—M. T. GOLDSMITH, New York, N. Y. This is an ornamental design for a back for hand-mirrors, brushes or similar articles. The mirror portion is circular with a graceful handle. A beautiful figure of a lightly-clad female is extended amid encircling flowers.

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 the 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.

Inquiry No. 6712.—For manufacturers of lead pipe making machinery.

Inquiry No. 6713.—Wanted, address of parties weaving cotton tubing in 24-inch lengths or longer.

Inquiry No. 6714.—Wanted, address of parties making or selling spring motors.

Inquiry No. 6715.—For manufacturers of small chains, like bicycle chains, small enough to take place of tape which operates typewriter carriages.

Inquiry No. 6716.—For parties having good rubber reclaiming process.

Inquiry No. 6717.—Wanted, address of violin maker's tools.

Inquiry No. 6718.—For firms in United States manufacturing apparatus for the dry distillation of wood, for producing alcohol, charcoal and other products.

Inquiry No. 6719.—For manufacturers of machines making shipping tags.

Inquiry No. 6720.—Wanted, address of manufacturer or dealer in water glass.

Inquiry No. 6721.—Wanted, address of firms manufacturing or selling devices for printing quotations, etc., on postal cards with metal or rubber type.

Inquiry No. 6722.—Wanted, address of manufacturer of railway ticket machines.

Inquiry No. 6723.—Wanted, oyster baskets in pints and quarts made of white paper with thin copper wire handles.

Inquiry No. 6724.—For manufacturers of bullet-proof felt.

Inquiry No. 6725.—Wanted, manufacturers of good reliable air guns, also novelty manufacturers.

Inquiry No. 6726.—Wanted, electric and combination fixture, parts, fittings and electrical supplies; also electro-plating equipment and supplies.

Inquiry No. 6727.—For manufacturers of any kind of amusement device operated by dropping a coin in a slot.

Inquiry No. 6728.—For manufacturers of hand-operating machines for planing wood floors.

Inquiry No. 6729.—For manufacturers of a device for sawing stone by means of a wire.

Inquiry No. 6730.—For manufacturers of spoke-turning machines.

Inquiry No. 6731.—For the best mixing vats, air compressors, washers, etc., for a dynamite plant.

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.

(9605) C. J. J. Co. says: Can you do us the favor to answer in the columns of your paper the following question? We desire to know how much water will be lifted by a simple undershot wheel having straight paddles, 14 in number, symmetrically spaced around the wheel. The wheel is 14 feet in diameter with paddles 6 feet long and 16 inches wide. The wheel revolves eight revolutions per minute and dips into the canal carrying water 16 inches deep, the ends and edges of the paddles fitting the canal quite closely, not more than ¼-inch slack showing at any point. The canal is curved to compel the wheel to lift the water 2½ feet so that the total duty is a lift of 2½ feet for the width of the wheel. Can you give us an opinion as to the amount of water that would be lifted by such an apparatus, and the power required to operate it? A. If we understand your question aright, the wheel is to be driven by external means, and used in a sense as a pump to lift the water in the canal up a curved incline two and a half feet. If this assumption is correct, and if there is no slip between the water and the paddle wheel and no leakage past the paddles, 2,500 feet of water will be lifted per minute, which would require, if the efficiency of the apparatus were perfect, 12½ horse-power. As a matter of fact, however, there will be a certain amount of leakage past the paddles, amounting to 10 per cent, or possibly 20 per cent. This would decrease the quantity of water actually lifted from 2,500 to 2,250 cubic feet, and as the efficiency of the apparatus is not perfect, it will require more power by a considerable amount. The efficiency of this device would probably not be far from 55 or 60 per cent. This would increase the power actually required to drive the wheel to from 16 to 20 horse-power. In order to have a reasonable margin of safety, it would be well to allow 25 horse-power. If this device is to be used, it will be necessary to either use buckets in place of flat paddles in the paddle wheel, or else to have paddles considerably wider than 16 inches, or else to have them made with a piece at right angles at the top of the paddle to prevent the water from running back over the top of the paddle after it has been lifted a portion of the way up the incline.

(9606) E. S. asks: Will you kindly give me the scientific reason for the hour before dawn being the darkest and coldest, particularly the former? A. We do not know any scientific reason for the belief among people that the hour before dawn is the coldest and darkest. The popular proverb is, "It is always darkest just before dawn," which we always understood to refer to the mental attitude of a man who is hard pressed and finds help. The coldest hour of the night is found to be from 3 to 4 A. M. The darkest hour is when the sun is furthest below the horizon, or midnight. We do not see any other scientific conclusion. All daylight is gone from the atmosphere after the sun is 18 deg. vertically below the horizon, the time which marks the end of twilight of evening and the beginning of the morning twilight. Between these two times it is deep night and there is no reason why one of the hours should be darker than another.

