

Judgment in Technical Matters.

In the course of a paper recently read before the Technical Society of the Pacific Coast, by Mr. George W. Dickie, of the Union Iron Works, San Francisco, the author put in an eloquent plea for the exercise of more judgment by technical experts who are appointed to supervise, for the firms or the government that they represent, the construction of work in manufacturing establishments. Mr. Dickie says that he does not know a single university that has a chair of common sense, and that, in trying to account for this omission, he can think of but one reason, and that is the impossibility of finding a man to fill such a chair. The author of the paper protests against the hard-and-fast interpretation which inspectors almost invariably put upon their "book of instructions," and complains that, too often, suggestions offered by the manager of the contracting works, looking to improved methods of executing the details of the contract, are received in an attitude of suspicion, and that these suggestions, in spite of obvious mutual benefit to both parties concerned, are often rejected merely because they do not conform to a literal interpretation of the contract. Mr. Dickie quotes the instance of a small marine boiler, which his firm was building for the Treasury Department, under a very strict specification. Finding that it would be better to weld the plate forming the sides of the combustion chamber—because the riveted seam, as shown in the drawing, came in the way of the stays—he recommended a change, and the inspector agreeing with him, the plate was welded instead of riveted. A slight waste in heating resulted in the plate being 1-32 of an inch thinner at the weld than in the body of the plate. At the completion of the job, the inspector, finding that the plate was slightly thinner at this point, rejected it under instructions from Washington, although, as a matter of fact, the welding had raised the strength from 67 per cent of the plate, if riveted, to 92 per cent, as welded. This is quoted as an instance, not of the desire of the inspector to cause a loss to the contractor, but simply of a failure on his part, or on the part of his superiors, to apply sound judgment to the question before them.

We agree with Mr. Dickie that, in such cases as the above, considered by themselves and apart from the

general principle of inspectorship over contracted work, there is a lack of good judgment; and, no doubt, there are cases when, if the inspectors were allowed a freer hand and the exercise of individual judgment, there would be a saving of cost and vexation to both parties to the contract. On the other hand, it would be a very easy matter to run to extremes, and entirely neutralize the value of inspectorship by giving to the inspector a license for the exercise of his judgment which would enable him practically to supersede a written contract. Such extreme cases as the one quoted above must be regarded as the accidental defects in the working of a system which, broadly considered, is admirable. As between an inspectorship which is rigidly bound to a literal interpretation of a contract and an inspectorship which is entitled to interpret the contract according to its own individual judgment, we think that the former is certainly the preferable extreme. Mr. Dickie's article, which is published in full in the current issue of the SUPPLEMENT, makes out a strong argument in favor of a middle course, in which the inspector, while guiding himself broadly by the contract, is ready to depart from its literal text where one or both parties to the contract would be benefited and the interests of neither assailed.

A Locking Device for Automobiles Wanted.

Quite a number of accidents have occurred with automobiles by reason of unauthorized persons attempting to operate them while they are left at the curb. Some makers of horseless carriages have provided various forms of locking devices, which seem to work admirably, but in most cases there is no reason why a person who is familiar with the particular type of automobile could not operate the carriage. Of course, in certain types of electrical carriages, special locking devices have been provided, which are controlled by a key similar to a door key, but for many other types of horseless vehicles there is really no guarantee that the carriage will not be tampered with. Some carriages are provided with means by which the switches or valves cannot be operated until the driver resumes his seat; but, of course, a device of this kind is only valuable to prevent the carriage

starting accidentally, as, for example, when it was run into by another vehicle. The subject is an interesting one, and affords a considerable field for invention. All carriages should be required by law to have some safety device by which the public will be protected from the dangers of a carriage set into motion by unauthorized or mischievous persons.

The Current Supplement.

