum which can be so paid legally? A. Silver coin is a legal tender to the amount of ten dollars at any one payment. Nickel and copper coins are a legal tender to the amount of 25 cents at any one payment.

(4169) G. W. F. S. asks: What provision can be made for properly carrying off water emanating from a cellar, when the cellar is below point of sewage plant? A. Water cannot be lifted without power. The location and facilities for obtaining it you have not stated, so that in a general way we can say, if you have gas, a small gas engine and pump is recommended. If not, a petroleum or gasoline engine and pump, such as is advertised in our columns, is in order. If you have facilities for accommodating a small windmill away from the house, with a suction pipe leading to a deep cesspool in the cellar and discharging into the drainage system, you will find it as inexpensive and easily managed as any device that we can name.

(4170) W. L. M. says: I am building a house, and to secure ventilation intend to place ventilating registers in the sides of the walls, the open space between the partition studs being used as a ventilating shaft. Above the attic floor a tube will connect with this shaft and be run either into the chimney flue or out under the eaves of the roof. Now the questions I want

answered are these: 1st. Should the ventilators be placed near the floor or near the ceiling? 2d. Will the hot foul air ascend this shaft? 3d. Would it be better to run the tube connecting with the air shaft into the chimney flue or out under the eaves of the house? A. For the best arrangement of ventilators in the rooms there should be one at the bottom and one at the top for each room. If you choose to use but one, place it at the top in rooms that have a fireplace and at the bottom in rooms that have no fireplace. Under no consideration should the ventilation be connected with the chimney, for there are times when the rooms will be filled with smoke from back draught, besides the danger from fire. The ventilator shaft should rise through the roof, with a draught hood on top. Opening the ventilator under the eaves is not good practice. The pressure on the windward side will make a strong down-draught in windy weather.

(4171) R. M. says: In looking at an imaginary object created by a mirage, would a telescope or a pair of field glasses reveal the deception, or would the deception still seem perfect? A. We have no experience with a telescopic view of a mirage, but should judge that as the telescope is only a larger eye, the effect would be the same; but the field of vision being so small in the telescope, the scope of a mirage, due to the larger field of the eye, would be lost in the telescope.

(4172) H. V. K. asks: 1. I have attempted to make a Leclanche cell: filled porous cup with broken bits of electric light carbon, about one large piece of regular battery carbon. Filled in with MnO₂. Set cup in strong solution of NH₄Cl, in which was bar of zinc. After settling for hours current is not strong enough to ring a bell. What is the matter? A. You should use the best quality of graphite, and manganese binoxide with the dust sifted out. 2. Has trinitrate of bismuth (art. on p. 87, February 6, 1892) another name? Large wholesale drug house in city claim no knowledge of it. Where can I get it? A. It is the neutral bismuth nitrate, and any reputable drug house should supply it. 3. Is stannous chloride and stannic chloride the same? A. No. The first is SnCl₂, a solid, the second is SnCl₄, a liquid. 4. Has the "Scientific American Cyclopaedia" a department on electricity? A. Electro-metallurgy is treated in it. For general electrical topics see our SUPPLEMENT catalogue or Hopkins' "Experimental Science," \$4 by mail. 5. Tell me where I can buy an autophone. A. Address any of our advertisers who deal in scientific apparatus, such as Queen & Co., Philadelphia, Pa. 6. What is a concentrated solution of borax, and how can you get shellac to mix with it? A. Heat the water with excess of borax and then pour off and heat with powdered shellac. 7. What is meant by the brush circuit and field circuit from a dynamo? A. The brush circuit should mean all the circuits taken from the brushes; the field circuit is the circuit which excites the field magnets.

(4173) J. W. C. asks: 1. Given a hollow air-tight body which with the superadded weight of one ton will be exactly submerged in water, what additional weight will be required to sink it thirty feet below the surface of the water? A. The compressibility of water is 0.000463 of its own bulk at 15 lb. pressure, so that if your apparatus displaces one ton water, then 0.000463 X 2,000 pounds = 0.93336 of a pound to sink it 34 feet after it is under water. This will also be somewhat modified by the elasticity of the hollow vessel, which is also subject to compression, and if it has as much or more compressibility than water under the increasing pressure of depth, it will go to the bottom without additional weight.

