(12079) J. S. asks: Kindly tell me in your Notes and Queries column how to produce extreme cold by means of carbonic acid gas and ether. I have tried letting the gas run into a bag which has been wet with ether. I understand this to be the method. The result should be a kind of frappé effect to use for a freezing mixture. A. Carbonic acid gas has no action upon ether. No lowering of temperature would be expected from passing the gas through ether. If liquid carbon dioxide is allowed to escape from a tube into a bag, some of the liquid will be frozen and solid carbon dioxide will be found in the bag. Place this in a porcelain crucible and pour ether into the crucible. A pasty solution of ether and the solid is formed with a great drop in temperature. Tyndall's "Heat as a Mode of Motion," which we send for $2.50, gives many experiments with solid carbon dioxide.

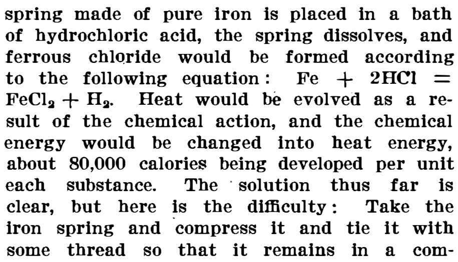
(12080) M. A. C. says: 1. In evaporation, does the water vapor formed crowd back the air? A. Carhart's "University Physics," vol. 2, will give you a correct view of the process of evaporation. There is no pushing back of the air by the molecules escaping from the surface of the water. There is plenty of room for them between the molecules of the gases of the air. 2. Does the air offer any resistance to evaporation of water? A. The air offers great resistance to the escape of water molecules into it—15 pounds to the square inch. In a vacuum water evaporates with violent boiling. It is the pressure of the atmosphere which keeps the water in the liquid form upon the earth. Otherwise all water would be in vapor in the space about the earth, as the air now is. 3. What is the best explanation of just how evaporation produces cold? A. The only explanation of evaporation is that heat changes water into vapor. The heat used for this work does not affect a thermometer, and is called the heat of vaporization. Since this heat must come from some other body, the surrounding bodies are made colder by the abstraction of heat from them to change the water into vapor. 4. Heat is defined as molecular motion. Does that mean that the amount of heat depends on the number of molecules striking a thermometer as well as their velocity? A. The more rapid the molecular motion, the higher the temperature of a body. More molecules would then strike a thermometer in a second, of course. They would also strike with a higher velocity. 5. In the expansion of gas against pressure, which is affected, velocity or number of molecules, in the change of temperature? A. In the expansion of a gas against pressure the velocity of the molecules is changed, and therefore the number of molecules per second passing a given point will also be changed. 6. Will you discuss the question if the expansion be into a vacuum? A. The expansion of a gas into a vacuum does not produce any cooling effect, since the expanding gas does no work in expanding. 7. What is the best explanation of a mixture of salt and ice producing cold? A. There is but one explanation of the action of salt and ice as a freezing mixture. The melting of the ice and salt is caused by the heat absorbed from the article to be frozen. The heat required to melt ice is very large, 80 calories per gramme. 8. What is the best explanation of rain being produced by a current of air striking a mountain? That is what cools the air? A. Warm air can hold more water vapor than cold air. When a warm current strikes a cold mountain side, the chilling of the air reduces its capacity for moisture and saturation is soon reached, after which the formation of rain drops begins. All these questions are treated in good textbooks of physics under heat. If you have not the Carhart referred to above, we can send you a copy for $1.75 prepaid.

(12081) A. E. W. asks: 1. Would you explain what is meant (when giving the caliber of small arms) by two numbers, as 45-90, 30-30, 25-20, and 56-50? I understand that there is a big difference in the size of calibers mentioned, and that the 25-20 is a bottle-shaped cartridge, but there is no apparent difference in the diameter of shell and ball of a 56-50. A. In giving the caliber of small arms by two numbers, 45-90, the first number stands for the caliber expressed in decimals of an inch (in your case 0.45 or 45/100), the second the number of grains of powder used in the charge. In the case of the 25-20 gun, the 25 stands for a repeating rifle, the 20 for a single shooter. The weight of the bullet is the same in both cases, but the repeater cartridge is enlarged to take a larger charge of powder. 2. What does the number giving the gage of shotguns mean? What part of an inch are they, or do they not represent some part of an inch or foot, 10, 12, 16, and 20 gage? A. The gage of the shotguns, as 10, 12, etc., is a survival of the old-fashioned nomenclature. In early days it was customary to find out how many spherical balls went to the pound weight. If 10, the gun was called a 10-gage gun. 3. Ice manufactured by a process, where cans of water to be frozen are immersed in a tank of brine, cooled by pipes carrying ammonia, there often appears a place in the center of the cake that is white or nearly opaque, sometimes looking like very small air bubbles. Would you explain the cause of the ice not being clear at the center as it is at the sides of the cake? I have been told that it was ammonia in the water, and some even claim that they can taste it, but I cannot see how that can be when the ammonia is confined in the pipes. I think it is a defect in the freezing. A. The white or semi-opaque place in the center of cakes of artificial ice is nothing more than what you say it looks like—air bubbles. The process of freezing excludes suspended air from the water, leaving it in the form of bubbles (as it often appears in natural ice) if steps are not taken to prevent it. In the can system of artificial ice making, the water is agitated while freezing to get rid of the bubbles, and as the ice forms from the outside inward, the outside and bottom end of the cake is generally clear. Sometimes, however, the agitation is not kept up long enough, as the block becomes nearly solid, and an accumulation of bubbles remains in the center near the top. You will notice that the white part you speak of is always at one end of a whole cake—the end which was uppermost as it stood in the can. There is no possibility for the ammonia from circulation pipes to reach the cans, the freezing of the latter taking place in brine, not ammonia, and elaborate tests of the purity of the ice water are regularly made in every properly conducted plant. The occurrence of this white core in plants using distilled water (from which the air is removed) as many now do is a sign of imperfect distillation or filtration, but not of such impurities as your friends suggest.