The current SUPPLEMENT, No. 1311, has a number of articles of unusual interest. "Primitive Huts of Ostia" and "The Farnese Theater at Parma" are very attractive illustrated articles. "The American Patent System" is a subject of a most important paper by Commissioner of Patents Duell, and it contains very valuable information and statistics. From it we find that Mr. T. A. Edison has received, between the years 1872 and 1900, 742 patents; Francis A. Richards, 619, and Elihu Thomson, 444 patents. "The Prepared Mustards of Commerce" gives a number of formulas. "The Bureau for Testing Paper at the Paris Chamber of Commerce" is accompanied by a number of engravings. "Compulsory Rotation or Positive Driving" is by Prof. C. W. MacCord. "On the Need of Education of the Judgment in Dealing with Technical Matters" is by George W. Dickie. "The Panhard-Levassor Automobile" is accompanied by a most elaborate series of engravings showing the details of mechanism of a racing machine. "The Engineering Works of the Suez Canal" is a valuable treatise. "The Burning of a Baku Oil Depot" is of particularly timely interest, owing to the recent conflagrations.

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RECENTLY PATENTED INVENTIONS.

Mechanical Devices.

FRUIT-PICKER.—GERHARD L. THUNEN, Oroville, Cal. This fruit-picker consists of two pivoted members, one of which is spring-controlled and constitutes a cutter. The device is to be secured to the first two fingers of the hand in a convenient position over the palm. The cutter-blade is operated by the thumb, so that the stem of the fruit can be readily cut.

APPARATUS FOR FORMING PLATE OR SHEET GLASS.—LAWRENCE H. DOLAN, Pendleton, Ind. By means of this apparatus it is possible to form curved, corrugated or flat sheet and plate glass without the use of a blowing-tube, or without the necessity of pouring the molten glass upon a bed-plate or into a mold. The principle of the invention consists in drawing a wide or narrow sheet or plate of glass from a reservoir containing molten glass; controlling the temperature of the glass as it is in process of formation into a plate or sheet, upon an appropriate forming plate supported upon a frame; and providing means for truing the side edges of the glass sheet or plate and also means for detaching the cooling plate or sheet from the mass of glass in the reservoir.

BOX-MAKING MACHINE.—CARL ENGBERG, St. Joseph, Mich. The machine forms boxes from an endless sheet of paper, metal or other material, and is so constructed that the box blanks are successively cut, their sides and flaps folded into position to form the box body and united by staples, and the finished box discharged from the machine. The box-blank is formed by dies between which the stock is passed by the action of an intermittent feed. A folder receives the box-blank from the device, which folder comprises a form and a reciprocating cross-head. Stapling devices on opposite sides of the folder drive staples through the box sides and flaps.

HOISTING-MACHINE.—EDWARD C. REITER, Rockville, Conn. The purpose of the invention is so to arrange a hoisting-machine that, when the drum is not rotating, the load on the hoisting-cable can be supported and held at any desired point without danger of lowering the load. The mechanism by which this result is attained consists essentially of a crown-wheel carried by a frame mounted to rotate on the hoisting-drum shaft, and a gear-wheel mounted to deflect and to engage two rows of teeth on the crown-wheel. The movement of the drum causes the deflection of the wheel.

CARVING AND ENGRAVING MACHINE.—ATTILIO STERIA, Manhattan, New York city. The object of the invention is to provide a reproducing machine for carving wood, according to a given pattern, but of different proportions. A triangular frame is hung at one apex by a universal joint. One of the sides of this frame is provided with two rectilinearly-moving slides, carrying respectively the

tracer and reproducer-tool. A graduated arm is pivoted to another apex of the triangular frame and is adjustably connected with the tracer slide. An extensible link is adjustably connected at one end with a graduated arm at a point between its pivot and the tracer-slide, and is connected at its other end with a reproducer-slide. The tracer can be readily moved over the pattern by reason of the universal joint. As the slide carrying the reproducer-tool moves in accordance with the movement given to the tracer-slide, an exact reproduction of the pattern is made on the face of the wooden block.

RAISIN-SEEDER.—FRANK H. PETERMAN, Manhattan, New York city. The raisin-seeder has an impaling-pin cylinder, an endless woven fabric, and guides to direct the fabric to and from a portion of the cylinder to engage the impaling-pins and to travel with them during part of the revolution of the cylinder. A deflector between the impaling-pins and the guides disengages the fabric from the impaling-pins. The deflector serves to direct the removed pulp to a receiving-box. Thus the seeds are forced out, without unduly tearing the raisins.

