## RECENTLY PATENTED INVENTIONS.

### Vehicles and Their Appliances.

BICYCLE-SUPPORT.—JAMES NEUBIGGING, JAMES EASTON, and JAMES BELL, Victoria, B. C., Canada. The bicycle-support consists of a head clamped to the lower brace of the bicycle-frame, to which head legs are loosely pivoted so as to be capable of spreading. The legs are provided with extension-arms at their fulcrum ends. A transverse locking member connects the extension-arms; and a retaining device holds the legs. In using the support, the legs are allowed to swing forward and are then firmly engaged with the ground by drawing the bicycle slightly backward. To disengage the legs, the bicycle is pushed ahead and the legs swung rearwardly and upwardly into engagement with the retaining device.

PLATFORM-WAGON.—TIMOTHY B. BENEDICT, La Grange, Mich. This platform farm-wagon is made much lower than the ordinary platform-wagon of the same height of wheels, whereby a load can be conveniently and quickly placed upon the platform. The vehicle is light, yet strong. Ordinary axles, bolster-blocks, bolster-hounds, reach, and sway-bar are dispensed with. The weight of the vehicle is equally distributed at the corners, and is equally supported at the wheels, which are beneath the corner portions of the platform. Each wheel is provided with a separate axle. Between the front axles a coupling is mounted. The tongue or pole permits the vehicle to be turned short with safety, and can be freely moved from side to side or up and down.

BICYCLE-FRAME MEMBER.—JAMES H. SULLIVAN, Cairo, Egypt. This invention provides an improvement in forks for bicycles. Tubular lower members and tubular upper members comprise the fork. The upper members are semi-cylindrical. A clamping-crown or block engages the members at the lower side, and has collars at its ends to embrace the lower members of the forks. A sleeve engages the members at the bend, and has portions extended through the collars and then turned outward. A latch turns outwardly. By the methods of fastening the members in the device as described, no brazing or soldering is necessary.

### Mechanical Devices.

AIRSHIP.—ARISTARCHUS F. HUBBARD, Simmler, Cal. The airship has an air-plane adapted to transverse pivots at each end of the ship, each pivot being located at the edge nearest the center of the ship. Between the air-planes is a mast over which a rope extends attached to the outer end edges of both air-planes and then extending beneath the air-planes within the body of the ship. The planes are swung positively and their angular directions are maintained by means of drums to which the ends of the rope are attached. The air-planes control the vertical position of the ship. When it is desired to elevate the ship, the air-planes will be thrown into such a position that their forward edges are higher than their rear edges. When it is desired to descend, the air-planes will be oppositely adjusted.

SCUTTLE-LIFTER.—GEORGE BICKELHAUPT, Manhattan, New York city. The object of this invention is to provide a scuttle-lifter which can be easily opened or closed and automatically and securely locked in closed position. A lever has sliding connection at one end of a guideway on the skylight or scuttle. When a swinging motion is given to the lever a corresponding movement is given to the scuttle. A catch is carried by the lever to engage the guideway and to hold the scuttle in the position to which it has been raised. A latch locks the closed scuttle to its frame, with which latch the catch is operatively connected. A rope operates the latches to unlock the scuttle before it is opened by the lever.

WHEELWRIGHT'S IMPLEMENT.—MICHAEL M. MAY, Rule, Neb. This invention is a novel machine for holding vehicle-wheels during the application of the tire, for permitting the wheels to be submerged in a tank immediately after the tire is placed in position, so as to cool the tire and shrink it on the felly. The machine is also useful for truing wheels and to prevent the dishing of wheels during the application of the tire.

CENTRIFUGAL MACHINE.—ANDREAS FREITAG, Amsterdam, Netherlands. Centrifugal separators are usually driven by belt and pulley. Water turbines and electric motors, however, have been applied directly to the separator shafts, thereby enabling the separators to be arranged in groups. With the driving belt, it is evident the machines must be arranged in rows. But the driving of centrifugal separators by electricity or by turbines is not readily applicable to existing machines, as in most cases the cost is considerable. The present invention attains the end by constructing the rotary bowl with buckets into which stationary nozzles discharge water. A trough receives the water; and a pump removes the water from the trough and discharges it again through the nozzles.

