Thought; On the Principle of Comparison in Physics; On the Part Played by Accident in Invention and Discovery; On Sensations of Orientation; On Instruction in the Classics and the Mathematico-Physical Sciences. Appendixes. I. A Contribution to the History of Acoustics. II. Remarks on the Theory of Spatial Vision.

PHOTOGRAMS FOR 1897. London: Dawbarn & Ward, Limited. 1897. Pp. 114. 8vo. Price 80 cents in cloth; 40 cents in paper.

This is a pictorial and literary record of the best photographic work of the year, compiled by the editors of the staff of The Photogram, assisted by Gleeson White. This publication is supposed to represent the pictorial side of photography in various parts of the world. In this respect, since it began and the subsequent years have proved it to be uniformly successful, especially from an artistic point of view. This excellence is fully maintained in the present volume for 1898. We note several of the landscapes and views on the river during foggy days, in which the English amateurs excel. Possibly the most striking photograph in the whole work is drawing the charge from the retort in the gas works. This would make an ideal subject for a realistic painter. In addition to examples of artistic photographs are to be found others showing the progress in Roentgen photography and the kinetograph, among the latter being a page or more of minute pictures representing the crowd of photographers leaving the convention hall at Yarmouth last summer. These are so distinct that noted personages may be readily picked out. It is a book whose annual appearance is always appreciated and is one of the best printed annuals that comes from London.

SIXTEENTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY TO THE SECRETARY OF THE INTERIOR. 1894–95. Charles D. Walcott, Director. Washington. 1896. 4to. Pp. 910.

The present volume contains the Director's Report and papers of a theoretic nature. It details the remarkable work which has been accomplished by this important bureau of the government. After examining this splendid volume, it is easy to see why the publications of the United States government are so much thought of abroad. Many of the articles in the report are of course only interesting to specialists, but anyone who is interested in science can easily spend an hour in examining it. The engravings adequately illustrate the work. There are 117 plates and 169 engravings in the text, besides valuable geological maps.

THE ARCHITECTS' DIRECTORY FOR 1897–98. Containing a List of the Architects in the United States and Canada. Together with a Classified Index of Prominent Dealers and Manufacturers of Building Material and Appliances. New York: W. T. Comstock. 1897. Fourth annual edition. Pp. 112. Price $1.

This excellent little book contains a classified list of the architects of the United States and Canada, and as it is issued by the publishers of Architecture and Building, it certainly should be trustworthy.

THE DWELLING HOUSE. By George Vivian Poore, M.D., F.R.C.P. London: Longmans, Green & Company. Pp. 178. $1.25.

The proper sanitation of dwelling houses is a leading subject in this handbook, a great portion of whose contents has been previously published in papers delivered before the Royal Institution, the British Medical Association, etc. Its illustrations and comments relate almost exclusively to the ideas and practice of English builders.

APPLIED MECHANICS. A Student's Treatise in Mechanical and Electrical Engineering. By John Perry, M.E., D Sc., F.R.S. London: Cassell & Company, Limited. Pp. 678. Price $3.50.

For students who have time to work experimental, numerical and graphical exercises, and who would like to review an entire course of instruction in applied mechanics, this volume presents the ready means, as it embraces a two years' course of such lectures at the Finsbury (London) Technical College. All mechanical and electrical engineering students in their first year have two lectures a week, and the substance of these lectures is here printed in large type, while the mechanical engineers had three lectures a week in their second year, and these are printed in small type, the whole forming a volume containing a great amount of technical instruction, chemical and building students also attending in the mechanical department. The Appendix contains many useful tables.

A NEW ILLUMINATED EDITION OF THE HOLY BIBLE, brought out by the American Bible Union, 230–238 South Eighth Street, Philadelphia (copyrighted by Frank E. Wright), presents a wealth of illustration such as, we believe, has never before been attempted in a volume designed for general circulation, and offered at popular prices. The text conforms to that of the Oxford Bible, of the University Press, Oxford, with full marginal references and a Concordance. The work is embellished with 800 pictures, designed not only to give the Bible student all possible assistance to the proper understanding of the Sacred Word, but to be faithfully and artistically illustrative of the text, as it has been interpreted at various times in the long period during which the Bible has been looked upon as the first of all books. The pictures also cover oriental scenes of many types and all ages of the world, including representations of recently discovered ancient monuments, with their almost undecipherable hieroglyphics, and fragments of papyri manuscripts which are now the objects of study by the most learned scholars. The typography and mechanical execution leave nothing to be desired, the type being large, clear and delightful to the eye, while all of the several types of binding in which the work is offered to the public, from the silk cloth to the full turkey, are of the same high character, as befits an edition de luxe.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & 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.

