RECENTLY PATENTED INVENTIONS.

Electrical Devices.

POLE.—W. ROBERTS and C. ROBERTS, Springfield, Ohio. The invention relates more especially to such poles as are used for stringing electric circuit wires and the like. The pole can be braced equally on opposite sides, when for example, the pole is inclined on curves and the like. The device is adapted removably to carry a mast and cross-arms upon which the wires are strung. Messrs. Roberts have invented another pole or standard formed from concrete or other plastic substances adapted subsequently to harden, and having reinforcing tension members imbedded or partially imbedded therein, T-iron or similar elongated members, and having annular holding members encompassing the tension members, the poles being formed in sections secured together by a connection of special form.

WIRE STRETCHING AND SPLICING DEVICE.—P. O. LARSON, Kellys, N. D. The invention refers to devices for stretching and splicing broken telegraph and telephone wires, and is designed to do away with the necessity of using clamps, pulleys, etc., now commonly used for this purpose, which becomes necessary when wires are cut, or broken by accident, accumulation of sleet, etc.

Of Interest to Farmers.

DRAFT-EQUALIZER.—H. C. SCOTT, Ritzville, Wash. The aim of the invention is to provide an equalizer arranged to distribute the load to be hauled equally to the animals in the team, to reduce the friction of the working parts to a minimum, and to provide a comparatively short but very strong and durable equalizer not liable to get out of order nor cause entanglement of the animals when in use.

Of General Interest.

ANCHORING-BASE FOR POSTS.—P. T. BAILEY, Middletown, R. I. The base is capable of being readily placed in position, and one wherein when the base is in position which is within the ground, will be firmly and immovably anchored, while that portion above the ground, and which is adapted to receive the post, will admit of vertical adjustment of the post and also lateral adjustment of the post in any direction necessary to bring it in proper alinement.

METAL STAIR.—C. F. STEIBER, New York, N. Y. The invention especially relates to staircases which are formed of metal. The intention in this instance is to produce a staircase adapted to be formed of steel or similar material, and the invention relates especially to the form of the separate parts and the manner in which the stairs are built up therefrom.

GATE.—C. A. EIDSMOE, Beresford, S. D. One object here is to provide a swinging gate which may be adjusted to any degree of inclination above or below the horizontal, and retained in such adjusted position. Another object is to provide a gate comprising an adjustable frame, pivoted at one end to a post and having its free end adapted to be raised or lowered, and means for retaining the frame in its adjusted position.

SUCTION DEVICE FOR AIR, GAS, OR SMOKE PIPES.—A. CAUCHEMONT, 17 Rue de l'Aqueduc, Paris, France. The air in entering the apparatus at one of the openings reaches a pipe tangentially. This air produces a suction effect inside this pipe and the smoke, gases or vitiated air escape through the openings and pass to the annular space comprised between the pipe and the strips of the lantern. Owing to the relative vacuum produced by the wind at the rear of the apparatus, the smoke or gases are drawn outside in passing through the apertures in the lantern.

SUSPENSORY.—G. C. JOHNSON, Dillon, S. C. This suspensory embodies a scrotum support, and a waterproof attachment thereto of novel construction, which forms a receptacle for the member and affords convenient means for the introduction and discharge of liquid medicaments for the treatment and cure of a diseased organ.

Hardware.

COMBINED LEAF-CLIP AND LINE-MARKER.—E. A. BAGBY, Louisville, Ky. This spring-actuated clip is especially adapted to clamp upon a leaf of a book or manuscript, and also to grip the flat end of a flat lining strip having parallel side edges, so as to hold said strip extended across or lengthwise of the leaf or page and be disposed adjacent to a selected line thereon; and for changes in adjustment for locating the straight edge of the liner strip close to lines on the page successively, to facilitate the correct posting of accounts or transfer of statements, and executing work requiring exact reading of written or printed lines consecutively.

WIRE-FENCE TOOL.—B. B. WOOD, Helena, Mont. In the present patent the invention is an improvement in tools for use in building wire fences, and it has for a particular object the provision of a novel construction whereby to apply to the crossing wires of wire fences the clamp covered in a former patent granted to Mr. Wood.