SELF-LOCKING PULLEY-BLOCK.—JOSEPH O. WALTON, 211 East Forsyth Street, Jacksonville, Fla. Mr. Walton has endeavored to secure the advantages of a rolling surface above a cramping pulley by which the rope is freely fed into the cramping groove, and also the advantages of a stationary binding surface to secure a positive lock. To this end his invention consists in combining with the cramping pulley a binding surface which rotates through the first part of the cramping action to allow the rope to be freely fed into the cramping groove and which locks and becomes stationary at the last part of the cramping movement so as to form a positive lock, thus securing the advantages of both forms of the device without the disadvantages of either.

### Miscellaneous Inventions.

CROSS-HEAD FOR MINE-SHAFTS.—JOHN T. SEMMENS, Bald Mountain, Colo. The cross-head is arranged automatically to be locked, during its ascent or descent in its guideways to the hoisting cable, and to be automatically unlocked when its lowermost position has been reached so that the hoisting cable and its bucket may descend further into the mine-shaft.

FOLDING-CHAIR.—ADAM COLLIGNON, Westwood, N. J. The chair is a steamer-chair, each side bar of which has a longitudinal slot and one or more recesses in the lower wall of the slots. A back has downwardly extended members provided with pins passed through the slots in the side bars. The pins have heads to engage the outer side of the side bars to prevent their spreading. Legs are pivoted to the forward portions of the side bar. Stops limit the rearward movement of these legs; and arms are pivotally connected with the forward legs and with the back of the chair. By means of the recesses and pins the back of the chair is firmly held in its adjusted position. In folding the chair the front legs are carried up and back, whereupon the arms fall down almost parallel with the seat frame.

TRACER.—HENRY M. ENRIGHT, Manhattan, New York city. The primary purpose of the invention is to provide a means for folding and closing the tracer-wheel so that the entire device may be carried in the pocket without danger of tearing the cloth. The tracer-wheel is journaled in one end of a shank; and at opposite sides of the shank, plates are hinged. These plates are arranged to form a handle and to inclose the shank and tracer-wheel between them.

MAIL AND PACKAGE DRAWER.—PAUL P. I. FYFE, Concord, N. C. The drawer is constructed in two sections adapted to slide one within the other. For the sections of the drawer a casing is provided, which is so located that parcels can be placed in a section of the drawer outside of the building and removed at the inside of the building. The drawer has an outside combination lock connecting the two sections with the casing. If one not familiar with the combination attempts to open the drawer an alarm will be sounded.

EGG-TESTER.—CHARLES S. JEWELL, Rahway, N. J. The egg-tester comprises a casing having openings in its opposite side walls, and a runway extending between the openings. Through these openings the light of a lamp passes. The runway is inclined downward from its inlet to its outlet end, so that the eggs roll in the runway. As the egg passes along the runway it is viewed through one of the openings formed in the end of the casing. It is well known that a good egg is translucent when held to the light; that a bad egg is opaque.

SACK-HOLDER.—FREDERICK D. BLANCHARD, Lewiston, Minn. By means of this improved construction, the holder automatically adjusts itself to the length of the sack. For this reason the sack can be entirely filled, thus avoiding refilling. The holder will support a sack which has no hem. But little space is required for the device. The filling of bags is greatly facilitated.

CURTAIN-POLE RING.—JOHN KRODER, 270 Canal Street, New York city. The curtain-pole ring is split and has a hub to engage the ends. Integral retaining ends shaped as frustums of cones are carried on the ends. The hub has its ends tapered outwardly. The walls of these ends are contracted and reduced upon the ends of the split ring so as tightly to embrace the retaining heads and thereby prevent the split ring from opening. The ends of the split ring are held in position in the hub without the use of solder or other similar fastening means.

BICYCLE-BRUSH.—PEMBERTON DUDLEY, Philadelphia, Pa. In a baseboard, rollers are mounted which receive the bicycle-wheel. In the bottom and side walls of this baseboard, brushes are so mounted that they engage the tread and sides of the tire. Upon rotating the wheel the brushes clean the tire.

### Designs.

BRACKET.—WILLIAM M. SCHRADER, Bucyrus, Ohio. The bracket supports a turpentine vessel beneath a hen roost in such a manner that parasitical insects must pass into the turpentine before they can reach the hens, and are, therefore, exterminated.

HALTER RING.—JAN BIRGEL, Dawson, N. D. The leading feature of this design consists of a straight member at one side, opposite which are converging straight members. Between these members are opposite inwardly curved members.

