probably higher. With say a rise of 30 feet, what horse power will it make with a turbine wheel, and what size wheel will it take to run a flouring mill, or will it do it at all? Our town has a population of 600, and could we light the town with the power from well? Say eight large electric lights and 400 incandescent lights for stores and dwellings. A. Four hundred gallons of water per second at a pressure equal to a head of 30 feet would develop 180 horse power. The number of pounds of water per second, multiplied by the head and divided by 5,500 will give you the theoretical power. If this flow of water could be constantly relied on, from 75 to 80 per cent of the above horse power could be generated by a turbine wheel, which would be sufficient to light your town, with considerable margin to spare. It is very doubtful if your well will continue its present output at the pressure which you mention for a great length of time. We would advise you, therefore, to get an expert's opinion on this point before making any large investment.

(9102) C. H. M. says: What is the formula for finding the horse power required to run an air compressor, given the following: The internal dimensions of the cylinder, the speed, and the maximum internal pressure, or the pressure at which the air is delivered from the compressor. A. The horse power required to run an air compressor, neglecting friction, equals the area of the cylinder in square inches multiplied by the internal pressure per square inch, multiplied by the number of feet which the piston moves per minute, and the whole divided by 33,000. Taking friction into account, the power necessary would be nearly double this amount. 2. In finding the exact horse power required, would the external pressure be considered? A. In determining the exact horse power, the difference in pressure of the two sides of the piston in pounds per square inch is the figure that should be used. 3. Of what advantage is a several-staged compressor over a single-staged one? A. A several-staged compressor has the following advantages: The air is compressed less in each cylinder, and therefore a larger amount of air can be forced out of each cylinder per stroke. The valves work more satisfactorily, and there is less leakage, because the difference in pressure on the two sides is less. Second, a small amount of leakage does less harm. The increase in temperature due to the compression in each cylinder is less, and the air may be cooled between the various stages of the compression. The work is more uniformly distributed throughout the entire stroke, making the compressor run more smoothly. 4. What would be the formula for finding the horse power required for a two, three, or four stage compressor? A. The horse power of the two, three, or four stage compressor is found by first finding the horse power of each cylinder, by the method already explained, and adding these amounts together. 5. Is there a formula for computing the horse power of a steam turbine, given the steam or air pressure and the number of cubic feet of steam or air delivered per minute at a given pressure? At what pressure will a turbine work most economically? Does a turbine generate as much power with a given amount of steam as a reciprocating engine? A. There is no reliable formula for computing the horse power of the steam turbine. In general, steam turbines will develop about the same horse power for a given amount of steam as reciprocating engines. A small power turbine at 120 pounds steam pressure non-condensing, will require 40 or 45 pounds of steam per horse power per minute. On the other hand, a larger turbine, designed so as to get the full benefit of the expansion of the steam, when working with steam at 180 pounds pressure and condensing, may be operated with about 16 or 18 pounds of steam per horse power per hour. The higher the steam pressure, the more economical will be the turbine.

(9103) H. M. K. says: I wish to thank you for the answer you mailed me and would be pleased to receive an answer to another question that it aroused in my mind. You said there was no capillary seepage through gas pipes in ordinary ground, as the internal pressure would prevent this. In drilling a gas well with 50 pounds pressure, 500 feet of water is cased off. Would there be any seepage through the casing? If so, at what depth, and how much? Also, why does a 2,000-foot gas well with 900 pounds pressure in the summer time freeze shut, and accumulate 2 or 3 inches of frost outside when the gas is being used? Why do the drilling tools freeze fast when the gas is struck in large wells? A. With a water pressure corresponding to a head of 500 feet, it would be difficult to make the joints in the casings sufficiently tight to prevent some leakage. There would not be, however, any seepage through the walls of a wrought-iron pipe. It is impossible to estimate the amount of leakage in the joints; if the workmanship were absolutely perfect there would be none. The frost which accumulates on the inside of a gas well with a high pressure is caused by the condensation and freezing of the moisture which the gas carries with it. The freezing is caused by the low temperature of the gas, due to its sudden expansion when it escapes into the atmosphere. If the well were capped, and the pressure at the bottom of the well was maintained at the outlet, this expansion could not occur, and there would be no fall in temperature. The frost on the outside of the pipe is due to the condensation and freezing of the moisture in the atmosphere. The drills freeze in the well when gas is struck, if the gas is at a sufficiently high pressure to expand enough to lower its temperature below the freezing point.

