## RECENTLY PATENTED INVENTIONS.

### Pertaining to Apparel.

HAT-FASTENER.—S. M. JOHNSTONE, New York, N. Y. The principal object of the invention is to provide simple and effective means for attaching a hat-fastener to a hat in such a way that it always remains upon the hat and does not have to be removed each time the hat is taken off, but at the same time can be removed, if desired, in order to secure it to another hat.

TROUSERS-HANGER.—A. CHELBERG, New York, N. Y. Hangers as heretofore constructed have been either too complicated for general use or have failed to provide means for supporting the garments in a proper manner. The principal objects of the invention are to construct a hanger in such a manner that although the trousers can be held in natural and proper position, yet the construction will be simple and there will be few parts liable to get out of order.

### Electrical Devices.

PANEL-BOARD.—E. R. LEMANQUAIS, New York, N. Y. Each section of the sectional panel-board may be used independently, if desired, and the sections may be combined in any number, so as to make up a panel-board of any desired size. The devices for holding the fuses are improved so that the latter may be securely held with proper electrical contact and yet removable at will without danger to the operator. The board minimizes the danger of shocking persons operating or adjusting the same.

### Of General Interest.

BALANCED SUCTION AND FORCE PUMP.—P. H. J. PAINDAVOINE and P. A. PAINDAVOINE-DUFOUR, Les Fontanettes à la Chapelle aux Pots, Oise, France. In this patent the invention has for its object a suction and force pump in which the effort required for operating it is distributed and rendered uniform, thus rendering its running exceedingly easy, so that far less fatigue is occasioned than would be necessary for operating under the same working conditions an ordinary suction and force pump.

CANDLESTICK.—J. KINDELAN, Leadville, Col. This readily adjusted miner's candlestick comprises a body portion consisting of a single length of spring-steel bent to form a loop terminating in segmented portions; a spike extended from one of the segmental portions; a hook on one of the segmented portions and segmental plates secured to the said portions.

VALVE.—C. E. SIMPSON, Portsmouth, Ohio. The more particular object of the inventor is to produce a valve that will prevent scale or foreign substances from being caught on the valve-seat as the valve is being closed, thereby preventing the injury often done by scale being crushed on or imbedded in the valve-seat or preventing the valve from entirely closing because of the obstruction having caught between the closing parts.

WORKING BARREL FOR OIL AND OTHER PUMPS.—W. H. WESTERMAN, Marietta, Ohio. The object in this case is to produce a working barrel which is now usually made of brass, iron, or steel that will combine the advantages of iron, steel, and brass, that will be cheaper and stronger than ordinary barrels, and one in which the cups or valves can be readily inserted without sticking and one in which the ends will not be crushed in when coupled with another section of pipe or barrel.

HOSE-CLAMP.—J. E. JOHNSON, New Paynesville, Minn. The invention is an improvement in that class of clamps that comprise a band and pivoted cam, which is permanently secured to one end of said band and adapted for detachable engagement with the other, the construction being such that in the closed position the cam holds the band drawn tightly around the hose.

DIRT-SCRAPER.—J. HARTER, Tiffin, Ohio. In this case the invention has reference particularly to improvements in dirt-scrapers for road and field work, the object of the inventor being the provision of a scraper of simple and novel construction and operating to thoroughly harrow or break up the dirt of a road or field and then smooth the same.

ROLL-PAPER HOLDER AND CUTTER.—J. F. FINAN, Cumberland, Md. The invention is in the nature of a paper-holder and cutter for holding upon a store-counter or elsewhere a roll of paper from which sheets of varying size may be cut off at will to suit the size of package to be put up. It is an improvement upon the device for which Mr. Finan was formerly allowed a patent.

### Household Utilities.

TRAP FOR SINKS, BATH-TUBS, AND THE LIKE.—A. SAVARD, Omaha, Neb. In its practical entirety this trap forms an integral part of the sink, bath-tub, or wash-basin with which it may be associated. It is easy of access for the purposes of cleansing or emptying accumulated contents and possesses the capacity for long and repeated service. The invention refers more especially to traps for sinks, bath-tubs, wash-basins, and the like, pertaining generally to the type of such devices forming the subject of Letters Patent formerly granted to Mr. Savard.