HARNESS HANGER HOOK.—JOHN STAGG, Paterson, N. J., and ARTHUR H. SPEAR, Manhattan, New York city. The hook consists of an elongated body portion having tongues at the ends inclined in opposite directions. The hook is to be used in fire-engine houses, and by reason of its peculiar construction the harness can be immediately dropped on the horses.

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

## Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send your name and address to the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

**Inquiry No. 97.**—For manufacturers of ice-making machinery.

Catalogue of ice-making machinery of the latest pattern can be had from the York Mfg. Co., York, Pa.

**Inquiry No. 98.**—For manufacturers of laundry machinery.

Up-to-date laundry machinery manufactured by the Troy Laundry Machinery Co., Ltd., 258 Broadway, New York.

**Inquiry No. 99.**—For manufacturers of wire crimping rolls.

"C. S." Metal Polish. Indianapolis. Samples free.

**Inquiry No. 100.**—For channel iron or steel suitable for rails of iron fencing, 1¼ inch by ¾ inch, weighing about 1½ pounds per lineal foot.

WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

**Inquiry No. 101.**—For machinery for manufacturing shovels and spades.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

**Inquiry No. 102.**—For the address of the "Strowyer Automatic Telephone Exchange.

For bridge erecting engines. J. S. Mundy, Newark, N. J.

**Inquiry No. 103.**—For deflated toy, rubber, gas balloons.

Everlasting monuments of white bronze made by the Philadelphia White Bronze Monument Co., Philadelphia, Pa.

**Inquiry No. 104.**—For the manufacturer of the "Pennsylvania" high-wheel lawn mower.

Gear Cutting of every description accurately done. The Garvin Machine Co., Spring and Varick Sts., N. Y.

**Inquiry No. 105.**—For manufacturers of chemical fire engines.

Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city.

**Inquiry No. 106.**—For automatic numbering machines with six wheels.

Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.

**Inquiry No. 107.**—For manufacturers of twisted wire goods.

A fine line of coffee mills manufactured by Logan & Strobridge Iron Company, New Brighton, Pa.

**Inquiry No. 108.**—For typewriter adding machines.

Palmer Brothers, Mianus, Conn. Gasoline engine catalogue on request.

**Inquiry No. 109.**—For friction clutches, preferably a rim clutch.

Volney W. Mason & Co., friction pulleys, clutches and elevators, Providence, R. I. Catalogue on request.

**Inquiry No. 110.**—For machinery for mixing and filling cans of baking powder.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

**Inquiry No. 111.**—For machinery for making medicinal tablets by compression.

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

**Inquiry No. 112.**—For devices to cut up French fried potatoes.

For woodworking machinery of all kinds, The Fay & Egan Company, Cincinnati, O.

**Inquiry No. 113.**—For manufacturers or patentees of India rubber substitutes.

Send for catalogue of candle-making machinery. Homan & Co., Cincinnati, Ohio.

**Inquiry No. 114.**—For complete saw-mill outfits.

Saw-mill machinery and outfits manufactured by the Lane Mfg. Co., Montpelier, Vt.

**Inquiry No. 115.**—For seamless steel tubing ⅛ to 5-16 inch bore.

Turbine Water Wheel catalogues on application to Christiana Machine Co., Christiana, Pa.

**Inquiry No. 116.**—For a buttonhole moistener and opener, preferably Miller Bros.

Wanted—Revolutionary Documents, Autograph Letters, Journals, Prints, Washington Portraits, Early American Illustrated Magazines. Correspondence Solicited. Address C. A. M, Box 773, New York.

**Inquiry No. 117.**—For manufacturers willing to make wire novelties on order.

Machinery for twisting wire into all shapes and forms manufactured by Blake & Johnson, P. O. Box 7, Waterbury, Conn.

**Inquiry No. 118.**—For handles for rubber stamps.

Rushton Boats and Canoes. Morris Canoes. The H. & D. Folsom Arms Co., 314 Broadway, N. Y.

**Inquiry No. 119.**—For meteorological instruments.

Building plot 41 feet wide for sale; on Greene Street; old buildings; suitable for improvement. E. A. Cruikshank & Co., 143 Broadway, N. Y.

**Inquiry No. 120.**—For foot or hand power emery grinder with attachment for sharpening lawn mower knives, or such an attachment for an ordinary grinder.