(12082) L. M. K. asks: 1. A tank of 5 cubic feet capacity is filled with a gas at 200 pounds pressure. How many cubic feet of gas will there be at 1 pound pressure? A. The answer to your first query is figured by the formula $P_1 V_1 = P V$, representing Boyle's law that the pressure of any gas is inversely as the volume and *vice versa*. In your case $P_1 = 1$ pound, $P = 200$ pounds, and $V = 5$ cubic feet. Substituting: $1 \times V_1 = 5 \times 200$, or $V_1 = 1{,}000$, i. e., a gas having a volume of 5 cubic feet at 200 pounds pressure (185.3 gage) would have a volume of 1,000 cubic feet at 1 pound pressure, or 13.7 below atmosphere. The above are absolute pressures, which must be used for the solution to be accurate by the formula; if you use gage pressures (pressures above atmosphere) add 14.7 pounds to both pressures before substituting in the formula. 2. To what pressure is it safe to compress a gas? A. A gas may be compressed to any amount according to circumstances, strength of container, temperature, etc., which you do not mention. All gases can be liquefied by sufficient pressure, their pressure becoming greatly reduced by liquefaction. 3. At what pressure is illuminating gas delivered to the consumers? A. Illuminating gas for domestic purposes is delivered at about half a pound pressure above atmospheric.

(12083) C. S. R. says: If a coiled spring made of pure iron is placed in a bath of hydrochloric acid, the spring dissolves, and ferrous chloride would be formed according to the following equation: $Fe + 2HCl = FeCl_2 + H_2$. Heat would be evolved as a result of the chemical action, and the chemical energy would be changed into heat energy, about 80,000 calories being developed per unit each substance. The solution thus far is clear, but here is the difficulty: Take the iron spring and compress it and tie it with some thread so that it remains in a compressed position. The spring now possesses potential energy as a result of this compression. Now place the spring, in this compressed position, in the HCl as before; the iron will dissolve as before, the spring all the time remaining compressed, because the thread is not acted on by the HCl. The question now rises, What has become of the potential energy the spring possessed? A. It appears to us that under the conditions you name there would be a liberation of heat in consequence of the tension of the spring. That is to say, if you provide two equal quantities of acid, and dissolve therein two springs exactly alike except that one is wound up and the other is unwound, there will be a greater liberation of heat by the dissolution of the spring under tension than of the other spring, the difference in heat representing the thermal value of the energy used in winding the spring. This question is very interesting, and has been discussed in our columns heretofore. We think it can be determined only by a careful experiment, coupled with quantitative measurements of the heat developed.

(12084) G. H. H. asks: I have here a mechanical problem, the solution of which I would like to see in your query column. Suppose we have two disks of equal diameter, each having ten blades projecting at equal



distances around the rim, as shown in above sketch. Now if one disk is made to revolve 10,000 R. P. M., while the other is stationary and in a position where one of its blades would come in contact with each of the revolving blades, there would be 100,000 contacts made per minute. Now if both disks were revolved in opposite directions, at exactly the same speed, 10,000 R. P. M., would the number of contacts remain the same, or would they be increased, and if so how much? A. Since by revolution of the left-hand wheel *A* at the same speed as that of the right-hand wheel *B*, each of the ten teeth of *A* touches one tooth of *B* once in every revolution, instead of only one tooth of *A* coming in contact with the teeth of *B*, as when *A* was still, it would appear at first sight that there should be ten times as many contacts as before; but whereas before one tooth of *A* was touched in each revolution of *B* by every tooth of *B*, now one tooth of *A* touches in each revolution only one tooth of *B*. The total number of contacts is therefore multiplied by ten and divided by ten, and remains the same.