CRIB.—W. W. GRIGSBY, New Orleans, La. The invention relates, more definitely stated, to crib attachments to bedsteads, and has for its object an improved attachment of this character, adapted for ready attachment and detachment, and adapted when detached to be folded into compact condition facilitating its being shoved under the bedstead or stored away ready for use.

WINDOW-FASTENER.—R. G. FRASER, Philadelphia, Pa. Mr. Fraser's invention pertains to window-fasteners, his more particular object being the production of a simple, efficient, and reliable fastener capable of locking the upper and lower sashes in any desired position and offering certain constructional advantages, such as the prevention of windows rattling or any movement between the upper and lower sashes until desired.

### Machines and Mechanical Devices.

MICROMETRICAL ADJUSTMENT FOR PRINTING-FILM FRAMES.—B. DAY, West Hoboken, N. J. Mr. Day's invention relates to the accurate hinging and holding of a printing-film frame and its printing-film so that they can be raised, lowered, removed for inking, and replaced and yet fall on the work in exactly their original positions, also to devices whereby subsequent prints from the same printing-film printed over or alongside the first print, can be manipulated with accuracy and the manipulation recorded for future reference. Many features of this invention and especially those relating to adjustment, can be operated in connection with Mr. Day's Weighted Hold-Fast, which is already patented.

LOOM-SHUTTLE.—W. H. WILSON, New Bedford, Mass. In this patent the invention relates to weaving; and its object is to provide a new and improved loom-shuttle having a spindle arranged to prevent undue wear and sidewise vibration and consequent breaking of the thread and to allow convenient renewal of a spindle-shank when broken or otherwise injured.

HEDGE-TRIMMING MACHINE.—R. SMITHERS, Nortonville, Kan. The objects of the improvement are to provide mechanism, first, to cut the top and side of hedge at the same time; second, for the proper adjustment of the sickles to cut either the top or the side separate; third, to raise or lower the horizontal sickle so that it can be adjusted to cut any height hedge while in motion; fourth, to facilitate vertical adjustment or the removal of the horizontal sickle; fifth, for adjusting the one end of the platform as may be required on inclined or uneven surfaces.

FILM-HOLDER FOR PICTURE-EXHIBITING MACHINES.—M. SMITH, Winnipeg, Canada. One purpose of the invention is to provide a film-holder for use in connection with picture-exhibiting machines, which will be readily operated and in which imperforate films can be used, thus simplifying the operation and greatly adding to the lifetime of the films.

WASHING-MACHINE.—H. F. PFLUM, New York, N. Y. A principal object of the invention is to produce a machine the construction of which especially adapts it for portability and enables the machine to be readily detached or attached in operative position. A construction has been adopted also which enables the principal part of the device to be thrown to one side, so as to facilitate the attachment of a wringer in the position normally occupied by the same. It relates especially to that class which may be operated by hand.

BLINDSTITCHING SEWING-MACHINE.—F. HERMAN, Lincoln, Neb. The object of the invention is to provide an attachment whereby blindstitching may be effected, with a greater degree of perfection and reliability than heretofore. The attachment is secured to the bedplate and head of an ordinary sewing-machine, preferably such as is employed for manufacturing purposes rather than of the domestic class, and but little modification of the sewing-machine proper is required.

### Medical Appliances.

TOILET ARTICLE.—F. A. STEELE, New Rochelle, N. Y. In its preferred embodiment the invention comprises a packing of paper having on one side a mass of absorbent material—to wit, cotton-batting covered by a woolen fabric. Preferably both the paper and the absorbent material are medicated, so that when dampened the medicines will act on the anus, thus exerting a curative effect at the same time cleansing the parts.

HYPODERMIC SYRINGE.—J. W. HORNER, Columbus, Ind. Mr. Horner's invention consists of a novel form of the ordinary hypodermic syringe designed to secure a tight fit of the piston in the syringe-barrel without risk of accidental loosening of the piston and by a very simple and practical construction. One modification of the invention gives a syringe of such compact form when closed as to be especially well adapted to the limits of the small case forming a physician's outfit.