Wanted. Pan Am. Exposition Patent Novelties suitable for souvenirs. Address J. M. B., 320 B'way, N. Y.

**Inquiry No. 121.**—For centrifugal gold-separating machinery.

Finest quality steam automobiles made in the world. Write Rochester Cycle Mfg. Co. Rochester, N. Y.

**Inquiry No. 122.**—For machinery for making excelsior.

**Inquiry No. 123.**—For manufacturers of small iron chain.

Shipping, weighing, dredging, quarrying and rafting chains made by the J. B. Carr Co., Troy, N. Y.

**Inquiry No. 124.**—For machinery for powder mills.

**Inquiry No. 125.**—Nor an automobile lawn mower (gasoline preferred) with detachable roller.

**Inquiry No. 126.**—For manufacturers of cigarette cardboard boxes.

The Rochester Folding Box Co., Rochester, N. Y., make the daintiest designs in cardboard boxes of all kinds.

**Inquiry No. 127.**—For manufacturers of merry-go-rounds.

Gillie Engine & Machine Co., Tonawanda, N. Y., steam riding galleries and whirling panoramas. Catalogues on request.

**Inquiry No. 128.**—For flexible steel ladder suitable for portable fire-escapes.

**Inquiry No. 129.**—For machinery for making fireworks.

**Inquiry No. 130.**—For electrically operated tools for lettering, carving and surfacing on granite or other stones.

**Inquiry No. 131.**—For machinery for the manufacture of brooms.

**Inquiry No. 132.**—For electrical, air beer pumps.

**Inquiry No. 133.**—For hand dynamos for experimental purposes.

**Inquiry No. 134.**—For manufacturers of leather link, for link and pin type of the flexible leather-link coupling.

**Inquiry No. 135.**—For machinery to manufacture fine emery cloth.

**Inquiry No. 136.**—For miniature arc lamps for alternating current with about ¼-inch carbon.

**Inquiry No. 137.**—For manufacturers of aluminium boxes.

**Inquiry No. 138.**—For manufacturers of telephone parts and appliances.

Simplex Interior Telephone Co., 431 Main Street, Cincinnati, O., manufacturers of telephone parts and accessories.

**Inquiry No. 139.**—For spring-hinges, locks and accessories for making show cases.

**Inquiry No. 140.**—For tachometers for giving directly the R. P. M. of a shaft, to be used in dynamometer tests of electric motors.

**Inquiry No. 141.**—For carpet cleaning machinery.

**Inquiry No. 142.**—For manufacturers of woven-wire willing to estimate on 2 miles of fencing.

Edward Darby & Sons, 233 Arch Street, Philadelphia, Pa., manufacturers of durable wire fencing.

**Inquiry No. 143.**—For a machine to straighten cold rolled round and square iron and steel shafting ¾ inch to 1¼ inch.

**Inquiry No. 144.**—For railroad track inspectors' tricycle, operated by gasoline or other motive power.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated: correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(8075) C. H. asks: 1. How many accumulators are necessary to give off 30 amperes for 12 hours at 50 volts pressure, and what size? A. A good storage battery of 25 cells, each cell with 11 plates, about 11 inches square, will give about 400 ampere hours of discharge, provided the discharge is not more rapid than 50 amperes per hour. 2. About how many pounds of wire and what number are there on a 50-volt, 50-light generator at 16 candle power? A. Approximately 15 to 20 pounds on armature, and 50 to 60 pounds on field, according to type of machine. The sizes used would also vary, 18 to 20 on field, and 12 to 16 on armature. If you wish more exact information, cut out a bit of the wires and gage them. Measure the resistance of the field and from a wire table get the length by means of the number and resistance. The table will give the feet per ohm for the number. To find the length of wire on the armature, count the number of turns in one coil and determine the length of wire in one coil as closely as possible. From this the quantity of wire on the armature can be calculated.

(8076) E. M. J. asks: Have you any rule or formula for making induction or X-ray coils giving sparks? The rule I want is one by which I can find the size of the core, the amount of primary and secondary wire to be used to get any desired spark. A. There is no recognized rule or formula for finding the dimensions of an induction coil for a given length of spark; or rather every maker of coils has his own formula and does not disclose it. Nor are any two the same. You will find the dimensions of a large number of coils given in Bonney's "Induction Coils," which we can send you by mail for $1. SUPPLEMENT No. 1124, price 10 cents, gives full plans for a coil giving a 6-inch spark.