(4174) D. R. F. asks: 1. Please inform me whether glass cells would not answer the same purpose or be superior to gutta percha cells in the construction of the large (8 cell) plunge battery described in "Experimental Science"? A. A glass cell is preferable to a gutta percha cell on many accounts. 2. Also kindly state how many cells would be required to run eight incandescent lights? A. It depends something upon the voltage of the lights. Six cells will run two or three 10 volt lamps. 3. Would the current from such a battery be as steady and the light as bright as from a dynamo? A. Yes.

(4175) T. H. B. asks: Will a wrought iron collar shrink in heating? To explain: Suppose I turn a collar large enough to just slip over an inch bar when it is cold, will it by heating make it tight on the shaft? (After it is cold.) Does a bullet have the same velocity on returning to ground as it had when it left the barrel of the rifle? Supposing it to be shot up vertically. A. Wrought iron rings will become slightly smaller, by heating and cooling, so that if made just to fit a mandrel, it will stick if put on hot and cooled. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 830, "Gun Wrinkles," for answers to various questions in relation to bullets and shooting.

(4176) A. asks: 1. Will the dynamo described in SUPPLEMENT, No. 161, light an incandescent lamp? If not, why? What changes would have to be made? A. The dynamo referred to will light two 5 candle power lamps. 2. Would motor described in SUPPLEMENT, No. 641, run the dynamo? A. It is hardly sufficient for running the dynamo up to its full capacity. 3. Can dynamo described in SUPPLEMENT, No. 161, be used as a motor? A. Yes. 4. Could number 18 or 20 wire be used for the armature instead of 16? What difference would it make in motor? A. Yes, it would give a higher electromotive force, but it will be necessary to modify the field magnet correspondingly.

(4177) "Andes" asks: What is the most simple method of testing the existence of borax when exploring alone on horseback, and therefore unaccompanied by baggage? A. Pulverize the mineral, moisten with sulphuric acid and cover with alcohol and ignite. A green flame will show the presence of boracic acid provided other substances (barium or copper) are not present. If present, separate by well known processes. A good test is to moisten the mineral with sulphuric acid and glycerine and ignite on a platinum wire in an alcohol lamp or blowpipe flame. A green flame goes to prove boracic acid. A good corroborative test is to dissolve the mineral, first pressing with sodium carbonate if necessary, then to slightly acidify with

hydrochloric acid, to dip a piece of turmeric paper in it and dry the paper at a low heat. A brownish red color shows boracic acid. This test is also interfered with, but the two are pretty good proof. See Cornwall's "Blowpipe Analysis and Determinative Mineralogy," \$2.50 by mail. Study and experience are required to prepare for field work in mineralogy.

(4178) J. W. P. asks: Can you tell me of any acid or liquid that will eat or burn up tinfoil (sample inclosed) in the same way that brass door-plates are protected in parts by wax and then the rest etched with acid? A. For etching tin use a mixture of 1 part nitric and 2 parts hydrochloric acid and 3 parts water; 1 part potassium bichromate may be added. All parts are by weight.

(4179) P. H. asks: How much storage battery should I require for say 20 lights, not over half of them being used most of the time, so as not to have to recharge the battery oftener than once in two or three months? A. It is impracticable to retain the charge in storage batteries for two or three months as you suggest. The batteries will have to be recharged once every ten days or two weeks. To light 20 lamps you will require 26 cells, provided the lamps are 50 volt lamps.

(4180) A. B. asks: 1. I made a condenser for the induction coil shown in SUPPLEMENT, No. 161, and same would not work satisfactory. I attached same to the primary wires, and the vibrator works all right, but the coil will not give any spark when the condenser is attached. In making the condenser I used 12 sheets of tin foil 5 inches by 5 inches and connected them at each end 1, 3, 5 = 2, 4, 6, etc., and separated each sheet by well shellacked paper. A. You will probably find that there is a cross connection or leakage in your condenser. 2. I have two glass cells 6 by 8 by 9, and each cell has two zincs and three carbons, 6 by 8 inches by ¼. What is the amperage of the two connected in series? (Plunge cells.) How can I compute the capacity of a plunge cell with reference to the square inch of plates? A. The amperage of a battery is computed by dividing its E.M.F. by its resistance.

