

RECENTLY PATENTED INVENTIONS.

The patents described in this department have been secured through the Scientific American Patent Agency, 361 Broadway, New York, N. Y.

Electrical Devices.

ELECTRICAL HOIST.—G. RASMUS, New York, N. Y. The object is this case is to provide an electric hoist having an electric motor provided with a revoluble armature and a revoluble field, the latter being driven from the armature and forming the hoisting drum, so that the apparatus takes up very little room, requires no brake mechanism and is exceedingly serviceable for use in overhead traveling cranes.

TELEPHONE-RECEIVER SUPPORT.—M. M. KAHN, Louisville, Ky. This invention illustrates a very simple and serviceable device for use in supporting a telephone receiver in proper position near the transmitter so as to leave the hand of the user free. The device comprises an ingenious series of connected members, the inner end being attachable to the arm of an ordinary telephone transmitter and at the outer end a standard is provided the top of which forms a seat for the receiver and the foot of which is adapted to rest on a desk or other convenient support.

ELECTRIC RAILROAD-SIGNAL.—T. C. FOGARTY, F. W. BROCK, and F. A. BOWDLE, Chatham, Ill. The improvement is in the nature of a novel construction and arrangement of block signal systems and relates especially to that form of signal systems adapted for electric railroads in which a continuous feed wire carrying an operating circuit of 650 volts is employed. The invention consists in the construction and arrangement of the switch and switch operating devices controlled by the passage of the car.

Of Interest to Farmers.

SEED-CLEANER.—J. H. HEMPEL, Alexandria, La. This invention is particularly useful in connection with apparatus for cleaning and freeing from foreign substances, cotton-seed, rice, wheat, corn, and other grain. The cleanser frees the seed from chaff and trash, as well as from particles of foreign matter or other impurities of higher specific gravity than the seed. It is automatic in action, and adjustable for use in cleansing seeds or granular material, and in which impurities capable of magnetic attraction are removed from the material by means of an electric magnet.

DRAFT DEVICE FOR PLOWS.—A. J. MINOR, Canton, S. D. The invention relates to draft devices, and especially to such devices when used for drawing plows. More specifically, to draft mechanism of this kind which is constructed so as to enable the animals to be hitched to the plow out of alignment with the plowshare, a construction being provided which tends to prevent side draft. Thus, the plow will continue in a straight line although the pulling force is applied at a laterally displaced point. The construction facilitates adjustment of the device to suit the pulling force.

Of General Interest.

BOTTLE-NECK AND CLOSURE THEREFOR.—A. McCAMBRIDGE, Williamstown, N. J. The purpose in this case is to provide details of construction for a bottle neck and closure which are very simple, and that when assembled after the bottle has been filled, will permit the free out-pouring of the liquid contents of the bottle but prevent refilling of the bottle.

CARD-HOLDER.—P. M. MATHESON, San Juan, Porto Rico. The holder is used in affixing price marks to clothing and articles in show windows, etc. The device is constructed of a single piece of wire by bending it to a point intermediate its length to provide a head, with the free ends of the wire brought together and arranged side by side, one of which is formed with a pointed extremity to provide a pin, and the other bent upon itself in a plane at right-angles to the plane of the head to produce a hook for engaging and holding the card.

SHAVING-MUG.—T. D. McKOWN, Pittsburg, Ga. One of the objects of the invention is to provide a simple and inexpensive mug, in which a soap holder is provided with a water-jacket serving to keep the soap suds from drying out when the mug is being used, and so constructed that the entire device can be easily and thoroughly cleaned.

RECEPTACLE-HOLDER.—C. C. LITTLE, San Jose, Cal. The holder is for use in holding cups, glasses and other like receptacles more especially constructed for the use of water color painters in outdoor sketching, and is adapted to be applied to the cross bar of an easel or other support in a manner to carry the glass in an upright position. There is a seat provided for the glass, and means for embracing the body thereof when placed on the seat, and for attaching the holder to a support.

Hardware.

WINDOW-LOCK.—L. G. MILLER, New York, N. Y. The invention relates more particularly to that type of lock which includes a locking member secured to one sash, and a keeper or casing on the other sash, adapted to engage with one end of the locking member to retain

the two sashes in engagement with each other and prevent the window from being opened.

Heating and Lighting.

GAS-MANTLE SUPPORT.—C. J. BARTON, Big Rapids, Mich. The so-called gas mantles attached to gas burners for intensifying the brilliancy of the flame, are very brittle and liable to be cracked or broken off when jarred or otherwise set suddenly in vibration. To avoid this result, and thus prolong the "life" of such mantles, the inventor has devised an improved means for supporting them from a burner.

Household Utilities.

WRINGER.—D. A. SAWYERS, Unionville, Iowa. The invention is particularly useful in connection with devices used for wringing out mops, wash-rags, and the like. An object is to provide a wringer arranged to be moved from place to place, having a frame adapted to support a receptacle such as a pail, and provided with means for wringing out mops, wash-rags, and the like.