(9104) W. M. says: I wish to experiment with compressed air, and desire a little information on that subject. Air compressed to a density of 50 pounds to the square inch and admitted to a cylinder 3 inches in diameter for a distance of 2 inches, how far will the piston travel before losing all its expansive force? Also, at 100 and 200 pounds to the square inch? A. When air expands, its *absolute pressure* decreases in the same proportion that its volume increases, so long as the temperature remains constant. The absolute pressure is found by adding 15 pounds—the atmospheric pressure—to the pressure which is shown by the gage. Thus, if one cubic foot of air at 50 pounds pressure expands to two cubic feet, the absolute pressure after expansion will be $50 + 15 \div 2 = 32.5$. This equals a pressure of $32.5 - 15 = 17.5$ pounds above the atmosphere. In the same way, if the volume were increased to 3 cubic feet, the final pressure would be $50 + 15 \div 3 = 21.6$. This equals a pressure of 6.6 pounds above the atmosphere. This rule can be applied to any pressure and to any change in volume, so long as the temperature remains constant. The rule does not exactly apply to compressed air in the cylinder, because the temperature of the air decreases when the air expands, and this decrease in temperature decreases the pressure somewhat by the figures given by the above rule. Where the expansion is not carried too far, however, the above rule gives results which are approximately correct. If the fall in temperature is known, the final pressure, as determined by the above rule, may be corrected by multiplying it by the following formula: $\frac{460 + t1}{460 + t2}$ where $t1$ equals the temperature of the air in degrees Fahrenheit at the end of the expansion, and $t2$ equals the temperature of the air in degrees Fahrenheit at the beginning of the expansion.

(9105) R. H. says: 1. Would you please inform me where I can find in some paper a good article on the three-phase system as used in traction? A. We have not printed anything upon this special subject, though there have been paragraphs here and there in articles upon power plants on the Pacific coast and other places. Some traction plants in Italy and Switzerland in which high potential motors are employed have been described in American journals. For articles upon the three-phase system in electric traction, you should follow the engineering journals, such as the Electrical World. 2. I tried to make a storage battery with lead plates and dilute sulphuric acid. I took 16 parts water to 1 of acid. Is that the right proportion? I mixed some red oxide of lead with some glycerine and put it on the positive plate. As soon as I put the plate in the acid water, the red oxide dropped off. What was the trouble? A. The paste made with glycerine and red lead was worthless for a storage cell, since the glycerine was destroyed by the sulphuric acid almost immediately upon coming into contact with it. It probably turned black very soon, owing to the decomposition of the glycerine. The strength of electrolyte employed varies in different forms of cells, but is generally from 1 in 3 parts to 1 in 4 parts of acid in water. The red lead is mixed with the electrolyte and the paste spread upon the lead plate. The details can be learned from a book on storage batteries. Treadwell's is a good one, price $1.75 by mail. 3. How can I tell when the storage battery is fully charged? A. A storage cell is fully charged when the voltmeter shows 2.5 volts. The only certain way to determine full charge is by the voltmeter. Rapid boiling, or escape of bubbles, is a rough way of telling when the cell is charged. 4. I have three cells in the battery, and when I charge them in series small bubbles come up from the plates, and when I charge them parallel there are no bubbles. I can get, however, the same amount of current in both cases. The dynamo runs easier when I charge them parallel. What is the cause of this? A. The bubbles which come off the plates are oxygen from the plate connected to the positive pole and hydrogen from the negative pole of the charging current. They result from the decomposition of water, and when the charge approaches completion the current decomposes more water than at first. 5. Where is the electric light placed in an electric fountain? A. The electric light in an electric fountain is placed so that the beam of light is sent up into the air, and strikes the ascending stream of water. It thus becomes visible. The part of the beam which does not meet water goes on out into space and is not seen.