(4181) S. M. I. writes: 1. I want to heat a German silver wire about 12 inches or 15 inches in length up to as high a temperature as it will stand with an electric current of 8 amperes with E.M.F. of 50 to 60 volts. What number of wire should I use? A. With above E.M.F., and using such current, you could heat about 14 feet of No. 19 German silver wire to 1,500° F. The amperes fix absolutely the diameter of the wire; the relation of amperes to volts fixes its resistance, i. e., its length; hence the calculation cannot be carried out for the incompatible conditions of length given by you. 2. Why on standing close to an incandescent electric lamp do the filaments appear as fine threads of white light, and on receding from the lamp they seem thicker until they appear as a single flame? A. The phenomenon is known as irradiation.

(4182) G. T. L. asks: What is the process of making the small or rough, sand-covered signs? What means are used to prevent the oil in paint, when lettering on cloth, from spreading around the margins of the letters and turning to a dark color? A. The ground is painted the same color as the smalts. The smalts are then thrown on in the same way as sanding paint. The figures or letters are painted on the cloth with a thin mullage of gum tragacanth and the color laid on so as not to overlap.

(4183) A. F. O. writes: I have somewhere heard of a process for roughening the surface of glass by applying something strongly adhesive, which, by subsequent drying and contraction, tore off the surface of the glass in thin flakes. Can you give me the particulars of the process? A. Make a thick solution of gelatine, pour it on the glass, let dry on a level. In shrinking, the gelatine will take out the surface of the glass.

(4184) A. W. says: 1. I wish to know what number of wire should be used on a magnet to draw the armature with the greatest force and how much wire, using three cells of Fuller battery. A. For your magnet use soft iron cores ⅝ of an inch in diameter, and upon them wind 140 feet of No. 20 magnet wire. 2. If the balance or fly wheel on a buzz saw or other fast running machinery were inclosed in a vacuum and the air kept out by a small pump operated from the main shaft, would there not be a considerable saving of power? It seems to me the speed would be more easily attained and a great deal harder to check. What are your views on the subject? A. It is doubtful if the plan suggested would effect any saving, as considerable power will be required to maintain a vacuum. You could, however, save something by inclosing the wheel in a practically air tight box. By this means the air would be prevented from being thrown off by centrifugal action. 3. Can you give me the formula for a composition that is a non-conductor of electricity, light in weight and will not warp by being put for hours in a liquid heated to 80° Fah.? A. We know of nothing better for your purpose than glass or porcelain.

(4185) W. E. B. asks: 1. Would you advise a person, wishing to purchase a first class watch, to purchase a non-magnetic watch, or is the ordinary watch as good as a non-magnetic one? A. If you are liable to visit places in which your watch would be subjected to magnetism, we should certainly advise the purchase of a non-magnetic watch, as the poorest watch of this kind will keep better time than any magnetizable watch when magnetized. 2. Where is the most desirable non-magnetic watch made, and by what company. Some jewelers tell me that the non-magnetic watch is a fraud; while others say the time is coming when a non-magnetic watch will be necessary if a person wants a reliable watch. A. There are several non-magnetic watches in the market, which are about equally good. We think that jewelers generally believe it to be impossible to make an absolutely perfect timepiece on the non-magnetic principle, but they are sufficiently accurate for all ordinary uses.

(4186) C. M. P. asks: 1. Is the simple motor, described in "Experimental Science," self-regulating? In other words: You say it is ¼ horse power,

Now, could I take half the battery required to run it at its fullest capacity, and run it as a one-sixteenth horse power machine? A. The motor would require more than one half the battery to run at one-half its full capacity. 2. Where the instructions are to use wood, would it be any better were I to use type or babbitt metal? A. Type metal or babbitt would not do for the core for the hub of the armature, unless you provide a commutator cylinder separate from the hub. 3. Please let me know what is meant by the word shunt as applied to electrical machines. A. Shunt is a term applied to one part of a divided circuit.

