RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

GARMENT HANGER.—R. C. Thomas, New York, N. Y. This garment hanger is constructed with two arms, each made of two strands with their inner end twisted and adjustably pivoted to the other arm. At the outer end of each arm is a shoulder loop made longitudinally adjustable through the intermediary of a connecting block.

Electrical Devices.

SPARK-PLUG ATTACHMENT. — F. D. Casey, North Water Gap, Pa. The object of this invention is to provide covers for the spark plugs of engines to prevent water or moisture from reaching the electrical connections on the spark plugs and thereby cause a short circuit. The device is particularly adapted for the engines of motor boats and motor vehicles.

TRANSPOSITION BRACKET FOR INSULATORS.—J. E. Skinner, Kingman, Kans. The purpose of this invention is to furnish means for transposing telephone wires at suitable intervals, so as to equalize induction effects on the several wires. The invention provides a device which may be supported by the wires themselves without the addition of extra cross arms on the pole.

Of Interest to Farmers.

FENCE POST.—A. M. Weatherly, Sr., Rome, Ga. The present invention is an improvement on a fence post previously patented by Mr. Weatherly. It is arranged to be cast in a single piece. Its form is such that it may be used as a corner post, as well as being provided with pockets or recesses which are closed at the back and separated by a recess extending at right angles to the above-mentioned recesses.

Of General Interest.

SMOKING PIPE.—W. R. Kaufman, Sulphur, Okla. This tobacco pipe is provided with a bulb in the stem which is adapted to trap the saliva. In the bulb is a central partition of screen material which strains, dries, and cools the smoke to be strained and dried. When desired the bulb, which is composed of two sections screwed together, may be opened and cleaned.

PLUG FOR GAS WELLS.—W. F. Burgess, Atwood, W. Va. The invention provides means for plugging gas wells whose yield of gas has ceased. It consists of a hollow tapered body portion with devices slidable thereon and adapted to wedge and lock the body in the well, and an elastic extensible sleeve or cylinder fitted with a tapered plug which is slidable in the body and thus adapted to extend the sleeve.

TRAP.—A. O. Thompson, Wolverton, Minn. This trap consists of two ring-shaped jaws which are spaced apart to make room for an intermediate opposing jaw that operates between them. A simple latch is provided to hold the intermediate jaw and a trigger arm on this latch extends across the ring-shaped jaws so that it will be sprung by an animal endeavoring to pass through the jaws.

PRESSURE REDUCER FOR GASEOUS VAPORS.—H. A. Reed, New York, N. Y. This invention provides a pressure reducer for ale, beer, and similar liquids, and has for its object to reduce the pressure of the fluid in drawing it from the barrel or cask so that the gas and liquid will pass out in proper proportions without waste of the gas, thus obviating the danger of the beverage becoming flat.

CALENDAR.—J. Ferreres, Habana, Cuba. This calendar is of the type provided with two members rotatable with respect to each other, one of the members bearing the names of the days of the week and the other the numerals of the days of the month. The calendar invented by Mr. Ferreres is so arranged that the names and numerals will be right-side up and easily read irrespective of the extent to which the rotary member is turned.

COLUMN.—C. T. Cunnius, Long Branch, N. J. Stave columns as generally constructed are apt to break at the joints and warp apart. The present invention aims to overcome this difficulty by constructing the column of a plurality of staves, all of approximately the same taper, with one stave having an inner and outer section, substantially equal to the length of the other staves. Through the staves a band is circumferentially passed with the ends emerging at the inner section of the sectional stave, where they are joined, to bind the staves together. The outer section is then applied to cover the joint.

ATTACHMENT FOR SEINES. — N. L. Lebille, Lockport, La. The object of the invention is to provide a stake which is to be used to secure the ends of the seine in place while the seine is being hauled. Means are provided for holding the seine close to the mud without damage to the seine. The stake is fitted with a number of points of different length, which may be applied as may be necessary for use on different bottoms where the depth of mud varies.

FILTER.—Virginia Toninetti, Milan, Italy. This filter is provided with two chambers, the upper one having a number of spouts projecting into conical holders supported in the lower chamber. These holders are adapted to be fitted with filtering material. The filtered liquid issues from the holders into the lower chamber, where it may be tapped off as desired.

CONSECUTIVE NUMBERING APPARATUS.—C. Spielman and F. W. Wicht, New York, N. Y. The object of this invention is to provide an improved consecutive numbering apparatus fitted with a number of sets of numbering wheels, actuated simultaneously and of which any set may be placed in print in either a transverse or a lengthwise direction. The sets may be adjusted toward or from each other and quickly fastened in the adjusted position.

HEDGE TRIMMER.—F. L. Gilman, Engene, Ore. This hedge trimmer is of the hand-operated type, consisting of a hand-operated mechanism which may be strapped to the person and a many-bladed cutting shears operable by this mechanism and adapted to be guided by the hand along the hedge.

TIE FASTENER.—J. P. Chambers, Chattanooga, Tenn. This invention provides a simple flexible member which may be used to rapidly secure the ends of a cord tied about a package. It is particularly adapted for tying packages of letters and the like, and should be useful for the mail service as well as for lawyers, bankers, insurance men, and the like, where numbers of packages of papers are kept on file. The particular advantage of the tie is that it holds the ends of the cord in such a way as to permit the package to be untied at a moment's notice.

COIN-CONTROLLED LOCK.—F. W. Kassler, St. Louis, Mo. This invention relates to a coin-controlled lock adapted particularly for use in connection with public telephone booths, the object being to insure the payment of tolls. The lock is provided with means for closing the coin chute when a person is using the booth so that it is impossible for any other person to interfere with the lock.

GAME PIECE.—F. Walstein, New York, N. Y. This game piece is adapted for use in out-of-door apparatus for playing chess, checkers and the like. It is arranged to permit of conveniently moving the piece about over the game board and to securely hold the same in position in a field of the game board when at rest.