(12085) E. M. S. asks: 1. Where does the largest supply of pearls come from? A. The best pearls as well as the largest quantity come from fisheries around Ceylon: see our article of April 24th. 2. How is a pearl valued? A. Pearls have a certain minimum value by weight above which their value varies more than that of any other gem through quite arbitrary conditions of form, color, perfection of "skin," lack of irregularity, etc. 3. Can pearls be made artificially? A. Imitation pearls are now made so well as to be detected with difficulty but are not identical chemically or physically with natural pearls as are artificial diamonds or rubies. 4. Does the voltage or the amperage destroy life in electrocution? A. A high voltage is required but as generally understood a fairly high amperage is the more essential. A very small current at 5,000 volts pressure may be taken with impunity from an induction coil whereas persons have been killed by large currents at pressures as low as 500 volts. 5. What is the meaning of the terms "cycle" and "frequency" in electricity? A. A cycle is one complete series of changes of the electromotive force in an alternating current. The voltage rises from zero to its plus maximum and falls through zero to the same negative value and back to zero in each cycle. The frequency is the number of complete cycles in a second. 6. Is there any difference in color between the water of the Red Sea and that of the Mediterranean? A. We should say that the difference is largely imaginary except in so far as the color is influenced by depth and the character of the bottom, which, in the Red Sea, is largely coral. 7. How many vessels pass through the Suez Canal? (8) Do they go through at night? A. Vessels pass through the Suez Canal in a continuous stream night and day, the canal being lit by powerful search lights. We have no recent figures as to the volume of the traffic but in 1904, 2,733 ships passed through the canal, with a tonnage of over eight million. The average time of passage is 18 hours. 9. How many kilowatts can a three-phase circuit of 7 strands of No. 6 wire cable transmit at 100,000 volts for a distance of 155 miles? and (10) what would be the amount of power lost in transmission? A. We cannot make this calculation without making you a charge. The subject occupies 100 pages in the Standard Electrical Engineer's Handbook, which we can send you for $4. We do not encourage lists of questions so long as the foregoing, which are no less trouble than the "examination papers" prohibited in our "Hints to Correspondents." Most of these questions could be answered from a dictionary and some from a school reader. The above are answered only on account of inquirer's address being probably remote from a library.

NEW BOOKS, ETC.

The Bullet's Flight From Powder to Target. By Franklin W. Mann. Milford, Mass.: Published by Munn & Co., 1909. Large 8vo.; pp. 384. Profusely illustrated. Price, $4.

This work deals with a subject the literature of which is not commensurate with its importance or interest, and it possesses unusual value, not only because it furnishes a large amount of information of a very practical kind, but because this information is the result of a practical experience on the part of the writer extending over a period of thirty-eight years. The author tells us that the results of his experiments as here given have been persistently and laboriously worked out with an earnest desire to assist his fellow craftsmen. In view of the fact that conjecturing and theorizing have been so prevalent in rifle literature, the work has been kept free from speculations, except where they have either been proved to be false or have been fully substantiated by recorded experiments. The first impression on glancing through this work is of the extrordinary number and value of the illustrations, which must average at least one to every two pages. Most of these are photographic reproductions of the results of actual tests. Particularly fine are those made of bullets before and after firing, and the large number of illustrations of carefully indexed targets against which firing tests had been made. The work has also been enriched with lettered line cuts and with halftone engravings of various experiments that throw light upon the questions discussed. Every page is full of interest and information for the rifle enthusiast. There is a full discussion of various kinds of rifles; of the effect of difference of length, of variations of rifling, etc., as well as of curious experiments, such as that of venting the barrel near the muzzle. An idea of the contents may be gathered from a few of the subjects treated, such as the Personal Element vs. Mechanical Rifle Shooting; Utility of Vented Barrels; High-Pressure Sharpshooting Powder; Telescope Mounts; Ruined Rifle Bores vs. Smokeless Powder vs. Primers; Accurate Ammunition Difficulties; Flight of Bullets. Gyration and Oscillation; Motions Executed by Normal Flying Bullets; Determining Rifle Twists; Kinetics of Spin, etc. In many respects this work is unique in the literature that has been published on this subject. It is thoroughly practical, and will be found to be of very real value to those who are engaged in a study of the ballistics of the rifle with a view to improving the all-round efficiency of that weapon.

Trigonometrische Längenbestimmung, Geodätischer Grundlinien. Von A. Tichy, Inspektor der K. K. Osterreichischen Staatsbahnen. Wien: Eigentum und Verlag des Osterreichischen Ingenieur und Architekten-Vereines, 1909.

The author of this monograph was commissioned in 1900 to devise a method of plotting the four great Alpine tunnels. He was instructed to abandon the conventional method of employing definite triangulation data, and to evolve an entirely new method based upon original data, the reason being that the older method was inapplicable for plotting tunnel lines in so mountainous a country. At that time the author was compelled to adopt a system of optical measurement based upon a qualified logarithmical method which seemed best adapted for the purpose. At the same time he developed another conception, and carried it out in practice, a method which would seem to be somewhat more exact than the qualified optical method in question. It was not until 1904 that this new measuring instrument was completed and actually employed. It is this instrument and its manner of use which Herr Tichy has thoroughly described in this monograph.

The South Americans. By Albert Hale. Indianapolis: Bobbs-Merrill Company, 1908. 360 pp.; 8vo.; fully illustrated with maps and photographs. Price, $2.50.