(4187) E. D. H. asks: 1. Please give the solution of the Leclanche batteries. A. Saturated solution of sal ammoniac and water. 2. What size storage battery would be required to run a small motor for operating a wood turning lathe? A. Your query is too indefinite to admit of direct reply. It requires 8 cells of storage battery per horse power. 3. About what it costs and how much would the cost be in renewing it? A. The cost of a storage battery is \$15 per cell. The cost of charging, of course, varies with the cost of the motive power used in driving the charging dynamo. Probably a fair average will be ten cents per cell.

(4188) M. W. writes: Suppose two electrical storage batteries each having capacity enough to run a dynamo for several hours of several horse power, the one being charged and the other not. How long a time will it require after they are connected till there is an equilibrium between the two, that is, will the charges in the two become equal in an instant or will it require some time? A. The charging of storage batteries by means of other storage batteries is practically the same as charging them by the current from a dynamo, and they should be charged at the same rate. For elaborate tables on charging and discharging dynamos consult SUPPLEMENT, No. 838.

(4189) H. R. writes: I am making some blue enamel for enameling iron ware made of sand, borax, potash, and cobalt oxide. When ground into a pulp, there is a white scum on the top of the enamel. Can you let me know the cause of it? Can you give me a receipt for blue enamel? Is there any book published on the manufacturing of glass and enameling? A. Fuse the mixture, pour while fused into water and re-grind it. This will give it greater uniformity and avoid the scum. The "Scientific American Encyclopedia of Receipts," \$5 by mail, gives a great deal of information on this subject.

(4190) W. P. D. writes: During last fall's drought we dug a cistern, at a depth of ten feet found moisture. It was walled up with brick and cement and bottom laid with same. (Star brand cement being used.) Later on, when the ground became thoroughly wet, a leak showed in bottom, and water rose two feet deep. It was pumped out and another layer of brick and cement was put down, making the bottom double, but it filled with water just the same. What had we best do to secure good results and make it hold full up? Would the water go out during drought as it came in? It is now half to three-fourths full. All comes through the bottom. A. The water will doubtless disappear in the dry season. The remedy will be to pump out the cistern, plaster walls and bottom with best Portland cement, neat, then put in another bottom and walls of brick laid up in the cement.

(4191) R. M. asks: 1. Please give chemical action in a single fluid battery using iron for the positive plate, and a saturated solution of common salt. A. The iron would oxidize very slightly and the battery would become polarized. The salt would merely act to accelerate oxidation. 2. Also E. M. F. of the same. A. It would be very slight; practically only a fraction of a volt.

(4192) E. L. writes: I have a silver wash made by dissolving silver chloride in a solution of hyposulphite of soda. When first made the solution worked very well and deposited silver nicely. Now, after a lapse of several months, it will not work at all, and there is a considerable amount of black sediment in it. Can you tell me how it can be made to work, or how the silver can be reclaimed, if that is impossible? A. Possibly your solution is exhausted. To get rid of black sediment, filter. To recover silver add a few pieces of zinc, acidify in open air with sulphuric acid, and eventually dissolve all the zinc. The silver will be left in the metallic state.

(4193) G. H. C. asks: If the rings used in the armature of motor No. 641 were so made that a segment of iron came between each pair of coils so that the circumference were unbroken, would it decrease or increase the power of the motor, and are such rings made? A. It would increase the power of the motor to some extent.

(4194) W. T. B. asks: 1. If the carbon sticks used for arc lamps be used for carbon element in bichromate plunge battery, should enough sticks be used to make the carbon surface equal the zinc surface? A. You should use enough of the carbon rods to make the carbon surface nearly or quite double that of the zinc surface. 2. How many half gallon gravity battery cells are required to run motor described in No. 761, SUPPLEMENT? A. The gravity battery is not suitable for running motors of this kind. You will probably require 20 or 30 cells to run the motor up to its full capacity. Better use a plunging battery or a Bunsen. 3. Would not said motor be just as efficient, if a circular iron band, say $\frac{3}{4}$ inch wide, $\frac{1}{8}$ or three-sixteenths inch thick, fastened to a wooden disk, were substituted for the iron disk to which the armature spools are attached, the spool cores to pass through the wood disk and be screwed to the iron band? A. There is no objection to the construction you describe.

