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. 4111.—For a machine for planing and sanding hardwood floors.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4112.—For manufacturers of agricultural and horticultural machinery.

Morgan Emery Wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4113.—For machinery for manufacturing aluminium.

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

Inquiry No. 4114.—For firms who fit up dock yards for government work.

Coin-operated machines. Willard, 284 Clarkson St., Brooklyn.

Inquiry No. 4115.—For dealers in numbers and letters for placing on houses and streets.

Blowers and exhausters. Exeter Machine Works, Exeter, N. H.

Inquiry No. 4116.—For makers of portable machine saws for felling trees.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4117.—For the manufacturers of a gasoline or kerosene engine called the Abenique.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4118.—For manufacturers and inventors of vending machines.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4119.—For dealers in powerful and first-class telephone transmitters and receivers.

Metal cut. bent, crimped, embossed, corrugated: any size or shape. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 4120.—For makers of filtering tubes for water.

WANTED.—Foundry foreman. Address with references and salary required. Foreman, Box 773, New York.

Inquiry No. 4121.—For makers of auto-trucks for hauling lumber.

Machine Work of every description. Jobbing and repairing. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4122.—For manufacturers of iron specialties.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 4123.—For a machine for destroying quack grass.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4124.—For the manufacturers of the machine for cutting paper covers for milk bottles.

Crude oil burners for heating and cooking. Simple, efficient and cheap. Fully guaranteed. C. F. Jenkins Co., 1103 Harvard Street, Washington, D. C.

Inquiry No. 4125.—For copper wire with an insulation that will stand a temperature of about 500 degrees F. or more, the insulating material not to increase the diameter of the wire more than about 75 per cent.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4126.—For the manufacturers of the "front-cut rear-delivery automobile harvester."

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 4127.—For makers of power machinery for making fish nets.

Experienced mechanical draughtsman wanted. Permanent employment assured to rapid and accurate draughtsman. Mill Work, Box 773, New York.

Inquiry No. 4128.—For the inventor or manufacturers of a machine used for folding headache powders.

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

Inquiry No. 4129.—For manufacturers of Home Savings Boxes.

Contract manufacturers of hardware specialties, machinery stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., 778-784 W. Lake Street, Chicago.

Inquiry No. 4130.—For dealers in pigments, also for dealers in glazed stone and glass bottles.

WANTED.—A competent superintendent, with a knowledge of drafting, for a growing manufacturing business in automobile parts and gears. Address Superintendent, Box 773, New York.

Inquiry No. 4131.—For dealers in machinery for use in optical plants.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $5. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 4132.—Wanted, catalogues, price list and trade discounts for wire, fittings, sundries and complete plants.

NOTICE TO TUNNEL CONTRACTORS.

Sealed proposals marked "Bid for Tail Race Tunnel" will be received by the undersigned until noon, May 11, 1903, for the construction of a tail race tunnel for the Toronto and Niagara Power Co., of Toronto, Ontario. Plans and specifications for this work are on file, and can be seen after March 30, 1903, at the company's offices at Home Life Building, Toronto, Ontario, and Niagara Falls, Ontario, or office of F. S. Pearson, No. 29 Broadway, New York, Room 220. The right is reserved to reject any or all proposals. Frederic Nicholls, Vice-President and General Manager, Home Life Building, Toronto, Ontario.

Inquiry No. 4133.—For manufacturers of machinery for making steel lead, lead pipe, lead syphons or traps for sewerage work and collapsible lead tubes for holding india rubber solution, toilet preparations, etc.

Inquiry No. 4134.—For manufacturers of spring wire covered with black silk.

Inquiry No. 4135.—For manufacturers of roofing and school slates.

Inquiry No. 4136.—For makers of cupolas that will melt from 3,000 to 6,000 pounds of iron in 1½ to 2½ hours.

Inquiry No. 4137.—For manufacturers of webbing suitable for halters for horses.

Notes and Queries.

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.

(8978) R. T. B. writes: Will you please inform me if 1,000 feet of natural gas as measured by meter, meter being fed from gas mains where the pressure is four ounces, will measure the same number of feet when the pressure is but two ounces in the gas mains? If not the same, what will be the difference in the number of feet? A. The meter will give the largest volume of free gas at the higher pressure; and if you are buying gas at 4-ounce pressure by meter, you will obtain more free gas than if measured under 2-ounce pressure. The difference is only about 0.005 of the volume as measured by the meter.