TABLE.—A. B. PHELAN, Alliance, Neb. This invention relates more particularly to improvements in that type of table in which there is provided a compartment beneath the top thereof which may be uncovered by moving said top. The compartment may be employed for the storage of kitchen or table articles, or may, if desired, be employed as a sink.

WASTE-PIPE CLEANER.—W. T. LISENEY, Longbeach, Cal. The invention is an improvement in waste pipe cleaners, having among other objects, the provision of an effective means for instantly unchoking and cleansing waste pipes which become clogged with paper, grease, or other foreign substance. Means are provided whereby as the piston is reciprocated any material which might become lodged in the pipes is positively forced out.

COMBINED CLOTHES AND CLOTHES-PIN RECEPTACLE.—W. H. CARPENTER, Lehr, N. D. The receptacle is adapted to be carried upon the person for use in hanging clothes upon or removing them from a line. The inventor's aim is to provide an inexpensive and simple receptacle of separate compartments, adapted to be hung by means of suitable straps from the shoulders of the user.

Machines and Mechanical Devices.

SELF-LUBRICATING SHAFT.—E. L. WOOD, Long Island City, N. Y. There is difficulty in lubricating shafting revolving at high velocities, because centrifugal force repels the oil. Mr. Wood puts the oil inside. This has been before proposed but he has made improvements which are radical and important. He provides convenient and reliable means of insuring a slow discharge under all conditions, with an increased rate of discharge when the shaft is revolved.

HYDRAULIC PRESS.—T. E. HOLMES, 8 Oakdale Road, Nether Edge, Sheffield, England. This invention pertains to hydraulic forging presses and the like worked by means of steam hydraulic intensifier apparatus, and wherein the valves for controlling the admission and exhaust of steam to and from the intensifier and lifting cylinders and for controlling the connections between the air vessel and the high pressure hydraulic system are all controlled by a single hand lever.

FRICTION-CLUTCH.—H. N. DAVIS, Independence, Mo. The object of the invention is to provide a clutch very effective and practically noiseless, and arranged to automatically connect the driving member with the member to be driven, as long as the driving member rotates in a forward direction, and to immediately and automatically release the driven member as soon as the forward motion of the driving member ceases or the driving member runs in a reverse direction.

AIR-LOCK FOR MINES AND TUNNELS.—P. H. DURACK, El Paso, Tex. In carrying out the invention two air locks are provided, one being located near the mouth of the mine shaft or tunnel, and another being placed contiguous to the heading or foot of the shaft or tunnel; and two pipes are arranged in the shaft or tunnel, one for conducting fresh air into the same and the other for removing foul air and water therefrom.

SOUND-REPRODUCING MACHINE.—J. SCHWAN, New York, N. Y. The machine is constructed as a permanent part of a support having a flat top and in the nature of a table, and the machine casing is movably supported below the top. The support is provided with a number of horns radiating to its border and connecting with the horn of the machine, which serve to uniformly distribute the sound waves throughout the room. Thus the ordinary use of the support as a table is not impaired, and the machine, which is to many an unsightly object, is concealed and protected from dust.

SELF-CONTROLLING DEVICE FOR NOTE-SHEETS.—H. MEYER, New York, N. Y. The object of the invention is to provide a device, more especially designed for causing the note sheet to travel at a uniform speed by rotating the winding up roller at a speed decreasing in proportion as the sheet winds up on the winding up roller, thus compensating for the increase in peripheral speed by the increasing thickness of the note sheet roll on the winding up roller.

PNEUMATIC ACTION.—H. MEYER, New York, N. Y. The invention relates to self-players, self-playing pianos, and like musical instruments, and its object is to provide a pneumatic action which is very compact, not liable to get out of order, and arranged to allow convenient and minute adjustment of the valve from the outside, to render the action exceedingly sensitive.

DOOR OPENER AND CLOSER.—P. D. GALARNEAU and W. S. NEWTON, East St. Louis, Ill. The construction of this device embodies a line having two branches, one of which is attached directly to the door and the other passing to the door lock and connected therewith in such a manner that when the line is pulled the door if locked and closed will be unlocked and then opened, or if the door be opened, a pull on the line will close it.

Prime Movers and Their Accessories.

VALVE MECHANISM FOR ENGINES.—W. L. WAYRYNEN, Dolph, S. D. One of the objects in this invention is the provision of means whereby the exhaust valve is automatically opened at the end of the exhaust stroke and held open by the escaping gas while the piston is completing its exhaust stroke.

GAS-ENGINE IGNITER.—W. C. PLANZ, Las Flores, Lower California, Mexico. This invention relates to improvements in ignition devices for use in internal combustion engines, and more particularly to that type of ignition device in which a small portion of the explosive charge is compressed in the ignition cylinder to such a pressure that it spontaneously ignites and serves for igniting the main charge in the main engine cylinder.