(9607) W. A. P. asks: I am building a 12-inch spark coil according to Allsop directions. What test can I make to find if I have a good or perfect condenser? If I put 250 volts 1 lamp in series across the foil ends I get no trace of leakage or short circuit, but 110 alternating lamp series does not light the lamp, but there is a big leakage—so much that it cannot be held in the hand. I refer to using the condenser only, as the coil has not yet been built. I have 20 sections secondary built on the primary and receive only ¾-inch spark with or without condenser, the maximum number being 96 sections. Does this appear right? A. The leakage of a condenser is found by charging it and discharging it immediately, then charging it and leaving it for say 15 minutes and discharging it again. The ratio of the discharge gives the leakage. There is no way of finding the leakage without proper instruments to measure with. We do not see any proof of leakage in what you write, though what you say is not clear. If you mean that a direct current of 220 volts shows no leakage, while with an alternating current 110 volts gives effects across the condenser, we reply that an alternating current does not charge a condenser at all. A condenser is not used on a coil when the alternating current is used with it. Without instruments or means of measuring the condenser you should make sure of each sheet of the paper, make the condenser as well as possible and rely upon the thoroughness of your work.

(9608) A. B. asks: Two weeks ago I purchased from you Hopkins's "Experimental Science." In the description of the ¼-horse-power motor in Volume I., I find a few dimensions missing: 1. Diameter of poles of fields. 2. Width of coils on poles and number of layers of wire on same. 3. When soldering wires to bars of armature, should both ends of twisted wires (when cut apart) be connected to same bar? If not, how should they be connected? 4. What thickness of leather board should be used for the lining of armature grooves? 5. Must there be an insulation between armature disks and sleeve? 6. Total thickness of disk (not counting flange and nut of sleeve). 7. In Fig. 498 on page 514, should first coil go from 18-1 to 9-8 as shown, or from 18-1 to 10-9? 8. What size wire should be used for spring of carbon brush? 9. Diameter of driving pulley. 10. Should field magnet be of wrought iron, or would cast iron answer the purpose? 11. Is it necessary that there be insulation between each layer of wire in armature and also in field? 12. Would you please give me data for the construction of the rheostat—wire, etc.? A. The dimensions of the parts of the motor described in "Experimental Science," Volume I., page 510, which are not given in the list of sizes, may be determined by measuring drawings in which the parts appear with others whose dimensions are given. Thus in Fig. 497a, the diameter of the pole pieces can be found from the diameter of the field-magnet drum. You will find them to be 2¼ inches. From the same figure the thickness of the field coils is determined to be 1 inch. We do not know the number of layers of wire in each field coil, but you must wind 1⅞ pounds in each coil. The number of layers will be determined by your skill in winding the wire closely. In soldering the wires to the bars of the armature, solder the end of one coil and the beginning of the next to the same bar. Any thickness of leather board may be used which will not be cut by the wire in winding. A piece of the thickness of heavy paper should be sufficient. No insulation is required between the armature disks and the sleeve. It would have been specified had it been required. We do not know the number of armature disks which will be required to fill the space allotted to them on the sleeve. No. 25, B. & S. gage, is 0.0179 inch thick. Slight inequalities and roughnesses will probably prevent you from bringing the disks into actual contact all over their surfaces and so you will not get the total number into the core which this thickness would indicate. The coils of the armature are to be put into the slots as given in the winding plan. Follow the directions closely. For a spring upon the carbon brushes several sizes of wire would do equally well. No. 16 or 18 will answer. The driving pulley should be of a size to produce the proper speed in the machine to be driven by the motor, which is to give 1,600 turns per minute. From this you can calculate the diameter of the pulley required. The field-magnet frame is of cast iron. The cut shows the mark where the two parts of the pattern came together in molding for the casting, in Fig. 497. The insulation between the layers of wire in all the coils is thick shellac, which is dried by baking the coils after they are wound. We have no data for the rheostat. Usually a rheostat giving three speeds is purchased. One with the coils imbedded is to be preferred.