(8979) F. P. asks for SUPPLEMENT, No. 600, containing a 1 horse power dynamo which can be turned by two or four men. Will you please let me know if by the application of any mechanical movement, it could be turned by one man for a couple of hours? A. There is no possible way in which a man can do 1 horse power work for even a moment. Engineering authorities agree that a strong man can do about ⅛ of a horse power of work. And there is no machine possible by which a man can increase the horse power of work which he can do. On this point there is much popular ignorance of the function of a machine. A machine may enable a man to move a weight which he could not otherwise move, but he must move it with proportionate slowness. Thus, if a man could just move a weight of 300 pounds one foot a second, by the aid of a machine he might move a weight of 1,200 pounds, but he would only move it with a velocity of 3 inches per second, disregarding the friction. Or on the other hand, he might by a machine move a weight of 100 pounds, and could then move it 3 feet a second. But by no possible application of machinery could the man's work become greater than 300 foot-pounds per second. Of course, this is a mere illustration, since no man could do as much as 300 foot-pounds of work per second. A horse power is 550 foot-pounds per second, and a man's power does not much exceed 70 foot-pounds per second. It will be evident then that if a dynamo requires 1 horse power to drive it, not less than eight men would be required to do this work, for any length of time.

(8980) G. L. asks: 1. In making estimates on atmospheric pressure, using as one atmosphere 15 pounds and two atmospheres 30 pounds, what would be the pounds pressure at 3, 4, etc., up to 25 atmospheres? A. The air pressure is any number of atmospheres less one, multiplied by 15. Thus, 10 atmospheres less 1 is $9 \times 15 = 135$ pounds, and so on. 2. What would be the degrees of heat required (without loss) to get 1, 2, 3, etc., up to 25 atmospheres of steam from water at 32 degs. and 60 degs.; and the increase of pressure at each change in same sized chamber? A. The total number of degrees from 32 degs. to 212 degs. in steam at atmospheric pressure is 180 degs. Fah.; at 2 atmospheres by gage, 240 degs.; 3 atmospheres, 273 degs.; 4 atmospheres, 291 degs.; 5 atmospheres, 305 degs.; and so on at a decreasing rate, each atmosphere being 14.7 pounds. See steam table of pressures, temperatures, heat units, etc., in Haswell's "Engineer's Pocket Book," $4 by mail.

(8981) S. B. asks: 1. Will you please tell me a good way to amalgamate a "Daniell zinc" for Fuller battery? A. A battery zinc is amalgamated by first dipping it into diluted sulphuric acid; acid 1 part, water 10 parts. Pour the acid into the water with constant stirring. When the zinc is well cleaned, dip it into mercury, or apply mercury to it in some other way. If the mercury does not readily adhere to the zinc in any spots, dip again into the acid and rub the mercury upon the bare spots. 2. What causes the following troubles? I have four carbon sal-ammoniac (open-circuit) batteries; in cool weather they become very weak, but in warm weather they work all right. A. If your cells do not work well in a cold place, try them in a warm place.

(8982) G. H. S. asks: 1. Please tell me if it is necessary to have alternators running in synchronism before connecting them in parallel, and if so, why? A. Alternators are brought into synchronism before they are connected in parallel. If a machine has a low armature reaction a heavy cross current may be produced if they are out of step. If the armature reaction is high, there is less danger of a heavy cross current due to lack of synchronism, or difference of wave form. This is treated at some length in Cudin's "Standard Polyphase Apparatus and Systems." 2. What is a "copper voltameter," and how shall I measure the strength of a current by means of such an instrument? A. A copper voltameter is a jar containing two copper plates and a solution of copper sulphate. When a current is sent through the jar, one plate increases and the other diminishes in weight, in proportion to the strength of the current and the time it flows. One ampere will deposit 0.0003281 gramme in one second. The instrument is not used for measuring currents practically. The amperemeter has taken its place. A zinc voltameter was once employed as an electric meter, but this has given place to the recording watt-meter.