ELASTIC-FLUID BURNER.—W. F. LEES, H. A. LEES, and C. W. GRISE, San Diego, Cal. The invention refers to elastic fluid turbines, the more particular object being to produce a turbine operated by the expansive force of gases, such as are produced by the explosion of heavy or light crude oil, petroleum refuse, anthracite, and bituminous gases, water and coal gases, benzene, gasoline, ethylene, marsh gas, natural gas, acetylene gas, semi-water gas, producer gas, various hydrocarbon gases, and alcohol.

Railways and Their Accessories.

ADJUSTABLE EXHAUST FOR LOCOMOTIVES.—H. H. MACKEY, Durand, Mich. In the present patent the object of the invention is the provision of a new and improved adjustable exhaust for locomotives, arranged to control the draft of the boiler, according to the work done at the time by the engine, so as to save fuel.

CAR-REPLACER.—W. M. KITCHEN, Havana, Fla. In operation the derailed car is moved forward until the flanges of the wheels engage the inclined faces of the integral flanges. Continued movement of the car forces the wheels toward the rails, and as the flanges engage the friction rollers, they trip the wheels, dropping them onto the rails with flanges in proper position. The plates are laid flat upon the ties, and engagement of the groove of one of two plates with the rail retains the other in place, and the latter is retained in place by weight of derailed car, the flange of the first mentioned plate receiving the greater stress.

Pertaining to Recreation.

TOY.—A. E. WOOLNOUGH, New York, N. Y. The invention relates to dolls, bears, and similar figure toys, having movable members such as legs or arms, and its object is to provide a toy arranged to allow of turning any one of the movable members independent of the others, and to hold the movable members firmly in any adjusted position, and to produce sounds within the body of the toy on turning any one of the movable members.

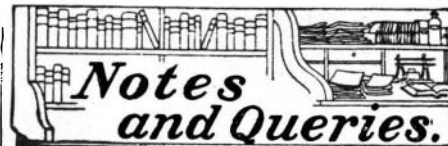
FISHING-FLOAT.—W. VON ROSENBERG, JR., Austin, Tex. The inventor has for his object the construction of a float, the attachment and detachment of which may be effected with great facility; and further to improve the float, or rather its attaching means, to the end that when the line is subjected to undue strain, as when the hook or sinker is snagged, that the line will not be subjected to a breaking strain at the float, in response to its tendency to assume a straight direction under the tension exerted on the line.

PUZZLE.—G. CHAPMAN, Arlington, N. J. The object in this instance is the provision of a puzzle embodying a movable body and a certain defined course or path over which the body is to be moved, the body and path being screened from the direct view of the operator who observes them only through the reflection of a mirror, whereby the natural order of things is reversed.

Pertaining to Vehicles.

ROLLER.—J. M. BRALY, Villapark, N. J. The invention is particularly useful in connection with road and lawn rollers as well as rollers for other purposes. One object is to provide an inexpensive roller having a smooth and hard rolling surface, and so constructed that the height of the roller is suitably proportioned to the weight thereof, to render the device most efficient.

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.



HINTS TO CORRESPONDENTS.

Full hints to correspondents were printed at the head of this column in the issue of August 8th, or will be sent by mail on request.

(10863) P. M. says: I am a high-school boy, and a friend of mine and I want to construct a wireless telegraph. Our homes are about one mile apart and we want to know if it would be possible to construct one at a reasonable cost. 1. Would thunderstorms cause any trouble; i. e., if lightning struck the pole what would happen? 2. About how high would the poles have to be? 3. Have there been any articles in the SUPPLEMENT telling how to construct a simple wireless telegraph? 4. Could you refer us to a few good books on the subject obtainable at a public library? A. We can furnish you SUPPLEMENT No. 1363, price ten cents, which contains a full description of a set of wireless telegraph apparatus for sending one mile. A larger set is described in SUPPLEMENT No. 1605, with full instructions for setting up and tuning a station, in SUPPLEMENT Nos. 1622, 1624, 1625, at ten cents each. These will give you the principal points which you will require to know. Of course a thunder-storm, or lightning, will do to the aerial for the wireless telegraph just what it will do to any other tall object which it strikes. The apparatus must be provided with a reliable lightning arrester. The aerial is always provided with a good ground. It is indispensable. Perhaps an aerial 18 feet above the house top will answer for a mile transmission. We would name good books for your study, Collins's "Wireless Telegraphy," price \$3.00; Mavor's "Wireless Telegraphy," price \$3.00; Collins's "Manual for Operators," price \$1.50. We shall be glad to furnish any or all of these books upon order.