(9106) T. H. D. asks: 1. Given a number of 16 c. p. incandescent lights, when first operated they may measure up to 16 c. p., but the light given from them gradually decreases until they give out entirely. What is the cause of the decrease in the amount of light given? A. The cause of the decrease of light from an incandescent lamp as it becomes old is an increase in resistance, which cuts down the current which can flow through the lamp with the voltage of the circuit. This increase is due to a decrease in the size of the filament. By the action of the current the carbon of the filament is driven away to the inner surface of the bulb, and can be seen there as a black deposit. This deposit itself also cuts off light. 2. If these lights are sold at so much per kilowatt, will it cost the consumer more to get the same illumination (if possible) from them after having been used, say, three months, than it did when they were first put to work? If so, why? A. Yes; since the current must be brought up by increasing the voltage of the circuit, the watts consumed are increased. After a time it is not possible to bring such a lamp up to full candle power. 3. If the same amount of current is supplied constantly to the meter, will that instrument register a greater or lesser quantity of electricity consumed as the age of the incandescent lights increases? A. If the same amount of current at the same voltage is supplied to a wattmeter, it will register the same number of kilowatts independent of the condition of the lamps. The resistance of the lamps increases with age, and it becomes very wasteful to use them after a certain time, since the light decreases more rapidly than the resistance increases. A reasonable limit for life of a lamp is 500 hours. 4. Is the resistance the same in a new and an old light? A. This topic is treated very completely in Crocker's "Electric Lighting," which we can supply for $6 by mail.

(9107) W. E. H. asks: Can you tell me if there is any machine invented or patented (or in use) to produce power by any of what are called the mechanical powers, such as the wedge, the screw or lever, as a motor solely without any other agent whatever, such as air, water, electricity, heat in any form or chemicals; simply a mechanical motor to drive or operate machinery? I do not mean the perpetual motion fiend business, but something to push and pull with for something. A. We do not know any motor as a generator of power such as you call for, but a lever or any other of the mechanical powers, by the aid of a weight, acting under gravity, will generate power and comes within the limits of your question. They do not use air, water, heat, electricity, or chemicals, but only gravity. They may drive machinery also, but the weight will have to be wound up again after it has run down to its limit. A clock is a machine so driven, and comes well within your requirements. Nor is it a perpetual motion machine.

(9108) L. J. T. says: 1. Will you kindly answer the following in your Notes and Queries: Supposing a hole to be bored through the center of the earth and to the surface on the opposite side, or in the same direction of the diameter of a circle, now if an iron ball was dropped in the hole, where would it stop? A. The ball would stop finally at the center of the earth, if the air is supposed to remain in the hole through the earth, and the rotation of the earth be disregarded. The resistance of the air will ultimately bring the ball to rest. 2. Now, if a vacuum could be created in that hole and the same ball be dropped from the surface in that vacuum, where would the ball stop, the rotation of the earth not to be considered? A. In a vacuum the ball should oscillate to and fro on either side of the earth's center forever, since there is nothing to stop the motion. 3. In the latter case would the ball act like a pendulum swinging in a vacuum and be eventually stopped by the attraction of the earth? A. The attraction of the earth cannot bring the ball to rest, since it acts only to accelerate the motion of the ball as it falls toward the center of the earth on either side of the center, and equally to retard its motion after the ball has passed the center of the earth. The ball will not be stopped by inertia nor by gravity, and would move forever.

(9109) W. B. K. asks: 1. Does the moon have any known effect upon the weather? We are continually hearing about what the weather will do when the moon changes. A. The opinion that the moon controls the weather is firmly fixed in the minds of sailors and unscientific people generally. The authorities of the Weather Bureau have stated that their records of the weather and its changes show absolutely no connection between the changes of the moon and changes of the weather. 2. Please inform me how I shall hold my watch in order to find the north when the sun is shining? I was told to stand facing the sun, to point the hour-hand at the sun, and one-half way from the hour hand to the XII. on the rim of the watch was south. I could not make this come right, but found that one-half way between the hour-hand and the minute hand would give me south. Which is correct, and what is the explanation that makes the watch designate the north? I understand, of course, that the above is only an approximate method of finding the north? A. Your statement regarding the manner of holding a watch to determine the south point of the horizon is correct. The south point is half way between the position of the sun and the twelve-hour mark when the hour-hand is pointed toward the point of the horizon directly below the sun. The explanation is simple. At noon the hour-hand and XII. are together, and both point to the sun, which is then in the south. At one hour from noon the hour-hand is one-twelfth of a circumference, or 30 degs. from XII., and the sun is 15 degs. from the south point, or half way between the place of the hour-hand and XII. The sun moves 15 degs. an hour; the hour-hand moves 30 degs. an hour, or twice as fast. The same reasoning applies to any other hour of the day.