(8983) L. D. G. asks: If a cannon is exploded by electricity on an island a thousand miles from any living being, does it produce sound? A. The answer to your inquiry depends upon the definition given to "sound." It has two definitions. One is: "Sound is the sensation produced in the mind through the ear by certain rates of vibration of elastic bodies." In this sense a sound does not exist unless there is an ear to receive and transmit the sensation to the brain. The other definition is: "Sound is a mode of vibration capable of affecting the auditory nerve." In this sense a sound exists wherever there is a vibrating body whose vibration would affect the auditory nerve, if there were an ear to receive these vibrations and transmit them to the brain. Sound is, in the first sense, physiological; in the second sense, it is physical. In the first sense of the word the cannon on a desert island does not produce a sound. In the second sense of the word the cannon does produce a sound, whether any ear is near enough to hear it or not.

(8984) F. W. G. asks: 1. How many pounds pressure is there at a faucet, if 17 quarts of water pass through a 3-16-inch hole, and 22 quarts through a ¼-inch hole in one minute? A. Seventeen quarts of water passing through a 3-16-inch hole per minute indicates a pressure of 18 pounds per square inch; 22 quarts passing through a ¼-inch hole, 10 pounds pressure per square inch. At 18 pounds pressure you will need a 7-16-inch nozzle for a quarter horse power. At 10 pounds pressure you will need a ¾-inch nozzle. 2. Can I get one-quarter horse power at such pressure? If so, please state what size wheel I must use. A. See SUPPLEMENT, No. 1049, for illustrated description of small water motors and their power; 10 cents mailed. 3. I have an Edison electric motor taken out of a phonograph, the same style as is illustrated in Hopkins' "Experimental Science," page 731. The armature has forty coils. Can I use the armature in a sheet-iron field, like the simple motor, page 498, in Hopkins' "Experimental Science"? Will it be as powerful as the simple electric motor? A. The armature from the phonograph is suitable for the sheet-iron field, page 498, "Experimental Science." Use No. 16 cotton-covered wire for the field pieces.

(8985) C. O. G. asks: Could you give me the recipe for a pocket battery suitable for a small induction coil? A. A paste for a dry cell may be made by taking oxide of zinc, 1 part; sal-ammoniac, 1 part; plaster of Paris, 3 parts; chloride of zinc, 1 part; water, 2 parts. All these, by weight, are mixed. The sal-ammoniac should be first dissolved in the water; the other chemicals are not very soluble.

(8986) W. G. L. says: May I ask one or two questions regarding the construction of a kaleidoscope? 1. If the diameter of the box containing objects to be reflected is 4 inches, what length should cylinder containing the reflectors be? A. The length of the tube of a kaleidoscope seems to be a matter of choice simply. We have one nearly 4 inches in diameter and 8 inches long, and one 2 inches in diameter, which is much longer, while another comes between the two both in length and diameter. 2. What kind of a glass is best for reflectors—smoked glass or mirror glass? A. A common glass painted black on one side is most often found in these instruments. We never saw one with a plate of mirror. 3. For a 4-inch diameter disk, would three or four reflectors be the more effective? A. Whether two or more reflectors be used is determined by the figure to be formed in the instrument, and not by its size. If two reflectors are used, placed at an angle, the field is star-shaped, with as many points as the angle of the glasses is contained in 360 deg. If three pieces of glass are used, an equilateral triangle is formed in the center of the field of view, and at each of its angles are to be seen five other triangles like it. We have never seen four plates used as reflectors. The whole thing costs so little besides time to make that you can best determine for yourself the various effects by a paste pot and some cheap cardboard. 4. The outside disk is ground glass, and the inside one plain. Are the reflectors (rather the end of the reflectors) supposed to touch the inside disk, or merely close to it without actual contact? A. It can make no difference whether the ground glass disk touches the reflectors or not. The colored objects are not in view except when they are in the angle of the reflectors, and this is but a small part of the angle of the box in which they roll about.