(8077) H. G. writes: I would like to know what a pair of hoisting engines will lift, size of the cylinder 20 by 32 inches, with an 80-pound steam pressure. Will you please show me how to work it? A. Find the actual horse power of the engine from the cut-off, mean steam pressure and speed as usual for steam engines. Multiply the horse power by 33,000, which will give the pounds that the engines will lift 1 foot in 1 minute. Divide this by the height in feet for the number of pounds it will lift the height in a minute, from which should be deducted the friction of the hoisting machinery. For example: 100 horse power engine × 33,000 = 3,300,000 foot pounds. If to be lifted 50 feet in one minute, then 3,300,000 ÷ 50 = 66,000 pounds, one-third of which should be deducted for machinery friction, leaving 44,000 pounds or 22 tons lifted 50 feet per minute.

(8078) C. C. asks: A boat using sufficient power to attain a speed of four miles

an hour in still water, what would be the speed per hour, using same amount of power, going with the current, current running four miles per hour? A. The boat will have its own speed added to the velocity of the current, and will make 8 miles per hour, as measured on the shore, and in the contrary direction can only hold her position against the current.

(8079) F. S. R. asks 1. Is the simple motor described in your issues of December 8 and 15 to be run with one or more dry batteries? A. The diagram of the electrical connection shows four cells, two series of two cells each, used to run the motor. Dry batteries will not answer. 2. I have used No. 27 sheet iron, 8 feet in armature and 32 feet in field magnet; does this affect its running? A. The difference is that you have used a thinner sheet iron, and will not have so much weight of iron in the field and armature; hence you will have less magnetism and less power. There is no reason why the motor should not run with lighter fields. It will not run so heavy a fan. 3. How does the current revolve the armature? A. If the current is sent through in one direction, the armature turns in one direction; if in the other, the direction of the rotation is changed. If the direction of rotation is not as you wish it, change the wires which lead into the armature so as to reverse the current in the armature, leaving the field unchanged. The same can be accomplished by changing the direction of the current through the fields.

(8080) P. A. S. asks: 1. By what process may clam shells be softened so that they may be flattened without breaking? A. Clam shells cannot be softened so they can be flattened. 2. How can celluloid be made plastic so that it may be flattened? A. Celluloid can be softened and moulded by pressing under heated oil. 3. Why does the dissolving of $NH_4Cl$ in water (as in making batteries) produce a lowering of the temperature? A. The simple solution of any substance in water is accompanied by a cooling of the water. This can be shown with common salt or sugar. It is very evident with ammonic chloride, and still more so with ice. It ought not to seem strange that this should be so, since heat is the means of dissolving the solid in all these cases. When no chemical action accompanies the mixing of a substance with water, the solution of it in water is always accompanied by an absorption of heat, a cooling of the water. Sodium sulphate dissolved in hydrochloric acid causes a fall of temperature far greater than the melting of ice can cause.

(8081) F. T. P. asks: 1. What is the temperature of liquid air? A. 312 deg. F. below zero. 2. How and by what kind of an instrument is it found? A. It is measured by a platinum thermometer. This depends upon the fact that the electrical resistance of pure metals is proportional to their temperature above absolute zero, and would have no resistance at absolute zero. See Scientific American for April 2 and April 23 1898, price ten cents each. 3. Where could I find a good article upon the subject of liquid air? A. We can send you ten good articles on the subject for ten cents each. Also a good book, Sloane's "Liquid Air," price $2.50 by mail.

(8082) H. O. P. writes: Please inform me as to what an alum cell and bromide cell are, which are mentioned in your book, "Experimental Science," under subject of heat, page 189, twentieth edition, of what made and where they can be bought? A. An alum cell is a glass cell filled with alum water. The glass cell is shown on page 619 of "Experimental Science." A similar cell filled with carbon bisulphide in which iodine is dissolved till the solution is opaque to light is an iodine cell such as is used to show the transmission of heat without light. It is not a bromide cell, as you term it, but an iodine cell which is used for the purpose. They can be bought from dealers in physical apparatus, or made from two plates of glass and some thick rubber. Rubber tubing filled with fine sand may be used for the sides and bottom of the cell. Four screw clamps are required to hold the glasses together.

