Notes and Queries.

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.

(12099) W. B. B. asks: To give information that will immensely benefit the public at large, I will be pleased to have you give me as soon as you can look into the matter thoroughly, the best means and best way to lay sewer pipe, and especially the making of cement joints. We have sanitary sewers here, and they are filled with roots that creep into the crevices and joints of the pipe. The pipes laid in this vicinity are placed in position, a little cement placed on the lower half of the bell or socket end of the pipe, and then the next pipe with a string of oakum on it is inserted into the pipe; the balance of the joint is mortared up with cement. The principal information I am seeking is whether the hemp or oakum string is necessary or of any value, or whether a good Portland cement joint is or is not the better way to make the joint. A. Provided the sewer pipe is laid upon a perfectly solid bed, so that the joints are unlikely to be distorted at all (by the filling in of material above the sewer, subsequent traffic over it, or otherwise) we should say that as far as the prevention of the entrance of roots into the joints is concerned, the oakum might better be omitted and a joint of neat Portland cement substituted. It is of course essential that any flow of water through the sewer should be prevented until the cement has had time to set; otherwise a very small quantity trickling through the joints will wash out a small part of the cement and leave interstices in it. The object of oakum or similar fibrous packing is to provide a small amount of give or spring, so that any slight distortion or settlement of the pipe will be compensated by expansion of the packing and will not leave openings nor crack the pipe or flanges; but such roots as you describe are quite capable of growing through the oakum, even when the latter apparently tightly fills the joints.

(12100) W. S. P. asks: Suppose I have a piece of 3-inch square steel 8 inches long and I wish to make a square taper. I clamp it on an angle plate, set square on the planer, with one end higher than the other to make it the desired taper. Now I keep turning it a quarter of a turn at a time, keeping the planed side against the face plates. Now when I have planed all four sides in this manner, will it be square? A. You will make a true taper in the manner described if you keep the axis or center line (or any unplaned side of the square bar) at the same angle to the face plate. Having planed the taper on two sides in the manner you describe, turning the bar through one-quarter turn, you will have two sides of the equilateral pyramid truncated, the top being square but not concentric with the axis of the bar. If you now make another quarter turn, resting the bar on the same blocking and adjusting as before, the tool will not cut the third side of the bar at all if fed through the same range as before, because the bar will rest with one of the tapered sides on the blocking and will be lower by the amount previously cut off. The blocking must therefore be raised by the amount cut off at the point of the bar where it rests on the blocking, and will then be right for the remaining two sides; the final result, without readjustment of the tool, being an equilateral truncated pyramid with a square top concentric with the axis, in other words the taper will be uniform on all four sides.

(12101) W. L. B. asks: In regard to using compressed air for cooling water. I have control of a mill plant here, and we have to drink hydrant water that gets very warm in summer, and we cannot use iced water successfully on account of its being too cold for the men to drink while very hot. We use compressed air at 40 or 50 pounds or 100 if needed, and I believe there could be a way to use it to cool the water, say to about the temperature of good cold well water, as I notice in cool weather (not near freezing) our pump that we run with air instead of steam will freeze up so bad that we have to run a hot-water pipe to it to keep it thawed out. A. The cooling effect of compressed air is due to the physical law that any gas heated by compression and then allowed to cool will, if expanded so as to do mechanical work, lower its temperature and therefore absorb heat from surrounding bodies. If the air has had time to cool after leaving the compressor (or is artificially cooled) it will have a considerable refrigerating effect if allowed to expand. If you place in your drinking-water tank a coil of small pipe open to the atmosphere at one end and connected at the other by a valve to the compressed-air line, the valve being as close as possible to the water, so that all the expansion is in the submerged coil, by leaving the valve just open and a little compressed air constantly escaping through the coil, you should be able to keep a considerable quantity of water comfortably cool.