(8987) C. P. asks: 1. Can oxygen be condensed in small quantities? A. Oxygen can be compressed to any extent desired. It is compressed in large quantities every day. 2. How much space would one-half hour's supply occupy in cubic inches? A. From 18 to 20 cubic feet of oxygen will be required by an average man for a half-hour's full breathing; 20 cubic feet compressed to one cubic foot would have a pressure of 300 pounds per square inch. 3. Is oxygen used practically for any purpose? A. Oxygen is used for certain purposes, though generally it is sufficient to use it as it exists mixed with nitrogen in the air. It is employed undiluted in the manufacture of platinum articles; in the calcium light; for purifying illuminating gas; and in medicine. It would be more extensively employed if it could be produced more cheaply. 4. Do divers still use air pump or oxygen? A. Divers have the air pumped down to them. 5. Is oxygen very expensive? If so, about how much? A. Compressed oxygen may be had for about 15 cents per cubic foot.

(8988) J. C. McC. asks: I would like to know if an incandescent lamp requires more current toward the end of its life than at the beginning. A. If an old incandescent lamp is to be kept up to candle power, more voltage must be put on to force the necessary current through it, since its resistance has increased by the decrease in the size of the filament. With no increase of pressure the light of the lamp decreases, since less current flows. It is poor economy to use such a lamp. It should be replaced by a new lamp. Most users of lamps keep them in service too long.

(8989) T. K. asks: Is it not a fact that since the earth was thrown off from the sun, or since the sun first appeared to shine upon the earth, there has been but one continuous day and night, which never "ends and begins," as the common saying is and the almanacs state? A. In a sense the fact is as stated, but it is not the common sense. If is a matter of common experience that day and night succeed each other at the place where we live. The earth presents one-half to the sun all the time. This half is every moment changing. This half is the half upon which it is day. Night is caused by the shadow of the earth, which extends away into space from the sun. When we enter this shadow, we have night. This is the common and universal usage of the words "day" and "night." There is no day or night for the earth outside of the earth's atmosphere. The energy of the sun does not become *light* till it strikes some material. Then its vibrations are changed so the eye may perceive them when they enter the eye.

(8990) F. S. L. writes: 1. What is meant by the sparking limit of the load of a dynamo? A. We do not know what "sparking limit" is, unless it be the distance beyond which a spark will not pass through the air. 2. What causes sparking? A. Sparking is caused by difference of potential. 3. What causes the neutral points in a dynamo to shift when a current is flowing in armature conductors? A. The rotation of the armature causes the lines of force in the space between the poles to be curved in the direction of the rotation, hence the brushes must be rocked forward till the position of least sparking is found. 4. What limits the output of a constant potential dynamo? A. The rise of temperature in the wires, as also the resistance of the external circuit and other minor causes, limits the output of a dynamo. Why do carbon brushes spark less than copper brushes under the same conditions? A. A brush in the neutral position, and with good contact with the armature bars, does not spark.

(8991) L. G. says: Please tell me what amount of water can be evaporated per pound of coal in the following manner: 1. *Surface* evaporation in a tank 10 feet by 10 feet and 12 inches deep? A. The surface evaporation from a tank depends upon the surface extension of its bottom, to enable it to absorb the greatest amount of the heat of combustion. The greatest possible amount of evaporation may be from 12 to 13 pounds of water per pound of coal. 2. *Surface* evaporation in a tank 10 feet by 5 feet and 24 inches deep? A. There will be but little difference as to the depth, after the water has been raised to the assigned evaporating temperature. 3. *Boiler* evaporation at 10 pounds pressure? A. Boiler evaporation at 10 pounds pressure is about 11 pounds water per pound of coal. 4. *Boiler* evaporation at 100 pounds pressure? A. Boiler evaporation at 100 pounds pressure, 9 to 10 pounds. What amount of water can be converted into steam per pound of coal in the following manner: 5. By ejecting water with a temperature of 222 degs. Fahr. into space? A. About 6 per cent of the volume, according to the condition of the atmosphere. 6. By ejecting water with a temperature of 312 degs. Fahr. into space? Are there any books that will give this information? A. About 12 per cent of the volume, according to atmospheric conditions. See a book on heat by Box, $5 by mail.

(8992) W. L. asks: What is the pressure in pipe organ bellows per square inch? Is there a difference in pressure for the reed and flute stops? A. The usual pressure in the bellows of a pipe organ varies from 3 pounds to 7 pounds, and possibly to 9 pounds per square inch. The great, swell, and choir organs usually have three pounds. The solo, trumpets, and tubas may run to 5 pounds, 7 pounds, and even to 9 pounds. Reed and flute stops do not have different pressures, as is shown by the statements above. Some organs have subsidiary bellows to allow a variation of pressure.