(4195) E. H. asks: What is meant by a silicated carbon filter? What is its composition, how made, and what is its action, or, in other words, how does it purify water, etc.? A. Silicated carbon filters may be any mixture containing silica and carbon. This may be sand and charcoal mixed or a porous sandstone slab covered with pulverized charcoal. Solid filter slabs may also be made from pulverized retort carbon, sand, and clay, by baking the same as bricks are made. The action is principally as a filter or strainer, with a slight

tendency to deodorize the water by the absorptive action of the carbon.

(4196) W. E. K. says: Will you please tell me what is meant by latent heat, and also something to take away warts? A. Latent heat is the heat that has been absorbed and which becomes hidden in the change of fluids to vapor, or in the fusion of solids. It is also the heat that is derived from the condensation of vapors and from fluids when passing into the solid state. As its name indicates, it is hidden or concealed heat, not shown by change of temperature. Try a drop of kerosene oil on the warts twice a day.

(4197) J. H. K. asks: 1. How are school blackboards made? A. The best mixtures contain a vehicle, often shellac varnish, with emery or ground pumice to give "tooth," and lampblack or other pigments, often with a little Prussian blue. See the "Scientific American Encyclopedia," \$5 by mail. 2. How can gas be lit by electricity and what is a simple way? A. By a spark coil, three or four Leclanche batteries in circuit therewith, and a circuit-breaking attachment to each burner. The latter are sold by electrical dealers. 3. How can small bombs be made, which, when thrown to the ground, do not make much of a report? A. Fulminate of mercury is the explosive of ordinary torpedoes. All this class of manipulation is very dangerous.

(4198) F. W. P. asks: Can a fish of any kind or eel shoot or swim up a ten-foot dam or falls? Does the bottom of a wagon wheel go slower than the top? Is it better to write a letter for information to the publishers of any paper, or send an article before doing so? A. Salmon are known to jump a considerable fall with deep water below. They jump all the falls of the Columbia below Spokane. We have no figures. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 275, for an interesting account. Eels crawl around falls or dams. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 706, for a discussion of the wagon wheel question. Send letters and article together.

(4199) C. C. B. writes: Will you allow me to add a little to your directions for reinking type writer ribbons. I find that one part each of alcohol and glycerine, with aniline dye, makes the ribbon too soggy, and causes it to blur in use. After using one of my ribbons for a day or two inked as above, I ventured to run a hot iron over it, having first put it between two blotters. This remedied the trouble at once.

(4200) W. D. R. says: I wish to convey water through a pipe 250 feet from a ditch. I have 24 feet fall. I would like to know what is the smallest size pipe I can use and have a supply of 3 gallons per minute. A. A $\frac{3}{4}$ inch pipe will give you about 5 gallons per minute. We do not recommend smaller pipe, on account of its liability to close after being in use some time.

(4201) H. G. G. asks: What occupies the space in the top of the barometer tube? Is it a vacuum? If it is not a complete vacuum, what fills the space? A. It is as near a perfect vacuum as possible. In a barometer that has no spot at the top when it is tipped down so that the mercury touches the top of the tube, there is good proof that it contains no air or gases. There is only a possibility that an infinitely small amount of vapor of mercury rises in the open space that condenses as the mercury rises to the top in tipping the barometer.