### Railways and Their Accessories.

RAILWAY-CAR TRUCK.—G. C. STEWART, Marengo, Ind. The object of the inventor is to provide details of construction for a car-truck that will counteract the lateral yielding movement of the car-body on its spring-supports, either forward, rearward, or sidewise, and by cushioning such a lurching movement obviate in a large degree the objectionable jerking motion incidental to the operation of cars having running-gear of ordinary construction. It more particularly relates to trucks of running-gears for street-railway cars propelled by motors actuated by electricity.

APPLIANCE FOR CAR-COUPLINGS.—P. W. HOGAN, Durand, Mich. Mr. Hogan employs an appliance comprising a hood or bonnet to adapt the appliance to be readily fitted in place over one of the heads of a coupling between the cars in the event of breakage of some part of the head—say, for instance, the usual knuckle carried thereby—combined with which head or bonnet is a knuckle to take the place of the one broken, means being also employed for securing the appliance in position for effective operation.

### Pertaining to Vehicles.

CHECKREIN-FASTENER.—C. W. BARRETT, Hanford, Cal. The invention has reference to improvements in devices to prevent accidental detachment of a checkrein from a check-hook, the object being to provide a fastening device that will be simple and inexpensive and that may be readily connected to any ordinary form of check-hook.

### Designs.

DESIGN FOR A ROSARY.—B. TEUBNER, New York, N. Y. This rosary as designed is very ornamental and chaste. The medals containing the heads of saints at the usual intervals are well executed, the Lord's at the junction of the loop and the pendant suspending the crucifix being in the form of a heart.

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

## Business and Personal Wants.

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

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

**Inquiry No. 7958.**—Wanted, makers of slot machines for vending water.

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

**Inquiry No. 7959.**—Wanted, a machine for engraving names, etc., on glassware.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

**Inquiry No. 7960.**—For manufacturers of wire nail machines.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

**Inquiry No. 7961.**—Wanted, parties to undertake the manufacture of 22-caliber round rifle barrels, 22 and 24 inches long, such as used on modern repeating rifles.

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

**Inquiry No. 7962.**—Wanted, a pump run by electric motor, an inch inlet and ¾ inch discharge, 16 feet suction, 40 feet raise, rotary; with motor ¼ h. p.

Lithographing adds solidity and strength to your business stationery. Letter heads, $2 per 1,000. Stilwell, 709 Pine St., St. Louis.

**Inquiry No. 7963.**—Wanted, manufacturers of dextrine.

FOR SALE.—Self-swinging gate, great improvement. Sell or lease on royalty. Patented November 21, 1905. Claude Siebring, George, Iowa.

**Inquiry No. 7964.**—Wanted, manufacturers of cardboard puzzles.

Metal Novelty Works Co., manufacturers of all kinds of light Metal Goods, Dies and Metal Stampings our Specialty. 43-47 S. Canal Street, Chicago.

**Inquiry No. 7965.**—Wanted, balls of about 1 inch or 1¼ inches in diameter for static machine; also wire suitable for brushes; also rubber in sheets and rods for same machine.

**Manufacturers of patent articles,** dies, metal stamping, screw machine work, hardware specialties, machinery tools, and wood fiber products. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

**Inquiry No. 7966.**—For makers of wire bands (electrically welded).

WANTED.—An experienced mechanical draughtsman. Must be competent to design machinery from sketches, must be able to accurately estimate weights and costs. No inexperienced correspondence school graduates need apply. Address or apply to Broomell, Schmidt & Steacy Co., York, Pa.

**Inquiry No. 7967.**—Wanted, a machine or appliance for cutting out canvas gloves.

WANTED.—Capable, business-like man to take full charge in manufacturing a line of cream separators. Must be graduate of Technical College; capable of handling men; acquainted with modern machinery and modern methods. Must have had experience in manufacturing cream separators. Only applications of first class men considered. Address or apply in person. Smith Mfg. Co., 158 E. Harrison St., Chicago.