To anyone contemplating a pleasure trip to South America or around the coast of our sister continent, the perusal of this book can be confidently recommended as providing pleasurable instruction, which will greatly add to the reader's intelligent interest in sights to be seen. To exporters or others having trade relations with the South American republics desiring to improve the efficiency of their sales service by an intelligent sympathy with their customers the book should be equally valuable. The author says that he writes "with a North American pen but looking through South American eyes," but we should say rather that he looks through North American eyes carefully purged of any prejudicial point of view and with an admirable determination not to overlook the good points of his subject. Such a work, if it reaches the readers who most need it, cannot fail to promote the cause of international amity, without which the industrial development by foreign capital of immense areas of great productive possibilities cannot well progress; and no reader, even if prejudiced, can fail to be repaid for its perusal by the interest of the story. After some introductory notes in lighter vein but none the less interesting the author takes up in turn the geography, the history, the government and the people and present conditions of Argentina, proceeding to discuss in the same order the same topics with regard to Uruguay, Brazil, and Venezuela in turn. He continues with a general review of trade conditions and concludes with an admirable chapter on the Monroe doctrine. It is a suggestive comment on the influence of democracy that in discussing the weaknesses which all nations possess, the author refers most frequently, as traits of South America in general and Venezuela in particular, to those marks toward which the shafts of foreign critics of the United States are most frequently directed—bombastic oratory and "graft." To offset this we are told that gallant manners on the part of the lower orders from the beggar upward co-exist with "an aristocracy of wealth, education, and blood, usually all three," of neither of which we are frequently accused by visiting critics.

The American Handy Book of the Brewing, Malting, and Auxiliary Trades. By Robert Wahl and Max Henius, Ph.DD. Two vols. Chicago: Wahl-Henius Institute of Fermentology, 1908. 1,600 pp.; 12mo.; ill.; tables; etc.

Most trades have their handbooks nowadays, engineering being blessed with the largest number, but though this is the only one we know of in reference to brewing and malting, there is no industry which has a more thorough handbook. It aims to be a pocket encyclopædia, by reference to which brewer, maltster, cooler, bottler, or anyone connected with the commercial end of brewing may find the answer to any question which may come up in his work without his having to wade through bulky textbooks and peruse quantities of information in search of a single item. This requires the condensation into the smallest compass of essential facts from a broad range of information covering arithmetic, algebra, physics, chemistry, rudiments of machinery, steam engines, and refrigeration, as well as practical details of brewing and malting, casking, bottling, and shipping; but so successfully was the work done, that the first edition was exhausted in a year, and the second larger one in a few years more. The present third edition includes the improvements in brewing and malthouse operations due to the recent developments of electrical machinery, and gives a new chapter on electricity and magnetism. A new chapter is also included to cover recent botanical studies of barley, and the chapters on Mechanics and Power are rewritten, while only the tables have been retained from the chapters on Arithmetic and Algebra. The printing and general appearance have been much improved by division of the work into two volumes on better paper, the division being so arranged that few individuals in the brewing trades requiring the volume as a pocket companion will not find all they need, each for his particular specialty, in one volume. Of the allied processes discussed, refrigeration is better treated than in any pocket book we know of the same scope, and in a general way the work retains its character as a model handbook in its line.

DYNAMO, MOTOR, AND SWITCHBOARD CIRCUITS FOR ELECTRICAL ENGINEERS. By William Rushton Bowker. Second Edition. New York: D. Van Nostrand & Co., 1908. 8vo.; pp. 168; 130 figures. Price, $2.50.

The special object of this book is to present the subjects indicated by the title in a non-mathematical way, and as viewed from the practical standpoint. The author originally had in view the needs of the student preparing for the City and Guilds of London examinations in electrical engineering, and for this reason the work covers certain important sections of the Syllabus of the Ordinary and Honor Grades. However, this would make it no less valuable to the American student and practical engineer. In the present second edition two new sections have been added to furnish information in regard to central-station layouts. This renders the book particularly useful to central-station engineers and their assistants.

ELEKTRISCHE UHREN. Von Dr. A. Tobler, Dozent am Eidg. Polytechnikum in Zürich. Zweite Auflage, bearbeitet von Johannes Zacharias, Ingenieur, Mit 120 Abbildungen.

Since the publication of the first edition of Zacharias' "Electrical Clocks," the technique of the art has advanced to such a degree that a new edition seemed necessary. Wall clocks, and even timepieces in which great accuracy is demanded, are now electrically driven. In order that the art might be fully covered it was necessary to omit electrical firm alarm apparatus which found a place in the first edition. In this volume, therefore, only electrical timepieces are described. In attacking the subject, the author has described first, electrical installations which are necessary to drive a clock train. He then passes to time telegraphs, recording apparatus, and finally discusses important inventions which have made their appearance in the last thirty years. Inasmuch as the data here presented have been collected largely as a result of personal intercourse with manufacturers, engineers and scientists, the book may be taken as an authoritative presentation of an interesting technical subject.

PRACTICAL CONCRETE BLOCK MAKING. By Charles Palliser. New York: Industrial Publishing Company, 1908. 75 pp.; 12mo.; fully ill. Price, 50 cents.

The author, though obviously somewhat prejudiced in favor of the concrete block from his years of successful experience in its manufacture, tells a convincing story going to show that much of the criticism applied to the block should more properly belong to the careless maker or the inadequate machine. The book is well written in clear, simple language, without any chemical or engineering formulæ, and explaining every technical term, so that any workman starting in the business for himself can understand every step of the operation of making good substantial concrete blocks. The author tells how to select molds and materials, how to find the right proportions of cement and aggregate, how to mix, make, and cure, and how to place the bricks in the wall, giving various methods of facing and practical hints on how to secure the best architectural effects.