BREAK-LEVER LOCK FOR GUNS.—JASPER L. ACKERMAN, Monon, Ind. In a previous patent granted to Mr. Ackerman, a means for locking the lever of a breech-loading gun was described by which the break-lever was prevented from being opened unless the owner of the gun so desired. In that device a bolt entering the lever was actuated by a rotary barrel turned by a detachable key. In the present invention the same result is accomplished by causing an external slide to lock the lever either through a bolt or by direct engagement, or both, and by so organizing the slide that the safety of the hammerless gun is secured.

CLOTHES-WASHING MACHINE.—WILLIAM M. THOMAS, East Chicago, Ind. This machine for washing clothes is characterized by its simple and inexpensive construction and by its rapid and efficient operation. The machine is so made that all parts can be duplicated or readily repaired, and that the clothes cannot be torn during the operation. The water can be drawn from the tub while the clothes are in the machine, and fresh water supplied. All parts can be readily removed when the machine is to be cleaned.

Miscellaneous Inventions.

APPARATUS FOR FUME-DUST CONDENSATION.—RODOLFO RUCCHI, Argentine, Kan. The invention relates to appliances for mechanically precipitating and collecting the solid matter contained in the fumes arising from metallurgical plants. The fumes pass through a cooling device having narrow chambers, spaced to form a circulating air-space. With the cooling device, a mixing device is connected into which the fumes from the cooling

device pass to equalize their temperature. A suction-fan is connected with the mixing device; and cooling and precipitating cylinders are each connected with a discharge-pipe leading from the fan. Each cooling and precipitating device has a circular water-jacketed channel into which opens the discharge-pipe from the fan. The channel itself leads into a water-jacketed discharge-pipe which carries off the exhaust-gases. Valved-discharge hoppers receive the solid matter from the channel and discharge-pipe.

TEMPORARY BINDER.—CHARLES V. HENKEL, Manhattan, New York city. This invention is a temporary binder designed especially for holding the leaves of a perpetual ledger, that is to say, of an account-book, the leaves of which are removable, so that the same book serves indefinitely for a number of prolonged accounts. The binder has a body on which two clamping sections slide toward and from each other. Guide members are fastened by one end to the corresponding clamping sections, these guide members having a permanent sliding engagement with each other so that they form an unbroken holder for the leaves regardless of the positions of the clamping sections. Each clamping section has an opening, such openings serving to receive the free ends of the guide members to permit these free ends to pass the inner faces of the clamping sections, when the clamping sections are moved together.

DIAL FOR SPRING-SCALES.—FLORENTINE L. KELLOGG, Santa Barbara, Cal. The weighing-scale comprises a casing, a platform, a spindle, projecting from the casing, a pointer on the end of the spindle, and a fixed bearing on the spindle, having a screw-fitted outer end. A dial is mounted to turn upon the bearing and the pointer plays over the dial. A washer on the bearing engages the dial. By means of a nut screwing on the bearing the washer can be forced with more or less pressure against the dial.

HAT-STRETCHER.—JOHN F. KENNEDY, Cripple Creek, Colo. The hat stretcher comprises sections having outwardly projecting top and bottom walls and vertical rollers mounted to rotate between the walls. By reason of this construction strain is exerted in all directions.

TOE-CLIP.—ARNOLD M. BALDWIN, Santa Cruz, Cal. This bicycle toe-clip is so arranged in relation to the pedal that it will fit over the instep of the rider, thus providing a good purchase for an upward pull on the up-stroke of the pedal. A wear-plate is furnished with the clip, which wear-plate is designed to relieve the pedal from undue wear by rubbing of the rider's foot.

DEVICE FOR TEACHING ARITHMETIC.—THOMAS E. BORDEN AND ALFRED A. WALLACE, Minturn, Cal. By means of this device a large number of examples can be readily formed. In a support or frame, rollers are

journalled with a series of tapes bearing numbers. These numbers varies progressively toward one end. Different tapes will afford arithmetical problems of increasing fractions. The device can be used for problems in fractions.