**Inquiry No. 7968.**—Wanted, makers of soap-molding machines.

**Inquiry No. 7969.**—Wanted, the name and address of the maker of the monarch wall paper trimmer.

**Inquiry No. 7970.**—Wanted, makers of translucid fiber, wire glass or other material for use in factory buildings.

**Inquiry No. 7971.**—Wanted, parties to do enamel work of special kind.

**Inquiry No. 7972.**—Wanted, parties to make small steel castings in small quantities.

**Inquiry No. 7973.**—Wanted, information concerning the Braum-Viga calculating machine.

**Inquiry No. 7974.**—For parties making small castings, and who enamel them.

**Inquiry No. 7975.**—For makers of small castings cast in metal molds to exact size.


HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

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

(9917) V. P. says: A few weeks back I was a member of a party visiting a gold mine in Colorado. When descending the shaft we were told by operator that the elevator could be dropped faster than our bodies could fall down the shaft. A. The elevator could not fall faster than your body unless pulled down by some force other than gravity. The law of falling bodies is that the acceleration due to gravity is 32.16 feet per second.

Letting $g$ = 32.16 feet per second in one second,

$v$ = final velocity, or velocity at time of contact with the earth,

$t$ = number seconds,

$h$ = space in feet passed in $t$ seconds,

then $v = gt$.

Thus, a body allowed to start falling from a point of rest, resistance of air neglected, falls 16.08 feet the first second. The acquired velocity is 32.16 feet per second. The distance fallen in two seconds would be $h = \frac{gt^2}{2} = 16.08 \times 4 = 64.32$ feet, and the acquired velocity is 64.32 feet per second. The increase in velocity in each second is constant, and is 32.16 feet per second. Thus,

$$v = gt = \frac{2h}{t}$$

(9918) H. H. asks: Is the specific gravity test of kerosene oil important with reference to its condition of purity? Is it important with reference to its lighting qualities? Is the so-called heat test of kerosene oil sufficient to prove its lighting qualities as well as its purity? Can adulteration, affecting the lighting quality of kerosene oil, be discovered by any other method than the specific gravity test? Will adulteration tend to lower or raise the so-called "flashing point" of kerosene oil? A. The specific gravity, or rather the Baumé test for kerosene, is an important test as regards its purity, but is only equal in importance with other tests which the oil has to withstand. There are many adulterants which could be used which would not change the specific gravity of the kerosene. The lighting qualities of kerosene depend, with equal importance, upon the "fire test," the "flashing point," the "viscosity," and the "specific gravity" of the oil. Adulterants can be used which raise the flash point or which lower the flash point. It all depends upon the kind of adulteration. As to the detection of adulteration in kerosene oil, we would say that it would be extremely difficult for one, other than an experienced oil chemist, to discover accurately the adulterant used, for in many cases pure kerosene will come far from the required tests and still contain no adulteration. One-half of one per cent of moisture in the oil could be easily detected from the cloudiness of the oil.

(9919) P. A. R. asks: Please send to my address any statistics you may have in back issues of your paper, in regard to the controversy which exists as to when the next year will come containing fifty-three Sundays. Some say that it will come in fifty years, others say in one hundred and ten years. A. The question when a year will contain 53 Sundays is not properly a subject of controversy. It can be decided by any one who will make a table of the years with care. Each common year contains 52 weeks and 1 day. Each common year then begins and ends on the same day of the week. Each leap year has 52 weeks and 2 days, and ends one day in the week later than it began. This is all which need to be known to settle the question. Now to begin, 1905 began and ended on Sunday, and so had 53 Sundays, 1906 begins and ends on Monday, and has 52 Sundays. 1907 begins and ends on Tuesday with 52 Sundays. 1908 begins on Wednesday, but as it is leap year it ends on Thursday, and 1909 begins and ends on Friday, while 1910 begins and ends on Saturday. All these have 52 Sundays. Now 1911 begins and ends on Sunday, and has 53 Sundays. This is six years later than 1905. The years of this century which will have 53 Sundays are 1905, 1911, 1922, 1928, 1933, 1939, 1950, 1956, 1961, 1967, 1978, 1984, 1989, 1995. It is seen that the differences are 5, 6, and 11 between the years of this series.