(12102) C. R. K. asks: Would you please verify the following: Air is in a stationary chamber at 32 deg. with a pressure of 25 pounds per square inch. If the temperature be raised to 212 deg., the pounds pressure per square inch will be 105; and if the temperature be raised to 490 deg. the pounds pressure will be 380. Are these figures correct? If at the start the pressure were 50 pounds per square inch, what would the corresponding results be? A. We regret that we cannot "verify" your figures, which are, if we understand you correctly, entirely wrong, and we cannot see how you derived them. The expansion of air at constant pressure due to increase of temperature is extremely small, and consequently its increase of pressure if the volume remains the same is equally small, amounting to 0.002037 (or two-tenths of one per cent) of its pressure for each degree Fahrenheit through which its temperature is raised. Thus if a given quantity of air has a pressure of 25 pounds at 32 deg. F. (supposing the figures you give to be Fahrenheit) i pressure at 212 deg., volume remaining constant, will be $25 + (25 \times 0.002037 \times 180)$ or 34.1575 pounds. If heated to 490 deg. F. the pressure will be $25 + (25 \times 0.002037 \times 468) = 49.0144$ pounds. If the initial pressure were 50 pounds, the pressure at 212 deg. would be 68.315 pounds, and at 490 deg. 98.0288 pounds.

(12103) R. M. H. asks: Will you kindly answer the following in your Notes and Queries column: 1. For heating a large residence of say 25 rooms, would hot water or steam be the best, and do you know the name of any firm manufacturing such systems? A. We cannot express an opinion as to the comparative advantages of steam and hot-water heating apparatus without knowing more of your conditions. You can best judge by comparing the advantages set forth in the printed matter of manufacturers. 2. Do you know where I can get any books on mechanical drafting? A. As publishers and dealers in scientific and technical books we can supply you with any book published on the subject of mechanical drawing. We would especially recommend the following: "A Manual of Mechanical Drawing," by Johnston, $2; "Mechanical Drawing Self-Taught," by Rose, $4; "Progressive Exercises and Practical Hints in Mechanical Drawing," by MacCord, $4. A still further list is contained on page 28 of our complete catalogue of books. 3. Are the materials used for the explosive in high-power shells of the larger guns stronger than nitro-glycerine, volume for volume, after they are compressed into the shell? A. The basis of most shell explosives is nitro-glycerine, and they are generally rather less powerful than the latter on account of deadening material being added to prevent the accidental explosion of shells by shocks or fire. These matters are kept carefully secret, however, and comparative figures are not available.

(12104) W. C. D. says: I wish to state that the formula for silver plating given in Van Horne's "Modern Electro-plating" is not right, as I followed directions very closely, and in making a gallon solution he says to use 9 to 12 ounces of cyanide 98 per cent, and I found that I had to use double the amount of water, as there was too much cyanide, therefore had to buy more chloride of silver to enrich the solution. A. We find that Langbein's "Electro-Plating," pages 357 and 359, gives much less cyanide per gallon than does Van Horne in the formula to which you refer. Van Horne, however, on page 131, gives the necessary directions for adjusting the bath for working freely, and so one can make a solution by his formula. Langbein gives 6 ounces cyanide per gallon for heavy plating and about 3 ounces for light plating.

(12105) F. L. W. says: Will you please explain why at the solstices the days do not begin to get longer or shorter at both ends at the same time? That is, why in December, for instance, does the sun begin to set later several days before the solstice, but not to rise earlier until several days after? A. The sun begins to set later in December in the afternoon by the clock, because the clock does not indicate true noon. The true forenoon and afternoon are of equal length all the year. True noon is midway between sunrise and sunset all the year. This is determined by the sun, and a sundial will give true noon or midday. The clock does not show the true solar time, but the mean solar time, and it is sometimes ahead of the sun and at other times behind the sun. Only on four days in the year are the clock and sun together. The lengthening of the afternoon in December is reversed in June, since then the forenoon begins to shorten some days before the summer solstice. Both changes are caused by the relation of the equation of time to the time by the sun. This is quite fully explained on page 113 of Todd's "New Astronomy," which we will send for $1.50 post paid.

(12106) A. R. D. says: Will you please advise what is the ratio of drop on water 150 deg. Fahrenheit inside temperature, water 30 deg. outside temperature, and water 60 deg. inside temperature, 30 deg. outside? In other words, which will freeze the quicker—hot or cold water? A. The rate of cooling of water is very nearly proportional to the difference of temperature between it and the temperature around it. If water is 150 deg. and the air around it is 30 deg., the difference is 120 deg. If the water is 60 deg. and the air is 30 deg., the difference is 30 deg. The water at 150 deg. will cool about three times as fast as that at 60 deg. That has no connection with the freezing of either of these waters. When water is cooled to the freezing point, it then must give off a great quantity of heat before it is frozen. It must cool to 32 deg. before it can freeze at all.