THE PROBLEM OF AGE, GROWTH, AND DEATH. By Charles S. Minot, D.Sc. New York: G. P. Putnam's Sons, 1908. 280 pp.; 8vo.; ill. Price, $2.50.

Whereas this book deals with a series of biological problems, it is, as the author points out, essentially a study of a single phenomenon, the increase in the amount of protoplasm. The increase to be considered is not that distributed through the system of the growing organism, but that which occurs within the limits of a single cell. The ultimate object of all biology being the discovery of the nature of life, the author considered that the most promising opportunities for the attack of the problem lay in the study of observable changes affected by age in organisms, senescence being a qualification of living matter having no apparent parallel in the inorganic. It is an essential feature of life and therefore a useful guide to the proper aim of biology. If genius is properly defined as "an infinite capacity for taking pains" Mr. Minot's study may certainly be described as a work of genius. He explains the limitations under which he has labored, the great number of interesting by-paths revealed as he started along his chosen road which his other occupation prevented his following, and does not at all claim his book to be a complete treatise on the subject, but so far as it goes and within the limits indicated by the title the work is admirably thorough. For a number of reasons convincingly explained by the author but too long to be quoted, the guinea-pig was selected as the most convenient organism in which to study growth as a function of age typical of its phenomena in any other organism, and some idea of the painstaking nature of the study will be obtained from the statement that for long periods as many as one hundred guinea-pigs, kept under the most carefully co-ordinated conditions, were personally examined twice every day. The results obtained are by no means confined to guinea-pigs, the evidence obtained from them being compared with changes in the higher animals including man. The language is clear and to the point and free as far as possible from Greek and Latin scientific terms, making it as interesting to the layman as to the biological student.

LA SYNTHESE DES PIERRES PRECIEUSES. Par Jacques Boyer. Paris: Gauthier-Villars, Imprimeur Librairie du Bureau des Longitudes de l'Ecole Polytechnique, 1909.

This little monograph on the synthetic production of precious stones is one of the first attempts which we have seen in book form to present a general review of the manufacture of gems artificially. Mr. Boyer gives an historical *résumé* and discusses in detail the processes of Verneuil, Paquier, Paris, Moissan, and Hannay. The little book gives one a fairly good popular idea of the work which is being done in a comparatively new field of physical chemistry.

HYDRAULIC TABLES. Second edition, revised and enlarged. New York: John Wiley & Sons, 1909. 104 pp.; 8vo. Price, $1.50.

This new edition contains little alteration beyond correction of errors discovered in the first edition and could hardly contain any improvement, being already well known as the most complete set of hydraulic tables published. An interesting explanation of the derivation of the formula known by the name of the authors is given, and a table of discharge from high weirs is added in response to requests from users of the former edition.

AUTOMATIC SCREW MACHINES AND THEIR TOOLS. By C. L. Goodrich, Screw Machine Expert Pratt & Whitney Company, and F. A. Stanley, Associate Editor of the American Machinist. New York: Hill Publishing Company, 505 Pearl Street; 6 Bouverie Street, London, E. C. American Machinist, The Engineering and Mining Journal, Power and The Engineer. Octavo; pp. 255; illustrated. Price, $2 net.

The subject matter of this book naturally divides itself into two parts. One devoted to various types of machines and their construction, general tool equipments, methods of camming, etc., and the other to tools in detail and containing specific information on making and using these tools, the speeds and feeds at which they should be operated, and other particulars which will be of service to mechanics interested in screw machine work. In the chapters on camming, the book illustrates and describes in detail the different makes of automatic screw machines and turret lathes, including single-spindle, double and multiple spinning machines, magazine feed, and other types of machines for finishing castings, forging, etc., with full tables of speeds and feeds for different kinds of stock and for all classes of cutting tools.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending May 4, 1909,

AND EACH BEARING THAT DATE

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

Abrasive bodies having a porcelain base, fastening for, G. Jung ... 920,475
Abrasive wheel, H. L. Slager ... 920,199
Acetylene-generators, Feeding means for, J. M. Morris ... 920,607
Acid, manufacturing nitric, F. S. Valentiner ... 920,224
Acid, strontium salt of dibrom-behenic, E. E. Fischer ... 920,306
Adjustable wrench, O. C. Caldwell ... 920,536
Air-brake, F. B. Rae ... 920,389
Air-engine, A. E. Smith ... 920,202
Air-purifying apparatus, Kosak & Herz ... 920,584
Air-ship, J. Sinkovits ... 920,675
Air-ships, winged propelling and guiding mechanism for, J. U. de Uherkocz ... 920,792
Aluminum and other metals, extracting, H. S. Blackmore ... 920,893
Amalgamator, G. H. Loucks ... 920,880
Amusement device, W. P. Hayes ... 920,567
Animal-trap, I. Lawrence ... 920,765
Automatic switch, Schramm & Oswald ... 920,667
Automatic switch, J. T. De Moss ... 920,836
Automobile sparking mechanism, G. S. Hill 920,326
Awning, W. Sullivan ... 920,686
Awning-support and lock therefor, J. C. McNamara ... 920,618
Axle-spindle, self-lubricating, E. W. Hanna 920,736
Badge or ribbon fastener, A. O. Paulson ... 920,639
Bag-case, J. Oliver ... 920,632