(9609) G. C. T. asks: Will you kindly answer through the notes and queries column the following questions? 1. While trying to find the direction of magnetic lines of force in the fields of a small dynamo I used a hand compass, and after letting the compass touch the poles a few times I found that the north end of the needle had been influenced some way and would be at rest only when pointing due south. The compass is still in that condition. Please explain reasons for this and a way to change needle back to original condition. Compass is inclosed in brass case and with what I suppose is a steel dial. A. The needle of your compass has its magnetism reversed by the dynamo field in some way, so that the former north end is now south. To restore it to its former polarity, place the compass so that the needle cannot turn and bring the end which you wish to have north against the south or minus pole of the dynamo. In a short time the needle will be charged in the proper direction. 2. Is it necessary with a series-wound dynamo to have the external circuit closed when starting, provided the field coils are separately excited? A. It is necessary to have the external circuit of a series dynamo closed when it is started. It will not generate E. M. F. on open circuit, since no current can flow around the field until the external circuit is closed. It is not the same with a shunt machine, which has its field circuit always closed. 3. Are series or shunt wound field coils best adapted for dynamos that are direct connected, or does the manner of winding affect the coupling of dynamos in any way? Hawkins's "Catechism of Electricity," page 157, states that dynamos of the under type are invariably used for direct connections but does not say whether manner of winding affects this or not. A. Series-wound dynamos are not used in parallel or coupled together, because if either generates too little current that fact reduces its power to generate still further and finally reverses the machine, which short-circuits the system. These matters are fully discussed in Crocker's "Electric Lighting," two volumes, which we can send for $6.

(9610) A. L. R. asks: 1. In running levels for a waterway of considerable length, like the Panama Canal, is not the rotundity of the earth an important factor that must be considered? A. In running levels for waterways of considerable length the line which is actually run is substantially a circle whose center is the center of the earth. The sites taken by the instrument between successive settings are so short that the curvature of the earth does not appreciably affect them, and at each new setting of the instrument the line of the level is parallel to the circumference of the earth at that point. 2. If it were possible to stretch a wire, perfectly taut, across a lake ten miles in width, so that it is perfectly level and absolutely without sag, would it not be necessary that the shore end of the wire be anchored at an elevation of not less than 16 2-3 feet above the water to prevent the immersion of the wire at the center of the lake? A. If it were possible to pass a perfectly straight line across a lake ten miles in width, the anchors must be elevated not less than 16 2-3 feet above the water to prevent the line from going below the level of the water at the center. 3. An extensive and perfectly level plain is traversed by a range of mountains; to pierce which, for a railroad, requires a tunnel ten miles in length. If such a tunnel is excavated with a floor perfectly level, as indicated by the surveyors' level or by "tees" placed at both ends and the center, assuming the possibility of sighting that distance, would not the center of the tunnel be lower than either end or than the plain outside, and would not the water in the tunnel drain toward the center? Would the specific gravity of an object placed in the center of the tunnel be affected by the superincumbent weight of the mountain mass? A. If the tunnel which you mention were to pierce a range of mountains ten miles long, it would not go in a straight line with the mountain, but be an arc of a circle whose center was the center of the earth, or else, as a matter of good engineering practice, it would be enough higher in the center, than indicated in the above statement, to allow drainage in both directions. If such a tunnel were excavated with a surveyor's level stationed at the point where the range of mountains left the level plain on one side, it would come out on the other side of the mountain range 65 feet above the plain. If the tunnel were excavated in an exact straight line from the plain on one side to the plain on the other, at the entrance of the tunnel on either side there would be a down grade of 65 feet in ten miles, or 6¼ feet to the mile. The tunnel would be level in the center, and would be at that point 16 2-3 feet below the surface of the plain. The specific gravity of an object placed at the center of the tunnel would be slightly less than outside on the plain, because of the influence of the mountain.

(9611) H. M. says: Please give the best receipt for making whitewash for outside work. A. A good durable whitewash is made as follows: Take ½ bushel of freshly burnt lime, slake it with boiling water; cover it during the process, to keep in the steam. Strain the liquid through a fine sieve, and add to it 7 pounds of salt previously well dissolved in warm water; 3 pounds of ground rice boiled to a thin paste and stirred in boiling hot; ½ pound powdered Spanish whiting; 1 pound clean glue, which has been previously dissolved by soaking it well, and then hanging it over a slow fire in a small kettle, within a large one filled with water. Add 5 gallons of hot water to the mixture, stir it well, and let it stand a few days covered from dirt. It must be put on quite hot. For this purpose it can be kept in a kettle on a portable furnace. About 1 pint of this mixture will cover a square yard.