HITCHING-WEIGHT HOLDER. — H. H. Tothill, Lockport, N. Y. A means is provided by this invention for supporting a weight employed temporarily for putting a check on a hitching strap. The weight is hung from the floor of the vehicle body. Normally it clears the ground, but when desired the driver may release the weight, without leaving his seat, and permit it to fall to the ground.

FLASHLIGHT FOR PHOTOGRAPHIC USE. —E. B. Moore, Los Angeles, Cal. When photographing an object by means of the ordinary flashlight, the high lights are apt to be accentuated and there is a sudden change to the deep shadows without any middle tones. The present invention aims to overcome this objection by providing a source of illumination having a relatively large area. In this way the harsh effect produced by an arc light or common flashlight in which the light emanates from the concentrated point is largely overcome.

COMBINED LADDER, STEP LADDER, AND SCAFFOLDING.—H. H. Thompson, Lawrence, Kans. The invention provides a ladder which may readily be converted into a step-ladder or may be employed as a portion of a scaffolding. The present invention is an improvement on a construction previously patented by Mr. Thompson. The design is such that two ladders may be connected so as to serve as the support of the scaffolding.

Machines and Mechanical Devices.

SOUND REPRODUCER.—W. A. Chapman, Smithville, Ark. This sound reproducer is particularly useful in connection with talking machines of the disk type. Its object is to provide an efficient sound reproducer which will eliminate harsh, shrill, and metallic tones and exactly reproduce the volume, register, and tone shading of the original sound.

CALCULATING MACHINE.—E. Leder, Berlin, Germany. The object of this invention is to provide a machine by means of which the logarithms of numbers can be ascertained, and logarithmic calculations be effected. With this machine ordinary arithmetical calculations can be made rapidly and accurately by the employment of logarithmic principles.

TALKING MACHINE.—W. A. Chapman, Smithville, Ark. The invention provides means for supporting the sound tube of a talking machine so that the tube is free to swing in two directions without interrupting the propagation of the sound waves through the sound tube and the horn which communicates therewith.

WASHING MACHINE.—J. Becker, Canal Dover, Ohio. A strong and efficient washing machine is provided by this invention which can be manually operated, which can be adjusted to adapt it for use with varying quantities of articles to be washed, and which can be taken apart so that it can easily be shipped or stored when not in use.

COMPUTING BALLOT BOX.—C. A. Ball, Marion, Ind. This computing ballot box is specially adapted for use of fraternal and benevolent societies, lodges, clubs, and the like, whereby a more reliable and secretive method of conducting the election of applicants for membership is obtainable than at present. The invention provides a method of conducting a secret, affirmative, or negative ballot, without the aid of tellers or the use of paper ballots.

Prime Movers and Their Accessories.

AUTOMATIC STARTING VALVE.—J. B. Lane, Glenwood Landing, N. Y. The invention relates to improvements in machines for controlling the pressure in conduits, containers, and the like, and more particularly relates to that type of controller in which the flow of liquid through one conduit, for instance a motive fluid for operating a pump, is controlled by the pressure in a separate conduit or container, for instance, air compressed by a pump operated by the motive fluid.

ENGINE STARTER.—L. S. Tuttle, Eastport, N. Y. A hand-operated starting device for internal combustion engines is here provided in which danger while cranking the engine due to back firing will be eliminated. The crank automatically operates to release the driven shaft or other mechanism for driving the engine, should the engine back fire, and it is ejected from the shaft as the engine starts in the proper direction under the influence of its motive agent.

Railways and Their Accessories.

CAR COUPLING.—O. L. Albertson, Richmond, Va. The invention relates to an improvement in car couplings of the twin jaw type and provides an improved method of interlocking the jaws so that when closed they will not exert any pressure upon the opening lever.

MAIL BAG CATCHER AND DELIVERER. —W. R. Morrison, Derry, N. H. Mr. Morrison's invention is an improvement in devices used on railways for receiving mail sacks from a passing train and delivering the same thereto. The device is arranged to relieve the impact of the mail bag so that injury to the same or the crane will be avoided.

TIE PLATE.—F. A. Piper, Redlands, Cal. The invention provides a strong and inexpensive tie plate formed of sheet metal and having shoulders at the ends to engage the outer edges of the rail bases. The plate is provided near the ends with openings to receive the spikes at opposite sides of the rail, and with laterally disposed flanges constituting spurs which are forced into the tie to secure the plate thereon.

CAR MOVER.—C. H. Shotwell, Akron, O. This car mover consists of a lever composed of two members which are pivoted together, the fulcrum being adjustable to operative position after the load arm has been disposed against the car wheel. The load arm, which serves as a shoe, has a surface which conforms with the configuration of the tread of the car wheel. The device may be attached to the periphery of the car wheel in such manner that when power is applied to the lever it will be locked to the wheel and turn with it.

METALLIC RAILROAD TIE.—A. M. Baird, Topeka, Kans. The present invention is an improvement on a construction previously patented by Mr. Baird. It is provided with an open channeled body and is fitted with metallic clamps for the rail, the clamps being secured in cross pieces or top plates connecting the sides of the channeled body. The tie is particularly adapted for use on sharp curves of a railroad or any other portion of the road bed that may incline more or less laterally. The tie body is fitted with wings or lugs which prevent endwise creeping.

RAIL BENDER.—D. Belloni, Edri, Pa. This device is designed for bending the rails or track to the necessary curve or for straightening the rails. It belongs to that class of benders in which a bowed yoke with hook shaped ends is provided at the center with a screw-threaded enlargement adapted to receive a screw stem which passes through the enlargement and bears against the rail at a point midway between the hooks of the bowed yoke.

Vehicles and Accessories.

MOVING VAN.—A. B. Yetter, New York, N. Y. The invention provides an extension for the rear end of a moving van whereby the capacity of the van may be increased whenever necessary, and which will protect articles ordinarily strapped outside the end of the van. The attachment is adaptable to any type of van and will not interfere with the opening or closing of the doors.

TRACTION WHEEL.—F. Bottrill, Tintinara, S. Australia, Aus. This invention has been devised to facilitate the movement of traction engines over sandy or yielding surfaces, and its novel features consist in the provision of a series of oscillating bearers, flexibly mounted upon and attached to the wheel rim in one or preferably two circles, the bearers in each circle being arranged end to end between suitable flanges extending around the rim.