(8993) F. F. W. asks: I would like you to give me the dimensions of an 11-inch Wimshurst machine, size of tinfoil sectors, number on each plate, size inside and out of Leyden jars, and whether or not it is large enough for X-ray experiments; if not, the size of one for such. Also a way for cutting glass circles and perforating plates for spindles. Also how to make collecting combs for the machine. A. A Wimshurst machine with 11-inch plates will not actuate an X-ray tube powerfully enough for any real work. If our correspondent would make an effective apparatus, he should make an 8 or 12-inch coil. We cannot advise him to attempt cutting glass plates unless he is an expert in cutting glass. He then only needs a round pattern and to cut around it with his diamond. The hole is made through the center by the sharp corner of a broken file wet with turpentine in which all the camphor it will take has been dissolved. SUPPLEMENT 548 contains plans for making a good Wimshurst machine. We should advise plates as large as 24 inches.

(8994) G. H. asks: In the experiment of the electrolytic decomposition of water to the two gases, hydrogen and oxygen, can you give me any figures of the size of plates or plate surface necessary to produce one cubic foot of oxygen gas at atmospheric pressure in one hour and power required, and would such gas raise under pressure a gasometer after the style of a gasometer in a gas works? A. The size of the plates is not important in the decomposition of water by the electric current. The plates are of platinum, and a large plate is too expensive. You will require 136 coulombs to decompose 1 cubic foot of oxygen in one hour. At least 1.5 volts must be used; more will give less heat, since fewer amperes will be needed. If you use 10 volts and 14 amperes, you will have a fair result. The gas produced will be like any other gas in pressure and other properties. This method of producing oxygen is a most expensive one. The chemical way is much better.

(8995) G. O. H. asks: I have been amusing my grandchildren by magnetizing the blades of their pocket-knives with a horseshoe magnet, using the "single-touch," as I believe it is called: drawing the magnet straight forward, and returning in the same direction, using the same pole a number of times without change. Is there a simple process better than this? A. The best and simplest way to magnetize a piece of steel with a magnet is to draw the steel off one pole of the magnet, perhaps ten times in the same direction; then draw the other end of the piece of steel off from the other pole of the magnet the same number of times. The magnetism is fixed by forcibly pulling the piece of steel through and away from the field of the magnet.

(8996) R. C. asks: Would you kindly explain to me the workings of the radiometer? A. The radiometer consists of a bulb of glass exhausted to a vacuum of about one centimeter of mercury. Within are two cross arms turning upon a pivot. These arms carry disks of mica, which are covered on one side with lampblack. The other side is metallic, shiny. When heat falls upon the vanes, the black side absorbs more readily than the metallic side and becomes hotter. The molecules of the gas remaining in the bulb coming in contact with the blackened surfaces are heated more than those striking the shining surfaces, and consequently rebound from the blackened sides of the vanes with more force than from the shiny side, thus causing a greater pressure upon the blackened faces. The vanes being able to move revolve by the reaction, their blackened faces moving away from the source of heat. If the vacuum is either too high or too low, no motion is produced. If exposed to an intensely cold body, the vanes revolve in the opposite direction.

(8997) W. W. L. asks: A train going at the rate of one mile a minute, with a cannon on one of the cars, loaded so as to give a firing velocity of one mile per minute, the cannon to be fired while the train is going at that rate in the opposite direction. How far apart will the train and the cannon ball be at the end of one minute? The resistance of the air is not taken into consideration. A. If a train is going at the rate of a mile a minute, and a ball be fired from the train with a velocity of a mile a minute in the opposite direction to that of the train, it will in one minute be one mile away from the train. This is because the cannon threw the ball a mile a minute. The train with the cannon on it, and the ball both before and after it was discharged, traveled by its inertia a mile in a minute in one direction, while the force of the powder sent the ball a mile in a minute in the opposite direction. These two motions will put the ball and the train a mile apart in a minute. But if you stood by the side of the train as the cannon was discharged, you would seem to see the ball fall from the mouth of the cannon to the earth and the train simply move away from it one mile in one minute. 2. Again, if the cannon were fired the same way the train was going, how far would the ball be from the cannon at the end of one minute? A. If the cannon were fired in the same direction in which the train was going in one minute the ball would be one mile ahead of the train, since it would have the velocity of one mile a minute by the inertia of the train and a velocity of one mile a minute by the force of the powder. It would actually have the velocity of two miles a minute.