NEW BOOKS, ETC.

L'AIR LIQUIDE. Sa Production, Ses Proprietés, Ses Applications. Par Georges Claude, avec une préface de M. d'Arsonval, membre de l'Institut. Un vol. grand in 8vo, avec photographies d'appareils et instantanés d'expériences. Vve. Ch. Dunod, éditeur, 49, quai des Grands-Augustins, Paris, 6e. Price, $1.00.

Georges Claude is a popular scientific writer best known in France for his "L'Eléctricité a la Portée de Tout le Monde." This last work, on liquid air, presents in a popular way the most noteworthy achievements in the liquefaction of the so-called permanent gases, and particularly of the liquefaction of air. The first chapter considers first theoretical matters, and secondly the liquefaction of air. In the second chapter the difficult problem of preserving liquid air is presented. Subsequent chapters treat of the properties and physical effects of liquid air, its physical and chemical applications, and the chemistry of low temperatures.

A MANUAL OF CORPORATE MANAGEMENT. Containing Forms, Directions and Information for the use of Lawyers and Corporation Officials. By Thomas Conyington, of the New York Bar. New York: The Ronald Press. 1903. Pp. 331.

Mr. Conyington's volume, although intended for lawyers and corporation officials, has not for its purpose the discussion of corporation statutes, or the law of corporations. The object of the work, as its title indicates, is to present in logical order, something of the details of corporate procedure and of corporate management. Perhaps the most valuable portions of the book are the collated forms which cover almost the entire range of ordinary corporate procedure and are those approved by the leading corporation attorneys. Mr. Conyington has prepared a work which may be regarded as the fullest of its kind on the particular subject which it discusses.

THE BOOK OF CORN. For Farmers, Dealers, Manufacturers, and Others. A Comprehensive Manual upon the Production, Sale, Use, and Commerce of the World's Greatest Crop. Illustrated. New York and Chicago: Orange Judd Company. 12mo. Pp. ix, 368. Price, $1.50.

Despite the great importance of maize, practically no book has as yet been published in which it is adequately discussed. For that reason "The Book of Corn" may be said to supply the proverbial long-felt want. While authoritative both as a practical manual and scientific treatise, the "Book of Corn" is of value to the business man.

STORAGE BATTERY ENGINEERING. A Practical Treatise for Engineers. By Lamar Lyndon, B.E., M.E. New York: McGraw Publishing Co. 1903. 8vo. Pp. 382. Price, $3.00.

This book is intended to assist the practical engineer in designing, installing and maintaining battery equipments and to guide him in the selection of types of batteries and auxiliary apparatus best suited to the service which they are to perform, and at the same time impress upon the technical public both the advantage and limitations of the storage battery in practice.

COTTON MACHINERY SKETCHES. By William Scott Taggart. London and New York: Macmillan & Co. 1903. 8vo. Pp. 104. Price, 60 cents.

The drawings of which this book is comprised are reproductions of illustrations selected from the author's work on cotton spinning. The book is intended for the use of such teachers who desire to present a sketch to their pupils and to explain the sketch in the particular way they have found to be most desirable for their purpose. Students may use the work for practice in sketching and for the purpose of developing their own descriptive powers in explaining a machine, without being influenced by the description associated with the drawing in a text book.

YEAR BOOK OF THE AMERICAN POWER BOAT ASSOCIATION. New York: The Rudder Publishing Co. 1903. Pp. 46. Price, 25 cents.

The rapid growth of interest in power boats and the remarkable strides made by the industry of late years is one of the signs of the times in the yachting world. A recent development is the attention that is being attracted to power-boat racing which promises to obtain a hold upon the yachting man and the general public second only to that of the sailing yacht. The American Power-Boat Association was formed to promote the use of power boats and the improvement of their design, etc., and formulate rules for racing. This small volume contains full information regarding the organization, jurisdiction, etc., of the Association; the racing rules, 27 in number, and a table of time allowances.

LLOYD'S REGISTER OF AMERICAN YACHTS FOR 1903-4. New York: Lloyd's Register of Shipping. 1903. Pp. 450. 42 pages of flags and signals. Price, $7.50.