Designs.

CLOCK STAND AND PICTURE FRAME.— G. Keppler, New York, N. Y. The design consists of an ornamental frame supported by a pair of legs in the form of dolphins. The frame is provided with a shell effect at the upper end, while at the sides are conventional flower effects.

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.

Notes and Queries.

HINTS TO CORRESPONDENTS.

The full name and address must accompany all letters, or no attention will be paid thereto. This is solely for our information. *All* queries are answered by mail, and a *few* of the selected answers are afterward published in the paper. We cannot undertake to furnish information on matters of personal interest, without reasonable compensation. To answer questions which are not of general interest usually costs us from $2.00 to $3.00 each upward, and this sum should invariably be remitted in such cases. When there are questions involving building or other construction, or when calculations must be made, an estimate of the cost will be furnished upon request. We cannot give answers to examination papers, or decide wagers, nor can we undertake to solve mathematical problems of any description whatsoever. Do not use postal cards.

Queries from this vicinity not answered within fourteen days should be repeated in full. Queries from points more remote will require a longer time.

We do not make chemical analyses; but we are always pleased to give the names of minerals which are submitted to us, when it is possible for us to do so. The minerals should be sent marked distinctly with the name of the sender, and should be sent fully prepaid.

Buyers wishing to purchase any article not advertised in our columns will be supplied with the addresses of the houses manufacturing or carrying the same, as soon as possible, or if we are unable to do so, their queries can be advertised in our special classified column.

Any books on any scientific or technical subject can be furnished. We solicit requests for quotations. The Scientific American Supplements referred to are mailed for ten cents each. Book and Supplement catalogues will be sent free on request. A careful reading of these "Hints to Correspondents" will prevent any misconception as to the uses and will prevent abuses of this column.

(10980) C. H. C. says: Can you inform me of the philosophy of the curving of a tennis ball when struck with a "cut," and why some balls, with a forward twist, drop, and others, with a reverse twist, carry a long way without dropping? Is the cause gyroscopic action, or the result of the climbing motion of the ball against the air, or what? A. The curving of a tennis ball is probably due to the same cause as that of a base ball. The rotation of the ball is such that the air pressure is greater on the side toward which the ball rotates, pushing the ball in the opposite direction. See Scientific American, July 16, 1904, for a discussion of this question. This explains upward and downward motions of balls, as well as sideways motions. There is no gyroscopic action, so far as we can see.

(10981) C. E. D. asks: In your reply to query 9606, you state that daylight is gone after the sun is 18 deg. vertically below the horizon. It seems to the writer that this is an error. On almost any clear night in the latter part of June, the sun's light can be traced, decreasing as the hours pass, farther and farther north until the North Pole is passed, when it begins increasing until dawn. If this is not daylight, what is it? It is a well-known fact that the nights in summer are not so dark as in winter, and this must be because the daylight is not so fully excluded. A. You are quite right in supposing that the light seen in the sky after the sun sets is sunlight. It is reflected from the dust particles in the upper air. This is twilight, not daylight, since daylight implies the seeing of objects distinctly, while twilight implies a dim, indistinct vision. *Twi* here means *between*, that is, neither light nor darkness. The twilight zone is about 1,500 miles broad, to the east and west of the sunset line. At different times in the year a different time is required for the sun to reach an altitude of 18 deg. below the horizon. In our latitude this is more than two hours in midsummer, and the shortest possible duration of twilight in the torrid zone is one hour twelve minutes, all the year round. The writer has lived there, and seen the night fall almost as soon as the sun sets. Twilight is not reckoned upon for working in the torrid zone, as it is here in the summer. The twilight illumination of the sky swings around toward the north as the sun itself does, and in the most northern portions of the United States the twilight zone does not dip below the horizon, even at midnight. About latitude 48 deg. twilight of morning meets evening twilight at the north. Even in Montreal or Edinburgh the evenings of summer are very long, and the streets are filled with people much later in summer than with us. But wherever on the earth the sun is 18 deg. below the horizon, it is night, and no light of the sun is to be seen above the horizon. Another fact in this connection, is that the sky is never dark. This, however, is not due to the sun, but to the stars. The Milky Way is above the horizon in summer in our latitude, and it gives a great deal of light by night, enough to make the night sky of that time brighter than when it is not a part of our night sky, as is the case in winter. Then, too, the stars which cannot be seen by the unaided eye give us much light. The stars which are not visible to the eye give more light than those which are visible. We quote Todd's "New Astronomy," p. 424, on this point: "Accepting a sixth-magnitude star as the standard, and expressing in terms of it the light of all the lucid stars registered by Argelander (a catalogue of 324,000 stars to the 9½ magnitude), they give an amount of light equivalent to 7,300 sixth-magnitude stars. But calculation proves that the telescopic stars of this extensive catalogue yield more than *three times* as much light as the lucid ones do. The stars, then, we cannot see with the naked eye, give more light than those we can, because of their vastly greater numbers." In the whole heavens the stars give about 1-80 as much light as the full moon. There is good reason for the fact that the sky is light all the night.

(10982) G. F. says: 1. Is there any sound when there is no ear to hear it? For instance, if a tree were to fall and there were no living thing within hearing, would there be any sound? Please explain fully. A. There may be *sound* when there is no ear to hear it, and the fall of a tree would produce exactly the same noise, whether or not there be any one near at hand. What we call "sound" consists in reality of pulsations or wave vibrations in the air or whatever medium the sound traverses. If a stone fell into a smooth body of water, it would produce waves on the surface of the water, whether or not there be any person present to see them. In the same way, it would produce waves or pulsations of sound in the air. 2. Give a rule for figuring the drawbar pull of a traction engine. As an example, figure the pull of the following engine: Cylinder, 10 x 10¼; 225 revolutions, cutting off at two-thirds stroke; pressure, 120 pounds; traction wheels, 64 inches diameter, geared 1 to 17. A. The engine which you describe ought to be able to produce a drawbar pull of from ten to fifteen thousand pounds for each cylinder, provided the driving wheels do not slip. If this force is more than eight or ten per cent of the weight on the driving wheels, they are likely to slip.