(9920) A. R. Van H. asks: 1. Will a four or a five inch spark of an induction coil penetrate a piece of glass or a piece of hard rubber 1/32 inch thick? If it will, will it penetrate the same, 1/16 inch thick? A. The electrical energy of a spark four inches long through the air would probably pierce a thin glass, or a piece of thin hard rubber. We have no figure for the thickness. The discharge points should be brought close to the glass on opposite sides, and the discharge be made as suddenly as possible. 2. I read in one of your papers of the number of pounds of water that flows over the Niagara Falls a second, but I cannot find it now. Would you please tell me the number? I think it was 213,000, but I am not sure. A. The commonly accepted volume of water passing over Niagara Falls is 224,000 cubic feet per second. This is 14,000,000 pounds per second. Falling 160 feet it gives about 7,000,000 horse-power continually.

(9921) H. M. asks: Does the buoyant or floating power of a tank filled with air vary in accordance with the depth to which the tank is submerged? For example: Would the lifting power of this tank be greater when the top of the tank would be one foot below the surface of the water than it would be if the top of the tank were ten feet below the surface of the water? If you could refer me to any literature which dwells on subjects of this kind, your kindness would be most highly appreciated. A. A tank closed airtight and submerged in water is buoyed up by the weight of the water it displaces, that is by amount equal to the weight of a volume of water which is the same as the volume of the tank. This is independent of the depth of submergence. If, however, the tank is open at the bottom, so that water enters it, its buoyant power decreases as it is sunk deeper into the water, since water enters and compresses the air into a smaller volume. The only point involved is the volume of water displaced. The principle is called Archimedes's principle, which may be found in any text-book of physics. Probably Kent's "Engineering Pocket Book," price $5, will give you the most assistance in matters of hydraulic engineering.

(9922) P. C. G. asks: Will you please describe to me just what is "denaturized" or "denaturalized" alcohol, that is now before Congress for entry free of duty? A. Denaturized alcohol is common alcohol to which some substance has been added to render it unsafe for its natural use; that is, if a small percentage of wood alcohol be added, the mixture is poisonous, and cannot be used for making any liquors for drinking, but it can still be used for mechanical purposes, or in the arts. There are other substances which may be added to alcohol with like effect. The word denaturized is not in the dictionaries as yet.

(9923) W. E. B. asks: In your issue of February 3, in an article headed "New Conceptions in Astronomy" by Prof. Edgar L. Larkin, he says: "A trillion is a million million." Webster's unabridged says: "A million million is a billion." Can Notes and Queries throw any light? A. You surely do not read your Webster as we read ours. Ours states under "Billion; according to the French and American method of numeration, a billion is a thousand millions, or 1,000,000,000; according to the English method, it is a million millions, or 1,000000,000000." The English method places six figures in each period; the French, three figures in a period. A trillion in a book published in England is 1,000000,000000,000000; in a French or American book a trillion is 1,000,000,000,000—only a millionth part of an English trillion. Prof. Larkin is an American and names numbers according to American custom. Webster's Dictionary, under "Numeration," states the matter clearly; so, also, does it under "Billion" and "Trillion." We follow the French or American method of writing and reading numbers.

(9924) A. C. asks: We had a discussion in our shop, and as we cannot try it I would like you to decide:. Weigh a tubful of water and then put in a 10-pound fish and if the fish does not touch the bottom will it weigh any more? A. If a fish alive or dead is put into a tub of water and no water runs over, the tub and fish will weigh as much more than the tub weighed before as the weight of the fish. That is because the fish is added to the contents of the tub. If a live fish is put into a tub entirely full of water and the fish floats in the water without resting any weight on the bottom of the tub, as much water in weight as the weight of the fish will flow over as the fish enters the water, and the tub, fish and remaining water will weigh the same as the tub and water weighed before the fish was put into the water. Every body submerged in a liquid is buoyed up by a force equal to the weight of the liquid displaced. If the fish sinks to the bottom and bears any part of its weight on the bottom of the tub, the tub will weigh more with the fish in it than it did before the fish was put into the tub. This last is, however, rarely if ever the case.

(9925) L. R. asks: What is the expansion of a zinc bar 40 inches long, during a variation of five degrees—say from 100 to 105 deg. F.? Is there any metal or alloy that will give a greater expansion? If so, what and how much? A. The expansion of a bar of zinc 40 inches long for a change of 5 deg. Fahrenheit is a trifle more than three ten-thousandths of an inch. Cadmium will expand slightly more than zinc, about in the ratio of 30 to 29.

