such as braces for cripples, which are made of steel. Please explain to me how many amperes or volts it requires. A. Carbonate of copper is commonly used for copper plating, and a double sulphate of nickel and ammonium for nickel plating. The methods for making the solutions are given in Van Horne's "Modern Electroplating," wh' h we send for $1. We cannot write out the several pages given to the description. A direct current must be used, either from a battery or from a dynamo. For copper a voltage of about 2 is perhaps a mean, and for nickel 3.5 to 5 volts are used. The amperes depend upon the area of surface to be worked. We would suggest that there is more to plating than simply to make a solution, place the articles in the bath, and turn on the current. The chances of failure are numerous. It would be prudent to secure a man of experience to run the plant and teach you the trade secrets.

(12072) G. S. asks: One of the mural paintings found at Herculaneum and exhibited at the Metropolitan Museum of Art represents an object resembling a globe, with the lines of latitude and longitude plainly visible. Taking into consideration that the ancient Romans imagined the earth having the form of a disk, what could this picture mean? A. Since Hipparchus, a Greek who lived in the second century before Christ, invented trigonometry for the use of astronomers, and both Hindoos and Romans were fully trained in the subject, it is suggested that globes and circles of the sphere were well understood at the time of the highest splendor of Herculaneum and Pompeii. See Encyclopædia Britannica under "Ptolemy" and "Astronomy," vol. 2, p. 749, for the work of Hipparchus.

(12073) P. M. E. asks: 1. To what height has man ascended in the air? A. A height of 33,790 feet is claimed by Dr. Breson as the height gained by himself in a balloon. We have not noted any ascent higher than this. Upon mountains the record is much below this altitude. We have no exact figures at hand. 2. How is lightning generated? What kind of electricity is it? A. Lightning is due to the burning of something by the intense heat produced by the resistance of the air to the passage of an electric current. The electricity is the same in kind as all electricity. There is but one kind of electricity. If it has a low intensity, it cannot jump across an air gap; if it is of great intensity, it can do so, and a spark is the result. When a trolley leaves the wire, or a wire breaks in which a current is flowing, we see a spark due to the flow of electricity through the air. This is lightning on a small scale. 3. How can oxygen and hydrogen be transformed to water? A. By burning oxygen and hydrogen they will unite and form water. The burning is most violent and makes a great noise if they are mixed and set on fire. If burned in a proper jet, such as is used in the oxyhydrogen lantern for the production of the lime light, the burning is quiet but the heat is very intense.

(12074) L. W. D. asks: Noting inquiry No. 12036, by A. E. H., in your SCIENTIFIC AMERICAN of March 27th last, I wish to know where I can get some information on delicate electroplating of that nature. A. Full and satisfactory instructions for electroplating delicate structures may be found in the SCIENTIFIC AMERICAN, Vol. 99, No. 22, price ten cents. Much beautiful work has been done in this direction recently, which has sold at high prices in the holiday season.

(12075) R. D. asks: The matter of the rusting of galvanized barb wire under various conditions is a very interesting one, and to my mind has never been clearly explained. Whether or not there are yet sufficient data to warrant a satisfactory explanation I do not know; but if some one of your readers can give a reason why the zinc coating should all drop off some of the wire, and it becomes thoroughly rusty, and the other wire under nearly the same conditions retain all of its coating and brightness, I should be very glad. The conditions of a case in point are as follows: About twenty rods off an ordinary reel of barb wire was stretched in two strands, the lower one two feet from the ground and the upper one three feet from the ground. The balance of the reel was left on the ground coiled up as it came from the factory. It is now four years since this was done. The reel has been turned over a few times to keep the wood from decaying. That is all that has been done. The strands on the fence have entirely lost their coating of galvanizing, and are completely covered with a thick coat of rust. The coil on examination was found to have lost none of its coating, and almost as bright as when it came from the factory. A clear and cogent reason for the above conditions might interest others as well as myself. A. Variations in the deterioration of galvanized wire are generally due to unavoidable variations in the uniformity of the zinc coating, and the frequently marked difference between one part very rusted and another quite bright is due to the fact that once the zinc coating is penetrated by moisture, galvanic action is set up, which accelerates rusting considerably. In your case, however, the difference is obviously due to the protection both from moisture and circulation of air afforded by the reel to the wire coiled upon it, whereas that stretched upon the fence has been exposed to rain and air currents from every direction.

NEW BOOKS, ETC.

DER MOND. By Dr. M .W. Meyer. Illustrated. Stuttgart: Kosmos Gesellschaft der Naturfreunde, 1909. Pp. 98. Price, paper, 50 cents.