The large and rapid increase in recent years in the fleet of American yachts has called for a separate register of them. The book con-

tains particulars of 850 steam and power yachts, and 1,939 sailing yachts, or a total of 2,789 yachts, all of which are owned in the United States or Canada. The addresses, clubs, and yachts of upward of 2,500 owners are given in a separate list arranged alphabetically according to the names of the owners. There are illustrations in colors of the flags of 94 American and Canadian yacht clubs, with the names of their officers, in the book, and 1,073 private signals of yacht owners. A list of the yacht builders and designers of the United States also appears, with the names of the yachts built or designed by them, and lists of signal letters, and of late names of yachts.

THE NATURE STUDY IDEA. By Prof. L. H. Bailey. New York: Doubleday, Page & Co. 1903. 12mo. Pp. 159. Price, $1.00.

This interesting volume is an illuminating and suggestive study of the new movement, originating in the common schools, to put the child into sympathy with Nature and his environment, to the end that his life may be stronger and more resourceful. The movement relates education directly to the life that the pupil is to live. It is a fundamental, epoch-making movement. It is a revolt from mere science-teaching in the grades and from all perfunctoriness in school work. It is the full expression of personality. It is not the mere addition of certain studies to a curriculum, but the inspiration of a new point of view in education. More than any other recent movement, it will touch the masses with a new educational impulse.

DISCOURSES ON WAR. By William Ellery Channing. Boston: The International Union. 1903. 12mo. Pp. 229.

Those who are opposed to the present militant spirit of the world will find much that will interest them in the volume before us.

VENTILATION IN MINES. By Robert Wabner. London: Scott, Greenwood & Co. New York: D. Van Nostrand Co. 1903. 8vo. Pp. 240. 30 plates. Price, $4.50.

A thoroughly modern work which deals with one of the most difficult problems known to the mining engineer—the supply of a uniform quantity of fresh air so that the workers can perform their task safely, at least, if not in comfort.

MUNICIPAL PUBLIC WORKS: THEIR INCEPTION, CONSTRUCTION AND MANAGEMENT. By S. Whinery. New York: The Macmillan Co. 1903. 12mo. Pp. 241. Price, $1.50.

This book is intended for the inexperienced city official and for the urban citizen. Numbers of good and earnest men are elected or appointed to official positions in our municipal governments whose interests and previous business experience and training have not been of such a character as to lead them to study the principles controlling and the problems that will be met with in conducting municipal public works, and who, upon assuming the duties and responsibilities of office feel that they are deficient in the special knowledge necessary to enable them to discharge intelligently and efficiently the duties of their new positions. To all such persons the book will commend itself.

PHOTOGRAPHIC LENSES. A Simple Treatise. By Conrad Beck and Herbert Andrews. New York: Tennant & Ward. 1903. 12mo. Pp. 288. Price 75 cents.

The book before us is the first work of its kind to be written by a lens manufacturer of repute. The work is not intended to give a very scientific explanation of the laws which underlie the construction of the photographic lens. It explains, for the benefit of the photographer, what he ought to know about his lens; how it should be used; how its efficiency should be judged, and how some of its scientific principles may be understood. The treatise, as the title page indicates, is simple—so simple, indeed, that any photographer should be able to grasp its explanations easily.

POSSIBILITIES OF SMALL LATHES. By James Lukin, B. A. London: Guilbert Pitman. 1903. 16mo. Pp. 130. Price, 60 cents.

The author is a well-known amateur mechanic and his instructions are always thoroughly practical. The book is an excellent one and will appeal to many of our readers. It is unfortunate that the illustrations are so poor.

THE SOLAR SYSTEM. By Percival Lowell. Boston: Houghton, Mifflin & Co. 1903. 12mo. Pp. 134. Price, $1.25.

The author has written an excellent book which will appeal to all astronomers, although it is hardly adapted to the use of those who are not familiar with a certain amount of mathematics.

A TREATISE ON BEVERAGES: or, THE COMPLETE PRACTICAL BOTTLER. By Charles Herman Sulz. New York: Dick & Fitzgerald. 1903. 8vo. Pp. 818. 428 illustrations. Price, $7.50.

The volume before us is one of the most satisfactory technical books which has come to the editor's table in some time. The subject is dealt with in a thoroughly adequate manner, as is shown by the fact that 116 pages are given up to water, its examination and filtration. The instructions for doing all kinds of bottling of aerated and other beverages are very full, and all the best types of apparatus are shown. The section devoted to mineral waters is particularly full and the analyses are most complete. Americans have carried the manufacture of artificial mineral waters and aerated beverages to a higher state of perfection than has hitherto been known, and this fact is easily demonstrated by this very satisfactory book.