(9926) R. T. asks: 1. How many amperes does a 110-volt incandescent lamp require? A. A 16-candle lamp at 110 volts takes about one-half an ampere. 2. What is the principle of a pedometer? A. A pedometer is moved by the rocking motion of the body in walking. It will register by the same motion when one is not walking. The motion of a rocking chair may make it run. 3. How long will a storage battery retain its full charge? A. A storage battery does not lose charge by leakage. So far as that goes the charge will be retained indefinitely.

(9927) G. A. R. asks: 1. A spark cannot be passed between two electrodes separated by a vacuum. Are we to infer from this that a vacuum is a perfect insulator? A. A perfect vacuum would be a perfect insulator. 2. The distance separating two particles can be halved. This second distance can then be halved and so on—according to mathematics, infinitely—which would require infinite time. Yet practically it can be accomplished in a finite time. How is this explained? A. It is quite true that mathematical zero cannot be reached by the successive division of a number by two, or by halving a certain space. But that need disturb no one. It is easy to reach a value less than any assignable value, and that is practically zero. Thus in the case of our money. When a sum has been halved successively till it is reduced to less than one mill, the process must end, since there is no denomination in which to express the value. Practically the problem you present is a logical quibble, of interest only to a mathematical quibbler. There ought always to be common sense back of logic, but unfortunately it is not always plainly visible.

(9928) A. A. F. asks: 1. How do they get this very low zero you speak of in February 10, 1906, No. 9887? A. Absolute zero is computed from the behavior of gases when cooled. Their contraction leads to the belief among scientific men that all heat would be gone from matter if it were cooled to 459 deg. F. below zero. 2. What is the lowest natural temperature known, and the lowest artificial cold yet produced? A. The lowest thermometer reading ever reported upon the earth is from a self-registering thermometer which was left for a number of years in the Arctic regions. It showed 95 deg. F. below zero. Previous to this the lowest observed was at a place in Siberia, 90 deg. F. below zero. 3. Please explain this; Haswell on page 879 asks: How many fifteens can be counted with four fives, operation

$$\frac{4 \times 3 \times 2 \times 1}{1 \times 2 \times 3} = \frac{24}{6} = 4.$$

A. The formula you give for fifteens to be made from four fives is the ordinary formula for combinations demonstrated in algebra. You will find it in any large algebra. 4. Why is it colder at the south pole than at the north? A. The southern hemisphere is largely covered with water, hence it is colder. The earth is farthest from the sun in July, which is the mid-summer month of the southern hemisphere. This makes the summer there a little colder than the northern summer.

(9929) E. H. asks: Would you kindly inform me where I could find a good description of Marconi's magnetic detector which is used in connection with a Wheatstone recorder? How are the inductance coils that are used in both the receiving and sending station wound and what size wire is used? What is the resistance of the choke coils used in the receiving circuits? A. You will find the Marconi magnetic detectors described in Maver's "Wireless Telegraphy," which we can send you for $2. Several sizes of choke coils are also described in the same book, as also are the induction coils.

(9930) J. D. writes: I have purchased some selenium for the purpose of making electro-light experiments, about which I have read so much in technical papers. I think it must go through some sort of a process before it can be used, for I find it to be a poor conductor of electricity. With a 1,000-ohm telephone ringer not the slightest effect is produced upon so delicate an apparatus as a telephone receiver. A. Selenium is not a conductor of electricity in any condition. It is a better conductor after it has been prepared than in the ordinary condition. It is kept for several hours at a temperature just below its melting point. It is then spread over the space between parallel wires, better wound upon a porcelain tube, so that the two wires are quite near together. When it has cooled it is in the sensitive state. The current sent from one wire to the other will be increased by allowing light to fall upon the selenium cell, as it is called. The resistance will be several hundred ohms probably at the lowest. We would advise you to apply to the professor of chemistry or physics at the University in your city. These men are always glad to give advice and assistance to others.

(9931) A. R. asks: Does a cannon ball fired from a cannon follow the tangent of the barrel a short distance after leaving the mouth of the cannon or does its path describe an arc with a diminishing radius beginning at the mouth of the cannon? A. A cannon ball becomes a falling body as soon as it clears the mouth of the gun, and falls in the same manner as far as distance and velocity is concerned as if it were to fall from rest with no forward motion. It does not follow the tangent of the barrel at all.