SEE-SAW, MERRY-GO-ROUND, AND LAWN-SEAT.—FRANK L. WRIGHT, Nyack, N. Y. The inventor has devised a see-saw so constructed that the teeter-board has not only a vertical pivotal motion, but also a horizontal motion, a ball and socket connection being provided between the teeter-board and its support to secure both motions. By hinging or pivoting legs to the under side of the board a lawn-seat is formed.

PORTABLE PHOTOGRAPHIC DARK-ROOM.—ALBERT WERNER, Arena, N. Y. Mr. Werner has devised a very convenient dark-room which will probably be extensively used by traveling photographers. The dark-room comprises a main box, having a flexible hood secured around an opening in the top of the box. Sleeves of flexible material are secured around openings in opposite sides of the box. The box is provided with openings in its sides, normally closed by slides. Auxiliary boxes, open only at one side, can be inserted in these openings when the slides are removed, so as to extend outwardly from the main box. These auxiliary boxes are used only for developing large plates.

METHOD OF MAKING SILICO-FLUORIDES.—WILLIAM C. SELLAR, 119A Mount Street, Berkeley Square, London, England. Calcium fluoride or fluor spar is fused together with dry calcium chloride, the resulting cooled mass being then ground in a dry state and mixed with silica or a suitable silicate. The inventor has found by experiment that the yield of silico-fluorides is much greater when calcium chloride is added and that within certain limits an increase of the calcium chloride relatively to the calcium fluoride increases the production of silico fluoride.

BUTTON.—FRANCISCO CLARK, Durango, Mexico. The invention is an improved button of the type in which a hinged head is employed so as to secure a simple and efficient construction in which the head is capable of assuming two different positions—an inserting position, in which it is readily movable, and a securing position in which it is practically locked. The improved button comprises a main head having a shank, a hinged head connected with the shank, and a locking-plunger mounted to slide lengthwise on the shank.

FASTENING DEVICE FOR BUTTONS.—JOSEPH NEVINS AND JOHN E. WHITE, Manhattan, New York city. The inventors have provided a fastening device applicable to any shank-button, which device can be covered with the same material as that from which the garment is made. For example, upon military uni-

forms it is advisable to conceal bright buttons on occasions; and these buttons the device is especially designed to hold in place.

CARTRIDGE-CARRIER.—DR. EDWARD T. GIBSON, U. S. A., Fort Harrison, Helena, Mont. The invention provides a body-band having pockets for supporting frames or cases for cartridges, which are so arranged on the band that a large supply of ammunition can be carried.

STOVE.—ERNEST C. COLE, 3218 Western Avenue, Chicago, Ill. A casing has a top plate above the firepot and a hot-air chamber above the plate. Opposite pipes in fixed relation to and extending through and supported by the top plate open into the chamber above the plate.

NON-REFILLABLE BOTTLE.—JOHN S. HAGGERTY, Astoria, Queens, New York city. The neck of the bottle is provided with adjacent enlargements. At the bottom of the neck a valve can be seated. A plug or stopper secured in the neck extends past one enlargement and into the next.

ELEVATED RAILWAY.—JOHN W. GONCE, Kinderhook, Ala. This elevated or suspension railway is particularly adapted to fill the wants of communities where there is not enough traffic to justify the construction of a surface railway.

EXHAUST-MUFFLER FOR AUTOMOBILES AND STATIONARY ENGINES.—LOOMIS AUTOMOBILE COMPANY, Westfield, Mass. The Loomis muffler for deadening the exhaust of hydrocarbon-motors is made of aluminum and asbestos.

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.

NEW BOOKS, ETC.

KANT'S COSMOGONY. As in his Essay on the Retardation of the Rotation of the Earth and his Natural History and Theory of the Heavens. With introduction, appendices of Thomas Wright, of Durham. Edited and translated by W. Hastie, D.D. Glasgow: James Maclehose & Sons. New York: The Macmillan Company. 1900. 12mo. Pp. cix. + 205. Price \$1.90.

Kant's work in the field of speculative philosophy has so completely overshadowed his scientific labors that the true value and startling originality of his "General Natural History and Theory of the Celestial Bodies" have been fully appreciated only by a few modern physicists.

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. 1.—Wanted the name and address of a manufacturer of double and single gasoline burners of the kind in which a little gasoline is allowed to run into a small cup attached to the burner to produce heat in the same before using.