SOCKET FOR SASH-CORDS.—F. DEGIORGIS, West Hoboken, N. J. The invention pertains particularly to means for use in securing cords to a sash, or for holding a sash cord when the sash is disconnected, as for instance when the window is being cleaned. The object is to provide a socket which greatly facilitates the attachment or removal of the cord but which is constructed in such a way as to effectually prevent any accidental displacement of the cord.

LEADER-BRUSH.—M. BLACKMAN, Jersey City, N. J. The object of the inventor is to produce a brush especially adapted for use in painting the inner side of leaders or rain spouts. In the operation of the device, it will feed small quantities of paint from the reservoir to the brush, and the parts are so arranged as to enable the device to turn the corners or bends of a leader.

Heating and Lighting.

GAS-METER.—W. F. ETZEL, Lowell, Mass. This invention relates to dry gas meter having alternately expanding and contracting measuring chambers. The object is to provide improvements in meters, whereby gas passes freely through the parts of the slide valve seats to and from measuring chambers, thus reducing the decrease of the gas pressure, incident to its flow through the meter, to a minimum.

Household Utilities.

BRUSH.—C. W. PATRICK, Phoenix, Arizona Territory. This brush is primarily intended for the bath, although with slight modifications it is adapted as a scrub brush for floors, wood-work, windows and scrubbing in general, where quick thorough cleaning is desired with the least possible exertion. For the bath, the brush has all the advantages enumerated when used as a scrubbing device, in addition to presenting a sanitary article effecting its own cleaning when in use.

INSECT-EXTERMINATOR. — MARGARET E. COCHRANE and J. J. COCHRANE, Jersey City, N. J. In this case the improvement refers more particularly to exterminators adapted to be used for destroying bed-bugs or the like, and each of which in general consists of a burner adapted to have one end connected to any suitable gas supply, and a pan movably carried by the burner and serving to receive the dead insects.

BATH-TUB ATTACHMENT. — NELLIE L. GILMORE and M. GILMORE, Phoenixville, Pa. This invention is an improvement in frames for use in application to bath tubs. The aim is to provide a frame which can be applied to and removed from the tub, and will afford facilities for holding a wash bowl and a soap dish. It will be found useful for general use, but especially so in boarding houses among the laboring classes.

MOP-WRINGER ATTACHMENT. — W. F. MCGLAUGHLIN, Denver, Colo. The purpose of the inventor is to provide a construction, wherein the mop, may be twisted to express the water therefrom, without the necessity of using the hands in direct contact therewith. When the cloth has been sufficiently wrung, the motion of the handle is reversed to bring the cloth into its original position, after which the operation may be repeated.

Machines and Mechanical Devices.

PENCIL-MAKING MACHINERY.—F. P. DORIZZI, 66 Elm Grove Road, Barnes, Surrey, England. Mechanical means are provided for inserting the leads or other material preferably with the combination therewith of gluing means. Leading means comprise a series of hoppers arranged over a suitable bed along which the grooved boards to be leaded are slid and means connected to each of said hoppers for feeding a single lead or strip of other material to each groove in the board at the required moment.

PNEUMATIC HAMMER.—V. E. LANE, Berwick, Pa. Among the objects of this invention are the provision of a powerful down-stroke in connection with a cushioned back-stroke, to render the hammer, as far as practical, independent of specified pressure of air in order to make it operative; to facilitate the removal and replacement of the barrel; to improve lubrication of movable parts; to hold the rivet-set securely at the end of the barrel, to prevent accidents and the set from falling out.

SCREW-CUTTER. — A. R. WEISZ, New York, N. Y. The invention has for its object the provision of a screw cutting device which is simple in construction, effective in operation and durable in use, adapted to be readily sharpened, and so constructed as to be capable of being accurately adjusted to screws of different diameters.

CARRIAGE-DRIVE.—J. J. SULLIVAN, Eagle Mills, Ark. The invention is particularly useful in connection with saw-mill carriages and the like. An object is to provide a support for the piston rod of a carriage drive, so that the piston rod is prevented from sagging and thereby wearing the stuffing-box and other parts with which it comes in engagement, in an irregular manner.

LACQUERING-MACHINE FOR CANS.—C. B. HANTHORN, Portland, Ore. The invention refers to a machine for the purpose of lacquering cans. The object is to produce a machine which will operate automatically to receive cans which are fed to it, in such a manner that the cans will be dipped in a bath of lacquer and dried before delivery from the machine.