(10864) H. H. F. says: Having studied the question from all sides, I should like to know what reason there is for not using a vertical open front engine on sidewheel steamers. According to several engineers on sidewheel vessels, this type of engine could be used to good advantage by simply placing the machine across the beam of the ship instead of fore and aft, swinging the shaft a little lower and placing the cylinders well up in the housing. It is a well-known fact that inclined engines wear on the underside of all the parts of cylinders, slides, piston, making it hard to keep them in good shape. In using a vertical engine, all this would be done away with, and these advantages gained: Economy of space, compactness, even running and wearing of parts, accessibility of parts, dynamos could be placed in engine room, less vibration. A. We are doubtful if the use of vertical engines with cylinders above the shaft would effect either of the first two or the last of the advantages you claim for it in sidewheel steamers (economy of space, compactness, or reduced vibration). There might be some economy of hold space by having the cylinders vertical instead of inclined, but this would be at the expense of deck or cabin space. The larger the diameter of the paddle wheel the greater its leverage, and consequently the greater the height of the shaft above waterline, and lowering of the shaft would reduce this leverage. The principal objection to superimposed vertical cylinders, however, would be the raising of the center of gravity of the boat higher above the center of buoyancy, tending to topheaviness, and the use of horizontal or inclined engines is with a view to keeping the center of gravity of the boat as low as possible to give increased stability. For this reason if vertical cylinders were used it would be better to have them below than above the shaft. Another objection to vertical cylinders in a sidewheel steamer is the increased tendency to roll in a beam sea due to the alternate vertical thrust of the pistons on opposite ends of the shaft, whereas the alternate thrust in a fore-and-aft direction has no such tendency and only causes an uncomfortable vibration in over-engined boats.

(10865) E. B. M. says: I, as well as several friends, am obliged by our business to go into out-of-the-way regions where the need may possibly arise to use a revolver against a "heathen." Perhaps your valuable columns may settle a discussion which has arisen. 1. Which has the greater penetration and muzzle velocity—one of the modern smokeless-powder automatic revolvers such as the Mauser or the Colt 32- or 38-caliber automatic, or a heavy "frontier" 44- or 45-caliber revolver using black powder? A. The small-bore automatic pistols using high-explosive smokeless powder are beautiful pieces of mechanism and have undoubtedly both higher penetration and muzzle velocity than the older and larger-bore weapons using black powder, but for self-preservation in emergency commend us by all means to the latter, for the following reasons: If you wish to see how far into a boiler plate or how far up the grain of a log of wood you can shoot, the small-bore, high-explosive weapon is preferable; if, again, you are sitting in a fort or other cover and you have no weapon but a pistol with which to pick off as large a number as

possible of men advancing to attack you across half a mile of open country, use the Colt or Mauser repeating pistol by all means; you can use it from the shoulder with a detachable stock and do vastly more accurate long-range shooting than you can begin to do with any other pistol. But for more ordinary self-defense at close range, we should certainly prefer the older, larger-bore, slower-shooting pistol. 2. From the experience of army officers and frontiersmen, which of the types of revolvers above mentioned is thought to have the greatest "stopping power"; i. e., supposing that a vital part was not struck, which arm would have the greatest disabling effect? A. As to "stopping power," it is not a question of "supposing a vital part were not struck"; a vital part may be pierced by a small-bore, high-penetration bullet without its stopping the aggressor sufficiently quickly. The writer has repeatedly had the experience of being unable to find, in dense jungle, game which he felt sure had been mortally wounded, and the more convincing evidence of finding, after great difficulty, animals which proved to have been shot through the heart or the brain, but which had had strength enough to hide themselves 100 feet or so away from where they were hit in dense jungle before they dropped dead. These were shot with a .303 Sporting Lee Metford high-penetration, flat-trajectory, range anything up to three miles, a beautiful little gun with which the writer has done better target shooting than with any other, but which he gave up for big-game shooting in favor of a .500 express and an old converted military Snider .550 entirely on account of the higher stopping power of the latter much older models which possessed none of the above-mentioned advantages of the former, and never after lost game which he was at all confident of having hit. He has also narrowly escaped the charge of a rhinoceros which proved afterward to have been mortally wounded by the small-bore gun, and once received a nasty crack on the head from the kris of an "Amok" Malay (fortunately turned flatwise by a blow on the latter's up-raised arm) after the "heathen" had been pierced through the heart, while still at least five yards from the writer by at least one Mauser automatic pistol bullet. The best stopping weapon we know of is a well-thrown, heavy sheath knife, but to be effective it must be thrown, as the writer has repeatedly seen it by an old side-partner, so as to insert about three inches of its blade through the ace of spades tacked to a post at about 20 yards, and as this requires a good deal of practice, we recommend you in the meantime to use the biggest-revolver you can get; the slowest-burning black powder makes a ball travel much faster than any man can rush at you, which is all you want. Use a double action (self-cocking) revolver by all means, but beyond that point, without depreciating improvements in mechanism, we have never been able to see the real advantage of automatic ejectors, top breaks and similar devices beyond convenience when at target practice. When you are in a really tight place and have used six cartridges, you won't have time to reload anyhow, however quick your automatic ejector, and you will have as much chance with the butt of a 20-year-old Colt with about 7½ inches of barrel, as with that of an up-to-date revolver with all the latest mechanical devices.