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

Inquiry No. 2.—Wanted the name and address of a manufacturer of porcelain plaques with pictures inside similar to buttons now used with photographs on same. The are the size of a small saucer.

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

Inquiry No. 3.—Wanted the name and address of a manufacturer or dealer in fancy wood marquetry for inlaying purposes.

Yankee Notions. Waterbury Button Co., Waterbury, Ct.

Inquiry No. 4.—Wanted the name and address of a manufacturer of portable gasoline motors mounted on wheels.

Handle & Spoke Mch'y. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 5.—Wanted the name and address of a manufacturer of spring motors of one or more horse power.

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

Inquiry No. 6.—Wanted the name and address of a manufacturer of acetylene gas engines for automobiles.

Inventions developed and perfected. Designing and machine work. Garvin Machine Co., 141 Varick St., N. Y.

Inquiry No. 7.—Wanted the name and address of a manufacturer of aluminum sheets suitable for strainers.

By mail, \$2.—Goldingham's new book, "The Design and Construction of Oil Engines." Spon & Chamberlain, 12 Cortlandt St., New York, U. S. A.

Inquiry No. 8.—Wanted the name and address of a manufacturer of aluminum rivets.

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. 9.—Wanted the name and address of a manufacturer of automatic speed controllers for hand power elevators.

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. 10.—Wanted the name and address of a manufacturer of small photographic instruments that will photograph, develop and finish entirely in the shortest possible time, of half a minute, if possible, for making abstracts of legal records in a county seat.

La Porte Watch School, La Porte Ind. Catalogue free.

Inquiry No. 11.—Wanted the name and address of a manufacturer of duplicating apparatus to copy and make duplicates of records.

Inquiry No. 12.—Wanted the name and address of the manufacturer of the Merritt Typewriter.

Inquiry No. 13.—Wanted the name and address of a manufacturer of autographic supplies.

Inquiry No. 14.—Wanted the name and address of a manufacturer of small hand power ice making machines for domestic use, making from 50 to 100 pounds, at a time.

Inquiry No. 15.—Wanted the name and address of a manufacturer of apparatus that can be attached to any ordinary printing press, and render the latter useful as a color printing machine.

Inquiry No. 16.—Wanted the name and address of a manufacturer of a complete plant for cleaning carpets, or machinery therefor.

Inquiry No. 17.—Wanted the name and address of a manufacturer of small burners such as are used on brazing and soldering forges, using gasoline.

Inquiry No. 18.—Wanted the name and address of a manufacturer or dealer in large colored photographs of scenery of Switzerland, the Alps and the Rocky Mountains.

Inquiry No. 19.—Wanted the name and address of a manufacturer of a dredge wherein the shovel opens and shuts like a clam shell, to be used for handling gravel.

Inquiry No. 20.—Wanted the name and address of a manufacturer of thermometers for measuring temperatures from 300° to 1000° Centigrade.

Inquiry No. 21.—Wanted the name and address of a manufacturer of pearl button machinery.

Inquiry No. 22.—Wanted the name and address of a manufacturer of machinery tools and material for manufacturing traveling bags, dress suit cases, etc.

Inquiry No. 23.—Wanted the name and address of a manufacturer of a small liquid air plant suitable for butcher shops, etc.

Inquiry No. 24.—Wanted the name and address of a manufacturer of parts and complete models of small steam engines and locomotives.

Inquiry No. 25.—Wanted the name and address of a manufacturer of acetylene lamps suitable for parlors and household use.

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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.

(8049) E. T. W. asks: Suppose a telegraph wire was allowed to rest on iron from one end of the line to the other, would that in-

terfere in sending messages? A. No message can be sent over a telegraph wire which rests on iron. The wire must be insulated from the earth at every pole or support. The insulators are either glass or porcelain.

(8050) E. C. H. asks: 1. Can the armature of a small shunt-wound dynamo be connected to collector rings so as to generate an alternating current? A. A direct current dynamo may have collector rings connected to opposite points on its armature coils, and the current taken off these rings will be alternating. The output of the dynamo will not be affected by the change. Of course, the field must be excited from an external source of current. 2. What does the word "cycle" mean when used with reference to electricity? A. The word "cycle" in an alternating current refers to the number of complete reversals per second.