(4202) W. S. T. says: Please give me the proper weight for a flywheel for an engine $3\frac{1}{2}$ inch bore, 6 inches stroke, running 90 revolutions, cutting off $\frac{1}{4}$ stroke, or give rule in next issue for finding weight of flywheels. A. For weight of flywheel rim

$$\text{mean piston pressure} \times \text{stroke in feet}$$

$$\text{Rev. per m.} \times .0003$$

or for your engine, assuming 40 pounds mean piston pressure per square inch,

$$\frac{40 \times 8 \times 29 \times \frac{1}{2}}{90 \times 90 \times .0003} = 34.6 \text{ pounds.}$$

(4203) H. M. asks: What is the red transparent composition used on the outside surface of corrugated lenses for semaphore signal lamps and how is it made to adhere to the glass? From close observation I notice that green and blue lenses are not made in this way, but apparently the coloring matter, whatever it may be, seems to have been mixed through the glass. From this the question arises, can green or blue lenses be made in the same manner as the red? A. Colored glaze is used and baked on as with glazed earthenware. Otherwise the coloring is made at the glass house by using colored glass in blowing. Colored varnishes may be used for cheap work. The principal colors in sheet glass are sold by the trade, consisting of ordinary glass glazed on one side with colored glass. This is a special business for ornamental windows and decorated work.

(4204) W. B. says: Suppose there is a hole through the center of the earth from one side to the other. The air being exhausted in the hole, a lead ball is dropped in; will it fall past the center? Will its velocity increase or diminish in the first 2,000 miles? A. The lead ball would not drop through the hole freely unless the hole was from pole to pole. The motion of the earth decreases from the surface toward the center or axis. The ball partaking of the surface velocity would hug the east side of the hole, because it would always be approaching a part having a slower motion as it moved toward the center. With a polar hole the ball would drop with an increasing velocity to the center, and pass to an equal distance to the other side with a decreasing velocity, from the effect of gravity, and would vibrate from surface to surface, no friction being considered.

(4205) C. P. M. asks: If a cannon be fired at a horizontal and another ball be dropped from the same height at the same instant, which will reach the ground first? I say there will be no difference. A says that is an old theory, and that modern science has proved that the ball that is dropped will reach the ground first, and if the SCIENTIFIC AMERICAN does not

agree with him he will not accept it as authority. Will the best modern rifle fired at 100 yards throw a ball in a straight line that or any part of that distance? If not, how far above the target will the rifle actually be sighted, and at what point along the line will the ball be farthest above a direct line, and how far? A says he has sighted rifles as a business, and that a rifle will throw a ball in a straight line for a given distance varying according to the velocity. What is your opinion of A? A. You are right as to the time of direct fall and the fall of the horizontal shot. A ball fired horizontally does not move in a straight line after it leaves the gun. It is a downward curve. The sighting is depressed from the line of the bore to meet the curve of the ball at given distances. Hence the ball rises on the line of sight, but not on the line of the bore. Do not think well of A's opinion. The depression in sighting depends upon strength of powder and weight of ball, as well as length of barrel or distance between the sights. We have not the figures used in practice.

(4206) W. E. MacK. writes: 1. I made an induction coil as described in your paper, but can only get about a one-half inch spark. There are two pounds of secondary wire wound perfectly, each layer shelled, with two layers of thin paper between each layer. I feel positive that the insulation is perfect throughout. The condenser is made from leaves of an old ledger, every leaf examined for imperfections and then dipped in paraffine. How can I test to find out where the trouble is? A. Test the secondary wire of your induction coil by means of a galvanometer and rheostat, and see if it has the resistance due to its length. If the resistance of the coil is less than that of the wire, your insulation is deficient at some points. If the resistance is extremely high, or if the current will not pass at all, it indicates a break. Possibly you are not using sufficient battery to develop the full power of the coil. If you are using small cells, try connecting them up by twos in parallel. 2. Why is it that if the wire from the zinc of a bichromate of potash cell be connected directly with the carbon it becomes red hot, while if connected at the binding post or to another piece of wire from the carbon it is not made even sensibly warm? A. By connecting the wire directly with the binding posts, you have the greatest possible current you can obtain from the battery. Any additional resistance introduced into the circuit reduces the current. 3. I have three cells of carbon and zinc battery which I charge with a saturated solution of bichromate of soda and one part sulphuric acid to five of solution. Why is it that when this battery is set up fresh it becomes so hot that the paraffine is melted from ends of the carbons, although everything is quite cold before the zinc is put in? A. The fact of the zincs becoming warm in your battery indicates poor amalgamation. You should amalgamate your zincs thoroughly in every part. 4. On page 321 of Mr. Hopkins' book he speaks of sulphurous acid water. What does he mean? A. Sulphurous acid water is water in which sulphurous acid (which is a gas at ordinary temperatures) has been absorbed. 5. How shall I go to work to harden a steel roller (tool steel) $\frac{1}{4}$ inches by 2 inches diameter with journals 3 inches by $1\frac{1}{2}$ projecting from each end? I wish the journals soft and the center as hard as possible to get it. I have made three, but all crack in the hardening? A. For your roller take steel that has been worked as little as possible, and never heated above a low cherry red. Heat the roll to a temperature required for hardening and dip it straight down into cool water, holding it there until it becomes cool; afterward draw the temper of the journals. A roll of this kind is almost sure to spring in hardening. It should be finished, after hardening, in a grinding lathe.