(10866) D. E. W. says: Will you please tell me if it is a fact that there is a total eclipse of the sun every 18 years and 10 days? A. Eclipses, solar and lunar alike, occur in a period of 18 years and 11 1-3 days, very nearly. It will be 10 1-3 days if there happen to have been five leap years in the period. No one knows when this fact was discovered, but it is certain that the Chaldeans knew it and predicted eclipses by its aid. About 70 eclipses occur in this period, varying somewhat because new eclipses come in at the eastern limit and old ones disappear at the western limit. The name of this period is the Saros. Of the 70 eclipses in a Saros, there are usually 29 lunar and 41 solar eclipses; and of the 41 solar eclipses, 10 are usually total.

(10867) F. B. asks: Why do not the equal days and nights occur when the sun crosses the celestial equator? For example, in one almanac calculated for latitude 40 deg. N., on March 21 last the sun entered Aries and spring began, but the nearest equal day occurred on March 18, three days before, while in September the nearest equal day occurs on September 27, four days after. A. Equal days and nights do occur every time the sun crosses the equator. The day is just twelve hours and the night twelve hours long. But because of the equation of time the clock time of sunrise and sunset varies from six. The true sun is east of the mean or clock sun by about seven minutes in March and a little more than seven minutes to the west in September. See any good textbook of astronomy for a full explanation of this. Todd's, price \$1.75, or Young's "General Astronomy," price \$3, are recommended and can be supplied by us. 2. What causes the synodic revolution of the nodes of the moon, and why does the line of apsides change? A. The synodic revolutions of the moon's line of apsides and the regression of the nodes of the moon's orbit are caused by the disturbing action of the sun upon the moon. The discussion of these effects constitutes the problem of the three bodies. A good elementary presentation of the problem may be found in Young's "General Astronomy."

(10868) P. Y. asks: Suppose recording maximum and minimum pressure gage is lowered below the disturbing influence of the waves, in the open sea, during a calm, what effect will the ebb and flow of the waves have on the gages during a storm, we will say at the time when the difference is 10 feet from the normal, or 20 feet from the crest to trough? A. A pressure gage under water will show the change of pressure due to change of depth of water. It can make no difference whether the depth changes because of a wave or because of a change of depth of the gage. If the water becomes ten feet deeper, the gage if sensitive enough will indicate that fact.

(10869) G. R. M. asks: Please answer through your paper the following questions: On a direct-current system a 16-candle-power incandescent lamp consumes ¼ ampere current per hour at 110 volts = 55 watts. Does the same lamp operating on alternating current of the same voltage consume an equal amount current equal in both cases? Why do wires carrying alternating current heat if both are not placed in same iron conduit or not concentrically wound? A. A 55-watt 16-candle-power lamp uses 55 watts on any form of current on which it can be raised so as to give 16 candles. It uses a half ampere all the time, and 55 watt-hours per hour. Wires carrying any form of current are heated by the current, producing $0.24CRt$ calories, in which C is amperes, R is ohms and t is the time in seconds. This cannot be avoided by any arrangement of the wires. It is the price in calories which must be paid to get a current over a line.

(10870) P. H. K. writes: Is ice formed from sea water salt or fresh? A. claims that it is salt. B. claims that it is impossible to have salted ice, as in the process of freezing the salt is eliminated. Who is right, A or B? A. When aqueous solutions freeze, the solids in solution tend to separate from the water, and the ice thus formed is pure or nearly so. It would not be easy to form a block of uniformly salted ice. This is sometimes expressed by saying that water freezes itself pure, which is not a very correct manner of stating what takes place. The water freezes molecule by molecule, and the solid in solution is separated from its solvent, the unfrozen portion of the solution becoming finally a saturated solution. B. has the better of the argument.

(10871) H. L. S. says: Will you please inform me how to connect up an electric bathtub? A. If the tub is of metal, connect one of the electrodes to the metal, while the other is held in the hand. If of porcelain, connect one electrode to a metal plate and place in the water.

(10872) M. M. asks: 1. If lightning strikes in a body of water where a man is swimming, will he feel it if it strikes within a hundred yards of him? A. We do not know any reason why a person should be affected by lightning striking the water in which he is swimming. The earth is at zero potential and is of infinite capacity, from which it follows that no amount of electricity can raise the electrification of the earth so that a man could be shocked by it when he is immersed in it. The case is the same as that of a man buried in the ground or in a cellar under the ground. No lightning stroke can harm him in either of these positions. Of course a man's head projecting above the water might be struck, but this is not the condition which you suppose. 2. Which will break first, a rope 5 feet long or a rope 100 feet long, if it has the same strength all over the rope and the same strength pulling it? A. If two ropes, one 5 feet long and the other 100 feet long, are pulled equally, the ropes being supported at the ends only, the longer rope will break first, since its weight is greater than that of the shorter rope, and is added to the pull upon it. If the ropes were lying on the ground or other support, we do not think the difference in length would make any difference in breaking strength, although we are aware that many hold the opposite opinion.