(8051) D. E. R. asks: 1. In what respect is a motor run by a battery different from one run by a dynamo? A. A motor run by a battery does not differ in any respect, electrically, from a motor run by a dynamo. As the current from a dynamo is usually of a higher voltage, the motor run from a dynamo must be wound to a higher resistance than the one to be run by a battery. 2. What should be the ratio of the size of wire on the armature to that on the field magnet? A. There is no definite ratio between the wires used on the armature and those of the field. The sizes to be used in any case are selected with reference to the number of turns required and the space in which the wire must be put upon the core. No rule can be given. The sizes are the result of the calculation in working out the design. 3. What should be the ratio of the field magnet's size to the armature's? A. The armature of a dynamo or motor is usually designed first. The field magnet is made of such a size that there will be surface of cross-section sufficient to produce the number of lines of force required to produce the voltage needed for the machine. The calculation of the number of turns of wire needed on the field and the size of wire which can be used follows, regard being had to economy in the weight of copper used, the amount of current to go through the field, etc. 4. Does the number of parts into which the armature is divided have any extra effect on the motor? A. The number of coils on the armature of a motor affects the steadiness of the pull of the motor, the more coils, the steadier the torque of the motor.

(8052) H. B. asks: Can you give me a method (simple) for treating wood so that it is impervious to sulphuric acid? A. Soaking wood in hot paraffin for a short time and brushing off excess will render wood impervious to acids to a certain extent. If a tank or wooden vessel to hold acids, the paraffin treatment may be perfected by brushing the hot paraffin on the surface inside and also on the outside, and then go over the surface with a hot iron: a sad iron or tailor's goose is a very efficient tool to drive the paraffin into the wood. A plumber's blowpipe is also very convenient for such work, but must be handled with care, so as not to fire the paraffin. You might try the application of a mixture of paraffin 2 parts and gutta percha 1 part used hot. A heavy coating of asphalt has been used for this purpose.

(8053) C. F. H. says: In SCIENTIFIC AMERICAN, August 11, 1900, a formula is given for photographic paper; the weights are given as parts; would the formula be correct if I should make it as follows, reduced 1-16?

Table with 4 columns: Substance, Weight, and other units. Includes Ferric oxalate, Oxalic acid, Nitrate silver, and Water.

The second column is the way parts can be converted; 1,000 minims is a trifle over 2 fluid ounces, there being 480 minims in one ounce.

(8054) W. G. R. writes: I want to make a solenoid of insulated copper wire, that will pull to best advantage on an iron core 6 inches long and 1/4 to 1/2 inch in diameter. Coil to be about 2 or 3 inches long. Current is alternating, 7 1/2 amperes, 115 volts, 60 cycle. With this current I want to pull iron core about 3/4 of an inch with a force to lift a 2-pound weight. Also, if it can be made to lift 4 or 6 pounds? What wire and size are necessary for solenoids? A. Your proposition to make solenoids to pull an iron core to lift 2 pounds with an alternating current is not feasible. The alternating current cannot be used in an electromagnet for lifting purposes. A direct current is needed. If you decide to use a battery for the lifting, you can wind No. 16 or No. 18 magnet wire to the length you need and till the magnet will lift by experiment what you require. The winding will depend in part upon the battery you use.

(8055) C. S. W. writes: Mr. Hopkins' recent article in your paper about the metal thermometer, does not state how to place the steel and brass strips in relation to the scale, in order to have the reading from left to right. If the expansion bar is placed to the right of the pointer should the steel strip be to the right of the brass strip or the reverse? A. As the brass strip expands more than the steel, it is obvious it should be nearest the roller, with the present scale. If the compound bar is reversed, the scale may be reversed to match it.