(7278) X. asks: Will you please give me through your column of Notes and Queries a receipt for making a hectograph composition and also a hectographic ink? I would like something better than the plain glue and glycerine composition, and also for an ink that would not rub and smear. A. Formulas for pads, also inks, are given in SUPPLEMENT, Nos. 1071, 1092, 1110 and 1119; price 10 cents each by mail.

(7279) W. R. asks (1) how a drum armature can be wound so that it can be connected to a two segment commutator. A. Connect the coils on one side in series end to end; also on the other side, and join the ends to the two part commutator; but there is no advantage in doing it. 2. What is the claim made for the drum armature over the shuttle? A. With a drum armature as many impulses of current flow into the line for each revolution as there are coils, and the current is rendered even and uniform. With a shuttle armature there is a decided fluctuation of current at the same speed, since there is but one coil. This is not a claim, but a fact. 3. What is the size and sustaining power of the smallest electromagnet ever made? A. We have not at hand the accounts of small magnets. You can find accounts of very small electromagnets which sustained very large weights in "Lectures on Electricity," by Prof. George Forbes, price $1.50 at this office. 4. In the SUPPLEMENTS describing the simplified Heltz machine, can the curved rod, G, forming the bearing for the sleeve, C, be placed in front of the revolving disk, or must it form the bearing for the sleeve? A. Make either arrangement, only let there be a firm support for the revolving parts. 5. Does it make any difference if the revolving plate is back instead of in front of the stationary? A. The side on which the discharge balls are is the front. It is much more convenient that the revolving plate should be on this side. There is also much less leakage. 6. Can a sal ammoniac battery be made with copper and zinc for the elements? A. Yes; but a very poor one, too poor for service. It gives less than one volt.

(7280) W. J. W. asks: Please inform me through your valuable paper how to resilver a looking glass? A. Valuable articles on this subject are contained in our SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 105, 121, 895 and 1006: price 10 cents each by mail.

(7281) F. H. M. writes: I wish to enlarge dynamo of which you give plans in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, to twice the dimensions given in paper. Would you kindly answer the following questions through the columns of your valued paper the SCIENTIFIC AMERICAN? 1. Should I use 48 divisions on commutators, or 24? A. The number of coils on the armature should not be changed. Wind 24 coils as before. 2. If 48 divisions are used on commutator cylinder, would it be necessary to use same number of divisions on armature core? A. Yes. 3. By doubling dimensions of dynamo gives it four times its capacity; using 14 wire on armature, 12 wire on field, would it run 32 16 candle power lamps more or less? A. Yes. 4. Could not the top of field, be cast in one piece instead of two, and bolts run down through field waists connecting all the field firm? If so, what size bolts, diameter? A. The principle of construction is to have as few joints in the castings as possible, as every joint causes some leakage. The top may be in one piece, and bolted as you suggest; ¾ inch bolts may be used.

(7282) F. S. G. writes: I have three Crowfoot gravity batteries on a short telegraph line; to charge them I put in 8 ounces of blue vitriol in each and filled them up with water, then to start the action I added 2 ounces of sulphate of zinc. I short circuited them, but the blue line will not come up any higher than the middle of the copper. What is the matter, and how can I remedy it? The way they are now, the three of them will not work one sounder. A. Fill the copper sulphate crystals in till the copper is covered. Then fill the jar with water till the zinc is covered. Short circuit for a few hours till the solution is clear like water to a point below the zinc. Your trouble is that you have not used blue vitriol enough. It is not necessary to use any sulphate of zinc in starting the gravity battery. It will form quite soon enough and will then have to be got rid of.

(7283) A. M. asks what the different compositions in the carbon for the brushes and arc lights are cemented together with. Would silicate answer the purpose? A. We are not able to give formulas as used by the different manufacturers of carbons; but the ground carbon powder is usually mixed with a sirup of sugar and gum and shaped by pressure. They are then baked in an oven to carbonize the adhesive substances. The details of the process are considered trade secrets. The Carre carbons are said to contain of powdered coke 15 parts, calcined lampblack 5 parts, special sirup 7 to 8 parts, mixed with water, moulded and dried in a crucible.