(10873) J. W. H. asks: Is there any difference in the strength of a magnet with a ¼-inch core and one with a ½-inch core if both are wound with the same amount of wire? Would it make any difference to the strength of a magnet having a ¼-inch core to have the core thinned down to ⅛ inch at the bending point? The reason for doing this is to make it easier to bend after the magnet is bound. A. The ease with which lines of magnetic force can pass through the core of an electromagnet is proportional to the sectional area of the core. For this reason a core ¼ inch in diameter will transmit four times as many lines as a core ⅛ inch in diameter, if all other conditions were the same. We should not advise the winding of an electromagnet and bending the core after the winding. It is much better to wind the coils on spools which will slide over the iron core and put them in place after the core has been bent into its final shape.

(10874) N. R. R. asks: Will you please let me know whether natural ice is colder than manufactured ice or not? The latter is made at a temperature of 20 degrees above zero, and natural ice undergoes a temperature sometimes many degrees colder. Does it retain this greater cold? A. All ice, natural or artificial, in any place below the freezing

point will have the temperature of that place; in any place above the freezing point it will have the temperature of the freezing point. Ice does not retain its temperature below the freezing point. It cannot be heated above the freezing point, under ordinary circumstances. Like any other solid, ice is cooled in the winter to the temperature of the air, be it zero or below, and becomes warmer as the temperature rises till its melting point is reached. Then it cannot be made hotter. It changes its condition to the liquid form.

(10875) H. C. D. asks: Being a constant reader of your valuable paper, I take the liberty of asking you to kindly inform me through your Notes and Queries column whether the following statements which appear in the Encyclopædia Britannica (vol. xi, pages 66 and 67) are correct. Under the heading "Gravitation," paragraph 2, it says: "Movement of a Falling Body.—Our knowledge of the force of gravitation being ultimately founded on observation and experiment, it will be convenient at this point to describe the experiments by which a knowledge of the laws of motion of a falling body may be ascertained. We shall first describe these experiments, and then we shall discuss the laws to which we are conducted by their aid. A beginner is apt to be surprised when he is told that a heavy and a light body will fall to the ground in the same time if let drop from the same height. Yet nothing can be easier than to prove this important fact experimentally. Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height. They will reach the ground together. Nor will the results be different if we try a stone and a piece of wood." On page 67 it says: "The various experiments to which we have referred suffice to establish the very important result that the time occupied by a body in falling to the surface of the earth, if dropped from a point above it, is independent of the mass of the body as well as of the materials of which the body is composed." I always understood it to be a well-known fact that the velocity of falling bodies depends upon the specific gravity and the density of the medium through which they pass, and I am therefore at a loss to understand the meaning of the paragraph referred to. That the above paragraphs cannot possibly refer to bodies falling in a vacuum seems to be shown by the sentence: "Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height." A. The article which you quote from the Encyclopædia Britannica was written by Prof. Ball, Astronomer Royal of Ireland at the time he wrote it. It is hardly likely that he was in error on so simple a matter as the fall of a cork and a bullet from the hand to the ground. Have you tried it for yourself? Had you done so, you could hardly have written the letter to us. The experiment is simple. So are others given by Prof. Ball. Try them till you are convinced that it is the matter of the earth which draws bodies down to its surface, and that the rate of fall is not dependent upon the weight or the density of the body falling. This was demonstrated by Galileo at the Leaning Tower of Pisa before the immortal demonstration of the law of gravitation by Newton. The paragraphs you refer to have no dependence upon the other fact that the lightest and heaviest bodies fall alike in a vacuum. They refer to the fact that all moderately heavy bodies fall practically alike through the air. Very light things are retarded enough by the air to have their rate of fall changed by the resistance of the medium through which they are falling.

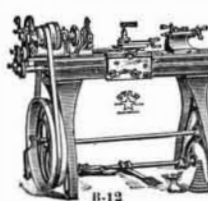
(10876) H. M. asks: 1. Why are the guns on battleships not larger than 45 caliber, 12-inch? Is it because they are strong enough, or because an ordinary ship is unable to carry larger guns? A. 45 calibers is found to be the maximum length which can be used to advantage for the 12-inch gun. The greater length would prove cumbersome, and necessitate larger turrets to accommodate the greater weight back of the trunnions. 2. By what formula is the displacement of ships known before they are launched? A. The displacement of ships is found by calculating the cubical bulk of the ship below the waterline. 3. Would it be possible to build torpedo boats of say 400 tons with a speed of 45 knots? A. In the present state of the art it would be impossible to build a hull of 400 tons displacement which would float horse-power necessary to give a speed of 45 knots. The "Viper," a torpedo boat of slightly over 400 tons, holds the record for speed of slightly over 36 knots an hour. The horse-power increases as more than the cube of the speed, and hence the weight of the engines to give a propeller thrust suitable for a speed of 45 knots would be altogether prohibitive. 4. a. A description of the 21-inch torpedo in use in the United States navy. A. The United States 21-inch torpedo was described in the SCIENTIFIC AMERICAN of January 6, 1906. b. A description of the 45-centimeter torpedo in use in the German navy. A. We are not aware that any data regarding the German 45-centimeter torpedo have been made public. 5. Is there any work giving complete statistics of all rapid-fire guns in use in the large navies? A. Brassey's Naval Annual gives full statistics. 6. Please put an article in your paper that treats of the new ships now building in England, i. e., "Dreadnought," armored cruiser "Orion," T. B. destroyer "Afridi," and the special type torpedo boat

that is intended to make 36 knots per hour. A. The "Dreadnought" was illustrated and described in the issue of the SCIENTIFIC AMERICAN of August 25, 1906. We have no data respecting the other vessels mentioned.