Bag-fastener, L. Kaestner ... 920,578
Baker's peel, F. Schumacher ... 920,188
Ball used for golf and like games, J. H. Roger ... 920,653
Banding-machine, Wagner & Malecsay ... 920,698
Basket, J. B. Kenny ... 920,480
Bath-tub, C. F. Ike ... 920,575
Bean-sorter, O. Sutter ... 920,499
Bearing, ball-, C. R. James ... 920,149
Bearing, car-axle, G. A. Woodman ... 920,802
Bed and douche pan, D. Hogan ... 920,463
Bed-pan, M. E. Stores ... 920,211
Belt, metallic, H. L. Canne ... 920,537
Bench. See Washbench.
Bicycle crank-hanger, C. F. Kline ... 920,583
Bicycle support or stand, E. H. Stayt ... 920,785
Binder, temporary, F. P. Impey ... 920,146
Binder, temporary, G. C. Shepherd ... 920,780
Blacking and polishing machine, shoe, J. C. C. Scheer ... 920,884
Blank-shaping machine, C. W. Graham ... 920,131
Boat, hydroplane-, W. H. Fauber ... 920,849
Boats, electrical-current connection for, E. Westrom ... 920,229
Bobbin marking and coating machine, F. C. Hodgman ... 920,870
Boiler, M. Kelley ... 920,153
Boiler, H. O. Keferstein ... 920,479
Boiler-flue connection, D. B. Hines ... 920,743
Bolt-locking mechanism, split, W. W. Parsons ... 920,386
Bookcase, collapsible, J. H. Scott ... 920,670
Bottle-closure, J. Melisch ... 920,771
Bottle-closure, G. Waldmann ... 920,794
Bottle-molds, turn-table for, M. Nester ... 920,622
Bottle-neck-forming tool, W. S. Dorman ... 920,550
Bottle, non-refillable, A. L. Rudolph, Jr. ... 920,184
Bottle, non-refillable, M. Loftus ... 920,590
Bottle or receptable, heat and cold non-conducting, P. O. E. Fredrich ... 920,562
Bottle-soaking machine, S. L. Goldman ... 920,564
Bottle-stopper, C. A. Hunt, Jr. ... 920,338
Bottles, means for extracting the contents of, A. J. Farmer ... 920,121
Box-cover fastener, C. W. Ridpath ... 920,494
Braiding-machine, G. W. Sears ... 920,189
Braiding-machine, W. T. Le Blanc ... 920,589
Brake-head, J. M. Coleman ... 920,434
Brake mechanism, load-regulated, Forney & Schoenky ... 920,310
Brake-operating device, O. Pfander ... 920,643
Brakes, apparatus for adjusting railway-vehicle and like, V. Chaveriat ... 920,540
Breeching-strap fastener, L. C. Freeman ... 920,315
Brooch or the like, C. G. Armstrong ... 920,517
Brooder, poultry, H. N. Heilman ... 920,740
Brush, air, L. Forester ... 920,855
Brush-machine, H. J. Lebherz ... 920,588
Brush-makng machines, bristle-feeding means for, W. G. Liebig ... 920,355
Buckle for compressed bales, E. L. Hines. 920,328
Building-block and wall constructed thereof, S. Strong ... 920,212
Bundle-forming machine, A. J. Chesson ... 920,541
Burglar-alarm, W. N. Fawcett ... 920,123
Burglar-alarm, H. Spencer ... 920,681
Burner, J. J. Kelly ... 920,750
Butter-merger, B. N. Hawes ... 920,738
Button for cushion-seats, tufting-, L. A. Young ... 920,514
Button, separable, E. Noelle ... 920,380
Buttonhole-cutter, C. Anderson ... 920,238
Cabbage-core shredder, H. D. Wilson ... 920,799
Cabinet, douche-, Van Denburg & Gilsmann ... 920,225
Cabinet, filing-, J. J. Atkinson ... 920,243
Cables through pipe-lines, device for passing, H. A. Greenan ... 920,455
Calculating-machine, Dreyfus & Levy ... 920,840
Camera enlarging attachment, C. F. Adlon ... 920,516
Camera-stand, photographer's, J. E. Harrod ... 920,135
Cam-filling machine, H. A. Blakeslee ... 920,250
Can-filling machine, G. H. Mallett ... 920,597
Can-making machine, Ellefsen & Lambin. 920,291
Can top, powder-, A. M. Coons ... 920,273
Canning-table fruit-distributing apparatus, W. C. Anderson ... 920,712
Car, R. Dunning ... 920,287
Car construction, passenger-, G. W. Lillie ... 920,594
Car-door operating mechanism, electrically controlled street or railway, H. Rowntree ... 920,183
Car, dump-, T. R. McKnight ... 920,616
Car, railway steam motor-, T. H. Curtis ... 920,114
Car-underframe, A. E. Ostrander ... 920,384
Car-underframe, A. Becker ... 920,813
Car underframe, freight-, W. J. Lage ... 920,759
Cars, controller-checking device for street-railway, N. Fallek ... 920,300
Cars, rotary wheel-guard for, F. E. Hutchings ... 920,467
Carbid, treatment of, A. R. Frank ... 920,857
Carbureter, J. W. Wood ... 920,511
Carbureter, automatically governed. O. Pfander ... 920,642