(10983) A. W. P. writes: 1. What is the complementary color of purple or violet? Is it green or yellow? A. The complementary color of purple is green. 2. Concerning wireless telegraphy, I have read that "the receiving antennæ should be about one-fourth the length of a wave." How may the length of the wave be determined? A. The length of electrical waves is dependent upon the number of oscillations per second of the discharge. With 300,000,000 oscillations the waves are about 3 feet long, since the speed of the waves is about the same as that of light. The mode of securing waves of a particular length is discussed in the several systems in Mayer's "Wireless Telegraphy," price $2. 3. Which is the best battery to use with a small induction coil (spark) for experimental purposes—one that will give a steady current and not annoy one by polarizing every few minutes? A. For experimental purposes you will find the plunging bichromate battery as satisfactory as any. A good form is described in our Supplement No. 792, price 10 cents.

(10984) B. B. asks: Which part of a wagon wheel, when traveling on the road, goes the fastest, the top or the bottom? A. All parts of a wagon wheel go along the road with the same speed, the same as the horse moves. So too all parts of the wheel turn around the axle with the same angular speed, that is, every point which is at the same distance from the center moves with the same speed, but each point moves with a speed which is proportional to its distance from the center of the axle. The center line of the wheel does not rotate at all. There are other motions of the parts of a wheel which are discussed in Queries 9622 and 9635; also in the correspondence column of Vol. 92, No. 25, to which we would refer you. We can send you these numbers for thirty cents.

(10985) H. A. K. says: I have a hollow cylinder 1¼ inches diameter by 3 inches high. How many cubic inches of air will be compressed into it at 100 pounds pressure per inch? At 200, at 300, at 400, at 500? If the height of the cylinder is cut in half, how many cubic inches will it contain at the same pressures? What is the rule for finding the volume of air compressed into a given space at a given pressure? What books treat on the subject? A. Your cylinder contains 3.68 cubic feet of air at atmospheric pressure. At 100 pounds pressure it will contain 3.68 times

$\frac{114.7}{14.7} = 28.8$ cubic inches. At 200 pounds per square inch it will contain 53.8 cubic inches. At 300 pounds per square inch it will contain 78.8 cubic inches. At 400 pounds per square inch it will contain 103.8 cubic inches. At 500 pounds per square inch it will contain 128.8 cubic inches of air at atmospheric pressure. If you halve the height of the cylinder, you will halve the amount of air that it will contain. The pressure of the atmosphere on an average is about 14.7 pounds per square inch. When the pressure is increased, the volume of each cubic inch of air is decreased in the same ratio that the pressure is increased above 14.7. In working these problems it is necessary to remember that pressures as ordinarily measured by gages are pressures above the atmospheric pressure. To obtain the absolute pressure or true pressure, it is necessary to add 14.7 to the pressure given by the gages, as has been done in working the examples above. We recommend and can supply you with the following book relating especially to the subject you refer to: "Compressed Air: Its Production, Uses, and Application," by Hiscox, price $5 postpaid.

(10986) P. H. C. asks: 1. I ask you to explain in your column of Notes and Queries why a small battery motor will run on a 110-volt alternating current when a 50 candle-power lamp is put in series. If the 50 candle-power lamp is removed and a 16 candle-power put in its place, the motor will not start. A. A 16-candle lamp does not carry current enough to run your motor; a 50-candle lamp does. 2. How long a spark ought an induction coil to give which is 8 inches long, 7½ inches in diameter, the core being 1 inch in diameter, the primary coil consisting of two layers of No. 16 copper wire and the secondary coil containing 4 pounds of No. 36 copper wire? A. You may be able to get a spark 3 inches long from your coil, but its proportions are not of the best. The primary winding is of too small a wire. No. 12 would have been right. The coil is too short. It should have been 12 or 14 inches. This would have made the outside diameter less, and brought the secondary nearer the primary and into a stronger magnetic field. The coil might then have given a spark of four inches. See our Supplement No. 1527 for plans for a 4-inch coil; price ten cents. 3. Having five known parallel forces applied at known points to a stick, what is meant by taking one of those points as the center of moments? A. When a point is taken at the center of moments, a force acting at that point does not assist in any way to rotate the stick. It simply produces pressure on the point. 4. What is meant by moments of forces? A. The moment of a force is the value of that force in producing rotation of the bar or wheel to which it is applied. The value of any force in moment is equal to the product of the force multiplied by the acting distance of the force. See textbooks of physics for full explanation of moments and forces.

(10987) E. De V. asks: Will you please tell me what kind of steel makes the best bar magnets? Also, I would like to know the relative strength of bar and electro-magnets. A. For permanent magnets some prefer Jessop's steel, some Stubs' steel, some manganese steel, and some tungsten steel. Probably any good high-grade steel will answer very well for the purpose, with little to choose. This is generally the case where there are so many opinions on a matter. There is no "relative strength" of permanent magnets. A good permanent magnet may lift five times its own weight. An electro-magnet will lift much more than this.

(10988) J. J. G. asks: Does an object which is viewed through the telescope of an engineer's transit appear to be larger than when seen with the naked eye? Although this may seem to you to be a foolish question, I find that several of my acquaintances, two of whom are graduate civil engineers, claim that while the image is clearer, it is no larger. By looking through the telescope with one eye and past it with the other, I am able to see both object and image at the same time, and thus seen the superficial areas appear to be about as 1 to 16. My friends claim that this is due to my eyes, but I do not think so. A. An engineer's transit usually is provided with a telescope which will magnify from 3 to 6 diameters, or from 9 to 16 times. If it did not magnify at all, an object seen through it would not be seen any more distinctly than with the naked eye. A simple way to determine the magnifying power of a glass is to look at bricks at some distance with one eye through the telescope and with the other eye directly. Find how many bricks seen with the naked eye are covered by one brick seen through the telescope. This is the number of diameters the telescope magnifies.