Marlboro asks: For a variety of whitewash receipts, —J. G. S. says: What is a good formula for a floor stain? How made and applied? —F. H. E. says: Is there any way in which short hair may be curled without the use of curling iron, and without doing any injury to either hair or scalp? —E. W. says: Please give me a cement to fasten glass and brass or glass and tin, so that it can stand hot water? —H. W. F. says: Will you give receipt for Worcestershire sauce, same as made by Lea & Perrins? —R. C. C. says: Please give formula for rubber mixture to repair rubber coat. —A. H. R. says: Can you inform us of some lacquer to use on brass signs to keep them from tarnishing? —R. F. M. says: Could you kindly give us a recipe for hard transparent cement for sticking glass, insoluble in water? —H. B. A. says: How can I remove mud stains from a sole leather dress suit case without leaving any mark? Is there any way to remove initials badly put on with the black paint generally used for that purpose? —C. J. McG. says: Oblige me with a receipt for making colored crayons. —B. P. H. says: Be so kind as to inform me how a solution for removing ink is made? —T. F. McD. says: Please give a receipt to make an easy-running bismuth solder? —T. J. says: Can you furnish me with the receipts by which billiard balls are colored? Also how are the stripes on pool balls done? —P. H. H. says: Is there any kind of a cement that will stick brass to glass so that when a heavy charge of electricity comes over the wires it will not melt the cement? 2. Can you temper a drill so that you could drill a hole in glass, and how? —A Reader asks how to clean wall paper. —C. H. C. asks for tin and zinc plating baths. —E. C. W. asks for a durable whitewash.

Answers to all of the above queries will be found in the "Scientific American Encyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

Replies to Enquiries.

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

Removal of White Incrustation from Bricks.—Large quantities of the pressed bricks referred to in query No. 4064, February 27, are made near here. Hydrochloric acid, dilute 1 in 3 water, and put on with a whitewash brush, will take off the white referred to. —W. D. B., Milton, Ontario.

NEW BOOKS AND PUBLICATIONS.

THE MECHANICAL ENGINEER'S POCKET BOOK OF TABLES, FORMULA, RULES, AND DATA. By D. Kinnear Clark, M. Inst. C.E. New York: D. Van Nostrand Co. 1892. Pp. xxxii, 656. Price \$3.

A book of this character, provided with an extended table of contents and also with a full index is always welcome. The work covers the ground designated by its title, with one noteworthy feature. This is the introduction of a considerable part devoted to electrical engineering, including, among other topics, dynamos, lamps, conductors, telephones, and lighting conductors. The preface states that the work is especially designed for the use of the mechanical engineer, and its numerous tables and practical rules and examples will prove of the greatest use to members of the profession in question.

NOTES ON BUILDING CONSTRUCTION. Part IV. Illustrated with text and folding plates. London and New York: Longmans, Green & Co. 1891. Pp. xix, 364. Price \$4.50.