Carbureter for internal-combustion engines, H. Z. White ... 920,231
Carding-engine, E. Gessner ... 920,862
Carpet-rug beater, A. F. Lewis ... 920,772
Carrier. See Sack-carrier.
Cartridge belt or bandoleer, F. R. Batchelder ... 920,413
Case or cabinet having sliding doors, C. F. Kurz ... 920,158
Cash-register, Cleal & Macauley ... 920,110
Cask-making machine, J. Gilmour ... 920,730
Caster, adjustable, J. Sharon ... 920,673
Casting blocks and other pieces, diminishing the formation of flaws or blow holes when, A. von Paravicini ... 920,638
Casting machine, line, J. McNamara ... 920,617
Ceiling construction, metal-, R. Goho ... 920,563
Cellulose material, making, Cross & Briggs 920,828
Cement-burning apparatus, H. S. Spackman ... 920,784
Cement posts, wire-holder for, P. Wachtel. 920,407
Chain grip systems, switch for automatic cable, G. S. Fouts ... 920,856
Chain-motor, L. W. Merriam ... 920,361
Chair, A. H. Clark ... 920,542
Chair attachment, rocking-, N. Evans ... 920,298
Change-making machine, L. J. Dittmar ... 920,281
Cheese, etc., apparatus for determining the amount of moisture in, Mitchell & Walker ... 920,773
Chimney-hood, adjustable, S. Neiburger ... 920,621
Chuck, self-tightening rock-drill, J. A. Thompson et al ... 920,788
Churn, W. L. Pratt ... 920,645
Cigar cutter and cleaner, Saul & Evans ... 920,395
Circuit-breaker, L. C. Steele ... 920,208
Clamp, T. Lucier ... 920,357
Clock winding mechanism, electric, F. H. Feraud ... 920,124
Clutch, T. F. Philippi ... 920,176
Clutch, interlocking friction-, F. B. Smith ... 920,203
Clutch mechanism, Z. P. Candee ... 920,726
Clutch mechanism, Duryea & Remington ... 920,841
Coat-hanger, S. W. Bonsall ... 920,894
Coffee-roaster, E. E. Burnham ... 920,428
Coin-receiver, M. W. Piper ... 920,177
Coke-ovens, regenerator system for by-product, H. Prentice ... 920,647
Collar-support, J. Kelley ... 920,342
Compass, A. Laube ... 920,587
Compasses or dividers, C. E. Hand ... 920,461
Concrete-block machine, L. Flanagan ... 920,851
Concrete construction, C. F. Lancaster ... 920,160
Concrete culverts and bridges, portable mold for, A. J. Fisher ... 920,448
Concrete-mixer, C. E. Bathrick ... 920,416
Concrete pipe, mold for making cement, H. H. Gardner ... 920,317
Condenser, H. Lemp ... 920,591
Conduits, device for removing obstructions in, T. J. Cope ... 920,544
Conduits for electric wires, connector for, G. E. Neuberth ... 920,169
Conveyances, impelling mechanism for, B. F. Seymour ... 920,191
Cooker, P. G. Hubert ... 920,330
Cooker, fireless, P. G. Hubert ... 920,329
Cooking apparatus, heat-accumulator for self-, E. Blasberg ... 920,719
Crane ladle or double-trolley electric, Taylor & Brosius ... 920,215
Crate, banana, L. D. Fowler ... 920,311
Crate, folding, L. E. Lane ... 920,162
Crate, folding, W. N. Luft ... 920,358
Crate-side machine, J. Eklund ... 920,290
Cream-separator, centrifugal, P. L. Kimball ... 920,481
Cultivator or harrow frame, T. C. West ... 920,408
Current-collecting apparatus, J. E. Noeggerath ... 920,627
Current motor, alternating-, E. F. W. Alexanderson ... 920,896
Curtain-support, E. S. Dinkel ... 920,440
Cuspidor, W. C. Bridges ... 920,722
Cutter-head, M. H. Dette ... 920,549
Damper for feeding air to combustion-chambers, smoke-flue, G. I. Munson ... 920,369
Damper, stovepipe-, J. M. Tribur ... 920,694
Darning outfit, S. S. Neely ... 920,620
Dash-pot, Blankenship & Sherwood ... 920,251
Decoration, interior, H. C. Leslie ... 920,593
Dental castings, appliance for making, A. P. Lee ... 920,483
Dental cuspidor, M. N. Callender ... 920,265
Dental-inlay-casting machine, E. M. Fredericks ... 920,561
Dermal-treatment apparatus, Behm & Rempt ... 920,814
Disinfecting device, G. W. & C. W. Allen. 920,711
Display and cover attachment for barrels, casks, or other receptacles, sanitary, L. F. Kaltwasser ... 920,579
Display apparatus, E. F. Cannon ... 920,538
Display-rack, E. A. Cummings ... 920,829
Display rack, garment, B. Siegel ... 920,197
Distillation-furnace, W. M. Johnson ... 920,473
Dock, floating dry, W. T. Donnelly. 920,282 to 920,286
Door-closng mechanism, sliding, W. Keating ... 920,477
Door-locking mechanism, emergency-exit, P. H. McEwan ... 920,375