FIRE-ESCAPE.—J. HEGEDUS, New York, N. Y. The object of the inventor is to provide a fire escape for permanent use on buildings, and arranged to allow repeatedly using the device for conducting people from any one of the floors of the building safely to the ground, and to permit the use of the device by firemen or others, for ascending to any one of the floors.

LINOTYPE-MACHINE.—C. ALBRECHT, Charlottenburg, Germany. One object of the invention is to provide means for reducing the wear and tear on the lugs of the matrices as they leave their magazine and enter the vertical channels. Another object is to improve upon the construction of the part or chute between the delivery mouth of the magazine and the vertical channels, particularly in machines designed for a plurality of magazines and where, therefore, the said part or chute is made movable.

Prime Movers and Their Accessories.

BALANCED VALVE.—W. ORD, Brooklyn, Ohio. The intention in this case is to provide details of construction for a valve which are practical and very efficient, and that enable the balancing of pressure on the body of the plug valve, so that leakage around the valve will be prevented, and the valve body be adapted for convenient adjustment to control the passage of fluid throughout.

Railways and Their Accessories.

RAILWAY-TIE AND RAIL-FASTENER.—P. E. FETTER and W. A. STICKLEY, Kenmare, N. D. One purpose of the inventors is to practically provide a construction of tie that will prevent shifting in the road bed, and to provide a smoothness of track that will lessen resistance, thereby saving property, and also to provide a rail lock that will hold the rails more firmly than spikes, and admit of the necessary expansion and contraction of the rails.

Pertaining to Recreation.

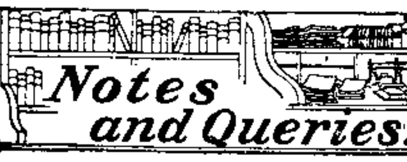
ROLLER-BOAT.—R. E. SHARP, Newaygo, Mich. In this patent the invention relates to small pleasure boats or launches, and the object of the inventor is to produce a boat having a simple construction which will be economical to build, and having improved propelling mechanism and improved steering gear.

Pertaining to Vehicles.

COMBINED HEARSE AND PASSENGER-VEHICLE.—F. HULBERG, New York, N. Y. The invention has reference to power-driven vehicles, such as automobiles, and its object is to provide a new and improved combined hearse and passenger vehicle, arranged to accommodate a coffin and flowers in one compartment and passengers in a separate compartment.

COMBINED ODOMETER AND SPEEDOMETER.—R. G. SANFORD, Yonkers, N. Y. The invention has for its purpose to provide for the actuation of the measuring means in the same direction, irrespective of the direction of movement of the part measured; to dispense with the usual flexible shaft such as is employed when the meter is applied to a vehicle, and in general, to provide a construction having little or no tendency to vibrate.

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.



Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th or will be sent by mail on request.

(12076) F. E. S. says: I am inclosing a copy of a report on the efficiency of a new kind of quadruple engine which is being built and placed on the market by a local concern. With 3.5 gallons of kerosene they developed, by brake test, 52 horse-power constantly for one hour. I am unable to find any efficiency tables for steam engines using kerosene for fuel. Can you tell me what the best machines now on the market do deliver? 3.5 gallons of kerosene develop 52 horse-power for 1 hour; 3.5 gallons kerosene weigh 23.57 pounds; 1 pound kerosene has 21,000 B. T. U.; 23.57 pounds kerosene have 494,970 B. T. U.; 494,970 B. T. U. equal 385,086,660 foot pounds; 52 horse-power is 102,960,000 foot pounds per hour. Fraction of the energy in the oil which is delivered by the engine is

$$\frac{102,960,000}{385,086,660} \text{ or } 26.74 \text{ per cent.}$$

A. You are unlikely to find tables of combined efficiencies of engines and boilers using oil fuel because the method of testing the efficiency of an engine by the fuel consumed under the boiler had come to be considered an unfair criterion before much advance had been made with liquid fuel. There is no analogy whatever between the terms engine horse-power and boiler horse-power, the latter being an unsatisfactory term only used for want of a better. That the capacity of the accompanying boiler depends upon the relative efficiency as well as the capacity of the engine may be shown by the fact that a single-cylinder non-condensing engine may take as much as 30 pounds of steam per horse-power per hour, whereas a modern triple-expansion condensing may require as little as 10 pounds. At the same time your comparison of the power delivered in useful work with the B. T. U. contained in the fuel consumed is a perfectly legitimate one, and your figures are apparently correct. The figures are certainly unusually high, the best we know of, for any kind of fuel shows an efficiency little more than half as high based on fuel consumption per horse-power.