(8998) R. B. C. asks: What causes a change of direction of the current in a simple dynamo during each revolution of the armature? A. The dynamo produces a current in the armature coils by whirling them across the lines of force of the field. These cross from one pole piece to the other through the armature. A coil of wire when flatwise receives the lines of force in one direction through it. When it has turned through a half circle, it receives these lines in the opposite direction. The current produced by the lines passing through the coil in one direction is the reverse of the current produced by the same lines passing through the same coil in the opposite direction. So that the direction of the current from a coil of the armature changes each half revolution. The current is called alternating. A commutator of a direct current machine acts to reverse every other one of the alternating impulses, and so the current comes out constantly in one direction. All dynamos generate alternating currents in their armatures. Dynamos with commutators give direct currents outside. You would understand this much better by reading some book, say Swoope's, price $2, or Jackson's "Elementary Electricity," price $1.50 post paid.

(8999) H. J. S. asks: Supposing the diameter of the moon's orbit was reduced so that the moon would revolve around the earth so near to its surface that it would barely avoid scraping the mountain tops, and suppose there was no resisting atmosphere to complicate the problem. Suppose also that it was moving in its orbit at its present rate of motion. What would be the time required for one revolution around the earth? Would the earth's gravitative power draw the moon to itself, or would its momentum, or centrifugal tendency, send it back into the heavens to revolve eventually in the same orbit that it now does? A. If the moon or any other body were to revolve around the earth so as just to escape its surface, its time of revolution would be 1 hour 24 minutes 39 seconds. This may be computed as an application of Kepler's Third Law, for which consult any astronomy. The supposition that the moon in this position should move with its present rate of motion cannot be allowed. It could not move with its present rate and be so near the earth. It would fall into the earth very speedily. Its present rate of motion is exactly right for its present distance from the earth. To prevent it from falling into the earth at the nearer distance supposed, its rate of motion must be greatly increased, so that it would go around the earth in the time given above. As to what would happen later on, what you will say to that depends upon whether you accept Darwin's hypothesis of tidal evolution. Into this question we will not enter, since we have not the space for it. We will refer you to Young's "Text-book of General Astronomy," price $3.50, or to Ball's "Story of the Heavens," price $3.50, the last chapter of which is devoted to this subject.

(9000) C. H. asks: 1. Would you kindly let me know of some cheap way of making oxygen that could be used for an oxyhydrogen flame? A. There is no cheap way of making oxygen. It is commonly made by heating a mixture of equal parts of chlorate of potash and dioxide of manganese in a metallic retort, but is not a safe operation except for a person with some knowledge of chemistry. 2. Does hydrogen mixed with oxygen give much more heat than mixed with air? A. Hydrogen gives a hotter flame with oxygen than with the air. It is not, however, used for the oxyhydrogen blowpipe unless for metals which melt above the temperature required for platinum. Street gas is commonly employed with oxygen in the so-called oxyhydrogen blowpipe, and this flame is hot enough to melt platinum. 3. Kindly let me know will sand readily melt when heated with the above gases, or does it require to be mixed with some other substance, and if so kindly mention which is cheapest and how mixed? A. Silica (sand) is not melted by the oxyhydrogen flame. The heat of the electric arc is employed for that purpose. If, however, the sand be mixed with an alkali, soda or potash, as in making glass, it may be melted in an ordinary furnace. For this, see works upon glass making.

(9001) R. R. wants to know how to bend flash boiler tubing without flattening ends. A. For making bends in ⅜ extra strong iron pipe as small as shown in your sketch, you must heat the parts of the pipe represented by the bend and slowly bend it to the required shape. If it flattens a little, it may be squeezed sidewise in a vise to keep it round. A good blacksmith can bend such pipe with very little distortion.

(9002) W. C. asks for a method of "setting" the colors of pressed flowers. A. Either dust salicylic acid over the plants as they lie in the press, or prepare a solution of 1 part of salicylic acid in 14 parts of alcohol; soak blotting paper in this solution, and place a sheet so soaked above and below the flowers when pressing.