(10989) G. J. B. writes: In your Notes and Queries of April 1, 1905 (No. 9594), you say that the curvature of the earth is 8 inches for one mile and 32 for two miles. This is right (approximately) when running an east-and-west level but ceases to be true when running north and south, or else the doctrine that the north-and-south axis of the earth is 26 miles shorter than the east-and-west axis must be false. It is easily evident that if you run a level starting from a given point on the equator and running west through 90 deg. of arc with 8 inches allowance for each mile and should then start at the same place on the equator and run north through 90 deg. of arc, you would come out up in the air at the north pole. This would be equally true if you run the same levels with equal fore and back sights. A true instrumental level is a series of short chords whose ends are equidistant from the center of the earth, and paradoxical as it may seem, a true level is a true circle. It is literally true that the Mississippi River runs up hill, else its mouth could not be farther from the earth's center than the source. It is also true that no river of the same levels could exist in an east and west course, unless its source was underground and it should rise gradually to the surface. The levels of the Amazon River are most decidedly different from the Mississippi. A. Definitions are the safeguards of a discussion. Unless words are used in the same sense by both sides to an argument a discussion is not profitable. And when you state that "an east-and-west level is not the same as a north-and-south level" and that "the Mississippi River runs literally up hill" it is evident that the terms "level" and "up hill" need definition. We cannot agree to either expression in the sense in which the dictionary requires us to use terms. If we define level, probably the term up hill will take care of itself, since it must be defined as departing from a level by rising above it. The Century Dictionary, which is usually considered as good authority, defines level as "an imaginary surface everywhere perpendicular to the plumb line, or line of gravity, so that it might be the surface of a liquid at rest. Every such surface is approximately that of an oblate spheroid, as the sea level, for example, is." This seems very plain. We cannot think that anyone would maintain that the sea from the latitude of the source of the Mississippi to that of its mouth is uphill, yet if the river flows uphill surely the sea also flows uphill, and a ship sails uphill in the northern hemisphere here, as it sails south. A level is not a surface equidistant from the center of the earth, and is never defined as such. That would not be a level. Water would not lie upon such a surface, and a level run north and south does not differ from one run east and west. It is nonsense to say that a level is run differently in one direction from what is done in another. The only difference is that centrifugal force acts to modify the level north and south, but the liquid of a level, the ship on the sea and the waters of the flowing rivers, all are sensible to the action of this force all the time and everywhere. A level is the surface of still water, and the water of a south-flowing river at its source in the northern hemisphere is above the level of its mouth, and the water of this river flows down hill from its source to its mouth.

(10990) J. F. S. asks: Will you kindly explain how it is that makers of dry batteries rate their cells in amperes? Thus, they claim that a cell will show 14 or 16 amperes. I always supposed that an ammeter simply showed the *rate* at which current flows. This being the case, the reading on the ammeter would be dependent on the voltage and the resistance in circuit. Would it not be better practice to test cells with a voltmeter? A. You are correct in supposing that the amount of current registered on an ammeter connected in a circuit is dependent upon the voltage and resistance. In testing dry batteries, however, it is customary to short circuit each cell for an instant through an ammeter to see what is the maximum rate at which it will discharge. When new, this gives an indication of the capacity of the battery, and, as a cell becomes run down, the rate at which it will discharge when momentarily short-circuited decreases. When this falls to 5 amperes the cell is about used up for anything but very light, intermittent work. Cells in this condition will sometimes still spark a gasoline engine if the vibrator is properly adjusted to suit the weak current they will supply. The voltage also falls off slightly as a dry cell becomes run down, but this indication is not as definite as the amperes in the cell will show, while with a storage cell the voltage taken when the cell is discharging is a good criterion of the amount of charge still in the cell. A dry cell shows 1.5 volts when new and anywhere from 1 to 1.25 or possibly more when run down. A storage cell shows 2.1 or 2 volts under discharge when full, about 1.9 when half discharged, and 1.8 or 1.75 when fully discharged. It will, however, immediately return to 2 volts when on open circuit. In short-circuiting dry cells through an ammeter, but one cell at a time should be tested and care should be taken to have large enough wire to carry the current easily. The wires to the meter should be as short as possible and all connections should be well made. A whole battery of 4 or 6 cells can be short-circuited at once, but this gives an average discharge only and does not indicate the condition of each separate cell.

(10991) W. I. H. asks: 1. What is the heat conductivity of carbon such as the pencils used in arc lamps? What order does it have in the scale of conductors? A. The conductivity of carbon for heat is 0.000405, when copper is 1.0405 on the same scale. This is less than all the metals, stones, and many minerals, and more than most woods, wool, and animal substances generally. 2. What is its fusing point, or does it only fuse in the electric arc? A. Carbon has not been melted, though under sufficient pressure there seems to be no reason why it may not be melted. It turns or seems to turn directly into a vapor upon heating it sufficiently. It vaporizes in the electric arc at a temperature between 5,000 and 7,000 deg. F. The electric arc is the only source of heat hot enough to vaporize carbon. 3. What is its specific gravity? A. The specific gravity of carbon in the form of graphite is from 1.9 to 2.3. The porosity of electric light carbons would probably cause them to appear lighter than this. 4. How is it manufactured and of what is it composed? A. Carbon is manufactured from wood as charcoal; from coal in retorts as graphite. Carbon is carbon. It is an element, and so far as man is able to affect it, it is not made from any other substance, nor changed into any other substance. 5. What holds it together, that is, is it plastic when molded or molded under great pressure? A. Cohesion holds the particles of a lump of coal or other piece of carbon together. It is not plastic in its ordinary states. In the electric light carbons the particles are bound together by some sticky material, and the rod is then burned in a furnace. 6. Is it what would be considered an expensive product? Please give some idea of cost in molded shapes and in bulk. A. Carbon is not an expensive article. You know probably what a ton of coal or a cord of wood is worth at your place. In buying either you are buying carbon. 7. Could scraps of it be pulverized and again molded into shape? A. Pulverized gas carbon, or graphite, is molded, as we have said above. 8. Can you supply us with the addresses of firms making articles of carbon? A. Consult our Manufacturers' Index sent free on request. All dealers in electrical goods have electric-light carbons, battery plates, and motor brushes for sale. They also may have granular carbon for use in the telephone transmitter. Jewelers deal in diamonds, which are crystallized carbon. 9. All authorities do not agree upon the melting point of gold. Please tell the melting point both in Fahrenheit and Centigrade. A. The melting point of gold ranges from 1,035 to 1,250 deg. C.; 1,080 deg. may be taken as an average value. This is from 1,900 to 2,250 deg. F.