(12077) J. V. A. asks: I am seeking information on the question of water power. I wish to utilize the water in a stream running through a flat country, with hills about 300 to 400 feet high on both sides, but these hills are not the source of the creek's supply. Could you put me in communication with some one, or a firm, who could advise me as to the best method of obtaining from 12 to 15 horse-powe from this creek, by hydraulic ram, to elevate water to the hills nearby to drive Pelton wheel, or undershot current wheel, or Poncelet's undershot wheel by damming up the creek, or any other method that may suit? You may be in a position to answer this question; if so, please let me know. I would require full details and plans of wheels, their construction and application to the creek, etc. (I wish to construct the wheels myself, if possible.) I am only a novice at using water power. The machinery I wish to operate from the stream is a Sisal hemp decorticating machine, and possibly a small circular saw. I inclose a rough sketch of cross section of creek, and some figures which were obtained at the same spot, which is a suitable one for the erection of the machinery in the event of your undertaking this question. A. Your method of measuring the flow of the water is quite reasonably approximate and, making due allowance for error and variation of the flow, we should say that you have just about enough water to generate 15 horse-power in the manner you suggest. A good Pelton or similar impact waterwheel should deliver 75 per cent at least of the theoretical power in a given fall of water, so for 15 horse-power you should have a fall and quantity of water with a theoretical power of 20 horse-power. The formula is $H.P. = 0.00189\,Q\,H$, in which Q = quantity of water in cubic feet per minute and H = head in feet. Supposing you lift your water with a ram to a height of 100 feet above the stream,

$$20\ (H.P.) = 0.00189\,Q \times 100 \text{ or } Q = \frac{20}{0.189} =$$

106 cubic feet per minute nearly. A good ram with not more than 100 feet conveyance will lift about 1/14 of the water required to operate it to a height ten times that of the fall required to operate it, so that 106 cubic feet of water could be raised 100 feet by 14 × 106 = 1,484 cubic feet of water with a fall of 10 feet. Your flow at the rate of 66 feet in 15 seconds of a stream 11 feet wide and 7 inches deep represents 1,694 cubic feet per minute, so that you have a fair margin. The length of the drive pipe does not matter, provided you have the whole of the water required to drive the ram inclosed in a pipe for the whole height of the necessary fall, i. e., the dam need be only 5 feet high if there is a further fall of 5 feet from its foot to the point at any convenient distance downstream where the ram is situated. We should say that you could not get the requisite power with a current wheel, as its efficiency is extremely low. With a Poncelet or, better, a low-head turbine, you could, but we should say the first cost of dam and equipment would be higher.

(12078) H. R. P. asks: Will you kindly answer the following questions? What is meant by the term cycle in relation to gas engines? Why is an engine which makes two revolutions to every explosion called a four-cycle engine? How is it possible for any engine to have more than one cycle? A. The "cycle" of any engine is the complete sequence of operations gone through by the operating fluid; in the case of gas or other internal-explosion engines it consists of inspiration during one stroke, compression during one stroke, ignition, explosion, and expansion during one stroke, and exhaust during one stroke. The terms "four-cycle" and "two-cycle" are misleading, and should more properly be "four strokes to the cycle," etc., in fact on this account the term "four stroke-cycle" is now coming into use. In two-cycle engines, either by exploding the gas on both sides of the piston or otherwise, the two separate cycles overlap each other, and whereas each is exactly the same as in the four-cycle engine, one or other cycle is completed every two strokes. The term "two-cycle" has, however, the alternative sense that two separate cycles are used in operating the engine and, therefore, though a later term than "four-cycle" and derived from it, is less inaccurate.