(8056) W. H. R. asks: 1. Please tell me where I can find descriptions and results of tests of earth and sea water batteries? A. We have not at hand any tests of earth batteries. One is described in SUPPLEMENT No. 1300, price ten cents, in article on electric clock. Sea water batteries are described in Carhart's "Electrical Batteries," price \$1.50 by mail. 2. Can you tell me where I can find any literature on the unipolar dynamo? A. The unipolar dynamo, so called, is discussed in Hawkins' and Wallis' "Dynamo," price \$3 by mail, and in Crocker's "Electric Lighting," vol. 1, price \$3 by mail.

(8057) W. C. E. writes: I wish to make water motor described in SCIENTIFIC AMERICAN, and would like to ask what will be the water pressure from a tank having a head of 24 feet? A. You will have 10 pounds pressure per square inch with 24-foot head.

(8058) D. S. writes: Our town is located in the "Black Swamp" district of Northwestern Ohio, almost flat, with large ditches, well underdrained, but in the spring of the year these ditches are nearly filled with water, so that the soil is liable to be completely saturated for a few weeks almost to the surface, and it passes through our cement walls into our furnace cellars. I write you to learn whether or not you can tell me how to make a cement that will be absolutely impervious to water. We desire to build a parsonage with a cellar and a furnace cellar. Can it be done without building the bottom of the cellar close to the surface, so that it shall be above the level of the saturated soil? Perhaps, a well-cemented cellar bottom and walls might be a certain distance below the level. A. Cellars made in wet soil may be made tight with Portland cement concrete bottoms and sides. They are made better if built in dry weather, with a coat of asphalt put on hot when the concrete has become dry. For sanitary reasons as well as architectural effect houses should be raised several feet above the ground level in wet or swampy districts, with embankments around the outer walls and with full-size cellars. Thus a full-sized cellar only one or two feet below the natural surface of a wet soil with the excavated part of the cellar made into an embankment, with a small addition from other sources, makes the most desirable cellar for a residence on plains and swampy lands.

(8059) H. L. G. writes: The account of a large gasometer exploding from a lightning flash has aroused in our midst a discussion as to the causes which have led up to explosions of a similar nature in the past. A contents that gas confined in a gasometer can only be exploded by a flash, not directly attributed to the gas itself, whereas B contents that gasometers have exploded by spontaneous combustion of the gas itself, without a primary cause of spark such as lightning or an electrical contact. A. Illuminating gas as inclosed in a gas holder is not of itself explosive. It is only when mixed with air to a large percentage that it becomes explosive by lightning or contact with fire. Usually where tanks or gas holders have been exploded, they have been ruptured by the stroke of lightning and the out-rushing ignited gas has made explosive mixtures with air. With covered petroleum oil tanks the space above the oil and cover is always filled with a dangerous mixture of oil vapor and air. When lightning strikes an oil tank at a time when the air and vapor mixture are in an explosive proportion a most dangerous explosion takes place. Gas does not explode spontaneously in any of its ordinary forms or combinations as used for illumination.

(8060) P. J. A. writes: I am interested in wireless telephony. Could you name some numbers of your paper that I could study up telephone transmitters, practical or impractical? A. The SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 250 and 966, price ten cents each, contain descriptions of telephone transmitters. You would, however, do better to buy Miller's "American Telephone Practice," price \$3 by mail, and have the whole story up to date.

(8061) N. M. S. asks: 1. I am desirous of getting information as to the length of vibration of different colored rays of light. If light vibrates the molecules of a body, why will it not vibrate the body as a mass? Is there any known molecular body or bodies which light will vibrate, or also that have properties of being magnetized? Do you know of any book or books which I could get on light on this line, e. g., vibration, waves, etc.? A. All higher text-books of physics treat of light as a vibration and give tables of wave lengths. We can recommend Barker's "Physics," price \$3.50 by mail. The vibrations of light are too minute and rapid to set ordinary matter into motion. They, however, do affect selenium. 2. Is there a chemical solution which will stop rays of heat and let light pass out? What is it? A. Yes: a solution of common alum in water is quite impervious to heat and allows light to pass with ease. So also iodine dissolved in carbon bisulphide forms a liquid nearly black. It stops light waves and allows heat waves to pass. Glass stops most of the ultra-violet waves, but quartz allows these to pass. Rock salt allows heat waves to pass.

(8062) F. T. asks: 1. Will the motor described in the December 8 and 15 copies give