(9612) C. F. writes: Some time ago I read about a liquid or composition which placed into a tree stump or roots would rot and thereby destroy them. Could you explain this or any other similar process of destroying tree stumps? A. In the fall bore a hole in the center of the stump, about 18 inches deep and 1 to 1½ inches in diameter. Put in about 2 ounces saltpeter, and fill the hole with water; plug it up tight. In the spring take out the plug, pour in 8 or 10 ounces petroleum, ignite, and the stump will smolder, but not blaze, to the extremities of the roots, leaving only ashes. Dynamite is also extensively used.

(9613) W. B. asks: 1. A chicken gains about twice in weight for the first twenty-four hours after hatching. What do they live on, as they do not eat anything? A. It is true that chicks can go for several days without food, as there is sufficient of the egg left in the stomach to supply nutriment. They will eat on the first day, however, if food is provided. Chicks almost double in size the first day, owing to the organs being relieved from the compression of the eggshell, and as the down on the chick dries, it fluffs out and adds to the apparent size. It may be that in individual instances they double in weight, but it is far from true as a general rule. We have known cases where the reverse was true. Where too much moisture has been kept in the incubator, the egg does not dry down enough, and the chicks hatch in a swollen, puffy condition. During the first day the surplus water in them evaporates, so that they shrink, and weigh less than when they were hatched. It may be true, too, that when there has been too little moisture in the incubator, and the eggs have been dried down too much, the chick will absorb moisture after being hatched and so increase in weight. Where the chick has been hatched under a hen, or where the conditions of moisture have been kept just right in the incubator, there will be very little, if any, change in weight during the first day. 2. A hard-boiled egg weighs quite a bit more than a raw egg. Where does it get the extra weight? A. The shell of an egg is very porous, and moisture and air also pass through it without difficulty. Hence in boiling water is absorbed by the egg, and this increases the weight of the egg. 3. Why does sap run up the tree? A. Sap is carried up a tree by osmotic pressure and capillarity, chiefly. The evaporation from the leaves tends to assist the flow during the season when the leaves are on the trees. These matters are explained in textbooks of physics.

(9614) R. A. asks: Would you please explain to me if a magnetic needle would show any greater resistance to turning out of directions if it was made much longer, if it had a large surface, of if it was made with electro-magnets. A. A long magnetic needle swings more slowly than a short one, and one with a larger surface in a vertical direction is resisted by the air more than a flat needle. It makes no difference to the swing whether the needle is a permanent or an electro-magnet.

(9615) M. S. asks: Is it not the tendency of a bullet fired from a rifle to ascend until it has spent its force? A. A bullet is a falling body, and descends by gravity after it leaves the gun, just as if it were dropped through the air. For this reason a bullet will not hit a target if the gun is aimed directly at the target. The sights of the rifle are so adjusted as to point the gun above the target to such an extent that the bullet will curve up above the target and down to the target when it has flown for the time required for the bullet to pass from the gun to the target. This curving increases as the distance from gun to target increases. A ball from a gun fired in a level line does not curve upward or ascend till it has spent its force. If it were so, there could be no science of gunnery.

(9616) H. H. A. asks: Kindly answer the following question: Does the date change between points on opposite sides of the 180 deg. meridian, or is it merely nautical reckoning that recognizes the date line? A. The date changes at any place when the line or meridian of midnight passes over that place. The date is constantly changing all the way around the earth during the twenty-four hours of any day. The international date line is a line which is very nearly coincident with the 180th meridian. To the east of that line the date is always one day later than on the west of that line. Night covers half of the world all the time. The meridian through the middle of the night is moving all the time around the earth. On the east of that meridian there is one day, on the west of that meridian there is another. A day is dying on the west side of that meridian, a new day is coming on the east. At eleven at night in your place, the line of midnight is one hour to the east of you. The day has one hour left. The next day is only one hour away to the east. In an hour it has reached you and passes over your head, speeding west ceaselessly, around and around the earth. However, when a ship passes the 180th meridian, it changes its date, since it has passed out of one day into another.