Dr. Mayer has here presented in a very popular and readable form what is at present known about the moon. To the man who does not care to read long technical treatises, this book ought to prove an acceptable medium of acquiring much useful information.

ALASKA. THE GREAT COUNTRY. By Ella Higginson. New York: The Macmillan Company, 1908. 16mo.; pp. 537. Price, $2.50.

The wonders of our great northern possession which we purchased from Russia are very numerous, and all those who have traveled in this delightful region will never forget the exciting experiences and the beautiful views obtainable. The illustrations in the present book give some slight idea of the very great beauties of this country. A vast mass of excellent material has been collected by the author. The book is exceedingly well written.

SOCIAL ENGINEERING. By William H. Tolman, Ph.D. New York: McGraw Publishing Company, 1909. 380 pp.; 8vo.; ill.

The author describes himself as a "social engineer," and to the average reader this does not at first convey much—one wonders if it does not mean perhaps municipal, even sanitary, engineering—but his book reveals that the term engineer is used in the larger sense to apply to one whose work is concerned with the application of exact sciences, for such social engineering aspires and even promises to be. A glance through this book shows the results of most interesting experiments and achievements in industrial betterment on the part of large manufacturing and other concerns throughout the country, and it is a great pleasure to observe what is being done to improve conditions of life and labor for the employee in, as it would seem, a philanthropic or humanitarian way. Further perusal of the treatise inclines one to believe, however, as the author claims, that industrial betterment is a "cold business proposition." Setting aside any considerations of philanthropy, it is shown that attention to the hygiene of factories has a direct result upon efficiency, in other words, that it increases output, which is what all producers are after. Manufacturers are prepared to spend large amounts upon improvement of the efficiency of their machines, and it is shown that proportionate results are obtainable by attention to the efficiency of the more complex human organism which operates them. And this goes much further than the evident fact that the individual workman can accomplish more in good light and fresh air. The effects of indigestion following a too hasty breakfast or a cold lunch eaten at a work bench cannot be figured on cost tickets, but its elimination or palliation by the provision of attractive lunch rooms and warm food supplied at cost, figures as an appreciable economy in the books of many a firm. The provision of club rooms for social purposes has proved an effective counter attraction to the saloon and promoted temperance among workers, as has the improvement of housing conditions added to their self-respect and general cheerfulness. Rest rooms and sick rooms for women and girl workers and the supply of simple remedies have saved many a half day's work on the part of an employee who would otherwise have gone home, as well as forestalling many an incipient epidemic which would otherwise have decimated a factory. Preference in choice of time and even in length of vacations given to those having the best record for attendance and punctuality has proved a marked stimulus to those virtues. The provision of safety devices and educational facilities, mutuality, opportunities for thrift, recreation, profit-sharing schemes, and communal or social benefit all receive attention from the author. Each is shown to be an economic problem; but though told in a plain, straightforward, matter-of-fact style, the whole is woven by the sympathy and enthusiasm of the author into a most attractive story. Where so many firms have made experiments so praiseworthy, it would be invidious to mention any; but it is most gratifying to learn that so many American captains of industry are making these endeavors, which must lead to greater harmony between capital and labor and therefore greater national efficiency.

APPLIED MECHANICS FOR ENGINEERS. By E. L. Hancock. New York: The Macmillan Company, 1909. 382 pp.; 8vo.; ill. by diagrams. Price, $2.

In the preparation of this work the author has followed the excellent rule that each new principle developed in the study of applied mechanics should be illustrated by its application to a practical problem, with the result that after each theorem showing how to find the moment of inertia of a parallelopipedon or the center of gravity of a paraboloid of revolution or similar bodies not frequently encountered, we are shown the kind of practical problems to which the formula developed can be applied. This, we should say, would make the subject much more interesting to the student, as the average engineering student is keenly in search of the practical, and apt to be skeptical about what seems to him only mental gymnastics. All the principles of the subject are amply covered, and the mathematics from which it is inseparable are as adequately given as anywhere, but it is the practical applications which distinguish the book from others on the subject. Tables of logarithms, trigonometric functions, etc., are given in the appendix, and the only improvement we can suggest is a little more cross reference in the index. The diagrams are clear, and the printing and paper in the usual excellent style of the Macmillan Company.

THE BOOK OF WHEAT. By P. T. Dondlinger, Ph.D. New York: Orange Judd Company, 1909. 370 pp.; fully ill. with photographs and diagrams. Price, $2.