(12079) J. S. asks: Kindly tell me in your Notes and Queries column how to produce extreme cold by means of carbonic acid gas and ether. I have tried letting the gas run into a bag which has been wet with ether. I understand this to be the method. The result should be a kind of frappé effect to use for a freezing mixture. A. Carbonic acid gas has no action upon ether. No lowering of temperature would be expected from passing the gas through ether. If liquid carbon dioxide is allowed to escape from a tube into a bag, some of the liquid will be frozen and solid carbon dioxide will be found in the bag. Place this in a porcelain crucible and pour ether into the crucible. A pasty solution of ether and the solid is formed with a great drop in temperature. Tyndall's "Heat as a Mode of Motion," which we send for $2.50, gives many experiments with solid carbon dioxide.

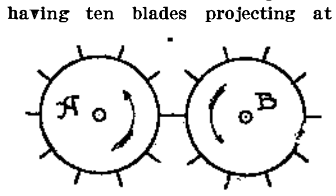
(12080) M. A. C. says: 1. In evaporation, does the water vapor formed crowd back the air? A. Carhart's "University Physics," vol. 2, will give you a correct view of the process of evaporation. There is no pushing back of the air by the molecules escaping from the surface of the water. There is plenty of room for them between the molecules of the gases of the air. 2. Does the air offer any resistance to evaporation of water? A. The air offers great resistance to the escape of water molecules into it—15 pounds to the square inch. In a vacuum water evaporates with violent boiling. It is the pressure of the atmosphere which keeps the water in the liquid form upon the earth. Otherwise all water would be in vapor in the space about the earth, as the air now is. 3. What is the best explanation of just how evaporation produces cold? A. The only explanation of evaporation is that heat changes water into vapor. The heat used for this work does not affect a thermometer, and is called the heat of vaporization. Since this heat must come from some other body, the surrounding bodies are made colder by the abstraction of heat from them to change the water into vapor. 4. Heat is defined as molecular motion. Does that mean that the amount of heat depends on the number of molecules striking a thermometer as well as their velocity? A. The more rapid the molecular motion, the higher the temperature of a body. More molecules would then strike a thermometer in a second, of course. They would also strike with a higher velocity. 5. In the expansion of gas against pressure, which is affected, velocity or number of molecules, in the change of temperature? A. In the expansion of a gas against pressure the velocity of the molecules is changed, and therefore the number of molecules per second passing a given point will also be changed. 6. Will you discuss the question if the expansion be into a vacuum? A. The expansion of a gas into a vacuum does not produce any cooling effect, since the expanding gas does no work in expanding. 7. What is the best explanation of a mixture of salt and ice producing cold? A. There is but one explanation of the action of salt and ice as a freezing mixture. The melting of the ice and salt is caused by the heat absorbed from the article to be frozen. The heat required to melt ice is very large, 80 calories per gramme. 8. What is the best explanation of rain being produced by a current of air striking a mountain? That is what cools the air? A. Warm air can hold more water vapor than cold air. When a warm current strikes a cold mountain side, the chilling of the air reduces its capacity for moisture and saturation is soon reached, after which the formation of rain drops begins. All these questions are treated in good textbooks of physics under heat. If you have not the Carhart referred to above, we can send you a copy for $1.75 prepaid.

(12081) A. E. W. asks: 1. Would you explain what is meant (when giving the caliber of small arms) by two numbers, as 45-90, 30-30, 25-20, and 56-50? I understand that there is a big difference in the size of calibers mentioned, and that the 25-20 is a bottle-shaped cartridge, but there is no apparent difference in the diameter of shell and ball of a 56-50. A. In giving the caliber of small arms by two numbers, 45-90, the first number stands for the caliber expressed in decimals of an inch (in your case 0.45 or 45/100), the second the number of grains of powder used in the charge. In the case of the 25-20 gun, the 25 stands for a repeating rifle, the 20 for a single shooter. The weight of the bullet is the same in both cases, but the repeater cartridge is enlarged to take a larger charge of powder. 2. What does the number giving the gage of shotguns mean? What part of an inch are they, or do they not represent some part of an inch or foot, 10, 12, 16, and 20 gage? A. The gage of the shotguns, as 10, 12, etc., is a survival of the old-fashioned nomenclature. In early days it was customary to find out how many spherical balls went to the pound weight. If 10, the gun was called a 10-gage gun. 3. Ice manufactured by a process, where cans of water to be frozen are immersed in a tank of brine, cooled by pipes carrying ammonia, there often appears a place in the center of the cake that is white or nearly opaque, sometimes looking like very small air bubbles. Would you explain the cause of the ice not being clear at the center as it is at the sides of the cake? I have been told that it was ammonia in the water, and some even claim that they can taste it, but I cannot see how that can be when the ammonia is confined in the pipes. I think it is a defect in the freezing. A. The white or semi-opaque place in the center of cakes of artificial ice is nothing more than what you say it looks like—air bubbles. The process of freezing excludes suspended air from the water, leaving it in the form of bubbles (as it often appears in natural ice) if steps are not taken to prevent it. In the can system of artificial ice making, the water is agitated while freezing to get rid of the bubbles, and as the ice forms from the outside inward, the outside and bottom end of the cake is generally clear. Sometimes, however, the agitation is not kept up long enough, as the block becomes nearly solid, and an accumulation of bubbles remains in the center near the top. You will notice that the white part you speak of is always at one end of a whole cake—the end which was uppermost as it stood in the can. There is no possibility for the ammonia from circulation pipes to reach the cans, the freezing of the latter taking place in brine, not ammonia, and elaborate tests of the purity of the ice water are regularly made in every properly conducted plant. The occurrence of this white core in plants using distilled water (from which the air is removed) as many now do is a sign of imperfect distillation or filtration, but not of such impurities as your friends suggest.