(10992) A. L. asks: Kindly oblige me by answering the following questions: 1. What is best material to make a magnet of? 2. What is the best means of making a magnet? 3. Does the north pole of a magnet repel the north pole of another magnet in practice the same as in theory? I mean on a large scale. A. Permanent magnets are made of steel, the best steel to be found. Tool steel is often used. See query No. 10987 on this page. Heat the bar to a cherry red, or if it is long, the ends of the bar, and plunge it endwise into water. It will then be glass hard. Draw the bar across the poles of a strong magnet, either another permanent magnet or, better, an electro-magnet. Do this ten to twenty times, pulling it off in the same direction from one pole, and then reverse the bar and pull the other end from the other pole in the same way. There is a repulsion between similar, and an attraction between opposite poles of two magnets. If the magnets be strong this will also be strong.

(10993) R. E. S. says: In your valuable paper, the Scientific American, of July 29, 1905, under the heading, "Five Thousand Degrees of Heat," I find these words: "We have a heat that cannot be surpassed, and we obtain, in fact, a heat of 5,000 deg." Now, are you aware of the fact that the Carborundum Company, of Niagara Falls, uses 7,000 degrees of heat in producing its so-called carborundum? A thousand horse-power of electric energy, furnished by Niagara, is said to be converted into over 7,000 degrees of heat. In fact the heat is said to be so intense that it burns and vaporizes every known element. I have heard, from various sources, that Thomas Edison, in trying to produce diamonds, led to the discovery and manufacture of carborundum. Carborundum is a mixture of sawdust, sand, and salt fused with coke at the tremendous heat of 7,000 deg. It is said to be diamond in character, of the same hardness, and even more indestructible. It is made up into wheels for grinding purposes and also made into hones and the like, and is, I assure you, absolutely the best grinding substance known. The above facts I take from a paper furnished by the Carborundum Company to one of its agents. A. We note your criticism of the phrase used by our Paris correspondent, "A heat of 5,000 deg." It is doubtless true that the electric arc furnishes the highest known temperature, and that this is the temperature at which carbon volatilizes. It is not so easy as you seem to assume it to be to determine just what that temperature is. A recent book on the electric furnace, by J. Wright, published 1905, contains this statement, page 9: "The temperature of the electric arc itself has never been determined." The highest authority in the world upon the electric furnace is without doubt Henri Moissan, of Paris. In his book, "The Electric Furnace," published July, 1904, page 19, he says, "We do not know the temperature of these pieces of apparatus; it depends upon the temperature reached by the electric arc which may be, according to Violle, 3,500 deg." This corresponds to 6,300 deg. F., since Violle used the Centigrade scale. The temperature of the electric arc is probably limited by the temperature at which carbon is volatilized. This has been variously estimated at from a little above 5,000 deg. F. to about 7,000 deg. F. In Chatelier's "High Temperature Measurements," published September, 1904, page 302, the "extreme temperature of the electric arc" is given at 3,600 deg. C., which is 6,500 deg. F. Wootham, in his book, published 1904, "Recent Development of Physical Science," page 77, gives the temperature of the electric arc as 3,000 to 4,000 deg. C., or 5,400 to 7,200 deg. F. We have given you the results as stated by the most reliable authorities. And we can say that we are not aware that it is certain that a temperature of 7,000 deg. exists in the electric furnace. It appears that our Paris correspondent used the lowest estimate of the temperature, while the advertising circular which you quote and which we have at hand uses the highest estimated temperature of the apparatus, as is natural that it should do. We do not know why our correspondent used the lowest figures, and personally we are accustomed to give both extremes when we use any figures on this point. One way or the other there is nothing to dispute about. If you will read the books we have quoted, especially the "High Temperature Measurements," which we can furnish for $3, you will appreciate the work done in this direction and the difficulties of the problem. Moissan's "Electric Furnace" is also a book well worth reading by any one who would know the facts in the matter. We send it for $3. This book contains the full history of the effort to produce diamonds artificially, in which Moissan has been the chief experimenter and the most successful one. It may be that Mr. Edison has taken a hand in this line of work, since he has done so in almost every line, but his name has not been publicly associated with the artificial production of diamonds. Your sources of information in the matter may be better than ours. The invention of carborundum is credited to Mr. E. G. Acheson in 1893. Moissan, "Electric Furnace," page 264, says: "I had occasion to find, in 1891, . . . small crystals of a silicide of carbon. . . . I did not, however, publish anything on this subject at the time, and the discovery of the crystallized carbon silicide really belongs to Acheson." It is not "diamond in character," as you state, since the diamond is simply crystallized carbon, while carborundum is a compound of silicon and carbon. It is next to the diamond in hardness, or between 9 and 10 on the mineral scale of hardness. Being harder than emery it is a better abrasive, although emery is still preferred by some.

NEW BOOKS, ETC.

Man in the Light of Evolution. By John M. Tyler, Ph.D. New York: D. Appleton & Co., 1908. 12mo.; pp. 231. Price, $1.25.

It is now about fifty years since Mr. Darwin published "The Origin of Species." A host of books have since been written on evolution, Darwinism, and natural selection, but comparatively few zoologists have attempted to show the bearing of the theory of evolution on man's history, progress, and life. They have usually left this problem to the sociologist and the archæologist. The author has attempted to mark out a straight and narrow path through the subject. He has viewed animals and man more from the physiological than from the anatomical standpoint. Much is said of functions, powers, actions; less of organs and structure.