The growth of a great industry, which synchronizes with and is sometimes essential to the growth of a state or nation, does not always receive from historian or economist attention proportionate to its importance. While many phases of the wheat industry have been adequately covered from the standpoint of the botanist, the farmer, the miller, or the merchant, no attempt has been made to cover the history of the industry as a whole as completely as its importance deserves, and it is this need that it is the endeavor of the author to supply. There are industries in which perhaps so complete a treatment would be more of a task, or even impossible in the same space—industries into which enter a greater variety or complexity of supplementary mechanical processes; but we cannot imagine that any industry could be more thoroughly or systematically treated than in the present work. Beginning with the etymological history of the very name, the botanical history of the plant, and its physical properties, the author conducts us through its evolution by selection, artificial cross fertilization, and environment, to its distribution, cultivation and harvesting, telling of the kind of soils it likes and their correction by fertilizers, and of the development of machinery accessory to its cultivation, from the earliest "header," described by Pliny a thousand years ago, to the monstrous combined steam plow, disk-harrow seeder, and fertilizer, or the combined harvester and thresher of the wheat belts of the great West to-day. The costs are carefully noted throughout, yield and cost of production, crop rotation and irrigation being considered in turn. There is a chapter on fertilizers, and one each devoted to diseases and insect enemies of wheat. Then we come to the transportation, storage, marketing and causes of fluctuation of prices of wheat, from which latter many an operator who knows wheat only through the medium of the ticker (and the baker) could learn much. Milling is adequately treated, as are consumption, production, and movement. Under consumption even breakfast foods in all their endless variety and the spectacular growth of this allied industry are discussed. The author's style is admirable, the language being lucid without the attempt to be unnecessarily ornate, and so well adapted to the subject. The book as a whole is as interesting reading to the layman as it should be valuable to farmer, miller, or merchant. Not the least valuable feature is an excellent bibliography of the subject and topical index.

THE MANUFACTURE OF EXPLOSIVES. Twenty Years' Progress. By Oscar Guttman, M. I. C. E. London: Whitaker & Co., 1909. Imported by the Macmillan Company. 85 pp.; 8vo.; ill. Price, $1.10.

The present work reproduces the Cantor Lectures delivered by the author before the Royal Society of Arts and, although not designated as a sequel, forms a supplement to the author's larger work with the first title, which remains the most complete and reliable practical and theoretical treatise on the history, physical and chemical properties, and manufacture of explosives. Within the limits by which a lecturer is confined the present volume describes as fully as possible the improvements and researches of the last twenty years; especially interesting are the experiments to determine what if any explosives are safe in fire damp, coal dust, and other dangerous atmospheres, and the manufacture of unfreezable nitroglycerin. The whole is told in an entertaining manner as attractive to the amateur as to the scientist.

CHILDREN AND GARDENS. By Gertrude Jekyll. London: "Country Life," S. W., 1908. Imported by Charles Scribner's Sons. 8vo.; 111 pages. Price, $2.

A charming book filled with delightful engravings of flowers and children. Children's gardens and playgrounds are extensively treated.