(12082) L. M. K. asks: 1. A tank of 5 cubic feet capacity is filled with a gas at 200 pounds pressure. How many cubic feet of gas will there be at 1 pound pressure? A. The answer to your first query is figured by the formula $P_1 V_1 = P V$, representing Boyle's law that the pressure of any gas is inversely as the volume and *vice versa*. In your case $P_1 = 1$ pound, $P = 200$ pounds, and $V = 5$ cubic feet. Substituting: $1 \times V_1 = 5 \times 200$, or $V_1 = 1{,}000$, i. e., a gas having a volume of 5 cubic feet at 200 pounds pressure (185.3 gage) would have a volume of 1,000 cubic feet at 1 pound pressure, or 13.7 below atmosphere. The above are absolute pressures, which must be used for the solution to be accurate by the formula; if you use gage pressures (pressures above atmosphere) add 14.7 pounds to both pressures before substituting in the formula. 2. To what pressure is it safe to compress a gas? A. A gas may be compressed to any amount according to circumstances, strength of container, temperature, etc., which you do not mention. All gases can be liquefied by sufficient pressure, their pressure becoming greatly reduced by liquefaction. 3. At what pressure is illuminating gas delivered to the consumers? A. Illuminating gas for domestic purposes is delivered at about half a pound pressure above atmospheric.

(12083) C. S. R. says: If a coiled spring made of pure iron is placed in a bath of hydrochloric acid, the spring dissolves, and ferrous chloride would be formed according to the following equation: $Fe + 2HCl = FeCl_2 + H_2$. Heat would be evolved as a result of the chemical action, and the chemical energy would be changed into heat energy, about 80,000 calories being developed per unit each substance. The solution thus far is clear, but here is the difficulty: Take the iron spring and compress it and tie it with some thread so that it remains in a compressed position. The spring now possesses potential energy as a result of this compression. Now place the spring, in this compressed position, in the HCl as before; the iron will dissolve as before, the spring all the time remaining compressed, because the thread is not acted on by the HCl. The question now rises, What has become of the potential energy the spring possessed? A. It appears to us that under the conditions you name there would be a liberation of heat in consequence of the tension of the spring. That is to say, if you provide two equal quantities of acid, and dissolve therein two springs exactly alike except that one is wound up and the other is unwound, there will be a greater liberation of heat by the dissolution of the spring under tension than of the other spring, the difference in heat representing the thermal value of the energy used in winding the spring. This question is very interesting, and has been discussed in our columns heretofore. We think it can be determined only by a careful experiment, coupled with quantitative measurements of the heat developed.