(7284) J. C. P. writes: I have a dynamo giving a current at terminals of 60 volts, 16 amperes. I wish to light a small Foucault arc lamp carrying ¼ inch carbons. 1. What resistance should I introduce in series with the same, dynamo running shunt, to get the most satisfactory results, i. e., quiet arc? A. The voltage and current taken by an arc lamp vary with the length of the arc, when properly lighted. Measurements with ¼ inch carbons gave these results:

Amperes.	Volts.
9	35
8·5	40
6·5	50

Assuming your smallest drop then in the arc to be 35 volts, you will need to provide for 25 volts and 9 amperes in the resistance box. Apply Ohm's law to this: $C=\frac{E}{R}$; or $R=\frac{E}{C}=\frac{25}{9}=3$ ohms. The lamp has the other 4 ohms which are needed to pass 9 amperes. $R=\frac{35}{9}=4$ ohms nearly. The resistance box should allow of varying the resistance from the smallest to the largest current required in your work. 2. Carbons seem to tend to burn to a slim pencil point. Why? A. Your lamp gets too much current. 3. In my 90° arc lamp, taking current of 40 volts and 12 amperes with cone carbons, a horn grows out on negative carbon and tends to short-circuit the arc. Why is this? How can it be avoided? A. By giving the lamp more resistance in box, and so less current.

(7285) M. L. F. asks for the best receipt for a powder or dry mixture fire extinguisher—something to throw into the fire that will put it out, and that will keep a long time without losing its strength. A. Vienna Fire Extinguishing Agent: A solution of 5 parts ferrous sulphate (copperas), 20 parts ammonium sulphate, 125 parts water. Johnstone's: Make a mixture of equal parts of pyrolusite (manganese dioxide), potassium chlorate, potassium nitrate. Moisten with water glass and press into a block. Place the block in a pasteboard box. Several boxes, connected by fuses, are suspended from the ceiling of a room.

(7286) W. J. A. says: A few evenings ago, a friend of mine took out of his pocket a box containing long white "pills," tapered at each end. Laying one of these on the edge of a table, he applied a match and lit the end of it. Burning slowly, the "pill" transformed itself into gray material about 5 inches long. This gray matter seemed to writhe like the body of a snake while forming. After the "pill" stopped burning, their formation would fall in pieces if touched. Can you give me a receipt for making them? A. Pharaoh's serpents are made as follows: One grain of dry mercury sulphocyanide is mixed with some gum tragacanth which has previously been soaked in hot water. When the gum is completely softened, it is transferred to a mortar and the mercury sulphocyanide (in fine powder) is mixed with it by aid of a little water, so as to turn out a somewhat dry pill mass. This is then formed and cut into pellets of the desired size, which are dried on glass. These are very poisonous, and must be handled with care. Do not inhale the fumes.

(7287) G. S. M. asks: Can aluminum be used in castings for a gasoline engine of 1 horse power? If not, why? Could I save any weight by using brass or gun metal instead of iron? A. Pure aluminum can be used in many of the parts of a 1 horse power gasoline engine. If lightness is the principal object: An alloy of 90 parts of aluminum, 9 parts of silver, 1 part of copper—all by weight—makes a very hard but workable metal, suitable for cylinder, piston and valves. The specific gravity of this alloy is but very little more than pure aluminum. The cylinder could be covered with a thin sheet metal water jacket, and thus make a very light and beautiful engine. This alloy makes close grained castings and can be easily soldered.

(7288) W. M. Z. asks: 1. How fast will air travel through a pipe leading into a vacuum? A. The theoretical velocity with which air will flow into a vacuum if wholly unobstructed, is 1,347 feet per second. The coefficient for an orifice is 0·707, which limits the quantity value to 952 feet per second. The friction of the air in the pipe still further retards the flow according to its length. 2. How much in bulk will air compress under different pressures? A. There is no known limit to the compression of air at ordinary temperatures; 15,000 pounds per square inch has been attained without liquefaction. At a temperature of 220° below zero, Fah., it liquefies at 573 pounds pressure per square inch. 3. How long will it take an air pump, say 10 horse power, to create a vacuum in a vessel of 1,000 cubic feet? A. A perfect vacuum cannot be made by any ordinary vacuum pump. The time of obtainining an approximate vacuum depends upon the relative volume of the pump and vessel, as also the speed of the pump; an approximate time, barring leakage, may be found by subtracting the pump volume from the volume remaining in the vessel for each stroke of the pump.

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