INDEX OF INVENTIONS

For which Letters Patent of the Upited States were Issued for the Week Ending April 27, 1909,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Acid, magnesium salt of dibrombehenic, E. Fischer 919,335
Adding and listing machine, Vincent & White 919,656
Aeroplane, W. S. Romme 920,085
Agricultural tool, hand, P. H. Withington .. 919,799
Air brake system, automatic, G. Macloskie. 919,609
Air compressor, compound, A. H. Meech 919,909
Air compressor governing mechanism, R. H. Rice 919,953
Air cooler, C. F. Martin 919,611
Airships, etc., propeller mechanism for, P. Jamnitzky 920,064
Alcohol and making the same, solidified, Perelzveich & Rosenbusch 919,759
Annunciator, E. Pickel 919,377
Armor plates, etc., manufacture of, Hartley & Deby 919,859
Automatic switch, Ingram & Allen 919,871
Automobile, G. A. Schacht 919,779
Bag or can carrier, W. E. Kleine 919,729
Baker, fireless, Thoits & Gronberg 919,494
Baking apparatus, confection, Lanier & Driesbach 919,601
Baling press, self-tying, G. E. Jackson 919,585
Barrel head, J. Leicht 919,441
Barrel or cask, metal, R. H. Hackney 919,345
Barrel press, J. Heagerty 919,720
Bath tub attachment, M. & N. L. Gilmore. 919,848
Battery charging apparatus, F. E. Case 920,103
Beaking mill, J. Kennedy 920,067
Bearing box, adjustable, J. F. & H. E. Dodge 919,700
Bedstead crib attachment, C. D. Beeland ... 920,009
Beet puller, W. D. Nason 919,748
Beet topper, G. Nicol 919,929
Belt striking device, P. Karthaus 919,437
Belt tightening device, J. E. Delhomme 919,548
Bench clamp, A. V. Davis 919,546
Bench stop, carpenter's, D. F. Larkin 919,732
Bib seat dresser, R. McBee 919,618
Binder, loose leaf, S. C. Nott 919,453
Binder, loose leaf, F. B. Jordan 919,589
Binder, temporary, C. D. Trussell 919,497
Binders, leaf or sheet for loose leaf, C. C. Maltby 920,072
Bird and insect catcher, combined, Martin & Ross 919,907
Bit, R. I. Watts 919,503
Blank-conveying apparatus, P. H. Standish .. 919,487
Block. See Die block.
Blowpipe, J. Harris 920,054
Boat, land and water, A. G. Cummings 919,829
Boat, life, J. H. Stoelt 919,974
Boat or yacht, J. M. Gibbons 919,343
Boat, roller, R. E. Sharp 919,782
Bobbin holder, C. E. Lovejoy 919,899
Bobbin winding machine, J. Scharer-Nussbaumer 919,475
Body brace and suspenders, combined, C. Klopf 919,885
Boiler, W. A. Henry 920,057
Boiler appliance, steam, J. A. Ray 919,462
Boiler cleaner, F. X. Bayer 919,680
Boiler tubes, machine for removing scale from, J. A. Silver 919,785
Bolt and nut, C. G. Ette 919,840
Book and filing case, sectional, J. S. McComb 919,619
Book, copy, E. H. Roudebush 919,642
Book, manifold, H. P. Brown 920,015
Boots and shoes, making vamps for, A. G. Legg 920,070
Boring, drilling, and tapping machine, T. M. Boggs 920,011
Bottle, E. C. Royer 919,468
Bottle, R. L. Williams 919,987
Bottle cap, C. F. Jenkins 919,872
Bottle closure, H. A. Olsson 919,937
Bottle, non-refillable, A. V. Westerlund 919,664
Bottle sealing machine, E. J. Godman 920,048
Bottle soaking machine, S. Volz 919,796
Bottling machine, A. Calleson 919,319
Box-making machine, W. H. Holland 919,866
Box or case for cigarettes and like articles, J. Rheinberg 919,952
Box strap supply reel, C. W. Mitchell 919,371
Bracelet bag, C. O. Mason 919,613
Bracelet, elastic link, F. Speidel 919,486
Bracket, G. R. Cockrum 919,421
Brake, W. S. Adams 919,671
Brake beam finger guard, W. E. Fowler, Jr. 919,565
Brake hanger, car truck, J. H. Baker 919,676
Brake shoe, C. W. Armbrust 919,518
Breast strap attachment, hame, H. M. Dingsley 919,555
Brush, C. W. Patrick 919,756
Brush filling machine, S. Levi 919,734
Brush, fountain, Lawson & Smith 919,440
Brush, fountain bath, P. Ford 919,844
Brush handle, E. Maeder 919,610
Brush, leader, M. Blackman 919,813
Brush, shaving, E. C. Ripley 919,466
Bucket, clam shell, F. W. Lovell 919,446
Buckle, lock, W. H. McGee 919,919
Buckle, suspender, J. H. Russ 919,959
Bumper guard, G. Hipwood 920,060
Buoy, log, C. M. Boll 919,531
Burglar alarm for suit cases, satchels, etc., A. T. Ruthven 919,385
Butter mold, R. A. Simpson 919,478
Button making machine, J. W. Miller 919,914
Buttons, buckles, etc., to boots, shoes, gaiters, etc., machine for attaching, T. H. & W. H. Stringer 919,791
Cabinet, lace, R. A. Thornton 919,398
Calcimine, sanitary, C. Ellis 919,560
Can body making machine, J. C. Donnelly .. 919,557
Can lacquering machine, C. B. Manthorn ... 919,858
Car ajustable platform, railway, W. Robinson 919,383
Car brake, J. S. McWhirter 919,746
Car coupling, J. F. & V. S. Durbin 919,331
Car coupling uncoupling device, T. M. Ramsdell 919,949
Car fender, F. A. Nelson 919,451
Car folding step, subway, J. M. Ernst 919,333
Car gate, E. L. Gillespie 919,711
Car, mining, C. M. Dibler 920,033
Car, muck, Henderson & Sheriff 919,863
Car packing case or box, motor, E. Weinacht 919,798
Car, passenger, H. Howson 920,062
Car roof construction, L. G. Nilson 919,931
Car roof construction, freight, Queenan & Murphy 919,461
Car, semiconvertible, E. S. Bucknam 920,020
Car stake or spike, logging, D. W. Marsh .. 919,447
Car underframe, C. H. Howard 919,356
Cars, etc., life guard or obstruction remover for tram, J. Bowring 919,688
Card table, F. E. Faulkner 919,709