Subject List of Works of Reference, Biography, Bibliography, the Auxiliary Historical Sciences in the Library of the (British) Patent Office. London: His Majesty's Stationery Office, 1908. 18mo.; 336 pages. Price, 6 pence.

An admirable addition to a most useful little series of bibliographical handbooks.

Gas-Engine Manual. By W. A. Tookey. London: Percival Marshall & Co., 1908. 12mo.; pp. 186. Price, $1.50.

There always seems to be room for a book on gas engines, although some fifteen or twenty years ago the literature on the subject was extremely meager. The introduction of the automobile has caused widespread interest in internal combustion motors. Some years ago the author produced several small handbooks which met with favor, and since that time he has been asked repeatedly to write a small, comprehensive work on the gas engine, which would form a stepping stone from these handbooks to more scientific treatises. He has devoted special attention to the nature of disturbances which usually affect the performance of gas engines when erected permanently in factories, which to a practical engineer is of more value than treatises dealing with the theoretical consideration of scientific research, or "test bed" experiments. A special feature of the book is a series of indicated diagrams, most of which are reproduced from actual cards taken by the author in everyday work.

Halley's Comet. An Evening Discourse to the British Association at Dublin on Friday, September 4, 1908. By H. H. Turner, D.Sc., F.R.S. Oxford: Clarendon Press, 1908. 8vo.; 32 pages.

In this paper Prof. Turner has presented a very excellent astronomical history of Halley's famous comet. He gives all the records of its former appearances.

Economic Zoology. An Introductory Textbook in Zoology. By Herbert Osborn, M.Sc. New York: The Macmillan Company, 1908. 12mo.; pp. 490. Price, $2.

This book is not intended merely as a textbook for a school or college student, but it is hoped that it may be of service to that very interesting body of citizens who wish to familiarize themselves with the general principles and the present status of knowledge regarding the animal kingdom. Zoology when presented in such a lucid form as in the present work can be made very attractive. The book is admirably illustrated by 269 engravings.

The Psychology of Advertising. By Walter Dill Scott, Ph.D. Boston: Small, Maynard & Co., 1908. 12mo.; pp. 269. Price, $2.

A most valuable book written by an expert, who brings the psychological laboratory into one phase of modern business life. The typical business man is an optimist. For him the future is full of possibilities that never have been aroused in the past. He is not, however, a day-dreamer, but one who uses his imagination in formulating plans which lead to immediate action. The advertiser may well be regarded as typical of the class of American business men. At the time when advertisements were poorly constructed and given limited circulation, certain enterprising men saw the possibilities of advertising, and began systematically to improve the whole profession of advertising. There is a vast difference between the advertisements of twenty-five years ago and to-day. It is not strange that advertising has as its one function the influencing of the human mind. Unless it does this, it is useless and destructive to the firms attempting it. As it is, the human mind in advertising is dealing with its only scientific basis in psychology, which is simply a systematic study of those same minds which the advertiser is seeking to influence. This fact was seen by wise advertisers, and some ten years ago various theories of advertising began to be reduced to concrete form. The author has produced a critical work dealing with memory, human instincts, suggestions, will, habit, laws of progressive thinking, attention to the value of spaces, psychology of food advertising, railway advertising, etc. It is an excellent book accompanied by a full bibliography.

Color Value. By C. R. Clifford. New York: Clifford & Lawton, 1908. 8vo.; 95 pages. Price, $1.

An admirable volume filled with good suggestions which will be of the greatest service to all interior decorators. It is a scientific treatise in every sense of the word. Its study will prevent the hideous combinations which offend the refined taste in so many houses.

Die Saeugetiere des Deutschen Waldes. Von Dr. Kurt Floericke. Mit Bildern. Octavo. Stuttgart: Kosmos Gesellschaft der Naturfreunde, 1908. Pp. 105. Price, 50 cents.

Dr. Floericke's book on the animals of the German forest is one of the popular series of nature books which have long been published by the well-known German scientific periodical Kosmos. The book is a simple, straightforward account, which should be read with interest by those who have no desire to penetrate deeply into natural history, but who want an intelligible, accurate, and non-technical book on the subject. With the exception of an attempt at fine writing, which seems to be inevitable in all popular works, the book strikes us as an accurate and careful presentation of the subject.

Experimental Elasticity. A Manual for the Laboratory. By G. F. C. Searle, M.A., F.R.S., Cambridge (England). New York: G. P. Putnam's Sons, 1908. 12mo.; 187 pages. Price, $1.50.

A highly specialized treatise which will be warmly welcomed by all physicists. The subject is an interesting one and is admirably treated.

Cement Houses and How to Build Them. By W. A. Radford. Chicago and New York: Radford Architectural Company, 1908. Small quarto; Pp. 158. Price, $1.

This is a practical treatise on the construction of cement houses, giving standard specifications for cement, standard specifications for concrete blocks, general information concerning waterproofing, coloring, paving, reinforcing, foundations, walls, steps, sewer pipes, chimneys, porches, floors, the use of concrete on the farm, with perspective views and floor plans of concrete block and cement plaster houses.

Electric Furnaces. The Production of Heat from Electrical Energy and the Construction of Electrical Furnaces. By Wilhelm Borchers. Translated by Henry G. Solomon, A.M.I.E.E. London and New York: Longmans, Green & Co., 1908. 8vo.; Pp. 224. Price, $2.50.

The present volume is an English version of the second German edition of "Die Elektrischen Oefen" by Dr. Borchers, the well-known authority on electro-metallurgy. The recent rapid development, notably abroad, of the electric furnace is sufficient to prove how important a part it is playing, and is destined to play in a still greater degree in the near future in connection with all classes of metallurgical operations. By the aid of electric furnaces it should be possible to develop new industries and in districts hitherto unsuitable for electrical enterprise, especially where the raw materials are readily obtainable for the production of the substances desired and current can be cheaply generated and supplied, as by the utilization of waste furnace gases and overhead transmission. To those who are comparatively familiar with the subject of electro-metallurgy, this book will prove a revelation. It is filled with the most interesting illustrations, numbering 279 in all. It is a book which we can heartily commend.