(9003) J. E. W. asks: What is the best material for putting a bright finish on hasps, hooks, and staples? A. Charcoal mixed with the sawdust in the tumbling barrel, without oil, is much in use for brightening tumbled work. The oiling should be a separate operation after the cleaning, which may be done with sawdust wet with linseed oil.

NEW BOOKS, ETC.

PERSPECTIVE DRAWING. Instruction Paper. American School of Armour Institute of Technology. Chicago. 1902. Pp. 69. 8vo.

The correspondence schools are playing so prominent a part in education, that their publications deserve attention. It must be confessed that the presentation of the subject in this book is clear, and particularly well adapted for school purposes.

THE CHEMISTRY OF INDIA RUBBER. Including the Outlines of a Theory of Vulcanization. By Carl Otto Weber, Ph.D. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Company. 1903. 8vo. Pp. x, 314. Price $5.50.

It is the purpose of this book to deal with the analytical methods which are most exclusively the work of R. Henriques, more particularly as regards rubber substitutes, so called, and the author's researches, chiefly concerning India rubber itself, and the vulcanization problem. This refers to work done within the last ten years. Before that time India rubber analysis, if it existed at all, was unknown to the outside world. Manufacturing processes as such, have not been dealt with. To have done so would have resulted in the destruction of the unity and aim of the work. The book is probably the best on the chemistry of India rubber which has so far been published.

THE ART OF ILLUMINATION. By Louis Bell, Ph.D. New York: McGraw Publishing Company. 1902. 8vo. Pp. 345.

The book deals not with the problem of distributing the illuminants but with their application, and treats of the illuminants themselves only in so far as a knowledge of their peculiarities is necessary to their intelligent use. To compress the subject within reasonable bounds, the general principles have been discussed rather than concrete examples of artificial lighting. A book of this character should tend to correct some of the commoner errors and failures in illumination.

FACTORY ACCOUNTS. Their Principles and Practice. By Emile Garcke and J. M. Fells. London: Crosby Lockwood & Son. New York: D. Van Nostrand Company. 1902. 12mo. Pp. xviii, 248. Price $3.

No doubt this book was the first attempt to discuss scientifically the principles relating to factory accounts, and the methods by which those principles can be put into practice and made to serve important purposes in the economy of manufacture. The authors are probably correct in their statement that warehousemen and business-men are for the most part content to accept accounts which are not capable of scientific verification and which can be regarded only as memoranda of transactions. In this present fifth edition some matters of factory routine and registration, not previously dealt with, are included. Although the book treats the subject largely from the English standpoint, it should be welcomed by American factory proprietors.

THE STEAM TURBINE. By Robert M. Neilson. London, New York, and Bombay: Longmans, Green & Co. 1902. 8vo. Pp. xii, 163. Price $2.50.

Since the steam turbine is likely to be extensively used in the future, a book on the subject should be of unusual value. Literature on the turbine has so far consisted chiefly of descriptions of the principal features only, or of accounts of the results of tests. The author has endeavored in this book to describe, not only the principal parts of leading types of steam turbine, but also small details which have such a preponderating influence in determining success or failure. The mathematical reasoning contained in the book is simple.

AN ELEMENTARY TREATISE ON THE MECHANICS OF MACHINERY. With Special Reference to the Mechanics of the Steam Engine. By Joseph N. LeConte. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. 8vo. Pp. x, 311. Price $2.25.

The author tells us that this book is the outcome of a course of lectures on kinematics and the mechanics of the steam engine. The first two parts embody the more important principles of what is generally called the kinematics of machinery, though in many instances dynamic problems which present themselves are dealt with, the real purpose of the book being the application of the principles of mechanics to certain problems connected with machinery. The third part treats of the mechanics of the steam engine, since that machine is perhaps the most important from the designers' point of view.

REAL THINGS IN NATURE. A Reading Book of Science for American Boys and Girls. By Edward S. Holden, Sc.D., LL.D. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1903. 16mo. Pp. xii, 443.