(10877) E. R. asks: Will you please state in your query column how many revolutions the earth makes in 365 days? A. The earth makes 366 revolutions on its axis in 365 solar days. One rotation of the earth on its axis is completed when a star which was due south last night is to-night in the same position. Since the earth is also moving in an orbit around the sun, the star seems to reach the south point about four minutes earlier each night than it did the previous night. The earth must turn on its axis, about four minutes of time more to bring the sun to the same place day by day. This extra time constitutes the difference in length between the solar and the sidereal day, and in a year causes that there shall be one sidereal day more than there are solar days. There are 365 solar days and 366 sidereal days in each year. The sidereal day is the true measure of the rotation of the earth on its axis with reference to a star or to a fixed point in absolute space.

(10878) H. B. C. asks: 1. Why is it that a light, when put into a 110-volt circuit, will not short-circuit the current, while a piece of small copper wire of about the same length as the filament of the lamp, when placed in the same position, will immediately short-circuit? I have found it to be a fact that when an incandescent light's globe breaks, the filament does the same as the piece of copper wire, provided, of course, that the current is on. Do I not, therefore, have reason for thinking that the air has something to do with this? A. When the globe of an incandescent lamp breaks, the hot filament is instantly burned by the oxygen of the air just as any other piece of carbon would be. The current is not short-circuited by the filament. The flash of light which is seen is due to the chemical action of burning the filament, and not to any electrical action. When the circuit is bridged by a short copper wire, the resistance of the copper wire is small and a large flow of amperes takes place, which heats and melts and also burns the copper. This is what is meant by a "short circuit." 2. How may a small, practical, 110-volt current electric heater be made? Is not German silver wire the best for this purpose? A. If you want an electrical heater which may be attached to a lamp socket, wind about 200 to 220 ohms of fine German silver wire on porcelain tubes and mount in some convenient fashion. SUPPLEMENT 1112, price 10 cents, contains valuable data concerning electrical heaters. 3. What is the smallest size of wire allowed by the Fire Underwriters' Association for wiring building with 110-volt current? I have been using what is known as No. 14 rubber-covered for my outside, and No. 14 weather-proof for my inside wiring. In this am I meeting the requirements or not? A. No. 14 wire is allowed by the Underwriters to carry 12 amperes in rubber insulation, and 16 amperes in other insulations. 4. Do wires necessarily need to be soldered in joining them to make them more electrically and mechanically perfect? A. In good work wires are always soldered at junctions to other wires. No other connection is allowed.

(10879) J. C. B. says: 1. In what probable way does Edison expect to utilize cobalt? Can he use the chlorine gas from it as a motive power? If not, how to use it in storage batteries? A. We regret to say that we are not able to answer your inquiry, "In what probable way does Mr. Edison expect to utilize cobalt?" etc. It would be a hazardous thing to attempt to tell what Mr. Edison will probably do, or may be expected to do. We doubt if he tells any one, even if he knows himself, what he expects to do. We may say that there is no chlorine in cobalt, and no motive power in chlorine. We are sure that Mr. Edison does not expect to find either of these results in his investigations. 2. In antebellum days here in North Carolina, by rubbing a pocket knife blade across the points of the old flat strap iron on the railroad track, the blades of the knife so rubbed became highly magnetic, capable of lifting iron or steel objects of considerable weight, a fourpenny nail or larger perhaps. I have so done often myself, but after some forty years cannot say positively I raised anything heavier than a fourpenny nail. Have tried the present T-iron rail repeatedly, with no magnetism resulting at all. Why is this? The magnetic properties were then well known, but do not know if I can now establish the fact by another witness than myself. A. Any magnetizing of a knife by stroking it on a rail was due to the fact that the rail was a magnet. If the old experiment cannot now be repeated, it is because the present rail is not a magnet. 3. From what source does the ocean derive its intense saltiness, and how retain same in uniform strength? A. The salt now in the ocean has been in the past ages washed out of the land or dissolved from beds of salt in the earth to which the water gained access. The saltiness remains, since all the water which evaporates from the ocean is fresh water. The original water was fresh. It became salt by dissolving salt from the earth. 4. Why are the conventional number of guns (21) fired in honor of the President of the United States? Is it by Congressional enactment? Why 21



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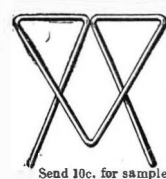
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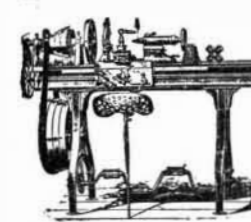
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and not 13 for original in thirteen States? A. The firing of 21 guns as a salute for the national flag, the President of this or other countries, or the sovereigns of foreign states, is an international custom.