THE COPPER HAND BOOK. A Manual of the Copper Industry of the World. Vol. III. of the year 1902. Compiled and published by Horace J. Stevens, Houghton, Mich. 8vo. Pp. 600. Price, $5.

This is the third annual issue of the "Copper Hand Book," and includes the history of copper, the geology of copper, the chemistry and mineralogy of copper, its metallurgy and its uses. It also deals with the copper deposits of the United States and Canada and Newfoundland, as well as foreign countries. The statistics relative to copper are most valuable.

LENKBARE BALLONS: RÜCKBLICKE UND AUSSICHTEN. Von Hauptmann Hoernes. Leipzig: Wilhelm Engelmann. 1902. 8vo. Pp. 359.

Capt. Hoernes has produced one of the most thoroughly scientific and scholarly treatises on aerial navigation which has ever come before our notice. He has exhaustively discussed the history of the airship, carefully reviewing the construction of and the results obtained with the Giffard, Dupuy de Lome, Haenlein, Baumgartner, Woelfert, Tissandier, Renard and Krebs, Schwarz, Zeppelin, Santos-Dumont and Deutsch airships. Through six chapters he discusses elaborately the principles of aerial dynamics and their influence upon the structure of the airship, basing his conclusions upon the results obtained with airships and balloons of widely different design. His concluding chapter is of a more theoretical nature and treats of the possibility of finally solving the problem of aerial navigation and the form which the solution may be expected to assume. Not the least valuable portion of Capt. Hoernes' admirable work is comprised of meteorological tables to which the aeronaut may refer for wind velocities during each month of the year for different years. An excellent bibliography and exhaustive index are provided.

PRACTICAL FARM DRAINAGE: WHY, WHEN AND HOW TO TILE DRAIN. By C. G. Elliott. New York: John Wiley & Sons. 1903. 16mo. Pp. 92. Price, $1.00.

A thoroughly practical book by a drainage engineer. The methods have been well tested and are now in constant use.

GAS ENGINE TROUBLES AND REMEDIES. By Albert Stritwatter. Cincinnati, n. d.: The Gas Engine Publishing Co. 16mo. Pp. 112. Price, $1.00.

The care of gas engines is dealt with only to a limited extent in works on the subject, so that the present eminently practical book will be a welcome addition to the literature of this modern power.

WIRELESS TELEGRAPHY AND TELEPHONY. Compiled by Dr. Maurice Ernst. London, n. d.: Electricity Office. 12mo. Pp. 32. Price, 40 cents.

This undated book on wireless telegraphy is unfortunate, in view of the strides which wireless communication is making. It is largely devoted to the Orling-Armstrong system. It contains a serviceable bibliography.

THE RESTORATION OF THE ANCIENT IRRIGATION WORKS ON THE TIGRIS: OR, THE RE-CREATION OF CHALDEA. By Sir William Willcocks, K.C.M.G., M.I.C.E. 8vo. Pp. 71, ten plates.

BRITISH STANDARD SECTIONS. New York: D. Van Nostrand Co. 1903. 9 charts. Price, $1.00.

These charts of British standard sections are issued by the Engineering Standards Committee, which is supported by the various engineering societies. Each subject, as T-bars or bulb-plates, has a drawing of the section and is accompanied by a table of dimensions and remarks. The tables should find their way to the drawing offices of all constructing engineers.

THE ART OF LIVING LONG. Milwaukee: W. F. Butler. 1903. 8vo. Pp. 214.

This volume is a new and improved English version of the Venetian centenarian Louis Cornaro, who was born in 1464 and died in 1566. Essays by Joseph Addison, Lord Bacon, and Sir William Temple are included. The work has been compared with ancient documents preserved in Italian archives. The book is an Italian classic and is worthily presented, and an example of good humanist literature.

DIE BRIKETT-INDUSTRIE UND DIE BRENNMATERIALIEN. Von Dr. Friedrich Juenemann. Vienna: A. Hartleben. 1903. 12mo. Pp. 320. Price, $1.75.