(12084) G. H. H. asks: I have here a mechanical problem, the solution of which I would like to see in your query column. Suppose we have two disks of equal diameter, each having ten blades projecting at equal



distances around the rim, as shown in above sketch. Now if one disk is made to revolve 10,000 R. P. M., while the other is stationary and in a position where one of its blades would come in contact with each of the revolving blades, there would be 100,000 contacts made per minute. Now if both disks were revolved in opposite directions, at exactly the same speed, 10,000 R. P. M., would the number of contacts remain the same, or would they be increased, and if so how much? A. Since by revolution of the left-hand wheel *A* at the same speed as that of the right-hand wheel *B*, each of the ten teeth of *A* touches one tooth of *B* once in every revolution, instead of only one tooth of *A* coming in contact with the teeth of *B*, as when *A* was still, it would appear at first sight that there should be ten times as many contacts as before; but whereas before one tooth of *A* was touched in each revolution of *B* by every tooth of *B*, now one tooth of *A* touches in each revolution only one tooth of *B*. The total number of contacts is therefore multiplied by ten and divided by ten, and remains the same.

(12085) E. M. S. asks: 1. Where does the largest supply of pearls come from? A. The best pearls as well as the largest quantity come from fisheries around Ceylon: see our article of April 24th. 2. How is a pearl valued? A. Pearls have a certain minimum value by weight above which their value varies more than that of any other gem through quite arbitrary conditions of form, color, perfection of "skin," lack of irregularity, etc. 3. Can pearls be made artificially? A. Imitation pearls are now made so well as to be detected with difficulty but are not identical chemically or physically with natural pearls as are artificial diamonds or rubies. 4. Does the voltage or the amperage destroy life in electrocution? A. A high voltage is required but as generally understood a fairly high amperage is the more essential. A very small current at 5,000 volts pressure may be taken with impunity from an induction coil whereas persons have been killed by large currents at pressures as low as 500 volts. 5. What is the meaning of the terms "cycle" and "frequency" in electricity? A. A cycle is one complete series of changes of the electromotive force in an alternating current. The voltage rises from zero to its plus maximum and falls through zero to the same negative value and back to zero in each cycle. The frequency is the number of complete cycles in a second. 6. Is there any difference in color between the water of the Red Sea and that of the Mediterranean? A. We should say that the difference is largely imaginary except in so far as the color is influenced by depth and the character of the bottom, which, in the Red Sea, is largely coral. 7. How many vessels pass through the Suez Canal? (8) Do they go through at night? A. Vessels pass through the Suez Canal in a continuous stream night and day, the canal being lit by powerful search lights. We have no recent figures as to the volume of the traffic but in 1904, 2,733 ships passed through the canal, with a tonnage of over eight million. The average time of passage is 18 hours. 9. How many kilowatts can a three-phase circuit of 7 strands of No. 6 wire cable transmit at 100,000 volts for a distance of 155 miles? and (10) what would be the amount of power lost in transmission? A. We cannot make this calculation without making you a charge. The subject occupies 100 pages in the Standard Electrical Engineer's Handbook, which we can send you for $4. We do not encourage lists of questions so long as the foregoing, which are no less trouble than the "examination papers" prohibited in our "Hints to Correspondents." Most of these questions could be answered from a dictionary and some from a school reader. The above are answered only on account of inquirer's address being probably remote from a library.

NEW BOOKS, ETC.

The Bullet's Flight From Powder to Target. By Franklin W. Mann. Milford, Mass.: Published by Munn & Co., 1909. Large 8vo.; pp. 384. Profusely illustrated. Price, $4.

This work deals with a subject the literature of which is not commensurate with its importance or interest. and it possesses unusual value, not only because it furnishes a large amount of information of a very practical kind, but because this information is the result of a practical experience on the part of the writer extending over a period of thirty-eight years. The author tells us that the results of his experiments as here given have been persistently and laboriously worked out with an earnest desire to assist his fellow craftsmen. In view of the fact that conjecturing and theorizing have been so prevalent in rifle literature, the work has been kept free from speculations, except where they have either been proved to be false or have been fully substantiated by recorded experiments. The first impression on glancing through this work is of the extrordinary number and value of the illustrations, which must average at least one to every two pages. Most of these are photographic reproductions of the results of actual tests. Particularly fine are those made of bullets before and after firing, and the large number of illustrations of carefully indexed targets against which firing tests had been made. The work has also been enriched with lettered line cuts and with halftone engravings of various experiments that throw light upon the questions discussed. Every page is full of interest and information for the rifle enthusiast. There is a full discussion of various kinds of rifles; of the effect of difference of length, of variations of rifling, etc., as well as of curious experiments, such as that of venting the barrel near the muzzle. An idea of the contents may be gathered from a few of the subjects treated, such as the Personal Element vs. Mechanical Rifle Shooting; Utility of Vented Barrels; High-Pressure Sharpshooting Powder; Telescope Mounts; Ruined Rifle Bores vs. Smokeless Powder vs. Primers; Accurate Ammunition Difficulties; Flight of Bullets. Gyration and Oscillation; Motions Executed by Normal Flying Bullets; Determining Rifle Twists; Kinetics of Spin, etc. In many respects this work is unique in the literature that has been published on this subject. It is thoroughly practical, and will be found to be of very real value to those who are engaged in a study of the ballistics of the rifle with a view to improving the all-round efficiency of that weapon.