This large and beautifully made volume is designed to meet the requirements of the syllabus of the Science and Art Department of the committee of council on education, South Kensington, England, for what is termed the course for honors. When the English examination system is productive of good or harm to the cause of education is an open question. Its influence on the world of books is in some ways bad as tending to restrict the scope of books to the limited "requirements" of the examinations. This volume, however, while avowedly written for such end, treats so fully of its subject, building structures and calculations incident thereto, that it will be found valuable to many besides the mere crammer for the "honors" of a South Kensington examination.

HOW TO RUN ENGINES AND BOILERS. By Egbert P. Watson. New York, 1892. Pp. 125.

This is a little hand book of useful information and direction by the editor of the *Engineer*, designed to be particularly serviceable to young engineers and steam users. It treats of cleaning the boiler and removing scales, boiler fittings, grate bars and tubes, bridge walls, etc., and several short chapters are given to the slide valve throttling engine. Many valuable practical hints relative to engine running and management are given, and the information contained in the book is set out so plainly and clearly that the most ordinary mechanic cannot fail to understand and appreciate its contents.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 15, 1892.

AND EACH BEARING THAT DATE.

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

Acid in oils and fats, dissolving lactic, A. Som-	470,715
Acids in oils and fats, solution of, A. Sommer-	470,714
Acids, making oxymethoxybenzole, B. R. Seifert.	470,920
Advertising match box, Harrison & Hooper.	471,052
Air and gas meter, G. E. Abrahams.	470,814
Air compressor and reservoir, J. G. Haines.	470,984
Air moistening apparatus, E. Mertz.	470,725
Air or gas meter, H. Lane.	470,883
Ammunition car, rotating, H. A. Spiller.	470,955
Annunciator, A. H. Brintnell.	470,831
Arc light hanger, C. A. Pfleger.	470,799
Auger, earth, G. P. Vicken.	470,725
Awning, F. A. Leavitt.	470,894
Axle, car, A. Alfrod.	470,851
Axle lubricator, T. H. Fox.	470,948
Axle skelp, L. D. Hill.	470,787
Badge, C. A. Tripp.	471,039
Bag. See Bicycle bag.	
Baling press, A. Mattietz.	471,012
Bank, J. W. Clement.	470,966
Barrel stand, T. F. Marshall.	471,010
Barrels, etc., machinery for shaping, finishing, and flanging metal, T. C. Barraclough.	470,737
Basket, F. & H. Jepsen.	470,830
Basket for marketing fruit, M. B. Williams.	470,732
Battery. See Galvanic battery. Secondary battery.	
Bed bottom, folding, S. Raymond.	470,706
Beehive, U. G. Matthew.	470,789
Belt, straightening, C. R. P. Klem.	470,859
Bicycle bag, E. W. Mease.	470,873
Bicycle lock, A. W. Hall.	470,836
Binder for filing and binding papers, G. A. Hueve.	471,055
Blacksmith's vise, G. R. Moore.	470,764
Boiler furnace, J. F. Wangler.	470,726
Bolt. See Joint bolt.	
Bolts for doors, manufacture of cases and staples of sockets, G. Clarke.	470,945
Book, W. Chichester.	470,861
Bookbinding, A. C. Hafely.	470,866
Boring machine, J. Richards.	470,879
Bottle for mucilage, etc., C. M. Higgins.	471,003
Bottle stopper fastener, J. Menke.	471,013
Box. See Fare box. Journal box. Letter box. Sheet metal box. Show box. Stuffing box. Work box.	
Box fastener, S. S. Barrett.	470,968
Bracket range, W. Jones.	470,684
Bracket. See Scaffold bracket.	
Brake. See Car brake. Wagon brake.	
Brick mould sander, C. A. Adams.	470,963
Brooms, etc., holder for, Smith & Harding.	470,880
Bucket, iron, W. & A. McLaughlan.	470,947
Buckle, J. F. Ballard.	470,852
Buildings, construction of, W. T. Sears.	470,911
Burn, C. H. Martin.	471,011
Burial apparatus, C. C. Shults.	470,757
Burner. See Hydrocarbon burner.	
Butter tub closure, O. Duesler.	470,835
Button, link, F. E. Williams.	470,731