It must be confessed that the Germans have far outstripped us in the invention and manufacture of artificial fuels. In the briquetting of various substances they have certainly made marked advances. Dr. Juenemann has collected in this book all those methods which have in Germany proved themselves of practical value. He describes not only the processes used, but also presses and other machinery which enter so largely into the equipment of the briquetting plant.

LIMITS TO SEEING AND HEARING; OR, THE GREAT SCALE. Supplementary Reading in Physics. Prepared by J. A. Culler. Columbus, Ohio: O. T. Corson. Pp. 16.

THE STOURBRIDGE LION. A compilation of authorities proving the claim made for the Stourbridge Lion as having been the first locomotive to turn a wheel on the Western Hemisphere. Together with a brief biographical sketch of Horatio Allen, the first locomotive engineer in America. By Edward A. Penniman. Honesdale; Pa.: Citizen Print. 1903. Pp. 17.

DIE ENDGÜLTIGE LÖSUNG DES FLUGPROBLEMS DURCH EMIL NÉMETHY, FABRIKS-DIREKTOR IN ARAD. Mit drei in den Text gedruckten Abbildungen und einer Figurentafel. Leipzig: Verlagsbuchhandlung von J. J. Weber. 1903. Pp. 23.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA. Published For and on Behalf of the Government by Direction of the Hon. J. W. Taverner, M.L.A., Minister for Agriculture. Edited by D. McAlpine. Melbourne. 1902. Pp. 731, 835. Vol. 1, Part 8. August, 1902.

THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA. Published For and on Behalf of the Government by Direction of the Hon. J. W. Taverner, M.L.A. Edited by D. McAlpine. Melbourne. 1903. Pp. 837, 921. Vol. 1, Part 9. September, 1902.

JANET CHARLES: OBSERVATIONS SUR LES GUEPES. Paris: C. Naud, Editeur. 1903. Pp. 85.

CALORIMETRY. By Frank H. Bates. Philadelphia: Philadelphia Book Co. 1902. 16mo. Pp. 127.

THE TRAP NEST TEXTBOOK. By F. O. Welcome. 8vo. Pp. 129.

REPORT OF THE LIBRARIAN OF CONGRESS FOR THE FISCAL YEAR ENDING JUNE, 1902. 8vo. Pp. 278.

THIRTY PICTURES OF TUBERCULOSIS. By Addison W. Baird, M.D. New York: James T. Dougherty. 1903. 8vo. Pp. 24. Price 25c.

CRIMINAL RESPONSIBILITY OF THE EPILEPTIC. By John Puton, M.D. New York: William Wood & Co. 1903. 16mo. Pp. 11.

NINETEENTH ANNUAL REPORT OF THE BUREAU OF AMERICAN ETHNOLOGY TO THE SECRETARY OF THE SMITHSONIAN INSTITUTION. By J. W. Powell, Director. In Two Parts. Part II. Pp. 5771, 1160.

UNITED STATES GEOLOGICAL SURVEY: MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1900. David T. Day, Chief of the Division of Mining and Mineral Resources of the United States Geological Survey. Washington: Government Printing Office. 1901. Pp. 927.

SUBJECT LIST OF WORKS ON GENERAL SCIENCE, PHYSICS, SOUND, MUSIC, LIGHT, MICROSCOPE, AND PHILOSOPHICAL INSTRUMENTS IN THE LIBRARY OF THE PATENT OFFICE. Published at the Patent Office, 25 Southampton Building, Chancery Lane, London, W. C. Pp. 183. Price 25c.

MODERN MEXICO: STANDARD GUIDE TO THE CITY OF MEXICO AND VICINITY. By Robert S. Barrett. Third Edition. Modern Mexico, 2a Independencia 8, City of Mexico, Mex., and 116 Nassau Street, N. Y. 1902-3.

GEOLOGIC ATLAS OF THE UNITED STATES—MASONTOWN-UNIONTOWN FOLIO: PENNSYLVANIA; INDEX; MAP. Washington, D. C.: Engraved and printed by the United States Geological Survey. 1902.

GEOLOGIC ATLAS OF THE UNITED STATES—CHICAGO FOLIO: RIVERSIDE, CHICAGO, DESPLAINES, AND CALUMET QUADRANGLE; ILLINOIS-INDIANA. Washington, D. C.: Engraved and printed by the United States Geological Survey. 1902.

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INDEX OF INVENTIONS

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