(8083) A. R. H. writes: I have collected a lot of bells of the form used for electric bells. I want to make a set of musical bells, and have all sizes. Could you let me know through your column or by letter how I could tune them? They are not very far or much out of tune as they are, but I do not know how to alter the pitch of the note one way or the other. A. To raise the pitch, turn the edge off in a lathe cautiously until the desired pitch is reached. To lower the pitch, make the edge thinner, removing metal from the inner or outer side at and near the edge.

(8084) E. N. C. writes as to an inexpensive battery for lighting one or two incandescent lights. A. You will find the plunge bichromate battery described in Supplement, No. 792, price ten cents, as convenient as any primary battery for lighting one or two small electric lamps.

(8085) J. T. asks: Has the problem of seeing to a distance by means of electricity ever been solved? If so, can you give me any information in regard to the latest work that has been accomplished in this direction? A. The sending of portraits or other pictures by electricity has been done for several years. We do not know any success in the direction of seeing to a distance by electricity.

(8086) F. D. P. asks: Can you inform me through your information department, in a general way, of the most practical and economical way to establish a telephone line of short length? I wish to construct two lines, one about one-quarter mile, the other about two and one-quarter miles, in length. I have never had any experience in this line, and will be pleased to have all the particulars. A. You will need line wire of galvanized iron, if the line is in open country; or insulated, if the line is in a town where other lines are run along the streets. Transmitters, receivers, calls, and lightning arresters, batteries, insulators, etc., will complete the outfit. The list of these, with prices and quantities, will be furnished by the dealers to whom you may write for rates. We can furnish you Poole's "Practical Telephone Handbook," price $1.50 by mail, which will give you instructions upon many points concerning the installation of the apparatus.

(8087) W. E. P. asks: Can you inform me how many convolutions there should be in the primary and the secondary of an induction coil designed to produce a quarter-inch jump spark, using a cell which gives about 6 amperes at 1½ volts? Also sizes of wire suitable for primary and secondary coils. A. The primary of most induction coils is wound with two layers of wire. For a quarter-inch spark use No. 24 cotton-covered copper wire. For secondary use about 8-ounce No. 36 silk-covered copper wire. Full data, drawings and instructions for making all parts of coils from ½-inch spark to 6-inch spark are to be found in Boney's "Induction Coils," price $1 by mail.

(8088) M. N. asks: 1. Are lightning-rods a protection, or not, to a building, provided, of course, they are properly put on? A. Lightning-rods are a protection to a building when properly put on. They protect the building in two ways: 1. If the building is struck, the rods furnish a means of conducting the electricity to the earth without damaging the building. 2. They act as a path for electricity from the earth up into the cloud to neutralize its electricity before the lightning strikes. This may prevent the lightning from striking the building at all. This is probably often the case. For this service the rod gets no credit. 2. If they are not a protection, how did Franklin's discovery benefit mankind? A. Franklin's great discovery was not the invention of lightning rods. It was that lightning and electricity from the machine are identical, one and the same thing. He invented the lightning-rod after he found out what lightning is.

(8089) A. H. asks: Please inform me if any of the Scientific Americans contain instructions for making a storage battery that will register 15 volts or more. Please mention numbers. A. See Scientific American Supplement, No. 1195, price ten cents. You will require 8 cells to obtain 15 volts of pressure. One cell can give but 2 volts. To obtain 15 volts, join 8 cells in series.

(8090) O. H. H. asks: Does ice melt faster in a cool, damp cellar or in a warm, dry room? Have had different opinions on the same, and would like to know the correct one. A. The melting of a substance is proportional to the difference of temperature between that substance and the place where it is. There is no connection between the melting of ice and the moisture of the place where it is; or, rather, the place where ice is kept will soon be saturated with moisture, since ice evaporates at all temperatures without becoming liquid. Ice will, for these reasons, melt better in a warm place than in a cool place.