This is a children's book intended to be as useful and interesting as it can be. It explains in an easily grasped way something of scientific things, which every boy and every girl sees. The field covered is wide. The author has divided his work into nine books. The first deals with Astronomy; the second with Physics; the third with Meteorology; the fourth with Chemistry; the fifth with Geology; the sixth with Zoology; the seventh with Botany; the eighth with the Human Body; and the ninth with the Early History of Mankind. The boy who reads this book or studies it from beginning to end ought to know more than many of his elders.

CHAMBERS'S CYCLOPEDIA OF ENGLISH LITERATURE. New Edition by David Patrick, LL.D. A History, Critical and Biographical, of the Authors in the English Tongue from the Earliest Times Until the Present Day. With Specimens of Their Writings. Vol. I. London, Edinburgh, and Philadelphia: J. B. Lippincott Company. 1900. Pp. 832.

Most of our readers are probably familiar with the old Cyclopedia of English Literature edited by Dr. Chambers. The work was the first of its kind published in England, giving as it did a conspectus of English literature by a series of extracts from the more memorable authors, set in a biographical and critical history of literature itself. In this new edition, which may well be regarded as an entirely new enterprise in itself, the essential plan of the original cyclopedia has been adhered to, but considerably developed. Old English literature, formerly discussed in three pages, now occupies more than ten times the space; middle English has no longer some twenty pages allotted to it, but ninety. In the first volume alone, over fifty authors not named or hardly named in the older issues, are treated and illustrated by selections from their works. One of the characteristically modern features of the new Cyclopedia is to be found in the work of specialists. Dr. Stopford Brooke, Andrew Lang, Sidney Lee, George Saintsbury, and Edmund Gosse are a few of the more prominent critics who have contributed special articles on men with whose writings they are intimately acquainted. The historical surveys prefixed to the several sections were unknown to the old Cyclopedia, and constitute a most valuable addition to the new book. The same holds good of a large number of critical and biographical articles. Summing up this new enterprise as a whole, it may be said that the aim has been to carry out Dr. Chambers's plan more perfectly than he was himself able to, and to produce a cyclopedia more fully representative of our present and past literary history at the commencement of the twentieth century.

AMERICAN ELECTRIC AND AUTOMOBILE PATENTS MONTHLY. Compiled by James T. Allen, Examiner United States Patent Office. Washington, D. C.: American Patents Publishing Company. Price $5 per annum.

Mr. Allen has undertaken the task of preparing a compilation of the patents included in over four hundred sub-divisions of the Patent Office classes. The publication contains digested patents covering the subjects of electro chemistry, electric lighting, electric railways, electric signaling, electric conductors.

N. W. AYER & SONS' AMERICAN NEWSPAPER ANNUAL. 1903.

The Ayer Annual comes to us this year, portly and complete as ever. It contains a carefully prepared list of papers and periodicals published in the United States, Territories, and Dominion of Canada, with valuable information regarding their circulation, issue, date of establishment, political or other distinctive features, names of editors and publishers, and street addresses in cities of fifty thousand inhabitants and upward, together with the population of the counties and places in which the papers are published, according to the United States Census of 1900. In this new volume will be found a most valuable list of newspapers and periodicals published in Hawaii, Porto Rico, Cuba, and the West Indian Islands, which list, we are assured, is compiled from the latest obtainable information. A description of every place in the United States and Canada is given in which a newspaper is published, and likewise some brief account of railroad, telegraph, express, and banking facilities. Colored railroad maps to the number of fifty-eight indicate the location and number of railroads of the United States and its possessions, Canada, and the West Indies. The vote of states and counties at the Presidential election of 1900 likewise finds a place in the volume. In the latter portion of the book will be found a list of the newspapers of the United States and Canada arranged by counties, with a description of each state, territory, province and county, giving the location, character of surface and soil, chief products and manufactures. Separate lists of railroads and agricultural publications will prove of help to the manufacturer.

ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE FISCAL YEAR ENDED JUNE 30, 1902. Supplement to the Report of the Chief of Engineers. Reports of the Mississippi River Commission and Missouri River Commission. Washington: Government Printing Office. 1902. Pp. 215.

DIVINE SCIENCE AND HEALING. By Malinda E. Cramer. A Text Book for the Study of Divine Science, Its Application in Healing, and for the Well-being of Each Individual. San Francisco. 1902. Pp. 293.