NEW BOOKS, ETC.

THE ART OF RETOUCHING SIMPLIFIED. By Ida Lynch Hower. Chicago: A. C. McClurg & Co., 1908. 12mo.; 48 pp. Price, $1.

To know how to retouch negatives is more necessary in this day than ever before, because the photographer's posers are constantly demanding finer and more finished results. The steady improvement in photographic lenses—which have now reached such a high state of perfection—has so increased, that the negative is rare that does not need the manipulation of the retoucher's pencil. This little manual contains practical suggestions from the standpoint of over a quarter of a century of professional training on the part of the author, and the most modern methods and processes have been sought and used.

PRACTICAL TESTING OF GAS AND GAS METERS. By C. H. Stone, B.S., M.S. New York: John Wiley & Sons, 1909. 8vo.; 337 pp., 51 figures. Price, $3.50.

The author has received a large number of requests, at different times and from various men connected with the gas industry, for information regarding the methods, apparatus, and chemicals used in the testing of gas. The first thought was, naturally, to refer the inquirer to some standard work where he would find answers to all of his questions. Careful investigation, however, failed to reveal such a work. No attempt has been made to write a treatise on the manufacture and distribution of gas. The writer's chief aim has been to explain clearly, simply, and fully such tests as would be of practical service to the gas manager, chemist, or photometrist, and to make such comments and suggestions as might guide him in his choice of apparatus or process and assist him to secure accurate and useful results therewith. For this reason all chemical processes, reactions, and calculations have been explained at a length which may seem wearisome to the expert chemist. Many of the later forms of calorimeters, for example, have been described in different technical journals during 1908, and a brief account of these, together with the original reference, is given in the chapter on calorimetry. To the student, whether in the college or commencing work for a gas company, this book may prove a help by leading him by easy journeys over the rather troublesome roads of photometry, calorimetry, and the chemical analysis of gas.

THE ART OF MAGIC. By T. Nelson Downs. Edited by John Northern Hilliard. Buffalo: The Downs-Edwards Company, 1909. 8vo.; 342 pp. Price, $5.

The author has produced a book which treats of standard tricks, also many novelties. The volume before us deals almost entirely with card tricks, tricks with coins, and tricks with a wand. It does not trespass on the field of Hopkins's "Magic," which considers more particularly the other and more complicated tricks requiring more or less elaborate paraphernalia, so for this reason we believe that the book will prove of value to those who are already in possession of "Magic."

THE NEW INTERNATIONAL YEAR BOOK, 1908. Frank Moore Colby, M.A., Editor, assisted by various special contributors. New York: Dodd, Mead & Co., 1909. 8vo.; pp. 776; 47 full page illustrations, 9 maps.

The 1908 issue of the New International Year Book is the second of a new series of annual volumes which was arranged to follow the publication of the New International Encyclopedia, and it is to be hoped that it will be maintained without the interruptions that have detracted much from the value of these and other annual records that have been attempted in this country in the past. A distinct policy of continuity is most essential for a work of this kind, and invaluable as it is, as a supplement to an encyclopædia or other reference work it should be compiled and judged solely on its merits as an authoritative record of the year. The New International Year Book for 1908 contains a summary of the progress of the world for that year in all departments of history, art, literature, and science, so that it affords the busy man a conspectus of what has happened in any field during the twelve months under review, and enables him to read his newspaper with an appreciation of previous events. In this way the Year Book thoroughly prepares the general reader for understanding any political crisis, such as the dethronement of the Sultan in Turkey, while its discussion of the presidential campaign in the United States is a valuable contribution to American political history and will prove of marked assistance to one who would understand current politics without undue study and reading. Thus the book should be very useful to the scientific man, as it enables him to keep in touch with developments in the world of politics, art and literature with a minimum of effort. All of the articles are prepared by recognized authorities in their special fields, and in pure and applied science the articles are specially valuable, not only in themselves but as forming an index to the progress of the year and indicating the most important work accomplished. It might be of assistance to the worker in science, as doubtless to the student of history and economics, if detailed and exact references in the form of foot-notes or otherwise were made to original authorities, though this might detract from the popular and unmistakably interesting character of the book. The reviews of the progress of Astronomy, Scientific Agriculture, Botany, Chemistry, Physics, and Psychology, to mention but a few of the scientific articles, seem specially well prepared, while interesting articles on Automobiles, Aeronautics, Bridges, Fire Protection, Railways, Military and Naval Progress, and Shipbuilding all show that the record of 1908 in applied science was not inconsiderable.