(10880) M. W. and C. P. write: We would like to know, through the columns of your valuable paper, how a boiler of 15 horsepower, that is only in use about three months during a year, should be left. Should it be filled with water or empty, and should the smokestack be protected? A. A boiler to be laid up for a season should be thoroughly cleaned on the inside, filled with water with steam on, so as to be full of hot water that has been boiled, up to the safety valve. The flues and fire surface of the boiler should then be cleaned; ashes and soot removed from every part where such lodge. Then close fire doors, ash pit, and put a cap on the smokestack. With this treatment laid-up boilers do not rust inside or outside. It is the moist air drawn through a laid-up boiler that does damage by rust.

(10881) C. F. C. asks: 1. Are lantern slides (which are printed by contact) more sensitive to the light than carbon velox? For instance, a plate that printed a good clear picture on carbon velox in 15 seconds, being held 12 inches from a large size house lamp, would a lantern slide take longer or shorter time to print it? A. Lantern slide plates are always slow plates, much less sensitive than ordinary plates. A longer exposure is required. 2. Have you a SUPPLEMENT telling how to make lantern slides? A. We can send you "Photo-Miniature Lantern Slides," price twenty-five cents, and Elmendorf's "How to Make and Color Lantern Slides," price \$1 by mail. We can send you SUPPLEMENT 483, 517, 724, 1062, 1082, on slide making, for ten cents each. 3. Also, how to make a lantern slide camera for making slides from 4 x 5 negatives? A. SUPPLEMENT 625 tells how to make a bellows for a camera to take 4 x 5 negatives, and in Elmendorf's book there is a chapter on working with a camera in slide making. 4. Is there a magic lantern made which takes standard slides and burns oil for the light? Is this done, and are the pictures clear when thrown on the screen? A. Yes. The pictures cannot be enlarged more than four feet in diameter with oil lamps since the light becomes so faint by diffusing it over so large a screen.

(10882) E. E. S. asks: 1. What is the best way to mount a map on a muslin backing, and would a window shade be suitable? A. Moisten the muslin, stretch and tack it down on a table. Then wet the map thoroughly and apply the paste evenly over the entire back of the map, being very careful to bring it to the edges of the paper. Now lay the sheet on the cloth and smooth it out and rub it down upon the cloth so as to remove air bubbles and bring it into contact with the cloth. A roller or squeegee such as is used for mounting photographs will enable you to do the job much better. 2. How can I produce on brass the bronze-like finish used on the instruments of surveyors and engineers? A. Bronzing of brass is effected by dipping in a solution of 5 drachms of perchloride of iron to 1 pint of water, until the desired color is obtained; then wash in hot water, dry, and lacquer with a thin shellac and alcohol varnish.

NEW BOOKS, ETC.

THE BUILDING MECHANICS' READY REFERENCE. Cement Workers' and Plasterers' Edition. By H. G. Richey, Superintendent of Construction of U. S. Public Buildings. New York: John Wiley & Sons. 16mo.; 458 pages, 193 illustrations. Price, \$1.50.

Of the making of handbooks there is no end, but their multiplication is hardly more rapid than that of highly specialized branches of engineering construction; and, if we may judge from the number of inquiries received, not only from builders' mechanics but from architects and engineers, information on the lines of reinforced and other concrete work is less completely supplied than in other branches. This want Mr. Richey's latest work seems to very adequately supply; the mensuration and miscellaneous tables are as complete as in the earlier editions for other builders' mechanics, those for transmutation from one system of measurement to another being exceptionally so. The various hints and recipes and the rules for superintendence are most practical; and as regards tests, analyses, and specifications for cements, we cannot think of any practical detail upon which we desire information which we cannot find in these pages. That most essential feature of a useful handbook, the index, has received proper attention and the illustrations are excellent, coated paper having been used where required for the reproduction of photographic half-tones, the remainder of the book being printed on thin paper to reduce bulk and keep it within dimensions convenient for the pocket.

NOTES ON HYDROELECTRIC DEVELOPMENTS. By Preston Player. New York: McGraw Publishing Company, 1908. 16mo.; pp. 68. Price, \$1.

The present book deals with the commercial aspect of an industry in which investors, capitalists, and bankers are much interested, as schemes for the utilization of water power are constantly coming to the fore. It is the object of this short discussion to indicate as



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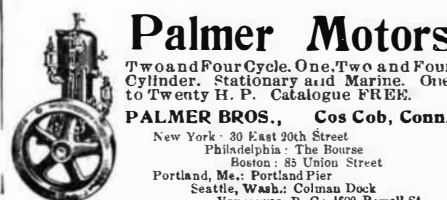
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