Door-spring, O. Gunther ... 920,323
Dough-mixer, R. Marchand ... 920,484
Draft attachment, wagon, W. F. Schoepflin. 920,398
Drag, road-, D. C. Boyd ... 920,422
Draw-box, E. H. Rooney ... 920,655
Drill-press work-holder, P. E. Reece ... 920,493
Drinking-fountain, C. A. Carothers ... 920,266
Drying-machine, hot-blast, W. H. Lamb ... 920,585
Dye, trisazo, Jordan & Neelmeier ... 920,151
Eccentric, R. M. Clark ... 920,543
Egg-tester, D. W. Hopkins ... 920,464
Electric conductors, perforated block for, F. R. McBerty ... 920,614
Electric-lighting system, J. L. Creveling ... 920,827
Electric-machine, dynamo-, J. E. Noeggerath ... 920,626
Electric machine, dynamo-, W. L. R. Emmet ... 920,845
Electric machine, dynamo-, H. F. T. Erben 920,846
Electric machines, cooling dynamo-, J. G. Callan ... 920,725
Electric machines, pole-piece for dynamo-, L. E. Underwood ... 920,886
Electric motor, reciprocating, C. W. Tremain ... 920,222
Electrical appliance, J. S. Stewart ... 920,786
Electrical power distribution, panel board for, A. C. McWilliams ... 920,490
Electrical protective device, C. A. Rolfe ... 920,778
Electricity meter, changeable rate, A. Nicol 920,623
Elevating device, A. F. Meyer ... 920,602
Elevator, C. H. Ocumpaugh ... 920,630
Elevator safety device, P. H. Costello ... 920,437
Elevator safety lock, E. J. Brown ... 920,820
Embroidering machine, tension device for the thread delivery rollers in, R. Zahn 920,233
Engine. See Air engine.
Engine, L. H. Marcil ... 920,165
Engine starting device, explosion, H. C. Bailey ... 920,411
Engine starting device, explosive, J. Zagora 920,515
Engine steering gear, traction, F. T. Flinchbaugh ... 920,125
Engine, timing device for explosive, Lamont & Steers ... 920,159
Envelop fastener, J. H. Husted ... 920,466
Etching machine, L. E. & M. Levy ... 920,766
Examination, operating, or treatment table, E. W. Thomas ... 920,500
Expansion tank, J. R. Shanklin ... 920,672
Explosive engine, J. W. Smith ... 920,405
Explosive engine, M. Berliet ... 920,417
Eyeglasses, E. H. Schild ... 920,666
Fabrics, apparatus for stretching textile, F. Farnworth ... 920,122
Face bleach, E. J. Clark ... 920,824
Fair leader, E. D. Roberts ... 920,394
Fare receipt, railway cash, G. M. Rose, Jr. 920,182
Faucet, dispensing, E. E. Murphy ... 920,612
Feed box, J. M. Hannibal ... 920,865
Feeder, poultry and hen, J. D. O'Connell ... 920,381
Feeder, stock, C. A. Wright ... 920,806
Fence post, composition, C. J. Welty ... 920,888
Fence stay wires, apparatus for applying, W. W. Hardy ... 920,737
File, bill, E. M. Shreiner ... 920,402
File, bill, J. G. Henderson ... 920,867
File, temporary binder, loose-leaf book, etc., J. Walker, Jr. ... 920,508
Film developing machine, R. L. Burton ... 920,263
Filter, metallurgical, Hedges & Allingham 920,739
Fire bar tilting mechanism, W. R. Peat et al. ... 920,640
Fire escape, N. Slavin ... 920,200
Fire escape, Erwin & Meyer ... 920,296
Fire extinguisher, automatic, Kast & Lathrop ... 920,340
Fire extinguisher with expansion device mounted on the discharge pipe, chemical, W. Graaff ... 920,454
Fire extinguishing installation, Sheppard & Chatterton ... 920,885
Fire pails and other articles, safety locking device for, T. F. Mullaney ... 920,368
Fire screen, G. A. H. Briggs ... 920,423
Firearm, automatic, Farquhar & Hill ... 920,301
Firearm, magazine, T. A. Fidjeland ... 920,303
Firearm sight, Hightower & Burrell ... 920,137
Firearms, illuminated sight for, Deere & Jaderborg ... 920,278
Firearms, safety device for the triggers of, H. Stephan ... 920,682
Fishing tackle box, J. M. Kersey ... 920,751
Flue cutter, S. T. Boyd ... 920,254
Flue cutter, A. Frykman ... 920,451
Fluid pressure brake, W. V. Turner ... 920,504
Fluid pressure controller, T. O. Perry ... 920,491
Fluid pressure regulator, C. C. Farmer ... 920,447
Fluid pressure regulator, A. G. Beckman ... 920,716
Flushing tank, J. L. Fruin ... 920,126
Flute, H. W. T. Jenner ... 920,471
Fly trap, H. Turner ... 920,696
Flying machines, surface of ascension or aeroplane for, A. P. Filippi ... 920,554
Folding chair or seat. Remsen & Bachwitz 920,650
Folding table, B. Boeswinkle ... 920,253
Food, manufacturing cattle, T. E. Breyer. 920,108