Nautical Charts. By G. R. Putnam, M.S. New York: John Wiley & Sons, 1908. 8vo.; Pp. 162. Price, $2.

This is the first work on an important subject. In all the countries of the world, more than a million copies of charts are now issued annually. A considerable portion of the human race are interested directly or indirectly, either as mariners or passengers, or shippers on the sea. Aside from supplying a handbook for those who might have a general interest in the subject, it was thought that a discussion of charts might lead to a further consideration of the principles governing their construction. It is an excellent work well illustrated and well printed.

Merck's 1907 Index. Third edition. New York: Merck & Co., 1907. 8vo.; 472 pages. Price, $5.

An encyclopedia for the chemist, pharmacist, and physician, stating the names and synonyms, source or origin, chemical nature and formulas, physical form, appearance, and properties, melting and boiling points, solubilities, specific gravities and methods of testing, physiological effects, therapeutic uses, modes of administration and application, ordinary and maximum doses, incompatibles, antidotes, special cautions, hints on keeping and handling, etc., of the chemicals and drugs used in chemistry, medicine, and the arts. It is a chemical encyclopedia. But whereas Beilstein takes in all possible combinations, Merck's 1907 Index limits itself to the chemicals and drugs actually on the market, giving in regard to them information comparable to Beilstein's. This latest edition is improved by the addition of the newest products of the chemical industry, by the adoption of the latest nomenclature, by the adherence to the most modern authorities. We have used older editions with much satisfaction. It is indispensable for the editor's desk.

Modern Practice in Mining. Vol. 1. Coal, Its Occurrence, Value, and Methods of Boring. By R. A. S. Redmayne. London and New York: Longmans, Green & Co., 1908. 8vo.; Pp. 199. Price, $2.

The present volume is the predecessor of several others which are to be brought out in successive order, the series constituting a complete work on modern practice in mining. While the British colliery practice is somewhat different than that in vogue in America, still the present work contains enough valuable information to warrant its purchase by any who are in any way interested in coal mining. Special attention is given to prospecting and boring for coal. In fact, this constitutes the largest part of the book. It is well illustrated by numerous engravings.

Ex-Meridian, Altitude, Azimuth, and Star-Finding Tables. By Lieut. Com. Armistead Rust. New York: John Wiley & Sons, 1908. 8vo.; Pp. 393. Price, $5.

All navigators will be interested in this book. It is not a textbook, no space being taken up by rules for the conversion of time, the finding of hour angles, and for plotting lines of position by the usual methods familiar to navigators, which may be found in any work on navigation. The book is a most commendable specimen of industry.

Heating and Ventilation. By Charles L. Hubbard, S.B., M.E. Chicago: American School of Correspondence, 1908. 8vo.; pp. 221. Price, $1.50.

In recent years such marvelous advances have been made in the engineering and scientific fields, and so rapid has been the evolution of mechanical and constructive processes and methods, that a distinct need has been created for a series of practical working guides of convenient size and low cost, embodying the accumulative results of experience and the most approved modern practice in a great variety of lines. To fill this acknowledged need is the special purpose of a series of hand-books to which this volume belongs. The volume is particularly adapted to the purpose of self-instruction and home study. The utmost care has been used to bring the treatment of each subject within the range of the common understanding, so that the work will appeal not only to the trained expert, but also to the beginner and to the self-taught practical man who wishes to keep abreast of modern progress. The method adopted in the preparation of this volume is that which the American School of Correspondence has developed and employed so successfully for many years. The book is excellently illustrated.

Mechanical Production of Cold. By J. A. Ewing, C.B., LL.D., F.R.S. Cambridge, England: University Press, 1908. G. P. Putnam's Sons, Importers, 1908. 8vo.; pp. 204. Price, $3.25.

This book is a reprint of lectures on the mechanical production of cold delivered before the Society of Arts in 1897, with additions and corrections which show the advance of the past eleven years, and bring the accounts of machines and processes into accord with the practice of the day. In its main feature the art of refrigeration has undergone little change in that time, but notable progress has been made in some directions, and this has required the introduction of a good deal of supplementary matter. The refrigerating machine is essentially a contrivance for pumping up heat from a place that is comparatively cold to a place that is comparatively warm, and the question of primary interest is how to do this pumping with the least expenditure of power. We are concerned with the theoretical limits to the economy of power that hold in ideal refrigerating processes, and with considerations as to how nearly the actual conditions under which refrigeration is carried out will allow these limits to be approached when one or another type of real machine is employed. The lectures are in great part an attempt to make this side of the subject intelligible without unnecessary mathematics. The book is excellently illustrated.

Sewer Construction. By Henry N. Ogden, C.E. New York: John Wiley & Sons, 1908. 8vo.; pp. 335; 192 figures. Cloth, $3.

The course represents the second part of a year's work, of which the book on "Sewer Design," already published, is the first part, and it is assumed that the reader is familiar with that volume. The work appears to be an excellent one, and is deserving of a good sale among those interested in the subject.

Massing of Spheres. A Geometrical Demonstration of the Constitution of Matter. By G. J. Stevens. London: J. Haslam Company, Ltd., 1908. 4to.; pp. 21. Price, $1.

The Letters of Jennie Allen to Her Friend, Miss Musgrove. By Grace Donworth. Boston: Small & Maynard Company, 1908. 12mo.; pp. 291. Price, $1.50.

INDEX OF INVENTIONS

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

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Cigarette machine, C. A. Marchal	903,101
Cisterns, form for making, T. B. Lepley	902,6[illegible]
Closet connection, G. M. McCloskey	902,897
Cloth stentering machine clip, A. A. Whitley	903,144
Clutch, F. M. Prather	902,761
Clutch, C. W. Pradeau	902,999
Clutch and brake mechanism, ratchet, J. M. Daly	902,805
Clutch for die presses, non-repeating, J. L. Allen	902,545
Coal and ore handling machinery, etc., W. Seaton, Jr.	902,839
Cock, ball, H. N. Libbey	902,825
Colander, H. L. McCoy	903,104