Trigonometrische Längenbestimmung, Geodätischer Grundlinien. Von A. Tichy, Inspektor der K. K. Osterreichischen Staatsbahnen. Wien: Eigentum und Verlag des Osterreichischen Ingenieur und Architekten-Vereines, 1909.

The author of this monograph was commissioned in 1900 to devise a method of plotting the four great Alpine tunnels. He was instructed to abandon the conventional method of employing definite triangulation data, and to evolve an entirely new method based upon original data, the reason being that the older method was inapplicable for plotting tunnel lines in so mountainous a country. At that time the author was compelled to adopt a system of optical measurement based upon a qualified logarithmical method which seemed best adapted for the purpose. At the same time he developed another conception, and carried it out in practice, a method which would seem to be somewhat more exact than the qualified optical method in question. It was not until 1904 that this new measuring instrument was completed and actually employed. It is this instrument and its manner of use which Herr Tichy has thoroughly described in this monograph.

The South Americans. By Albert Hale. Indianapolis: Bobbs-Merrill Company, 1908. 360 pp.; 8vo.; fully illustrated with maps and photographs. Price, $2.50.

To anyone contemplating a pleasure trip to South America or around the coast of our sister continent, the perusal of this book can be confidently recommended as providing pleasurable instruction, which will greatly add to the reader's intelligent interest in sights to be seen. To exporters or others having trade relations with the South American republics desiring to improve the efficiency of their sales service by an intelligent sympathy with their customers the book should be equally valuable. The author says that he writes "with a North American pen but looking through South American eyes," but we should say rather that he looks through North American eyes carefully purged of any prejudicial point of view and with an admirable determination not to overlook the good points of his subject. Such a work, if it reaches the readers who most need it, cannot fail to promote the cause of international amity, without which the industrial development by foreign capital of immense areas of great productive possibilities cannot well progress; and no reader, even if prejudiced, can fail to be repaid for its perusal by the interest of the story. After some introductory notes in lighter vein but none the less interesting the author takes up in turn the geography, the history, the government and the people and present conditions of Argentina, proceeding to discuss in the same order the same topics with regard to Uruguay, Brazil, and Venezuela in turn. He continues with a general review of trade conditions and concludes with an admirable chapter on the Monroe doctrine. It is a suggestive comment on the influence of democracy that in discussing the weaknesses which all nations possess, the author refers most frequently, as traits of South America in general and Venezuela in particular, to those marks toward which the shafts of foreign critics of the United States are most frequently directed—bombastic oratory and "graft." To offset this we are told that gallant manners on the part of the lower orders from the beggar upward co-exist with "an aristocracy of wealth, education, and blood, usually all three," of neither of which we are frequently accused by visiting critics.

The American Handy Book of the Brewing, Malting, and Auxiliary Trades. By Robert Wahl and Max Henius, Ph.DD. Two vols. Chicago: Wahl-Henius Institute of Fermentology, 1908. 1,600 pp.; 12mo.; ill.; tables; etc.

Most trades have their handbooks nowadays, engineering being blessed with the largest number, but though this is the only one we know of in reference to brewing and malting, there is no industry which has a more thorough handbook. It aims to be a pocket encyclopædia, by reference to which brewer, maltster, cooler, bottler, or anyone connected with the commercial end of brewing may find the answer to any question which may come up in his work without his having to wade through bulky textbooks and peruse quantities of information in search of a single item. This requires the condensation into the smallest compass of essential facts from a broad range of information covering arithmetic, algebra, physics, chemistry, rudiments of machinery, steam engines, and refrigeration, as well as practical details of brewing and malting, casking, bottling, and shipping; but so success-