(9932) R. S. McF. asks: Would you kindly explain how I could use a 100-volt induction motor on a 110-volt current? I tried one way by connecting a 10-volt lamp in series with it, but had no satisfaction. A. A small resistance coil placed in series with your motor will take up the extra ten volts and enable the motor to run with safety. The wire must be of a size which will carry the current without heating too much. The small lamp you used was not able to carry the current required. Its filament had too high a resistance to allow current enough to flow for the motor, and so the motor did not get current enough to turn it.

(9933) C. W. asks: In your issue of February 10, 1906, page 137, Notes and Queries (No. 9887), you state that absolute zero is —459 deg. Is it a fact that scientists have accepted this as absolute zero? On what is it based? How was it determined? and how is it measured? What does absolute zero mean? Is it a condition of temperature at which no heat whatever exists or is radiated? A. It may be positively stated that all modern scientists accept 273 deg. C as absolute zero, or the temperature at which molecular motion would cease, all heat would be gone from matter. Astronomers believe that this is the temperature of the spaces outside of the earth's atmosphere. The degree we gave, —459 deg. F, is the Fahrenheit equivalent of —273 deg. C. The idea of absolute zero is based upon the fact that all gases at the freezing point of water expand and contract by the same amount if the temperature is changed one degree and this amount is 1/273 of their volume if the temperature is changed one degree Centigrade. Since the volume of a gas is dependent upon its temperature it is evident that the cooling of a gas degree by degree will cause it to shrink proportionately till if it is cooled 273 degrees its power to shrink will be gone also; that is, all the heat will have left the gas. This reasoning is not weakened by the fact that the gas would change to liquid before the absolute zero is reached. Dewar has gone within a very few degrees of absolute zero in the attempts to liquefy helium. The absolute scale was devised by Lord Kelvin and is very frequently employed in giving temperatures in scientific papers. It is the only scale in which the degrees have a direct quantitative relation.

## NEW BOOKS, ETC.

High-Tension Power Transmission. By the High-Tension Transmission Committee of the American Institute of Electrical Engineers. New York: McGraw Publishing Company, 1905. 8vo.; pp. 466. Price, $3.

At a meeting of the Board of Directors of the American Institute of Electrical Engineers on September 26, 1902, the resolution was passed to appoint a committee for the purpose of collecting data on present practice in electric transmission at high voltage. The work covered a large scope, including data upon line construction, insulators, insulator pins, and the like, and conditions of operation at different voltages and under different climatic conditions, also conditions attendant upon the switching of high-tension circuits, and data respecting lightning and static disturbances, and the use of grounded protective wires. The work of this committee brought out much valuable information, which is here collected in compact and convenient form, and should prove a very valuable addition to engineering literature.

Wireless Telegraphy and Telephony. By Prof. Domenico Mazzotto. Translated by S. R. Bottone. New York: Macmillan & Co., 1906. 16mo.; pp. 416; 253 illustrations. Price, $2.

The object of this work is to present to the reader in as simple a form as possible the principles on which the wireless system of signaling is founded, and to describe the apparatus required. It also follows step by step the progress of different inventors who have revised wireless systems, and it traces chronologically the progress made in wireless telegraphy from the first experiments of Marconi at Bologna to the last results of transatlantic wireless signaling.

Taschenbuch der Kriegsflotten. VII. Jahrgang, 1906. Mit teilweiser Benutzung amtlichen Materials herausgegeben von B. Weyer, Kapitaenleutnant. Mit 410 Schiffsbildern. Muenchen: J. F. Lehmanns Verlag. Cloth, 16mo.; pp. 392. Price, $1.75.

This year's annual of the world's navies, edited by Capt. Weyer, shows considerable improvement over last year's volume so far as the amount of material published is concerned. Furthermore, the number of pictures of vessels actually in commission has been increased. There is hardly a single type of vessel that is not illustrated both by photographs and by clear diagrams. Naturally, the most marked changes to be noted in the volume before us are the records of the Russian loss and Japanese gain in naval power. An admirable feature of the book is the collection of naval programmes of the various countries. Capt. Weyer announces the intention of publishing an appendix in the month of June, which will contain whatever modifications have been made in the navies of the world since January, 1906.