WHEN RAILROADS WERE NEW. By Charles Frederick Carter. New York: Henry Holt & Company, 1909. 12mo.; 324 pages. Price, $2 net.

A fascinating history of the struggles and fantastic failures and the final triumphs of the pioneer railroad builders is now gathered together for the first time in book form. No attempt is made by the author to follow the vicissitudes of all the railway schemes, but he follows graphically the history of those roads which best typify the processes of evolution and the characteristic circumstances up to where the story ceases to be romantic and commences to be commercial and commonplace. It is not primarily a book of reference, but is a highly interesting narrative for the general reader. What is strangest is that the general reader might search in vain for any satisfactory account of how the railroad first came to America, how it was built and how it was run, how the early pioneers struggled with poverty, ignorance, and other inevitable obstacles and blundered and struggled on again until at last they had developed a method of transportation that measured by its influence on civilization is the greatest achievement in the annals of the race. All the important inventions relating to railroading appear to be claimed for several men. Thus the four-wheel truck was claimed by three men. One of them obtained a patent for the device and then spent a fortune trying to protect it, only to find out in the end that he was not entitled to it. All the early stories seem mythical. At the outset the first engines ran only on fair days and they were replaced by horses on rainy days by the proud but prudent owners, says one account. This story is, however, considered to be legendary by some authorities the first engineer claiming that he ran his machine every day, rain or shine. The titles of the chapters are "The Dawn of the Railroad Era," "America's Pioneer Railroad," "Early Days on the Erie," "The Pennsylvania Railroad," "Genesis of the Vanderbilt System," "Incubator Railroads," "The Frst Continental Railroad," and "Romance of a Great Railroad." There are a number of excellent half-tone illustrations.

THE PHOTOGRAPHY OF COLORED OBJECTS. By C. E. Kenneth Mees, D.Sc. New York: Tennant & Ward, no date. 69 pp.; 12mo.; 14 plates; color chart; photogravure frontispiece; stiff paper covers. Price, 56 cents.

Although written from the English standpoint, Dr. Mees's book contains much that is of value to the American student of photography. The first chapter, on the nature of colors, and the second, on sensitiveness to colored light of the eye and of photographic plates, discusses the physics of color. The fourth chapter tells how color contrasts are rendered. The fifth deals with portraiture, and the sixth discusses photography of colored objects for reproduction. The remaining chapters are devoted to landscape photography and tricolor photography. While not employing purely scientific nomenclature and phraseology, Dr. Mees has made no attempt to be practical, on the principle that the application of an ounce of accurate knowledge is worth a ton of unreasoning practice.

STORY OF THE CATACOMBS. By Florence Edythe Blake-Hedges. Cincinnati: Jennings & Graham, 1909. 12mo.; 148 pages. Price, $1 net.

The Catacombs of Rome always have a fascination for American tourists who visit them in order to see the first examples of Christian art, and also because the foundations of much of the Christian religion were laid in these early worshiping places. The present work is a pleasing little volume, which serves as an introduction to those who are unfamiliar with the great volume of the remains to be found in the city of Rome and the Campagna. It is rather prettily printed on tinted paper.

HOW TELEGRAPHS AND TELEPHONES WORK. By Charles R. Gibson. Philadelphia: J. B. Lippincott Company, 1909. 12mo.; 156 pages. Price, 75 cents.

A small book written in simple non-technical language, dealing with telegraphs and telephones, such as would be useful to those who are specially interested in those instruments. A chapter on wireless telephony, and a short discussion of the electron theory, bring the volume thoroughly up to date.