(8091) A. L. L. writes: My two boys are anxious to understand electrical testing and electrical-testing instruments. They say commence at first principles, as it puzzles them to understand voltage. They can master amperage and resistance, but voltage and potential difference seem to puzzle them. Would you kindly advise as to what book or books they had better procure? A. Your boys may think of this: A man pumps water from a trough up to another twenty feet above the first. From the upper trough the water flows down into the trough from which it was raised through a pipe, turning a wheel on the way. If this little example in water power is understood, it will be possible for the boys to apply it to the action of a battery or dynamo current. The battery or dynamo pushes the difference of potential up on its plus side to a level higher than on its minus side. Then from the higher level the electricity flows down again, doing work on the way—lighting a lamp, or turning a motor. The current of water can do work in proportion to its quantity. So can the current of electricity. This is measured and called amperes. The water is prevented from doing work in proportion to the friction along the pipe and the difficulty in turning the wheel. So the current of electricity is prevented from doing its work by the difficulty it has in forcing its way along the wire. This is resistance, and is measured in ohms. The water gets power in proportion to the height to which it is pumped. So the electricity has power to do work in proportion to the height to which it is raised. This is its difference of potential, or, as it is sometimes called, its electromotive force, or *voltage*. These names may later be distinguished from each other, but at first a distinction is hardly necessary. Electromotive force is also thought of as *pressure*. This is like the pressure the water would have in a pipe up which it is being pumped. The higher the pipe, the greater the pressure at the bottom. So a dynamo may produce a pressure of 50 volts, or 100 volts, or 5,000 volts, and the current will flow down with more violence as the pressure in volts is made greater. We recommend Thompson's "Elementary Lessons in Electricity," $1.40; Slingo & Brooker's "Electrical Engineering," $3.50.

(8092) F. P. S. asks: Can you inform me why a buzzing sound is heard at a simple electro-magnet which is connected with a small, shunt-wound dynamo driven by a water-wheel, when the dynamo is running. A. The dynamo is probably furnishing an alternating current, and the sound heard is the musical note corresponding to the number of alternations per second of that current.

(8093) W. B. writes: I am in want of exact information as to what extent lightning-rods prevent buildings from being damaged by lightning. I want reliable information, other than from interested parties who have rods for sale. A. We have frequently expressed our opinion that lightning-rods are a great protection to buildings, both in preventing lightning from striking and in conducting the discharge to the earth when it occurs. Scientific American Supplement, No. 998, price ten cents, contains a very valuable paper on the subject, from the pen of Prof. McAdie, of the Weather Bureau. His word ought to be considered as final.

(8094) J. T. V. writes: 1. In reading "Experimental Science," on page 350 I find the author makes the following statement: "In the search for perpetual motion, vain efforts have been made to discover a substance which could be interposed between the magnet and its armature, and removed without the expense of power, and which would intercept the lines of force, so as to allow the armature to be alternately drawn forward and released, but no such substance has ever been discovered." On page 481 there is shown a magneto-electric machine, deriving its power from a series of magnets. Inferring from the passage quoted that a permanent magnet continues to attract its armature indefinitely, will you kindly explain the effect the revolving armature has on the magnets of this magneto-electric machine, that renders them incapable of imparting motion, as I understand it does in time? A. The statement quoted from "Experimental Science" is quite true. There is no substance which can intercept lines of magnetic force which is not also attracted by the magnetic field. The magneto-electric machine derives its power from the fact that a coil of wire revolving in a field of force, so as to include a varying number of lines of force as it revolves, will have an electric current generated in it proportionate to the force required to revolve it; that is, proportionate to the number of lines of force which it cuts. This power is not lost by its exercise, but can be used indefinitely to produce an electric current. 2. Does the temperature affect the passage of the electric current through steel or copper wire? A. Yes; every conductor has its resistance changed by a change of temperature. Carbon has less resistance when hot than when cold. Metals have more resistance hot than cold. The change of resistance for one degree is called the temperature co-efficient. 3. Will you also please advise the number of shots it is calculated can be fired from the new 16-inch gun described in a recent issue of the Scientific American? A. The life of the 16-inch gun depends upon the intensity of the explosives. As to the number of shots that can be fired before the gun gives out, it probably cannot bear more than 100 shots at long range.

(8095) H. E. McC. asks: Will you please inform me if I may solder the wires to commutator segments? A. Armature wires are usually soldered to the commutator bars.

(8096) E. L. M. asks: I would like to inquire if the furnace of Supplement 1182 can be used for melting lead, Babbitt and such metals and kept at a steady heat? A. An electrical furnace cannot be used for melting metals at a low temperature. Its heat is so intense that the metals would be burned.

(8097) J. Z. asks: On a short telegraph line of about 300 yards, which instruments would you advise me to use—two five-ohm, or two twenty-ohm, instruments; or would it be just as good to use one of each, and why? A. Almost any sounder will work 300 yards. We do not know any reason for preferring one of these to the other.

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