Lectures on Mathematics. By Edward Burr Van Vleck, Henry Seely White, Frederick Shenstone Woods. New York: Macmillan Company, 1905. 12mo.; pp. 187. Price, $2.

This book is published for the American Mathematical Society, and contains the papers read at the Boston Colloquium, in 1903. The subjects covered are Linear Systems of Curves on Algebraic Surfaces, by Mr. White; Forms of Non-Euclidean Space, by Mr. Woods; and Selected Topics in the Theory of Divergent Series and of Continued Fractions, by Mr. Van Vleck.

The World Almanac for 1906. New York: Press Publishing Company. Pp. 569. Price, 25 cents.

The 1906 edition of the World Almanac and Encyclopedia, which has just been issued, differs little from its predecessors of other years, beyond the usual addenda, corrections, and enlargement necessitated by the occurrences of the past twelve months. The book is so well known and so largely used by many of the reading public that it needs little recommendation at the hands of the reviewer. It will often be found invaluable as a supplement to reference works of a general character, for the comprehensive information contained in its pages is of necessity concise and brief. Particularly varied and brief are the facts relative to New York city and vicinity, and this portion of the publication forms an excellent guide book and directory, not only for the stranger, but for resident New Yorkers as well. The arrangement of the major part of the general information in tabular form, together with the wide cross-indexing of the table of contents, is of great assistance to the reader in locating any of the data in the book.

Congress of Arts and Science. Universal Exposition at St. Louis, 1904. Edited by Howard J. Rogers, A.M., LL.D., Director of Congresses. Vol. I. History of the Congress by the Editor. Scientific Plan of the Congress by Prof. Hugo Muensterberg. Boston and New York: Houghton Mifflin Company, 1905. 8vo.; cloth; pp. 626. Price, $2.50.

To the readers of the technical press, the papers which constitute this first volume of the Proceedings of the Congress of Arts and Science, which met at the Universal Exposition of St. Louis, 1904, are more or less familiar. Their collection and publication in book form assuredly gives them the permanence which they deserve. Among the more important papers which were contributed may be mentioned Prof. Simon Newcomb's "Evolution of the Scientific Investigator"; Prof. Ladd's "Development of Philosophy in the Nineteenth Century"; Prof. Ostwald's "Theory of Science"; and Prof. Poincare's "Principles of Mathematical Physics."

Weltausstellung St. Louis, 1904. Die Chemische Industrie (Unter Rücksichtnahme auf das Unterrichtswesen). By Dr. Paul Cohn, Alfred Hölder, K. U. K. Hof- und Universitäts-Buchhändler. Vienna: 1905. 4to.; pp. 112.

In this monograph Dr. Cohn has presented a very comprehensive view of the chemical exhibits of the St. Louis Exposition of 1904. After a general introduction in which the general scope of the chemical industry is set forth, and its relation to expositions explained, he passes to a discussion of metallurgy and anorganic industrial chemistry. The progress of the industry in each country is discussed in detail. The second division is devoted to fuels and organic technical industries and discusses at some length dye-making in various countries. The third division is devoted to pharmaceutical operations, essential oils and perfumes. In the fourth division, fats, soaps, candles, glycerine, and explosives are treated. The fifth division is a special treatise on educational work and scientific instruction. A summary closes the monograph.

The Pennsylvania Railroad System at the Louisiana Purchase Exposition, Locomotive Tests and Exhibits. Philadelphia: The Pennsylvania Railroad Company, 1905. 8vo.; pp. 734; 800 illustrations Price, $5.

This valuable work is a compendium of the elaborate series of tests carried out by the Pennsylvania Railroad Company in connection with their exhibits at the Louisiana Purchase Exposition at St. Louis. This plant was the most complete locomotive testing plant ever erected and the tests of the eight locomotives that were submitted were made with every refinement known in the art of carrying out mechanical tests of this character. In planning the plant, it was laid out with sufficient capacity to accommodate locomotives of widely varying types and dimensions. It was intended originally to present the plant merely as an exhibit, and at the close of the exposition to remove it to the Pennsylvania Railroad's property; but it was ultimately determined to carry on at St. Louis a series of tests and enlist