(9617) E. A. W. asks: 1. Why does a condenser increase the current in an induction coil, and is one necessary in wireless telegraphy? A. The condenser suppresses the spark which would be produced on the closing of the primary circuit of an induction coil and intensifies the spark upon the breaking of the primary circuit. All coils which are to throw sparks must have condensers. Hence one must be used in wireless telegraphy. The full action of the condenser is given in answer to Query 8184, Vol. 84, No. 20, which we send for ten cents. 2. Could a spark coil such as are used on gasoline engines be used instead of an induction coil? A. If the spark coil of the gasoline engine has a primary and a secondary winding and condenser, it may be used to send wireless signals for a short distance. 3. How large a coil and how many batteries would be needed in a wireless outfit between two places 500 feet apart? A. We should not advise any one to experiment with wireless telegraphy over any short distance even without having a coil capable of giving an inch spark. 4. Which is best in a wireless telegraph receiver—a coherer containing carbon granules connected directly with the battery and a telephone receiver, or a coherer containing nickel or brass filings with a decoherer and connected with a relay which operates a sounder? A. The coherer should contain metallic filings, and be provided with a tapper to decohere the filings. 5. Does there have to be a spark in the secondary coil to make the Hertzian waves? A. The Hertzian waves are produced by the surgings of the discharges of an induction coil, or some other electric discharge of similar character. Lightning produces them. 6. Can a magneto generator be used in a transmitter? A. A magneto cannot be used as a transmitter unless it can be used to send current through the primary of the induction coil, and they are not usually wound for any such purpose. 7. What size of wire is usually used in winding electric bells? A. Any size of wire may be used upon an electric bell which will allow current enough to pass to magnetize the core of the magnet and thus ring the bell. To ring through great resistance a fine wire, No. 30 to 36, is commonly employed, and as many as 1,000 ohms may be wound on the spools. 8. If a meteor is heated by friction with the air, how is it heated when it is out in space? A. A meteor is not heated on the outside of the earth's atmosphere. In external space the temperature is supposed to be in the neighborhood of absolute zero, and all small bodies there must be as cold as the place in which they are.

NEW BOOKS, ETC.

How to Know the Starry Heavens. An Invitation to the Study of Suns and Worlds. By Edward Irving. New York: Frederick A. Stokes Company, 1904. 12mo.; pp. 313. Price, $2.

This book is a popular introduction to the study of astronomy, and in its pages will be found a careful selection of the most typical, interesting, and instructive facts and theories known so far concerning the universe. These are described and illustrated in a way that will make them attractive, not only to the general reader and beginner, but also to persons having a more advanced knowledge of the subject. The idea of the author in writing this book (which is the first of a series dealing with the sciences of astronomy, biology, and sociology) is to give a bird's eye view of the subject without the confusion of too many details. The figures given in the work are mostly in round numbers, and while they may not be absolutely accurate, they are fairly so. Within the twenty-five chapters of the book such subjects are dealt with as the Construction and Dimensions of the Universe and Principles Utilized in Measuring It; Kepler's Three Laws; Galileo's Laws of Motion; Newton's Laws of Gravitation; the Nebular Hypothesis, and many theories and discoveries regarding it, as well as the various Modifications of the Nebular Theory; the Apparent Motions of the Heavenly Bodies, as Shown by Observation, and the Rival Theories to Explain Such Apparent Motions; Some Problems Used in Celestial Measurements; the Principles and Applications of the Spectroscope; Lunar Geology and Geography and Igneous Forces on the Moon and Elsewhere. The book is very completely illustrated with no less than 128 full-page illustrations and 121 smaller cuts, besides a number of colored charts. Many of the half-tones are from excellent photographs of the heavens obtained in the various leading observatories. Altogether, this book forms one of the best popular treatises which has yet come to the field.

Practical Electric-Light Fitting. By F. C. Allsop. New York: The Macmillan Company, 1905. 12mo.; pp. 283; 242 illustrations. Price, $1.50.

This work, which is now in the sixth edition, forms a treatise on the wiring and fitting up of buildings deriving current from central station mains, and the laying down of private installations. It is a thoroughly practical treatise for fitters and others who require plain, practical instruction and diagrams, rather than abstruse mathematical formulæ. All forms of switches, cut-outs, lamps, meters, heaters, storage batteries, dynamos, etc., used in electric lighting are described in detail, and full descriptions, illustrated with diagrams, are given regarding the wiring of buildings.

Uncooked Foods and How to Use Them. By Mr. and Mrs. Eugene Christian. New York: The Health Culture Company, 1904. 12mo.; pp. 246. Price, $1.

This book is a treatise on how to get the highest form of animal energy from food. It opens with a general consideration of the food question, and the various products, such as cereals, fruits, nuts, milk, etc., are discussed and comparative tables of food values, time of digestion, etc., are given. The effects of cooking upon various kinds of food are set forth in full, the authors claiming that the application of heat in the cooking of food destroys some of the vital and organic food elements by rendering them inorganic. Many of these elements are needed in building up the system and maintaining the bodily and mental health. The book tells how to begin the use of uncooked foods, and discusses their proper use under various conditions. About 200 receipts for the preparation of fruits, cereals, vegetables, nuts, salads, cakes, puddings, sauces, etc., together with a seven days' menu, are given; and these show very clearly how much can be done in the way of setting an attractive table with purely uncooked foods.